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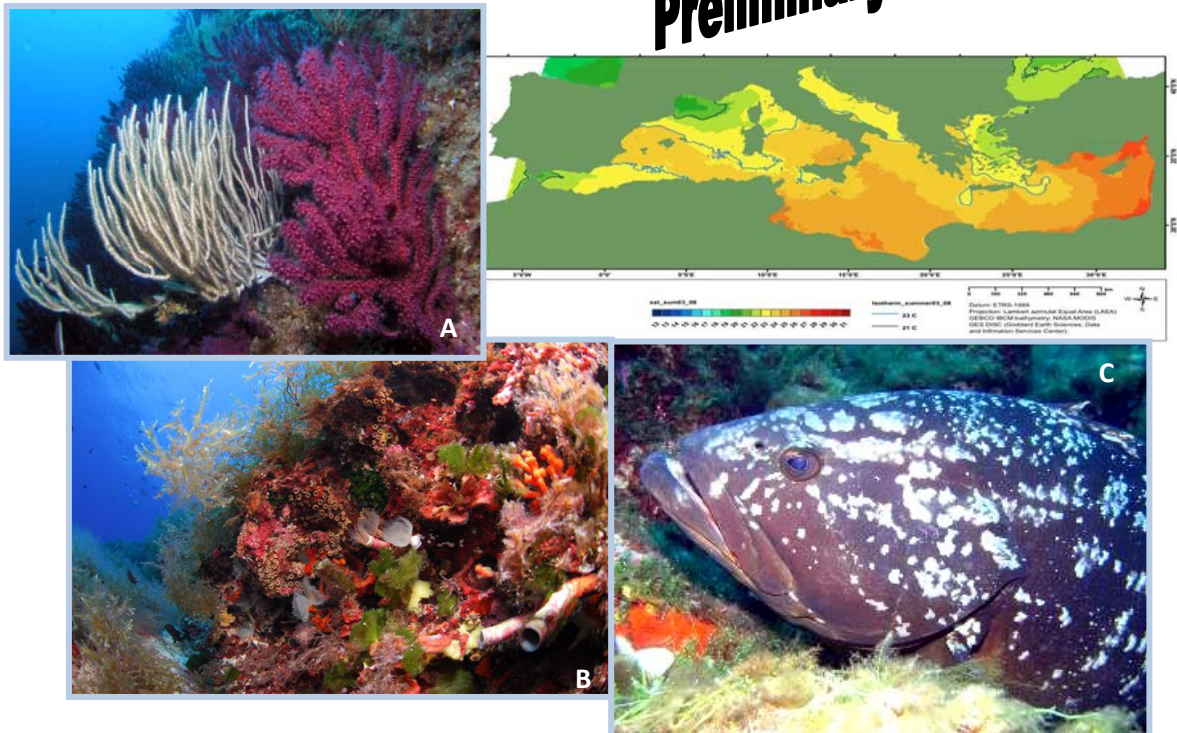
Regional Activity Centre for Specially Protected Areas

“Further development of the Ecosystem Approach within the Barcelona Convention”

RAC/SPA Component

Identification of important ecosystem properties and assessment of ecological status and pressures to Mediterranean marine and coastal biodiversity

Preliminary Report



March, 2010

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F. Badalamenti (B)

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Foreword

This preliminary report constitutes a draft compilation of initial findings and results related to the preliminary assessment of the ecological status and pressures to Mediterranean marine and coastal biodiversity in the Mediterranean countries. These first results are based on the information provided by the draft national reports already submitted to the International consultants and RAC/SPA.

Considering that only 10 draft national reports out of 19 national and 4 sub-regional expected ones have been submitted until now and that other 6 national reports are still pending to start, it has to be noted that the results, the conclusions and the recommendations presented here are still draft ones and do not constitute yet consistent elements to be taken into account for the scientific and technical assessment of the step 3 of the Ecosystem Approach (ECAP) process. The elements included in the present report are provided only for internal use in relation with the Meeting of Technical Experts on the Application of the Ecosystem Approach by the Mediterranean Action Plan, planned to be held in Rome, Italy, on April 2010.

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“Further development of the Ecosystem Approach within the Barcelona Convention” RAC/SPA Component

1. General framework of the activity

The Ecosystem Approach (ECAP) has been introduced aiming at improving the way human activities are managed for the protection of the marine environment. Following the World Summit on Sustainable Development, the ECAP has been adopted by many International Conventions and Regional Seas Organizations. The Contracting Parties to the Barcelona Convention have adopted it in January 2008 at their Almeria meeting. The proposals to that meeting were developed in the framework of a project (ECOMED) funded by the EC.

In this context, any environmental policy should be developed in a way that secures an effective protection of the marine environment and that makes possible the continued provision of marine goods and services for the wealth of the population. The application of the ECAP has the potential to help reach a balance between the requirements of human activities and the conservation of the marine environment. Its adoption and gradual implementation within the framework of the Mediterranean Action Plan (Barcelona Convention) will give new impetus to the preparation of more integrated and holistic policies by the Convention, including the impact of human activities on the marine environment.

To ensure the sustainability of the exploitation of marine goods and services in the Mediterranean Sea, it is important that the ECAP and its related conservation and management measures be applied not only to areas under the jurisdiction of States, but they should cover also the habitats and ecosystems located beyond the national jurisdiction. As a consequence, the implementation of the Ecosystem Approach is not only a task for the Convention and its subsidiary bodies, but also and mainly for its Parties.

Within this framework, the MAP has received funding from the European Commission to undertake a project aiming at providing support to the Barcelona Convention for the Implementation of the Ecosystem Approach, including the establishment of MPAs in open seas areas, including deep sea.

The project aims, among others, at promoting and enhancing the implementation of the road map for the application of the ecosystem approach to the management of human activities. Five first steps have been identified to implement the road map until July 2012.

These first five steps are as follows:

- ✓ Definition of an ecological Vision for the Mediterranean,
- ✓ Setting of common Mediterranean strategic goals,
- ✓ Identification of important ecosystem properties and assessment of ecological status and pressures,
- ✓ Development of a set of ecological objectives corresponding to the Vision and strategic goals,
- ✓ Derivation of operational objectives with indicators and target levels.

The first step has already been completed by the Contracting Parties and the agreed ecological vision is: “A healthy Mediterranean with marine and coastal ecosystems that are productive and biologically diverse for the benefit of present and future generations”;

The second step has also been completed and the agreed strategic goals are:

- a) To protect, allow recovery and, where practicable, restore the structure and function of marine and coastal ecosystems thus also protecting biodiversity, in order to achieve and maintain good ecological status and allow for their sustainable use.
- b) To reduce pollution in the marine and coastal environment so as to minimize impacts on and risks to human and/or ecosystem health and/or uses of the sea and the coasts.
- c) To prevent, reduce and manage the vulnerability of the sea and the coasts to risks induced by human activities and natural events.

The Step no. 3, is under progress. It consists on the preparation of assessment documents on the identification of important ecosystem properties and the ecological status and pressures.

2. Objectives of the activity

The overall objective of this activity is to further develop of the Ecosystem Approach within the Barcelona Convention

The specific goal for the RAC/SPA component is to provide for information, interpretation and recommendations at national and regional levels aiming at identification of important ecosystem properties and assessment of ecological status and pressures to Mediterranean marine and coastal biodiversity, in accordance with the outcomes of the 15th Ordinary Meeting of the Contracting Parties (OMCPs) to the Barcelona Convention.

3. Methodology for the implementation of the process

3.1. Recruitment of the national and International consultants

For the preparation of the abovementioned assessment documents, It has been agreed at MAP level to subdivide the Mediterranean Sea into four areas, based on bio-geographic and oceanographic considerations. The four areas agreed upon are:

- (i) Area 1: Algeria, France, Italy (Ligurian-Tirrenian Sea areas), Monaco, Morocco, Spain and Northern Tunisia, (ii)
- (ii) Area 2: Albania, Bosnia & Herzegovina, Croatia, Italy (Adriatic Sea area), Montenegro, and Slovenia, (iii)
- (iii) Area 3: Greece (Ionian Sea area), Italy (Ionian Sea area), Libya, Malta and Eastern-Southern Tunisia and (iv)
- (iv) Area 4: Cyprus, Egypt, Greece (Aegean/Cretan Seas area), Israel, Lebanon, Syria and Turkey.

In most of the countries (17 countries), RAC/SPA, in close consultation with the national authorities, has selected a national consultant, which will provide for the preparation of a National document aiming at the identification of important ecosystem properties and assessment of ecological status and pressures to Mediterranean marine and coastal biodiversity in [the Country]". For Cyprus, Italy Lebanon and Malta, the selection of the national consultants is still pending due to administrative constraints.

Furthermore, for each of the four areas, an International consultant has been engaged by RAC/SPA in order to manage the work of compilation of inputs delivered to RAC/SPA by the national consultants. The International consultants, under the overall guidance and coordination of RAC/SPA, will assist the national consultants under their clusters and give them guidance and technical support, in order to provide for the preparation of the assessment documents.

3.2. Tasks and responsibilities

3.2.1. National consultants

Parties' National Consultants will provide for the preparation of the ecological status assessment documents and identify gaps on important ecosystem properties and acting pressures in each country.

The sections to be prepared will refer to (i) ecosystem status chapters on Biological characteristics and habitat types; (ii) Pressures and impacts chapters related to biological disturbance as well as (iii) emerging issues, such as climate change effects and deep sea ecosystems modifications.

The National Consultants should take into account, as a reference for their best tasks execution, the relevant recent global, regional and national documents and findings related to ecological status and biodiversity in national coastal and marine areas.

The National Consultants should keep information and consultation exchanges on a regular basis with International Consultants (assisting RAC/SPA for the merging within clusters) involving their respective countries or country areas.

3.2.2. International consultants

The RAC/SPA international consultant will support RAC/SPA through managing, the countries inputs appointed to him, coordination with national experts, SAP BIO national correspondents and institutions asking for assistance, when participating in the process of the further development of the Ecosystem Approach within the Barcelona Convention following pre-defined attached annexes to their contracts. The International consultants have to:

- co-ordinate, assist, guide and harmonize the inputs provided to RAC/SPA by National Consultants under the cluster assigned,
- collate, revise and provide coherence to the inputs received,
- prepare and harmonize the assessments for the respective clusters and identify gaps on important ecosystem properties, ecological status and pressures to Mediterranean marine and coastal biodiversity, and

- present the draft cluster assessments to RAC/SPA and finalize them in accordance with the outputs of the eventual working meeting(s), and recommendations and comments by RAC/SPA.

3.2.3. RAC/SPA

The RAC/SPA is ensuring guidance for the different countries and stakeholders and leads the harmonization of the work and the inputs. It will hold, if possible, ad hoc meetings at regional or lower levels and will lead the preparation of the final synthesizing documents.

RAC/SPA has also provided, when possible, for the National and International Consultants relevant information at the Mediterranean level regarding the ecosystem properties and assessment of ecological status and pressures, and resulting impacts on marine and coastal biodiversity. The following documents have been included (as available):

- RAC/SPA SAP BIO and NAPs along with any other reports on marine and coastal biodiversity,
- RAC/SPA 2009 reports of Climate Change impacts on Mediterranean marine and coastal biodiversity,
- Other useful biodiversity reports and relevant documents produced by Regional Conventions and Agreements embracing the Mediterranean (Bern, Bonn, ACCOBAMS, etc...)

Finally, in order to provide for full available information and harmonized contents and structure of the assessment, the National Consultants should follow the annotated contents and structure needed for this ECAP phase (see attached document), already prepared and provided by RAC/SPA in close consultation with the four International Consultants.

4. Preliminary results and findings

In this section of the report, we will present the preliminary findings and results related to the preliminary assessment of the ecological status and pressures to Mediterranean marine and coastal biodiversity in the countries. These preliminary results are based on the information provided in the national reports already submitted to the International consultants and RAC/SPA. Only 10 reports on a total of 19 expected reports to be delivered have been already submitted. Since the international consultants are still waiting for the submission of the remaining reports, planned to be done by mid-March, no sub-regional report has been prepared until now. RAC/SPA has proceeded to the preparation of this preliminary report for the needs of the meeting on the ECAP implementation.

Since there has been already an agreement to subdivide the Mediterranean Sea into four areas for the preparation of the assessment documents, we will present the preliminary results of the submitted draft reports, country by country according to each of the four areas. For each country, the preliminary results will be presented as follows:

- An overview on the marine and coastal status and pressures relevant for national marine and coastal areas,

- The national needs, and
- The urgent actions proposed

4.1. Area 1: Algeria, France, Italy (Ligurian-Tirrenian Sea areas), Monaco, Morocco, Spain and Northern Tunisia.

For this cluster, we have only received the national draft reports of **Algeria** and **Morocco**. The National consultants of **France, Monaco, Spain and Tunisia (Northern part)** will submit their draft reports by mid-March. The latter will be finalized by end March taking into account the comments and the guidance of the International consultants and RAC/SPA. Their preliminary results of the national reports of Algeria and Morocco are presented hereinafter.

4.1.1. ALGERIA

A. Marine and coastal status and pressures relevant for national marine and coastal areas

- Marine and coastal status

The inventory of biodiversity and habitats allows some comments:

- Biodiversity is broadly representative of the marine and coastal Mediterranean with an interesting degree of endemism even if it is difficult to make an accurate assessment. For some groups such as algae, seagrass, benthic fauna, it is arguable that most of the species still persist along the Algerian coast.
- The marine and coastal biodiversity in Algeria remains unknown on several components: many groups are still unknown and does not have inventories: the benthic macrofauna of hard substrates (corals, sponges, etc..) and certain groups of soft substrates (sipunculidae, nematodes, Nemertes, oligochaetes, isopods, etc..).
- The richness of marine zooplankton as well as its structure is still only partially identified. Most studies focus one zoological group (such as copepods, chaetognaths, the Thaliacea the larvae of decapod crustaceans, etc..).
- Several segments of the coast remain unexplored to date. The investigations focused on the central coast of Algeria for reasons often objective (presence of specialists and academic research institutions dealing with marine and coastal biodiversity in this region). The establishment of various institutes and university departments in other coastal wilayas since the mid 1980s and was intensified in the early 2000s has improved the level of knowledge while remain below the required rate.

- The diagnosis also helped to identify a pool of more than 70 species of marine and coastal, exploited in other regions of the world, but yet untapped in Algeria: holothurians, bivalves, gastropods, cephalopods, sponges, crustaceans.
- biodiversity data also suffer from their ad hoc nature, sporadic and episodic, does not necessarily reflect the dynamic and evolutionary aspects of different populations.

- **Impacts and pressures**

- The various threats and pressures on the marine and coastal biodiversity tend to be more negative.
- To improve the capacity of ports, large volumes of marine sediments, mainly mud or sand or silt dredged regularly. These funds generally consist of vases, compact and loaded with rotten organic material and often contaminated by heavy metals and hydrocarbons are deposited in open areas.
- The various manifestations of these pressures already reported, include the depletion of elements with high heritage value in the ecological sense but also the decrease the economic functions of coastal habitats (reduction of organic production). As illustrative example, the case of the three main species of shrimp caught the most in Algeria: *Aristeus antennatus*, *Parapenaeus longirostris* and *Penaeus kerathurus*. These species are scarce.
- The signs of erosion of biodiversity are clearly observed in various segments of the Algerian coast and affect different taxonomic groups, however, most of these signals remain qualitative and do not allow assessing seriously the extent of this erosion or its magnitude. This erosion of marine biodiversity has affected marine areas located near large coastal cities such as Algiers region and the region of Oran in the west and the region of Annaba in the east.
- The best illustration of this loss of biodiversity is specifically given by the disappearance of the Mediterranean monk seal *Monachus monachus* in the axis Habibas islands - Rachgoun island. The depletion of other symbolic species is also reported for several species and in many sectors of the Algerian coast, particularly *Pinna nobilis*, *Patella ferruginea*, *Centrostephanus longispinus*, *Epinephelus sp.*, etc.
- The main causes of regression of *Posidonia oceanica* seagrass beds are: (1) industrial and urban pollution, (2) turbidity due to nutrient intakes in fine sediment and organic matter, (3) dredging; (4) illegal use of explosives, (5) coastal modifications, (6) changes in sediment dynamics.

B. Needs

- Need to strengthen the national network of marine taxonomists
- Need to establish a national marine bio-monitoring
- Strengthening dialogue, cooperation and coordination across sectors

- Needs to develop networking activities
- Resolve the issue of standards and standard methodologies and protocols for sampling, data collection and information processing
- Implementation of structured and organized database
- The establishment of a national repository, an indispensable tool for improving knowledge and capacity building
- Well sizing of projects
- The adaptation of university education
- Adaptation and strengthening of legislative and statutory frame

C. Urgent actions proposed

The most urgent actions to be implemented are related to institutional aspects, financial, legislative and organizational. Priority actions are listed below.

- Institutional
 - Acceleration of the implementation of the national action plan for marine and coastal protected areas.
 - Readjust the national strategy of rising of awareness with regard to the marine and coastal biodiversity.
 - Establish the sensitivity map and that of vulnerability of the coastal zones in Algeria
 - Increasing efficiency of CNDRB, CNL and ONEDD.
- Data management and bio-monitoring
 - Implementation of a national intelligence, warning and monitoring of marine and coastal biodiversity. This device should be organized around thematic networks (benthos, macro algae, seagrass meadow, toxic phytoplankton and colored water, ballast water, invasive species, thermophilous species ...). Two other networks are needed to complete the frame of interactivity on the marine and coastal biodiversity in Algeria: one concerning the researchers involved in these issues and the other of taxonomists.
 - Establishing a process for monitoring, alert and monitoring related to the effects of coastal erosion and climate change on marine and coastal biodiversity.
 - Implementation of a GIS for the marine and coastal biodiversity. This system is extremely urgent and must be based on those already established by the MATET: SIGBIOMARAL (2007). Inclusion in this database of species and groups regarded as minor or "without status" is important for understanding of marine biological compartment as a whole.

- Training

- Adaptation of a relevant training plan (taxonomy, management and conservation of sensitive coastal marine ecosystems, marine protected areas, implementation and monitoring of action plans).
- Implementation of a national repository related to the marine and coastal biodiversity.

- Legislative and statutory tools

- Updating the list of marine and coastal protected areas.
- Accelerate the process of drafting the law on protected areas.

