Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

IOC-UNEP-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs)

Seventh Session

Paris, France
5–6 July 2005

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Abstract

The Seventh Consultative Committee Meeting on Large Marine Ecosystems (LMEs) was held on 5–6 July 2005. The consultation was convened by the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the US Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) , the World Conservation Union (IUCN), and the United Nations Environment Programme (UNEP). It was hosted by IOC at UNESCO Headquarters, Paris, France. The meeting was co-chaired by the IOC Executive Secretary, Dr Patricio Bernal and Dr Kenneth Sherman of NOAA. The meeting agenda is given in Annex I and a list of attendees in Annex II.

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1. INTRODUCTION

Dr Kenneth Sherman called the meeting to order at 9:00 a.m. on Tuesday, July 5, 2005, and welcomed the 34 participants to the LME meeting. He reported on the LME partnership with the UNEP-Regional Seas Programme and Global Programme of Action (GPA) for the Protection of the Marine Environment from Land-Based Activities. The Regional Seas Programme has a long history of bringing countries together to draft legal instruments for reducing ocean pollution. The new partnership is an opportunity to translate UNEP's Regional Seas Programme into concrete actions through the use of LMEs as operational management units, to reduce coastal pollution, restore damaged habitats and recover depleted fishery stocks. LME Projects in support of the UNEP Regional Seas Programme will integrate land-based sources of pollution activities with the LME modular assessment strategy. The 5-module LME approach applies suites of indicators for measuring changing ecosystem conditions focused on changes in productivity, fish and fisheries, and pollution and ecosystem health. The challenge now being addressed is to develop scientific indicators for socioeconomics and governance as well.

The Global Environment Facility (GEF) is a funding agency that assists developing nations in applying the ecosystem approach to the assessment and management of marine resources and their environments. The GEF has now increased funding for GEF-LME projects from US$ 650 million to an unprecedented level of US$ 1.8 billion. An additional US$ 200 million in grants and loans is being directed to countries of sub-Saharan Africa committed to ecosystem-based sustainable fishery management practices, bringing the total of GEF-World Bank funding support of LME projects to US$ 2 billion. NOAA will be providing scientific and technical assistance to UNEP in modifying existing GEF-supported projects based on land based sources of pollution into more ecosystem-based assessment and management projects. This is a unique opportunity made possible by the combined expertise of the LME network of marine resource specialists representing the Intergovernmental Oceanographic Commission (IOC), UNEP, the World Conservation Union (IUCN), the National Oceanic and Atmospheric Administration (NOAA), the UNDP and UNIDO.

Dr Patricio Bernal, Executive Secretary of IOC-UNESCO, stated that the LME Consultative Committee meeting was the 7th that the IOC had helped to organize and host, in which the different LME Projects are brought together for exchanges of information and perspectives. He noted the importance of the adoption by the Global Environment Facility (GEF) of an LME strategy, in country-driven LME projects that are moving toward the introduction of an ecosystem-based approach to the assessment and management of marine resources. In addition, participating countries are making significant improvements in their management and governance institutions. Several years ago, UNEP began to develop an approach to a Global International Waters Assessment (GIWA), based on the assessment of conditions within 66 regions around the globe. This initial effort is now being completed, and a follow-on effort is under consideration by the United Nations. The IOC and UNEP have been tasked by the U.N. to take the lead in this effort, which is to be an assessment of global ocean assessments. In the development of the "assessment of assessments" approach, IOC and UNEP will be examining closely the results of the GEF-LME projects wherein it has already been demonstrated that a multi-sectoral ecosystem-based approach to the assessment and management of marine resources and their environments is achievable and practical.

2. LME PARTNERSHIP WITH THE UNEP-REGIONAL SEAS PROGRAMME

Martin Adriaanse, representing the UNEP/Global Programme of Action (GPA) for the Protection of the Marine Environment from Land-Based Activities (UNEP Office in The Hague), reported on the recently-established NOAA-LME partnership with the UNEP-Regional Seas Programme. UNEP's Regional Seas Programme, established in 1974, has developed regional action-oriented programmes and legally binding regional conventions for countries bordering the 18 Regional Seas. In 1982, UNEP began to address issues related to impacts on the marine environment from land-based activities. The response to intense pressures put on coastal systems was the 1995 Washington Declaration, in which governments and countries adopted a GPA Program. In 1998, the GPA Coordination Office was established in The Hague. In 2001, an intergovernmental review meeting took place in Montreal to review the implementation of the GPA. The meeting took note of the causative relationship between poverty, human health, unsustainable consumption and production patterns, poorly managed social and economic development and environmental degradation. It highlighted the urgent need to integrate coastal zone management with river basin management and land-use planning, and to support poverty alleviation, human health and food security. A major outcome of the 2001 meeting was the Montreal Declaration on the Protection of the Marine Environment from Land-based Activities (see the full text of the Montreal Declaration at http://www.gpa.unep.org/igr/Montreal-Declaration).

LMEs and the UNEP-Regional Seas Programme are a good fit: the coordination office of the Regional Seas and GPA promote ecosystem-based management. NOAA's LME Programme offers a flexible approach to ecosystem-based management by identifying driving forces of change. LME projects in developing countries are funded by the Global Environment Facility (GEF), a funding agency that partners with national and international agencies to meet the 4 ecosystem-related WSSD goals to: achieve substantial reductions in land-based sources of pollution by 2006; introduce an ecosystems approach to marine resource assessment and management by 2010; to designate a network of marine protected areas by 2012; and to maintain and restore fish stocks to maximum sustainable yield levels by 2015. When adopting the GPA the participating countries are expected to take into account regular assessments of the state of the marine environment; and to deal with all land-based impacts, specifically from sewage, persistent organic pollutants, radioactive substances, heavy metals, oils (hydrocarbons), nutrients, sediment mobilization, litter, and the physical alteration and destruction of habitats. The 2006 UNEP-sponsored intergovernmental review meeting to take place in Beijing will examine the state of the marine environment as it relates to GPA issues.

The NOAA-UNEP partnership is focused on activities to develop the capability to measure progress in ecosystem sustainability; to create policy based on millennium development goals, which include the goal to halve between 1990 and 2015 the proportion of people who suffer from hunger; to integrate the principles of sustainable development into country policies; and to provide linkages with the agricultural sector and between catchment areas and coast. The UNEP global coastal assessments are provided by the results of the Large Marine Ecosystems Programme, the Millennium Ecosystem Assessment (MA), the Global Environment Outlook (GEO), the LOICZ Synthesis, and the Global International Waters Assessment (GIWA). For more information on the LOICZ Synthesis and Integrated Coastal Zone Management, see http://ioc.unesco.org/icam/. The LME/UNEP Regional Seas partnership is undertaking the production of a report on the general ecological condition of LMEs as operational management units within the UNEP designated Regional Seas.

3. LMES AND PROTECTION OF THE ARCTIC MARINE ENVIRONMENT (PAME)

The importance of goods and services of the marine Arctic was presented by Tom Laughlin, NOAA International Affairs, and Soffia Gudmundsdottir, PAME Executive Secretary, in their description of the mandates for the Protection of the Arctic Marine Environment (PAME) Working Group, and their terms of reference for introducing an ecosystem-based approach to the assessment of changing states of Arctic ecosystems. Tom Laughlin outlined the US role in ecosystem-based management in the Arctic, and explained that the Arctic Council Ministers, in a 2002 declaration, recognized that "existing and emerging activities in the Arctic warrant a more coordinated and strategic approach to address the challenges of the Arctic coastal and marine environment." The Council has agreed "to develop a strategic plan for protection of the Arctic marine environment under the leadership of PAME", a working group of the Arctic Council. The PAME work plan (2004-2006) is to initiate the identification of ecosystems in the Arctic, and the identification of indicators of ecosystem health and ecosystem objectives. PAME will conduct a comprehensive and integrated Arctic marine shipping assessment. This assessment, due to be completed by 2008, will be conducted by Canada, Finland and the US. In the Arctic, "the average extent of sea-ice cover in the summer has declined by 15-20% over the past 30 years. This decline is expected to accelerate, with the near total loss of sea ice in the summer projected for late this century" (ACIA, 2004). The US has volunteered to lead or co-lead all ecosystem components of the work plan. Fifteen LMEs in the North Polar Region have already been identified. LME delineation is based on the 4 ecological criteria of bathymetry, hydrography, productivity and trophic linkages. There is a need to review the already designated Arctic LMEs, and to compile more information on the boundary features for these LMEs. The US, as the leading PAME country for introducing the ecosystem-based management approach, has been tasked by PAME to organize a Steering Group for planning and implementing LME-based management.

Soffia Gudmundsdottir provided information on the small indigenous and non-indigenous communities living in the Arctic that are heavily dependent on the Arctic living marine resources. The Arctic Council was described as an intergovernmental forum addressing many of the common concerns and challenges faced by Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the USA. There are five working groups of the Arctic Council including PAME. More than 20 treaties and agreements cover the Arctic area. PAME is an independent partner of the UNEP Regional Seas Programme. Its international secretariat has since 1999 been located in Iceland. Several countries and groups of countries are engaged in scientifically-driven management of marine ecosystems, including Norway, with an integrated approach similar to the LME approach.

4. LME – ICZM LINKAGES AND INDICATORS

4.1 GEF-LME PROJECTS AND INTEGRATED COASTAL ZONE MANAGEMENT

Dr Biliana Cicin-Sain, University of Delaware, is co-chair of the Global Forum on Oceans, Coasts and Islands, which mobilized in 2001 to put oceans, coasts and SIDS on the WSSD agenda (see www.globaloceans.org). She reported on the need for closer integration with the Coastal Zone Management community to ensure that allowances are made for proper jurisdictional scaling within LMEs in general and in the near coastal areas in particular. She reported declines in marine resources and ecosystems, with 76% of global fisheries and 70% of marine mammal species in trouble, 58% of coral reefs (on which 50 million people depend for food and income) under threat, and 46 million people at risk every year from flooding. She noted the lack of socioeconomics data, continuance of poverty and unhealthful conditions in the coastal communities of the developing world, and the existence of governance gaps at all levels, sub-national, national, regional and global. She noted that 120 countries are presently engaged in integrated coastal management (ICM) projects, as compared to 59 in 1992. More countries are engaged in Europe, North America, and

East Asia, less in Oceania, the Caribbean, Africa, the Near-East and Latin America. In many cases, ICM is donor driven. Coastal Management needs to scale up to larger parts of the coastal zone. Regarding linkages between coastal management and watershed areas, about 40 countries have national action plans under the Global Programme of Action (GPA) for the Protection of the Marine Environment from Land-Based Activities, in which UNEP has been tasked to lead the coordination effort. Questions put to the Meeting were: 1.) How do LME projects help national authorities to develop harmonized national and regional ocean and coastal management policies; 2.) What is the LME synergy with the work of the Global Forum on oceans, coasts and islands, with GEF funding dedicated to SIDS, countries with economies in transition, and developing countries? Answering the first question, Professor Chidi Ibe, Programme Manager for the Guinea Current GEF-LME Project, mentioned the Accra Declaration as a high-level ministerial declaration that first expressed the necessity of ocean policy across the Guinea Current LME region as a whole, and established linkages between land-based activities in the watershed area, coastal activities and LMEs. The GEF-LME projects promote coastal management from a place-based LME 5-module approach that seeks to recover depleted fish stocks, restore degraded habitats and control and eliminate coastal pollution.

