



MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE



A Mediterranean Cooperation for Sustainable Use of the Marine Biological Resources: a Supportive Tool for the Synergic Implementation of the MSFD and the EcAp initiative

Technical Report

Introduction

MedSuit is a joint project between the Italian Ministry of Environment and the General Fisheries Commission for the Mediterranean of the FAO (GFCM). The project aims at contributing towards the achievement of Good Environmental Status (GES) in the Mediterranean and Black Sea by discussing how to progress with the assessment of the European Commission (EC) Marine Strategy Framework Directive (MSFD) Descriptor 3 (which is related to Population of commercial fish / shell fish), and also to Descriptor 1 (Biological Diversity) in the GFCM area of competence. MedSUIT also aims at contributing to the much needed harmonization of the work under the MSFD with relevant policies by third countries as well as similar initiatives in Regional Seas Conventions concerned. In this latter respect, MedSUIT is also expected to benefit from the collaboration with UNEP-MAP for the definition of targets and indicators through the Ecosystem Approach (EcAp) Process. The existing Memorandum of Understanding (MoU) between GFCM and UNEP-MAP will be relied upon in the implementation of MedSuit.

Although the GFCM has already developed indicators and reference points for exploited populations, the latter are mainly focused on single species reference points relating to a short list of commercial species. This has been due to: (i) the lack of operational criteria, as accompanied with references to applicable methodological standards for assessing the extent to which GES on the GFCM area of competence is being achieved and (iii) limitations of data available to the GFCM. However, following the adoption of decision 2010/477/EU of the European Commission of 1 September 2010 on criteria and methodological standards on GES of marine waters, new tools have been made available to EU Member States to amend non-essential elements of the MSFD. Furthermore, new policies to strengthen data collection within GFCM are being developed (GFCM 2014a).

Prior to MedSuit work was undertaken by GFCM on the EcAp Process. Among others, GFCM shared its reference points with UNEP-MAP while contributing to the definition of indicators and targets within the roadmap of the EcAp Process. Nonetheless, on the basis of relevant MSFD descriptors, criteria and methodological standards on GES of marine waters, MedSuit will contribute to develop a coherent and coordinated framework across the GFCM area of competence with three main objectives:

- a) Establishing a comprehensive set of environmental targets and associated indicators for the Mediterranean and Black Sea marine waters by harmonizing the criteria to define those targets mainly associated with Descriptor 3 (Commercial Fish), but contributing as well with Descriptor 1 (Biological Diversity) and Descriptor 4 (Food Webs);
- b) Continuing ongoing assessment and regular updating of targets to determine GES of exploited populations in the Mediterranean Sea, including at sub-regional level for areas such as the Adriatic Sea and the Strait of Sicily, and taking into account relevant socio-economic aspects;
- c) Proposing measures to achieve and/or maintain GES, when necessary, including the design of monitoring requirements.

In so doing, MedSuit will foster regional cooperation among GFCM Members and coordination with UNEP-MAP, in a) the analysis of habitat types and biological features of exploited populations in the Mediterranean Sea, b) the analysis of pressures and impacts arising out of human activities in the Mediterranean Sea, and c) the analysis of socio-economic aspects related to the use of marine living resources, including sustainability of exploitation rates and ecosystem resilience.

Aims of this technical report

The aim of this report is to contribute towards one of the main objectives of MedSuit, namely to establish a comprehensive set of environmental targets and associated indicators for the marine waters of the GFCM area of competence by harmonizing the criteria to define those targets to achieve GES for Descriptor 3 of the MSFD. This corresponds to the first phase of the MedSuit project, namely the comparative analysis of the existing frameworks related to the definition, monitoring and proposed measures toward GES, to move toward the harmonization of criteria including GFCM reference points, MSFD indicators and UNEP-MAP EcAp indicators.

On the basis of relevant descriptors, criteria and methodological standards on GES of marine waters issued by the EU, this report contributes to develop a coherent and coordinated framework across the marine region or sub-regions concerned for the definition of the measures and the different elements of the marine strategies, by establishing a comprehensive set of environmental targets and associated indicators for the marine waters (Joint Research Agreement 2013).

Within the remit of the joint agreement between the Italian Ministry of Environment and the GFCM, this report addresses Action 1 therein (Integrate existing information in view of the undertaking of a consolidated assessment, in order to prepare the activities within Actions 2 and 3 of the joint agreement) by integrating available information with additional information and evaluations developed in the implementation of the first phase of the MSFD to undertake the initial assessment related thereto, together with EcAp Process.

Methodology of the revision

The information available relating to past and ongoing assessments from the MSFD by the EC and the International Council for the Exploration of the Sea (ICES), from the UNEP-MAP

EcAp framework and from GFCM was reviewed with the aim of identifying common principles in relation to the achievement of sustainable use of marine resources and ecosystems.

The revision included the comparison of the following definitions, terms and concepts:

- a) Definition of overarching objectives and targets
- b) Definition of indicators
- c) Definition of reference points (targets, thresholds, limits)
- d) Definition of operational objectives
- e) Tools for the scientific monitoring and data collection

The key documentation revised is listed below:

1.1. EC-MSFD

- Directive 2008/56/EC. Article 6 of Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (MSFD).
- JRC 2012. Monitoring for the Marine Strategy Framework Directive: Requirements and Options. N. Zampoukas, H. Piha, E. Bigagli, N. Hoepffner, G. Hanke & A. C. Cardoso. EUR 2518 EN. Pag. 42.
- ICES 2014. Report on the workshop to draft recommendations for the assessment of Descriptor D3 (WKD3R). 13-17 January 2014, Copenhagen, Denmark. ICES CM 2014/ACOM: 50. 151 pp.
- EC 2014a. The first phase of implementation of the Marine Strategy Framework Directive (2008/56/EC) – The European Commission’s assessment and guidance. SWD (2014) 49 final. 194 pp.
- EC 2014b. Article 12 Technical Assessments of the MSFD 2012 obligations: Italy. 46 pp.
- EC 2014c. Article 12 Technical Assessments of the MSFD 2012 obligations: Spain. 69 pp.
- Gobierno de España. 2012. Descriptor 3: Especies Marinas Explotadas Comercialmente. Parte IV. Descriptores de Buen Estado Ambiental. Demarcación Marina Levantino-Balear. Estrategia Marina. 32 pp.
- ISPRA 2012. Descrittore 3: Pesca. 49 pp.

