CIESM Response to the EU Green Paper Consultation

Priorities for marine research and policy in the Mediterranean Sea – a multilateral view

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I - Preamble

The International Commission for the Scientific Exploration of the Mediterranean Sea (CIESM) was conceived in 1910 and has been promoting research in the Mediterranean and Black Seas ever since. Covering a region too often divided by ancient conflicts, CIESM offers a unique forum for scientific exchange and dialogue, bringing together several thousands of researchers from all shores of a Basin who apply the latest scientific tools to understand, monitor and protect a fast changing, highly impacted sea.
The Commission is thus able to defend research and environmental priorities with scientific impartiality, strengthened by the combined political support of its 23 Member Governments.

CIESM naturally welcomes

the effort of the European Commission to develop a strong, integrated Maritime Policy aimed at protecting and conserving the marine environment,

and especially the recognition in the EU Declaration of objectives for 2005-2009 of a « particular need for an all-embracing maritime policy… to be supported by excellence in marine scientific research, technology and innovation ».

Note: while CIESM geographic mandate includes a majority of non EU countries, it is worth noting that all CIESM scientists, from both EU and Third countries, strongly supported the Commission efforts in this respect.

CIESM much appreciates

the importance given by the Green Paper to the sound management of marine biodiversity and supports efforts to map the biogeography of marine resources. With its authoritative, constantly updated Atlases of Exotic Species and its cross-Mediterranean monitoring programs of key variables, CIESM is developing a thematic (diversity-oriented) marine platform, offering regular, efficient exchange of Mediterranean best practice examples, and will be pleased to develop it in partnership with the European Commission.

CIESM supports

the interest of the Commission in the potential of marine diversity for biotechnology. Taking in consideration the basic principles that regulate the sharing of benefits derived from natural (e.g. genetic diversity) resources and related property rights, CIESM shall endeavour to help filling gaps of knowledge/ expertise across the whole Basin and to facilitate integration and cooperation efforts of its Member States in this sector.

CIESM further welcomes

the view of the Commission on the importance of developing scientific research capacity and of investing efforts for a better dialogue with stakeholders. To this end, CIESM is planning to develop an “intelligent” geographic Mediterranean Metabase, fed by reliable field data provided by its own programmes and relevant national agencies. Completed by trend analyses and synthetic reviews, this will allow CIESM to issue periodic reports on the “State of the Mediterranean Environment” to all stakeholders and policy makers.

CIESM believes

that integrative, ecosystem-based approaches are a *sine qua non* condition to guarantee the success of environmental management strategies.
From its origins (1910), CIESM has based its initiatives on scientific cross-disciplinarity and broad geographic representativity. As the organization of reference in Mediterranean marine research, CIESM well illustrates how the use of integrative, ecosystemic approaches can be successfully combined with multi-lateral cooperation.

CIESM takes the opportunity

of its cross-Basin coverage (7 EU; 13 non-EU Member States) to encourage the consolidation of marine cooperation between the European Union and its Mediterranean neighbours in an integrated, muti-lateral fashion rather than in segmented, bilateral approaches.

THE CIESM CONSULTATION PROCESS

This document was prepared on the basis of a broad consultation process, taking advantage of the rich, diversified expertise of the CIESM network, which covers a broad range of marine disciplines, encompassing geophysical, chemical and biological process, along with high-resolution mapping of the sea-bottom.

The CIESM consultation comprised four steps :

1- an initial brainstorming meeting with twenty representative scientists from various disciplines (Beaulieu-sur-mer, France, 16-17 March 2007);
2- a Panel presentation of the brainstorming preliminary recommendations, followed by discussions with an audience of over 150 marine scientists (Istanbul, 13 April 2007, 38th CIESM International Congress);
3- consolidation (May 2007) of CIESM input with expert feedback from the CIESM scientific network collected via a specially dedicated electronic forum;
4- circulation of the final draft document among the CIESM Board Members for comments and final suggestions (early June).

