



EUROPEAN COMMISSION  
RESEARCH DIRECTORATE-GENERAL

Directorate I - Environment  
**Bio-diversity and Marine ecosystems**

Brussels, 20 December 2002  
RTD/I/4/ PM/ck D(2002)

**THE CONTRIBUTION OF THE EC RESEARCH FRAMEWORK PROGRAMMES TO THE  
INFORMAL CONSULTATIVE PROCESS ON OCEANS AND THE LAW OF THE SEA:  
PROTECTING VULNERABLE MARINE ECOSYSTEMS;  
AND THE SAFETY OF NAVIGATION**

**The 5<sup>th</sup> Framework Programme of Research of the European  
Communities (1998-2002)**

Within the Sustainable Marine Ecosystems Key Action of the 5<sup>th</sup> Framework Programme of Research of the European Communities (1998-2002), a number of groupings, or clusters, of funded research projects have been formed. A brief description of the clusters that are most relevant to the topics of interest to the 4<sup>th</sup> meeting of the informal consultative process on oceans and the law of the sea foreseen for June 2003 follows.

## Protecting Vulnerable Marine Ecosystems

- **OMARC (Ocean Margin Deep-Water Research Consortium)**

### Objectives

The cluster is established as a multidisciplinary Margin research consortium intending to improve understanding of geological, biological and microbiological environments of the European Margin. The projects are mostly oriented towards the exploration of relatively deep-water areas (> 200 m) which remain still poorly known. The domains of research are gas-hydrates, submarine slope stability, Quaternary climatic and sedimentary evolution of the European margin, cold-water coral reefs, and seafloor and sub-seafloor biosphere activity. It aims mostly at tackling issues in the sedimentary column and in deep-waters, with a specific attention to economic/environmental oriented research topics.

These projects are to contribute to complete the inventory of the deep-water mineral and biological resources of the European margins. They will help conducting a safe and environment friendly exploration and exploitation of European deep-water resources. In particular they will bring new elements on environmental aspects of deep-sea rich bearing hydrocarbon provinces and highly exploited fishery zones.

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The OMARC cluster provides a well-established collaboration frame, which can be used in the future to set up the community research component for global change and ecosystem dealing with issues relating to the deeper part of the ocean.

### **Structure of OMARC**

The Margin cluster (OMARC), with a total *EU contribution of 25 M€*, consists of the following **13** projects:

***COSTA*** (Continental Slope Stability);

***STRATAGEM*** (Stratigraphical Development of the Glaciated European Margin);

***ECOMOUND*** (Environmental Controls on Mound Formation along the European Margin);

***ACES*** (Atlantic Coral Ecosystem Study);

***GEOMOUND*** (The Mound Factory-Internal Controls);

***DEEPBUG*** (Development and Assessment of New Techniques and Approaches for Detecting Deep Sub-Seafloor Bacteria and their Interaction with Geosphere Processes);

***HYDRATECH*** (Techniques for the Quantification of Methane Hydrate in European Continental Margins);

***EURODELTA*** (Concerted action: European coordination on Mediterranean prodeltas);

***ANAXIMANDER*** (Exploration and evaluation of the Eastern Mediterranean Sea gas hydrates and the associated deep biosphere) (*Under negotiation*);

***METROL*** (Methane fluxes in ocean margin sediments: microbiological and geochemical) (*Under Negotiation*);

***EUROSTRATAFORM*** (European margin strata formation) (*Under negotiation*);

***PROMESS 1*** (Profiles across Mediterranean sedimentary systems – Part 1. (*Under Negotiation*);

***OMARC*** (Ocean margin deep-water research consortium) (*Subject to final Commission decision*).

The Cluster is interacting with Industry, in particular through COSTA, with 4 joint Industry Projects (JIPs) that represent 27 European oil companies, which are the SEABED project in Norway, GEML Network in the Faroes, WFA in the UK and PIP in Ireland. The Cluster is also strongly connected to the Ocean Drilling Programme, the international consortium conducting deep-sea seafloor sampling all around the world.