4.2 INDICATORS FOR INTEGRATED COASTAL ZONE MANAGEMENT

Dr Robert Siron, of the Department of Fisheries and Oceans, Canada, presented the Canadian approach to indicators for Integrated Coastal Area Management (ICAM) purposes. Several agencies, including the IOC, the University of Delaware, NOAA and the Canadian Government, were involved in the preparation of an indicator "Handbook for measuring the progress and outcomes of integrated coastal and ocean management". ICAM indicators in the handbook include social, economic and ecological considerations, and governance performance. Dr Siron stated that there are about 700 ICAM efforts and projects taking place in approximately 120 countries of the world. A special issue of Ocean & Coastal Management (2003) reported on the IOC-DFO-NOAA Workshop on the role of indicators in integrated coastal management, which took place in Ottawa, Canada, in 2002. The ICAM methodology is a dynamic process that integrates "top-down" (properties of the ecosystem) and "bottom-up" approaches (human activities of concern) in identifying ecosystem components and developing specific objectives. It seeks to integrate governance, socioeconomics and ecological dimensions through "menus" of indicators that are cross-walked through the 3 dimensions. The next step is to test these indicators in projects taking place in Canada, the USA, Chile, Belize, France, China, Tanzania and Mozambique. Regarding Canadian delineations in the Arctic, a workshop was held to identify Canadian marine ecoregions to be used as a basis for integrated oceans management. The criteria for delineation were geological, pertained to physical oceanography, and to biological properties.

5. REPORTS ON THE PLANNING AND IMPLEMENTATION OF LARGE MARINE ECOSYSTEM ASSESSMENT AND MANAGEMENT PROJECTS

The Committee welcomed a series of presentations on the status of LME planning and implementation for projects around the globe.

5.1 GUINEA CURRENT LME

Dr Chidi Ibe, Regional Director of the Guinea Current LME Project, advised the Committee of a Project that is now extended over the entire spatial dimension of the Guinea Current LME and includes the participation of 16 countries, Sierra Leone, São Tomé and Principe, Liberia, Equatorial Guinea, Guinea, Guinea-Bissau, Gabon, Democratic Republic of the Congo, Congo, Angola, Benin, Cameroon, Côte D'Ivoire, Ghana, Nigeria, and Togo. He stated that the GCLME is a productive and resource-rich ecosystem with widespread upwelling areas serving as spawning and nursery

grounds for skipjack, yellowfin and bigeye tuna, as well as for small pelagic fish species. Threats to fish production are: 1.) The overexploitation of fishery resources, the use of destructive fishing practices and the destruction or modification of ecosystems and; 2.) The conflict between artisanal and industrial fisheries and poaching. The socioeconomic impacts of loss of fisheries for local populations are income reduction, loss of employment, population migration, conflicts between user groups, loss of recreation opportunities, a decline in protein intake, lack of food security and social upheavals in the region. LME-wide transboundary issues are the loss of income from the regional and global trade of marine products, a region-wide decrease in marine biodiversity, destructive fishing techniques, an increase in catch effort on pelagic species such as tuna and sardinella, and general non-compliance with the FAO Fisheries Code of Conduct. However, the 16 countries are agreed on how to resolve the problem of fish depletion and are moving forward with programme objectives that include comprehensive and extensive surveys and assessments to support management actions for the recovery and sustainability of the GCLME fisheries, restoration of mangroves, and reduction and control of pollution.

Dr Ibe outlined the history of the fisheries assessments and survey and vessel programme in the region. Prior to the initiation of the GCLME project, fish stock surveys with one exception had only limited and intermittent coverage in space and time and were carried out by individual countries or groups of countries including the former colonial powers. The one exception was the Guinean Trawling Survey of 1963 and 1964, the only comprehensive and extensive survey carried out in the region (described by Williams 1968). The results, however, on the whole, of occasional surveys were limited, since they dealt with only parts of the ecosystem, and were insufficient to present fishery managers with the database necessary for a sustainable management of the fishery resources. Such one-off surveys, as discussed by Van der Knaap in 1985 and Oliver and Miquel in 1987, were not able to detect shifts and possible biodiversity changes in the ecosystem. Consequently, it was deemed essential that GCLME surveys of the fish and fisheries of this ecosystem be conducted to provide the needed information for the management of fishery resources from an LME perspective and in the context of economic and scientific cooperation in the region. Three surveys have taken place (R/V *Antea*, R/V *Sussainah*, R/V *Nansen*). The first two surveys were carried out under the Gulf of Guinea LME Project, which formed the basis for common regulatory actions within the region. For instance, the decision to drastically limit the registration of new fishing vessels, except for tuna vessels, in the Gulf of Guinea LME countries was a good example of corporative decision making and joint action.

The R/V *Nansen* survey was conducted with 13 member countries of the GCLME Project. The surveys collect plankton and assess the abundance and distribution of the pelagic and demersal fish species. The survey objectives are to determine the seasonal, temporal and spatial (including bathymetric) distribution of fish using the swept area method; measure the total length and weight of principal fish species; collect zooplankton and phytoplankton samples for biodiversity and biomass assessments; sample stomachs for a determination of food and feeding habits; sample gonads of fish species for sex and other reproduction patterns; collect oceanographic parameters such as temperature, salinity, dissolved oxygen, pH and turbidity; and analyze nutrients. The results from the surveys already carried out in the GCLME region show an increase of catch rates in inshore waters. The higher fish density in the near coastal areas is explained by the associated high productivity. Bainbridge (1960) reported the existence of large standing crops of phytoplankton and high rates of carbon fixation in shallow coastal lagoons and estuaries of West Africa throughout most of the year. This high primary productivity supports an abundant biomass of small pelagic fish species in the near coastal areas. Assessments of the abundance and distribution of fish species in relation to environmental conditions are used in the estimates of biomass, and the establishment of total allowable catch levels to promote fish stock recovery and achieve sustainable yield levels.

Fish and fisheries indicators for the Guinea Current LME Project include: (1) biological indicators (diminution of CPUE, reduction in the length of first sexual maturity, reduction of average size of fish at landing, commercial extinction of certain fish species not linked to pollution or change of habitat, fishing down the food web, and reduction of resource biomass); (2) physical indicators (increasing encroachment of industrial fisheries into artisanal fishing grounds); and (3) technological indicators (changes in fishing techniques, the recent introduction of pair trawling in Ghana and Cameroon, and changes of fishing gear from simple mesh size net to multi-mesh size gillnet in artisanal fisheries). For the GCLME a sustainable fishery is defined as one in which fishing can continue at a level that does not deplete the target population, and allows it to recover to healthy levels from past depletion. A sustainable fishery maintains and maximizes ecological health and abundance; maintains the diversity, structure and function of the ecosystem on which it depends as well as the quality of its habitats, minimizing the adverse effects it causes; maintains present and future economic and social options and benefits; is conducted in a socially and economically fair and responsible manner; and is managed and operated in a responsible manner, in conformity with local, national and international laws and regulations.

5.2 BENGUELA CURRENT LME

Dr Michael O'Toole, chief technical advisor for the Benguela Current LME (BCLME) Project, presented the Committee with a briefing on the successful implementation of activities. The project involves three participating countries (Angola, Namibia, and South Africa) bordering an LME characterized by a uniquely high productivity, pristine waters, and valuable resources (oil, diamonds, fisheries). The project's development goal is to sustain the ecological integrity of the BCLME through integrated transboundary ecosystem management. The cold Benguela Current is positioned between two warm water currents, the Angola Current and the Agulhas Current. Environmental status indicators are provided by productivity and carrying capacity data, and by an early warning system for monitoring outbreaks of harmful algal blooms through monitoring buoys. Recent satellite data shows the widespread and complex distribution pattern of a bloom of the small dinoflagellate *Prorocentrum triestinum* in the Namaqua Shelf region. There are regional monitoring lines for zooplankton off the coasts of South Africa, Namibia and Angola. The Continuous Plankton Recorder (CPR) and the Aquashuttle, developed by the NOAA-NMFS Laboratory in Narragansett and by the National Oceanography Institute in the U.K., will soon be deployed in the BCLME, with training to be provided by the Narragansett Laboratory. A proposed Atlantic Eastern Margins CPR Transect will monitor the Guinea Current LME to Angola and the Benguela Current from Angola to South Africa in the Fall of 2005, using the MV *Tugela.*

The BCLME Programme is focusing project activities on the ecosystem's fish and fisheries. Fisheries resources have been over fished by foreign fleets from the European Union and the countries of the former Soviet Block off the coast of Namibia. Shared stocks in the BCLME include hake, pilchard, horse mackerel, deep sea crab, rock lobster, sardinella and sharks. In the early 1990s a serious collapse of the transboundary hake stock impacted the stocks of seals whose numbers were low in 1994-1995 off the coast of Namibia. Hake is a valuable economic resource across the entire BCLME. The collapse was followed by a rapid recovery of both hake and seals. Following the hake collapse, the national governments adopted an ecosystem approach to fisheries management. The three countries are conducting surveys of shared stocks and are also harmonizing their ecosystem surveys and assessment methods.

Regarding pollution and ecosystem health, MODIS satellite imagery in April 2004 captured a massive sulfur bloom event off coastal Namibia. A key policy action of the BCLME project is the assessment of environmental variability, ecosystem impacts and improvement of predictability in this complex and variable ecosystem. Two cornerstones of this policy are the development of an environmental early warning system (already operational) and the improvement of predictability of

extreme events and their impacts in the BCLME. An environmental baseline will be put in place in 2007 against which all future changes in variability will be measured. Management actions will be based on knowledge of the configuration and shift of the Angola-Benguela oceanic front influencing the movement of transboundary stocks between Angola and Namibia. Coastal degradation off the coast of Namibia and northern South Africa shows the large-scale impact of diamond mining and sedimentation produced by ongoing diamond operations. A regional oil spill contingency plan will be in place by 2006.

Steps are being taken to maintain the health of the BCLME, enhance effective pollution management and safeguard fisheries and other resources. There will be an assessment of vulnerable species and habitats, and a region-wide marine biodiversity conservation management plan by the end of 2005. The BCLME Programme seeks to introduce ecosystem-based management incrementally through fisheries in a bottom up approach that connects the science with socioeconomic indicators of food security and jobs and addresses the issue of resource allocation between industrial and artisanal fishermen. The Socioeconomics and Governance aspects of fisheries have major importance for the new government of Angola, which has only recently emerged from a civil war. All three countries have a strong will to cooperate. The key instrument for Programme implementation is the Interim Benguela Current Commission (IBCC), established to strengthen regional cooperation in the area of governance, and due to be operational in 2006. The participating countries are set to harmonize national legal and regulatory frameworks at a regional level by 2007. When asked, Dr O'Toole said the project might serve as a model for eastern boundary current systems such as the Canary Current LME off the coast of West Africa and the Humboldt Current LME off of Chile and Peru. Dr O'Toole announced the upcoming publication of an LME volume on the BCLME. He also described an LME Global Ocean Observing System (GOOS) workshop which took place in South Africa in November 2004 and which focused on forecasting and data assimilation in the Benguela and comparable systems. Permanent, continuously operating real-time regional ocean prediction systems are increasingly required to support a variety of critical activities in the ocean and coastal environments, including fisheries management, navigation and marine operations, response to oil and hazardous material spills, search and rescue, and prediction of harmful algal blooms and other ecosystem or water quality phenomena.

5.3 YELLOW SEA LME

Professor Qisheng Tang, Director General of the Yellow Sea Fisheries Research Institute, Qingdao, China reported on the GEF-supported Yellow Sea LME Project (YSLME), which involves the cooperation of China and Korea. The Project has had a long development period beginning in 1990 with the original idea for a project proposal made in Monaco at the first international conference on LMEs and ending in 2005 with the official launching of the project, the establishment of a project management office in Korea and the appointment of the Yellow Sea LME Project Manager, Mr Yihang Jiang. The first steering committee meeting for this project was held in Seoul, Korea on 7-8 March 2005. The UNDP is the implementing agency. The Project's overall mission is, "To protect, conserve and manage the Yellow Sea through sustainable use of its waters and watershed, by reducing development stress and promoting sustainable exploitation of its resources," with the overall objective of an, "Ecosystem-based, environmentally-sustainable management and use of the YSLME and its watershed by reducing development stress and promoting sustainable exploitation of the ecosystem from a densely populated, heavily urbanized, and industrialized semi-enclosed shelf sea."