4.1.2. MOROCCO

A. Marine and coastal status and pressures relevant for national marine and coastal areas

Marine and coastal ecosystems of the Mediterranean part of Morocco have an undeniable interest in terms of species and habitats. Indeed, despite the obvious lack of comprehensive information on marine and coastal biodiversity in this area, many sensitive species and habitats of Mediterranean which does not tolerate disruption, are widespread and persist in this sector of the Mediterranean sea. Included, as example, the various species of algae *Cystoseira spp.*, *Saccorhiza polyschides*, *Laminaria ochroleuca*, *Lithophyllum byssoides*, the cnidarian *Actinia equine*, *Astroides calycularis*, *Paramuricea clavata* and *Parazoanthus axinellae*, fish *Anthias Anthias*, *Apogon imberbis* and *Thalassoma pavo* etc.. which are considered as indicators of good health of marine ecosystems (Garcia-Gomez 2007). This would demonstrate an acceptable state of health of marine ecosystems and a resistance of Moroccan coastal and marine habitats and species to the anthropogenic stresses. Indeed, many sites have been identified in the Plan for Protected Areas in Morocco (AEFCS, 1996) as "sites of biological and ecological interest" (SIBE); one of which was erected into a National Park in 2004 and in SPAMI 2009 (National Park of Al Hoceima). Other sites were designated Priority 1 (Moulouya and Jebel Musa), Priority 2 (Sebkha Bou Areg, Cap des trios Fourches) and Priority 3 (Cirque El Jabha, Rhomara coast, Koudiet Taifour, Laguna of Smir). However, this order of priority should be reviewed. For example, Cirque el Jebha SIBE in category 3 is confirmed and will be revised to "increase". The interest of species and habitats observed in the Circus and its surroundings justify the establishment of a coastal and marine protected area (UNEP / MAP RAC / SPA 2009).

- **Biological disturbance**

In the Mediterranean part of Morocco, there is no confirmed data on biological introductions, which does not comment on the impact of these biological disturbances. There is no data on the effects of "tropicalization" and "southernization".

The main biological disturbances are

related to fishing. Monitoring of fishery resources in Morocco indicate overexploitation of resources. Given the large number of species caught, and the difficulty to understand comprehensive coverage

inherent lack of precise data on their operations, assessment work has been limited to target species considered representative of each fishery (NHRI 2002). Indeed, for pelagic fishing in the Moroccan Mediterranean, the average biomass of *Sardina*, which a key species supporting fisheries of small pelagic fish, has declined in recent years. This decrease is amplified by overfishing. The economic status indicators show on the other hand, a negative return for most seiners active in the Mediterranean (INRH 2002). For the demersal fisheries, *Mullus barbatus* and high sea pink shrimp, which are key species that support fisheries, are now considered fully exploited to overexploited. Socio-economic analysis of some indicators shows that, firstly, the estimated net benefit is negative for all ports in the area and, secondly, the activities trawlers have a positive effect on the national and regional economy (INRH 2002).

However, it should be noted that no study to assess the impact of overfishing on marine ecosystems, particularly on the food chain.

Fishing causes other biological disturbances in connection with the fishing gear used. Indeed, the intensification of fishing trawlers had a significant impact on the destruction of benthic habitats. However, the magnitude of its impact can't be assessed accurately at the lack of specific study such issues in the Moroccan Mediterranean. In addition, trawling constitute currently a conflict of use with artisanal fisheries due to illegal fishing trawlers that occurs in the coastal zone to below the limits. This phenomenon is observed regularly and has been reported by many artisan fishermen. Moreover, many interactions were identified between the pelagic and marine mammals, sharks and marine turtles (Tudela et al. 2005).

Another type of biological perturbations is related to phytoplankton blooms particularly deadly for certain species of shellfish and sometimes to humans. This has led to a ban on fishing and marketing of these bivalves. The phytoplankton responsible for the contamination by the toxin PSP (Paralytic Shellfish Poison) is *Gymnodinium catenatum*.

Moreover, the proliferation of small jellyfish (*Pelagia noctulica*) along the Mediterranean coast of Morocco, have become more regular in recent years, particularly in summer. These jellyfish are harmful to the health of bathers.



Figure 1: Impact of intensified trawling fishing on the destruction of benthic habitats (photos H. Bazairi)

- **Emerging Topics**

Climate change is certainly unequivocal (GIEC 2007) and the Mediterranean basin is a hot spot (Brochier & Ramiere 2001). Climate change is widely recognized as a serious threat to the global environment, particularly for marine and coastal biodiversity.

In Morocco, where many initiatives have been undertaken in terms of biodiversity, no activity or action in connection with the impacts of climate change (CC) on marine and coastal biodiversity (MCBD), including Mediterranean, has been proposed (Bazairi 2008). In fact, Morocco does not have policies, programs or major actions specifically directed towards assessing the impacts of CC on the MCBD, especially in the Mediterranean. Morocco accuses the considerable delay in comparison to

what happens in other countries bordering the Mediterranean in terms of interactions CC / MCB. An action plan on the CC and the CCD is strongly recommended.

However, some recent observations could be explained by climate change. Indeed, Ocaña et al. (2007) identified in the region of Sebta, for the first time in the Mediterranean, a species of black coral *Anthipathella wallastoni* (Gray, 1857). This species is known only from Macaronesia (which includes all the Canary Islands, Madeira, the Azores, Selvagens islands and the islands of Cape Verde) (Ocaña & Brito 2004). The CC was considered by these authors as a possible explanation for the appearance of this species in the Mediterranean (Ocaña et al. 2007). Furthermore, another species of coral *Dendrophyllia laborelii* Zibrowius & Brito, 1984 was recently recorded in the region of Cabo Negro (Tetouan) on the Moroccan Mediterranean coast (Ocaña, pers. Com.). This species is known only to the area localized between Mauritania and Ghana including the Canary Islands (Brito & Ocaña, 2004). His signs in the Mediterranean for the first time would be potentially related to the CC. Then a sea squirt (being identified), epibiont of Cnidaria *Paramuricea clavata* has been observed in the region of Ceuta (Ocaña, pers. Com.). It is may be an invasive species that recently installed in the Mediterranean would be in relationship with CC.

For coastal birds, various findings have been attributed to the CC in the region. Indeed, significant changes were detected regarding the phenology of migratory birds. Thus, some trans-Saharan species begin to attend Morocco as a wintering area. For example, some populations of Pied Flycatchers and Reed Warblers have changed their phenological status of trans-Saharan migrants in regular wintering in Morocco, especially in the Ramsar site Moulouya on the Mediterranean coast (Rguibi et al. 2006a). This is also true of Sedge Warbler (Rguibi et al. 2006b).

On the other hand, few data exist on the effects of human activities on the alteration of ecosystems in the open sea including the deep sea. The only biological disturbances are related to fishing (overexploitation and trawling) and maritime traffic with all the risks of disruption it may cause (degassing, ballast, etc.).

B. Needs

Needs to implement an ecosystem approach can be summarized in the following points:

- adequate scientific information on the various components of marine and coastal Mediterranean Moroccan: data and information are necessary to improve coastal and marine management. These are necessary inputs at all levels of ecosystem management, including policy formulation, management plans, assessing trends and updating of policy and action plans for continuous improvement.
- legal and institutional tools suitable for the application of the ecosystem approach: strengthening legislative and institutional frameworks in line with the ecosystem approach. This will involve the stakeholders through a participatory approach
- awareness at the national level by all stakeholders involved in the management of marine and coastal ecosystems for the multiple interests of applying the ecosystem approach.
- to be part of the strategic Mediterranean policies aimed at implementing the ecosystem approach: international cooperation, particularly with neighboring and riparian Mediterranean countries, will enhance knowledge, skills and scientific experiments on the application of the ecosystem approach.

- capacity building and training: implementing the ecosystem approach may lead to changes tasks and priorities. It is necessary to give an appropriate and effective training to all personnel involved in the management of coastal and marine areas and resources.
- adapt management plans of Marine Protected Areas of Mediterranean Moroccan on the basis of the ecosystem approach.

C. Urgent actions proposed

Among the needs identified, urgent action may be proposed:

- Needs of relevant scientific information:
 - Action 1: Undertake an inventory of marine and coastal biodiversity (species, habitats ...);
 - Action 2: Strengthening research to fill gaps in the MCBD and help researchers and scientists to obtain funds.
 - Action 4: Conduct monitoring programs designed to highlight the trends of various components of marine and coastal ecosystems.
 - Action 5: Provide summary information and a dashboard accessible to policy makers, managers and scientists. A special effort should be made to GIS.
 - Action 6: Federating skills and standardizing approaches can strengthen the knowledge at the regional level. This will lead to a homogeneous state of knowledge in the Mediterranean and effective implementation of the ecosystem approach at regional level.
 - Action 7: Building indicators linked with the ecosystem approach.
- Need for legal and institutional tools:
 - Action 8: Adapting national legislation, regulatory tools, governance of coastal and marine ecosystems with reference to international instruments, taking into account provisions for implementing the ecosystem approach.
- Need for awareness at the national level:
 - Action 9: Strengthen the synergy between the various national actors in connection with the management of marine and coastal ecosystems.
 - Action 10: Identify gaps (scientific, legal ...) impeding an ecosystem approach into policies.
 - Action 11: Give priority to correct gaps identified by Action 9 in research and development policies.
 - Action 12: Develop information tools and outreach to better reflect the benefits of the ecosystem approach.
- Needs to be part of the strategic Mediterranean policy:
 - Action 13: Operate in a regional framework for a better exchange of experiences, knowledge transfer and optimization of devices for applying the ecosystem approach to reconcile the imperatives of conservation and sustainable development needs at the regional level.
- Need for capacity building and training:
 - Action 14: Develop a national capacity able to implement the ecosystem approach.
 - Measure 15: Strengthen national capacity by improving regional / international cooperation

- Action 16: Strengthen the links between science and management by developing research to enhance the ecosystem approach (impacts on ecosystems, assessment and improvement of management measures, socio-economic impacts, etc.).

4.2. Area 2: Albania, Bosnia & Herzegovina, Croatia, Italy (Adriatic Sea area), Montenegro, and Slovenia.

For this cluster, we have only received the national draft reports of **Albania, Bosnia & Herzegovina** and **Slovenia**. The National consultants of **Croatia and Montenegro** will submit their draft reports by mid-March, to be finalized by end March taking into account the comments and the guidance of the International consultants and RAC/SPA. The national report of the **Adriatic part of Italy** is pending due to administrative constraints

The preliminary results of the submitted reports are presented hereinafter.

4.2.1. ALBANIA

A. Marine and coastal status and pressures relevant for national marine and coastal areas

The coastal area in the last 15 years had been “attack” by the population migrating from the rural and mountain areas. Their activities and living is the major pressure causing different changes in the coastal zone. Chaotic tourism development on the other hand, particularly on the Adriatic Sea, is making its negative impact on the land and marine environment. The major problems are caused by the solid waste and the waste water.

- Solid wastes



The solid wastes are very present in the Albanian coast (particularly on the beach area) but also inside the marine part more in a plastic form. Not only the tourism bring them but also through the rivers there are a lot of garbage and plastic waste finishing on the sea. In some areas there are just on the sea side as a layer of 50 cm (look at the picture). The wastes are damaging a lot the habitats and the living organism on the littoral.

- Wastewater

For the used water, in spite of a working sewage water treatment a Kavaja, Albania is developing now the first four wastewater treatments plants on the coastal area (Shengjin, Durres, Vlora and Saranda) through constructed treatment wetlands. They are not in function yet and there efficiency during the touristic period is expecting to be until a certain level. In any case at the moment the system of the septic holes have a big negative impact on the marine water as the level of organic elements in the sea water beach is increasing (Selfo L. & Hajderi E, 2003). A continues and covering all the coast length monitoring of environmental elements is not complete, neither in the space, nor

in time and indicators, (including chemical/bacteriological content of sewage urban waters) because the financial constraints to which Albanian institutions are faced. The same happens with the studies for the environmental impacts in coastal zone and the marine environment from economic activities.

- **Institutional prospective and performance**

From another perspective the analyses of the marine and coastal pressure should be linked with the institutional prospective and performance. There are no clear government institutions dealing with the coastal and marine issues and no any scientific research covering the marine subject. The scientific work is covered by some experts in the Universities of Tirana and Vlora. This is linked to the obligation and responsibilities of work to be done.

Other issues well-known in the marine and coastal areas that pressure also this part of the Albanian territory are:

- Increasing deforestation (especially riverbanks composed mainly of alders), overgrazing and wood exploitation completely destroyed several estuary alluvial forest and reduced forest (Kune, Fushe-Kushe, Patok, Butrint, etc) to a few dozen ha. Fires, roaming cattle, collect of fuel wood are the main causes of the deforestation.
- Overhunting in coastal wetlands led to a drastic collapse of the formerly rich and diversified water bird colonies. The number of hunters and the seasons are not respected anymore. Protected species are also hunted.
- Posidonia meadows and other phanerogams present are under stress due to the human activities, particularly touristic and trawlers.
- Illegal fishing is reported, as well as dynamite fishing thus overfishing especially since 1992. There is no control on the fishermen and there are no tools for doing this control.

- **Fisheries stock management**

About two thousand families rely on the Albanian fisheries sector for their livelihoods and an estimated twenty five million US dollars are generated by the sector for the country each year. Recent research indicates that the fishery sector is facing some severe challenges that require urgent attention if the Government wishes to ensure an economically viable and sustainable fisheries sector, with the potential for growth and development (MoEFWA, 2009). The main issues identified are related to:

- Some fish stocks are being over exploited and are potentially threatened with extinction;
- The under resourced and limited fishery management structure that cannot adequately manage the resources;
- The limited fisheries research capacity that is unable to give acceptable management advice supported by adequate stock assessment;
- An extremely high level of illegal fishing related to almost no capacity to enforce fisheries legislation;
- An inefficient and exhausted marine fishing fleet; and
- A general lack of knowledge related to food safety and export requirements within both the public and private sector.

- **Wetlands**

Wetlands had been considered from a long time as the main biodiversity ecosystems on the country hosting about 70% of the Albanian biological diversity. The last 15 years the utilization of the wetlands territory (tourism, fish, hunting, waste water, etc) brought a lot of negative impact. The monitoring data of the Ministry of Environment shows that the situation is stabilize the last 5 years but experts not published data speak for a high reduction of the birds' presence with about 30%. Some wetlands areas as Kune, Rushkull, Orikum, etc., are losing clearly their habitat values to be populated by the birds species as in the past. The construction are coming more near to the area, the hunting and fishing is very present, the woodlands are destroyed, the water is polluted, etc., are some of the activities or damages caused to this areas.

B. Needs

- There are big concerns among experts for not enough policies made for the marine and coastal area and not sufficient efforts made from the government institutions on this regard. The coastal area had been used most of the time as possibility for the political issues for compensation or as a property of nobody (particularly the sea). In the approved Inter-Sectorial Environmental Strategy (2007) there no clear policy related to the marine and coastal zone. On the other hand there are developed some documents that are not approved or remain unused such as the Strategy and Action Plan for the Wetlands (Ramsar Strategy), Fisheries Policy and Strategic Plan, etc.
- Most of the threats and problems phenomena on the coastal and marine area remain at the level of observations. It is difficult to made quantitative and qualitative assessment in the respect to environmental pollution of the coastal zone and marine environment. Because of the financial constraints faced by Albanian institutions, monitoring of environmental elements is not complete, neither in the space, nor in time, and indicators are still to be identified (including chemical/bacteriological content of sewage urban waters). The same happens with the studies for the environmental impacts in coastal zone and the marine environment from economic activities. Having not specialised marine research institutions the scientific work is based on the individual experts that are mostly concentrated for biological studies at the Faculty of Natural Sciences (University of Tirana). On this context the most studied species group are phytoplankton, benthos fauna, macro algae and phanerogam and fish.
- There is a clear axareness that it is difficult to find any country in the world to have full knowledge on its marine biodiversity as a whole. For this reason it is important to identify priorities for actions and investment in a short term. Among the three defined levels of the biodiversity, the more feasible and easy to be studied is the community/ecosystem level. That's because Mediterranean marine communities are already inventoried and their classification is well standardized. Mapping would allow the identification of very sensitive areas, where research and studies may focus in the future. The collection of data and valuable information on the marine biodiversity and later its analysis and synthesis in order to create a base for future planning is imperative. These activities should be conducted by local (national) experts, possibly with the assistance of foreign experts. The first action would be a checklist of species reported along the Albania's coast, preferably by indicating the locations of data collection. Based upon this checklist, it might be possible to identify the priority for protection. Locations where priority species have been recorded might be considered as priority sites for protection and management.

- The establishment of a monitoring system must be part of all the attempts of the different institutions. Having no enough data and sometimes having no possibility to establish a monitoring system, a need of such information gathering is very crucial. Regular data collection in some of point of the coast, monitoring of the benthos habitats in front of the river mouth, the continuation of survey for the Posidonia meadows, etc, are some of the needs to be accomplish. In this context the establishment of a marine study institution is very necessary. In 2005, with the support of the EU Interreg Program Italy-Albania and the partnership of an Italian University Consortium (CoNISMA) and Albanian relevant institutions (including the Ministry of Environment), a project for the establishment of the International Centre for the Marine Sciences started. Although the centre was not established, a number of studies were produced, and analyse for the presence of such institutions in Albania was made.
- The strengthening and enlargement of the protected areas system is considered as one of the most important objectives of the Program of Work and Action Plans of the Ministry of Environment, Forest and Water Administration. In this framework it is aimed, as a short term objectives that the protected areas will cover 15% of the territory (currently about 10%) and a long term objectives (year 2015) about 20% of the overall country's surface.
- Claim and management of Marine Protected Areas fall under the objectives mentioned above. Aiming to join the EU structures, Albania would need to improve its environmental quality, too. Regarding coastal and marine protected areas, the implementation of Marine Strategy Framework Directive (2008/56/EC) and Water Framework Directive (2000/60/EC) would be important for meeting the international standards and requirements. The designation of a Marine Parks and other marine protected areas is mention as a priority in the National Biodiversity Strategic Action Plan and potential sites are identified such as Kepi i Rodonit, Karaburun (Vlore) and Porto Palermo (Himare). These areas, as being well preserved in their natural conditions, are of a Mediterranean importance, and provide an attraction for recreation and specialized high quality tourism. They might provide models where conservation and recreation & tourism objectives can be combined and achieved jointly (short-term). The main issues that the designation of marine national protected areas should address and focus on are: (1) biodiversity protection and the maintenance of natural conditions of the marine environments; (2) preservation of its seascape and landscape beauties, and (3) preservation and rehabilitation of its cultural heritage.
- The fishing activity is another field with great impact in the marine and coastal area and need to have a lot of more interest from the government. Passing the Fishing Directorate under the MoEFWA (2005) was a positive political action but with result in making the role of government much weak as before. In light of the data collected and the research made for this sector, in the policy document have been defined the current status of the sector. On this basis the strategic plan identify the desired plan and the implementation measures. Also risks and threats for non-implementation are also identified (MoEFWA, 2006). From these suitable and realistic needs have been defined for the fisheries sector, with the hope that they offer positive ambition to move the sector into a more encouraging period of growth and development:
- The educational programmes and public awarenes need to be strengthening either in the schools or in the community. Particularly information and training must be intensified on the fisherman

for making them clear what are the request of the laws and the new approach for the conservation and protection of marine and coastal areas.