1.2. UNEP-MAP ECAP

- UNEP-MAP 2012. EcAp-MED Project Document. Implementation of the Ecosystem Approach (EcAp) in the Mediterranean by the Contracting parties in the context of the Barcelona Convention for the Protection of the Marine Environment and the Coastal region of the Mediterranean and its Protocols. Pag. 34.
- UNEP-MAP & GFCM 2013. Background document on cooperation needs between UNEP-MAP and GFCM. Internal document. Pag. 14.
- UNEP-MAP Descriptor 3. 2013. Proposed approaches for GES determination and GES targets with regard to Ecological Objective 3 (Harvest of commercially exploited fish and shellfish). Internal document. Pag. 11.

- UNEP-MAP 2014a. GFCM Information Note on EO3. Integrated Correspondence Groups of GES and Targets Meeting. Athens (Greece), 17-19 February 2014. 19 pp.
- UNEP-MAP 2014b. Working document on Common Indicators for the Mediterranean. Integrated Correspondence Groups of GES and Targets Meeting. Athens (Greece), 17-19 February 2014. 8 pp.

1.3. GFCM

- Joint research agreement 2013. A Mediterranean Cooperation for the Sustainable Use of the Marine Biological Resources. A supportive tool for the synergic implementation of the MSFD and the ECAP initiative. Joint Project Agreement between the Ministry of the Environment, Territory and Sea of Italy and the GFCM.
- GFCM 2012. Guidelines on a general management framework and presentation of scientific information for multiannual management plans for sustainable fisheries in the GFCM area. 2012.
- GFCM 2013. Report on the Sub-regional Technical Workshop on Fisheries Multiannual Management Plans for the Western, Central and Eastern Mediterranean. 7-10 October 2013, Tunis.
- GFCM 2014a. GFCM Data Collection Reference Framework. GFCM Secretariat. 42 pp.
- GFCM 2014b. Summary of data collection gaps and needs of GFCM Members (outcomes of 2013 FWP questionnaires). Scientific Advisory Committee (SAC). St Julian's, Malta, 17-20 March 2014. 18 pp.
- GFCM 2014c. Proposal on the definition of Good Environmental Status and associated indicators and targets for commercially exploited fish and shellfish populations. Scientific Advisory Committee (SAC). St Julian's, Malta, 17-20 March 2014. 18 pp.
- GFCM 2014d. Reference points and advice in the SAC ad in other relevant organizations. WKREF-WGSA. Bar, Montenegro, 28th January-1st February 2014.

1.4. Other documents

- Gascuel, D., Coll, M., Fox, C., Guénette, S., Guitton, J., Kenny, A., Knittweis, L., Nielsen, R., Piet, G., Raid, T., Travers-Trolet, M., Shephard, S., Under review. Fishing impact and good environmental status in European seas: a diagnosis from stock-based and ecosystem indicators. Fish and Fisheries.
- Shannon, J.L., Coll, M., Bundy, A., Shin, Y.J., Travers-Trolet, M., Gascuel, D., Kleisner, K., Tam, J., Piroddi, C., Heymans, J.J., Lynam, C.P., Submitted. Trophic level-based indicators to track fishing impacts across marine ecosystems. Marine Ecology Progress Series.
- Shin, Y.J., Shannon, L.J., Bundy, A., Coll, M., Aydin, K., Bez, N., Blanchard, J.L., Borges, M.F., Diallo, I., Diaz, E., Heymans, J.J., Hill, L., Johannesen, E., Jouffre, D., Kifani, S., Labrosse, P., Link, J.S., Mackinson, S., Masski, H., Möllmann, C., Neira, S., Ojaveer, H., Ould Mohammed Abdallahi, K., Perry, I., Thiao, D., Yemane, D., Cury, P.M., 2010. Using indicators for evaluating, comparing and communicating the

ecological status of exploited marine ecosystems. Part 2: Setting the scene. ICES Journal of Marine Science 67, 692-716.

- Rosenberg, A.A., Fogarty, M.J., Cooper, A.B., Dickey-Collas, M., Fulton, E.A., Gutiérrez, N.L., Hyde, K.J.W., Kleisner, K.M., Kristiansen, T., Longo, C., Minte-Vera, C., Minto, C., Mosqueira, I., Chato Osio, G., Ovando, D., Selig, E.R., Thorson, J.T. & Ye, Y. 2014. Developing new approaches to global stock status assessment and fishery production potential of the seas. FAO Fisheries and Aquaculture Circular No. 1086. Rome, FAO. 175 pp.
- Abella, A. 2014. Alternative methods useful for stock assessment for data poor fisheries. Working document.
- Walters, C.J., Christensen, V., Martell, S.J., Kitchell, J.F., 2005. Possible ecosystem impacts of applying MSY policies from single-species assessment. ICES Journal of Marine Science 62, 558 - 568.

Frameworks and aims to achieve GES

Comparative analysis of the existing frameworks related to the definition, monitoring and proposed measures are presented below for MSFD, UNEP-MAP EcAp and GFCM.