The first meetings of the YSLME Working Groups (WG) were focused on fisheries, biodiversity, ecosystem, pollution and investment activities, took place in April and May 2005. The key activities of the WG on Fisheries concentrated on stock assessment, carrying capacity,

mariculture production, regional agreements and national laws and a management plan. The activities of the biodiversity WG will examine habitat conservation and vulnerable species, genetic diversity and introduced species and try to develop coordinated strategies. The WG on the ecosystem will focus on its status, carrying capacity and stressors, whereas the WG on pollution will focus on critical areas, contaminant levels, and the fate and transport of contaminants and will develop a regional strategy for pollution control. The special attention of the WG on Investment Activities will focus on stakeholders, public awareness and participation, data and information management, and financial instruments. The outcomes of the deliberations and findings of the 5 Working Groups will constitute the framework for updating the preliminary Transboundary Diagnostic Analysis (TDA) and Strategic Action Plan (SAP) for the YSLME project.

Professor Tang described many changes observed over several decades in the Yellow Sea LME. The LME is one of the most intensively exploited areas in the world, with a significant increase in fishing effort since 1980. Fishing pressures have caused shifts in species composition and abundance, with anchovy now being the dominant species of fish in the YSLME. The feeding habits of species such as the Spanish mackerel and largehead hairtail have changed significantly over the past 20 years. The mean trophic level of the fisheries biomass catch has declined from 4.1 in 1959 to 3.4 in 1999. The SAP will focus special attention on a comprehensive assessment of ecosystem goods and services provided by fisheries, mariculture, and other ecosystem resources to the densely populated coastal urban centres located along both the Korean and Chinese coastal areas of the LME, in order to better understand the interactions among the important biological, chemical and physical characteristics of the Yellow Sea LME and increase the predictive capability of resource scientists and managers. In an effort to initiate recovery of the depleted demersal species, China has, since 1995, closed the Yellow Sea to Chinese fishermen during the summer months.

5.4 CANARY CURRENT LME

Dr Andrew Cooke, the coordinator for the Canary Current LME Project, reported good start-up progress for the seven participating coastal countries bordering the LME on the northwest Africa coast and working with FAO as Executing Agency and UNEP as Implementing Agency. The participating countries are Morocco, Mauritania, Senegal, Gambia, Cape Verde, Guinea-Bissau, and Guinea. The project was in a planning stage for many years but is now launched and expects more funding from the GEF in the future. The Land-Based Pollution project is being transformed into a more fisheries-oriented project by the FAO. The aim of the project, now in the planning phase, is to reverse the depletion of fisheries and degradation of nursery habitat caused by over fishing and pollution. The LME is a region of highly productive fisheries. There is a well established regional perspective and strong donor presence in the marine field, mainly in fisheries, CZM and conservation. There are numerous national and regional projects in the area of fisheries policy, law and institutions. Fisheries in the CCLME include the industrial fishing for offshore tuna, small pelagics and octopus, shrimp trawling, intensive artisanal fishing of demersals and small pelagics, and small scale artisanal fishing in Cape Verde, Guinea-Bissau and Guinea. There is severe coastal pollution in areas of urban development (near Dakar), and there are increasing risks of pollution from petroleum exploitation off the coasts of Mauritania and Senegal. Climate change effects include natural expansion of the Sahara, natural North/South climatic shifts, declining upwelling, shifting wind direction and reduced speed, and slowing of the East Atlantic gyre. The sub-areas of the LME are the northern upwelling zone, with a desert coast and productivity offshore, the southern estuaries and margins, with productivity onshore, and the offshore islands, with low productivity and high biodiversity.

Dr Cooke asked the Meeting for advice on the building of regional constituencies and frameworks for effective management, and in regard to the proximity of European countries. The TDA will identify the principal shared problems and their root causes, as well as national, regional,

and transboundary priorities. Fish and fisheries are one transboundary issue critical to the food security for the people inhabiting the region, particularly in Senegal and Mauritania. Ecosystem assessments will focus on fisheries, water quality, socioeconomics and governance. Dr Cooke also raised the issue of whether the Azores, Cape Verde, Madeira, the Canary Islands and Guinea are within the boundaries of the Canary Current LME. He announced the first Canary Current Workshop, due to take place on 10 and 11 October 2005. The workshop, sponsored by FAO and the SRFC, will be held in Senegal and will be attended by delegates of all 7 member states of the project, international agencies and NGOs. The workshop will be followed by the first meeting of the Steering Committee of the CCLME project.

5.5 SOMALI CURRENT/ AGULHAS CURRENT LMES

Dr David LaRoche, UNDP Task Manager, described the long history and present status of the planning for the Agulhas and Somali Current GEF-LME projects. The 9 countries represented are Comoros, France (Reunion and Mayotte), Kenya, Madagascar, Mauritius, Mozambique, Seychelles, South Africa, and Tanzania. The Project, "ASLMEs Ecosystem Assessment Programme," presently extends beyond the boundaries of the 2 LMEs to include adjacent waters of the Mascarene Plateau. In 1996, the project was submitted by UNEP to the GEF as a traditional PDF-B, involving 8 countries of the East Coast of Africa and covering too broad an area with too little funding. Lacking an LME focus, the project went through the steps of the TDA and SAP process without success. In 2002, planning resumed on the project. The three lead UN implementing agencies for the Agulhas and Somali Current LME projects are UNEP, the World Bank and the UNDP. UNEP initiated a project relating to pollution from land-based sources (the "Western Indian Ocean Land-Based Sources of Pollution" Project). This land to blue water project, approved at a level of US$ 11 million by the Global Environment Facility (GEF), aims to reduce stress on ecosystems by improving water quality, to strengthen the legal basis for preventing pollution from land-based sources, and to develop regional institutions for sustainable development. The World Bank has implemented a "Southwest Indian Ocean Fisheries Project" (SWIOFP), an offshore fisheries assessment activity that is to develop a common, blue-water fisheries management strategy for all participating countries. And the UNDP Project is a multi-country ecosystem project meant to support science-based assessments for the ASLMEs Programme, with a focus on near-coastal fish and fisheries, and ecosystem-wide productivity and oceanographic conditions.

The common programme goal is to ensure the long-term sustainability of the living resources of the Agulhas and Somali LMEs. Prime concerns in the area are the over-exploitation of resources in the coastal zone, over fishing of "blue water" fisheries resources, environmental variability, climate change induced effects on coral reefs and other marine resources, and estuarine and marine pollution in near-shore areas. Dr LaRoche's presentation was followed by a collective discussion regarding the status of this project and options for moving the process forward before the document draft was due to be reviewed by the GEF Council. The consensus was to refocus the UNEP GPA project and the World Bank fisheries project on the LME approach, and to incorporate an in-depth artisanal fish and fisheries assessment component to the project that would include funding to support fish and fishery surveys and assessments of the socioeconomic and environmental dimensions of artisanal fisheries. Another proposed revision to the document was to scale down the productivity and oceanographic assessment component of the UNDP project, to relate it to the artisanal fisheries of the two LMEs, and to include a TDA and SAP process each for the Agulhas and Somali Current LME that is based on the 5-module GEF-LME assessment and management approach.

5.6 THE BALTIC SEA LME

Dr Jan Thulin, Project Coordinator on behalf of ICES http://www.ices.dk/, reported on activities for the Baltic Sea Regional Project (BSRP) and noted that the project funded at US$ 12M to introduce an ecosystem approach, is in its last year of funding and will require additional funding from GEF to move into phase 2, to complete the introduction of the ecosystem approach by the participating nine countries, including the emerging democratic countries in the eastern Baltic region (Estonia, Latvia, Lithuania, Poland, and Russia).

International managing bodies and governance institutions participating in the Baltic Sea LME Project are the Helsinki Commission, the European Commission, the International Baltic Sea Fishery Commission, and ICES, providing scientific and coordination expertise to the project. The project aims to strengthen technical capacity in the marine, coastal and land areas by improving scientific and political coordination, with activities that include joint integrated assessment surveys (already underway) and the modelling of water quality and nutrient transport. The organization, while complex, functions successfully on the basis of a network of coordination centres, lead laboratories and institutes in the participating countries. The coordination centres lead activities are focused on Baltic Sea productivity, fish/fisheries, ecosystem health, data management, and socioeconomics. The lead laboratories have been established for open sea surveys, biodiversity, coastal activities, ships of opportunity, zooplankton, invasive species, fisheries research and salmon restoration. The Institutes are supported by in-kind scientific and technical assistance from Denmark, Finland, Germany, Sweden and the USA. The major strength of the programme lies in its organization, its extensive network and its success in demonstrating the ecosystem approach. A major upcoming challenge is to implement a new European Union project for the Baltic Sea ecosystem, to be supported by an estimated US$ 70 million in EU grants over the next several years.

5.7 BAY OF BENGAL LME (BOBLME)

Dr Ned Cyr, of NOAA, briefed the committee on activities associated with the BOBLME, as a representative of the Programme was unable to attend. Dr Cyr attended the Second Regional Workshop held in 25-29 October 2004 in Colombo, Sri Lanka. Planning for the project has been ongoing for several years with a GEF PDF-B grant awarded in 1998. FAO is the executing agency. A draft project brief was submitted to GEF and to the World Bank for review in early December 2004. The eight participating countries (Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand) were directly impacted by the Tsunami, which took place in December 2004 and caused 3,000 deaths. This event has altered the entire framework for the GEF-LME programme and may warrant some major changes. In February 2005, the Project brief was accepted for inclusion in the GEF work plan. FAO is securing donor support and final country endorsement. The projected start date of the Project is late 2005.

5.8 CARIBBEAN SEA LME

Dr Robin Mahon briefed the Committee on recent project activities in the Caribbean Sea LME, with a focus on fisheries assessments and management strategies. The 33 states bordering the LME range in size, culture, language and degree of wealth. Regarding fisheries, the objectives of the Caribbean Sea LME Project are to identify, analyze, and prioritize the transboundary issues, root causes, and actions required to achieve sustainable management of the shared living marine resources and to improve the shared knowledge base. Caribbean fisheries are small-scale and artisanal, with widely scattered landing sites and small, open, outboard engine-powered boats. The mosaic of fisheries resources includes reef fish, coastal pelagics, conch, lobster, shrimp, snapper/grouper complex, flying fish, and large pelagics. Issues relating fish/fisheries and

pollution/ecosystem health are gear selectivity and bycatch, destructive fishing methods, lost gear, vessel technologies and practices (engines and antifouling paints), fish processing waste and by products. There is direct physical fish habitat destruction and habitat degradation by land-based inputs. Most fisheries resources are fully or over-exploited. Assessments focus on lobster, conch and shrimp. Fisheries management poses a series of challenges, with unidentified landings, many transboundary issues and multiple resource and institutional scales (coastal, regional, international). There is needed integration with Coastal Zone Management. The main capacity issues to be addressed are enforcement, co-management, marine protected areas and sustainable livelihoods.

Regarding governance, implementing legal, policy, and institutional reforms regionally and nationally to achieve the sustainable management of transboundary resources is a challenge due to the geographic dispersion of the countries and their diversity in terms of cultures and values. Multilateral environmental agreements (MEAs) relevant to fisheries include UNCLOS, CITES, CBD; the FAO Code of Conduct for Responsible Fisheries; FAO Plans of Action; the United Nations Fish Stocks Agreement relating to the conservation and management of straddling fish stocks and highly migratory fish stocks (UNFSA); WSSD targets; and the Specially Protected Areas and Wildlife (SPAW) Protocol to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region. The challenge will be to develop an interactive governance framework that links science and technology with consensus building around shared principles and values, and also provides the means for locally based organizations and stakeholder groups to adapt to early warning indicators of change.

