EUROPEAN COMMISSION

29

Marine Institute
Foras na Mara

EUROCEAN 2004

Marine Board

Galway, Ireland
10th - 13th May 2004

- Celebrating European Marine Science
- Building the European Research Area
- Communicating Marine Science

Éire 2004 Uachtaránacht an Aontais Eorpaigh
Ireland 2004 Presidency of the European Union
www.eu2004.ie

O

EurOCEAN 2004 was a Marine Science – Policy Conference. It followed as a proud successor to the previous MAST-DAYS and EurOCEAN Conferences held in Brussels (1994), Sorrento (1996), Lisbon (1998) and Hamburg (2000).

The EurOCEAN conference series provide a forum for policy makers and strategic decision makers to interface and exchange views with representatives of the marine research community and other marine stakeholders.

EurOCEAN 2004 provided a unique and timely forum to

- Review the impacts of marine R&D supported under the EU's 5th Framework Programme (1998-2002);
- Provide information on the implementation of the 6th Framework Programme (2002-2006) relative to marine research;
- Highlight achievements in addressing current challenges;
- Identify future marine R&D opportunities and challenges that should be addressed within the context of the proposed European Research Area (ERA) and supported by the 6th Framework Programme and the forthcoming 7th Framework Programme.

Over 50% of the territory of the European Research Area is "underwater". This territory comprises Member States' Exclusive Economic Zones and Extended Continental Shelves stretching from the Arctic, through the Baltic, Atlantic, Mediterranean and Black Sea.

The European seas and oceans are of pivotal strategic importance for the future economic and social development of Europe. It is now clear that living resources are finite and that Governments and scientists have responsibilities both to improve their understanding of the maritime environment and also to use and disseminate their knowledge towards the effective and sustainable management of this unique resource.

The challenge facing the scientific community is to turn scientific knowledge into sound management advice that can be implemented in policies. This process will be essential over the coming decades to implement the ecosystem approach to sustainable fisheries management; develop renewable ocean energies in order to diversify our energy supply and meet our Kyoto commitments; develop safe and environmentally friendly shipping opening up the "Motorways of the Sea"; and protect marine biodiversity while utilising the benefits of this unique biodiversity through "blue" biotechnology.

Products from EurOCEAN 2004 Include:

- EU FP5 – FP6 Projects' Book of Abstracts, describing 184 FP5/6 collaborative marine projects
- FP5 – FP6 Project Poster Presentations (available on CD)
- Posters describing Marine Science Programmes in Bulgaria, Cyprus, Estonia, Latvia, Lithuania, Malta, Poland, Romania, Slovenia, and Turkey
- Marie Curie Fellowships in the domain of Marine Sciences - Abstracts (Hardcopy and CD) – describing 35 individual Marine Marie Curie Fellowships

Ancillary Meetings Held During EurOCEAN 2004

- European Consortium for Ocean Research Drilling (ECORD), Consortium Meeting.
- European Federation of Marine Science & Technology Societies (EFMSTS), General Assembly.
- European Fisheries and Aquaculture Research Organisations (EFARO), Network Annual Meeting.
- European Land-Ocean Interaction Studies – ELOISE, Research Project Consortium Meeting.
- Marine Board - European Science Foundation – (ESF-MB), Plenary Meeting.
- Marine Board - European Science Foundation– Innovative Hydrodynamic Modelling Working Group, Meeting.
- Marine Board - European Science Foundation– Communicating Science Working Group, daily meetings
- European Sea Floor Observatory Network – ESONET, NoE Consortium Meeting.
- European Sea Level Service Project – Research Infrastructures (ESEAS-RI), Research Project Consortium Meeting.
- Science and Policy Integration for Coastal Ecosystems (SPICES), Proposal Consortium Meeting.

For further information:
www.eurocean2004.com

EurOCEAN 2004

European Conference, Marine Science & Ocean Technology

Celebrating European Marine Science

Building the European Research Area

Communicating Marine Science

Galway, Ireland: 10th – 13th May 2004

Summary Report

March 2005

Compiled and Edited By:
Gilles Ollier, Niamh Connolly & Geoffrey O'Sullivan

Contributors:
John Joyce, George Zodiatis, John Marks, Yvonne Shields, Luis Farina Busto, Anu Reinart

EurOCEAN 2004
European Conference,
Marine Science & Ocean Technology

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INTRODUCTION

The EurOCEAN 2004 Conference attracted over 550 marine researchers, policy makers and private sector representatives to Galway (Ireland) between 11th – 13th May 2004. Organised as an Irish EU Presidency Event, EurOCEAN 2004 was co-hosted by the European Commission, the Marine Institute (Ireland) and the Marine Board of the European Science Foundation (MB-ESF).

This Rapporteurs' Report provides a summary of the output and conclusions of the Conference. The full Conference Proceedings will be published separately.

In reviewing the many co-operative marine research projects supported under the 5th and 6th EU Framework Programmes (totalling 184 individual projects) EurOCEAN 2004 drew attention to the need to:

- Realistically quantify, in economic terms, the value of marine resources and services in order to place their value within an overall European economic context;
- Improve the communication of the results of marine sciences, particularly their practical application in terms of sustainable resource management, social integration and quality of life issues;
- Modify the strict application of the "*precautionary approach*" to incorporate, where appropriate, "*risk based management*" (e.g. in relation to maritime transport and operational forecasting) and "*alternate scenario planning*" (e.g. in relation to Integrated Coastal Zone Management);
- Recognise the importance of adopting an interdisciplinary approach to address challenges, particularly in the context of the ecosystem approach to fisheries management, Integrated Coastal Zone Management and operational oceanography;
- Provide appropriate supports and structures to encourage young researchers (and not so young researchers) to embark on a career in science, particularly marine science.

The Special Poster display dedicated to the Marine Research Programmes/Priorities of the New EU Maritime Member States (Cyprus, Estonia, Latvia, Lithuania, Malta, Poland and Slovenia) and including Bulgaria, Romania and Turkey was much appreciated by all. The interdisciplinary forum created by the range of supporting meetings and networking opportunities provided was also greatly appreciated by the participants.

THE GALWAY DECLARATION

EurOCEAN 2004 concluded with the endorsement and official release of the "Galway Declaration" which calls on the European Commission and the Member States to recognise:

- *the crucial role of the oceans in climate patterns, carbon cycle and Life on Earth;*
- *the major contribution that maritime industries can make to the achievement of the objectives outlined in the Lisbon Agenda;*
- *the essential role of marine science and technology in generating the knowledge needed to fuel this economic achievement in harmony with the environment;*
- *the critical role the European Research Area and the 7th Framework Programme must play in supporting world-class excellence in marine science and technology.*

In conclusion, EurOCEAN 2004 demonstrated that marine science and technology represents a suite of very lively disciplines with new visions and challenges emerging that can make significant contributions to European economic, social and environmental development. Further it initiated the debate on the role and status to be accorded to marine science in the EU 7th Framework Programme (2007-2011).

Gilles Ollier
DG Research, EC

Niamh Connolly
Marine Board-SF

Geoffrey O'Sullivan
Marine Institute (Ireland)

EurOCEAN 2004
European Conference, Marine Science & Ocean Technology

THEMATIC SESSION 1
"The Role of Ecosystem and Biodiversity Research in the Conservation of Natural Reserves and Marine Resources"

Chair: **Professor Mário Ruivo**, Chairman of the Portuguese Committee for the IOC

Rapporteur: **Dr. John Joyce**, Fisheries Science Services, Marine Institute

Keynote 1: "*The role of fishery science in fisheries management: lessons from the past and perspectives for the future.*"
Dr. Gabriella Bianchi (Italy), Food and Agriculture Organisation of the United Nations (FAO)

Keynote 2: "*The science needed to underpin ecosystem-based management of European Seas.*"
Professor Chris Frid (UK), School of Marine Science & Technology, University of Newcastle-upon-Tyne

Keynote 3: "*Marine biotechnology and biodiversity: use of marine organisms as sources of pharmaceuticals and other biologically active compounds.*"
Dr. Adrianna Ianora (Italy), Stazione Zoologica "A. Dohrn", Naples.

Keynote 4: "*Marine Biodiversity- what it is and what are the problems?*"
Professor Carlo Heip (Netherlands), NIOO-CEME Netherlands Institute for Ecology, Yerseke.

Convener: **Piia Tuomisto** (DG Research)

In opening the first Thematic Session, the chair, Professor Mario Ruivo, reiterated the importance of the effective communication of marine science, to inform not only the public, but also those in positions to influence the research priorities, policies and budgets under which marine science operates.

The Ecosystem Approach to Fisheries Management: An Integration of Science and Socio-Economics towards Sound Policy and Management Decision-making

Dr Bianchi stated that, while knowledge-based management is the most effective way to manage the ocean's resources in a sustainable way, scientific information must be combined with practical considerations.

Implementation of an *ecosystem approach* to fisheries management puts great emphasis on consultation and communication with stakeholders. It identifies roles, objectives and the close relationship between management targets and the science required to underpin them.

The main challenges for science in the development and future application of a truly ecosystem approach to fisheries management were identified as:

- **Consideration of Several Different Timescales** - Science based ecosystem approaches need long-term timescales that are not typical of working fisheries.

- **Reconciling Private Sector Research with the Public Good** - How is it possible to reconcile privately funded research with the public good and long term perspectives?

- **Lack of Communication and Linkages Between Stakeholders** – This includes the need for increased communication to enhance understanding of the challenges related to dealing with uncertainty, complexity, and different timescales.

The Science Needed to Underpin Ecosystem-based Fisheries Management in European Seas

Professor Chris Frid profiled how an ecosystem approach could be applied to fisheries management. Fisheries are vitally important industries for nutrition, health and economics. And yet, society cannot manage the ecosystem or the

climate that influences fisheries. All that society can manage is the human activity within the system.