C. Urgent actions proposed

- The most urgent thing to be done is the intervention to stop some of the activities that are related to the fishery and for this three actions are proposed:
 - The banning and limitation of some fishing techniques;
 - Temporal closure of fishing activities in some areas;
 - Establishment of Marine Protected Areas.

- The law enforcement must be another urgent actions and the collaboration between different organisations, particularly with the Coast Guard and the army, should be strengthen.

- The attempt designation of a Marine Parks in Albania does exist and it regards the area of the Karaburun peninsula. The aim was to proclaim the Marine National Park of Karaburun area for improving protection and management of the marine and coastal biodiversity, involving the active participation of local stakeholders and authorities in the management system. The process is undergoing and needs for urgent actions as:
 - a) the preparation and implementation of a technical management plan for the MNP of Karaburun area;
 - b) promoting, developing, and regulating eco- and cultural tourism and other recreational related activities so that all are compatible with the long-term sustainability of the marine and coastal ecosystem's biodiversity and its economic use;
 - c) establishing the legal and institutional framework for management, addressing the needs of the area;
 - d) undertaking the public awareness activities necessary for the marine and coastal biodiversity conservation objective of the sustainable management of the area; and
 - e) developing an eco-centre able to conduct training for Albanian professionals and civil society on the inventory and monitoring of the marine biodiversity.

4.2.2. BOSNIA & HERZEGOVINA

A. Marine and coastal status and pressures relevant for national marine and coastal areas

Unfortunately, there are no adopted policies and taken measures relevant to the application of the ecosystem approach. A number of problems have been created in the coastal area as a consequence of a permanent and strong pressure of competitive demands for land on the coast, provoked by the attractiveness of such locations. As these pressures occur in a relatively small area, they often generate conflicts.

- **Wastewater treatment**

The Bosnian part of the Adriatic is still one of the best-preserved regions in the European part of the Mediterranean. But, wastewaters flowing from the hinterland into the sea are the biggest polluters (see Figure hereinafter).

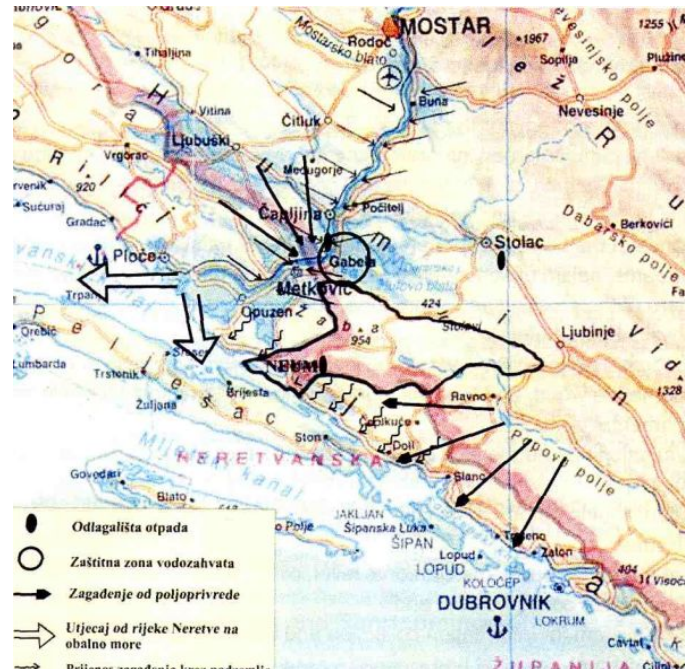


Figure 3. Sources of pollution in the Wider Coastal Area

There is uncompleted waste water management system which does not include pretreatment of waste water from all households. Water is discharged about 2.5 km in depth, but certain amount of water is discharged directly into coastal area. This pressure is especially important during the summer months when the population is ten times increased. After completion of construction program of concerned treatment plants, communal waste water pollution will be gradually decreased.

- **Wetlands**

The Bosnia and Herzegovina has a relatively small coastal area, approximately 25 km long, consisted of Neum-Klek Bay and sea area in the outer part of Klek, the peninsula in the Mali Ston channel of Croatia. The Sea area of B&H is surrounded by Croatian waters. Whole coastal area belongs to Neum Municipality. The nearest wetland in this area is Hutovo Blato but it territorially belongs to another municipality (Čapljina Municipality) and therefore it is not in the coastal area of B&H.

Some of the main reasons for the threat to general biological variety in this wetland are:

- change in habitat – destruction, degradation, fragmentation;
- environmental pollution – soil, water, air;
- overuse of natural resources – felling, harvesting;
- transport of foreign species in the ecosystem.

In addition to this, it is important to mention that biological minimum of water, especially in Deransko Lake (which is located in the area of Hutovo blato) is threatened and thus flora and fauna in the wetland. This is a consequence of climate change and reduced water flow from rivers Bregava and Trebišnjica by their underground flows, especially from Popovo polje (field) due to re-routing waters to hydro power plant Plat.

Preservation of biological and ecological phenomena of the Neretva River delta as a wetlands habitat of international importance is directly related to the maintenance of the water regime of karst fields in this part of Herzegovina. Because of the intensive anthropogenic processes (hydromelioration, construction of hydro power plants over the past 50 years, regulating the river bed of the Trebišnjica River by building a concrete canal in length of over 60 km, building of compensating lake - Svitavsko lake for the needs of HPP Capljina) image of these areas is completely changed. In this way, many environmental and biological values of Hutovo blato are irreversibly lost.

- **Low land areas**

Since there is no available information on the presence of low-land areas in the coastal part of B&H, therefore, critical impacts and effects in these areas can not be emphasized.

- **Important beaches**

Unfortunately, there are no important beaches in coastal part of Bosnia and Herzegovina. Almost all the beaches are artificial.

- **Ecosystems and habitats, populations/biota**

Habitats are exposed to significant impact of man. Some habitats such as sandy muds, sands, gravels and rocks in euryhaline and eurythermal environment are under the influence of pollution and intensive use (urbanization, aquaculture, tourism, agriculture in the hinterland). Because of the attractiveness for mariculture there is a risk of (intentional and unintentional) entering allochthonous species (a risk that some of them become invasive). Since the habitat hard beds and rocks is developed in a narrow area along the coast where is great pressure of human activities, communities are very vulnerable. They are very sensitive to eutrophication and their natural restoration after damage is very slow. They are endangered by submarine outfall effluent, construction and filling in the sea, fish farms and shellfish.

In the coastal area global and local anthropogenic influences are expressed, and that is the reason why the sensitive species (date mussel, sea urchin) are on a serious level of threat.

- **Species at high risk**

There is no available data on species at high risk in B&H marine and coastal area.

- **Fisheries and mariculture**

Aquaculture represents the cultivation of organisms in sea water, and also includes the cultivation of algae, various invertebrates and fish. Two fish farms for sea bass and gilthead sea bream rearing exist, together with several low scale mussel rearing sites (*Mytilus galloprovincialis*) in Neum-Klek Bay. In the process of fish rearing the greatest impact on the environment occurs in the phase of cage feeding. Various global studies have shown that approximately 23% of C, 21% of N and 53% of P from food that is brought into farm ends up in sediment, and significant effect occurs within 1 km around the farms. Nitrogen, phosphorus and carbon are three elemental substances whose accumulation determines the fate of benthic organisms of sediment bottom.

Some studies of the impact on algal community of the rocky bottom showed that within the algal community in the vicinity of cage fish farms comes to the complex changes. Changed

environmental factors enable the development of atypical species of algae for these areas, and certain species are developed in unusual large quantities. Thus, increased amounts of organic matter may result in the development of nitrophyll species of algae such as green alga *Ulva rigida* (sea lettuce) or brown algae *Colpomenia sinuosa*, *Scytosiphon lomentaria* and representatives of the order Ectocarpales, and which are typical organisms in the area loaded by organic matter. Within algae settlements, near to fish breeding cages, often comes to extraordinary increase of sea urchins *Paracentrotus lividus* and *Arbacia lixula*. In addition to the increased number, these echinoids are spreading towards depths deeper than their usual depth distribution. Numerous echinoids often consume all available algae.

- **Agriculture, grapes, olives**

Since agriculture, so as production of olives and grapes, are not well developed in the coastal area of B&H, their impact on the marine and coastal biodiversity is also limited.

B. Needs

Considering that Bosnia and Herzegovina has poor knowledge on marine biodiversity compared to its knowledge on terrestrial biodiversity and consequently has insufficient amount of data on ecological status and pressures on biodiversity in whole, as well as on marine and coastal biodiversity, following needs may be preliminarily listed:

- To identify species, habitat types and sites
- To map B&H marine and coastal habitat types
- To collect the data and valuable information on the marine biodiversity and later its analysis and synthesis in order to create a base for future planning is imperative. These activities should be conducted by local (national) experts, possibly with the assistance of foreign experts
- To establish approaching ecosystem management
- To introduce policies on state level
- To identify gaps, needs and priorities for education, training and public awareness on climate change
- To conduct wider research on the impact of CC on marine and coastal biodiversity
- To establish co-operation with Institute for Marine and Coastal Research (University in Dubrovnik)
- To raise awareness of coastal area issues and establish the coastal area management system

C. Urgent actions proposed

Taking into account general circumstances in the country following actions and measures are determined as most urgent:

- To conduct more precise research of flora and fauna as well as habitats present in marine and coastal part of B&H in order to be able to approach the general assessment of ecological and pressures
- To develop action plans for the most vulnerable species; secure viable populations, model future distribution, develop mitigation and adaptation measures
- To develop and implement methods for assessment of ecological pressures
- To establish a joint monitoring of coastal areas with Croatia

- To establish emergency response center
- To develop action plans for the most vulnerable species; to secure viable populations, model future distribution, develop mitigation and adaptation measures
- To establish co-operation between all relevant national research and conservation institutions
- To start new or continue existing relevant international co-operation
- Implement transboundary project for the Neretva Delta and Maloston Bay
- To start public awareness activities immediately

4.2.3. SLOVENIA

A. Marine and coastal status and pressures relevant for national marine and coastal areas

The main pressures on marine biodiversity of the Slovenia are the colonisation of the area with NIS, the phenomena of mucus aggregates, the episodes of oxygen depletion, the issues related to mariculture and intensive fisheries. The majority of them are strongly related to anthropogenic activities. Certain of those pressures have already caused direct impacts on marine biodiversity.

- **Oxygen depletion**

The cases of oxygen depletion were recorded in many different years. The area which is impacted in that regard is the central part of the Gulf of Trieste. Especially drastic impact on the marine biodiversity were caused by episodes of anoxia (the concentration of O₂ below detection) which were recorded in the area in 1974, 1980, 1983, 1987, 1989 and 1990 (Malej & Malačič, 1995).

- **Introduction of NIS**

There are many known NIS in the area, however, at the moment there is not known any evidence of their impact on the biodiversity. The NIS are normally found in devastated habitats where they can fill empty ecological niches. A peculiar area in that regard is the coastal wetland Škocjan Inlet, where many such species were recorded.

- **Mucus aggregates phenomenon**

The phenomenon of mucus aggregates is well known in the Gulf of Trieste with the first such record known already from 1729 (Fonda Umani et al., 1989).

- **Mariculture**

There are many objects of mariculture placed in different localities in the Slovenian coastal sea. The organisms mainly cultured in such objects are sea bass (*Morone labrax*) and gilt sea bream (*Sparus aurata*) among fishes and mussels *Mytilus galloprovincialis* and oysters *Ostrea edulis* among bivalves. The extent of mariculture is nowadays limited to the waters off Sečovlje in the southern part of the Piran Bay.

B. Needs

The Gulf of Trieste is one of the cradles of marine research. However in Slovenia, we possess today only basic knowledge about marine biodiversity. In the last decade big effort was made in compiling species list of organisms living in Slovenian sea and habitat types here present. Not much is yet known about ecology, population trends, etc. Even bigger are problems in implementing

obtained results and knowledge for better management and protection of marine and coastal ecosystems. Several needs were identified concerning national marine and coastal areas biodiversity:

- Knowledge about species and habitat types should be completed.
- Data over longer timelines should be obtained so the trends could be observed. Regarding this the most important groups should be identified and a proper sampling and monitoring program prepared and executed without discontinuity. Especially for phytoplankton and zooplankton inner-annual sampling frequencies should be raised to obtain any relevant results.
- Monitoring of exotic, non-indigenous and invasive species should be put in practice.
- Monitoring in protected areas should be put in practice.
- Activities should be start regarding possible nursery area in Northern Adriatic. Here also cooperation with Italy and Croatia is of highest importance.
- By-catch needs better attention, with studies, monitoring and preparations of guidelines for its reduction.
- Policies have to be put in action together with proper prosecution policies .
- Action plans for cartilaginous fish
- Action plan for endangered habitat types
- Guidelines for reduction of mariculture impact on marine environment
- Public awareness activities
- Network of experts (also transboundary experts included) connected in a working group to discuss the phenomena's of bioinvasion and tropicalisation

C. Urgent actions proposed

The major urgent actions according to our opinion for the Slovenian coastal sea are:

- To reduce the impact of by-catch on non-target fish population, other vertebrates and invertebrates:

This argument is justified since to our opinion by-catch should be considered as the most important factor known to affect the marine biodiversity of the studied area and worldwide. Many non-target fish species and benthic invertebrates are caught in nets and the majority of discarded animals die afterwards. Even more problematic is this issue when vertebrates such as endangered and protected species loggerhead turtle and bottlenose dolphin are found entangled in nets. Since the area is considered a nursery ground for certain species of shark such as thresher shark (*Alopias vulpinus*), blue shark (*Prionace glauca*), sandbar shark (*Carcharhinus plumbeus*) and certain batoid species (*Pteromylaeus bovinus*, *Myliobatis aquila*). In that regards we would like to propose the establishment of the monitoring of large vertebrates (sharks & rays, turtles, birds, marine mammals) and preparation (as soon as possible) the national action plan for this issue. Inthere the guidelines for the reduction of the by-catch in the area should be proposed.

- To put into action effective regime (deriving from legislative measures) in order to conserve protected species and habitat types:

The effective regime put into practice in marine protected areas and elsewhere is the only way to resolve problems related to anthropogenic. The paper alone resolves nothing.

- Other topics

National action plans (bioinvasion, seagrass, by-catch), prepared for different aspects of impact to marine biodiversity, should be realized in practice. For other topics, not yet prepared, experts in the field should be invited to prepare action plans for specific issue (sharks and rays, cetaceans, endangered benthic invertebrates, etc...).

4.3. AREA 3: Greece (Ionian Sea area), Italy (Ionian Sea area), Libya, Malta and Eastern-Southern Tunisia.

In this area, it has to be noted that we have only received the report of **Greece** on the Ionian sea area. The others reports are under preparation are supposed to be submitted by Mid March in view to be finalized by the end of the month.

4.3.1. GREECE: IONIAN SEA AREA

A. 1. Marine and coastal status and pressures relevant for national marine and coastal areas

A baseline assessment of the Ecological Status of all Hellenic surface waters (HCMR/EKBY, 2008) has been produced by HCMR and a monitoring plan (operational and surveillance types) has been designed for coastal and transitional waters. According to this base line assessment, the Ecological status of Ionian costal areas is presented in the figure below.

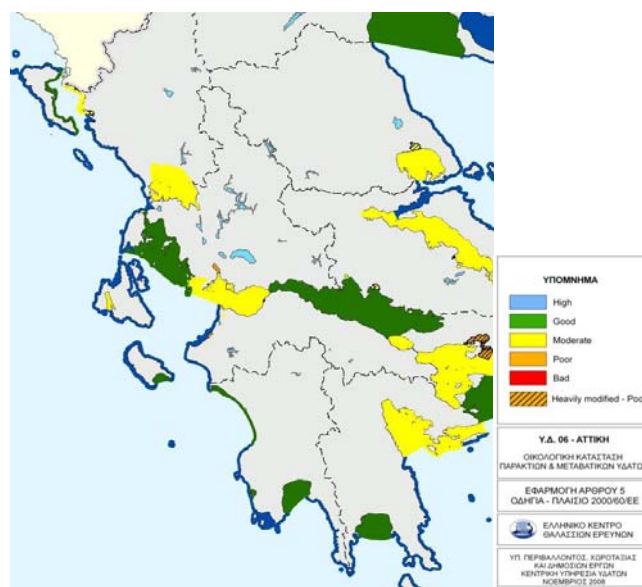


Figure 4. Ecological status of Ionian costal areas

Note: Red arrow points at Amvrakikos gulf one of the most ecologically important lagoonal systems in the Mediterranean; Brown arrow at Patraikos gulf (Source: HCMR/EKBY, 2008).

Biodiversity largely depends on the habitat type, the proximity with other pathways and basins and generally environmental conditions. However anthropogenic pressure is a major factor threatening biodiversity through loss of habitat and making the environment hostile for the survival of benthic organisms. Sensitive taxa recede and other more tolerant to stressors survive and proliferate to the expense of others more susceptible. As shown in figure 16 areas of compromised biodiversity in the Ionian, are the gulf of Amvrakikos and Patraikos.