6. EUROPEAN LMES

Hein Rune Skjoldal, of the Institute of Marine Research, Norway, provided the Committee with a summary of the ICES review of options for introducing ecosystem-based management to the European Community (EU) and adjacent countries. The EU has made a request for scientific information and advice about appropriate eco-regions for the implementation of an ecosystem approach in European waters, with the ecosystem boundaries being based on biological and physical processes. He described the close affinity between the recommended ecosystem delineations of ICES and LMEs, with most delineations broadly following LME delineations in the Barents Sea, Norwegian Shelf, Faroe Plateau, North Sea, Baltic Sea, and Black Sea, with some adjustment for the Celtic-Biscay Shelf and Iberian Coastal LMEs, a split into 3 sub-areas of the Mediterranean and a joining of the Iceland Shelf and East Greenland Shelf LMEs. During subsequent discussion it was pointed out that the final designations of marine management units have not up to now been made by the EU. Dr Sherman indicated that a study soon to be released by the European Environmental Agency reviews eco-regions and LMEs and is quite favourable to the LME approach. The meeting discussed delineations based on scientific assessments rather than on political or economic considerations, and how this relates to project commitment to ecosystem-based management.

On the review of Arctic delineations on the basis of scientific criteria, Hein Rune Skjoldal described the Arctic region as very dynamic with strong seasonality and a diversity of marine habitats and degrees of ecosystem productivity. In several instances, the boundaries need to be reviewed and drawn with more precision. Consultations are ongoing with Canadian colleagues to delineate LMEs around Canada and in particular the Baffin Bay. Hein Rune Skjoldal also announced an upcoming LME Symposium, to be held in Bergen, Norway in August 2006 and sponsored by NOAA, UNEP/CBD, FAO, and IUCN. The symposium will focus on (1) the concept of Ecosystem Approach as it relates to management, with a particular focus on fisheries management; (2) the linking of scales, with emphasis on local scales in the coastal areas and on land, and on wider scales in large ocean basins bordering continental shelf LMEs; and (3) the use of

ecological criteria and LMEs in the designation of Marine Protected Areas (MPAs), and the use of MPAs as managment tools within LMEs.

7. LME MODELING

7.1 NITROGEN INDICATORS FOR LMES

Dr Sybil Seitzinger, Rutgers University, presented the watershed modeling approach used by her and her colleagues to examine land based sources of nutrients to LME coastal systems. Nutrient inputs of Nitrogen and Phosphorus are unevenly distributed around the world. The results project estimates of global Nitrogen loading to increase by 50% by the year 2050, based on the business as usual (BAU) premise. Dr Seitzinger also announced a 2005 workshop that will train 20 participants from LMEs around the world (Yellow Sea, Baltic, Humboldt Current, Guinea Current, Bay of Bengal, Gulf of Mexico and Benguela) in the new modeling techniques and their specific application to the 64 LMEs. A subsequent workshop will discuss the models in greater detail and their usefulness for future projections, and interact with the International Nitrogen Initiative (INI), an international programme that develops solutions that optimize the use of nitrogen to produce food and addresses the negative consequences of too much nitrogen for human health and ecosystem health. The next steps of this work will link land-based nutrient inputs to freshwater conditions, examine coastal ecosystem effects (primary production, fisheries yields), develop nutrient control strategies and implementation, and analyze land-based plus ocean-based nutrient sources to LMEs and resulting ecosystem effects. The workshops on Nitrogen flux models are one of 6 components of the Medium Size Project (MSP) sponsored by the IOC. The meeting discussed the need to examine natural as well as anthropogenic LME inputs, and to consider the importance of ocean nutrients, as in the Benguela Current LME. Natural events leading to nutrient loading are a key issue in the Benguela Current LME, and an invitation was extended to Dr Seitzinger to work with the BCLME project in that regard.

7.2 ECOPATH/ECOSIM LME WORKSHOPS

Dr Villy Christensen described the global applications of the ECOSIM/ECOPATH approach to the estimation of expected carrying capacity for marine fish and fishery yields in the 64 LMEs. With these models Dr Christensen and his colleagues at the University of British Columbia evaluate ecosystem effects of fishing and environmental factors (including nutrient loading) by analyzing historic trends in ecosystems. They describe agents of mortality and trophic interdependencies. This work is a component of the GEF-funded Medium Size Proposal (MSP) for promoting ecosystem-based approaches to fisheries conservation and LMEs. The models known as ECOPATH and ECOSIM are based on ecosystem trophodynamics and are used to identify the most likely hypothesis for fish declines in a given LME, and provide useful information for optimizing marine resources and the carrying capacity of LMEs with regard to sustainable biomass yields. It is a database driven approach. Over the next 24 months, spatial models covering all LMEs will be examined using the biomass of benthos, plankton, mesopelagics, marine mammals and birds; fish diversity, growth parameters, diets; primary production and nutrient loading; and catches from 1950 to the present. ECOSIM/ECOPATH training was provided in several LME project locations around the globe, including the Baltic Sea, Benguela Current and Guinea Current. Future workshops will take place in South East Asia. The marine scientists from the University of British Columbia Fisheries Center Sea Around Us Project are continuing with their work on synthesized FAO fish catch statistics for each LME. This information is available on their website at www.seaaroundus.org. Each of the 64 LME descriptions includes information on coral reefs, seamounts, primary production, and estuaries; a description of the Ecopath model; biodiversity (commercial fish, cephalopods, marine mammals and marine birds); the trophic pyramid and marine

trophic index; catches and the value of catches by species and country fishing (1950-2002); and a governance profile.

8 ECOSYSTEM INDICATORS

Dr Kenneth Sherman discussed ecosystem indicators of changing states for LMEs in Regional Seas. It was agreed that a hierarchical series of core indicators of LME changing states would be prepared for presentation to the second global meeting of UNEP's GPA, scheduled for October 2006 in Beijing. As the GEF-LME projects become funded to a level of US$ 2 billion, there is a need for a set of scientifically credible common indicators that can accommodate a variety of jurisdictions and boundaries. Dr Sherman presented a comparison between the Northeast Shelf and Scotian Shelf in terms of ecosystem dynamics as an illustration of the use of LME indicators. He stated that the 5 indicators of pollution and ecosystem health, developed by the US-EPA in the National Coastal Condition Report have been applied in all LMEs adjacent to the USA. Dr Sherman also discussed the new marine technologies that combined the use of *in situ* water column observations and remotely sensed satellite observations that will provide a three dimensional view of the coastal ocean to better understand productivity in the LMEs. There is interest in acquiring this new technology by GEF-LME projects in the Baltic, Benguela, Guinea Current and the Yellow Sea. Dr Sherman's presentation was followed by a discussion on indicators and their appropriateness for non-industrialized countries experiencing localized pollution in otherwise pristine coastal areas.

9. LME-RELATED FISHERIES DATABASE

Dr Gus Rassam, American Fisheries Society (AFS), presented AFS's 3-year project, funded by the World Bank and by GEF, to create an electronic network and database of scientists and fisheries managers around the world. The overall goal is to strengthen an ecosystem-based approach to fisheries conservation and sustainability. This is accomplished through workshops and seminars on fisheries management, surveys of the needs and capacities of developing countries, the strengthening of GEF-LME project networking and other marine fisheries networks and partnerships, and through the development of this extensive database of ecosystem oriented fisheries management practices and experts.

10. IUCN – THE WORLD CONSERVATION UNION

Ms Kirsten Martin, from the IUCN Global Marine Program, made a presentation on IUCN support of LME management and MPAs. Since the 1990s the IUCN has had a partnership with LME Programmes, sharing knowledge, facilitating meetings and providing financial support. Regarding marine protected areas (MPAs), an initiative of the IUCN and other partner organizations is the Global Marine Species Assessment (GMSA). The initial focus of the GMSA will be on fish and corals, starting with groups such as sharks, rays and chimaeras, groupers, seabasses, wrasses, parrotfishes, and Indo-Pacific coral reef fishes. The GMSA is the first global, strategic review of the conservation status of marine vertebrate species, selected invertebrates and plants. The GMSA assessment aims to identify the most vulnerable marine species, main threats, conservation measures needed, and priority sites, in order to provide guidance for future conservation actions. IUCN Activities on MPAs have focused on creating global networks of MPAs and establishing global marine conservation priorities. The IUCN played a leading role in the convening of the Durban, South Africa World Parks Congress (2003), and 3rd IUCN World Conservation Congress (2004), which recognized MPAs as vitally important elements in the protection and sustainable management of marine biodiversity. The IUCN was also actively engaged in high-level dialogues on high seas issues at international meetings including UNICPOLOS, UNGA, and CBD. The aim of the IUCN is to establish and strengthen mechanisms for national and regional implementation of

MPAs, disseminate success stories, revise 1995 priorities, monitor and evaluate progress, develop and field-test available tools and measures.

Highlights of MPA activity are in Eastern Africa (community-based MPAs for sustainable fisheries), West Africa (development of a network of national and regional transboundary MPAs), Samoa, Vietnam and Tanzania (with 3 pilot MPAs), the Seychelles (Project on Marine Invasive Species to Coral Reefs) and Chile (Project on Marine Invasive Species and Aquaculture). An MPA case study with fisheries objectives is the St. Lucia, West Indies project which aims to support an improved fish catch and sustained catch levels in an area previously over fished. MPAs with fisheries objectives are widely recognized as effective tools for fisheries management and for maintaining fisheries biodiversity and can be combined with other fisheries management tools. The IUCN is partnering with other agencies in field-testing tools resilient to climate change in MPA selection, design and management, and is involved in monitoring coral reef health in MPAs in areas affected by the recent tsunami. An important priority is to develop the socioeconomics and governance modules of the analytical framework of LMEs as they relate to MPAs.

Ms Martin also reported on the International Waters (IW) Conference in Brazil and Bangkok Meeting outcomes. The IW Conference held 3 sessions on GEF-LME projects. Conference themes on governance, economic valuation and socioeconomic integration had LME implications. Detailed minutes of the LME sessions will be made available on the electronic LME network. In Brazil, the GEF-sponsored IW:Learn Structured Learning Project identified governance, stakeholder participation and communication, project management, the coastal zone, economic valuation, ballast water, alien species and socioeconomic integration as areas of high priority. The 3rd IUCN World Conservation Congress took place in Bangkok in November 2004 and included one LME session in which managers, scientists and local stakeholders involved in large scale regional projects identified the benefits of an ecosystem wide approach to marine resource management, especially fisheries. Experts shared experiences on methods to integrate the legal, socioeconomic and ecological components comprising the “bottom up” approach of managing LMEs with tools and measures that exist at other scales, for example marine protected areas.

11. LME PROJECTS AND GOOS AND GEOSS

11.1 GEOSS AND IOOS

Dr Ned Cyr, Marine Ecosystems Division, NOAA Fisheries, provided information on the contribution of LME indicators to GEOSS and IOOS. He briefed the Committee on the rapidly developing hierarchy of global earth observation systems, with the Global Earth Observation System of Systems (GEOSS) as a global coordinating body, and the Integrated Ocean Observing System (IOOS) as a national system under the umbrella of the Global Ocean Observing System (GOOS). GEOSS enables the collection and distribution of accurate, reliable Earth Observation data, information, products, and services to both suppliers and consumers worldwide. For example, it integrates satellite data from various platforms with in situ measurements from, e.g. buoys, aircraft and ships.Sixty countries, the European Commission and 40 global organizations are involved in GEOSS. The US component of the system, IOOS, is a coordinated national network of observations, data management and analyses that systematically acquires and disseminates data and information on past, present and future states of the oceans and the nation’s EEZ. It provides the data and information required for more rapid detection and timely prediction of changes occurring in the marine environment that are likely to impact U.S. social, economic and ecological systems.