Moving forward, the scientific community needs *to make the scientific advice stronger and more applicable to ecosystems and their inherent resources*. It is widely recognised that there is too much fishing effort at present and that this effort needs to be reduced. Other measures such as *closed areas and technical conservation measures* need to be taken into account.

Science needs to underpin this approach in **two areas**:

(i) **The Science Educator's Role** – scientists need to inform the widest possible constituency about the choices to be faced. Realistic assessments have to be made as to what is possible and what is not.

(ii) **Provision of Clear Management Advice** - an ecosystem approach requires access to knowledge derived from a far wider range of sciences than conventional approaches would use. The scientific community needs to develop better predictive regimes to inform society as to what might happen to a given ecosystem, using simulations and models.

Policy makers need to know about habitat quality and marine protected areas and how they should be geographically spaced and linked, to respond to biological dynamics.

Marine Biotechnology and Biodiversity

Adrianna Ianora described some of the opportunities that marine biotechnology offers.

Opportunities

- European waters - containing a wide range of species and habitats – represent a vast reservoir of biological material;
- The scientific community must develop the technology improvements necessary to facilitate discovery and analysis;
- The scientific community has the opportunity to enhance its knowledge, and to educate the public, marine industries, policy makers and the financiers of research as to the vital importance of biodiversity and an ecosystem approach to fisheries management;
- This dissemination and application of knowledge, both in the European and global contexts, will lead to improved application of this knowledge for the public good.

Challenges

The research community should address the following:

- Reducing the loss of biodiversity – as a result of pollution, overfishing, invasive species and climate change;
- Addressing collapsing fish stocks as a result of overfishing;
- Ignorance of the consequences of reducing biodiversity and habitat destruction;
- Incompatibility of the time scales required by scientific methods and the immediate problems of fishing industries;
- Communicating to decision makers the difficulties scientists face in dealing both with and predicting uncertainty;
- Conflicting uses by society for the marine resources, for example between fishing industries, conservation interests, marine extraction and waste disposal requirements, etc.

Marine Biodiversity – What it is and What the Problems Are

Professor Carlo Heip explained that marine biodiversity is poorly understood and largely unexplored. Marine biodiversity is under threat from a range of human activities; for example, the introduction of invading species through ballast water causes coastal ecosystems to become homogenised globally, ultimately reducing biodiversity.

Fisheries and the overexploitation of top predators is also a major threat to biodiversity. Biodiversity is important – it holds the key to many vital marine processes and possibly to biological resources of relevance to the pharmaceutical and bioprospecting industries. The reduction in biodiversity has ethical implications. Society cannot ignore the effects human activities have upon biodiversity.

Future Research and FP7

The future marine R&D priorities should address the need to:

- Introduce 'Marine Science' issues on the FP7 agenda;
- Mobilise interdisciplinary research;
- Fully understand ecological processes, particularly in support of the ecosystem approach to fisheries;
- Map and catalogue living resources;
- Perfect techniques for synthesising and mass-producing marine biochemicals;
- Communicate scientific developments and successes to decision makers as well as the general public;
- Raise awareness of the importance of 'The Sea' within the European Commission, Parliament and Member States' Governments and agencies.

- **Application of the Ecosystem Approach to Fisheries Management**

The only thing society can endeavour to manage is human activity. In the first instance, the scientific community needs to demonstrate links between problems and develop instruments to discriminate between climate and other anthropogenic effects on the ecosystem.

Secondly, in relation to the application of an ecosystem approach to commercial aquaculture, it was noted that the dependence on the use of fish protein to culture high value fish (such as salmon, trout, cod and flatfish) was unsustainable. If this link between aquaculture and fisheries could be broken, conservation of wild fish resources would be enhanced.

Biotechnology

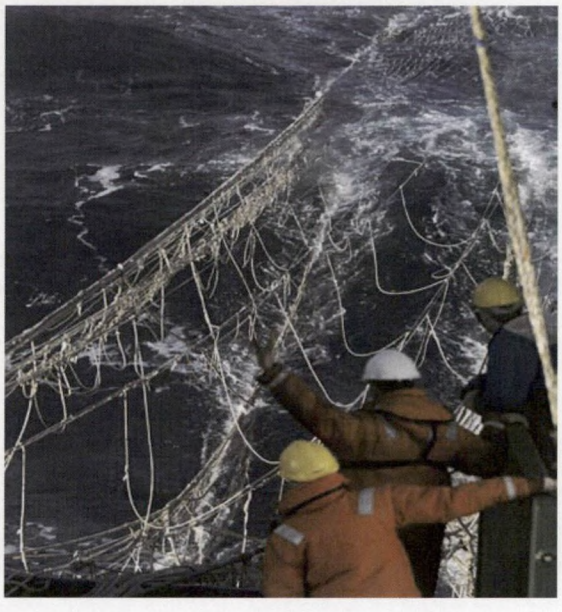
The opportunities for the next ten years in marine applications of biotechnology are promising. Microalgae are already mass-produced for a number of industrial processes, and it may be possible to apply mass-production to new discoveries from the sea. Scientists must be allowed time to discover the properties of these new biomolecules before mass-production can be developed.

Communication and Research

The ecosystem approach to fisheries management is a prime example of how communication between scientists and society needs to be improved. Specific questions that need to be addressed include: How can the research community best communicate its scientific knowledge for the public good? How do scientists perceive that ecosystems should develop in the future?

Rapporteur's Summary

Regarding management of marine ecosystems, the traditional approach of studying single impacts in isolation appears to be too blunt an instrument to fully understand the delicate balances and interlocking webs of biological dependence that make up life in the sea. Until scientists and society can understand the full impact of anthropogenic effects on complex ecosystems in a truly holistic way, society risks losing the benefits such systems have to offer in terms of biodiscovery, food production and the maintenance of life on this planet.



Knowledge is the key to enhanced management; the scientific community must take responsibility and communicate with a range of stakeholders, including decision makers, politicians, other scientists and the general public, to inform them of how vitally important the problem of ecosystem management and biodiversity loss is for all society.

KEY POINTS THEMATIC SESSION 1

ECOSYSTEMS FUNCTIONING AND BIODIVERSITY

- The ecosystem approach to marine resource management needs to be considered in a long-term-perspective, particularly with regard to fisheries management;
- The research community needs to improve communication to inform the widest possible constituency about the choices to be faced in adopting the ecosystem approach;
- The research community needs *to make its scientific advice stronger and more applicable to real ecosystems*, allowing scientific information to be combined with practical considerations, resulting in the *provision of clear management advice;*
- Marine biodiversity - poorly understood and largely unexplored - is under threat from a range of human activities including the introduction of invading species, resource exploitation, climate change etc;
- The overexploitation of top predators is a major threat to biodiversity; there is a need to reduce fishing effort, and to implement Marine Protected Areas;
- European waters contain a wide range of species and habitats; a vast reservoir of biological material exists which may be of relevance to the pharmaceutical industry;
- Scientists must be allowed time to discover the properties of these new biomolecules before mass-production can be developed;
- Marine science is trans- and inter- disciplinary and must be considered as such in FP7;
- Future marine R&D priorities should address the need to:

  -Mobilise inter-disciplinary research.
  -Fully understand ecological processes, particularly in support of the ecosystem approach to fisheries.
  -Map and catalogue living resources.
  -Perfect techniques for synthesising and mass-producing marine biochemicals.
  -Communicate scientific developments and successes to decision makers as well as the general public.

- Raise awareness of the importance of 'The Sea' within the European Commission, Parliament and Member states.

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THEMATIC SESSION 2
"Forecasting and Transport Research in Support of the Security of the Maritime Environment"

Chair: **Mr. Michael Ó Cinnéide**, MEHS, Marine Institute

Rapporteur: **Dr. George Zodiatis**, Oceanography Centre (DFMR), University of Cyprus

Keynote 1: "*Developments in operational oceanographic and meteorological services for the maritime environment*"
Dr Peter Ryder (UK), EuroGOOS & GMES Consultant

Keynote 2: "*Research in support of the security of the maritime environment- including the specific involvement of an SME.*"
Ms. Konstanze Reichert (Germany), OceanWaveS GmbH, Germany

Keynote 3: "*European marine transport research supporting the ocean environment.*"
Mr. Nils Telle (Norway), Norwegian Ship Owners' Association

Keynote 4: "*Tanker transport and ocean environment*"
Mr. Tim Wilkins (UK), INTERTANKO London

Convener: **Alan Edwards** (DG Research)

This session on forecasting and transport research in support of the security of the marine environment was organised around four keynote presentations. Peter Ryder (EuroGOOS) described "Developments in Operational Oceanographic and Meteorological Services for the Maritime Environment". Konstanze Reichert outlined how the German SME OceanWaveS GmbH carries out research in support of the security of the maritime environment. Nils Telle of the Norwegian Ship Owners' Association described European marine transport research supporting the ocean environment, while Tim Wilkins of INTERTANKO (UK) spoke about tanker transport and the ocean environment.

One of the permanent risks regarding a maritime transport incident in the European seas is associated with the heavy traffic of all types of vessels. It is estimated that more than 200,000 vessels pass annually through the Mediterranean Sea. A similar situation can be found in other sea regions surrounding Europe. Such dense maritime transport activity imposes on coastal countries the need for operational forecasts and efforts to prepare an operational response in the event of an incident.

The Barcelona Convention for the Protection of the Mediterranean Sea against Pollution, the Marine Pollution Emergency Response and Support System (MPERSS), the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) administered by the International Maritime Organization (IMO), the Global Maritime Distress and Safety System (GMDSS) and other international, sub-regional and local agencies, manifest the necessity for the implementation of operational applications to improve the information that is needed for taking actions in response to major maritime incidents, and in general to support the security of the maritime environment.

The primary procedure recommended for responding to maritime incidents, which will assist the local and regional decision makers to take appropriate actions, includes the application of operational forecasting models to provide predictions of the marine environment. Until recently, the most significant marine services, in terms of safety at sea, were provided by the meteorological weather forecasting agencies, in the form of wind, waves, storm surges and sea-ice forecasts.