The Amvrakikos Gulf in Western Hellas (Ionian Sea), covering approximately 405 km², is a deep indentation in the western coastline of Hellas, but maintains its connection with the Ionian sea via a

very narrow channel. It takes the form of a nearly closed off "inland sea" with a average depth of 26 metres and a maximum depth of 65 metres. Amvrakikos is a complex ecosystem consisting of shallow marine waters, a rare wetland formation of the double delta of Louros and Arachthos rivers, lagoon systems, coastal strips surrounding the lagoons and large areas of riparian and halophytic vegetation.

The wetland is one of the most ecologically important lagoonal systems in the Mediterranean, protected by the convention of Ramsar and it is also included in the Natura 2000 network (see also part on lagoons).

The riverine outputs load the gulf with agricultural wastes as they flow and drain areas of intense agriculture. This riverine organic load together with urban wastes causes the eutrophication of the gulf which is one of the main causes of ecological status degradation. Other anthropogenic pressures also affecting the condition of the gulf is several industrial activities such as pig breeding units, dairy farms, oil mills etc.

Patraikos gulf has also been classified as in moderate ecological status. It is also an ecosystem which suffers from intense human activity, reflected in domestic and tourist industry growth in coastal area, industrial growth, big constructions such as the Rio- Antirrio Bridge, the new Patras harbor and fishery.

From 2000 to 2002 a large scale ecological cartography has been carried out in the Hellenic Seas, for the implementation of the "habitat" Directive 92/43/EEC and the delimitation of the areas (sites) which will contribute to the European NATURA 2000 network.

The total number of sites mapped for the implementation of the Directive was 45 for the Aegean and 15 for the Ionian. These sites, mapped at 1:10.000 scales, represent 2.079 kilometers of coastline and 117.359 ha of continental shelf surface. The presence of *Posidonia* meadow (priority habitat according the Directive), was a key element for the selection of the Hellenic marine NATURA 2000 sites. The cartography of *Posidonia* meadows was based on original air photography, combined with field work (echo-sounding and diving). In every site the meadows were classified in 3 classes (A=high, B=good, C=low) of representatively and conservation status. A data base was organized in a GIS (ARC/INFO environment). According to the results, in the studied sites, *Posidonia* meadows cover about 28.566 ha. About 47% of the meadows were qualified as A class, for both representatively and conservation status (HCMR/EKBY, 2008).

The main critical impacts and effects on marine and coastal biodiversity are presented hereinafter:

- **Exploited mollusca**

Apart from a few species (e.g. *Pinna nobilis*, *Lithophaga lithophaga*, *Donacilla cornea*), and these only at a local scale, there is no population assessment in Hellenic seas. The existing legislation for eleven of these species is not enforced in 50 practice, and seems insufficient to guarantee their conservation. It is suggested that targeted collection data, networked nationally and internationally, should be promoted so this invaluable source of biodiversity information can be accessed for conservation and planning purposes.

- **Corals**

After the recent discovery of an extensive and well developed *Lophelia-Madrepora* deep-sea coral mound in the western Ionian Sea (North of the Calabrian Arc) (Mastrototaro *et al.*, 2002), the biological and ecological importance of these habitats became a major scientific concern and much

effort was put into further exploration of Mediterranean deep-water ecosystems. Despite the fact that no live cold-water communities have been discovered in the Hellenic Seas so far, increased ROV and Submersible investigations during several HCMR cruises swiftly revealed the presence of various deep-living species (Vafidis *et al.*, 2006; Mytilineou *et al.*, 2009; Smith *et al.*, submitted) which had been previously ignored or scarcely reported in Hellenic inventories. One colony of the deep black coral *Leiopathes glaberrima* and many colonies of the bamboo coral *Isidella elongata* were identified in Hellenic waters (Vafidis *et al.*, 2006), species whose presence decreased in the Italian Ionian due to the trawl activity.

- **Deep Waters**

Trawling has been suggested as a major threat for these highly vulnerable deepwater communities, either by immediate removal of (erect, slow growing) organisms and/or by habitat and trophic level modifications (Mytilineou *et al.*, 2009). However indirect trawling effects such as sediment resuspension and related increased sedimentation rates should also be considered as severe causes of deep-sea habitats degradation (Cartes *et al.* 2004), even at depths well beyond the ones trawled (Palanques *et al.*, 2004).

The importance of studying, understanding and protecting deep Mediterranean ecosystems assumes far greater importance if one considers the fact that a large part of the Mediterranean coast has deepwater beds very near shore, typically a few hours away by commercial vessels (Cartes *et al.* 2004), thus being even more susceptible to exploitation. Currently, deep-water ecosystems of the Eastern Ionian Sea region are under focused scientific research in the frames of CoralFISH Project (<http://eu-fp7-coralfish.net/>).

- **Endangered species**

Twenty seven (27) species have been included in the recent Red list of threatened animals in Hellas (Legakis & Maragou, 2009). These include seven (7) Critically Endangered species, nine (9) Endangered and eleven (11) Vulnerable. Nevertheless it has to be noted that for the majority of the Hellenic fauna has either not been evaluated for the Red List or there have been no sufficient data for safe evaluation.

C. caretta and *C. mydas* are listed as Endangered and *D. coriacea* as Critically endangered in the IUCN Red List of Threatened Species. All three species are protected in Hellas by national legislation including several ratified international conventions (e.g. Bern Convention, Bonn Convention, Barcelona Convention) as well as European Community regulations (e.g. CITES) and directives (e.g. 92/43 Habitats Directive) and is nominally protected by P.D. 617/80 (Official Journal 163A/18-7- 1980) and 67/81 (Official Journal 23A/30-1981 and 43A/18-2-1981). According to SAP BIO (2002) the main issues concerning the conservation of marine turtles in Hellas are related to tourism, (increase of tourism and recreational facilities in the coastal zone, as well as leisure vessels in the sea, and to lesser extend urban development) , and interaction with fisheries fishing (use of trawls and illegal driftnets and deliberate killing. The former factor is believed to be of increasing significance whereas the latter is either decreasing (use of trawls and illegal driftnets) or there were no sufficient data to extract a trend (deliberate killing). Other factors of lesser importance include natural events (sea inundation and beach erosion and predation by natural enemies (SAP BIO, 2002). Conservation efforts in a sea turtle nesting area can be undermined by the impact caused by fisheries by-catch on the same population in another area or country. The Ionian population enjoys only vestigial protection along the coasts of the National Marine Park of Zakynthos and Strofades isl. Although

some coastal and marine areas of Kefalonia and Ithaca islands were *ad hoc* included in the *Natura 2000* network in 2002, effective management and conservation actions are yet to be addressed.

The Mediterranean monk seal is one of the world's most endangered mammal species and the world's most endangered pinniped (Aguilar and Lowry 2008) listed as Critically Endangered in IUCN Red List. The species' main threats include (Androukaki *et al.* 2006, Johnson *et al.* 2006, Aguilar and Lowry 2008): mortality caused by deliberate killing (likely exacerbated by overfishing-caused fish depletion); mortality caused by accidental entanglement in fishing gear; habitat loss caused by alteration of coastal ecosystems and disturbance caused by increasing human activities (i.e. tourism, fishing, use of dynamite, military exercises, human encroachment in coastal areas, and possibly climate change); prey depletion caused by overfishing; and pollution. According to SAP-BIO (2002) of these issues the impact of tourism was at an increasing trend whereas all the rest were decreasing with the exception of deliberate killings where there were no reliable data to extract a trend.

The major threats regarding cetacean conservation in Hellas have been identified as:

fisheries (overfishing, use of driftnets, illegal practices (dynamite use), killings, 52 uncontrolled use of acoustic devices); tourism (uncontrolled whale watching and leisure vessels in the middle of cetacean pods); human-cetacean contacts (introduction of new viruses); use of chemicals (introduction of organochlorine compounds and heavy metals; military exercises (use of low and mid frequency active sonar technologies); marine traffic; and oil industry activities (SAP –BIO 2002). Of these the fisheries interactions (mainly overfishing and to lesser extent killings and use of dynamite) and the noise pollution caused by marine traffic are regarded as the most serious ones (SAP –BIO 2002). On the other hand tourism impact limited for the time being is following an increasing trend and its importance maybe increased in the future.

- **Hot spot areas**

The hard substrata communities are very sensitive because of their structural and functional complexity, their high productivity and also their position in the food web (primary and secondary consumers). Certain processes and activities have a negative impact on rocky bottoms, such as eutrophication, species introduction and invasion, Biodiversity in the main port areas (Patra and Kalamata) is severely reduced and the biotopes become simplified. Thus, several biotopes are heavily modified.

- **Aquaculture sites**

Macrofauna, megafauna, fish fauna, microplankton and macroalgae have been studied in a few aquaculture sites. The results clearly demonstrate that fish farms affect deep *P. oceanica* meadows growing in open coasts, and that these impacts are still progressing, c.a. 10 years after farm onset.

- **Lagoons**

Transitional waters are ecosystems of special importance for a number of reasons and require effective management. In Hellas, biodiversity and environmental data that help to manage these ecosystems do exist, although they are scattered and not easily accessible. An overarching, publicly accessible system combining all kinds of information has not been available until now.

The Amvrakikos wetland located in Western Hellas (Ionian Sea, see figure 16) is one of the most ecologically important lagoonal systems in the Mediterranean, covering about 250 km², including more than 20 coastal lagoons. Amvrakikos complex it is one of the largest wetland areas in the Mediterranean Europe, characterized by very diverse wetland habitat types and comprises critical habitats for at least 47 Annex I

bird species, including the globally threatened *Pelecanus crispus*, *Phalacrocorax pygmaeus*, *Aquila clanga*, and *Numenius tenuirostris*. One of two breeding colonies of the globally threatened *Pelecanus crispus* is resident to Amvrakikos lagoons. The breeding population of this species in the lagoons represents about 20% of the respective total European populations and 3.5 % of the global one. Several commercial fish species (*Anguilla anguilla*, *Gobius niger*, *Sparus aurata*, *Dicentraurchus labrax*) are exploited traditionally in the lagoons.

The major anthropogenic pressures imposed on the lagoons of Amvrakikos concern mostly modification of the lagoon's hydrological regime (creation of hydroelectric dams, fresh water abstraction and dikes). Organic and chemical pollution water is not severe and arises mainly from agricultural and agrochemical activities. Fish farming and urban development have also degraded large parts of the lagoons.

Amvrakikos it is protected by the convention of Ramsar, included in the Natura 2000 network, and considered as Special Protection Area (SPA), Wildlife Refuge, and Important Bird Area.

- **Vulnerable areas: Marine Parks**

Apart from the numerous coastal lagoons the National Marine Park of Zakynthos is the only marine area with an existing legal protection framework in the Hellenic Ionian Sea. Despite this regime, the area is still subject to numerous human-induced impacts that impose serious hindrances to the successful reproduction of the endangered marine turtle *Caretta caretta*. Much effort is currently put into public awareness and coastal management plans aiming to reduce the severe effects of the tourist development that is massively expanding along the sandy beach of Laganas, an area that is ranked among the most important Mediterranean nesting sites of *C. caretta*. In addition, waste disposal and illegal fishing are issues that have not yet been thoroughly resolved.

Much scientific information exists on the marine habitats and biodiversity that characterize the National Park's coastal area (Laganas Bay), but there is almost no such data available for its offshore part, which comprises the distant and uninhabited islets of Strofades. This data paucity does not permit any speculations about this area's ecological quality and/or vulnerability.

A large part of the Hellenic Ionian coasts is known to host important populations of marine mammals (i.e. *Physeter acrocephalus*, *Tursiops truncatus*, *Delphinus delphis*, some of which have shown clear declining trends during the last years. Urgent management measures are thus needed in order to ensure their conservation.

B. Needs

The following paragraphs describe the data available and the data needs to fill in reported gaps in knowledge. However, a first priority should be the establishment of national committees (working groups of experts) reviewing regularly and reporting annually the state of art and latest assessments for each topic. Luckily, much is gathered and reported in the frame of two HCMR initiatives namely the state of the Hellenic Marine Environment and State of Hellenic Fisheries (SohelMe, 2005, SohelFi, 2007). However, both publications are already outdated and they do not cover all subjects. For example taxonomy is briefly addressed. Thus, spatial and temporal patterns of taxonomic groups are not known alas from review papers.

Climate change induced changes are not reported and so are not many recent findings. Hence the need for regular assessments presenting the national picture to all interesting bodies is paramount.

Fisheries data In the framework of the IMAS-Fish project, an integrated fisheries' databank has been constructed to support the data input and the statistical analysis of the collected data of the large-scale sample surveys. The EC Data Collection Regulation (DCR, 1543/2000) has been implemented since 2001 with the aim of harmonising the collection of fisheries biological and economic data across the Member States.

Regulation (EC) No 1543/2000 establishes a Community framework for the collection and management of data needed to evaluate the situation of the fishery resources and the fisheries Sector. The information required for each programme is collected in the form of evaluation modules covering fishing capacities and fishing effort, catches and, finally, the economic situation of the sector (EC No 1639/2001). Despite the recognized benefits brought about by the DCR, the scientific community and managers acknowledged that the current procedure of collecting biological data on a stock basis and economic data on a fleet based do not favour the provision of relevant inputs to fishery-based management advice. The setting up of the second stage of the DCR is the opportunity to integrate the fishery-based approach in the future collection of bio-economic data. In addition to statistical analysis, it provides advanced modelling and predictions made with the help of GIS (Geographic Information Systems).

There is a need to expand existing data collection and analysis programs to assure an adequate knowledge base that can efficiently support sound scientific advice to decision makers, and they even provide suggestions that may contribute to the improved management of fishery resources, highlighting the importance of developing such management mechanisms that will promote the sustainable exploitation of our marine resources to optimally accommodate the increasing demands from diverse stakeholders.

- **Data on Transitional Waters**

EL-NET Database has been constructed as a *biodiversity* transitional waters information system for the development of distributed information in Hellas. The system is a functional application consisting of a comprehensive database and an online interface with an interactive map, and search capabilities for biological and environmental data on Hellenic transitional waters. The data base comprises 9 complete biodiversity datasets on 10 Lagoons in Hellas, with time range from June 1990 to July 2005, comprising 745 different taxonomic names, 1125 distribution records and 300 abiotic readings. Results from a case study carried out on the macrobenthic inventories of the lagoonal systems included in the system demonstrate the potential use of this simple type of information by environmental managers and scientists. The system, still in its initial phase, will be improved by integrating new datasets and developing tools for data retrieval and analyses. LNet website (<http://elnet-net.hcmr.gr>) is freely available on the web, acting as a communication /dissemination Forum for the Transitional Waters in Hellas. The database should be linked to other biodiversity databases to participate in a distributed information network and disseminate the information through other global biodiversity portals (Faulwetter et al, 2008).

- **Data on Alien species**

Recognizing the need for collaboration in research and management of aquatic alien species at both national and international level and in particular for data exchange, a network of experts was established in 2007 at HCMR. To date, the Hellenic network for Aquatic alien species (ELNAIS: <http://elnais.ath.hcmr.gr/>) includes 42 experts carrying out relevant research, who are based in 11 research centres/Universities across the country. ELNAIS is an open information system providing on line the state of art in aquatic alien species in Hellas. There are currently 193 marine alien species

recorded in ELNAIS, accompanied by photographs and distribution maps within Hellas. ELNAIS, though without any financial support, is continually updated thanks to the input of experts and the enthusiasm of a small group, and aims to improve (Freshwater alien species are to be included in the near future) and be a powerful tool to scientists and stakeholders (Zenetos et al, 2009a).

- **Zoobenthic data**

The Zoological Museum of the Aristoteleio University of Thessaloniki hosts large collections of many other invertebrate groups (e.g., Porifera, Actiniaria, Polychaeta, Peracarida) which comprise more than 2,000 species. All these species are/will be registered in an information system along with the relevant literature information. All these data will be available through the web site of the Zoological Museum (A.U.Th).

This information system intends to be a single source of information on the marine invertebrate diversity of the Aegean Sea and to contribute to the free dissemination of the relative information in the international scientific community and to the development of educational tools for a more comprehensive training of the students in the fundamental concepts of biodiversity, zoogeography and ecology of marine invertebrates (Koukouras et al, 2007).

The project "*Excellence of the Institute of Marine Biology of Crete in Marine Biodiversity*" was funded, in June 2002 and completed in May 2006. The subject of the project is the creation of a Centre of Excellence in Marine Biodiversity in the area of the Eastern Mediterranean. The main components of the project include: (a) the development of the first national electronic infrastructure in the field of Marine Biodiversity see MEDOBIS (www.medobis.org), (b) the compilation of the national Strategy on the Biodiversity which may be a tool for further organization and development of the national research and academic network and also a vehicle for the development of the peripheries of the state.

MedOBIS- a Biogeographic Information System for the Eastern Mediterranean and Black Sea aims at collecting current biological data, preserving historical biological data, providing high quality data, analysing data, visualising them and finally disseminating them through the Web. Currently it holds 632 stations from the Aegean Sea and 71 stations from the Ionian Sea (Arvanitidis et al, 2006), as depicted in figure 17.

There is a lack of detailed information on systematics of zooplanktonic and phytoplanktonic communities and consequently a lack of archived zooplankton & phytoplankton database.

Information on phytoplankton ecology is scanty. There is a lack of information on the species composition and ecology of mesozooplankton concerning groups other than copepods and cladocerans. Macrozooplankton is poorly known whereas there are very few studies on the copepod production, grazing impact and metabolism. The role of mesozooplankton as a link between the lower trophic levels (phytoplankton, microbes) and the higher trophic level (fish) has to be investigated both in coastal and offshore waters. Attempts should be made to relate phytoplankton to the food web of the pelagic ecosystem. Population explosions, especially in connection with red tide phenomena, should be studied.

- **Ecosystem assessment**

The WFD - Water Framework Directive (EU Directive 2000/60/EC) is the actual legal framework for the EU's water policy. Its overall objective is that all EU member states should achieve good ecological and chemical status for all water bodies by December 2015. Ecological status/quality is to be evaluated in EU waters by using biological communities as Quality Elements. This is a refreshingly innovative approach, and includes the establishment of Reference Conditions and Ecological Status

Class boundaries by using indicative parameters or metrics (preferably in numbers) of the different Quality Elements. Ecological Status is to be graded into five categories: high (indicative of Reference Conditions), good, moderate, low, bad.