This report deliberately focuses on selected sections of the Green Paper (research, innovation, governance) which relate to CIESM areas of expertise. The other sections will be certainly taken up by relevant, concerned agencies,

This document aims :

(i) to provide a broad Mediterranean perspective, with a coverage including the views of Mediterranean scientists from all shores;
(ii) to underline the peculiar complexity and specificities of Mediterranean marine ecosystems; and
(iii) to identify future concerted actions that would provide major added value in response to the environmental needs in the region.

II - CIESM COMMENTS ON "INTRODUCTION" (CHAPTER 1, PP. 3 –7)

As indicated in the Green Paper, "oceans and seas cannot be managed without cooperation with third countries." And without multi-lateral fora. This is particularly so in the case of the Mediterranean Sea, where more than half of bordering countries are non EU Member States. There a Maritime Policy will not succeed without integrating multidisciplinary, multi-sectoral, multicultural and politically diverse realities. CIESM, strongly recommends that this be developed via adequate cooperation mechanisms initiated at the onset.

GP Sub-section 1: Introduction	
GP Question	**CIESM Answer**
- How can the EU add value to the many national, local and private initiatives which already exist in the maritime field?	The complexity and heterogeneity of existing policies and research initiatives at local and national level undoubtedly makes it difficult to efficiently implement an integrated maritime policy and governance. This is especially true for management of coastal zones and high seas. The EU should promote the creation of a common framework to which all local, national and private initiatives should refer to, including those from non EU countries. This can be achieved only by close, multilateral interactions and cooperation with non EU countries.

III - CIESM COMMENTS ON "INNOVATION UNDER CHANGING CIRCUMSTANCES" (CHAPTER 2.4, PP. 14-17)

The CIESM contribution to Chapter 2 is focused on **section 2.4** (*Innovation under changing circumstances*). It underlines that, as a semi-enclosed "miniature ocean", and due to its unique properties including limited freshwater input, deep-sea proximity (with the coldest deepwater temperature above 12°C), sites of deepwater formation, complex seabed topography and its cross-road position between two adjacent Oceans, the Mediterranean Sea offers an excellent, highly specific opportunity to lead world-wide actions oriented on: *(a)* Climate Change, *(b)* Alternative sources of energy, and *(c)* Blue Biotechnology.

Climate change

As noted by IPCC[1], climatic regimes currently vary at rates beyond previously observed ranges. The major forcing seems to be the dramatic increase of global concentration of greenhouse gases mainly derived from human activities since 1750 and now largely exceeding pre-industrial values. Multimodel averages, based on a set of different scenarios, indicate that, if the currently greenhouse gases and aerosol concentration will remain constant (which is yet unclear), a further warming of about 0.1°C per decade in the sea would be globally expected, with much speculation regarding associated changes in regional climatic conditions[2]. Weather patterns variability causes ocean salinity changes (changing balance between evaporation and precipitation), driving change in thermohaline circulation patterns that redistribute water masses.

The Mediterranean as major Opportunity - The Mediterranean Sea is expected to react to annual temperature rise quite distinctly. For example, contrary to Northern European Seas, it is agreed that it will be subjected to a general decrease of precipitation and runoff (hence an increase in salinity)[3]. More likely than not, global environmental change will affect the semi-enclosed Mediterranean sea more rapidly and intensively than the world oceans. The numerous *in situ* measurements taken by the CIESM MedGLOSS[4] and HydroChanges[5] monitoring programs already indicate marked trends in terms of sea-level rise (eastern basin), and in the warming of deep waters.

Changes of circulation patterns, including an increase of the outflow of higher salinity Mediterranean waters to the Atlantic, and steeper and steeper salinity gradients, already influence the composition and seasonal patterns of planktonic communities, and affect the efficiency of biological pump across transient zones that seem to move northwards. An increased migration rate of tropical organisms, through an enlarged and deepened Suez Canal, is also anticipated. Together with other high-impact human activities (e.g. overfishing, shipping, chemical pollution), such changes further contribute to the degradation of the Mediterranean ecosystems, ranging from shifts in marine food webs (e.g. toward dominance of gelatinous organisms)[6], to increased extension of alien species geographical coverage[7] and epidemiological outbreaks[8].