## **Impacts in EU and internationally**

The OMARC cluster involves end-users in particular with a strong participation and interest from the oil industry, and it is of strategic interest for the exploitation of deep-sea natural resources through projects of significant scale (the entire European margin).

The Cluster is also strongly relevant to the Ocean Drilling Programme and to the future IODP, the international consortium conducting deep-sea seafloor sampling all around the world. The projects have well identified drilling sites and are seeking the proper means to achieving the drilling operations, either through ODP/IODP or as part as the mission specific platform initiative within Europe.

### **• European Land-Ocean Interaction Studies (ELOISE)**

#### **Objectives**

ELOISE (European Land-Ocean Interaction Studies) was established by the European Commission in 1994 and jointly implemented by the MAST, and Environment and Climate Programmes. **It constitutes the official EU contribution to the LOICZ Core Project of the International Geosphere Biosphere Programme (IGBP).**

ELOISE has served to co-ordinate European research on coastal ecosystems by focusing on the important question of how the land-ocean interaction operates and on how this is influenced by human activities. This cluster is the largest coastal research initiative in the world combining research on marine problems with work on processes in catchment basins.

Recent emphasis has been put on the development of integrated coastal management concepts, strategies, practices and tools for the better use, monitoring and management of the coastal area through integration of interrelated processes. The ELOISE cluster therefore now also includes projects on coastal EVOLUTION and PROTECTION in order to promote the integration among projects traditionally focused on coastal morphology, evolution and protection (coastal engineering) and the ones on ecological processes and ecosystem dynamics.

#### **Structure of the cluster**

ELOISE comprises 25 current FP5 projects (and 54 projects in total from its inception) which are formally linked together via a common attachment to the Description of Work of each project.

*The EU contribution for the 25 FP5 projects is 43.5 M€, while the Community funding of the total 51 projects is about 75 M€.*

Fifteen projects address coastal marine ecosystems and as such are funded within Key Action 3:

*MEAD* (Marine Effects of Atmospheric Deposition),

*SIGNAL* (Significance of external/anthropogenic nitrogen for Central Baltic Sea N-cycling),

**OAERRE** (Oceanographic application to eutrophication in regions of restricted exchange),

**NTAP** (Nutrient dynamics mediated through turbulence and plankton interactions),

**MOLTEN** (Monitoring long-term trends in eutrophication and nutrients in the coastal zone: Creation of guidelines for the evaluation of background conditions, anthropogenic influence and recovery),

**DOMAINE** (Dissolved organic matter (DOM) in coastal ecosystems: transport, dynamics and environmental impacts),

**EUROTROPH** (Nutrients Cycling and the Trophic Status of Coastal Ecosystems)

**M&MS** (Monitoring and managing of European seagrass beds)

**DANLIM** (Detection and Analysis of Nutrient Limitation in Coastal Plankton Communities across a Hierarchy of Temporal and Physiological-Systemic Scales),

**TIDE** (Tidal Inlets Dynamics and Environment),

**HIMOM** (A system of Hierarchical Monitoring Methods for assessing changes in the biological and physical state of intertidal areas),

**OROMA** (Operational Radar and Optical Mapping in monitoring hydrodynamic, morphodynamic and environmental parameter for coastal management);

**COSA** (Coastal Sands as Biocatalytical Filters);

**BIOCOMBE** (The impact of BIOdiversity changes in Coastal Marine Benthic Ecosystems);

**DITTY** (Development of an Information Technology Tool for the Management of European Southern lagoons under the influence of river-basin runoff).