EU - MSFD definitions, terms and concepts

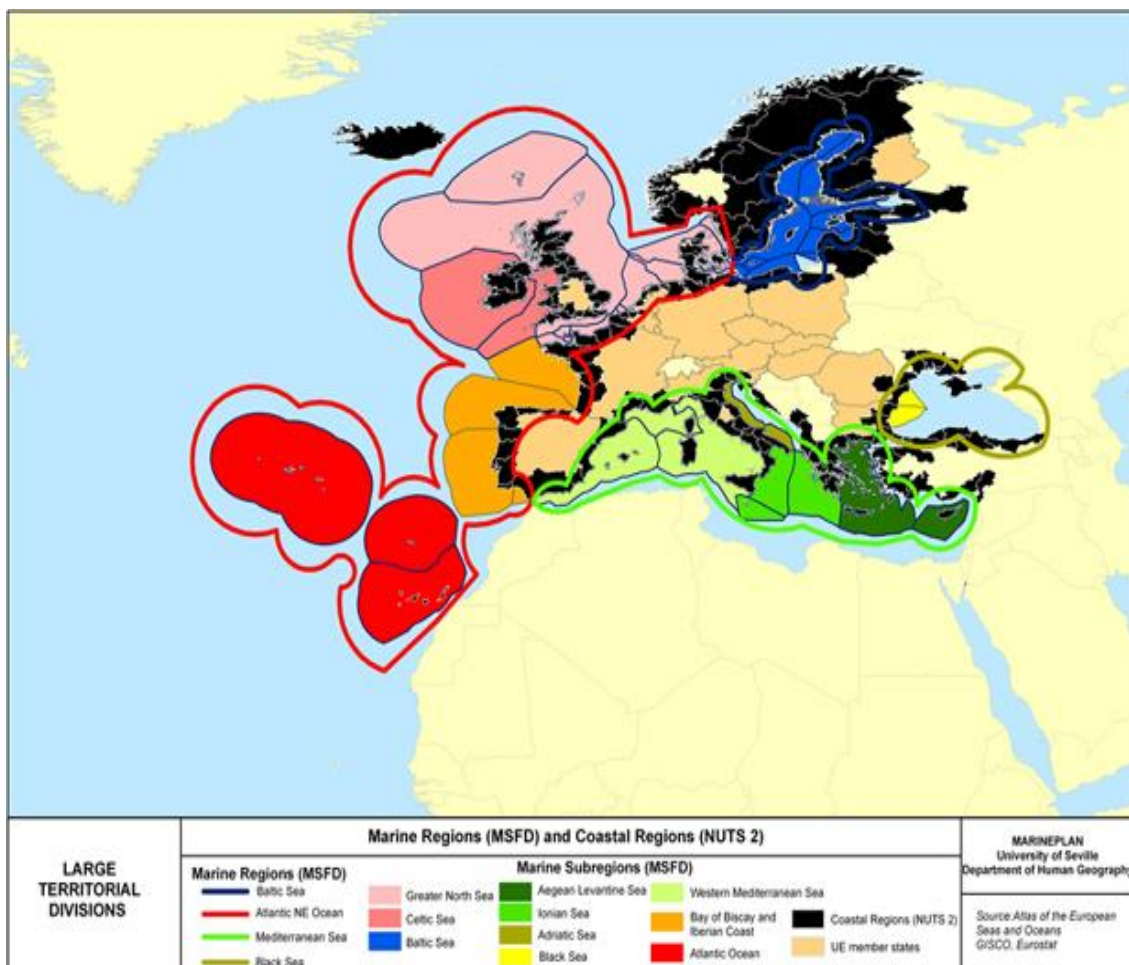
Introduction

The aim of the MSFD is to protect the marine environment across Europe. It aims to achieve good environmental status GES of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. The MSFD constitutes the vital environmental component of the Union's future maritime policy, designed to achieve the full economic potential of oceans and seas in harmony with the marine environment.

The MSFD establishes European Marine Regions on the basis of geographical and environmental criteria. Each Member State - cooperating with other Member States and non-EU countries within a marine region - are required to develop strategies for their marine waters. The marine strategies to be developed by each Member State must contain a detailed assessment of the state of the environment, a definition of GES at regional level and the establishment of clear environmental targets and monitoring programmes.

The goal of the MSDF is in line with the objectives of the 2000 Water Framework Directive which requires surface freshwater and ground water bodies - such as lakes, streams, rivers, estuaries, and coastal waters - to be ecologically sound by 2015 and that the first review of the River Basin Management Plans should take place in 2020.

Figure 1. Marine Regions (MSFD) and Coastal regions (NUTS 2). Source: <http://www.eurocean.org/>



Definition of overarching objectives and targets

The MSFD is very explicit about its aims and context of its development: “It is evident that pressure on natural marine resources and the demand for marine ecological services are often too high and that the Community needs to reduce its impact on marine waters regardless of where their effects occur” (Directive 2008/56/EC).

The document Directive 2008/56/EC states the following aims of the MSFD framework and the strategy to be developed:

1. The development and implementation of the thematic strategy should be aimed at the conservation of the marine ecosystems. This approach should include protected areas and should address all human activities that have an impact on the marine environment.
2. It establishes a framework within which Member States shall take the necessary measures to achieve or maintain GES in the marine environment by the year 2020 at the latest.

It is then clear that the overall objective of the MSFD is to achieve GES, with a temporal objective (2020). Therefore, the overarching target of MSFD is to maintain or move marine ecosystems within European Seas towards GES.

The MSFD defines the GES (Directive 2008/56/EC) as:

- ‘The environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations, i.e.:

(a) The structure, functions and processes of the constituent marine ecosystems, together with the associated physiographic, geographic, geological and climatic factors, allow those ecosystems to function fully and to maintain their resilience to human-induced environmental change. Marine species and habitats are protected, human-induced decline of biodiversity is prevented and diverse biological components function in balance;

(b) Hydro-morphological, physical and chemical properties of the ecosystems, including those properties which result from human activities in the area concerned, support the ecosystems as described above. Anthropogenic inputs of substances and energy, including noise, into the marine environment.

- In addition, ‘Environmental status’ means the overall state of the environment in marine waters, taking into account the structure, function and processes of the constituent marine ecosystems together with natural physiographic, geographic, biological, geological and climatic factors, as well as physical, acoustic and chemical conditions, including those resulting from human activities inside or outside the area concerned.

The MSFD approach also states that in view of the dynamic nature of marine ecosystems and their natural variability, and given that the pressures and impacts on them may vary with the evolution of different patterns of human activity and the impact of climate change, it is essential to recognise that the determination of good environmental status may have to be adapted over time. Accordingly, it is appropriate that programmes of measures for the protection and management of the marine environment be flexible and adaptive and takes account of scientific and technological developments (Directive 2008/56/EC).

Programmes of measures and subsequent action by Member States should be based on an ecosystem-based approach to the management of human activities, in particular the precautionary principle (Directive 2008/56/EC).

The MSFD defines four marine regions within European Seas: the Baltic Sea, the North-east Atlantic Ocean, the Mediterranean Sea and the Black Sea.

To achieve the objectives of the MSFD, the Directive states the following:

1. Marine strategies shall be developed and implemented in order to:

(a) Protect and preserve the marine environment, prevent its deterioration or, where practicable, restore marine ecosystems in areas where they have been adversely affected;

(b) Prevent and reduce inputs in the marine environment, with a view to phasing out pollution, so as to ensure that there are no significant impacts on or risks to marine biodiversity, marine ecosystems, human health or legitimate uses of the sea. ‘