In recent years, several international initiatives, such as GOOS, EuroGOOS, MedGOOS, BOOS and recently GMES, MOON, plus research projects such as MFSPP, MFSTEP, MAMA, MERSEA, EuroROSE etc., have promoted the development and establishment of operational oceanographic observing and forecasting systems and the relevant networks around Europe. Within the framework of these activities several pre-operational oceanographic observing and forecasting systems are

active in Europe at present on global, regional, sub-regional and coastal scales: e.g. MERCATOR, FOAM, TOPAZ, MFSTEP, POSEIDON, CYCOFOS, etc.

The effective exchange and dissemination of observational and forecasting products to end-users is recognized as playing a crucial role in the operational response to maritime incidents. The use of the forecasting products for certain derived applications has proved to assist the security of maritime transport in cases of oil spill incidents.

There are two main research directions that support security in the maritime environment:

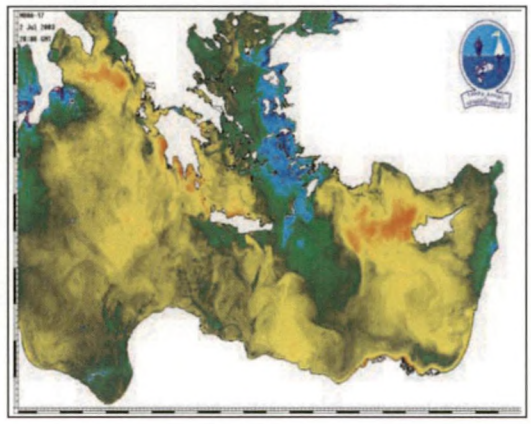
1. **The application of statistical analyses of the ocean and atmosphere (physical, biological and chemical), coupled with near-real-time (NRT) oceanographic and meteorological forecasts;**

The influence of sea-state on maritime transport and coastal and offshore structures plays a crucial role in increasing the safety and protection of the maritime environment. Wave and current monitoring systems, such as the WaMoS and HF radar systems, are valuable new tools in monitoring and reporting on sea-state, as demonstrated in the EuroROSE and MaxWave Projects. This new knowledge gained about sea state must be implemented into ship and offshore design criteria.

The oceans are generally considered as being seriously under-surveyed. Questions related to where best to invest for improvement in *in situ* and remotely sensed oceanographic observations, assimilation methods or hydrodynamic models, still remain. It is not yet possible to reliably forecast high-impact weather events. Neither is it clear how to meet the wide range of disparate needs for services in both a comprehensive and economical way.

In view of the above, there is a requirement to improve and to extend observing and forecasting systems on global, regional and coastal scales. The development of operational oceanographic forecasts requires an engagement in collaborative experiments that build upon existing operational and pre-operational capabilities, e.g. THORpex (for improved weather observing systems and forecasts), MERSEA (integrated project on operational oceanography) and similar EuroGOOS initiatives in coastal zones, etc. This should lead to the establishment of a European oceanographic observing and forecasting capacity, which builds upon, develops and exploits the GMES initiative.

In addition, there is a need to address identified deficiencies, use international standards and design in interoperability and finally to commit to an oceanographic and forecasting research programme in FP7, closely-coupled to GMES and GEOSS.



2. **The improvement of the design, construction *and operation* of maritime transport.**

The improvement of the design, construction and particularly the *operation* of maritime transport will enhance safety at sea.

Despite the fact that 99.98% of the oil transported by tankers arrives safely at its destination, the regulations on the *operation* of maritime transport are largely developed in the aftermath of accidents, such as those of "Exxon Valdez", "Erica", and recently the "Prestige".

The tanker industry is convinced that the most efficient way to minimize accidents is to design and construct safer vessels, taking into consideration not only advances in technology, but also the increasing knowledge of the environmental effects from shipping. Today, all of the newly delivered tankers have double hulls. Furthermore, the tanker industry, jointly with the shipyard industries and the classification societies, wishes to raise the minimum standards in the design, construction and operation of tankers.

Within these efforts, several conventions related to ballast water discharge, anti-fouling, operational oily waste and garbage discharges are implemented by the shipping industry; these protocols are regrettably not supported by many flag and port states.

The major directions in research related to maritime transport can be summarized as follows:

- Apply new technologies for on-board treatment of ballast water to avoid distribution of harmful organisms;
- Apply new technologies for the further reduction of gaseous and particulate emissions from maritime engines;
- Promote the education and training of seafarers in marine environment matters.
- Use alternative fuels, especially natural gas;
- Use improved double hulls by developing energy-absorbing structures;
- Establish Vessel Traffic Management and Information Systems in Europe (VTMIS);
- Develop contingency plans for ships in distress and incidents in European seas.

Operational Forecasting and Maritime Transport

Common Concerns - Risk Management

The areas of common concern to both operational forecasting and maritime transport include, for example, how to:

- Handle uncertainty in forecasts;
- Advise on sea-state extremes;
- Introduce technical solutions and procedures which minimise risk rather, than taking a purely precautionary stance.

Possible Solutions Include:

1. Trial probabilistic forecasts with professional end-users who are managing risk;
2. Characterize extreme events in a probability distribution format / table and educate users on how to use them;
3. Encourage a "*risk based management approach*" in legislation and operations.

Conclusions

The main conclusions and main messages that emerged from this Session identified the need to:

- Engage in experiments that build upon existing operational and pre-operational capabilities;
- Develop and implement incentive schemes to make European "green shipping" profitable;
- Integrate the sea-state and weather forecasts into the decision support systems for ship design and operation.

KEY POINTS THEMATIC SESSION 2

MARITIME FORECASTING AND TRANSPORT

- For Europeans seas, which support heavy vessel traffic; there is a need to promote the education and training of seafarers in marine environmental matters;

Forecasting

- Forecasts (models, pre-operational oceanographic observing and forecasting systems, statistical analyses of the ocean and the atmosphere etc.) are needed to prepare operational responses in the event of a polluting incident in Europeans seas;
- A European oceanographic observing and forecasting capacity should be established, which builds upon the GMES initiative.
- An oceanographic and forecasting research programme should be secured within FP7, closely-coupled to GMES and GEOSS;
- Effective exchange and dissemination of observational and forecasting products to end-users is recognized as playing a crucial role in the operational response to maritime incidents;
- Researchers must engage in experiments that build upon existing operational and pre-operational oceanographic capabilities.

Possible Solutions to Integrated Forecasting with Transport Include:

- Trial probabilistic forecasts with professional end-users who are managing risk;
- Characterize extreme events in a probability distribution format / table and educate users on how to use them;
- Encourage a "*risk based management approach*" in legislation and operations, rather than adopting a purely precautionary stance.

Maritime Transport - Research Priorities Include Efforts to Improve the Design, Construction and Operation of Maritime Vessels

- New technologies for on-board treatment of ballast water to avoid distribution of harmful organisms;
- New technologies for the further reduction of gaseous and particulate emissions from maritime engines;
- Use alternative fuels, especially natural gas;
- Use improved double hulls by developing energy-absorbing structures;
- Establish Vessel Traffic, Management and Information Systems in Europe (VTMIS);
- Develop contingency plans for ships in distress and incidents in European seas;
- Develop and implement incentive schemes to make European "green shipping" profitable;
- Integrate the sea-state and weather forecasts into the decision support systems for ship design and operation.

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PLENARY SESSION 1
"FP6 ERA- European Research Area"

Chair:	**Prof. Karin Lochte,** University of Kiel
Rapporteur:	**Dr. John Marks,** European Science Foundation
Keynote 1:	*"ERA and FP6 marine research in Europe."* **Mr. Pierre Mathy (EC),** Directorate General for Research.
Keynote 2:	Presentation of the FP6 NoE Marine Genomics. **Professor Adelino Canario (Portugal),** University of Algarve.
Keynote 3:	*"European strategy for the preservation and conservation of the marine environment. Knowledge requirements."* **Mr. José Rizo (EC),** Directorate General for Environment
Keynote 4:	*"Marine Research Infrastructures- need for a better co-ordination."* **Dr. Rudy Herman (Belgium),** Science and Innovation Administration.
Keynote 5:	*"European Marine Science in the Global Context."* **Dr. Jean-François Minster (France),** IFREMER
Convener:	**Cathy Eccles** (DG Research)

The concept of the European Research Area (ERA) has been established as a platform to emphasise that a strong European research effort requires a concerted effort of EU funding through the Framework Programme, together with nationally funded research programmes. Only enhanced coordination and a real integration of research activities in Europe can overcome the fragmentation that currently characterises the European research effort. Marine science and technology are a perfect example of a domain where this integrated approach is developing and will bear fruit.

In opening the Session, Pierre Mathy highlighted changes in the position of marine science and technology in the context of political changes in the thinking about research and development in general at the European level. The role of the new instruments of FP6 in integrating science and scientists was illustrated in the presentation of Adelino Canario. José Rizo showed the importance of close and early interaction between users and scientists in defining the research questions. The need for better coordination of Member State policies with those of the EC was argued by Rudy Herman, using the example of marine research infrastructures. Finally, Jean-François Minster put marine science and technology in a global context, arguing that enhanced coordination of European efforts requires a global perspective, as the oceans ignore continental boundaries and marine research both requires and benefits from global co-operation.

The Session yielded several forward looking recommendations regarding the further strengthening of the European Marine Research Area, the further development of the marine research agenda and the conditions necessary for success.

Challenges and Opportunities - The ERA

6th Framework Programme (2000-2006)

Marine science and technology has benefited considerably from the successive EC funded research Framework Programmes (FPs). Previous FPs had specific dedicated marine programmes, such as Marine Science & Technology (MAST) and Fisheries & Aquaculture Research (FAR). In the approach chosen for FP6 there is however no dedicated

marine science programme. While marine science clearly benefited from all FP6 instruments: the new instruments (Networks of Excellence and Integrated Projects), ERA-NET, as well as the traditional smaller sized projects (STREPs), there is little or no evidence of integration between the eight Priority Themes of FP6. A further concern is that funds allocated to environment related research decreased by 35% from FP5 to FP6. To reverse this trend in FP7 will require the presentation of convincing arguments from the scientific community and the Member States.