The Hellenic Center for Marine Research (HCMR/EKBY, 2008) has produced a baseline assessment of the Ecological Status of all Hellenic surface waters and a monitoring plan (operational and surveillance types) for coastal and transitional waters has been designed and submitted in the WISE system. The implementation of the WFD monitoring projects (operational and surveillance) throughout the first River Basin Management Plan period, is expected to fill biodiversity gaps as large scale sampling will cover gaps in areas and water bodies with unknown ecological and biodiversity status.

- **Climate change**

Gaps exist our understanding of CC and its impact on biodiversity. What remain to be implicitly addressed are the implications of changes in the water mass characteristics and the influence of the modified water masses to the biology of the Hellenic Seas' as assessed through experimental and modelling studies. Long-term data on climate change and on communities changes in the Hellenic seas and an appropriate framework are required.

C. Urgent actions proposed

The main objectives of the National Strategy for the sustainable development have set towards the protection and conservation of the marine environment, the prevention of its degradation and, wherever possible its restoration, where it has been unfavorably affected. To achieve this target the following actions are proposed:

- Adoption of measures for the control of pollution from land based sources such as best agricultural practice in river basin catchments for the control of pollution of marine coastal areas from the unsustainable use of fertilizers and pesticides and the adoption of best available techniques in industry.
- Correlation with the respective measures that are being undertaken in the framework of the implementation of the Community Water Framework Directive (2000/60/EC) and implementation of the respective actions that have been adopted in the framework of the Barcelona Convention (Land Based Sources protocol and respective action programmes).
- Integrated management and identification of suitable uses in the coastal zone, adoption of the respective Community and Regional (UNEP/MAP) provisions. Strengthening of mechanisms for the effective control of illegal construction and development of illegal activities in the coastal zone areas.
- Development of a strategy for the marine waters for each marine area with independent characteristics with the intention to achieve a good environmental status by 2020, adopting an ecosystem approach to the management of human activities that exert an effect on the marine environment.
- Promotion of basic research to fill the knowledge gaps concerning the status of the marine environment of Hellas as well as the adoption of applied research for the development of suitable tools for monitoring, detection (eutrophication, oil spills etc.), upholding the relevant

- legislation and control concerning the development of cleaner and more environmentally friendly technologies and production procedures (for fisheries, aquaculture etc.)
- Identification and carrying out the studies required for the introduction of new marine areas into the Natura 2000 Network (SCI and SPA).
 - Systematic inventorying and mapping (scale 1:10.000) of the Posidonia meadows at a national scale, with suitable storage of the inventory data to support management and monitoring.
 - Implementation of effective programmes for the management, wardening and monitoring of the most important Hellenic lagoons.
 - Implementation of programmes for systematic monitoring and collection of data to evaluate the status of threatened marine species populations, identification and application of measures and actions for their sustainable management and the preparation of the respective national legislation
 - wherever this is required.
 - Systematic monitoring of the phenomenon of the introduction of alien species into the marine environment and in the framework of the implementation of the Water Framework Directive, international cooperation to study the effects and interactions of the introduced alien species with the natural environment and native species covering the entire Mediterranean (species fished, possible effect on human health) and wherever possible development of a strategy to confront the phenomenon. Adoption of measures for prevention of the transfer of alien species through maritime activity.
 - Evaluation of the magnitude and effect of the interactions between fisheries and marine species populations (monk seal, sea turtles, cetaceans, etc.), identification and application of action plans for the normalization of conflicts.
 - Application of measures for the sustainable use of fisheries resources in the sense of the Community Regulation for the Mediterranean (EC) 1967/2006.
 - Effective reduction of fishing capacity in the direction of stock recovery, applying a targeted enforcement of measures for the permanent termination of fishing activity on vessels that exert the greatest pressure on fisheries stocks.
 - Evaluation of the fisheries stocks and carrying capacity of lagoons, drawing up plans for fisheries management of lagoons, giving priority to Natura 2000 areas. Control of small scale interferences in lagoons linked to aquaculture such as the construction of embankments, and the opening up of dikes and channels.
 - The intensification of controls and inspections in support of the sustainable use of fisheries resources, the effective protection aquatic resources of fishery interest and the application of the principles of responsible fishing and aquaculture, including the compliance with conditions for environmental use.
 - Promotion of fisheries research to support the formulation of fisheries policy, for more effective management of common fisheries resources and best use of resources for the protection of stocks, through the realization of reliable scientific evaluations and analyses.

4.4. Area 4: Cyprus, Egypt, Greece (Aegean/Cretan Seas area), Israel, Lebanon, Syria and Turkey.

For this cluster, we have already received the national draft reports of **Greece (Aegean/Cretan seas area), Israel, Turkey and Syria**. The National consultants of **Egypt** will submit their draft reports by mid-March, to be finalized by end March taking into account the comments and the guidance of the International consultants and RAC/SPA. The national report of the Cyprus and Lebanon are pending due to administrative constraints

The preliminary results of the submitted reports are presented hereinafter.

4.4.1. GREECE: AEGEAN/CRETAN SEAS AREA

A. Marine and coastal status and pressures relevant for national marine and coastal areas

- Biodiversity loss

Biodiversity largely depends on the habitat type, the proximity with other pathways and basins and generally environmental conditions. However anthropogenic pressure is a major factor threatening biodiversity through loss of habitat and by making the environment hostile for the survival of benthic organisms. Sensitive taxa recede while stress tolerant taxa survive and proliferate to the expense of others. There is evidence of discrete pollution gradients in the coastal areas adjacent to the largest metropolitan cities of Greece: Athens and Thessaloniki.

In Saronikos gulf, surrounding Athens, a gradient of the Ecological Quality status according to WFD (2000/60, EC) (EQS) as assessed by the Bentix index (Simboura & Zenetos, 2002) is evident ranging from poor around the Psittalia sewage outfalls to moderate in the inner Saronikos and good in the outer Saronikos (Figure 5). Also Primpas *et al.* (2010) presenting the development of a multivariate index for assessing eutrophication according to the WFD, used Saronikos gulf as a test area and assessed the area close to the sewage outfall as eutrophic (corresponding to poor EQS) and the rest of the Inner Saronikos gulf as mesotrophic (corresponding to moderate EQS). The Ecological Evaluation Index (Orfanidis *et al.*, 2001) which is an intercalibrated method for macroalgae, also demonstrated the moderate and poor EQS of the inner Saronikos macroalgae communities.

Organic pollution from urban and agricultural wastes discharged in the enclosed Thessaloniki Bay and Gulf results in eutrophication and consequently in the degradation of the benthic element.

The pressures on the EQS are more prominent in the more enclosed bay of Thessaloniki declining towards the opening of the gulf (Figure 6).

A large scale ecological cartography was carried out (from 2000 to 2002) in the Hellenic Seas for the implementation of the "habitat" Directive 92/43/EEC and the delimitation of the areas (sites) which will contribute to the European NATURA 2000 network.

The total number of sites mapped for the implementation of the Directive was 45 for the Aegean Sea and 15 for the Ionian Sea. These sites, mapped at 1:10.000 scale, represent 2079 kilometers of coastline and 117.359 ha of continental shelf surface. The presence of *Posidonia* meadow (priority

habitat according the Directive), was a key element for the selection of the Hellenic marine NATURA 2000 sites. The cartography of *Posidonia* meadows was based on original air photography, combined with filed work (echo-sounding and diving). In every site, the meadows were classified in 3 classes (A=high, B=good, C=low) of representativity and conservation status. A database was organized in a GIS (ARC/INFO environment). According to the results, *Posidonia* meadows cover about 28.566 ha in the studied sites. About 47% of the meadows were qualified as A class, for both representativity and conservation status (HCMR/EKBY, 2008).

The main critical impacts and effects on marine and coastal biodiversity are as follows:

- **Exploited mollusca**

Apart from a few species (e.g., *Pinna nobilis*, *Lithophaga lithophaga*, *Donacilla cornea*) and these only at a local scale, there is no population assessment in the Hellenic seas. Existing legislation for eleven of these species is not enforced in practice, and seems insufficient to guarantee their conservation. It is suggested that targeted collection data, networked nationally and internationally, should be promoted so that this invaluable source of biodiversity information can be accessed for conservation and planning purposes.

- **Exploited Porifera**

Sponge banks in the Dodecanese have been mostly harvested through time, and as such are subject to particularly high mortality rates. Recent results have revealed signs of recovery of bath sponges after the devastating epidemic events. These results are encouraging for a future sustainable stock exploitation and open a new perspective for sponge mariculture in the area (Voultsiadou *et al.*, 2008).

- **Exploited Corals**

The occurrence of cold-coral reefs in Crete, Karpathos and Rhodes islands, at least during the Pleistocene, suggest that live coral grounds may still persist in some hitherto unexplored areas. Considering the fact that direct and indirect trawling effects pose a major threat for these highly vulnerable deep-water communities, further scientific effort is currently needed in order to timely detect, map and effectively protect these remarkable biogenic formations. The need for an international research programme aiming at investigating the spatial distribution and population structure of red coral in the Hellenic Seas is, thus, urgently recommended in order to address proper and effective management measures.

- **Demersal fish**

Fishing impact on the demersal resources of Hellenic waters could be generally considered strong for depths shallower than 500m. According to existing data, the demersal stocks of hake and common Pandora in most studied areas of the Aegean Sea were found overfished to a higher or lower degree depending on the area and the species. The only exceptions were the Evvoikos and Pagasitikos Gulfs (partly closed to trawling), the demersal stocks of which seemed to be under an optimal exploitation state.

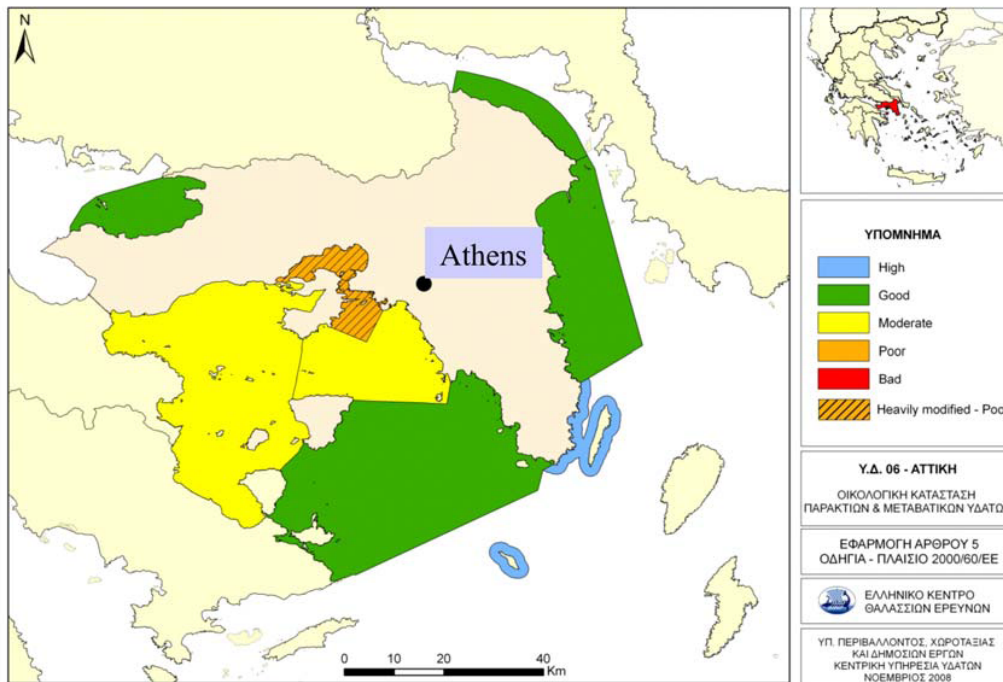


Figure 5: Ecological Quality status of Inner Saronikos gulf.
(Source: HCMR/EKBY, 2008)

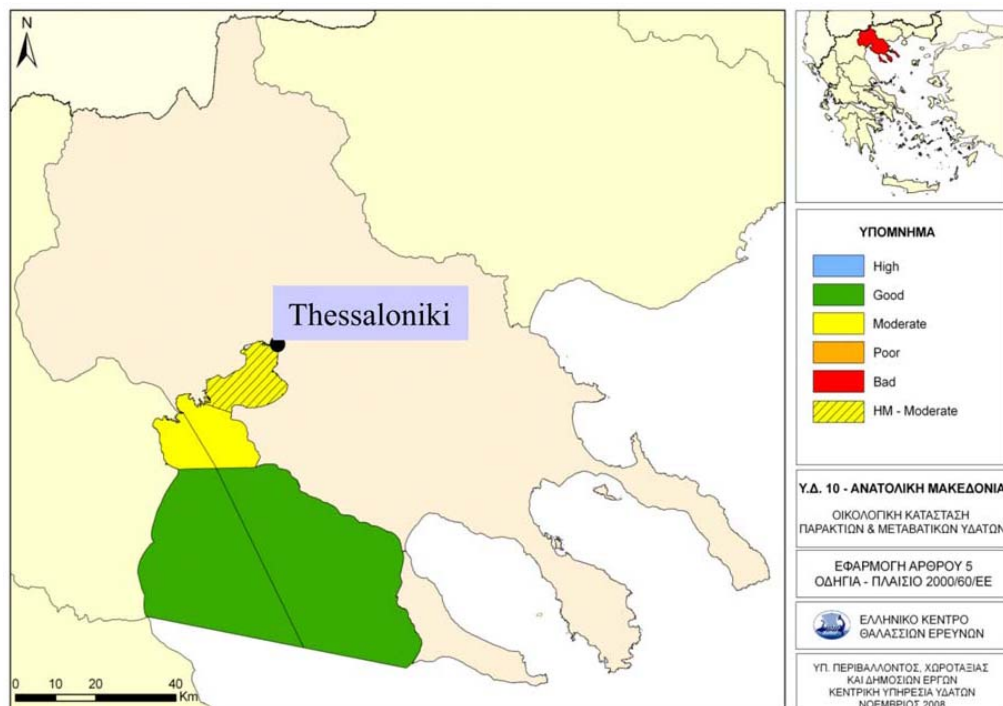


Figure 6: Ecological Quality status of Thessaloniki gulf, the Inner and Outer Thermaikos gulf.
(Source: HCMR/EKBY, 2008)

- **Pelagic fish**

Since the small pelagics are explored legally only by the purse-seine fleet and the pelagic trawl fishery is banned, there is a bias towards large specimens in landings, implying the need for in year monitoring of the stocks through fisheries' independent techniques (e.g. acoustics; Daily Egg Production Method). The peculiarity of the Hellenic Seas (islands, numerous gulfs of varying degree of enclosure, etc.) implies the need to investigate the effect topography has on the spatial structure of small pelagics, in order to improve survey design, thus better understanding the seasonal movement and the interaction among species.

A weak point in the management of small pelagics in the Mediterranean Sea is that it should be ideally addressed to the total stock that is usually shared among several states. Besides the absence of a common policy between countries regarding the management, another difficulty occurs as the status of the stock populations in several countries is largely unknown. For example, even if we know the status of the stock in the Hellenic part of the Aegean Sea, the status in Turkish waters is largely unknown. This is also the case for the population in the Ionian Sea regarding the status of the populations in Albanian waters.

- **Hot spot areas: Ports**

The communities of the hard substrata are very sensitive due to their structural and functional complexity, their high productivity and also their position in the food web (primary and secondary consumers). Certain processes and activities, such as eutrophication, species introduction and invasion, have a negative impact on rocky bottoms. Biodiversity in port areas is severely reduced causing the simplification of the biotopes. Thus, several biotopes are heavily modified (e.g. the Thermaikos and Saronikos gulfs).

- **Aquaculture sites**

Macrofauna, megafauna, fish fauna, microplankton and macroalgae have only been studied in a few aquaculture sites. The results clearly demonstrate that fish farms affect deep *P. oceanica* meadows growing in open coasts, and that these impacts are still progressing, c.a. 10 years after farm onset.

- **Lagoons**

Transitional waters are ecosystems of special importance for a number of reasons and require effective management. In Greece, biodiversity and environmental data that help to manage these ecosystems do exist, but are scattered and not easily accessible. An overarching, publicly accessible system combining all kinds of information has not been available until now.

- **Vulnerable areas: Marine Parks**

Contrary to the prevailing European MPAs context, the existing Marine parks in Greece have been established rather on the narrow scope of protecting endangered marine species than on an integrated ecosystem-based approach. For instance, the National Marine Park of Northern Sporades in the Aegean Sea was originally established to protect the indigenous populations of the Mediterranean Monk seal (*Monachus monachus*). On these grounds, much scientific and NGOs' effort has been put into saving and rehabilitating traumatized animals, as well as resolving strong fisheries conflicts that torment this area. However, basic research to describe the Marine Park at biodiversity or even habitat scale, still lags behind. Such lack of data restrains the scientific community from assessing the hitherto protection effects and/or providing decision makers with proper and effective management schemes.

B. Needs

The following describes the data available and the data needed to fill in reported gaps in knowledge. **A first priority** should be the establishing of national committees (working groups of experts) regularly reviewing and reporting annually the state of art and latest assessments for each topic. Luckily, much data was gathered and reported in the frame of two HCMR initiatives, namely the state of the Hellenic Marine Environment and State of Hellenic Fisheries (SohelMe, 2005, SohelFi, 2007). However, both publications are already outdated and do not cover all subjects. For example, taxonomy is briefly addressed. Thus, spatial and temporal patterns of taxonomic groups are not known apart from review papers; climate induced changes are not reported. Hence there is a need for regular assessments of the Hellenic marine environment.

- ***Climate change***

Gaps exist our understanding of CC and its impact on biodiversity. What remain to be implicitly addressed are the implications of changes in the water mass characteristics and the influence of the modified water masses to the biology of the Greek Seas' as assessed through experimental and modelling studies. Long-term data on climate change and on communities changes in the Greek seas and an appropriate framework are required.

- ***Fisheries data***

In the framework of the IMAS-Fish project, an integrated fisheries' databank has been constructed to support the data input and the statistical analysis of the collected data of the large-scale sample surveys. The EC Data Collection Regulation (DCR, 1543/2000) has been implemented since 2001 with the aim of harmonising the collection of fisheries biological and economic data across the Member States.