Four projects, grouped in Coastal EVOLUTION and PROTECTION, address coastal morphodynamics and protection and thus they are funded within Key Action 3:

**DELOS** (Environmental Design of Low Crested Coastal Defence Structures),

**HUMOR** (Human interaction with large- scale coastal morphological evolution),

**PROTECT** (Prediction of the Erosion of cliffed terrains),

**CoastView** (Video monitoring of littoral processes in support of coastal-zone management).

Six others address catchment basin processes and as such are funded under Key Action 1. These are:

**COMET** (Composition of dissolved organic matter and its interaction with metals and ultraviolet radiation in river-ocean systems: impact on the microbial food web),

**INCA** (Integrated Nitrogen Model for European Catchments),

**BEAM** (Bridging effects of mixtures to ecosystem situations and regulations),

**EUROCAT** (European Catchments: Catchments changes and their impact on the coast),

**DANUBS** (Nutrient Management in the Danube Basin and its impact on the Black Sea),

**STREAMES** (Human effects on nutrient cycling in fluvial ecosystems: Development of an Expert System to assess stream water quality management at reach scale).

The recent projects focus on: a) the impact of the Directive on Urban Wastewater Treatment on coastal ecosystems, b) impact of nitrate load to facilitate implementation of the Directive on Nitrate Discharge, c) the scientific underpinning of the implementation of the Water Framework Directive and d) the development of new tools for an integrated coastal zone management.

## • **IMPACTS on the marine environment**

### **Objectives**

The aim of the **IMPACTS** cluster is to provide realistic explanations of how pollutants affect the marine environment and to develop management models of pollutants and nutrients at basin, regional and site-specific scales. Strategies and options for dealing with anthropogenically caused environmental degradation and scenarios of socio-economic benefits arising from the reduction of anthropogenic effects will be developed within the cluster.

### **Structure of IMPACTS**

The **IMPACTS** projects are formally linked together via a common attachment to the Description of Work. The **EU contribution** is **21.4 M€**.

The **IMPACTS** cluster comprises the following projects:

**MATBIOPOL** (Role of microbial mats in bioremediation of hydrocarbon polluted coastal zones);

**SIGNAL** (Significance of external/anthropogenic nitrogen for Central Baltic Sea N-cycling);

**CYCLOPS** (Cycling of Phosphorus in the Mediterranean);

**MEAD** (Marine Effects of Atmospheric Deposition);

**FAMIZ** (Food web uptake of persistent organic pollutants (POPs) in the Arctic marginal ice zone of the Barents Sea);

**BEEP** (Biological effects of environmental pollution in marine ecosystems);

**INTERPOL** (Impact of natural and trawling events in resuspension, dispersion and fate of pollutants);

**ADIOS** (Atmospheric deposition and impact of pollutants and nutrients on the open Mediterranean sea);

**AIRWIN** (Structure and role of biological communities involved in the transport and transformation of POPs at the marine air-water interface);

**BIOCET** (Bioaccumulation of Persistent Organic Pollutants in small cetaceans in European waters);

**MERCYMS** (An integrated Approach to Assess the Mercury Cycling in the Mediterranean Basin);

**TREAD** (Transport, Reactions and dynamic of heavy metals in contaminated marine sediments);

**COMMODE** (Communities of Marine Micro-organisms for Oil Degradation);

**ACE (FP4 Project)** (Assessment of anti-fouling agents in coastal environments).

Linked to the IMPACTS cluster are two data-management projects: **MEDAR** and **MEDNET**.

The resulting RTD knowledge will underpin Europe's management models on the cost-benefits of pollution reduction, the rehabilitation of degraded ecosystems and the sustainable development of the marine environment and will provide input to relevant conventions including OSPAR, HELCOM, Barcelona and Bucharest Conventions.

## • **The EUROHAB Initiative and cluster**

### **Objectives**

EUROHAB, the European Initiative on Harmful Algal Blooms started in 1999, is formulated to generate and co-ordinate the required research to manage better the effects of toxic/harmful marine micro-algae and cyanobacteria in the marine and brackish waters of the EU. The EUROHAB Science initiative was described in a publication of European Commission (European Commission, Research in Enclosed Seas-5, EUR 18592, ISBN 92-828-6612-2, 1999).

The European Commission/DG Research is promoting today, through EUROHAB, both the high-level research and networking on HAB issues needed at European level in co-ordination with the national relevant activities.