The European Research Area concept (adopted in 2000) marks the beginning of a more integrated approach to science and technology in Europe. As a result, FP6 not only addresses EC funded research, but also provides support for the co-ordination of national research. The Lisbon Summit (2000) set the objective that Europe should become *"the most competitive knowledge based economy in the world"* by 2010, and clearly identified R&D as an important instrument in this context. The Barcelona Council (2002) set a goal of 3% GDP for the spending on R&D, of which 2/3 should come from the private sector. For marine science and technology it is important that the Gothenburg Summit (2001) added the concept that all R&D should contribute to the sustainable development of the economy and underlined the responsibility for contributing to the research needs of the international environmental Conventions to which the EU has signed up. As a result, the 6th EU Environment Action Programme was adopted in 2002 to promote the integration of environmental concerns in all EU policies. This adds environmental considerations to the strengthening of European competitiveness. The World Summit on Environment and Development in Johannesburg (2002) further amplified the responsibilities of the industrialised countries regarding sustainable development. The greater emphasis on economic goals has nevertheless strongly shaped FP6, with less room for environment related research and fundamental science.

The marine science community has so far been rather successful in FP6, with three Networks of Excellence (NoEs) and five Integrated Projects (IPs) approved (at the time of this conference), in addition to several STREPs. Several projects address the science needs related to the EU fisheries policy, which is an important user of knowledge. As this policy is based on an ecosystem approach, the science involved is mainly basic research.

The research funding agencies have responded to the need for enhanced coordination by successfully proposing ERA-NETs in the field of Ocean Drilling (ECORD), coordination of Baltic Sea environmental research (BONUS) and recently the overarching MarinERA for co-ordination of national marine sciences programmes

7th Framework Programme (2007–2011)

Although only halfway through FP6, the development of the FP7 agenda has already begun. Under the Irish Presidency, the Research Ministers decided that basic science should receive increased support in FP7. Basic science is seen as a nursery ground for new ideas and is crucial for training the future generations of scientists. Meanwhile, the EC has proposed a doubling of the research budget for FP7. In a recent Communication, the Commission proposed six axes for the future research policy of the EU:

1. *Collaboration:* continuation of the 'new' and 'traditional' FP6 instruments;
2. *Technology platforms*: encourage public-private partnerships;
3. *Competition in basic research:* bottom up, no themes, peer review processes under control of the scientific community;
4. *Human resources development:* enhanced Marie Curie programmes;
5. *Research infrastructure:* not only access, but also investment;
6. *Enhanced coordination of national programmes:* ERA-NETs, access to Article 169 funding.

All six axes, individually and collectively, are important for creating a strong and effective European Marine Research Area. The marine research community is encouraged to develop ideas for the implementation of these axes from the marine perspective and to bring these to the attention of their National Authorities, particularly those involved in the development of FP7.

Given the new orientation of EC support for research, in arguing for more support for marine research from FP7, the following questions should guide the discussion:

- To which category of users is the topic of importance?
- Is the topic relevant to the public good?
- Should the topic be addressed at the European or at Member State level?

Marine RTD Priorities

Though this Session focussed less on the identification of new priorities than did some of the other Sessions, the presentations identified examples of user requirements for new priorities and some new scientific challenges.

The main messages outlined include:

- The need to make connections between traditional marine disciplines and other disciplines, giving rise to innovative new science (e.g. marine genomics);
- The need to better address user requirements, (e.g. ecosystem approach in Fisheries Policy).
- The need to re-integrate "policy oriented" research (Priority 8) into the appropriate Priority Themes 1 - 7. For example, relevant policy research related to environment should be located in Priority 6.3. Global Change & Ecosystems.

There is a strong need for a stakeholder driven research agenda. Policies for the preservation, conservation and sustainable use of the marine environment require a scientifically based approach (i.e. the ***ecosystem approach***). The ecosystem approach is defined as the comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystems and their dynamics. An important component of the necessary knowledge relates to the development of suitable indicators for ecosystem health. Priority topics for research include the identification of ecological properties that are important to the structure or function of the ecosystem, or to the human uses of it. Because of the limited knowledge of ecosystems, the highly complex character of the processes involved and the limitations of the management systems, it is important to be able to deal with uncertainty and variability. This requires the development of risk assessment and of models through which future scenarios can be explored.

Genomics provides an example of a scientific domain which developed outside marine science and which is introducing important innovations into the marine science research agenda. Genomics is the large-scale analysis of genome architecture aimed at the discovery and identification of the function of many genes simultaneously. High throughput analysis technology and developments in bio-informatics have led to the mapping of the human genome and the genomes of several animal and plant species. Genomics is a potentially powerful tool to study the microbial diversity and functionality of model organisms. The emerging research domain of environmental genomics tries to understand the functional significance of genomic variation in natural communities. In metagenomics, entire ecosystems are treated as a single living organism. The application of genomics in samples from the Sargasso Sea has already given rise to the discovery of 148 previously unknown phylotypes and 1.2 million unknown genes.

In that context, the Marine Genomics Europe Network of Excellence, involving 44 partners in 16 countries and bringing together more than 300 researchers, was profiled as an example of an operational Network of Excellence. It is important that the marine genomics community establishes close links with the various other national and European genomics initiatives, in particular with the aim of sharing infrastructure.

Many of new discoveries in the Ocean frontier are of significant societal importance. The mapping of gas hydrates, for example, and the research necessary to assess their importance in terms of both risk (submarine landslides and subsidence) and as a new source of energy and pharmaceutical products can contribute to safety at sea, diversification of energy supplies and new commercial opportunities.

Integrating marine science to address questions of **global climate change and sustainable development** is another priority. Examples of the research questions that are addressed in this context include the study of low frequency processes in climate variability and the mapping in sediments of palaeoclimate events associated with major changes in the ocean circulation during the last glacial period.

Several identified priorities have already been addressed in the Marine Board-ESF's Position Paper *Integrating Marine Science in Europe (2002)*. As a result of the recommendations of the EurOCEAN 2004 Conference, the Marine Board is in the process of up-dating this strategic document, particularly in the context

of identifying priorities to be addressed within FP7.

What is Needed to Make it Work?

This section is oriented towards a "future look" at the presentations and discussions of the first Plenary Session. Challenges include: What should be done to maximise the contribution of marine science to the needs of society and to the development of science itself? How will it be possible to strengthen the position of marine science and technology in FP7?

Interaction with Stakeholders in Developing the Research Agenda

EC funding for research is traditionally mission oriented, designed towards supporting EU policies, enabling sustainable development and strengthening the competitiveness of the European private sector. A research agenda addressing these missions is best developed in dialogue with the potential end-users of the research results. This Session illustrated that such dialogue could lead to innovative science. The dialogue should start at the very initial stage of the development of the agenda. The scientific community should not be seen as just trying to sell its agenda to potential stakeholders!

From the presentation of José Rizo, and the discussion that followed, it became evident that in setting up this dialogue, it is important to take into account requirements and activities in related areas (e.g. supporting the implementation of the Water Framework Directive, the Common Fisheries Policy, etc).

The oceans are a rich source of resources, which, if exploited in a sustainable way, could benefit many sectors of society. This means that the design of a research agenda needs to involve '*non traditional*' marine stakeholders, such as the pharmaceutical and energy sectors.

The Role of SMEs

Marine science and technology benefits from collaboration with the private sector. Involving SMEs in the development of advanced research equipment creates mutually beneficial opportunities. SME representatives emphasised that this potential was insufficiently realised at present. Other areas where SMEs could play a much greater role include the provision of specialist services. Examples given included the use and dissemination of data collected for research purposes (or operational monitoring) and in the development of engineering solutions, for example for integrated coastal zone management.

Research Infrastructure

Rudy Herman reported that an estimated 50% of national funding for marine science goes to the development, construction and operation of marine research infrastructures. Very little support for marine research infrastructure is contributed from EU funds. There is a clear need to:

- Support a coherent and strategy-led approach to the common development of major research infrastructures in Europe;
- Facilitate multilateral initiatives leading to a better use and development of existing marine research infrastructures.

These issues are within the remit of the European Strategy Forum for Research Infrastructures (ESFRI), which established an Ad Hoc Working Group to address the situation in the marine sciences - Marine Infrastructures Working Group (MISG). The MISG addressed not only research vessels and other experimental or observation equipment, but also data and information. The MISG Report "*European Strategy on Marine Infrastructure*" was published by the Academy of Finland (2003) (ref. 6/03). The Working Group formulated four strategic visions for the coming decade:

1. European research vessels and associated marine equipment should constitute a coherent flexible facility that can effectively respond to a wide array of research needs.
2. European waters should be supplied by a network of buoys, profilers and sea bottom observation systems that provide long term coherent data for research and operational purposes.
3. Samples, data, analysis and other information retrieved by European marine scientists would benefit from networks of well-equipped marine centres, including online access to data calibration and quality control.
4. European marine research should be supported by an integrated and interactive web-based information system.

With regard to research vessels, the need for co-operation between smaller coastal research vessels is perhaps as important as for large ocean-going ships (for which collaborative schemes currently exist). A system, adapted for the regional scale, which allows for

exchange of ship-time between countries should be developed. At the same time, standardisation of selected technical issues relating to coastal research vessels should be initiated.

With regard to data and information, the need for sustained archiving, ease of access and wide dissemination was emphasised. Ease of access is particularly important for the SMEs interested in developing services.

Addressing the problem of the funding of long-term time series observations of key variables was identified as urgent. The data obtained by long-term observations are of crucial importance to the identification of global change and serve also to monitor the effectiveness of mitigation measures. In this context the contribution to the marine component of the Global Earth Observation System of Systems (GEOSS) and GMES (Global Monitoring for Environment & Security) is essential for science, policy and economic exploitation. National governments and the EC should enable existing or new operational agencies to take responsibility for this. A major challenge will involve securing sustained funding of the monitoring systems from public and private sources.