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There is a need to expand existing data collection and analysis programs to assure an adequate knowledge base that can efficiently support sound scientific advice to decision makers, and to even provide suggestions that may contribute to the improved management of fishery resources, or highlighting the importance of developing such management mechanisms that will promote the sustainable exploitation of our marine resources to optimally accommodate the increasing demands from diverse stakeholders.

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capabilities for biological and environmental data on Hellenic transitional waters. The data base is comprised of 9 complete biodiversity datasets on 10 Lagoons in Greece, with time range from June 1990 to July 2005. It includes 745 different taxonomic names, 1125 distribution records and 300 abiotic readings. Results from a case study carried out on the macrobenthic inventories of the lagoonal systems included in the system, demonstrate the potential use of this simple type of information by environmental managers and scientists. The system, still in its initial phase, will be improved by integrating new datasets and developing tools for data retrieval and analyses. The Elnet website (<http://elnet-net.hcmr.gr>), is freely available on the web, acting as a communication/dissemination Forum for the Transitional Waters in Greece. This database should be linked to other biodiversity databases to participate in a distributed information network and disseminate the information through other global biodiversity portals (Faulwetter *et al.*, 2008).

- **Data on Alien species**

Recognizing the need for collaboration in research and management of aquatic alien species at both national and international levels, and particularly for data exchange, a network of experts was established in 2007 at HCMR. To date, the Hellenic network for Aquatic alien species (ELNAIS: <http://elnais.ath.hcmr.gr/>) includes 42 experts based in 11 research centres/Universities across the country, carrying out relevant research. ELNAIS is an open on-line information system that provides the state of art in aquatic alien species in Greece. Implementation of the right framework for dealing with the biological invasion in Hellenic Seas requires: a) The development of monitoring programmes for hotspots (ports, coastal lagoons, aquaculture sites, sensitive areas, etc.); b) Promoting the development of an indicator based on alien species; c) The development of training programmes concerning marine species introductions and non-indigenous species; d) Launching the procedures for enacting or strengthening national legislation governing the control of non-indigenous species introduction; and e) Ratification of the IMO Convention on ballast waters (for species introductions via shipping).

- **Zoobenthic data**

The Zoological Museum of the Aristoteleio University of Thessaloniki hosts large collections of many invertebrate groups (e.g., Porifera, Actiniaria, Polychaeta, and Peracarida) and includes more than 2,000 species. All these species are/will be registered in an information system along with the relevant literature information. All this data will be available through the web site of the Zoological Museum (A.U.Th).

This information system intends to be a single source of information on the marine invertebrate diversity of the Aegean Sea, to contribute to the free dissemination of the relative information in the international scientific community, and to develop educational tools for a more comprehensive training of the students in the fundamental concepts of biodiversity, zoogeography and ecology of marine invertebrates (Koukouras *et al.*, 2007).

The project "*Excellence of the Institute of Marine Biology of Crete in Marine Biodiversity*" was funded, in June 2002 and completed in May 2006. The subject of 60 that project was the creation of a Centre of Excellence in Marine Biodiversity in the area of the Eastern Mediterranean. The main components of the project included: (a) the development of the first national electronic infrastructure in the field of Marine Biodiversity (see MEDOBIS www.medobis.org), and (b) the compilation of the national Strategy on the Biodiversity which may be a tool for further organization and development of the national research and academic network and also a vehicle for the development of the peripheries of the state. MEDOBIS aims at collecting current biological data, preserving historical biological data,

providing high quality data, analysing data, visualising them and finally disseminating them through the Web. It currently holds 632 stations from the Aegean Sea (Arvanitidis *et al*, 2006).

- **Plankton**

Apart from copepoda and cladocera, macrozooplankton diversity is poorly known.

Other taxonomic groups should be inventoried. Studies on copepod production, grazing impact and metabolism should be carried out in more areas. The role of mesozooplankton as a link between the lower trophic levels (phytoplankton, microbes) and the higher trophic level (fish) has to be investigated in both coastal and offshore waters. Attempts should also be made to relate phytoplankton to the food web of the pelagic ecosystem. Population explosions, especially in connection with red tide phenomena, should be studied further.

- **Ecosystem assesment**

The WFD, or Water Framework Directive (EU Directive 2000/60/EC) is the actual legal framework for the EU's water policy. Its overall objective is that all EU member states should achieve good ecological and chemical status for all water bodies by December 2015. Ecological status/quality is to be evaluated in EU waters by using biological communities as Quality Elements. This is a refreshingly innovative approach, and includes the establishment of Reference Conditions and Ecological Status Class boundaries by using indicative parameters or metrics (preferably in numbers) of the different Quality Elements. Ecological Status is to be graded into five categories: high (indicative of Reference Conditions), good, moderate, low, bad.

The Hellenic Center for Marine Research (HCMR/EKBY, 2008) has produced a baseline assessment of the Ecological Status of all Hellenic surface waters and a monitoring plan (operational and surveillance types) for coastal and transitional waters has been designed and submitted in the WISE system. The implementation of the WFD monitoring projects (operational and surveillance) throughout the first River Basin Management Plan period, is expected to fill biodiversity gaps as large scale sampling will cover gaps in areas and water bodies with unknown ecological and biodiversity status.

C. Urgent actions proposed

Towards the protection and conservation of the marine environment, the prevention of its degradation and its restoration (wherever possible), the following actions are proposed

- Adoption of measures for the control of land based pollution sources, such as best agricultural practice in river basin catchments for the control of pollution of marine coastal areas from the unsustainable use of fertilizers and pesticides.

Also, by the adoption of the best available techniques in industry. Correlation with the respective measures that are being undertaken in the framework of the implementation of the Community Water Framework Directive (2000/60/EC) and implementation of the respective actions that have been adopted in the framework of the Barcelona Convention (Land Based Sources protocol and respective action programmes).

- Integrated management and identification of suitable uses in the coastal zone, and adoption of the respective Community and Regional (UNEP/MAP) provisions. Strengthening of mechanisms for the effective control of illegal construction and development of illegal activities in the coastal zone areas.
- Development of a strategy for the marine waters for each marine area with independent characteristics with the intention to achieve a good environmental status by 2020, adopting an

ecosystem approach to the management of human activities that exert an effect on the marine environment.

- Promotion of basic research to fill the knowledge gaps concerning the status of the marine environment of Greece as well as the adoption of applied research for the development of suitable tools for monitoring, detection (eutrophication, oil spills etc). Also, the upholding the relevant legislation and control concerning the development of cleaner and more environmentally friendly technologies and production procedures (for fisheries, aquaculture etc.)
- Identification and carrying out the studies required for the introduction of new marine areas into the NATURA 2000 Network (SCI and SPA).
- Systematic inventorying and mapping (scale 1:10.000) of the Neptune grass prairies at a national scale, with suitable storage of the inventory data to support management and monitoring.
- Implementation of effective programmes for the management, wardening and monitoring of the most important Hellenic lagoons.
- Implementation of programmes for systematic monitoring and collection of data to evaluate the status of threatened marine species populations, identification and application of measures and actions for their sustainable management and the preparation of the respective national legislation wherever this is required.
- Systematic monitoring of the introduction of alien species into the marine environment and in the framework of the implementation of the Water Framework Directive, international cooperation to study the effects and interactions of the introduced alien species with the natural environment and native species covering the entire Mediterranean (species fished, possible effect on human health) and wherever possible development of a strategy to confront the phenomenon. Adoption of measures for prevention of transfer of alien species through maritime activity.
- Evaluation of the magnitude and effect of the interactions between fisheries and marine species populations (monk seal, sea turtles, cetaceans, etc.), identification and application of action plans for the normalization of conflicts.
- Application of measures for the sustainable use of fisheries resources in the sense of the Community Regulation for the Mediterranean (EC) 1967/2006.
- Effective reduction of fishing capacity in the direction of stock recovery, applying a targeted enforcement of measures for the permanent termination of fishing activity on vessels that exert the greatest pressure on fisheries stocks.
- Evaluation of the fisheries stocks and carrying capacity of lagoons, and planning fisheries management of lagoons, giving priority to NATURA 2000 areas. Control of small scale interferences in lagoons linked to aquaculture such as the construction of embankments, and the opening up of dikes and channels.
- The intensification of controls and inspections in support of the sustainable use of fisheries resources, the effective protection aquatic resources of fishery interest and the application of the principles of responsible fishing and aquaculture, including the compliance with conditions for environmental use.
- Promotion of fisheries research to support the formulation of fisheries policy, for more effective management of common fisheries resources and best use of resources for the protection of stocks, through the realization of reliable scientific evaluations and analyses.

4.4.2. ISRAEL

A. Marine and coastal status and pressures relevant for national marine and coastal areas

- **Habitat loss and fragmentation**

Rapid population growth and rising standards of living brought about an accelerated urban development and suburban sprawl along the Mediterranean coast of Israel, from Ashkelon in the south to the northern tip of Haifa Bay, with but few yet “undeveloped” areas. The urban sprawl caused the loss of coastal habitats (sand dunes, eolian ridges) and ecosystems and their associated biota. The few remaining areas nominated as nature reserves are increasingly hemmed in by residential, industrial or agricultural zones, and their remnant populations are in decline either due to habitat loss and fragmentation, impact of pollution or other anthropogenic disturbance (light, noise, traffic), or by incursions of feral or invasive alien species. Parts of the littoral have been undergoing rapid change in the past 30 years. Extensive port building and enlargement, marinas and coastal barriers, causing the modification of sedimentary coastal dynamics, and the subsequent destruction of large extensions of valuable marine coastal habitats. In recent years maritime infrastructure – gas and oil pipeline installations, evermore marine discharge outfalls and intake pipes – litter the littoral.

- **Land-based pollution**

The main pollution sources are connected to the intense coastal metropolis and industrial activities. More than 100 industries, cities and towns discharge waste into the sea, either directly or via coastal rivers. Since the early 1980s the overall pollution load into the coastal zone has declined due to the combination of the following factors: (a) the increase of public awareness and governmental actions, (b) the national commitment to implement international conventions on marine pollution prevention, and (c) the progress and expansion of the National Sewage Project and sewage treatment. The three major classes of pollutants affecting the area are nutrients, heavy metals and toxic organic compounds.

Their introduction into the coastal zone is via both point and non-point sources. The main point source inputs include direct pipeline discharges and riverine input, and the main diffused pathways are atmospheric deposition and runoff. From 1982 to the early 1990s more than one million tons of coal fly ash (approximately 17% of the total amount generated) were dumped at a deep water site (1500 m, 200 km²) located 70km off the Israeli coast (Kress et al., 1993). Industrial sludge was dumped at another deep-water site (Kress et al., 1998).

- **Coastal erosion**

Since the construction of the low Aswan dam in 1902 the Nile delta has retreated about 10 km, 5 km since the completion of the high dam in 1964 alone. There is no concrete evidence yet that the negative sand budget in the delta has affected the Israeli coast. The coastal sand reservoirs of Israel have been depleted by massive mining for construction, outlawed only in 1964, and by the construction since the late 1960s of coastal structures hindering its natural northward movement. The Israeli building industry utilizes at present approximately 8 million m³ annually; however, planned marine structures would greatly increase the demand. To satisfy construction needs options such as offshore sand mining and sand importation are being examined. The effects of detached breakwaters and other

Sea level rise will accelerate coastal erosion - a rise of 1 m will lead to loss of coastal strip of 50-100 m wide along the sandy beaches which make up more than half the Mediterranean coastline of Israel. Assuming an incline of 1-5 %, a sea level rise of 10 cm will lead to retreat of 2-10 m, or loss of 0.4-2 kms in a decade. Coastal erosion will significantly impact the low lying wetlands, the supra-tidal zone with its particular biota, and the unique, Mediterranean-endemic vermetid reefs. Coastal erosion may impact important coastal structures such as ports, power stations, coastal archeological sites, and valuable housing built atop the coastal cliffs. It may impact tourism and recreation due to reduction in the width of sandy beaches, to the detriment of turtles' nesting sites.

- **Bottom trawling – habitat destruction and high discards**

The bottom trawling fleet predominate the Israeli Mediterranean fisheries, being responsible for a high share of total catches (see above). Bottom trawls are used all along the Israeli coast, from 15 to 400 m depth, to catch prawns and demersal fish. Before the mid-1980s, many complex habitats were relatively undamaged, because fishermen kept bottom trawls out of areas where structures such as boulders or ridges might snag their nets. The technical innovations allowing precise navigation now allow access to virtually all of the continental shelf off Israel.

Trawlers have dramatic effects on the ecosystem including physical damage to the seabed and the degradation of associated communities, the overfishing of demersal resources, and the changes in the structure and functioning of marine ecosystems derived from the depletion of populations and the huge amount of bycatches and associated discards. There is mounting scientific evidence that trawling in is one of the most destructive types of bottom fishing because it homogenizes habitat, smoothing the sediment and breaking down complex structures, reducing overall habitat complexity, and permanently changing the types of species that live on the seafloor (Tudela, 2004).

- **Climate change and thermophilic alien species**

Changing climatic conditions may bring about biogeographical range shifts. Short-term pulses of increased temperatures have long been known to impact species' distributional limits. Species with pelagic stages are highly likely to experience range shifts with climate change.

Recent work in the Mediterranean has provided documentation of warming-associated latitudinal range shifts. Changes in the abundance of southern taxa increased while northern taxa decreased during periods of warming.

In marine environments, direct climatic effects on individuals are important: organisms may be more stressed near their species' range boundaries, and their distributions may be expected to shift as environmental conditions change. However, environmental processes which impact population dynamics are extremely important in marine environments, where they play a greater role than in terrestrial habitats. Current-mediated dispersal limitation can define many biogeographical boundaries in coastal oceans, despite potentially suitable habitat beyond the dispersal barrier.

Climate change, along with exploitation, habitat alteration, and pollution, is reducing the abundance of many marine species and increasing the likelihood of local extinction. Conversely, climate change plays a role in the determining the rate at which new species are added to communities. In addition to allowing natural range expansions (see above), warming temperatures can facilitate the establishment and spread of alien species. More generally, climatically driven changes in species composition and abundance will alter species diversity, with implications for ecosystem functions such as productivity and invasion resistance.

Of the 324 alien species known along the Mediterranean coast of Israel, 291 have been introduced from the Red Sea/Indo West-Pacific through the Suez Canal. Evidence is accumulating that changes in biodiversity patterns in the Mediterranean coast of Israel are linked to direct drivers such as climate change and invasive species, in addition to the well-established drivers of habitat change, overexploitation and pollution. By the middle of the century, climate change and invasive species may be the dominant direct drivers of biodiversity loss and increased risk of extinction for many species, especially those already at risk due to low population numbers, restricted or patchy habitats, and limited climatic ranges. Both processes – global warming and the influx of Erythrean aliens – may impact the already teetering fisheries, mariculture, and tourism through proliferation of alien parasitic, noxious and poisonous species, displacement of commercially-important native species, or through alteration of the food web and by causing phase shift in coastal ecosystems and changing seascape patterns.

- **Sea level rise**

The most obvious consequence of sea level rise will be an upward shift in species distributions. Most species are expected to be able to keep pace with predicted rates of sea level rise, with the exception of some slow-growing, long-lived species such as the unique, Mediterranean-endemic vermetid reefs. The rimmed reef platforms are formed by the gregarious sessile gastropod *Dendropoma petraeum* and *Vermetus triqueter*, endemic to the Mediterranean. Rare species with restricted habitats, or those which required habitat may not readily shift latitudinally, will be endangered. Other ecological changes could result from decreased habitat availability within a particular depth zone. For example, intertidal habitat area may be reduced by a significant amount (see above) and where coastal cliffs and anthropogenic structures (e.g. sea walls) prevent the inland migration of wetlands and sandy beaches. Coastal Nature Reserves and wetlands may shrink. Low-lying off-shore islets serving as nesting sites for water fowl will disappear, and the area of sandy shore available for nesting of marine turtles will be seriously circumscribed. Abrupt land-use transitions in the near shore area may impede some biota from traversing highly altered human-dominated landscape. Without ecological corridors, many species may not be able to shift their ranges.

B. Needs

- **Inventorying and mapping marine biodiversity in the Levant**

The Levantine basin is frequently described as impoverished: “The floro-faunistic impoverishment of the eastern Mediterranean compared with the western Mediterranean richness in species” (Sarà, 1985) has been generally accepted, as well as the perception of a gradational decrease from west to east. It was recognized that the scanty data may be due to sparse research efforts, that the “the different parts of the Mediterranean have not been equally sampled” (Fredj and Laubier, 1985), and that a particularly “limited amount of sampling [was] carried out in the eastern basins” (Bellan-Santini, 1990). It was even suggested that “[t]he relative species richness of ... faunas of the different sectors of Mediterranean is better correlated with the level of research effort than the true species richness” (Bellan-Santini, 1990). Indeed, recent research disclosed that of the seven species of Tanaidomorpha collected off the coast of Israel, five are previously undescribed species, one each in the genera *Akanthophoreus*, *Leptochelia*, *Pseudotanaeis*, *Typhlotanaeis* and *Tanaissus*, the last being

the commonest tanaidacean in the samples, yet the first record of the genus for the Mediterranean (Bamber et al, 2009).

A concentrated effort to complete the inventory of the littoral marine biota is necessary if we are to monitor changes in its biodiversity. The number of new species, mostly smaller invertebrates and protists, undergoes upward revisions and new discoveries modify previous estimates every year. To continue updating our knowledge of marine diversity it is necessary to further invest in taxonomic knowledge, increase sampling of taxonomic groups and habitats that have been poorly studied. Past inventories should be validated, because littoral habitats have been severely modified (see above), and the list of species and their abundance may no longer be current. Spatial and temporal data should be integrated using innovative information technology and combined with physical and chemical data. Priority should be given to threatened and sensitive habitats such as vermetid reefs, rocky littoral, rhodolithe beds and trawled bottoms.