### **Structure of the cluster**

EUROHAB includes 8 projects, from which 2 are FP4 MAST III projects and 6 are FP5 ESD projects. They are formally linked together via a common attachment to each Description of Work. Of the FP5 projects one is funded under key action 2 (*HABES*), the rest are funded under key action 3.

***The total EC contribution to EUROHAB is 10.5 M€, with 9.2 M€ for FP5 projects.***

The projects of the EUROHAB Initiative are:

***HABES*** (Harmful Algal Bloom Expert system),

**BIOHAB** (Biological control of harmful algal blooms in European coastal waters: Role of eutrophication),

**STRATEGY** (New strategy of monitoring and management of HABs in the Mediterranean Sea),

**ALIENS** (Algal introductions to European shores),

**FATE** (Transfer and fate of Harmful ALgal Bloom toxins in European marine waters),

**HABILE** (Harmful Algae Blooms initiation and prediction in large European marine waters).

- **Marine Biodiversity Cluster**

**Objectives**

Several marine biodiversity research initiatives are currently being funded by the EU. Given the importance of biodiversity, and the potential of and threats to marine biodiversity, it is strategically in the interest of the EU to cluster marine biodiversity research at the European level in order to create long-term, large-scale and lasting solutions. Marine biodiversity research has been fragmented, local and short-term. For sustainable marine ecosystems, Community level complementarity is needed.

It should be noted that under *Support for Research Infrastructures (SRI)*, there are two terrestrial biodiversity databases (**Fauna Europaea** and **EURO+Med**), and a **European Register of Marine Species (ERMS)** has been completed. Last year, **BioCASE** commenced a close co-operation with these. Moreover, a future **Species 2000 Europe**, now called *Eurocat*, is currently being negotiated.

The following is a list of marine biodiversity projects with a total EU funding over 10 M€. Complementary and value-adding projects, however, are in every other key action, because all ecosystem dynamics etc. contribute to biodiversity studies, and technologies and monitoring are needed to map biodiversity:

**PICODIV** (Monitoring Biodiversity of Pico-Phytoplankton in Marine Waters);

**EUMAR** (European marine genetic biodiversity);

**BIOMARE** (Implementation and Networking of Large-scale Long-term Marine Biodiversity in Europe);

**M@RBLE** (Electronic conference on Marine Biodiversity in Europe);

**MARBENA** (Creating a long-term marine biodiversity infrastructure in the EEA and the NAS) (*Under negotiation*);

**MIRACLE** (Microbial marine communities diversity: from culture to function) (*Under negotiation*);

**MaBenE** (Managing Benthic Ecosystems in relation to physical forcing and environmental constraints) (*Under negotiation*);

**OASIS** (Oceanic Seamounts: an Integrated Study) (*Under negotiation*)

**BIODEEP** (A Case Study in Marine Biodiversity and **ACES** (atlantic Coral Ecosystem Study) are very close to **OASIS**.

**EUROGEL** (EUROpean GELatinous zooplankton: Mechanisms behind jellyfish blooms and their ecological and socio-economical effects<sup>1</sup>) (*Under negotiation*)

**BASICS** (Bacterial single-cell approaches to the relationship between diversity and function in the sea) (*Under negotiation*)

**ALIENS** (Algal introductions to European shores) (**ALIENS** is currently part of the harmful algal bloom cluster EUROHAB. However, **ALIENS** does not deal with HABs but with invasive *seaweed* species, which are a major issue in biodiversity studies).

### **Impacts in EU and internationally**

The European marine biodiversity research cluster will coordinate European research efforts in the field, and enhance sustainability of the continent's seas and oceans. It will bring together different approaches and disciplines as well as different stake-holders, researchers and end-users of the research results. The cluster will help bring about continuity and coherence in marine biodiversity research methods, observations and data, reference material and databases. It will also give visibility to the importance of the diversity of life forms in the very rich and different marine ecosystems Europe hosts, and help create strategies and policy options to safeguard these. Clustering European marine biodiversity research will also help the EU act within the global framework of (marine) biodiversity initiatives, such as the Census of Marine Life (CoML), DIVERSITAS, Species 2000 etc.