2. Marine strategies shall apply an ecosystem-based approach to the management of human activities, ensuring that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while enabling the sustainable use of marine goods and services by present and future generations.
3. To determine the characteristics of GES in a marine region or sub-region, Member States shall consider each of the qualitative descriptors defined in the Directive to identify those descriptors which are to be used to determine good environmental status for that marine region or sub-region.
4. The establishment of marine protected areas is an important contribution to the achievement of good environmental status under the MSFD.
5. By applying an ecosystem-based approach to the management of human activities while enabling a sustainable use of marine goods and services, priority should be given to achieving or maintaining good environmental status (GES) in the Community's marine environment, to continuing its protection and preservation, and to preventing subsequent deterioration.
6. In order to achieve those objectives, a transparent and coherent legislative framework is required. This framework should contribute to coherence between different policies and foster the integration of environmental concerns into other policies, such as the Common Fisheries Policy (CFP), the Common Agricultural Policy and other relevant Community policies.
7. The diverse conditions, problems and needs of the various marine regions or sub-regions making up the marine environment in the Community require different and specific solutions. That diversity should be taken into account at all stages of the preparation of marine strategies, but especially during the preparation, planning and execution of measures to achieve GES in the Community's marine environment at the level of marine regions or sub-regions.
8. Coastal waters, including their seabed and subsoil, are an integral part of the marine environment, and as such should also be covered by this Directive.
9. The Community and its Member States are each parties to the United Nations Convention on the Law of the Sea (UNCLOS) approved by Council Decision 98/392/EC of 23 March 1998 concerning the conclusion by the European Community of the UNCLOS and the Agreement of 28 July 1994 relating to the implementation of Part XI thereof.
10. The Directive should also support the strong position taken by the Community, in the context of the Convention on Biological Diversity, on halting biodiversity loss, ensuring the conservation and sustainable use of marine biodiversity, and on the creation of a global network of marine protected areas by 2012. Additionally, it should contribute to the achievement of the objectives of the Seventh Conference of the Parties to the Convention on Biological Diversity, which adopted an elaborate programme of work on marine and coastal biodiversity with a number of goals, targets and activities aimed at halting the loss of biological diversity nationally, regionally and globally and at securing the capacity of the marine ecosystems to support the provision of goods and services, and a programme of work on protected areas with the objective of establishing and maintaining ecologically representative systems of marine protected areas by 2012. The obligation for Member States to designate Natura 2000 sites under the Birds Directive and the Habitats Directive will make an important contribution to this process.

11. The Directive should contribute to the fulfilment of the obligations and important commitments of the Community and the Member States under several relevant international agreements relating to the protection of the marine environment from pollution.

Definition of indicators

The MSFD states that on the basis of the initial assessment of GES, Member States shall, in respect of each marine region or sub-region, establish a comprehensive set of environmental targets and associated indicators for their marine waters so as to guide progress towards achieving good environmental status in the marine environment, taking into account the indicative lists of pressures and impacts (Directive 2008/56/EC). The directive provides a set of characteristics, pressures and impacts that are relevant.

Qualitative descriptors for determining GES under the MSFD auspices relevant for this report are:

Descriptor 3 (D3): “*Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock*”.

Descriptor 1 (D1): “*Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions*”;

Descriptor 4 (D4): “*All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity*”.

In the Commission Decision 2010/477/EU three criteria including methodological standards were described for MSFD Descriptor 3 (D3). The three criteria and indicators are:

MSFD Descriptor 3(Exploited fish and shellfish):

a) Criterion 3.1. Level of pressure of the fishing activity

Primary indicator: Indicator 3.1.1 - Fishing mortality (F)

Secondary indicator: Indicator 3.1.2 - Ratio between catch and biomass index (here called ‘catch/biomass ratio’). The secondary indicator may be useful if analytical assessments yielding values for F are not available.

b) Criterion 3.2. Reproductive capacity of the stock

Primary indicator: Indicator 3.2.1 - Spawning Stock Biomass (SSB)

Secondary indicator: Indicator 3.2.2 - Biomass indices. The secondary indicator may be useful if analytical assessments yielding values for SSB are not available.

c) Criterion 3.3. Population age and size distribution

Primary indicator: Indicator 3.3.1 - Proportion of fish larger than the mean size of first sexual maturation

Primary indicator: Indicator 3.3.2 - Mean maximum length across all species found in research vessel surveys

Primary indicator: Indicator 3.3.3 - 95% percentile of the fish length distribution observed in research vessel surveys

Secondary indicator: Indicator 3.3.4 - Size at first sexual maturation, which may reflect the extent of undesirable genetic effects of exploitation.

Measures regulating fisheries management within D3 can be taken in the context of the Common Fisheries Policy (CFP), as set out in Council Regulation (EC) No 2371/2002 of 20 December 2002 on the conservation and sustainable exploitation of fisheries resources, based on scientific advice with a view to supporting the achievement of the objectives addressed by this Directive, including the full closure to fisheries of certain areas, to enable the integrity, structure and functioning of ecosystems to be maintained or restored and, where appropriate, in order to safeguard, inter alia, spawning, nursery and feeding grounds. The CFP should take into account the environmental impacts of fishing and the objectives of this Directive (Directive 2008/56/EC).

An informative list on MSFD parameters and proposed indicators that can relate to monitoring parameters of the CFP is listed in Annex 1 (JRC 2012).

Recent work performed by ICES to draft recommendations for the assessment of Descriptor D3 of the MSFD presented preliminary results of the assessment regarding data availability and regional assessments of the four marine regions of the MSFD (Baltic Sea, North-east Atlantic Ocean, Mediterranean Sea and Black Sea) (ICES 2014). This work also assessed if commercially exploited fish and shellfish stocks had sufficient data available to assess each against the three criteria above. Regarding the European part of the Mediterranean Sea region, the group highlighted the weak international survey coordination in the region which has a direct impact on the proportion of stocks assessed achieving GES, which is still generally low when adopting indicators 3.1.1 and 3.2.1 above (ICES 2014). The assessment also highlighted that available knowledge on the status of the stocks is still poor in some GSAs (ICES 2014). Limitations of the data to fulfill requirements to calculate criteria 3.3 were found to be challenging (ICES 2014). Therefore, the assessment concluded that there is an urgent need to establish an overarching strategic framework to ensure the coordination of approaches toward GES assessment and monitoring programmes at the Mediterranean Sea regional scale, by collaboration between GFCM, EC and the Barcelona Convention (ICES 2014).

In addition, the MSFD indicators for Descriptor 1 and Descriptor 4 are as follows:

MSFD Descriptor 1 (Biological Diversity)

1.1.1. Distributional range

1.1.2. Distributional pattern within the latter, where appropriate

1.1.3. Area covered by the species (for sessile/benthic species)

1.2.1. Population abundance and/or biomass, as appropriate

1.3.1. Population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity rates, survival/mortality rates)

1.3.2. Population genetic structure, where appropriate

1.4.1. Distributional range

1.4.2. Distributional pattern

1.5.1. Habitat area

1.5.2. Habitat volume, where relevant

1.6.1. Condition of the typical species and communities

1.6.2. Relative abundance and/or biomass, as appropriate

1.6.3. Physical, hydrological and chemical conditions

1.7.1. Composition and relative proportions of ecosystem components (habitats and species)

MSFD Descriptor 4 (Food webs)

4.1.1. Performance of key predator species using their production per unit biomass (productivity)

4.2.1. Large fish (by weight)

4.3.1. Abundance trends of functionally important selected groups/species

Definition of reference points (targets, thresholds, limits)

Within the MSFD framework, the ‘Environmental target’ means a qualitative or quantitative statement on the desired condition of the different components of, and pressures and impacts on, marine waters in respect of each marine region or sub-region. Environmental targets are established in accordance with Article 10 of the Directive (Directive 2008/56/EC).