IOOS areas of interest include climate and weather (variations in sea surface temperature; surface fluxes of momentum, heat & fresh water; sources & sinks of carbon; sea ice); marine operations (variations in water level, bathymetry, surface winds, currents & waves; sea ice;

susceptibility to natural hazards); natural hazards (storm surge & coastal flooding; coastal erosion; susceptibility to natural hazards; public safety & property loss); national security (nearshore current & wave environment; water clarity & sediment loads; acoustic performance & propagation of electromagnetic waves; nuclear, biological & chemical contamination); public health (risk of exposure to human pathogens, chemical contaminants, and biotoxins); healthy ecosystems (habitat modification, loss of biodiversity, eutrophication, harmful algal events, invasive species, diseases in & mass mortalities of marine organisms); living marine resources (fluctuations in spawning stock size, recruitment & natural mortality; changes in areal extent & condition of essential habitat; food availability & hydrographic conditions).

There is a good deal of overlap between LME indicators for productivity, fish and fisheries, and pollution and ecosystem health, and IOOS observations. LME Projects can benefit from monitoring and assessing environmental variables that can be supplemented and combined with numerical modelling, satellite remote sensing, and in situ data for use in ocean forecasting. LME indicators are consistent with GEOSS, GOOS and IOOS. A close collaboration should be encouraged between global observing systems and LME programmes. It is a two-way process to the benefit of both. In many developing countries, LME monitoring and assessment efforts may be the only in situ data providers for the ocean components of GEOSS (e.g, the Guinea Current fisheries surveys).

11.2 GOOS AND GEOSS IN AFRICA

Mr Justin Ahanhanzo, of IOC, addressing the meeting on the topic of LME Projects and GOOS and GEOSS in Africa, commented on the good cooperation established between the African LME projects and the positive synergy with GOOS-AFRICA reinforcing the United Nations Inter-agency Cooperation involving UNESCO-IOC, UNIDO, UNDP, UNEP, FAO, GEF and the World Bank. The Meeting reached consensus on supporting a planned joint LME/GOOS-AFRICA initiative to convene a Leadership Training Workshop on integration of *in situ* observations and measurements with satellite remote sensing and modelling for Assessment and Integrated Management of African Large Marine Ecosystems. The Workshop will be hosted by the BCLME Activity Center on Environment Variability at the University of Cape Town in November 2005.

12 GLOBAL INTERNATIONAL WATERS ASSESSMENT (GIWA)

Professor Gotthilf Hempel described the winding-down of UNEP's GIWA activity, which consisted of examining GIWA results for 34 GEF-eligible LMEs. GEF in consultation with ICSU tasked GIWA to produce a comprehensive picture of the state of water-related concerns. The upcoming report, due to be published before the end of 2005, is a comprehensive picture of the state of these 34 LMEs, organized along the 5 modules of productivity, fish and fisheries, pollution and ecosystem health, socioeconomics and governance. The main objective is to identify the major environmental problem areas and socioeconomic root causes in each of the LMEs, allowing GEF on the basis of these assessments to prioritize the activities or areas needing more support. The reports, compiled by Dr Sherry Heileman, were based on the assessments of experts in each region. The GIWA methodology incorporates the link between the ocean areas and large river basins and includes in its matrix the specific issues of freshwater shortage, pollution, habitat and community modification, unsustainable exploitation of fisheries and global change. Experts were selected from the GIWA and from the LME network to review the reports. A Review Committee will be invited to make a final evaluation before publication. Major findings are the key problems of over fishing, over-irrigation, freshwater, and eutrophication. The anthropogenic impacts in many areas are often obscured by climate change, a methodological difficulty that needs to be addressed. The development of a uniform comprehensive methodology including indicators for a world-wide ecosystem approach will be the next step to be taken by GEF and UNEP.

Dr Sherry Heileman, the consultant who prepared the GIWA reports, discussed progress made on the project and the changes in its approach and format. Her work was based on reports on the 66 GIWA sub-areas and on the web descriptions for the relevant LMEs. The GIWA methodology was combined with the LME modular approach (productivity, fish and fisheries, pollution and ecosystem health, socioeconomics, and governance), and focused on transboundary issues relating to the marine environment. Areas examined were freshwater shortage (modification of stream flow, pollution of existing supplies, changes in the water table), pollution (microbiological pollution, eutrophication, chemical pollution, suspended solids, solid wastes, thermal pollution, radionuclides and oil spills), habitat and community modification (loss or modification of ecosystems or ecotones), unsustainable exploitation of fisheries (overexploitation, excessive by-catch and discards, destructive fishing practices, decreased viability of stocks through contamination and disease, impact on biological and genetic diversity) and global change (changes in hydrological cycle and ocean circulation, sea level change, increased UV-B radiation as a result of ozone depletion, changes in ocean CO2 sink function). Experts were selected from the GIWA and from the LME network to review the LME descriptions. Dr Heileman described her use of the GIWA scoping exercise and some of the methodological problems in disaggregating the GIWA-LME assessments to extract results, which she then supplemented with information from other sources. Each chapter is approximately 8 pages long. All of the individual LME drafts have been reviewed, most of them by two reviewers each. The reviewers' comments have been incorporated into a revised draft. The completed book (titled "GIWA's Assessment of Large Marine Ecosystems") will include an introduction and a discussion chapter. The GIWA assessments are quite closely matched with and complementary to the TDAs in GEF-LME projects.

13. THE HUMAN DIMENSIONS OF LMES (SOCIOECONOMICS AND GOVERNANCE MODULES)

Dr Timothy Hennessey of the University of Rhode Island (URI) Department of Political Science announced the publication of the LME volume, "Sustaining LMEs, the Human Dimension," edited by J. Sutinen and T. Hennessey and published earlier this year by Elsevier. He briefed the Committee on the ecology of governance and socioeconomics at multiple LME scales and described the 12-step human dimensions framework and case studies presented in the NOAA Technical Memorandum (TM) "A Framework for Monitoring and Assessing Socioeconomics and Governance of Large Marine Ecosystems," available at http://na.nefsc.noaa.gov/lme/publications.htm. The 12 steps are:

1. Identify uses
2. Identify users
3. Identify governance mechanisms
4. Assess levels of use activities
5. Assess interactions between activities and resources
6. Assess impacts on users 7. Assess interactions between governance & use
8. Assess socioeconomic importance
9. Assess public preferences
10. Assess costs of policy options
11. Compare benefits & costs
12. Identify financing alternatives for preferred options

Dr Jon Sutinen of the University of Rhode Island Department of Environmental and Natural Resource Economics discussed his and Dr Hennessey's upcoming visits to LME projects including the Baltic Sea and the Benguela Current project coordinating units, to ground truth their methods in preparation for a Socioeconomics and Governance Workshop, which will take place at the University of Rhode Island in March 2006 and will be attended by 18 participants from GEF-supported LME projects. The URI professors and the Coastal Resource Centre (CRC) will be assembling materials for the workshop and developing measurable socioeconomic and governance indicators which will probably need to be tailored to each LME. Indicators can be used to shape policy by enticing governments to invest in the marine environment. The Committee urged the professors to assist the countries by identifying very tangible outcomes, such as in the area of the ongoing tension over fishery agreements and the selling of fishing rights.

14. IOC CAPACITY BUILDING AND POSSIBILITIES FOR JOINT ACTIVITIES

Dr Ehrlich Desa, of IOC, briefed the committee on IOC Capacity-building, and opportunities for synergies and joint activities with the ongoing LME programmes. He emphasized that Capacity-building was necessary for the full delivery of the benefits of LME programmes, because national scientists are typically more closely aware of the local consequences of economically difficult decisions, and are the best advocates for changes in national policy. The presentation highlighted the special advantages of IOC as a partner of the LME program. The IOC is the UN agency responsible for marine science and technology transfer, and has a record of experience in Training, Education and Mutual Assistance. All these have made it a natural and potentially effective partner of the LME programmes for Capacity-building. Recognizing the key role of heads of institutes for networking and self-sustainability of Capacity-building, Dr Desa proposed leadership workshops for heads of institutes as a possible joint LME/IOC activity, and the organization of proposal-writing workshops where LME scientists would share their experience for the formulation of proposals. This would enhance the capacity to secure funding for research and Capacity-building. Another possibility offered by Dr Desa was to convene a workshop to raise awareness of decision-makers at various decision-making levels, of the economic and societal benefits of marine sciences, through demonstration to decision-makers with modern visualization of products and applications. These activities would seek to address urgently needed issues, while preparing the long-term objective of self-sustainable and self-directed Capacity-building.

15. ACTIVITIES AND ACCOMPLISHMENTS DURING 2004-2005

This section briefly summarizes activities and project accomplishments made since the 6th LME Consultative Committee Meeting in March 2004:

15.1 LME PROGRAMME OFFICE REPORT

During 2004 and 2005, the LME Programme Office continued to provide scientific and technical assistance to coastal countries with developing economies in Asia, Africa, Latin America, and Eastern Europe who seek GEF funding for "country-driven" LME projects. The Programme Office continued its collaboration in project development with international agencies such as IUCN, IOC, UNIDO, UNDP, FAO, the World Bank , GIWA and the GEF. In a new developing partnership with UNEP-Regional Seas and NOAA, LMEs will be used as the operational management units for translating Regional Sea programmes into concrete actions. A new 8-page brochure, "UNEP Regional Seas linked with Large Marine Ecosystems—Assessment and Management" was issued by UNEP, describing the new partnership. One of the outcomes of the partnership will be a synthesis of descriptions for each of the 64 LMEs listed under UNEP Regional Seas Programmes. NOAA also partnered with universities and international agencies in a GEF-

funded Mid Size Proposal, "Promoting ecosystem-based approaches to fisheries conservation and LMEs."

LME project directors reported significant progress from the Benguela Current, Guinea Current, Baltic Sea and Yellow Sea LME projects. An agreement was reached between the LME Programme Office and the UNEP Regional Seas Programme Office with the Murmansk Marine Biological Institute for expert advice on the boundaries of the Arctic LMEs, and with the Woods Hole Policy Center for a study on improved methodologies for assessing goods and services for selected LMEs, which included economic valuations, benefit-cost methodologies, and approaches for consideration of the human dimensions of LME projects.

15.2 MEETINGS AND WORKSHOPS

Meetings, consultations, workshops, and symposia continued through 2004 and 2005 as a useful means for exchanging views and planning projects on the application of the LME approach to resource assessment and management actions. Advisory actions included workshops in the Guinea Current LME; several meetings with the GIWA to help finalize a report on GEF-eligible LMEs; meetings with the representatives of the UNEP-Regional Seas Programme; and a Steering Committee meeting for the Yellow Sea Large Marine Ecosystem Project in Seoul, Korea. Consultations were held with GEF, the IUCN and LME project managers at the International Waters Meeting in Brazil. LME sessions were conducted during the IUCN-sponsored 3rd IUCN World Conservation Congress (2004). Workshops, symposia and conferences relating to assistance in the scientific and technical aspects of LMEs included ECOPATH/ECOSIM modelling workshops for estimating carrying capacity for marine fish and fishery yields, and planning was completed for forthcoming workshops on nutrient modelling. An LME socioeconomics and governance workshop is scheduled for March 6–10, 2006 by the University of Rhode Island.

15.3 OUTREACH

Outreach efforts continued with the preparation and distribution of brochures describing UNEP-NOAA cooperation, stakeholder support of the Benguela Current LME Project, and preparation of a brochure on the Guinea Current LME Project. The Programme Office continued to issue portfolios and documents describing the modular assessment approach used in GEF-supported LME projects.

15.4 LME VOLUME PREPARATION

The volume Sustaining Large Marine Ecosystems: The Human Dimension, edited by T. Hennessey and J. Sutinen of the University of Rhode Island, was published by Elsevier in 2005. This volume was the 13th in the LME series. Editorial work continues on a new LME volume on "Predicting the Benguela," based on studies of physical and biological forcing of the Benguela Current LME. A listing of the LME volumes, chapters and authors is given on the LME Website http://www.lme.noaa.gov/.