## The safety of navigation

- **Operational Forecasting Cluster**

### **Objectives**

The aim of the Operational Forecasting (OF) Cluster is to further the development of the operational forecasting methods, tools and systems required in Europe. As a consequence, an intensive exchange of information and increased co-ordination and co-operation is foreseen between the projects participating in the OF Cluster.

### **Structure of the OF Cluster**

The OF Cluster was originally formed from seven MAST-III projects. These projects were: **MFSP** (Mediterranean Forecasting System Pilot Project); **DIADEM** (Development of Advanced Data Assimilation Systems for Operational Monitoring and Forecasting of The North Atlantic and Nordic Seas); **EuroROSE** (European Radar Ocean Sensing), **SEANET-DI** (SeaNet Data Interface); **CLIMEROD** (Influence of Climate Change on Coastal Sediment Erosion); **PIONEER** (Preparation and Integration of Analysis Tools Towards Operational Forecast of Nutrients in Estuaries of European Rivers); **ESODAE Phase 1** (Planning for a North West European Shelf Seas Ocean Data Assimilation and Forecast Experiment).



The OF Cluster currently comprises sixteen research projects that are all formally linked together via a common attachment to the individual Descriptions of Work of each project. These projects are the following:

***SOFT*** (Satellite-Based Ocean Forecasting);

***TOPAZ*** (Towards an Operational Prediction System for the North Atlantic and European Coastal Zones);

***MaxWave*** (Rogue waves - Forecast and Impact on Marine Structures);

***EDIOS*** (European Directory of the Initial Ocean Observing System);

***ANIMATE*** (Atlantic Network of Interdisciplinary Moorings and Time Series for Europe);

***MAMA*** (Mediterranean Network to Assess and Upgrade the Monitoring and Forecasting Activity in the Region);

***GAVDOS*** (Establishment of a European Radar Altimeter Calibration and Sea-level Monitoring Site for JASON, ENVISAT and EURO-GLOSS);

***GAMBLE*** (Global Altimeter Measurements by Leading Europeans).

***PAPA*** (Programme for a Baltic Network to Assess and Upgrade an Operational Observing and Forecasting System in the Region);

***BRIMOM*** (Bio-fouling Resistant Infrastructure for Measuring, Observing and Monitoring);

***EASEAS-RI*** (European Sea-Level Service Research Infrastructure);

***IOMASA*** (Integrated Observing and Modelling of the Arctic Sea Ice and Atmosphere);

***ODON*** (Optimal Design of Observational Networks);

***MFSTEP*** (Mediterranean ocean Forecasting System: Toward Environmental Predictions);

***IRIS*** (Ice ridging information for decision making in shipping operations);

***ARENA*** (A Regional Capacity Building and Networking Programme to Upgrade Monitoring and Forecasting Activity in the Black Sea Basin)

The total EU commitment to the ***Operational Forecasting cluster in FP5*** is ***nearly 31 M€***.

## **The 6<sup>th</sup> Framework Programme of Research of the European Communities (2002-2006)**

Within the 6<sup>th</sup> Framework Programme of Research of the European Communities (2002-2006), research on global change and ecosystems will provide major support to the EU strategy for Sustainable Development, which was decided in 2001 at Göteborg and which has been enlarged to an international scale in the context of the Johannesburg Summit on Sustainable Development (SD) in 2002. The programme of activity offered by the Sub-Priority "Global Change and Ecosystems" will strengthen the necessary scientific knowledge for the future orientation of the EU's SD strategy and the EU's 6<sup>th</sup> Environment Action programme. It will also provide socio-economic tools and assessments and overall management practices. Furthermore it will ensure their implementation at the enlarged EU level and, when relevant, at the world level.

The aim of the research activity is to assemble a critical mass of resources helping to integrate and strengthen the European Research Area. For this purpose new instruments will be widely used, that is Networks of Excellence (NoE) and Integrated Projects (IP).

Within the Sub-Priority "Global Change and Ecosystems", the topic of immediate relevance to the issue of protecting vulnerable marine ecosystems is that of "Biodiversity and ecosystems". A general outline of the initial research areas that will be addressed is given below.