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1 Fourth Assessment Report of the Intergovernmental Panel for Climate Change (2007)

2 Marine Board ESF Position Paper 9 (2007) : Impacts of Climate Change on the European Marine and Coastal Environment. 83 p.

3 CIESM, 2006. Fluxes of small and medium-size Mediterranean rivers: impact on coastal areas. CIESM Workshop Monographs n°30, 112 p.

4 Joint CIESM and IOC/UNESCO Programme (ongoing since 1997) Mediterranean Network for Systematic Sea-level Monitoring in the Mediterranean & Black Seas http://www.ciesm.org/marine/programs/medgloss.htm

5 CIESM, 2002. Tracking long-term hydrological change in the Mediterranean Sea. CIESM Workshop Monographs n°16, 134 p.

6 CIESM, 2000. Fishing down the Mediterranean foodwebs. CIESM Workshop Monographs n°12, 99 p.

7 CIESM Atlases of Exotic Species in the Mediterranean. (2000, 2002, 2003) Also accessible via http://www.ciesm.org/online/atlas/index.htm

8 CIESM, 2006. Marine Science and Public Health –major issues. CIESM Workshop Monographs n°31, 128 p.

GP Sub-section 2.4 : Innovation under changing circumstances	
GP Question	**CIESM Answer**
- What further steps should EU take to mitigate and adapt to climate change in the marine environment ?	- Actions to mitigate or adapt to climate changes should be based on a reliable Advance Basic Knowledge of their possible impact. To this effect, the EU should help cross-link available information (field measurements), and consolidate the acquisition new field data via the deployment of a Network of Observatories interacting with a set of complementary long-term (e.g. decadal) field programs monitoring currents, coastlines, marine populations and habitats, marine acidification, marine productivity.

CIESM Initiatives and Perspectives

Because of its relatively small dimensions, the sea response to atmospheric forcing is very rapid. Hence the Mediterranean Sea represents a natural prototype for studying and monitoring the effects of global climate change, particularly on marine biodiversity, which marked by a high ratio (30%) of endemic species.

CIESM is leading several actions in this direction, among which the identification and monitoring of Exotic Species in the Mediterranean Sea, with well-known, regularly updated Atlases (http://www.ciesm.org/online/atlas/index.htm). We have a long history of coordinating data collection in all relevant areas and are using our rich biological archives and active taxonomist network to investigate which endemic species are under risk of extinction.

Energy

The marine realm presents many opportunities for energy exploitation in coastal waters (trapping renewable wind and wave sources of energy) as well as in deep sea areas where previously unknown resources have been discovered, such as methane hydrates and microbial fuel cells[9].
The deep seafloor harbours abiotic resources formed mainly by geological processes (such as biogenic and thermogenic hydrocarbon gases emitted at seeps from gas hydrate-bearing sediments).

The Mediterranean Sea as major opportunity – The Mediterranean region constitutes one of the world's major provinces where hydrocarbon-derived fluids have been and are massively emitted at the surface both on land (Apennines) and on the seafloor, particularly in the deep sea. The fluid flows within the seabed sediments (fluid seepages) and related features (mud volcanoes, gas chimneys, gas plumes, authigenic sedimentation) are widespread, occurring in different geodynamic settings of the Mediterranean domain, from active to passive margins.

Fluid seepages are of various types. In the Mediterranean Ridge, they result from the compressive tectonics of the ridge dewatering by compaction of the piled up sediment (cold seeps), resulting in mud volcanoes, mud diapirs and small anoxic basins. Cold seeps also provide an access window to deep hydrocarbon systems, which is of economic interest. In the Eastern Mediterranean (Anaximander mountains and the Cyprus Arc), the presence of gas hydrates has been reported and sampled in major submarine mud volcanoes.