An indicative list of characteristics to be taken into account for setting environmental targets (Directive 2008/56/EC):

- (1) Adequate coverage of the elements characterising marine waters under the sovereignty or jurisdiction of Member States within a marine region or sub-region.
- (2) Need to set (a) targets establishing desired conditions based on the definition of good environmental status; (b) measurable targets and associated indicators that allow for monitoring and assessment; and (c) operational targets relating to concrete implementation measures to support their achievement.
- (3) Specification of environmental status to be achieved or maintained and formulation of that status in terms of measurable properties of the elements characterising the marine waters of a Member State within a marine region or sub-region.
- (4) Consistency of the set of targets; absence of conflicts between them.
- (5) Specification of the resources needed for the achievement of targets.
- (6) Formulation of targets, including possible interim targets, with a timescale for their achievement.
- (7) Specification of indicators intended to monitor progress and guide management decisions with a view to achieving targets.
- (8) Where appropriate, specification of reference points (target and limit reference points).
- (9) Due consideration of social and economic concerns in the setting of targets.

(10) Examination of the set of environmental targets, associated indicators and limit and target reference points developed in light of the environmental objectives laid down in Article 1, in order to assess whether the achievement of the targets would lead the marine waters falling under the sovereignty or jurisdiction of Member States within a marine region to a status matching them.

(11) Compatibility of targets with objectives to which the Community and its Member States have committed themselves under relevant international and regional agreements, making use of those that are most relevant for the marine region or subregion concerned with a view to achieving the environmental objectives laid down in Article 1.

(12) When the set of targets and indicators has been assembled, they should be examined together relative to the environmental objectives to assess whether the achievement of the targets would lead the marine environment to a status matching them. In fact, the discussion about reference points and reference directions is a large one under the context of the MSFD (ICES 2014).

The recent work performed by ICES to draft recommendations for the assessment of Descriptor D3 of the MSFD presented preliminary results of data availability and regional assessments of the four marine regions of MSFD (including the Mediterranean Sea and Black Sea) also preliminarily assessed the feasibility to establish reference levels and targets for the indicators investigated under Descriptor 3 (ICES 2014). The availability of meaningful reference points was identified as a challenge for indicator-based assessments. For stock status, the spawning stock biomass (SSB) is the internationally recognized indicator and the SSB that can produce the maximum sustainable yield (SSB_{msy}) should be the corresponding reference point). During the workshop there were discussions if the agreed reference points and criteria under MSFD Descriptor 3 and CFP are applicable for all stocks (ICES 2014). It is thus clear that the discussion around reference points is an important one and more work is needed to approach opinions and establish common procedures.

Different methods to derive indicators and reference point's proxies applied to assess Data Limited Stocks (DLS) under Descriptor 3 are being discussed in several occasions and venues (ICES 2014; Rosenberg et al. 2014, Abella 2014). This is also an issue that requires attention, especially in the Mediterranean Sea where data available to assess the status of stocks is scarce (ICES 2014).

Definition of operational objectives

Under the MSDF framework, each Member State should develop a marine strategy for its marine waters which, while being specific to its own waters, reflects the overall perspective of the marine region or sub-region concerned. Marine strategies should culminate in the execution of programmes of measures designed to achieve or maintain GES (Directive 2008/56/EC).

Each Member State shall, in respect of each marine region or sub-region concerned, develop a marine strategy for its marine waters in accordance with a plan of action. Member States having borders on the same marine region or sub-region covered by this Directive, where the status of the sea is critical to the extent that urgent action is needed, should endeavour to agree on a plan of action including the earlier entry into operation of programmes of measures. In

such cases, the Commission should be invited to consider providing supportive action to Member States for their enhanced efforts to improve the marine environment by making the region in question a pilot project. (Directive 2008/56/EC). Since action at international level is indispensable to achieve cooperation and coordination, this Directive should further enhance the coherence of the contribution of the Community and its Member States under international agreements. This is essential for the MedSUIT initiative and the work to be developed under GFCM auspices.

Member States sharing a marine region or sub-region shall cooperate to ensure that, within each marine region or sub-region, the measures required to achieve the objectives of this Directive, in particular the different elements of the marine strategies referred to in points (a) and (b), are coherent and coordinated across the marine region or sub-region concerned, in accordance with the following plan of action for which Member States concerned endeavour to follow a common approach:

(a) preparation: (i) an initial assessment, to be completed by 15 July 2012 of the current environmental status of the waters concerned and the environmental impact of human activities thereon, in accordance with Article 8 of the MSFD (Directive 2008/56/EC); (ii) a determination, to be established by 15 July 2012 of good environmental status for the waters concerned, in accordance with Article 9 (Directive 2008/56/EC); (iii) establishment, by 15 July 2012, of a series of environmental targets and associated indicators, in accordance with Article 10 (Directive 2008/56/EC); (iv) establishment and implementation, by 15 July 2014 except where otherwise specified in the relevant Community legislation, of a monitoring programme for ongoing assessment and regular updating of targets, in accordance with Article 11 (Directive 2008/56/EC);

(b) programme of measures: (i) development, by 2015 at the latest, of a programme of measures designed to achieve or maintain good environmental status; (ii) entry into operation of the programme provided for in point (i), by 2016 at the latest (Directive 2008/56/EC).

Therefore, in 2012 Member States made an initial assessment of their marine waters, taking into account the existing data were available and comprising the following:

(a) an analysis of the essential features and characteristics, and current environmental status of those waters, based on the indicative lists of elements set out the Directive, and covering the physical and chemical features, the habitat types, the biological features and the hydro-morphology;

(b) an analysis of the predominant pressures and impacts, including human activity, on the environmental status of those waters which: (i) is based on the indicative lists of elements set out in the MSDF (Directive 2008/56/EC), and covers the qualitative and quantitative mix of the various pressures, as well as discernible trends; (ii) covers the main cumulative and synergetic effects; and (iii) takes account of the relevant assessments which have been made pursuant to existing Community legislation; (c) an economic and social analysis of the use of those waters.

In 2012, as a first step in the preparation of programmes of measures, Member States across a marine region or sub-region within European waters undertook the analysis of the features or characteristics of, and pressures and impacts on, their marine waters, identifying the predominant pressures and impacts on those waters, and an economic and social analysis of their use and of the cost of degradation of the marine environment. They have used

assessments already carried out in the context of regional sea conventions as a basis for their analyses. On the basis of such analyses, Member States have determined for their marine waters a set of characteristics for GES. For those purposes, the MSFD stated that was appropriate to make provision for the development of criteria and methodological standards to ensure consistency and to allow for comparison between marine regions or sub-regions of the extent to which GES is being achieved. The next step towards achieving GES was the establishment of environmental targets.