15.5 LME WEBSITE

The LME Programme continued to use multi-media technologies via project websites to help inform the international marine environmental and resource institutions and networks of LME project activities. The LME website (http://www.lme.noaa.gov) continued to serve as a means for providing a modular assessment-based approach to understanding ecosystem-wide changes in productivity, fish and fisheries, pollution and ecosystem health, socioeconomics, and governance issues of LMEs across the globe. The website serves to connect users with regionally based

programmes, and provides links to governmental and NGO information relevant to each LME project. Christopher Damon of the University of Rhode Island continues to work with the LME Programme Office to update and produce new maps or images of the "Large Marine Ecosystems of the World." The Arctic LME delineations are being reviewed, which will lead to the production of a new Arctic LME map. An LMEs of the United States image is available on the website, as is the "Large Marine Ecosystems of the World and Linked Watersheds" map, which is GIS compatible and provides LME boundaries, shape files, and bathymetry and elevation information for export to other systems. There was since 2004 an increase of 15% of queries to the website.

15.6 LME BOUNDARIES

The LME Consultative Committee considers proposals for designating new LMEs, or modifying existing LME boundaries, based on the four ecological criteria of bathymetry, hydrography, productivity and trophically-dependent populations, peer-reviewed published articles, recommendation by a delineation sub-committee of the LME Consultative Committee. Five LME boundary issues were placed on the agenda and considered during the meeting, effecting the: (1) Mascarene Plateau; (2) Canary Current LME; (3) Arctic LMEs; (4) Western Pacific LMEs; and (5) European Union ecoregions. Concerning the Mascarene Plateau, the 6th LME Consultative Committee Meeting had already visited the potential of the area for LME designation. There was a revisiting of the area in the 7th Committee Meeting on the basis of an article by Rolph Payet on "Research, Assessment and Management of the Mascarene Plateau: a LME perspective," published in 2004, by the Royal Society. However, more information and a better understanding of the physical and biological processes, including more data on the monsoonal system, biodiversity, critical habitats, and ecosystem health, is needed before the Mascarene Plateau can be designated as a LME. The Canary Current LME is already designated but its boundary might require modification in order to include the Cape Verde Islands, which are in close proximity to the West African coast and within the current system, as observed from recent frontal analysis by Dr Igor Belkin of the University Of Rhode Island Graduate School Of Oceanography. LME boundaries in the Arctic region are under review (see these activities under PAME). In the Western Pacific, at present, the only designated LME in the region is the Insular Pacific-Hawaiian LME, around the Hawaiian archipelago. Other island and archipelagic systems under consideration include: Samoa, the former Marshall Islands, the Line Island Archipelago, and the Marianas. The focal area of the GEF funded Project "Western Pacific Warm Pool Marine Ecosystem" extends from the Cooke Islands to Micronesia in the Pacific Ocean and includes many small island developing states (SIDS). Delineation of the EU Eco-regions in relation to LMEs is discussed in Section 6.0 of this report.

16. PAME CONSULTATION

A meeting of scientific and technical experts to review the already designated Arctic LME boundaries took place following the 7th LME Consultative Committee Meeting, on July 7,005. At that meeting, the PAME consultation on approaches to the introduction of an ecosystem-based approach to the Arctic reached consensus on adoption of the large marine ecosystem as the assessment unit. It was agreed to make adjustments to the boundaries of the designated Arctic LMEs through email exchanges among representatives from Canada, USA, and Norway, and report the results to the PAME Secretariat prior to the next PAME meeting scheduled for Copenhagen in September 2005. The Russian Federation representative indicated that a map of Arctic LME boundaries would be made available for review prior to the September meeting. Results of the consultation will be reported to the next PAME meeting by the US delegate to PAME, Thomas Laughlin.

17. PROMOTING LME APPROACHES TO FISHERIES CONSERVATION

Prior to the 7th LME Consultative Committee Meeting on July 5 and 6, a meeting of the Steering Committee for the GEF/IOC supported Medium-Size Proposal (MSP) for promoting ecosystem-based approaches to fisheries conservation and LMEs was held at the IOC/UNESCO headquarters on July 4. The Steering Committee reviewed progress in the implementation of each of the 6 MSP components: (1) the fisheries ecosystem capacity building project, which is an electronic networking project for members of International Fisheries Societies conducted by Gus Rassam and Jessica Geubtner of the American Fisheries Society; (2) training in the application of ECOSIM and ECOPATH modelling for 64 LMEs conducted by Villy Christensen, of the University of British Columbia; (3) training in the application of Nitrogen flux models to all 64 LMEs under the direction of Sybil Seitzinger, NEFSC/Rutgers University, for the IOC; (4) training in GIS applications for GEF-supported LME projects by Christopher Damon of the University of Rhode Island; (5) reporting of global marine fish catches by LMEs for 2001-2005 by Richard Grainger, FAO Rome; and (6) the assessment of particle size patterns as an indicator of LME resilience and stability under the direction of Simon Levin, of Princeton University, and Zack Powell, of the University of California at Berkely. Each of the 6 component activities were found to be underway and on schedule.

18. UPCOMING LME MEETINGS

Objectives of four GEF-LME project-related planned international meetings were approved by the Committee including: (1) the joint LME/GOOS-Africa Leadership Training Workshop to be held on the integration of *in situ* observations and measurements linked to satellite remote sensing techniques and modelling for the assessment and management of African LMEs. The Workshop will be hosted by the Benguela Current LME Activity Centre on Environmental Variability at the University of Capetown in November 2005; (2) It was agreed to develop a hierarchical series of core indicators of LME changing states for presentation to the second global meeting of UNEP's Land Based Sources of Pollution Global Programme of Action Conference scheduled for Beijing in October 2006; (3) It was agreed to assist in the planning and convening of a meeting on comparative LME studies to be scheduled for Bergen, Norway by the Institute of Marine Science in April 2006; and (4) To accept the invitation by Professor Qisheng Tang to convene a Conference in Qingdao, China during early October, 2007 on the accomplishments of the LME approach since the last large International Conference held in Monaco in 1990.

ANNEX I

AGENDA

DAY 1 – 5 July 2005

TIME	TOPIC	SPEAKER(S)
9:00–12:00 noon	IOC Welcome & Marine Ecosystems Assessments Overview	Patricio Bernal Umit Unluata
	LME/Regional Seas & NOAA Partnership	Kenneth Sherman
	GEF-LME Projects and Scaling in Integrated Coastal Waters Management	Biliana Cicin-Sain
	IUCN Support of LME Management & MPAs	Kirsten Martin
	Arctic Regional Sea: PAME/LME Ecosystem-based Assessments	Soffia Gudmundsdottir
	PAME & US role in Ecosystem-based Management, Marine Transportation, & Shipping	Tom Laughlin
12:00–2:00 pm	**LUNCH**	
2:00–6:30 pm	LME Partnership with the UNEP-Regional Seas Program	Martin Adriaanse
	Ecosystem Indicators for LMEs in Regional Seas: Indicators of Changing States	Kenneth Sherman
	Productivity Center in West Africa: Plankton & Gulf of Guinea LME Indicators	Chidi Ibe
	Nitrogen & Other Biogeochemical Indicators for LMEs	Sybil Seitzinger
	Fish & Fisheries Indicators for LMEs in Regional Seas	Brad Brown Chidi Ibe
	Guinea Current LME Project: Vessels, Fisheries Assessment & Management	Chika Ukwe Chidi Ibe
	Bay of Bengal LME Project Update	Ned Cyr
	Caribbean Sea LME Fisheries Assessment & Management Strategies	Robin Mahon
	Yellow Sea Ecosystem-based Fisheries Assessment & Indicators	Qisheng Tang
	GEF-ECOPATH/ECOSIM LME Workshops	Villy Christensen
	GEF-Database Fisheries Management IT Network	Gus Rassam Jessica Geubtner, AFS
6:30 pm	**ADJOURN**	

DAY 2 – 6 July 2005

TIME	TOPIC	SPEAKER(S)
9:00 am-12:30 pm	Review of LME Delineation Actions: Mascarene Plateau, EU Eco-regions & Arctic LMEs	Marie-Christine Aquarone
	Delineation of Global Marine Ecosystem-based Assessment & Management Units: LMEs; Eco-regions; Biogeographic Areas	Hein Rune Skjoldal, Stephan Lutter, Marjo Vierros, Kenneth Sherman
	LMEs of Arctic Regional Seas	Gennady Matishov
	GIWA Assessments & LMEs	Gotthilf Hempel Sherry Heileman
	LME Symposium on Comparative Ecosystem Condition	Hein Rune Skjoldal
	IW Conference & Bangkok Meeting Outcomes	Kirsten Martin
	Pollution & Ecosystem Health Indicators for LMEs in Regional Seas	Kevin Summers
	Socioeconomic & Governance Indicators for LMEs in Regional Seas	Timothy Hennessey Jon Sutinen
	The Contribution of LME Indicators to GEOSS & IOOS	Ned Cyr
12:30-2:00pm	**LUNCH**	
2:00 – 5:00 pm	Indicators for Integrated Coastal Area Management (ICAM) Purposes	Robert Siron
	Baltic Sea LME Assessment & Management	Jan Thulin
	Indicators for the Benguela Current LME & Comments on Governance	Mick O'Toole
	Canary Current LME Transboundary Issues	Andrew Cooke
	Agulhas Current LME and Somali Current LME: Transboundary Issues	Magnus Ngoile David LaRoche
	IOC Capacity Building and Possibilities for Joint Activities	Ehrlich Desa
	LME Projects and GOOS & GEOSS in Africa	Justin Ahanhanzo
	Discussion: Advancing the LME Approach to Assessment & Management Within Regional Seas	ALL
	Preparing the Indicators Workshop	ALL
	Round Table Discussion/Planning Session 2005-2007 Leaders	ALL
5:00 pm	**ADJOURN**	

ANNEX II

LIST OF PARTICIPANTS

Mr Martin Adriaanse UNEP/GPA Coordination Office P.O. Box 16227 2500 BE The Hague, THE NETHERLANDS Tel: 31 70 311 4466 Fax: 31 70 345 6648 Email: m.adriaanse@unep.nl	Dr Villy Christensen Associate Professor University of British Columbia Fisheries Center 2259 Lower Mall Vancouver, B.C. CANADA V6T 1Z4 Tel: 1 (604) 822-5751 Fax: 1 (604) 822-8934 Email: v.christensen@fisheries.ubc.ca
Mr Justin Ahanhanzo IOC/UNESCO 1, rue Miollis 75732, Paris Cedex 15 FRANCE Tel: 33 1 45 68 36 41 Fax: 33 1 45 68 58 12 Email: j.ahanhanzo@unesco.org	Dr Biliana Cicin-Sain University of Delaware Marine Studies 301 B Robinson Hall Newark, DE 10716 USA Tel: 1-302-831-8086 Fax: Email: bcs@udel.edu
Dr Marie-Christine Aquarone USDOC/NOAA/NMFS Narragansett Laboratory 28 Tarzwell Drive Narragansett, RI 02882 USA Tel: 1 (401) 782-3288 Fax: 1 (401) 782-3201 Email: aquarone@mola.na.nmfs.gov	Dr Andrew Cooke Project CCLME – FAO Commission Sous-Regionale des Peches Villa 4430 BP 20505 Dakar, SENEGAL (West Africa) Tel: 221-6099-373 Fax. Email: andrewcooke@sentoo.sn cclme@sentoo.sn
Dr Patricio Bernal Executive Secretary of IOC IOC/UNESCO 1, Rue Miollis, 75732 Cedex 15 Paris, FRANCE Tel: 33-1-45-68-3983 (or 3984, secretary) Fax: 33-1-47-83-49-98 Email: P.Bernal@unesco.org	Dr Ned Cyr USDOC/NOAA/NMFS Headquarters Bldg. SSMMC3, Rm. 12555 1315 East-West Highway Silver Spring, MD 20910-3282 USA Tel: (301) 713-2363 ext. 159 Fax: (301) 713-1875 E-Mail: Ned.Cyr@noaa.gov
Dr Bradford (Brad) Brown 11266 SW 166 Terrace Miami, FL 33157 USA Tel: 1 (301) 253-4991 Fax: 1 (301) 361-4219 Email: Brad.Brown@noaa.gov	Ms Shannon G. Dionne International Affairs Specialist USDOC/NOAA, Office of International Affairs 14th & Constitution Avenue, NW Room 6228, MS 5230 Washington, DC 20230 USA Tel: 1 (202) 482-6196 Fax: 1 (202) 482-4307 Email: Shannon.Dionne@noaa.gov