[9] As demonstrated in 2001, voltage gradients at sediment-water interfaces could supply energy (for fuel cells) for self-sustaining oceanographic equipment (US Patent No. PCT/US00/28983). Further the recent development of a microbial fuel cell that can harvest electricity from the organic matter stored in marine sediments has shown the feasibility of producing useful amounts of electricity in remote environments.

The exploration and exploitation of energy resources are becoming more and more intensive activities. They should be better controlled so as to preserve unique marine ecosystems. This problem is acute in the Mediterranean, due to the relative proximity to shore of deep sea areas rich in energy. Such systems are host to complex, poorly known biological communities. Hence the correct positioning and management of pipelines, electrical cables and telecommunication cables at the bottom of the sea is an issue of serious concern. Deep sea installations (deeper than a few hundred meters) require closer concertation between research, industry and conservation agents, keeping in mind the vulnerability and fragility of unique deep sea communities thriving in extreme environments..

GP chapter 2.4 : Innovation under changing circumstances	
GP Question	**CIESM Answer**
- How can innovative offshore renewable energy technologies be promoted and implemented?	- Efforts should be undertaken to characterize renewable energies at sea and compare them in terms of cost/benefit and sustainability of their use, and to develop technologies in relation with innovative industries. Exploration/exploitation activities offshore should be accompanied by accurate analyses of associated risks (e.g.environmental, geological). Deep sea installations (deeper than a few hundred meters) require the utmost care, sophisticated technologies such as swath bathymetric mapping, improved near-bottom seismic-reflection techniques, and innovative sampling techniques (e.g. for gas hydrates). Those activities should provide a fertile ground for enhanced trans-Mediterranean cooperation.
- How can energy efficiency improvements and fuel diversification in shipping be achieved?	- Among alternatives, biological resources, including uncellular organisms and bacterial metabolic pathways with potential application (e.g. biofuel) and marine eukaryotic/ microbial fuel cells, should be valorised.
CIESM Initiatives and Perspectives A recent CIESM Workshop critically reviewed our geological/geophysical knowledge on fluid seepages and related features[10]. CIESM together with Ifremer regularly produce high resolution synthetic maps of the eastern and western Mediterranean seabed. They reveal active geological features of tectonic, volcanic, sedimentary and biogeochemical origin imprinted on the seafloor. These efforts, combining seafloor mapping with modern swath bathymetry tools, have profoundly modernized our knowledge of deep basins and our understanding of submarine geological processes in the Mediterranean Sea.	

Blue Biotechnology

The immense genomic diversity characteristic of marine environments opens vast promises for blue biotechnologies. In particular the biological adaptations found in extreme deep-sea environments and in certain shallow areas (south Tyrrhenian, Levant) represent a virtually untapped resource for the discovery of novel bioproducts, drugs, cell components or metabolic pathways with huge potential pharmaceutical and industrial applications[11].

The Mediterranean as major Opportunity - Because of its history (sapropels, evaporites) and its complex structure (e.g. deep sea anoxic basins, mud volcanoes, fluid seepages, hydrothermal vents, seamounts, deep coral communities), the Mediterranean is a complex mosaic of very unusual, diversified,

[10] CIESM, 2005. Fluid seepages / mud volcanism in the Mediterranean and adjacent domains. CIESM Workshop Monographs n°29, 155 p.

[11] Biotechnological products, mostly enzymes, are already in use in many industrial sectors, from textile manufacture and food production to wastewater treatment, air monitoring, waste recycling, cleaning of exhaust gases or the decontamination of soil or ground water. Mechanical engineering already makes 450 different biolubricants and biohydraulic oils available on the market.

yet easy-to-reach marine habitats. These harbour biological communities with metabolic features of great industrial interest. The Mediterranean offers a rare opportunity to launch coordinated efforts for large scale screening of marine organisms and bioproducts for biotechnological purposes.