Mobility and Careers

As in other domains of science, many activities within marine research are people-limited rather than limited by the availability of infrastructure or funds. There is an urgent need to educate and support the next generation of marine researchers. This requires above all the creation of career perspectives for young researchers. For marine science, the traditional mono-disciplinary structure of universities' training and facilities imposes undesirable constraints.

With regard to mobility, and in relation to research facilities, there is a need to create a 'market' to link expertise with available facilities. This should be a component of the enhanced co-ordination of national programmes.

Communication

Several of the presentations addressed the need for enhanced communication. To summarise:

- Scientific advice to policy makers should be clear, direct and relevant to the needs of the users. This requires an interactive process in which policy makers pose tractable questions, and scientists in turn put themselves in the position of the policy maker in trying to respond;
- The public shows a great interest in ocean issues, as is demonstrated by the success of aquaria and various media devoted to the sea. Outreach activities should become a systematic requirement in scientific projects.

Partnerships and Co-ordination

Many players must contribute to the success of achieving a European Marine Research Area. The marine research community should strengthen, and where necessary develop, new partnerships, including:

- Enhanced co-ordination between EC programmes and national programmes;
- Partnerships with the rest of the world: to fully include the overseas European territories, to develop partnerships with the US, Japan and others to address global marine science issues or to do research in the polar regions, to develop GEOSS, to participate in the international global change research programmes and to include the developing countries in the worldwide research efforts;
- Public-private partnerships for the development of technologies, for the exploitation of data and the provision of services.

Of course, enhanced partnership requires more co-ordination. There has been a rapid increase of the number of co-ordination instruments within FP6: including ERA-NETS, NoEs, IPs, ESFRI etc. The co-ordination efforts are seen as important tools, but they should be easy to handle and should not detract from the research effort. There is a clear need for rationalisation of instruments and approaches

In general, it was agreed that more flexible instruments are needed to address the challenges identified above. These instruments should be suited to the goals to be achieved.

CONCLUSION - ACT NOW!

Finally, the participants in the Session concluded that now is the time to influence the development of FP7. In order to make marine science a clearly identified element in FP7, it is necessary to communicate actively with the Member State National Authorities responsible for the structuring of FP7.

KEY POINTS PLENARY SESSION 1

FP6 AND THE ERA

- Enhanced co-ordination and integration of research activities in Europe is required to overcome the current level of duplication and fragmentation; marine research is a perfect example of a domain where this integrated approach is developing;

- The need for better co-ordination of Member States' policies with those of the EC is particularly pertinent with regard to marine research infrastructures (to address standardization, co-operation etc.);

- Enhanced co-ordination of European efforts requires a global perspective, as the oceans ignore continental boundaries and marine research both requires and benefits from global co-operation;

- Communication, partnerships and education of marine researchers are of primary importance; there is a need to make connections between traditional marine disciplines and other disciplines, giving rise to innovative new science (e.g. marine genomics);

- Marine R&D priorities currently being addressed include:

  - Ecosystem approach to marine resource management.
  - Marine genomics.
  - Mapping gas hydrates.
  - Global climate change and sustainable development.

- There is a need to better address user requirements and societal needs (e.g. ecosystem approach in Fisheries Policy), to maximise the contribution of marine science to the needs of society and to the development of science itself; A common research agenda has to be established involving all the stakeholders, particularly the SMEs, this requires:

  - Interaction with stakeholders in developing the research agenda.
  - Involvement of SMEs.
  - Clear planning for marine infrastructure.
  - Clear career structure and enhanced mobility opportunities for researchers.
  - Enhanced communication.
  - Effective partnerships and co-ordination.

- Programme instruments developed for enhanced co-ordination are seen as important, but they should be easy to handle and should not detract from the research effort; there is a clear need for rationalisation of instruments and approaches.

- Marine scientists in Europe showed their collective capacity to build a coherent comprehensive vision of their key scientific, technological and infrastructure issues, expressed in the Marine Board position paper "*Integrating Marine Science in Europe*". The marine research community is encouraged to develop ideas for the implementation of the six thematic axes of FP7 and to bring these to the attention of their National Authorities.

EurOCEAN 2004
European Conference, Marine Science & Ocean Technology

THEMATIC SESSION 3
"Natural and Anthropogenic Impacts on Coastal Ecosystems"

Chair:	**Mr. Pierre Valette,** European Commission
Rapporteur:	**Ms. Yvonne Shields**, Marine Institute, Ireland.
Keynote 1:	*"Marine and coastal conservation: An achievable goal in a new Europe?"* **Professor Laurence Mee (UK)**, University of Plymouth
Keynote 2:	*"Biogeochemical cycles and the management of coastal ecosystems: a perspective from ELOISE research."* **Dr. Peter M.J. Herman (Netherlands)**, Netherlands Institute of Ecology (NIOO-KNAW)
Keynote 3:	*"Integrated Coastal Science and Management: Current status and future prospects."* **Professor R. Kerry Turner (UK)**, The Zuckerman Institute, University of East Anglia
Keynote 4:	*"Ocean: An inexhaustible renewable energy source."* **Dr. Teresa Pontes (Portugal)**, INETI
Convener(s):	**Christos Fragakis** and **Hartmut Barth** (DG Research)

This Session included four keynote speakers; three speakers - Laurence Mee, Peter Herman, and Kerry Turner - focussed on Integrated Coastal Zone Management, the fourth speaker - Teresa Pontes - focused on the ocean as a source of renewable energy.

Integrated Coastal Zone Management (ICZM)

Europe's coastal and associated marine regions support a diverse range of economic, social and cultural activities. Coastal zones are under heavy pressure from both land-based and maritime activities. Up to 85% of Europe's coast will experience moderate to high economic development in the near future; 25% of Europe's coastline is subject to erosion. Development pressures coupled with the dynamic aspects of the coastal zone and ubiquitous anthropogenic impacts, including global climate change, present a significant challenge to policy makers, planners and residents of coastal areas. Such pressures also present challenges to the research community in terms of integrating scientific, social, economic and technological issues that are required to implement an integrated coastal zone planning and management framework.

Over the past 10 years the EC has supported several ICZM related R&D projects, including those within the framework of the ELOISE research projects cluster (funded through FP4, FP5 and FP6). The ELOISE projects cluster consists of research projects and assessments addressing land-ocean interactions at the European scale. Knowledge outcomes from the ELOISE projects ultimately contribute to the development of improved policies for coastal zone management. In addition, ICZM demonstration projects were supported via the LIFE and PHARE programmes.

Arising from this body of research, the following specific operational, management and R&D challenges have been identified:

Challenges:

1. At an **operational level**, there is a need to:
   - Identify the management implications of the volume of existing data and information;

- Compile consistent and detailed databases at catchment level;
- Improve the spatial resolution of databases of coastal ecosystems;
- Link data archiving and predictive modelling with EC policy and Directive requirements (e.g. those of the Water Framework Directive WFD and the EU's Marine Strategy);
- Apply atmospheric deposition models in an operational context and use these models to improve the evaluation of nutrient dynamics in coastal ecosystems;
- Develop regional indices of vulnerability across Europe.

2. At a **management level**, there is a need for:

- Recognition of the diversity of forms which contribute to the European coastal zone; there is no single European coastal zone;
- A thorough evaluation of the balance between different nutrient sources and processes to support the designation of sensitive areas;
- Enhanced understanding of how physical changes affect coastal dynamics.

- Increased emphasis on developing technologies to harness renewable energy sources - for example wave and tidal energy - and to develop a better understanding of both the environmental impacts and the positive synergies and benefits that can arise from technology focused developments in the coastal zone.

To move forward, the Session identified a need to build on what has been achieved to date and to embrace new ideas and concepts that will enhance society's ability to address the particular and dynamic challenges of ICZM and sustainable development.

3. In terms of **R&D priorities**, there is a need for:

- In-depth knowledge of the processes affecting carbon and nutrient dynamics, including the development of operational models for carbon and nutrient delivery to the coast; evaluate the consequences for coastal ecosystem functioning and biodiversity;
- Enhanced understanding of the structure and functioning of coastal food webs; develop predictive models for different food webs and anthropogenic impacts;
- Enhanced interdisciplinary research requiring methodologies to generate unique information; efforts to develop appropriate coupled models, incorporating not only physical, biogeochemical and biological aspects, but also ecological economics and social models;
- Research to predict trajectories for recovery of habitats, ecosystems, etc.

CONCLUSIONS

Issues identified during the discussion included:

- The importance of addressing ICZM in an interdisciplinary context, recognising uncertainties and the linkage between social, economic and natural sciences, particularly to support policy development at the European level;

- Development of interdisciplinary research teams should be characterised by excellence and enhanced dialogue both within and between teams;

- The need for improved economic and social data, comparable across European countries;

- As part of the important contribution of ecological economics to ICZM, research is needed to evaluate the non-commercial role of marine resources in the European economy;

- Formal risk assessment is not feasible in the coastal environment. Increased use of foresights and scenario testing

would offer insights into possible future environmental and socio-economic developments, contribute to reducing uncertainties and assist in policy development.

- If Europe is to support the development of technology driven sectors such as offshore wind and wave energy in coastal areas, more research will be required to identify sustainable development options. Potential synergies and environmental benefits remain unexplored.
- Finally, important points were raised by a contributor from the floor who asked: Is there a need to invent new policy development tools? How does the scientific community accommodate the need for institutional innovation and change?

In summary, to achieve successful ICZM, the EC, national governments, local agencies, industries and coastal communities must attempt to integrate the results of economic, social, environmental and technological research to adopt a more complete, valid and reliable framework and set of tools to support policy and decision making.