In March 2014 the EC has produced the first assessment of the first phase of implementation of the Marine Strategy Framework Directive (EC 2014a). The EC has evaluated the overall achievements and Member States achievements and had made recommendations to improve the MSFD strategies in each region. In general, the assessment of the EC states that the overall process followed by Member States has been developed in parallel and no real coordination has been achieved between European Regional Seas or sub-regions within these regional seas, such as in the Mediterranean Sea (ICES 2014).

During 2014, Member States should evaluate the first assessment of the EC and work towards the establishment and implementation of a monitoring programme for ongoing assessment and regular updating of targets (Directive 2008/56/EC). This program should be the basis to establish a set of measures designed to achieve or maintain good environmental status and should enter into force no later than 2016. Those measures should be devised on the basis of the precautionary principle and the principles that preventive action should be taken, that environmental damage should, as a priority, be rectified at source and that the polluter should pay (Directive 2008/56/EC).

Provision should be made for the adoption of methodological standards for the assessment of the status of the marine environment, monitoring, environmental targets and the adoption of technical formats. GES shall be determined at the level of the marine region or sub-region on the basis of the qualitative descriptors. Following this, adaptive management on the basis of the ecosystem approach shall be applied with the aim of attaining GES (Directive 2008/56/EC).

Tools for the scientific monitoring and data collection

The MSFD states that since programmes of measures executed under marine strategies will be effective only if they are devised on the basis of a sound knowledge of the state of the marine environment in a particular area and are tailored as closely as possible to the needs of the waters concerned in the case of each Member State and from the general perspective of the marine region or sub-region concerned, provision should be made for the preparation at national level of an appropriate framework, including marine research and monitoring operations, for informed policymaking (Directive 2008/56/EC).

On the basis of the initial assessment of GES, Member States shall establish and implement coordinated monitoring programmes for the ongoing assessment of the environmental status of their marine waters on the basis of the indicative lists of elements set out in the Directive, and by reference to the environmental targets established (Directive 2008/56/EC).

Monitoring programmes shall be compatible within marine regions or sub-regions and shall build upon, and be compatible with, relevant provisions for assessment and monitoring laid

down by Community legislation, including the Habitats and Birds Directives, or under international agreements (Directive 2008/56/EC).

The list of species to be monitored in the Mediterranean Sea under the Data Collection Framework (DCF) can be found in the appendix VI of the Commission Decision 93/2010 adopting a multiannual Community programme for the collection, management and use of data in the fisheries sector for the period 2011-2013 (DCF).

UNEP-MAP EcAp definitions, terms and concepts

Introduction

The Barcelona Convention and its seven Protocols represent a political and legal framework for the protection of the marine environment and the coastal areas of the Mediterranean region. The ecosystems approach is a strategy for the integrated management of land, water and living resources that promoted conservation and sustainable use in an equitable way. The Parties to the Barcelona Convention have engaged into a process to implement the ecosystems approach in the Mediterranean the ultimate objective of which is to influence the management of human activities (UNEP-MAP 2012).

UNEP-MAP Programme of work with regard to ecosystem approach (EcAp) is ambitious with the view to implementing the roadmap adopted by the Parties in 2008, through Decision IG 17/6 and an important vehicle for advancing the implementation of EU Marine Strategy Framework Directive (MSFD, 2008/56/EC) (UNEP-MAP 2012).

Contracting Parties decisions reflect the wish to strengthen cooperation and seek synergies with EU initiatives such as the Water framework Directive and the MSFD to achieve a shared vision of “a healthy Mediterranean with marine and biological ecosystems that are productive and biologically diverse for the benefit of present and future generations” (UNEP-MAP 2012).

Through Decision IG.17/6 the Contracting Parties to the Barcelona Convention have committed to progressively apply the Ecosystem Approach to the management of human activities with the goal of effecting real change in the Mediterranean marine and coastal environment (UNEP-MAP 2012).

In addition, Decision IG.17/6 outlines a roadmap for the implementation of the ecosystem approach. The roadmap consists of several subsequent steps, which in addition to the vision and strategic goals, provide for undertaking of an assessment of marine and coastal properties and pressures including a socio economic analysis, development of ecological objectives, operational objectives and respective indicators, development of good environmental status and targets, the monitoring programmes that takes into account the agreed indicators, as appropriate and finally to undertake the necessary management measures and programmes to achieve Good Environmental Status. Moreover, the UNEP/MAP – Barcelona Convention 5 year Programme of Work adopted at the Contracting Parties meeting in Marrakesh in 2009, considers EcAp as its over-arching priority cutting across its six thematic areas (UNEP-MAP 2012).

A project funded by the European Union and UNEP/MAP is ongoing since 2009 for supporting the implementation of the first steps of the roadmap in particular the completion of the integrated ecosystems assessment; development of 11 ecological objectives, operational objectives and corresponding indicators; a timeline; as well as taking initial steps to design a common methodology for determination of GES and targets (UNEP-MAP 2012).

Definition of overarching objectives and targets

The Barcelona Convention is playing a relevant role on the application of the “Ecosystem Approach” in the Mediterranean waters, as agreed by the Conference of the Parties in 2008 (Decision IG17/6), being aimed at achieving GES in the Mediterranean Sea by 2020 (UNEP-MAP 2012).

Parties agreed that the ecological vision of the Ecosystem Approach to be realized through the following strategic goals (UNEP-MAP 2012):

1. To protect, allow recovery, and where practicable, restore the structure and function of marine and coastal ecosystems – thus also protecting marine biodiversity – in order to achieve and maintain good ecological status allowing for sustainable use.
2. To reduce pollution in the marine and coastal environment so as to ensure that there are no significant impacts or risks to human and/or ecosystem health and/or on the uses of the sea and the coasts.
3. To preserve, enhance, and restore a balance between human activities and natural resources in the sea and the coasts and reduce their vulnerability to risks.

The implementation of the Ecosystem Approach (EcAp) on the management of human activities that may affect the marine and coastal environment in the Mediterranean was launched with Decision UNEP(MED)IG in January 2008. Following this decision EcAp was identified as the overarching principle for all Barcelona Convention/UNEP/Map activities and 11 Ecological Objectives (EOs), covering 28 Operational Objectives, and 61 Indicators were agreed on (UNEP-MAP 2012).

It is then clear that the overall objective of the Barcelona Convention and EcAp is conceptually very close to the MSFD, but it covers a much more heterogeneous region covering all the Mediterranean Sea countries. The main aim is to achieve GES, with the same temporal objective (2020). Therefore, the overarching target of UNEP-MAP EcAp is to achieve GES in the Mediterranean Sea applying an Ecosystem Approach.