The early results obtained from the various initiatives launched at both national and European levels (*EU FP5* BIODEEP, and *EU FP6* Marine Genomics-NoE) are exciting[12] but the work remains preliminary and fragmentary so that the evolutionary and adaptive mechanisms of organisms able to thrive under extreme Mediterranean conditions have yet to be decoded.

GP chapter 2.4 : Innovation under changing circumstances	
GP Question	**CIESM Answer**
- *What is needed to realise the potential benefits of blue biotechnology?*	- What is needed is a clear strategy, a roadmap with defined deliverables, such as: *(i)* Launching large scale, long term[13] screening programs. *(ii)* Providing leading research groups with adequate infrastructures (e.g. easy access to innovative sequence technology) so as to allow large scale processing of collected materials. *(iii)* Developing computational tools (high-speed optical networks, grid-based computing, and new visualisation technologies) and databases that remain flexible and responsive to all researchers who could benefit of this resource (e.g. from experts on biodiversity and biogeochemistry to scientists studying evolution and genomes)[14]. *(iv)* Promoting and strengthening the link between research and industry A successful strategy shall be based on the coordinated activity of multidisciplinary cross-cutting Consortia/Networks (including scientists of various complementary disciplines[15], and end-users). It will certainly benefit of awareness promotion initiatives enhancing visibility of the potential of marine biotechnology to impact on non-marine related areas (e.g. food, health, energy and industrial materials) so as to strengthen the attractiveness of the sector to many audiences and potential participants, and to secure the commitment of local governments.

12 For example see Nature 440: 203-207 (2006) or Science 307: 121-123 (2005).

13 10 to 20 years is the average time frame required for identification of marine bioactive materials and better use of the acquired materials, particularly when commercialising a biotechnology based health product.

14 The necessary steps to be undertaken so as to obtain leadership on the sector are all time consuming and require a big coordination effort but they differ remarkably in terms of cost. Particularly, whereas the sampling and sample processing for Blue Biotech purposes are very expensive, there are two bottle-neck steps that could be bypassed at a relatively low cost, namely: *(i)* correct management of intellectual properties in mixed scientific/industrial consortia, and *(ii)* need of bioinformatics platform for data analyses.

15 Knowledge generation requires scientific excellence. There is strong support for concentrating effort towards areas of science which enable the full potential of biodiversity of the oceans to be explored. Only a fraction of marine organisms have been described. Speeding up the discover process requires access to the underpinning science areas of marine biology – biochemistry, molecular biology, genetics and natural products chemistry in order to create tools and protocols on which biological libraries can be built. New skills and processes in areas as marine resource mining, targeted sequencing, bioinformatics, post genomics, functional genomics, transcriptomics, proteomics, protein structures, metabolomics, and assays to assess bioactivity are required.

CIESM Initiatives and Perspectives

The unusual complexity of the Mediterranean seafloor presents a yet untapped resource of new enzymes, genes, and metabolites with potential industrial applications. In fact different areas of the Mediterranean sea could meet different industrial interests (e.g. deep-sea anoxic basins could produce water-retaining metabolites of interest to the cosmetics industry, etc.). A consortium involving research and industrial partners on both shores could be usefully created to investigate Mediterranean sub-regions.

Φ CIESM would be keen to join EU efforts to expand Blue Biotechnology benefits. We have identified the development of a Mediterranean Bioinformatics Network[16] as an axis to possibly mediate partnerships of mutual benefits between northern and southern Mediterranean scientific communities. This would facilitate fast transfer of knowledge on marine biotechnology, job creation, enhance cross-mobility and exchanges, and so accelerate advances in science and biotechnology where the lack of expertise in bioinformatics is a critical "bottle-neck".