- **Monitoring**

Several marine and coastal pollution-monitoring programs were undertaken in Israel since the 1970s. Until the early 1970s, only the monitoring of fecal pathogens in authorized bathing beaches was carried out. Since then other monitoring programs, as well as compliance monitoring programs in outfalls and dumping sites, were added. The "status and trends" type of heavy metal monitoring has been carried out continuously since the early 1980s in Haifa Bay, and from 1988 along the entire coastline, and constitutes a part of Israel's National Monitoring Program within the framework of MED POL. In addition, several research projects aimed at understanding the pathways, fate and impact of anthropogenic metals in the marine environment were performed. Nutrient loads of coastal rivers began in 1990, atmospheric loads were added in 1996, nutrients and phytoplankton in the littoral to 30 m depth, in 2000; benthic assemblages in the shallow littoral to 15 m, as well as Satellite-based imaging used to determine the relative distribution of chlorophyll and particulate matter in coastal waters, began in 2005.

The overall aim of the monitoring and related research activities is to provide a basis for decision-making on a variety of management issues such as marine waste disposal, pollution control and seafood safety. The specific objectives are to assess the status of the coastal zone with regard to pollutant contamination, to identify contamination sources and to detect early signs of potential health and ecological risks. The results of the monitoring are used as a basis for environmental decisions, control and abatement activities, as well as for the assessment of their effectiveness. The monitoring reports present information on the environmental quality of Israel's Mediterranean coastal waters in the years 2003-2007, based on the National Marine Environmental Monitoring Program (NMEMP) and related activities carried out by IOLR. The reports present trends of environmental changes based on analysis of long-term monitoring data. The NMEMP is guided by the Marine and Coastal Environment Division of the Ministry of Environment. The aim of the program is to provide a scientific basis for decision making with regard to protection of the marine environment, including enforcement of the provisions of national legislation and international conventions.

The benthic monitoring sites should be extended to encompass the littoral to 80 m depth, in order to monitor the impacts and trends of the two main threats to biodiversity stressors (in addition to land-based pollution): bioinvasion and trawl fisheries.

C. Urgent actions proposed

A substantial effort is urgently needed in the Mediterranean to improve the scientific advice provided as well as its application by management. The current investment in stock assessment and, more generally, in fishery research for assessment purposes is not enough or not appropriate for the elaboration of proper and efficient advice to fishery managers and industry. In order to encourage the efforts to produce the needed scientific advice, the SAC, recommended in 2000, inter alia, to update and improve the quality and coverage of fishery data and statistics, to increase the number of assessments in the southern and eastern areas and to ensure that all the assessments be carried out on a regular basis. SAC also drew the attention on the importance of the role of the relationship between the environment and resources. Additionally the SAC indicated that the definition of geographical management units to report the indicators is essential and that homogenous socio-economic indicators in each of these management units had to be developed.

4.4.3. SYRIA

A. Marine and coastal status and pressures relevant for national marine and coastal areas

- Human activity

Human activity along the Syrian shores can be traced long back, but the heaviest uses started some 4 decades ago. The major driving force for MCECs changes in the coastal zone is population density and associated developments. Such pressures are mostly associated with urban development along the coast which creates various environmental pressures through habitat transformation. There is a real problem in planning strategies in which most of the industrial establishments, agricultural projects and other sources of living are located along the shore on the account of the coastal mountains. This facilitates population migration from the coastal mountains and concentration in the coastal area, in and around the two large coastal cities of Lattakia and Tartous. This places high demands on the MCECs in terms their capacity to assimilate the domestic and industrial discharges.

Large population density (≈ 500 inh./Km², direct calculations from CBS 2006) and considerable number of private properties and public infrastructures are located in the coastal area. More than 625 industrial establishments are located on this fertile area (thermal power generation station, oil refinery, petroleum pipelines, cement factory, organic chemicals and oil & phosphate terminal, Battery factory, wood industry, food processing, beverage, textiles, engines factory, metallurgy...etc.) were located in the coastal plain in the vicinity of the shoreline: full information can be found in Ibrahim, 2003). Four commercial ports (in Lattakia, Tartous, Baniyas and Arwad Island) and 14 fishing harbours are operated on the seashore. The industrial complexes are usually accompanied by heavy nearby residential settlements located on the coast and are potentially of high impact on the marine environment. These exert a heavy pressure on marine & coastal biodiversity (MCBD).

MCECs are damaged by sewage and storm water discharges. More than 13 different sewage outfalls are located along the Syrian coast especially in Tartous city due to its land topography. The industrial discharge is not separated from the domestic ones which make future treatment more difficult. Deterioration in coastal water quality threatens the ecosystem health. However, there is a project to

build 17 treatment plants along the coastal area and the coastal municipalities which will reduce the effect on MCECs.

- **Shipping activities**

Pressures associated with shipping arise through oil spills and the discharge of ballast and waste waters from vessels, reducing marine water quality and suitability for marine ecosystem, particularly around commercial ports and harbours. Following the development of the ports of Lattakia, Baniyas and Tartous, ship traffic has increased considerably. According to the data provided by the General Directorate of Ports (GDP), heavy commercial shipping is practiced in the Syrian marine waters. During 2007, some 4225 commercial ships enter the commercial ports in Lattakia, Tartous and Arwad and 406 tanker entered Baniyas and AlHosain oil terminals.

- **Global warming**

Regional disturbances include the rise of sea surface temperatures linked to global warming. The level and extent of such disturbances are still to be evaluated in the Syrian marine environment.

- **Illegal fishing**

Illegal fishing is also known to impact the region, through direct taking of fish. Incidences of turtle or cetacean entanglement in the fishing gears are frequent in the Syrian coast (Ibrahim *et al.*, 2009).

- **Legislations and policies**

Past legislations and policies related to environmental management in Syria have been fragmented both in implementation and responsibility. There is now a strong claim that these legislations and policies be improved to promise more effective and efficient management to MCECs in the country.

On the other hand, based on the available data, on field experience and on the analysis of the questionnaire, 10 sensitive & endangered areas along the Syrian coast had been identified and the main sources of impact had been specified:

	Affected area	Main Source of Impact
1.	Al-Basit Resort	✓ Tourism; Garbage & solid waste disposal ✓ Sewage discharge.
2.	Om Altiur Resort	✓ Garbage & solid waste disposal
3.	Ibn Hani	✓ Pollution by oil discharged in the Marina. ✓ Garbage & solid waste disposal
4.	Al-Azhari	✓ Swage discharge from Lattakia city. ✓ Oil pollution Alyogslavia harbour and Lattakia port.
5.	Al-Kabir Al-Shimali river Estuary	✓ Overfishing ✓ Urban waste water ✓ Industrial waste waters Olive extractor waste water discharge ✓ Low freshwater input due to dams building..
6.	Joun Jableh-Lattakia	✓ Pollutants discharged from the landfill area. ✓ Sewage discharge coming from the coastal municipalities.
7.	Banias beach	✓ Industrial wastewater from the refinery and the Power Generating Station. ✓ Oil spill from tankers. ✓ Sewage discharge.
8.	Al-Housen river Estuary	✓ Oil pollution from oil installation in the area ✓ Municipal waste from the surrounding municipalities ✓ Olive extractor waste water discharge
9.	Tartous beach	✓ Sewage discharge. ✓ Oil pollution from the Commercial port and the Marinas. ✓ Solid waste disposal.
10.	Al-Nawras beach	✓ Sewage discharge. ✓ Garbage & solid waste disposal. ✓ Oil pollution.

The estimations point out at 9 major habitats regarded as having the most threatened species; they are as follows:

	Affected habitats	Main threatened species
1.	AlBassit-Om Altiur	<ul style="list-style-type: none"> • Crustacean: <i>Ocypode cursor</i> • Reptiles: <i>Caretta caretta</i> • Mollusk: <i>Dendropoma petraeum, Connus mediterraneus</i>
2.	Ibn Hani	<ul style="list-style-type: none"> • Echinodermata: Sea urchins
3.	Joun Jableh-Lattakia	<ul style="list-style-type: none"> • Higher plants: <i>Zostera marina, Cymodocea nodosa</i> • Reptiles: <i>Caretta caretta & Chelonia mydas</i> • The commercial fish species
4.	The coastal sea	<ul style="list-style-type: none"> • Fish: <i>Caranx crysos, Umbrina Cirrosa, Dicentrarchus labrax, Dicentrarchus puncta and Epinephelus aeneus</i>
5.	Sandy beaches	<ul style="list-style-type: none"> • Reptiles: <i>Caretta caretta & Chelonia mydas</i>
6.	Arwad coastal sea	<ul style="list-style-type: none"> • Sponges: <i>Hippospongia communis, Spongia officinalis</i>
7.		<ul style="list-style-type: none"> • Mammals: <i>Monachus monachus, Cetacean species</i>
8.	Al-Nawras	<ul style="list-style-type: none"> • Higher plants: <i>Zostera marina, Cymodocea nodosa</i>
9.	Banias coast	<ul style="list-style-type: none"> • Crustacean: <i>Ocypode cursor</i>

B. Needs

- The need for national inventories of natural habitats, with the physical and biological structures and biodiversity distribution. Such inventory is needed on both coastal and deep sea. The

resulting maps will be made available to the scientists and local authorities for proper management. Biodiversity distribution GIS maps (species & ecosystems) with adequate resolutions are required.

- Marine and coastal habitats classification undergo large deviation between various research projects done so far in Syria, where same locality is given different specifications according to the researcher. To avoid any confusion, national researcher should really refer to RAC/SPA "Handbook for interpreting types of marine habitat...; Bellan-Santini *et al.*, 2002)".
- The need to study the present status of the key species in each habitat in order to be able to monitor future changes due to the disturbance exerted on each habitat.
- More comprehensive work on biodiversity status are needed through initiating research project for long periods of time and include wider study areas along the shore and in deep water in order to be able to assess the past, present and future changes under the expected situation of CC.
- Harmonized ecological seabed habitats maps are needed. Information on where habitats are threatened by human activities and the spatial distribution of such activities should be obtained. This enables us to derive standardized maps of pressures. The same pressure may lead to different impact above different seabed habitats, dependent on the sensitivity of the habitats to a particular pressure.
- To understand the status of functioning processes of the marine ecosystem and the energy transfer between the trophic levels, projects on phytoplankton cells grazed by microzooplankton should be initiated in the Syrian marine waters.
- Regional disturbances include the rise of sea temperatures linked to global warming. The level and extent of such disturbances are still to be evaluated in the Syrian marine environment. Similarly, the virtual absence of a particular species and weakening of species & ecosystems, especially when combined with multiple other local disturbances are still to be evaluated.
- Previous scientific work on species introduction into the Syrian waters has been jointly done within the framework of joint cooperation agreements between HIMR- Syria and each of: NCMR-Lebanon (marine biodiversity & species migration, biodiversity on LVTs and status of sponge species). In order to have wider view about such species, their origins and the mode of introductions, cooperation should be extended to include more countries of concern. Assessing the impact of the invasive species on local biodiversity is of utmost importance
- There is a lack of qualitative data on the impacts that already occurred, currently occurring and those expected to be occurred in the Syrian MCECs. In addition, the impact and vulnerability of species & ecosystems to the pressures exerted from various sources, especially the distribution & migration consequences, are still to be initiated.
- The majority of key institutions working in the field of marine ecosystem are lacking the capacity to deal effectively with specific issues concerning MCECs such as the effect of CC on various components of marine and coastal biodiversity. The level of the existed capacities in the country can be estimated as low and need enhancement.
- Regarding civil societies and NGOs who are somehow active in dealing with the environmental issues, little of their attention is directed to incorporate the ecosystem approach into their activities.
- More MPAs are needed to restore the health of MCECs in areas jeopardized by habitat and species loss. They come under sites for specific purposes such as sanctuaries, fisheries

management areas, conservation areas, and wildlife refuges to protect habitats and the endangered species.

- The Integrated Coastal Zone Management (ICZM) of Syria should take MCEC dimension into account and a National Information Database on MCECs (NIDEC) should be established to make all research results available for consultations.

C. Urgent actions proposed:

- The need for national inventories of natural habitats, with the physical and biological structures and GIS maps on biodiversity distribution.
- With the help of RAC-SPA, a national action plan of cetacean conservation in Syria had been prepared. A similar action plan should be formulated for marine turtles, for cetacean, for Sea birds, and for cartilaginous fish. Moreover, national networks for conservation should be arranged. As there are many stranded cases encountered along the Syrian shore, especially from turtles and cetacean, such networks should be established at the earliest time. Creating the required capacity for effective implementation of the network is also needed
- Fish stock assessment is needed in order to properly manage the natural populations and avoid dislodging biodiversity components.
- Setting up a rescue centre and a treatment unit (first aid) for marine turtles, monk seal, cetaceans and sea birds. This can be located at Ibn Hani MPA which neighbours the HIMR.
- Studies on vulnerability & adaptation of biodiversity to CC are needed. In this context, it is worth identifying reference habitats and species to monitor biodiversity trends in response to various pressures and threats. SMEA and HIMR could be directly involved in this task.
- A comprehensive inventory of the threatened species and habitats in the marine and coastal ecosystems is required and habitat and species have to be prioritized accordingly.
- More MPAs are needed to restore the health of marine ecosystems.
- Renewing the Syrian Integrated Coastal Area Management Plan in a view of sustainable development and CC. As a starting point, zoning coastal areas into functional sections such as MPAs, Marine Reserves, approved fishing areas, has the potential to reduce the rate of habitat degradation caused by development.
- Increasing awareness toward the MCECs and enhance the link between people and marine biosphere to increase the responsibility of coastal communities towards the protection of the ecosystems. Materials produced in Arabic are necessary and establishing a marine exhibition Centre (Wonders of the Sea !!) is always claimed by local community and tourists.
- Assessing the impact of the invasive species on local biodiversity is regarded as an urgent measure.

4.4.4. TURKEY

A. Marine and coastal status and pressures relevant for national marine and coastal areas

- **Eutrophication**

The marine ecosystem in the Turkish Mediterranean coast is in a fragile state and facing collapse. When the food web structure carrying capacity of the Mediterranean fisheries ecosystem, and the amount of fish removed by the fishing fleet are taken into account, the future of any large apex predator population, such as the monk seal and the dolphins, is threatened (Gucu, 1995). The side effects of coastal urbanisation and tourism are numerous, including untreated waste discharges into the sea, sand extraction for construction, infrastructures on the shore and disturbance to wildlife by increased recreational activities. Eutrophication is an equally significant factor threatening fish fauna. It is induced by excess nutrient load from untreated sewage that reaches the sea. As a consequence, phytoplankton growth is enhanced and planktivorous small pelagic fish move into an advantageous position. Increased phytoplankton growth also shadows the light penetrating the bottom and hinders benthic productivity that is food to most of the demersal fish. Surplus plankton production that is not utilised in the food chain also sinks to the bottom, and is decomposed further depleting bottom oxygen available for benthic fauna. In areas where eutrophication reaches crucial levels, such as in the Gulf of Izmir and in Mersin Bay, a remarkable increase in the abundance of planktivorous small pelagics is observed while demersal fish species dramatically disappear (Cihangir 2000, Gucu 2000). The issue has economical benefits to the fishery through increased catch, however dominance of pelagic species poses a significant threat to the demersals in the ecosystem.

- **Solid wastes**

Solid wastes, such as plastic bottles, bags, greenhouse materials, are excessively used and mostly wasted in daily life. A great proportion reach the sea and are rapidly spread, even to very remote areas, by the action of wind and currents. Plastic material is not easily degradable and stays as a deposit for decades in the sea. Their impact is highly significant for benthic life as they blanket the bottom surfaces, hinder the oxygen exchange and form lethal anoxic patches killing all life. Sand is used as a basic construction material and its coastal extraction proportionally increases with the increasing rate of buildings. Sand extraction and building of infrastructure on sandy beaches like groins, interfere with sand dynamics.

- **Coastal extraction**

Apart from damaging the natural sand transport in sand dunes, coastal extraction also has an adverse effect on fish nursery grounds. Near shore hard bottom substrates are important settlement and recruitment sites for several ecologically and economically important fishes like the Sparids. Manipulation of sand dynamics induces erosion or results in excess sedimentation changing the structure of fragile nursery habitats.

- **Aquaculture**

The adverse environmental impacts of aquaculture on the marine ecosystem are inevitable and well documented worldwide. The policy in Turkey, however, sees this industry as a significant supplement to the gaps in national economy and as a solution to over-fishing and unemployment in the coastal rural communities.

It is known that a remarkable amount of reared fish escape from cages and interbreed with local populations. There are no studies on either them, their hybrids' fate or the impact on the natural stocks. However, behavioural changes in fish near the cages may be an indication of genetic

deformation. Natural populations of gilt head bream (*Sparus aurata*) undergo horizontal seasonal migration. The resident aggregations observed around all farm cages indicate biological deformation.

- **Industrial development and economic**

In Turkey, as a developing country, the concern for industrial development and economic gains surpasses the concern for environmental issues. In the Mediterranean and the Aegean coast of the country there are three hot spots for industrial pollution, namely the Gulf of Izmir, the Gulf of Iskenderun and Mersin Bay. Economical bottlenecks lead the industrial factories to reduce their cost of waste treatment. When untreated industrial wastes are discharged into the sea it causes lethal environmental conditions for marine life. In Turkey, a significant percentage of the populations livelihood is from agriculture. Use of artificial fertilisers and chemicals like pesticides, insecticides, etc. are becoming an increasingly common practise. Impacts of agriculture on biological diversity are felt in estuaries. Agricultural wastes are carried via the in-flowing rivers, underground waters, surface run-off and via drainage channels into the estuaries. These water sources feeding the estuaries are also used for irrigation. Nutrient rich brackish waters of estuaries provide excellent nursery grounds for several fish species. On the other hand, even slight changes in their hydrological and chemical peculiarities spoil the ecological significance of these habitats. Manipulation of the natural water regime causes desalination and reduces the hydrological quality; excess nutrient load, and PCB's contamination deteriorates the nutritious quality of the estuaries.

- **Marine Prptected Areas**

Existing MPA's given in the map below and orange dotes shows specially protected areas in the Turkish part of the Eastern Mediterranean Sea .A total, 15 marine protected areas already designateddesignated (see map hereinafter).



Nevertheless, more marine protected areas is needed in the eastern Mediterranean part of Turkey and more effective measures needed for the protection, i.e. Management plans of MPA's is not yet finished.