EUROPEAN LIFESTYLES AND MARINE ECOSYSTEMS PROJECT

The recently funded *European Lifestyles and Marine Ecosystems* FP6 project was presented as an example of a project that will focus on large-scale issues. It will model the likely consequences to the marine environment of a number of plausible scenarios for European development in the next 20 to 30 years. A major aim of the project is to facilitate the development of a new capability for modelling across social, economic and ecological scales in Europe. This enhanced capability will improve the ability to support the integration of marine and coastal conservation into future EU policies. It will also assist with the identification of targeted research projects at the regional and local scale.

KEY POINTS THEMATIC SESSION 3

IMPACTS ON COASTAL ECOSYSTEMS

- The coastal zone is an area of intense use, subject to both maritime and land-based influences;
- ICZM research has to be addressed in an interdisciplinary manner to integrate scientific, social, economic and technological issues that are required to develop and implement an ICZM operational framework;
- In adopting an interdisciplinary approach, the ICZM research community should integrate their assessment of biogeochemical cycles, models, food webs, ecological economics etc. to ultimately develop a more reliable framework to support policy and decision making;

Enhancement of ICZM research requires:

Operational Support to Address

- Standardisation of databases; the identification and provision of integrated social, economic and ecological data;
- Development of coupled models, incorporating ecological economics, particularly in support of European policies and Directives;
- Development of regional indices of vulnerability;
- Incorporation of ecological economics;

Management Support to Address

- Uptake and use of knowledge of coastal dynamics, ecosystem functioning and recovery capacity etc:
- Scenario development and testing;

R & D Priorities to Address

- The development of models for nutrient and carbon delivery to the coast; evaluate consequences for coastal system functioning and biodiversity;
- Structure and functioning of coastal food webs; predictive models for different food webs and anthropogenic impacts;
- Interdisciplinary efforts to develop appropriate coupled models;
- Modelling of habitat vulnerability and recovery potential;
- The evaluation of the non-commercial aspects of marine resources to the European economy;
- Development of foresight scenarios to assist the policy process;
- Development of technologies to harness offshore wind, wave and tidal energy.

EurOCEAN 2004
European Conference, Marine Science & Ocean Technology

THEMATIC SESSION 4
"Exploration of the European Ocean Margin, Its Deep-sea Resources and Ecosystems"

Chair: **Dr. Jean Boissonnas,** Former Head of EU MAST Programme

Rapporteur: **Dr. Luis Fariña Busto, (Spain)** University of Vigo

Keynote 1: *"Ocean Margins Research: Science, Stakeholders and Societal Relevance."*
Mr. Bilal Haq (USA), National Science Foundation

Keynote 2: *"Ocean margin systems- scientific challenges and new technologies."*
Professor Dr. Gerold Wefer (Germany), DFG Research Centre Ocean Margins, University of Bremen

Keynote 3: *"Frontiers in deep-sea biological research: towards understanding the functional and structural adaptation of marine microbial communities to the deep-sea ocean margins."*
Dr Laura Giuliano (Italy), Instituto per l'Ambiente Marino Costiero (IAMC), Consiglio Nazionale delle Ricerche, Naples.

Keynote 4: *"Steps on the Slope: Europe's exploratory tract in Ocean Margin Research."*
Professor Dr. Jean-Pierre Henriet (Belgium), Renard Centre of Marine Geology. University of Gent.

Convener: **Dr. Luis Fariña Busto** (DG Research)

Session 4, focussing on exploration of the European Ocean Margin and its deep-sea resources and ecosystems, included four keynote speakers: Bilal Haq addressed societal responsibilities and implications; two speakers - Gerold Wefer and Jean-Pierre Henriet - focussed on geological aspects, while the fourth speaker - Laura Giuliano - profiled marine microbes in the ocean margin.

State of the Art
European science in the domain of deep-sea and ocean margins research is entering a new phase, brought about by newly developed technology and recent discoveries. The domain has a strong potential for economic exploitation, including the involvement of industry and SMEs, a contribution to security of operations and protection of the environment, as well as a tradition and a future in international collaboration, both across the Atlantic and globally.

Recent Developments in ocean margin and deep-sea research have opened up fields virtually unknown a decade ago. These include:

- Newly discovered ecosystems such as deep-water (cold-water) coral reefs, carbonate mounds, mud volcanoes, deep hydrothermal vents and seep communities. These ecosystems are only barely explored, although the cold-water corals in the Porcupine Seabight had already been recorded by the HMS Porcupine expedition in 1869;
- Deep-water coral reefs are a biodiversity hot-spot supporting a large diversity of life forms;
- Gas hydrates: their genesis, potential as a future fuel and their role in slope instability;
- Exploration of structures such as turbidites and slides, probably associated catastrophic instabilities and the generation of tsunamis;
- A variety of microorganisms adapted to extreme conditions, including sub-seafloor bacteria, which constitute an enormous pool of evolutionary diversity preserved in the oceans. Their potential applicability and their theoretical importance alone justify the study of the oceans.

Although still at an early stage of development, deep-sea / margins science has already shown its potential for applicability and commercial exploitation. For example, the global market for thermostable enzymes was estimated at US $250 million in 2000. Annual sales of only four antimicrobials derived from natural products are estimated to be worth over US $1 billion. While not all of these products are of marine origin, the wealth discovered in the preliminary exploration of extreme marine ecosystems suggests a very promising future.

A knowledge of gas hydrate deposits in the ocean margins (which are estimated to be of the same order of magnitude as the total reserves of hydrocarbons from other sources) may have an impact on the understanding of the role of the ocean in global climate change, and is essential for security of operations in the area. It should be noted in this context that at least one third of future (conventional) oil reserves is expected to be found at the ocean margin.

Immediate applications of the results of deep-sea / margins research include:

- Improved safety of ocean margin operations and marine infrastructure;
- Extraction of new and traditional energy sources and non-living resources;
- Development and testing of new technologies in a demanding and extreme environment.

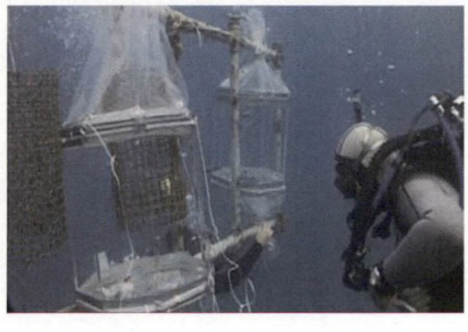
Opportunities for Economic Exploitation in Related Fields Include:

- Applying or, when necessary developing of novel screening technologies (with emphasis on the newly, successfully applied metagenomic approaches for harvesting the genetic resources of unculturable organisms in marine environments) and ensuring sustainable sources of supply.
- Optimising production and recovery of bioproducts;
- Design and optimisation of bioreactors for marine metabolite production;
- Opening up of new possibilities to address fundamental scientific questions through newly developed technology (such as 3D seismic profiling);
- High potential for industry (including SME) participation, which is already a reality, both through the technological aspects of the research itself and the industrial applicability of its results;
- New techniques and products useful in molecular biology, biotechnology, medicine, pharmacology, etc.
- Cosmetics, detergents, paper bleaching, artificial snow;
- Baking and brewing, food additives, dietary supplements;
- Bioremediation.etc.

Future Opportunities & Challenges

The potential contained in this domain can be realized and is open to progress in many directions:

- Exploration of newly discovered deep-sea structures and ecosystems (gas hydrates and related processes, cold-water corals, carbonate mounds, mud volcanoes, seep communities, etc.);
- New observational deployments (e.g. deep-sea medium to large scale networked instruments allowing remote real-time access);
- Development of targeted technology optimised for the exploration and sampling of extreme environments;
- Deep-water instrument recovery and tool standardisation is a challenge world-wide;
- Identification of new sources of bioproducts;
- Important applications in the implementation of the provisions of the United Nations Convention for the Law of the Sea (UNCLOS), which covers in particular "exploitation issues" together with the related ones of delimitation and research.



Relevance for the Objectives of the European Research Area

The initial exploratory stages of the European deep-sea and ocean margin domains have gone through an intense phase of Europe-wide integration and expansion under the EC Framework Programmes 4, 5 and 6, benefiting from an important initial impulse under MAST and arriving at a substantial level of integration in FP6.

The research community in this field has contributed very significantly to achieving the objectives of the Framework Programmes and bringing about the European Research Area: world-class science with substantial societal impact, involvement of industry (including SMEs), a high degree of European collaboration and integration and Europe-wide synergy of national activities even when Community funding was very limited or absent. OMARC and ECORD are good examples. HERMES will no doubt continue this trajectory.

A related and important element is the *international dimension* of research in ocean margins and deep-sea, in particular the design and implementation of research in a harmonised way on both sides of the Atlantic. This is a marked feature of on-going ocean margin and deep-sea research and is in agreement with the objectives of the EC Framework Programme.

Points of importance made during the discussion included that:

- An effort is required to promote public awareness in a field where the diversity of interests makes it necessary to be able to face and resolve conflicts. The exploitation of deep-sea living and non-living resources may easily lead to conflicts and a balanced approach must be found. Respect for nature and the preservation of pristine systems, with a systematic application of the precautionary principle, should be compatible with responsible research and sensible exploitation. It is worth bearing in mind that preservation of special ecosystems is a precondition of their use as a source of biotechnological products.
- Ocean margin research has progressed in Europe with initiatives and activities on a wide spectrum of scales, from individual entrepreneurs to large-scale integrated programmes.