IV – CIESM COMMENTS ON PROVIDING THE TOOLS TO MANAGE OUR RELATIONS WITH THE OCEANS (CHAPTER 4, PP. 31-35)

The CIESM contribution to this chapter addresses **sections 4.1** (*Data at the service of Multiple Activities*), and **4.3** (*Making the Most of Financial Support for Coastal Regions*). It formulates our main recommendations for strengthening reliable monitoring programs in the Mediterranean Sea. More detailed information on specific Mediterranean trends (e.g., time series of key descriptors) and key features (e.g. strategic warning areas to place permanent observatories) is available upon request. Obviously the provision of suitable tools for "managing" the Mediterranean Sea shall not exclude the integration of non-EU Mediterranean Countries in the data collection and management activities.

GP chapter 4.1 : Data at the service of Multiple Activities

GP Question	**CIESM Answer**
- How can a European Marine Observation and Data Network be set up, maintained and financed on a sustainable basis?	- Marine Observation Networks for generating field data have been sporadically set up by separate initiatives at national level. An integrative European Observatory Network is much needed. When integrating existing national infrastructures and data sets much caution should be applied to select only reliable and robust data.. - With easier access to key data, the private sector should be a major beneficiary, and provide a return on the initial investment.

CIESM Initiatives and Perspectives

The particularly complex structure and meso-scale dynamics[17] of the Mediterranean Sea impose special constraints on monitoring programs. Preferably they shall rely on a combination of permanent observatories (including sea floor observatories) strategically located in "early warning areas" with monitoring programs for long-term (one decade minimum), high definition measurements. Scientific analyses of trends will be needed to discriminate "permanent changes" from medium (months to years) or long-term (decades or longer) "fluctuations".

[16] Handling metagenome-related immense datasets, that are going to exponentially increase in number and size in coming years, will pose considerable technological challenges.

[17] CIESM, 2005. Strategies for understanding mesoscale processes. CIESM Workshop Monograph n° 27, 132 p.

Φ Various monitoring programs tracking key marine parameters (sea level, deep sea temperature and currents, extension of exotic species, radionuclides) already operate across the Mediterranean under CIESM control (www.ciesm.org/marine/programs/index.htm). To manage the different sets of data thus generated, CIESM has included Data Management among its priorities and plans to develop a prototype Mediterranean MetaBase for the consultation/ management of data in relation to their geographic location. The near-term development of new CIESM programs on river fluxes, coastal erosion, biological macrodescriptors, will soon enrich the MetaBase which is naturally set to "dialogue " with relevant data network such as that proposed for Europe.

Φ Regular analyses of CIESM data will allow us to produce at regular intervals user-friendly, "intelligent" information on the "State of the Mediterranean". This information, aimed at all stakeholders and policy makers, will also help raise public awareness of Europe's southern maritime heritage.

- Should a comprehensive network of existing and future vessel tracking systems be developed for coastal waters of the EU?	- *"Vessels of opportunity"* (e.g. ferry lines) are a low-cost, efficient manner to obtain regular measurements. They can be equipped with sensors for salinity, temperature, chlorophyll, contaminants measurements, and with instruments of other kinds. The coastal waters of Europe and of the Mediterranean are crossed by high-frequency ferries. A coordinated network would produce a vast amount of long-term environmental data.

CIESM Initiatives and Perspectives

The success of the EU FerryBox Project (FP5) demonstrates the potential of research strategies based on the use of vessels of opportunity for operational oceanographic purposes and for monitoring various environmental parameters. However, with the exception of the Athens-Iraklion (GR) line in the Eastern Mediterranean, FerryBox ship routes were restricted to the Northern European Seas.

Φ CIESM has launched its own TRANSMED monitoring program, which aims to monitor the surface of the Mediterranean sea, using ships of opportunity (http://www.ciesm.org/marine/programs/transmed.htm).