Dr Charles N. (Bud) Ehler President Ocean Visions Box 3488 Annapolis, MD 21035 USA Tel: 1-410-798-1483 Fax: 1-410-570-5-67 Email: charles.ehler@comcast.net	Dr Timothy M. Hennessey Professor, Political Science University of Rhode Island Washburn Hall Kingston, RI 02881 USA Tel: 1 (401) 874-4052 Fax: 1 (401) 874-4072 Email: Hennessey@uri.edu
Ms Jessica Geubtner Policy & Development Coordinator American Fisheries Society 5410 Grosvenor Lane, Suite 110 Bethesda, MD 20814-2199 USA Tel: 1 (301) 897-8616 ext. #215 Fax: 1 (301) 897-8096 Email: jgeubtner@fisheries.org	Dr Chidi Ibe c/o UNIDO Field Office United Nations Compound Ring Road, East PO Box 1423 Accra, GHANA Tel: 233 21 781 225 (or 226 Fax: 233 21 773 898 Email: ibechidi@aviso.ci
Ms Soffia Gudmundsdottir PAME Executive Secretary Borgir, Nordurslod 600 Akureyri ICELAND Tel: 354 461 1355 Fax: 354 462 3390 Email: soffia@pame.is	Dr David LaRoche Task Manager United Nations Development Programme Box 36 Orleans, VT 05860-0036 USA Tel: 1 (802) 754-9308 Fax. 1 (802) 754-2181 Email: dal1727@starband.net
Dr Sherry Heileman Marine & Fisheries Biologist Environmental Writer/Editor GIWA Consultant 31 Rue Robert de Flers Paris, 75015 FRANCE Tel: 33-1-40-59-08-34 Fax: Email: sh_heileman@yahoo.com	Mr Thomas Laughlin Deputy Director for International Waters USEC HQTR Route: IA BLDG: HCHB RM: 5809 14th & Constitution Avenue, NW Washington, DC 20230-0001 USA Tel: 1 (202) 482-5118 Fax: 1 (202) 482-4307 Email: Tom.Laughlin@noaa.gov
Prof. em. Dr Gotthilf Hempel Berater des Prasidenten des Senats fur den Wissenschaftsstandort Bremen-Bremerhaven Tiefer 2 D-28195 Bremen GERMANY Tel: 49 (0) 421-361-2005 Fax: 49 (0) 421-361-10990 Email: ghempel@marketing.bremen.de	Dr Robin Mahon Centre for Resource Management & Environmental Studies (CERMES) University of the West Indies, Cave Hill St. Michael, BARBADOS Tel: 246-417-4570 Fax: 246-424-4204 Email: RMAHON@caribsurf.com
Ms Kirsten Martin Programme Officer, Global Marine Program IUCN – The World Conservation Union 28 Rue Mauverney 1196 Gland, Switzerland Tel: 41 22 999 0218 Fax: 41 22 999 0020 Email: Kirsten.Martin@iucn.org	Dr Sybil Seitzinger Institute of Marine & Coastal Sciences Rutgers, The State University of New Jersey 71 Dudley Road, Cook Campus New Brunswick, NJ 08901-8521 USA Tel: (732) 932-6555 ext. #342 Fax: (732) 932-1792 Email: sybil@imcs.rutgers.edu

Ms Elizabeth S. McLanahan International Affairs Specialist USDOC/NOAA, International Affairs Office 14th & Constitution, NW, Room 6228 Washington, DC 20230 USA Tel: 1 (202) 482-5140 Fax: 1 (202) 482-4307 Email: Elizabeth.McLanahan@noaa.gov	Dr Kenneth Sherman Director USDOC/NOAA/NMFS Narragansett Laboratory 28 Tarzwell Drive Narragansett, RI 02882 USA Tel: 1 (401) 782-3211 Fax: 1 (401) 782-3201 Email: Kenneth.Sherman@noaa.gov
Dr Magnus Ngoile Director General/Pew Fellow National Environment Management Council P.O. Box 63154/63207 Dar es Salaam TANZANIA Tel: 255 748 490049 or 744 420049 255 22 2134603 Fax: 255 22 2111579 Email: nemc@nemctz.org mngoile@nemctz.org	Dr Robert Siron Marine Environmental Quality National Coordinator Oceans Directorate Fisheries and Oceans, Canada 200 Kent , 12E-229 Ottawa (ON) K1A 0E6 CANADA Tel: 1 (613) 993-9801 Fax: 1 (613) 993-6414 Email: sironr@dfo-mpo.gc.ca
Dr Mick O'Toole Chief Technical Advisor Benguela Current LME Programme Programme Coordination Unit Aaron Kasingo House Uhland Street, PO Box 40728 Ausspannplatz, Windhoek NAMIBIA Tel: 264-61-246948 Fax: 264-61-246803 Email: bclme@mweb.com.na	Mr Hein Rune Skjoldal Institute of Marine Research PO Box 1870 Nordnesparkon 2 Bergen, NORWAY 5024 Tel: 47-55-23-8500 Fax: Email: hein.rune.skjoldal@imr.no
Dr Ghassan (Gus) Rassam Executive Director of Fisheries American Fisheries Society 5410 Grosvenor Lane, Ste. 110 Bethesda, MD 20814-2199 USA Tel: 1 (301) 897-8616 Ext. #208 Fax: 1 (301) 897-8096 Email: grassam@fisheries.org	Dr Jon G. Sutinen Professor and Director of Graduate Studies Department of Environmental & Natural Resource Economics 216 Kingston Coastal Institute University of Rhode Island Kingston, RI 02881 USA Tel: 1 (401) 874-4586 Fax: 1 (401) 782-4766 Email: JSutinen@URI.EDU
Dr Qisheng Tang Director General/Professor Yellow Sea Fisheries Research Institute 106 Nanjing Road Qingdao, Shandong Province 266071 P.R. of CHINA Tel: 86-532-5836200 Fax: 86-532-5811514 Email: ysfri@public.qd.sd.cn xinfy@ysfri.ac.cn	Dr Umit Unluata Head of Ocean Sciences Section Intergovernmental Oceanographic Commission UNESCO 1 rue Miollis 75015, Paris FRANCE Tel: (33-1) 45 68 40 08 Fax: (33-1) 45 68 58 12 Email: u.unluata@unesco.org

Dr Jan Thulin ICES Palaegade 2-4 1261 Copenhagen K DENMARK Tel: +45-33 154225 Fax: +45 33 934215 Email: jan@ices.dk	Dr Christian Wild Ocean Sciences Section UNESCO 1 rue Miollis 75015, Paris FRANCE Tel: (33-1) 45 68 39 78 Fax: (33-1) 45 68 58 12/10 Email: c.wild@unesco.org

ANNEX III

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ANNEX IV

LIST OF ACRONYMS

ACC SOCA	U.N. Administrative Committee on Coordination's Subcommittee on Oceans and Coastal Areas
BENEFIT	Benguela Environment Fisheries Interaction and Training Program
BOBLME	Bay of Bengal Marge Marine Ecosystem
BCC	Benguela Current Commission
BCLME	Benguela Current Large Marine Ecosystem
CBD	Convention on Biological Diversity
CBOs	Community Based Organisations
CCAMLR	Commission for the Convention of Antarctic Marine Living Resources
COOP	Coastal Ocean Observation Panel
ECOPATH/ECOSIM	Mass-balance Food Web Modelling using "ECOSIM"
ENVIFISH	Environmental Conditions and Fluctuations in recruitment and Distribution of Small Pelagic Fish Stocks
FAO	Food and Agriculture Organization (UN)
FSA	Fish Stock Agreement
GCLME	Guinea Current Large Marine Ecosystem
GEF	Global Environment Facility
GPA	Global Programme of Action for the Protection of the Marine Environment
GESAMP	Group of Experts on the Scientific Aspects of Marine Pollution
GIWA	Global International Waters Assessment
GLOBEC	Global Ocean Ecosystem Dynamic
GOOS	Global Ocean Observing System (IOC-WMO-UNEP-ICSU)
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HELCOM	Helsinki Commission
IBCC	Interim Benguela Current Commission
IBSFC	International Baltic Sea Fisheries Commission
ICES	International Council for the Exploration of the Sea
ICM	Integrated Coastal Management
IDYLE	Interactions and Spatial Dynamics of Renewable Resources in Upwelling Ecosystems
IFOP	Instituto de Fomento Pesquero
IMARPE	Instituto del Mar del Peru
IUCN	World Conservation Union
IWLEARN	International Waters Learn
JCP	Baltic Joint Comprehensive Environmental Action Program
LME	Large Marine Ecosystem
LMR	Living Marine Resources Module
MHLC	Multilateral High Level Conferences on South Pacific Tuna Fisheries
MPA	Marine Protected Areas
NGO	Non-governmental Organization
NOAA-NMFS	National Oceanographic and Atmospheric Administration; National Marine Fisheries Service
ONRIFO	Office of the Naval Research International Field Office
ONR	Office of Naval Research, US
OSPAR Com.	The Oslo and Paris Commission (for the Protection of the Marine Environment of the North-East Atlantic)

PCU	Programme Coordinating Unit
PDF-B	Project Development Facility, Phase B Planning Grant
PEMSEA	Partnership for Environmental Management of the Seas of East Asia
POPs	Persistent Organic Pollutants
ROOFS	Regional Ocean Observing Forecasting System
SAP	Strategic Action Programme
SEAFO	South East Atlantic Fisheries Organisation
SEA-WATCH	Buoy System for Physical, Chemical and Biological marine
SIDS	Small Islands Development States
SPACC	Small Pelagic Fishes and Climate Change (GLOBEC)
TDA	Transboundary Diagnostic Analysis
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
VIBES	Viability of Exploited Pelagic Fish Resources in the Benguela Ecosystems in relation to the Environment and Spatial Aspects
WSSD	World Summit on Sustainable Development, Johannesburg, South Africa, 2002
YSLME	Yellow Sea Large Marine Ecosystem

In this Series, entitled

Reports of Meetings of Experts and Equivalent Bodies, which was initiated in 1984 and which is published in English only, unless otherwise specified, the reports of the following meetings have already been issued:

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans S. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' ***(Also printed in Spanish)***
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP(SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping ***(Also printed in French and Spanish)***
12. Joint 100-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and lntercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica lnternacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica ***(Spanish only)***
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources ***(Also printed in French and Spanish)***
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and lntercalibration
27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans ***(Also printed in French)***
28. Second Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOCARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities ***(Also printed in Spanish)***
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
35. Fourth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
36. First Consultative Meeting on RNODCs and Climate Data Services
37. Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow
38. Fourth Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
39. Fourth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
40. Fourteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
41. Third Session of the IOC Consultative Group on Ocean Mapping
42. Sixth Session of the Joint IOC-WMO-CCPS Working Group on the Investigations of 'El Niño' (***Also printed in Spanish)***
43. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
44. Third Session of the IOC-UN(OALOS) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
45. Ninth Session of the IOC-UNEP Group of Experts on Methods, Standards and lntercalibration
46. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
47. Cancelled
48. Twelfth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
49. Fifteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
50. Third Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
51. First Session of the IOC Group of Experts on the Global Sea-Level Observing System
52. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean
53. First Session of the IOC Editorial Board for the International Chart of the Central Eastern Atlantic ***(Also printed in French)***
54. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico ***(Also printed in Spanish)***
55. Fifth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
56. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
57. First Meeting of the IOC *ad hoc* Group of Experts on Ocean Mapping in the WESTPAC Area
58. Fourth Session of the IOC Consultative Group on Ocean Mapping