### **Areas III - Biodiversity and ecosystems**

The objective is to develop a better understanding of marine and terrestrial biodiversity and of ecosystem functioning, to understand and minimise the negative impacts of human activities on them and to ensure sustainable management of natural resources and terrestrial and marine ecosystems (including fresh water systems) as well as the protection of genetic resources.

The research will focus on assessing and forecasting changes in biodiversity, structure, function and dynamics of ecosystems and their services, with emphasis on marine ecosystems' functioning, relationships between society, economy, biodiversity and habitats, integrated assessment of drivers affecting ecosystems functioning and biodiversity, and mitigation options and on risk assessment, management, conservation and rehabilitation options in relation to terrestrial and marine ecosystems.

#### **III.1. Assessing and forecasting changes in biodiversity, structure, function and dynamics of ecosystems and their services, with emphasis on marine ecosystems functioning.**

The research should focus on understanding biodiversity and ecosystems patterns, processes and dynamics at European and global scales, in a changing environment. Proposals should take account of developing earth systems analysis and modelling initiatives.

III.1.1 Developing a network for European long-term terrestrial and fresh-water biodiversity and ecosystem research, based on existing facilities.

III.1.2 Developing a network to structure and integrate European research on marine biodiversity and ecosystems.

III.1.3 Developing genomic approaches to enable the understanding of biodiversity and ecosystems structures and dynamics.

III.1.4 Development of cost effective, reliable and efficient technologies for enabling progress in biodiversity and ecosystem science, in particular for observing, monitoring, surveying and forecasting of physical, biological and chemical parameters in marine ecosystems, ranging from very shallow to deep water.

III.1.5 Integrated research on ecosystems lying in the deeper ocean section (ocean margin).

### **III.2. Relationships between society, economy, biodiversity and habitats**

The research should focus on gathering data sets and developing models and tools for assessing and forecasting the impacts of socio-economic mechanisms on biodiversity and ecosystems, and so, contribute to the development of mitigation and restoration strategies.

III.2.1. Generating models of socio-economic impacts on biodiversity and ecosystems with a view to facilitating the development of integrated strategies for preserving/restoring their integrity. Economic mechanisms, institutional and legislative systems, industrial and commercial practices at European and global scales should be taken into account.

### **III.3. Integrated assessment of drivers affecting ecosystems functioning and biodiversity, and mitigation options**

The research should be dealt with by implementing research initiatives aimed at developing models for assessing and forecasting the combined effects of the main biodiversity and ecosystems drivers, taking into account the natural variability and the various ecosystem types, the ultimate objective of these models being to facilitate the development of mitigation and sustainability strategies.

III.3.1 Develop models and simulations to assess and forecast changes in terrestrial and fresh water biodiversity and ecosystems, and changes in the ability of biodiversity and ecosystems to supply goods and services.

III.3.2 Develop models for assessing and forecasting the impacts of climate and anthropogenic forcing on pelagic ecosystem (open ocean). This work will be synchronised with related initiatives in the US.

### **III.4. Risk assessment, management, conservation and rehabilitation options in relation to terrestrial and marine ecosystems**

The research should be dealt with by implementing research initiatives to assess in an integrated way, large scale environmental risks impacting on biodiversity and ecosystems and to develop concepts and tools for risk management. The coastal zone management, based on integrated risk assessment is also considered here.

III.4.1. Assessing large-scale environmental risks to biodiversity and to terrestrial and freshwater ecosystems, including risks consequent on biological invasions (also by pathogens), climate change, environmental chemicals, rate and extent of loss of pollinators.

III.4.2. Develop model(s) for assessing and forecasting the impact of environmental pollution on fresh water and marine ecosystems and their biological diversity.

III.4.3. Create an inventory of invasive species that threaten European terrestrial, fresh-water and marine environments, and provide the basis to prevent and control biological invasions through the understanding of the biological, social, economic and other factors involved.

III.4.4. Harmful Algal Blooms in European marine and brackish waters.

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