GP chapter 4.3	Making the Most of Financial Support for Coastal Regions
GP Question	**CIESM Answer**
- Is there a need for better data on coastal regions and on maritime activities ?	Data on coastal regions are often fragmentary since they result from independent projects. Future resources should be allocated to larger, cross-border initiatives that will collect data under the same strategy and via application of homogeneous protocols. In addition most data available for Mediterranean coastal regions solely concern the EU countries as (a) information from non-EU coastlines is rarely accessible and (b) EU initiatives too rarely integrate non-EU scientists in the data collection and processing.

CIESM Initiatives and Perspectives

Φ The long, successful practice of CIESM is to associate *de facto* researchers from <u>all</u> Mediterranean shores in <u>all</u> its activities. This is imperative in any of our cross-border coastal monitoring programs. CIESM would be keen to associate its network with future EU efforts in gathering data on the socio-economic value of coastal resources related to biodiversity.

V - CIESM COMMENTS ON MARITIME GOVERNANCE (CHAPTER 5, PP. 41-46)

CIESM input here specifically addresses questions related to sections 5.3 (International rules for global activities) and 5.4 (Taking account of geographical realities), highlighting key issues specific of the Mediterranean Sea which need to be taken into account in a future integrated EU maritime policy.

The Mediterranean Unique Context – The Mediterranean Sea is not just a "European" Sea as it is bordered for a great part by non-EU Countries (Albania, Algeria, Bosnia-Herzegovina, Croatia, Egypt, Israel, Lebanon, Libya, Montenegro, Morocco, Syria, Tunisia, and Turkey). Therefore, new neighbourhood instruments for cross-border maritime cooperation are urgent, especially for what concerns:

* Resources exploitation and property rights
* Governance of maritime activities

Resources exploitation and Property rights

The emergence of metagenomics highlights the need to incorporate data from vastly divergent sources to meet the needs of a wide range of interests. With the recent development of targeted cyber-infrastructures that enable researchers to clothe the bare genetic sequences in a wealth of other data including the source of each genetic sequence, many coastal countries may soon want a share of commercial applications that derive from their marine resources. Detailed agreements are urgent for clarifying how the benefits derived from these data will be shared.

Whereas the basic legal framework exists (UNCLOS 1982, Convention on Biological Diversity 1992), endowing coastal nations with the sovereign rights to explore and exploit all resources within their "exclusive economic zone", there is little regulation to encourage the sharing of benefits arising from genetic resources beyond national waters. UNCLOS considers mineral resources on the deep seabed as the "common heritage of mankind"; this means that any benefits deriving from them should be shared with the international community. But when it comes to biological resources, just about anything goes.

Areas beyond national jurisdiction are subjected to increased "bio-prospecting", i.e., the search for and exploitation of commercially valuable compounds from genetic resources[18]. Deep-sea exploration - with the lengthy research and development that follows - is an expensive business, which is restricted only to the world's wealthiest nations. Finding a balance between the unregulated status quo and cumbersome controls over research on marine biodiversity is now the concern[19].

Another concern is the ecological impact caused by repeated visits to the same deep-sea spot by research and industrial prospectors. So far, little thought has been devoted to the consequence of unregulated access but there are new, pioneering actions in this domain[20].

[18] Arico S., C. Salpin (2005) UNU-IAS report—Bioprospecting of genetic resources in the deep seabed: Scientific, legal and policy aspects. Yokohama (Japan): United Nations University Institute of Advanced Studies. Available: http://www.ias.unu.edu/binaries2/DeepSeabed.pdf.

[19] One compromise might be for coastal states to allow all research on their genetic resources with the proviso that exploitation of any commercial application is subject to further negotiation. Another possibility is for the patent system to take responsibility for seeing that benefits are shared fairly, only granting patents based on biological resources if a royalty is paid into a global commons trust fund.

[20] International Institute for Sustainable Development (2006) Ad Hoc Opened Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction. Winnipeg (Canada): International Institute for Sustainable Development. Available: http://www.iisd.ca/oceans/marinebiodiv.