KEY POINTS THEMATIC SESSION 4

OCEAN MARGINS

- Ocean margins and deep-sea ecosystems provide a promising territory for research, in terms of exploitable resources, and the insights to be gained in physiology, evolution and the origins of life itself;

- The complexity of the system, the challenging nature of the technology required for its exploration and its large exploitation potential points to the appropriateness and need to develop research through the complementary interaction of public and private actors on the one hand and a combination of EU and national funding on the other;

- Ocean margin research has a strong potential to support economic development, including the involvement of industry and SMEs, a contribution to security of operations and protection of the environment, as well as a tradition and a future of international collaboration;

- The exploitation of deep-sea living and non-living resources may easily lead to conflicts and a balanced approach must be found. Respect for nature and the preservation of pristine systems, with a systematic application of the precautionary principle, should be compatible with responsible research and responsible exploitation;

- Future challenges to support exploration of deep-sea structures and ecosystems (gas hydrates and related processes, cold-water corals, carbonate mounds, mud volcanoes, seep communities, etc.) include:

  - New observational deployments (e.g. deep-sea medium to large scale networked instruments allowing remote real-time access);
  - Development of targeted technology optimised for the exploration and sampling of extreme environments;
  - Deep-water instrument recovery and tool standardisation;
  - Identification of new sources of bioproducts.

- A science domain with such high quality results, high potential for technological development and innovation and for economical exploitation, an established world-wide international dimension, with profound societal implications and such a real and committed contribution to the integration of European research must secure its place in the 7th Framework Programme.

EurOCEAN 2004
European Conference, Marine Science & Ocean Technology

PLENARY SESSION 2
"The Contribution of the Young Generations to the Future of the European Marine Research Area: Marie Curie Fellowships in the Domain of Marine Sciences."

Chair: **Dr. Evangelos Papathanassiou,** Institute of Oceanology, Greece

Rapporteur: **Dr. Anu Reinart,** Uppsala University

Speaker 1: *"The Marie-Curie Fellowship support scheme."*
Dr. Georges Bingen (EC), Marie Curie Fellowships Unit, Directorate General for Research, Brussels.

Speaker 2: *"Heavy metal and endocrine disrupter impact on marine mammals."*
Dr. Krishna Das (Belgium), Christian-Albrechts-Universiteit zu Kiel, Forschungs und Technologiezentrum Westkueste Hafentoern, Germany

Speaker 3: *"Understanding vitamin C requirements in fish."*
Dr. Konrad Ocalewicz (Poland), INRA, Laboratoire de Génétique de Poissons, France

Speaker 4: "*Gas and hydrates in the Black-Sea.*"
Dr. Irina Popescu (Romania), Renard Centre of Marine Geology, University of Gent, Belgium

Speaker 5: *"Career-paths after a Marie Curie Fellowship."*
Dr. Kim Araujo Stobberup (Denmark), Marine Resources Department- DRM, IPIMAR- National Research Institute for Agriculture and Fisheries, Portugal.

Convener: **Olga Lage** (DG Research)

The principal objectives of Plenary Session 2 were to highlight the contribution of young researchers to the European Marine Research Area, identify obstacles to their career development and pose solutions. After the opening of the Session by Evangelos Papathanassiou, Georges Bingen, Head of Unit of the Marie Curie Fellowship Programme, described the EC Marie Curie Programme. This was followed by presentations by three actual Marie Curie Fellows: Krishna Das (Belgium), Konrad Ocalewicz (Poland) and Irina Popescu (Romania) working in Germany, France and Belgium respectively. These young researchers described their work and what the Marie Curie Fellowship meant to them in terms of career and personal development. The final speaker, Kim Araujo Stobberup, of the Marie Curie Fellowship Association (MCFA), described the work of this Association in following up the careers of former Marie Curie Fellows.

THE MARIE CURIE FELLOWSHIP PROGRAMME

Georges Bingen introduced the EC's new €1,580 million Marie Curie Fellowship Programme promoting life-long training through mobility. The Marie Curie Programme follows a bottom-up approach and includes actions from early stage and advanced training, transfer of knowledge and possibilities for re-integration of young researchers to their country of origin. Under FP6, the Marie Curie Programme offers training and career opportunities to researchers from both academia and industry.

The Marie Curie Programme is clearly attractive to researchers, as evidenced by a high subscription rate. The downside of this level of interest is that, for instance, only 7% of early stage training proposals are financed; many excellent projects have to be rejected because of limitation of funds .

In general, there is a notable South to North and East to West trend in mobility; the UK, followed by France and Germany, are the favourite destinations for young researchers. French Spanish, German and Italian researchers, in that order, are the most mobile. New Member States are poorly represented, both as applicants and as host institutes.

Planned activities to increase the effectiveness of the Marie Curie Programme in the training of scientists include:

- More focused calls for inter- and multidisciplinary projects;
- Promote more industry-academy collaboration through specific calls;
- Encourage greater participation of Accession and Candidate countries, especially through the modification of re-integration grants making these countries more attractive to researchers.

A new initiative, the European Researchers' Mobility Portal, aims to create a more favourable environment for career development by providing structured information on research fellowships and grants, as well as practical information on administrative and legal issues when moving from one country to another.

CONTRIBUTION OF THE YOUNG GENERATION TO MARINE RESEARCH

Three Marie Curie Fellows presented their research projects in diversified marine fields and shared their experiences as Marie Curie Fellows.

Krishna Das, from Belgium, working at the Christian-Albrechts University in Kiel, Germany, described her work on the effects of pollutants (heavy metal and endocrine disrupters) on the general health and immune system of the harbour porpoise. This work is fundamental to understanding how marine pollution can impact mammalian endocrine and immune systems.

Konrad Ocalewicz, from Poland, presented his work, at the INRA, Laboratoire de Génétique de Poissons, France, on a multidisciplinary based approach to fish biochemistry, evolution and molecular genetics, as a key for studying the complex metabolic pathways of vitamin C requirements in fish.

Irina Popescu, from Romania, described her work at the Renard Centre of Marine Geology, University of Gent, Belgium, on gas-hydrates in the Black Sea.

Current Status of Young Researchers

Kim Araujo Stobberup a former Marie Curie Fellow, presented the results of an MCFA survey carried out in 2002 on the career prospects and mobility patterns of 2,790 researchers. Among the findings, the survey concluded that:

- Marie Curie Fellows are highly employable; 85 % are employed within three months of the end of their fellowship, but most not in a permanent position.
- Many Marie Curie Fellows (52%) stayed in their host country or moved to another country; less than half (48%) returned to their home country;
- Most Marie Curie Fellows establish a career in academia or public research institutions, though many appeared flexible in their career direction; 55% of these indicated that they were open to a move from academia or public research institutions to industry at some point in their career.

PROFILE OF A YOUNG MOBILE RESEARCHER

No permanent home, no social security, no pension

Highly motivated and independent; dedicated to his/her work

Late 20s or early 30s; no children

Long work hours, poorly paid

Good at overcoming practical hurdles; flexible

People with initiative and original ideas

Highly employable (but not necessarily at home)

Short-term contracts/fellowships

Long wait for permanent position and independence

Non-linear-careers becoming more common

Perceived as overskilled - too specialised for industry

Lack of training in carrer essentials (e.g. project management, proposal writing, fundraising, communication).

K.A. Stobberup, EurOCEAN 2004

On the negative side, there is an apparent rise in the number of "*nomadic researchers*". These are highly skilled and motivated researchers moving from project to project and country to country and missing out on the opportunities provided by stability (e.g. family life, community involvement, pensions, health insurance, social security, etc).

CONCLUSIONS To maintain Europe's competitiveness, successive generations of scientists and researchers are clearly needed. Out of 100s of its workforce, the EU only employs five researchers, compared with eight in the US and nine in Japan. Supporting young scientists and providing a satisfactory career structure is essential. Accordingly, it is important not only to provide research and training opportunities for young researchers, but also to treat them well and provide opportunities to continue with their research careers in universities and institutes (research and education), in applied science (industry and enterprises) and in the public sector (analysts, policymakers, managers).

To achieve these goals there is a need to:

- Develop mechanisms (e.g. the European Researchers' Mobility Portal), to better match skills acquired during a Marie Curie Fellowship period with the research needs of EU Member State and privately funded Research Programmes. This could enhance job possibilities by offering skills to the organisations that need them;
- Provide additional training in project drafting, management, communication skills, entrepreneurship, etc.
- Increase the responsibility of the host institutes towards young researchers in their stewardship.

PhD and Post-Doc Fellowships Opportunities:
In order to facilitate access to information related to PhD and Post-Doc Fellowships in the domain of marine science, the EurOcean website (http://ioc.unesco.org/eurocean/categories.php?category_no=38) currently hosts a list of available Marie-Curie Actions in marine science and technology.

Finally, but of no less importance, young researchers need to play a more active role in awareness raising for their own interests, take more responsibility for their own career, increase their visibility and communicate better with society.

For further information on the Marie Curie Programme see :

Marie Curie Programme
http://www.cordis.lu/improving/fellowships/home.htm.

The European Researchers' Mobility Portal
(http://europa.eu.int/eracareers)

The Marie Curie Fellowship Association
(www.mariecurie.org

KEY POINTS PLENARY SESSION 2

MARINE CURIE FELLOWSHIPS

- Maintaining Europe's competitiveness, and securing a knowledge-based economy will require investment in successive generations of scientists and researchers.
- There is a need to develop mechanisms (e.g. a brokerage mechanism – the European Researchers' Mobility Portal), to better match skills acquired during a Marie Curie Fellowship with the research needs of EU Member States.
- Marie Curie Fellows should be provided with additional training in project drafting, management, communication skills, entrepreneurship, etc.
- There is a need to increase the responsibility of the host institutes towards the young researchers in their stewardship.