Within the context of EcAp, “environmental status” means the overall state of the environment in marine waters, taking into account the structure, function and processes of the constituent marine ecosystems together with natural physiographic, geographic, biological, geological and climatic factors, as well as physical, acoustic and chemical conditions, including those resulting from human activities inside or outside the area concerned.

The definition of GES means the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations.

Definition of indicators

Under the context of UNEP-MAP EcAP, an indicator is a parameter chosen to represent (indicate) a certain situation or aspect and to simplify a complex reality. In this context, indicators are specific attributes of each GES criteria that can be measured to make such criteria operational and which allow subsequent change in the attribute to be followed over time.

The draft EcAp COP decision proposes a list of GES and Targets, next to a process to achieve by COP19 (2015) an integrated Mediterranean Monitoring and Assessment Programme. For this Integrated Monitoring and Assessment Programme the necessary first steps to be carried out during upcoming years are reaching agreement among Contracting Parties on a short list of knot targets/common indicators, with associated thresholds and baselines, while also addressing related data-management needs. In addition, methodologies will need to be drawn up to ensure the successful adoption of selected indicators and targets by the end of 2015.

Regarding knot targets/common indicators, it is important to note that other Regional Seas Conventions (RSCs) have defined common or core-indicators. The EcAp process on the other hand has for the time being focused on knot targets envisioned as measurable and concrete. Based on discussions at the last EcAp CG Meeting the UNEP-MAP Secretariat is thus studying possible bases of agreement both for some knot targets (which, if monitored, could assess different indicators and/or ecological objectives) as well as for common indicators (which could be applied through the whole Mediterranean region). Subsequently, the Contracting Parties will have the chance to discuss and agree on key knot targets/common indicators and matching baselines/thresholds, later in 2014.

Indicators, GES and targets of seven EOs covering main threats have been developed within the EcAp process under the overall guidance of the EcAp coordination Group (EcAp CG) and through expert level discussions in the Correspondence Groups on GES and Targets (COR-GEST groups) and are expected to be approved by COP18. However, the remaining four EOs regarding fishing, marine food webs, seafloor integrity and marine noise require further work and are therefore not currently covered by the integrated UNEP/MAP list of Mediterranean Good Environmental Status.

The GFCM has been involved in the process of developing and defining indicators, targets and GES related to biodiversity and fisheries, and is expected to contribute with information on data-availability and scientific progress. This process has led to a draft table of indicators, GES and targets related to fisheries and marine food webs, but the COR-GEST meeting of the second sub-cluster group on Biodiversity and Fisheries (during the SPA Focal Points meeting in Rabat, 2 July) recommended to consider the work done so far on EO3 as preliminary and to refine it jointly with GFCM. Due to the high environmental impact of fisheries in the Mediterranean EOs 3 and 4 related to fisheries and marine food webs would need to be included in the Integrated Monitoring and Assessment Programme of EcAp as early as possible.

The MedSuit project is (similarly to the planned Adriatic EcAp project, which will test all the agreed common indicators/knot-targets on a sub-regional basis) an important contribution to the feasibility assessment of targets/indicators related to EO3. UNEP-MAP and GFCM are committed to ensure that the outcomes of MedSuit project can feed into the EcAp process in a

timely manner and that discussion on EO3- in relation to agreement on common indicators (max 3-4) and/or knot targets is possible also during the discussion in the upcoming EcAp expert level groups (COR-GEST in Feb/March and COR-MON between April-June).

Other EOs that have a direct relation to fisheries are the following: EO1 regarding biodiversity (the conservation of special habitats as well as mitigation of by-catch of birds, cetaceans and marine reptiles); EO2 regarding invasive (the reduction of invasive species introduced via aquaculture); EO9 regarding contaminants (Testing the levels of known harmful contaminants in major types of seafood); and EO11 regarding marine litter (with a specific link to fisheries with fishing for litter initiatives).

GFCM and UNEP-MAP EcAp initiative have inter alia taken into account the indicators that have been recommended by Commission Decision 2010/477/EU in the context of the MSFD as a priority for the development of the Integrated Monitoring and Assessment Programme of EcAp.

In order to ensure coherent work and that the work of the GFCM fully feeds into the EcAp process, it is important to look in more detail at the indicator “3.1.4. Ratio between catch and biomass index (hereinafter catch/biomass ratio)” that has the GES “The catch/biomass ratio allows to recover the stock or to maintain it at a level where it can produce the Maximum Sustainable Yield (MSY)” with the following remark: “This ratio can be calculated only if regular sampling programmes and surveys at sea are carried out by the countries” (the remark about landings and discards it also worth considering). This point has no target yet, although it should be noted that the “negative trend” target is suggested by the GFCM in the table presented on February. As the remark states, it might currently be difficult to use this indicator on the level of the entire Mediterranean, but, as the Commission Decision 2010/477/EU underlines the importance of this indicator, it would nevertheless be good to develop the target so that the indicator can be operable in the near future in at least some GSAs.

Further, the indicator “3.1.2 Fishing mortality” with the GES “Fishing mortality in the stock does not exceed the level that allows MSY ($F \leq F_{MSY}$)” and the target “ $F_{0.1}$ ” is recommended by the Commission Decision 2010/477/EU and the development of the definition of the target, as well as the implementation of monitoring should be a priority.

Further, the operational objective “3.2 The reproductive capacity of stocks is maintained” with its indicators “3.2.1 Age/size structure determination (where feasible)” and “3.2.2 Spawning Stock Biomass (SSB)” and their respective GES are both suggested by the GFCM as a priority for development, based on recommendations by the Commission Decision 2010/477/EU. The indicator regarding Spawning Stock biomass is currently without target, and we feel that the development of a target, as well as research on its feasibility, is immensely important. In this case too it should be noted that the target $SSB > B_{thr}(2 \times B_{lim})$ is suggested by the GFCM in the table presented on February.

EO4 regarding marine food webs still needs development and defining of targets and species and some indicators suggested by GFCM (see section 4.3) may contribute to this EO as well.

Definition of reference points (targets, thresholds, limits)

Regarding baselines/thresholds the Secretariat of the Barcelona Convention is looking at previous work of UNEP-MAP, as well as the practice of other RSCs, international and regional bodies as possible bases for agreement, to be discussed together with the debate on possible knot-targets and/or common indicators, as of starting early 2014 at the first Coordination Group Meetings on GES and Target (COR-GEST).