Governance of maritime activities / scientific advice

To be effective, the governance of maritime resources must be based on the best available scientific advice, with repeated cross-cutting entry points for scientists in the decision-making process. Scientific advice must not simply take the form of a single, preliminary consultation step.

The implementation of key maritime regulations for safety and security will ultimately fail if not established at Basin scale. It must take into consideration the greatly varying degrees of industrialisation and industrial development within the Mediterranean. Priority should be given to rules governing maritime transport and to treatment plants/strategies supplying water discharge activities. The latter should consider the striking increases in local populations during tourist seasons, when more contaminants enter coastal systems through sewage (treated and untreated) and more seafood is consumed. Because of substantial cultural differences among Mediterranean populations, different lifestyles and food habits must be examined carefully when addressing public health issues[21]. Conferences reviewing best practice in Mediterranean maritime governance would be helpful.

GP chapter 5.3 : International rules for global activities	
GP Question	**CIESM Answer**
- How can EU external policy be used to promote a level playing field for the global maritime economy and the adoption of sustainable maritime policies and practices by third countries?	EU external policy should be based on multilateral agreements with non EU countries, enabling an effective cross-Basin maritime governance. This is particularly important to ensure a sustainable and equitable exploitation of resources and related property rights. Regulations of maritime activities (especially in relation to safety and security issues, pollution) should stem from an interactive consultation process involving, from the onset, scientists, policy makers and end users and should be adapted to regional needs and realities. Scientific advice should be sought via concerted consultation of the scientific community (rather than based on the opinion of one or two experts) and constitute the "compass" of the future maritime policy.

GP Sub-section 5.4 : Taking account of geographical realities	
GP Question	**CIESM Answer**
- What regional specificities need to be taken into account in EU maritime policies?	- The absence of EEZs in the Mediterranean Sea is a major obstacle preventing the application of the UN Law of the Sea over large expanses of water. It contributes to the mismanagement of offshore marine resources in a highly-impacted, most vulnerable sea. - Far more attention must be given by the EU Maritime Policy to deep sea environments, where the risks of over-exploitation and environmental degradation are particularly high. This is an issue of utmost concern for the Mediterranean, where fragile deep sea areas[22], rich in mineral and biological resources, are within easy reach from shore. Despite their enormous potential for biotechnology and growing research interest (Hermes EU initiative), such ecosystems remain largely unknown[23].

[21] For example, rules related to seafood consumption should take in consideration that religious restrictions forbid some populations from eating shellfish, hence almost all harvested and cultivated production is exported to EU countries. While no direct concerns may exist for local populations, seafood safety should comply with EU guidelines and regulations.

[22] Due to their shoreline proximity (and because of winter convection and strong mesoscale activity), highly fragile Mediterranean deep-sea ecosystems are strongly exposed to fast horizontal and downward transfer of stress effects (e.g. chemical pollution and water cycles/climate change).

[23] CIESM, 2003. Mare Incognitum? Exploring Mediterranean deep-sea biology. CIESM Workshop Monographs n°23, 128 pp.

VI – A FINAL REMARK

The Mediterranean Sea is shared by the EU and many other countries, straddling major cultural, socio-economic, technological divides. In such a sensitive geographic context, a European Maritime Policy will miss its desired targets if it is based solely on European views and on a legitimately proud European leadership in research.

Drawing from its century-old experience in fostering dialogue and scientific cooperation in the region, CIESM recommends as a matter of urgency that the EU facilitates relevant technology/ knowledge transfer across the Basin, and promotes scientific capacity building in Mediterranean non-EU Countries. Areas where job opportunities may fast develop in partnership with the "north", for example at the interface between marine sciences and biotechnologies, are clearly worthy of attention.

Without the provision of clear economic benefits and returns for the populations on both shores, hopes for an efficient management and lasting protection of Mediterranean marine resources will remain illusory. As far as marine sciences have an important role to play in this scenario, CIESM will be pleased to assist the EU, when and where needed.