8. GLOSSARY OF TERMS

BONUS	for Baltic Sea Science – Network of Funding Agencies (ERA-Net project)
BOOS	Baltic Ocean Observing System
CYCOFOS	Cyprus Costal Ocean Forecasting and Observing System
CZM	Coastal Zone Management
ECORD	European Consortium for Ocean Research Drilling
EFARO	European Fisheries and Aquaculture Research Organisations (network)
EFMSTS	European Federation of Marine Science & Technology Societies
ELOISE	European Land-Ocean Interaction Studies (EU Initiative on ICZM; research projects)
ERA	European Research Area
ESEAS-RI	European Sea Level Service Project – Research Infrastructures (research project)
ESF-MB	European Science Foundation – Marine Board.
ESFRI	European Strategy Forum for Research Infrastructures.
ESONET	European Sea Floor Observatory Network (Network of Excellence)
EuroGOOS	European Global Ocean Observing System
EuroROSE	European radar ocean sensing (research project)
FAO	Food and Agriculture Organisation
FOAM-	Forecasting Ocean assimilation model
GEOSS	Global Earth Observation System of Systems
GMDSS	Global Maritime Distress and Safety System
GMES	Global Monitoring for Environment and Security
GOOS	Global Ocean Observing System
HERMES	Hotspot ecosystem research on the margins of European Seas (research project)
ICZM	Integrated Coastal Zone Management
IOC	Intergovernmental Oceanographic Commission
IMO	International Maritime Organization
IPs	Integrated Projects
LIFE	EU Life Programme
MAMA	Mediterranean network to Access and upgrade Monitoring and forecast Activities (research project)
MarinERA	Co-ordination of National and Regional Marine RTD Activities in Europe
MAST	Marine Science and Technology Programme
MB-ESF	Marine Board, European Science Foundation
MCFA	Marie Curie Fellowship Association
MedGOOS	Mediterranean Global Ocean Observing System
MERCATOR	Ocean forecasting model
MERSEA	Marine Environment and Security in the European areas (research project)
MFSPP	Mediterranean Forecasting system Pilot Project (research project)
MFSTEP	Mediterranean Forecasting System Towards Environmental Predictions (research project)
MPERSS	Marine Pollution Emergency Response and Support System
MOON	Mediterranean Operational Oceanography Network
NoEs	Networks of Excellence
OMARC	Ocean Margin Research Consortium
PHARE	EU PHARE Programme
POSEIDON	Monitoring and forecasting system for Greek Seas (research project)
REMPEC	Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea
RTD	Research, Technology & Development
SME	Small to Medium Sized Enterprise
SPICES	Science and Policy Integration for Coastal Ecosystems (proposal consortium)
STREPs	Specific Targeted Research Projects
TOPAZ-	Towards an operational prediction system for North Atlantic European coastal zones (research project)
WaMoS	Wave and Surface Current Monitoring System.

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- The MACHNAS Team who entertained us with a memorable opening spectacle,
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Celebrating European Marine Science

Building the European Research Area

Communicating Marine Science

Galway (Ireland) 10th – 13th May 2004

EurOCEAN 2004

The Galway Declaration

To ensure that recognition is taken at Member State and European Community Level of:

- **The crucial role of the oceans in climate, carbon cycle and Life on Earth.**
- **The major contribution maritime industries can make to the achievement of the objectives outlined in the Lisbon Agenda.**
- **The essential role of marine science and technology in generating the knowledge needed to fuel this economic achievement in harmony with the environment.**
- **The critical role the European Research Area / 7th Framework Programme must play in supporting world-class excellence in marine science & technology.**

Marine Institute
Foras na Mara

Marine Board

EUROCEAN 2004

THE GALWAY DECLARATION

The seas and oceans have historically played a formative role in the development of many European coastal states. From the utilisation of fish as a food source, to the development of international trade, commerce and maritime transport, European society has thrived and prospered from its partnership with the sea. Much of this prosperity can be traced back to the application of science and engineering. Critical developments, underpinned by science and technology, which gave European countries dominance over international trade in the middle ages included shipbuilding and the development of navigational aids.

In May 2004, over 500 leading marine scientists, policy-makers and representatives of the marine industry sector, from all corners of the European Union (EU+25), gathered in Galway (Ireland). Their objective - to determine how marine science and technology can contribute to the achievement of European Union objectives as stated in the Lisbon, Gothenburg and Barcelona Declarations. Namely, *to make the European Union the most competitive knowledge-based economy in the world*, based on the application of science and technology and the principles of sustainable development.

The EurOCEAN 2004 Conference Noted That:

- The European Union has a significant marine dimension, with over 50 % of the territory under the jurisdiction of its Member States being underwater. This territory extends from the Baltic through the Atlantic to the Mediterranean and Black Sea.

- The ocean plays a crucial role in planetary/ecosystem function. It influences climate, the carbon cycle and supports an impressive diversity life forms.

- The European seas and oceans are of major strategic importance to the economic and social development of Europe as well as its security.

- The application of science and technology to our seas and oceans presents new and exciting opportunities for economic growth and innovation in the maritime sector.
- New and emerging scientific knowledge and technologies are providing unprecedented access to marine resources. The flip side of this coin is that increased exploitation (e.g.

over Fishing, environmental impacts of oil exploration, urban expansion, etc) is having a negative impact on the sustainability of marine resources.

- The participation of European researchers and the European Union in global research partnerships is vital if we are to truly understand earth ecosystem function.

- The development of mutually supportive and complementary links between the marine industry sector (particularly SMEs) and the research community is essential in order to develop new exploration technologies, support the sustainable development of marine resources and to ensure the transfer, utilisation and commercialisation of research results.

- The European Union Framework Research Programmes, supporting marine science, coupled with national marine research programmes, have created a strong element of co-operation and a truly "*European Marine Science Community*".

Future Challenges Include:

- The implementation of an ecosystem-based approach to sustainable development and improved stakeholder input to management decisions;

- Integrating the exciting new discoveries in marine science (e.g. the role of the picoplankton, deep sea extremophiles and sub-seafloor micro-organisms, etc.) to our understanding of marine ecosystem function and their possible commercial application.

- Development of renewable ocean energy to diversify energy sources and contribute to our Kyoto commitments on CO_2 reduction;

- Development of coastal shipping as an environmentally friendly and economic mode of bulk transport whilst improving safety and reducing negative environmental impacts;

- The development of the ocean component of a Global Earth Observation (GEO) System as advocated by the Johannesburg Conference and the G8 Summit;

- Conserving marine biodiversity, whilst utilising its unique biodiversity for social and economic purposes (e.g. new bioactive compounds for medicinal, pharmaceutical and industrial purposes);

- The exploration of the deep ocean and continental margins, one of the last frontiers of our planet, in order to uncover its mysteries and assess its resource potential;

- Responding to the implications of global climate change and its impacts on marine and coastal environments and communities;

- Developing a new paradigm to promote inter-institutional co-operation in the context of an expanded Europe (EU +25).

Responding to the New Challenges Will Require:

- Recognition of the actual and potential value of the marine resource in EU development policies / strategies;

- A partnership approach between Member States and the European Commission in developing and implementing a European Marine Resource Development Strategy;

- Recognition of the critical supportive role of marine science and technology in the sustainable development of our shared marine resource.

More Specifically, the EurOCEAN 2004 Conference:

- Calls for the recognition of marine science and technology as a clearly identified component of the European Research Area.

- Welcomes the Commission's draft proposals on the structure of the 7th Framework Programme (2007 - 2011) with its six axes: Collaborative Research, Competition in Basic Research, Technology Platforms, Human Resources, Research Infrastructures and Enhanced Coordination.

- Undertakes to advise, through its National Authorities, how these new structures can best be utilized to support marine research and its contribution to sustainable development and economic growth.

- Welcomes the draft DG Environment Marine Strategy with its emphasis on an ecosystem approach to sustainable development as well as the evolution of fishery and security policies.

- Notes that the Marine Science Community must:

  - Impress on their respective National Authorities the important contribution that marine science can make to the realisation of the Lisbon, Gothenburg and Barcelona Agendas, such that this message is brought by the Member States to the Council of Ministers and the European Commission;

  - Improve its communication skills in explaining the contribution that its work can make to economic and social development;

  - Increase its efforts and capabilities to quantify, in social and economic terms, the actual value of maritime industries & marine resources;

  - Develop procedures to ensure that data collected under publicly funded schemes is made available to the private sector who in many cases are more able to develop value added products and services.

- Notes that long-term ocean observations, such as are proposed under the GEO and GMES initiatives, are critical if we are to implement an ecosystem-based approach to resource management – and that it is the responsibility of the EU AND the Member States to find appropriate ways, including Public-Private Partnerships, to finance the operational aspects of these observations.

- Notes that young researchers are the backbone of research and the lifeblood of the future. Accordingly, better career structures must be put in place if we are to secure the best researchers in the marine sector.

What Must We Do Now?

- Working through our respective National Authorities, to ensure that recognition is taken at Member State and European Community Level of:

- The crucial role of the oceans in climate, carbon cycle and Life on Earth.

- The major contribution maritime industries can make to the achievement of the objectives outlined in the Lisbon Agenda.

- The essential role of marine science and technology in generating the knowledge needed to fuel this economic achievement in harmony with the environment;

- The critical role the European Research Area / 7th Framework Programme must play in supporting world-class excellence in marine science & technology.

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For further information on the EurOCEAN 2004 Conference see www.eurocean2004.com

INSIDE BACK COVER

1. **Marine Sciences have allowed a number of very important progresses and discoveries in the recent years, and European scientists actively contributed to this.**

2. **Marine Sciences and Technology are a very lively discipline, where new visions and challenges have emerged on a number of subjects.**

3. **Marine Scientists in Europe showed their collective capacity to build a coherent comprehensive vision of their key scientific, technologic and infrastructure issues, expressed in the Marine Board position paper "Integrating Marine Science in Europe".**

4. **Marine Sciences are very open disciplines, which will benefit from progresses in many other fields.**

5. **The socio-economic activity at sea is essential to Europe and its development depends on innovation and continuously improved public policies.**

6. **The public shows great interest to ocean issues throughout Europe.**

7. **The European dimension is key to Marine sciences, socio-economy and policies.**

J.F. Minster (EurOCEAN 2004)

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DG Research
European Commission
Directorate-General for Research
European Commission
B-1049 Brussels
Tel: +32.2. 299.11.11 (switchboard)
E-mail: research@cec.eu.int

Marine Institute
Foras na Mara
Galway Technology Park
Parkmore
Galway
IRELAND
www.marine.ie

Marine Board
European Science Foundation
1 Quai Lezay-Marnésia
67080 Strasbourg Cedex
France
www.esf.org/marineboard