B. Needs

The national biodiversity strategy and action plan (2007) summary of the needs for the sustainable use of coastal and marine resources:

- An inventory of marine and coastal flora and fauna should be built up to collect available information; any lacking information should be completed; and more resources should be allocated to maintaining inventory studies concerning marine and coastal biological diversity.
- Measures should be taken to ensure information exchange, cooperation and coordination between experts, laboratories and organizations; guides should be prepared; the participation of those experts in the international studies should be ensured.
- Studies concerning the conservation of eelgrasses (*Posidonia oceanica*), which have a very important role for the marine organisms in the Mediterranean Sea and have a wide occurrence, should be maintained and both short- and long-term scientific monitoring methods should be developed for the other important species and plant categories.
- Information booklets and documents should be prepared for the executives, the related groups and public on the endangered species and the Specially Protected Areas, and people's awareness should be raised using visual media.
- Effective methods for the identification and observation of alien species should be developed and implemented; regulations on the entry of alien species into the new ecosystems, in particular, should be reviewed and made agreeing to the international conventions; and strict controls should be exercised to prevent exotic invasive species from entering Turkey's waters both at the national and international levels. Measures should be taken to minimize the adverse impacts of fishing practices on the fishery stocks in the marine and coastal ecosystems; fishing control infrastructure, e.g. remote monitoring system, should be strengthened.
- An inventory of fishing technology and fishing gears should be built up, first at regional and then at the national levels.
- Restocking by means of aquaculture of those species which were affected from overfishing pressure and saw a fall in their populations should be performed.
- Artificial reef application should be made widespread.
- With regard to aquaculture, off-shore cage culture should be supported with a view to protecting the environment.
- Regulatory actions should be taken to protect the sea caves of Turkey and conserve the organisms in those caves.

C. Urgent actions proposed

- Management of coastal fisheries, effective controls of the fishing restrictions.
- Enforcement of the marine protected areas.

- Mitigate measure for the ghost fisheries in the Aegean and Mediterranean Seas
- Mass public awareness campaigns, mostly for fishermen, local people, harbour authorities, coast guards, school teachers, students and tourists.
- All kind of Pollution prevention measures for the Eastern Mediterranean Sea .
- Coordination of the relevant ministries (Ministry of Environment, Ministry of Forestry and Ministry of Agriculture and Rural affairs).
- More effective cooperation of the relevant organizations within the framework of the national strategy for the conservation of the Mediterranean monk seal.
- In situ protection measures should take place in Gökçeada in the Northern Aegean Sea, The Foça region in the Central Aegean Sea, Kokar, Siğacık and Dilek Peninsula, Bodrum Peninsula, from Fethiye to Antalya, from Gazipaşa to Erdemli and from İskenderun to Samandağ. Within the above mentioned areas, Yalıkavak (Bodrum Peninsula, the Aegean Sea) and Bozyazı-Aydıncık (the Mediterranean Sea) should be special protected areas, because in Aydıncık area there are still some seals breeding and most of the killings occur in this area.
- Enforcement of legal protection measures in the above mentioned areas.
- Collection of biological and ecological data and monitoring studies with RAC/SPA protocols and priorities such as Elasmobranches, Coralligenous species and others.
- Establishing artificial reefs for mitigate trawling advers impacts in the coastal areas.

5. Preliminary conclusions and recommendations

Considering that only 10 reports on 19 expected reports have been submitted until now and that 5 other reports are still pending, it has to be noted that the conclusions and recommendations presented hereinafter are still draft ones and do not constitute consistent elements to be taken into account for the scientific and technical assessment of the process.

5.1. Preliminary conclusions

Taking into account the above, these are some preliminary conclusions:

- Although the Mediterranean knowledge concerning certain groups of organisms is more or less satisfactory, there are considerable gaps regarding the distribution, range, populations and conservation status for the majority of species. Therefore, research and systematic monitoring of Mediterranean biodiversity must be supported. The adoption of the National Biodiversity Strategies and Action Plans, elaborated within the SAP BIO Programme, the integration of biodiversity concerns into sectoral policies combined with the effective operation of the Natura 2000 European ecological Network, especially for the Mediterranean European countries, will be decisive for its preservation. The evolving process of institutional protection of the network's sites, the creation of Management Bodies for important sites and the enforcement of environmental control institutions and mechanisms are very significant steps. The institutional protection of new sites and the support to the operation of new Management Bodies or schemes will have a catalytic effect on the conservation of the Mediterranean biodiversity.
- During the last 20 years, the state of the Mediterranean fishery resources shows negative trends, despite the reduction of the fishing capacity in accordance to national efforts and EU regulations for the management of the fishing fleets of the member states, aiming at the reduction of the fishing pressure on stocks. Moreover, the Mediterranean fisheries' sector's viability appears to be pessimistic, influenced by a variety of factors related to the capacity to produce sufficient amounts of fisheries' products and the conditions of the market. The above underline the complexity and the sensitivity of the problem and denote that management of Mediterranean fisheries should be based on both the sustainable exploitation of resources and the viable development of the sector.
- The estimates of the Mediterranean marine resources are limited and are based on information gathered within research projects which are funded by national or community sources and therefore, the information we have is scarce and geographically limited. This makes the management of the fisheries' resources rather difficult, complicated and of high cost.
- Measures for the minimization of the adverse effects of human activity on the marine environment, such as the implementation of restrictions on solid and liquid waste disposal, and the amelioration of the effects of overfishing, of illegal and unreported fishing, as well as of by-catch and discards, are required to be implemented along with effective measures for the protection and conservation of endangered marine species and important marine sites as

well as international cooperation to deal with the phenomenon of invasion of alien marine species.

- Similarly, measures are required in order first to understand the impact of climate changes in the Mediterranean marine ecosystem and its functioning and take the necessary action whenever appropriate to mitigate it.

5.2. Preliminary recommendations

Preliminary recommendations include:

- Promotion of basic research to fill the knowledge gaps concerning the status of the marine environment of the Mediterranean sea as well as the adoption of applied research for the development of suitable tools for monitoring, detection (eutrophication, oil spills etc.), upholding the relevant legislation and control concerning the development of cleaner and more environmentally friendly technologies and production procedures (for fisheries, aquaculture etc.).
- Investigation of the diversity of little studied and/or unexplored groups such as Ascidia, Foraminifera among zoobenthos, dinoflagellates, mesozooplankton groups (other than copepoda and cladocera), and macrozooplankton, microplankton. Gaps in knowledge of biodiversity in unexplored geographic areas and habitat types e.g. hard bottom zoobenthos should also be addressed.
- Extending the scope of studies beyond the level of species matrices, incorporating more data on size, life cycle, trophic relations, productivity, ecophysiology and genetics.
- Application of measures for the sustainable use of fisheries and aquaculture assessing the level of damage that can be sustained and/or is acceptable by the ecosystem through these practices (including also secondary effects such as the impact of the partial removal of a predator or a part of a life cycle of one species, information on fate and survival of discards and the impact on epifaunal benthic communities).
- Particular importance should be paid for studying, understanding and protecting deep ecosystems. Action plans and scientific research for the sustainable management of deep water fisheries with emphasis on the protection highly vulnerable deep-water communities, either by immediate removal of (erect, slow growing) organisms and/or by habitat and trophic level modifications. Studies on the deep water coral mounds in the areas must be intensified.
- Developing Rapid Assessment Surveys (RASs) for the assessment of the Marine Environment EQS
- Development of Long-Term Projects in a few selected areas covering the need for assessing temporal trends and comparisons among anthropogenic impacted vs. naturally disturbed environments.

- Networking: joining forces, setting the essential questions, developing the National Strategies in compliance with the International Treaties and Conventions, linking with the relevant EU Networks (such as MARBEF, EUROCEANS, MARINERA)
- Future studies approach should be large-scale press and relaxation experimental work coupled with energy budgets that can be used to improve ecosystem models for predictive work.
- Since marine protected areas are becoming an important tool for preserving biodiversity and for managing fisheries, there is an urgent need for studies to determine baseline information such as size, number and location in order to improve the efficiency of these areas.
- Also in the level of marine protected species (particular cetaceans, seals and turtles) an estimation of population status, threats and trends for the top priority species is highly needed.
- Along the same line inventories and mapping of Posidonia meadows as well as of lagoons and small wetlands must be drawn to cover their extend
- Coralligenous/maërl assemblages should be granted legal protection at the same level as *Posidonia oceanica* meadows.
- Co-ordinated, cooperative regional research is to investigate the phenomenon of introduced species, particularly in hot spot areas such as ports and lagoons. Particularly studies on the pelagic ecosystem presumably affected by ballast waters are urgently needed.
- Co-ordinated, cooperative multidisciplinary research is to understand and investigate the impact of CC on the marine ecosystem. Long-term data on climate change and on communities changes in the Mediterranean seas through an integrated framework are required.
- Establishment of national working groups addressing various biodiversity issues meeting regularly and reporting once a year.

Annex : Annotated Contents and Structure of the National reports to be prepared within the ECAP Process

**FORMAT, CONTENTS AND ANNOTATED CONTENTS AND STRUCTURE OF THE “NATIONAL
DOCUMENT AIMING AT THE IDENTIFICATION OF IMPORTANT ECOSYSTEM PROPERTIES AND
ASSESSMENT OF ECOLOGICAL STATUS AND PRESSURES TO MEDITERRANEAN
MARINE AND COASTAL BIODIVERSITY”**

1/ Format

Format:

(To be defined by RAC/SPA)

Font size:

For chapter titles: 12 Arial Bold CAPS (ALL TEXT)

For subchapter titles: 12 Arial Bold ...

For general text: 12 Arial

References :

Citation within the text successively throughout the text :

- a) 1 author (Author surname, year)
- b) 2 authors (1st author surname and 2nd author surname, year)
- c) More than 2 authors (1st author surname et *al.*, year)

Citation of references at the end of document alphabetically, then chronically for same author.

Additional bibliography: As Annex at the end of document

Language: Correct English or French, as appropriate

Delivery: 3 hard copies by post
Digitized word and pdf formats (through e-mail)
CD by post

2/ Contents - titles only

(first cover page)

(second cover page)

Executive summary

Introductory note

List of Acronyms

List of contents

1. Reference documents and information consulted
2. Marine and coastal ecosystem status a) Biological characteristics, b) Habitat types
3. Pressures and impacts a) Biological disturbance, b) Emerging issues such as climatic change effects and deep sea ecosystem modifications
4. Expert opinion on a) Marine and coastal ecosystem status, b) Pressures and impacts
5. Expert opinion on related priority national needs
6. Funding problems and opportunities
7. Conclusions and recommendations

List of Annexes

List of References

3/ Annotated contents and structure

First cover page – as per Contract conditions

Second cover page – as per Contract conditions

Executive summary

3-4 pages

To summarise:

- *Availability and problems of actual information and knowledge*
- *Level and quality of national activities*
- *List critical issues and gaps in national marine /coastal areas*
- *List priority needs and actions*
- *Comment funding problems*
- *Add key recommendations*

Introduction note

1 page

The overview has been prepared as one of the Ecosystem Approach (ECAP) activities. It has been prepared by Mrs/Mr..... as National consultant, guided by Mrs/Mr..... National SAP BIO Correspondent, supervised by Mrs/Mr..... NFP for SPAs, and guided and assisted by Mr.....RAC/SPA international consultant responsible for cluster A (B, C or D).

In addition, the following national/local authorities, institutions, correspondents and experts were informed/consulted on the present action: (consulted ones to be listed stating surname, name and (eventually) affiliation).

List of Acronyms

1-2 pages

1. Reference documents and information consulted

3-4 pages

- 1.1. Documents provided by RAC/SPA and its international consultants** (list and comment)
- 1.2. National documents and publications identified and available** (list, comment)
- 1.3. Other documents identified**, if any
- 1.4. Quality and comprehensiveness of available information documents** (for. 1.4 a short critical analysis to be provided, major gaps identified, the resulting problems...)

2. Marine and coastal ecosystem status

10-15 pages

(Here, please note that the attention for RAC/SPA reports will be paid mainly to the biological characteristics and habitats types, other relevant characteristics such as physical and chemical characteristics will be treated by other MAP components reports).

2.1. Biological characteristics

2.1.1 Description of water column biological communities (basically phyto- and zooplankton) including the species and seasonal and geographical variability

The description should be based on results of studies undertaken to obtain:

- *The spatial distribution of phytoplankton production and chlorophyll a biomass*
- *Information on euphotic zones to determine total phytoplankton production and biomass*
- *Information on phytoplankton cells grazed by microzooplankton*

Known singularities existing in the described area with respect to other Mediterranean ones should be underlined.

2.1.2. Information on invertebrate bottom fauna, macro-algae and angiosperms including species composition, biomass and annual/seasonal variability

Describe the above emphasizing the information on endemisms, species of restricted distribution in the concerned country/region, habitat structuring species, and species of known sharp reduction along last decades.

2.1.3 Information on vertebrates other than fish

Description of population dynamics (including trends), historical and current range and status of species of marine mammals, sea turtles and seabirds

Describe the above emphasizing the singularities differentiating your country/region situation from other ones. Include all such species listed in the ASP/BD Protocol annexes.

2.1.4 Inventory of the temporal occurrence, abundance and spatial distribution of exotic, non-indigenous and invasive species

Further to the inventory, provide additional information on identified trends along the last decade and any valuable data to develop the respective chapter on impacts below.

2.1.5 Information on species of commercial interest for fishing (fish, mollusc and shellfish): Structure of populations, their abundance, spatial distribution and age/size structure

Ecosystem management seems to be a good alternative for fisheries preservation, such as its application in large-scale marine protected areas, in which no fishing takes place or access is restricted to certain beneficiaries in properly controlled conditions, being its adoption as a primary management tool that satisfies simultaneously all objectives that have been set for ecosystem management.

Focus and develop available information regarding the above in main commercial species and species included in annexes to the SPA/BD Protocol. Include also the five main species of interest for artisanal fleets regarding catch, as well the five main species regarding revenue for those fleets in the respective countries.

2.1.6. Others

To the extent not described above, description of coastal biodiversity regarding species composition and abundance

2.2. Habitat types

Predominant habitat types should be described in terms of physical, chemical and biological features. Habitats of special scientific or economic or biodiversity interest or habitats subject to intense or specific pressures should be identified. Identification and mapping of special habitat types including MPAs, etc.

*Use as habitat standardisation tool the **RAC/SPA “Handbook for interpreting types of marine habitat for the selection of sites to be included in the national inventories of natural sites of conservation interest”** (Bellan-Santini et al, 2002) (<http://www.rac-spa.org/dl/MSDF.pdf> (English version) and <http://www.rac-spa.org/dl/MIHM%20FR-P2.pdf> (French version)). Profit of eventual Natura 2000 habitat distribution information for your country to transduce it into the equivalent RAC/SPA habitat type, as per the above Handbook equivalence references.*

*Provide maps and available “shape” files and their related metadata for any geo-referenced thematic cartography (MPAs, coralligenous, *Cystoseira* spp., vermetid reefs, etc). Provide reference information and potential source on any such existing material of restricted distribution.*

2.3. Conclusions and identification of gaps

Provide general and if possible specific comments and include here clear gaps identified after collecting the available information for your country on the above.

3. Pressures and impacts

8-12 pages

3.1. Biological disturbance

(non-indigenous and invasive species, microbial pathogens, impact of fisheries on target and non-target species)

(Here also, please note that the attention is focused on biological disturbance. Other sources of disturbance such as contamination, dumping activities, nutrient and organic matter enrichment, physical disturbance...etc, will be treated by other MAP components reports).

Ballast waters, aquaculture, biofouling are factors that contribute to the non-indigenous biological disturbances. Related to the impacts, the most important ones are those associated to loss of biodiversity, alteration of habitat and socioeconomics negative impacts. Tropicalization and meridionalization effects refer to the components that produce a never-ending positive feedback loop. Provide key information related to these issues coming from the respective country.

Fishing drives fish stocks to exhibit smaller body sizes and age/length at maturity, and increases catch variability, thus increasing uncertainty. Impact of gears varies across countries and areas, depending on their composition target and by-caught species and regulations implementation means. Focus

information here on main impacts by gear and areas regarding habitats and sensitive species presence in by-catch. Describe identified problems in catch reduction on key species for artisanal fisheries economies (e.g. Palinurus sp., Sparidae, etc.).

3.2. Emerging issues (Such as climatic change effects and deep sea ecosystem modifications)

Consider herein available country information from the respective 2008 country report to RAC/SPA on effects of climate change on marine and coastal biodiversity, as well as updating it with eventual 2009 data.

Add any available information on human effects on open seas ecosystem alterations including on the deep seas.

4. Expert opinion on marine and coastal status and pressures and impacts on the marine and coastal biodiversity **3-5 pages**

4.1. Marine and coastal status and pressures relevant for national marine and coastal areas

This chapter could include the conclusions and all issues of serious concern (e.g. health issues) and hot spot areas where urgent action is needed. Where policies are in place and measures have been taken relevant to the application of the ecosystem approach, these could be taken into account.

(Here all key impacts and pressures related to the marine and coastal area to be mentioned, - not only biodiversity related)

4.2. Critical impacts and effects on marine and coastal biodiversity

Here critical impacts/ areas to be identified; check list : low land areas, wetlands, important beaches, ecosystems, habitats, populations/biota, species at high risk fisheries and mariculture, Mediterranean agriculture, grapes, olives, other if supposed as critical...

5. Expert opinion on related priority national needs **3-4 pages**

5.1. Needs

Here priority needs concerning national marine and coastal areas biodiversity; check list : policies, measures, plans, actions, projects, research, monitoring, training and capacity building, TB actions, international cooperation and assistance, other if relevant.

5.2. Urgent actions proposed

(Here, among needs identified, the most urgent actions should be proposed)

6. Funding problems and opportunities **3-4 pages**

5.1. Regular national sources, potentially available

5.2. Other (private, public, partnership) sources, if any

5.3. International funds, projects, programmes (here, in 5.1 and 5.2 in particular, potential national sources as co-financing for international projects should be looked for. In addition, in 5.3, national eligibility for international programmes / funds should be identified.

7. Conclusions and recommendations

3-4 pages

(Consultants are invited to avoid general and non-specific statements). Conclusions to be related to country specific situation and problems, targeted at national marine/coastal areas and critical locations/topics

Recommendations to include problem solution related proposals and urgent actions, including eventually common actions with neighbouring countries

Annexes –if any-

Reference list

2-3 pages

Total volume of the document, approximately

41-57 pages

If needed and as appropriate, few pages more would be acceptable

maximum 65 pages