59. Second Session of the IOC-WMO/IGOSS Group of Experts on Operations and Technical Applications
60. Second Session of the IOC Group of Experts on the Global Sea-Level Observing System
61. UNEP-IOC-WMO Meeting of Experts on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change
62. Third Session of the IOC-FAO Group of Experts on the Programme of Ocean Science in Relation to Living Resources
63. Second Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
64. Joint Meeting of the Group of Experts on Pollutants and the Group of Experts on Methods, Standards and Intercalibration
65. First Meeting of the Working Group on Oceanographic Co-operation in the ROPME Sea Area
66. Fifth Session of the Editorial Board for the International Bathymetric and its Geological/Geophysical Series
67. Thirteenth Session of the IOC-IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans ***(Also printed in French)***
68. International Meeting of Scientific and Technical Experts on Climate Change and Oceans
69. UNEP-IOC-WMO-IUCN Meeting of Experts on a Long-Term Global Monitoring System
70. Fourth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
71. ROPME-IOC Meeting of the Steering Committee on Oceanographic Co-operation in the ROPME Sea Area
72. Seventh Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' ***(Spanish only)***
73. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico ***(Also printed in Spanish)***
74. UNEP-IOC-ASPEI Global Task Team on the Implications of Climate Change on Coral Reefs
75. Third Session of the IODE Group of Experts on Marine Information Management
76. Fifth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
77. ROPME-IOC Meeting of the Steering Committee for the Integrated Project Plan for the Coastal and Marine Environment of the ROPME Sea Area
78. Third Session of the IOC Group of Experts on the Global Sea-level Observing System
79. Third Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
80. Fourteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
81. Fifth Joint IOG-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
82. Second Meeting of the UNEP-IOC-ASPEI Global Task Team on the Implications of climate Change on Coral Reefs
83. Seventh Session of the JSC Ocean Observing System Development Panel
84. Fourth Session of the IODE Group of Experts on Marine Information Management
85. Sixth Session of the IOC Editorial Board for the International Bathymetric chart of the Mediterranean and its Geological/Geophysical Series
86. Fourth Session of the Joint IOC-JGOFS Panel on Carbon Dioxide
87. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Pacific
88. Eighth Session of the JSC Ocean Observing System Development Panel
89. Ninth Session of the JSC Ocean Observing System Development Panel
90. Sixth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
91. First Session of the IOC-FAO Group of Experts on OSLR for the IOCINCWIO Region
92. Fifth Session of the Joint IOC-JGOFS CO, Advisory Panel Meeting
93. Tenth Session of the JSC Ocean Observing System Development Panel
94. First Session of the Joint CMM-IGOSS-IODE Sub-group on Ocean Satellites and Remote Sensing
95. Third Session of the IOC Editorial Board for the International Chart of the Western Indian Ocean
96. Fourth Session of the IOC Group of Experts on the Global Sea Level Observing System
97. Joint Meeting of GEMSI and GEEP Core Groups
98. First Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
99. Second International Meeting of Scientific and Technical Experts on Climate Change and the Oceans
100. First Meeting of the Officers of the Editorial Board for the International Bathymetric Chart of the Western Pacific
101. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
102. Second Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
103. Fifteenth Session of the Joint IOC-IHO Committee for the General Bathymetric Chart of the Oceans
104. Fifth Session of the IOC Consultative Group on Ocean Mapping
105. Fifth Session of the IODE Group of Experts on Marine Information Management
106. IOC-NOAA *Ad hoc* Consultation on Marine Biodiversity
107. Sixth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
108. Third Session of the Health of the Oceans (HOTO) Panel of the Joint Scientific and Technical Committee for GLOSS
109. Second Session of the Strategy Subcommittee (SSC) of the IOC-WMO-UNEP Intergovernmental Committee for the Global Ocean Observing System
110. Third Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
111. First Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate
112. Sixth Session of the Joint IOC-JGOFS C02 Advisory Panel Meeting
113. First Meeting of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS)
114. Eighth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of "El Niño" ***(Spanish only)***
115. Second Session of the IOC Editorial Board of the International Bathymetric Chart of the Central Eastern Atlantic ***(Also printed in French)***
116. Tenth Session of the Officers Committee for the Joint IOC-IHO General Bathymetric Chart of the Oceans (GEBCO), USA, 1996
117. IOC Group of Experts on the Global Sea Level Observing System (GLOSS), Fifth Session, USA, 1997
118. Joint Scientific Technical Committee for Global Ocean Observing System (J-GOOS), Fourth Session, USA, 1997
199 First Session of the Joint 100-WMO IGOSS Ship-of-Opportunity Programme Implementation Panel, South Africa, 1997
120. Report of Ocean Climate Time-Series Workshop, Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate, USA, 1997

121. IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional Global Ocean Observing System (NEAR-GOOS), Second Session, Thailand, 1997

122. First Session of the IOC-IUCN-NOAA *Ad hoc* Consultative Meeting on Large Marine Ecosystems (LME), France, 1997

123. Second Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), South Africa, 1997

124. Sixth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico, Colombia, 1996 ***(also printed in Spanish)***

125. Seventh Session of the IODE Group of Experts on Technical Aspects of Data Exchange, Ireland, 1997

126. IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), First Session, France, 1997

127. Second Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 1998

128. Sixth Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1997

129. Sixth Session of the Tropical Atmosphere - Ocean Array (TAO) Implementation Panel, United Kingdom, 1997

130. First Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 1998

131. Fourth Session of the Health of the Oceans (HOTO) Panel of the Global Ocean Observing System (GOOS), Singapore, 1997

132. Sixteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), United Kingdom, 1997

133. First Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1998

134. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IOC/EB-IBCWIO-IW3), South Africa, 1997

135. Third Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), France, 1998

136. Seventh Session of the Joint IOC-JGOFS C02 Advisory Panel Meeting, Germany, 1997

137. Implementation of Global Ocean Observations for GOOS/GCOS, First Session, Australia, 1998

138. Implementation of Global Ocean Observations for GOOS/GCOS, Second Session, France, 1998

139. Second Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Brazil, 1998

140. Third Session of IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), China, 1998

141. Ninth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Ecuador, 1998 ***(Spanish only)***

142. Seventh Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Croatia, 1998

143. Seventh Session of the Tropical Atmosphere-Ocean Array (TAO) Implementation Panel, Abidjan, Côte d'Ivoire, 1998

144. Sixth Session of the IODE Group of Experts on Marine Information Management (GEMIM), USA, 1999

145. Second Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), China, 1999

146. Third Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Ghana, 1999

147. Fourth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC); Fourth Session of the WCRP CLIVAR Upper Ocean Panel (UOP); Special Joint Session of OOPC and UOP, USA, 1999

148. Second Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1999

149. Eighth Session of the Joint IOC-JGOFS CO2 Advisory Panel Meeting, Japan, 1999

150. Fourth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Japan, 1999

151. Seventh Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1999

152. Sixth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 1999

153. Seventeenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), Canada, 1999

154. Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y el Golfo de Mexico (IBCCA), Septima Reunión, Mexico, 1998

IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (IBCCA), Seventh Session, Mexico, 1998

155. Initial Global Ocean Observing System (GOOS) Commitments Meeting, IOC-WMO-UNEP-ICSU/Impl-III/3, France, 1999

156. First Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Venezuela, 1999 ***(also printed in Spanish and French)***

157. Fourth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), China, 1999

158. Eighth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Russian Federation, 1999

159. Third Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), Chile, 1999

160. Fourth Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS). Hawaii, 2000

161. Eighth Session of the IODE Group of Experts on Technical Aspects of Data Exchange, USA, 2000

162. Third Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 2000

163. Fifth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Poland, 2000

164. Third Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 2000

165. Second Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Cuba, 2000 ***(also printed in Spanish and French)***

166. First Session of the Coastal Ocean Observations Panel, Costa Rica, 2000

167. First GOOS Users' Forum, 2000

168. Seventh Session of the Group of Experts on the Global Sea Level Observing System, Honolulu, 2001

169. First Session of the Advisory Body of Experts on the Law of the Sea (ABE-LOS), France, 2001 ***(also printed in French)***

170. Fourth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, Chile, 2001

171. First Session of the IOC-SCOR Ocean CO_2 Advisory Panel, France, 2000

172. Fifth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Norway, 2000 ***(electronic copy only)***

173. Third Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, USA, 2001 ***(also printed in Spanish and French)***

174. Second Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Italy, 2001

175. Second Session of the Black Sea GOOS Workshop, Georgia, 2001

176. Fifth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2000

177. Second Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Morocco, 2002 ***(also printed in French)***

178. Sixth Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Australia, 2001 ***(electronic copy only)***

179. *Cancelled*

180. Second Session of the IOC-SCOR Ocean CO_2 Advisory Panel, Honolulu, Hawaii, U.S.A, 2002 ***(electronic copy only)***

181. IOC Workshop on the Establishment of SEAGOOS in the Wider Southeast Asian Region, Seoul, Republic of Korea, 2001 (SEAGOOS preparatory workshop) ***(electronic copy only)***

182. First Session of the IODE Steering Group for the Resource Kit, USA, 19–21 March 2001

183. Fourth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), France, 2002

184. Seventh Session of the IODE Group of Experts on Marine Information Management (GEMIM), France, 2002 ***(electronic copy only)***

185. Sixth Session of IOC/WESTPAC Coordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2001 ***(electronic copy only)***

186. First Session of the Global Ocean Observing System (GOOS) Capacity Building Panel, Switzerland, 2002 ***(electronic copy only)***

187. Fourth Session of the ad hoc Advisory Group for IOCARIBE-GOOS, 2002, Mexico ***(also printed in French and Spanish)***

188. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IBCWIO), Mauritius, 2000

189. Third session of the Editorial Board for the International Bathymetric Chart of the Western Pacific, Chine, 2000

190. Third Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Vietnam, 2002

191. Eighth Session of the IOC Consultative Group on Ocean Mapping, Russian Federation, 2001

192. Third Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Lisbon, 2003 ***(also printed in French)***

193. Extraordinary Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Chile, 1999 ***(Spanish only; electronic copy only)***

194. Fifth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, France, 2002

195. Sixth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, South Africa, 2003

196. Fourth Session of the Coastal Ocean Observations Panel, South Africa, 2002 ***(electronic copy only)***

197. First Session of the JCOMM/IODE Expert Team On Data Management Practices, Belgium, 2003 *(also JCOMM Meeting Report No. 25)*

198. Fifth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2003

199. Ninth Session of the IOC Consultative Group on Ocean Mapping, Monaco, 2003 ***(Recommendations in English, French, Russian and Spanish included)***

200. Eighth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 2003 ***(electronic copy only)***

201. Fourth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Greece, 2004 ***(also printed in French)***

202. Sixth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2004 ***(electronic copy only)***

203. Fifth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Argentina, 2005 ***(also printed in French)***

204. Ninth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 2005 ***(electronic copy only)***

205. Eighth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), China, 2003 ***(electronic copy only)***

206. Sixth Meeting of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Spain, 2006 ***(also printed in French)***

207. Third Session of the Regional Forum of the Global Ocean Observing System, South Africa, 2006 ***(electronic copy only)***

208. Seventh Session of the IOC-UNEP-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2005 ***(electronic copy only)***