Under the context of UNEP-MAP, a target is a qualitative or quantitative statement on the desired condition of the different components of, and pressures and impacts on, marine waters in respect to each marine region or sub-region. A target expresses 'where we want to be' or 'what we want to achieve' that will attain or contribute towards reaching GES. In a context of planning and management based on the ecosystems approach paradigm, it would be useful to apply the DPSIR framework, where D = drivers (human activities) lead to P= pressures (emissions, fish captures), that change S = State (of the environment), and result in I = impacts (pollution, health related issues, erosion). Such impacts are counteracted by R = Responses (policy, conventions, regulations), which aim to control Drivers.

In Addition, knot-targets are those targets which are key importance, as meeting them may benefit many of GES descriptions, possible even in multiple Eos.

Definitions of operational objectives

The draft EcAp COP decision proposes a list of GES and Targets, next to a process to achieve by COP19 (2015) an integrated Mediterranean Monitoring and Assessment Programme. For this Integrated Monitoring and Assessment Programme the necessary first steps to be carried out during the biennium are reaching agreement among Contracting Parties on a short list of knot targets/common indicators, with associated thresholds and baselines, while also addressing related data-management needs. In addition, methodologies will need to be drawn up to ensure the successful adoption of selected indicators and targets by the end of 2015.

At the same time, it will need to be ensured, that those ecological objectives and/or indicators which were not found mature enough to be part of the current draft EcAp COP decision's integrated GES and targets list, will not be left behind either and that scientific developments, work of other international, regional bodies will be able to be reflected and incorporated in the EcAp process, with the possibility to re-visit the list of indicators, GES and targets with these relevant updates in 2015. The Secretariat is currently in the process of analysing possible knot targets/common indicators, thresholds and baselines, proposed methodologies, for discussion with Contracting Parties through a participatory process, starting in early 2014.

The integrated list of Mediterranean Good Environmental Status containing the targets and GES of the seven mature EOs was recently adopted by COP18 (3-6 December 2013), while further work is already planned, as laid out in the information document on EcAp process for 2013-2014 on identifying/refining common indicators and knot targets.

In order to insure coherence and consistency of the development and monitoring of all EOs, the immediate development of a small set of common indicators regarding fisheries has started in coordination with GFCM. Nevertheless, the remaining targets, GES and indicators

should not be left behind, and depending on their feasibility and informative value they could be developed and implemented at a later stage.

The GFCM agreed on continuing joint work to define the EcAp GES and targets and refine the definition of indicators for EO3, so that these are more aligned with the monitoring that the GFCM currently employs for the management of sustainable fisheries as well as with the guidelines established in the MSFD. In the framework of the project MED-SUIT, an 18-months GFCM pilot-project in the Adriatic funded by the Italian government, some of the fisheries targets (or their associated GES and indicators) will be tested and developed. Meanwhile UNEP/MAP is planning to run a pilot project in the Adriatic sub-region in order to test indicators and targets of the seven EOs that were just endorsed at COP18.

These two initiatives present a very good opportunity for collaborative meetings to discuss and develop the links between fisheries, marine food webs and biodiversity and ensure the successful integration of outcomes. Aiming for adoption of fisheries related GES and targets by COP19, it is suggested to prioritize the development of four common indicators and to 1) discuss the feasibility of using these four indicators either in the entire Mediterranean basin or in several GSAs 2) focused testing of these indicators and targets through the pilot projects and 3) continue work of the Correspondence Groups on Monitoring (COR-MON) to review the feasibility of the suggested indicators.

UNEP-MAP is looking forward to participating in more collaborative meetings and evaluations of indicators, GES and targets together with the GFCM so as to exchange views on and develop links between fisheries, marine food webs and biodiversity, while making sure there is compatibility between developments of the GFCM and the EcAp process. At the same time differences in priorities and data-availability need to be taken into consideration – also in relation to the MSFD. More specifically UNEP/MAP suggests the joint development of a small set of indicators so that EO3 and 4 can be included in the updated list of indicators, GES and targets presented at COP19 in 2015, while further developing the remaining draft indicators and targets to be implemented in light of more data being available, and ensuring that indicators and targets from other EOs - but linked to fisheries - are implemented in the best possible way.

Based on the outcome of these discussions and based on already ongoing additional research work by the Secretariat of UNEP-MAP on relevant monitoring methodologies and practices of other RSCs, the Secretariat will prepare during the first half of 2014 a draft monitoring guidance, which will include the proposed knot-targets and/or common indicators, baselines/thresholds and relevant methodologies and data-management options.

This draft will be presented to the Coordination groups on Monitoring (COR-MON) and further discussed at the relevant EcAp expert and policy groups, with the aim of agreement on the core of the draft by mid-2015, as a basis for the future Integrated Monitoring and Assessment Programme.

Next to the need of further integration in order to draw up the Integrated Monitoring and Assessment Programme during the next biennium (as described above), there is also need to further address the less mature Ecological Objectives (EOs) and/or indicators, as highlighted by many of the Contracting Parties at the 3rd EcAp CorGr Meeting.

Seven Contracting Parties that are EU member states have the obligation to implement the Marine Strategy Framework Directive (MSFD, 2008/56/EC) the objectives of which are

similar with the objectives of the Barcelona convention and its Protocols and fully consistent with Decisions UNEP (DEPI)/MED IG 17/6 and IG. 20/4 on “The Application by the UNEP/MAP-Barcelona Convention of the Ecosystem Approach in the Mediterranean”. Moreover, the EU MSFD clearly establishes a role for regional seas. In this respect, the MSFD requires Member States to cooperate and is promoting cooperation with and through the Regional Seas Conventions and specifically the Barcelona Convention in the Mediterranean Region.

Tools for the scientific monitoring and data collection

UNEP-MAP recognises that data-availability and quality is an enormous challenge for the process of developing indicators, GES and targets for fisheries, and therefore the process of focussing on a smaller set of indicators in the short-term is thought to be necessary in order to apply the required precautionary approach. For data-limited stocks, available information should be used and advice should be given to the extent possible based on the same principles as applied for stocks with analytical assessments and catch forecasts. Moreover, besides the data collected by the GFCM, fisheries related monitoring is done through the EU Data Collection Framework (DCF) for the Common Fisheries Policy (CFP), which specifies 97 stocks in the Mediterranean and the Black Seas and by STECF, which currently provides management advice of about 30 stocks in the Mediterranean and Black Sea.

Additionally, European projects such as MEDISEH, MERMAID and CREAM are involved in gathering information and coordinating key players in fisheries management and research in order to achieve GES of EO3 in the Mediterranean by 2020.

Since the MSFD monitoring guidance document GES/20/2013/7 suggests combining the EU subsidized DCF monitoring and other fisheries related monitoring, for instance also MEDITS, with monitoring of other MSFD descriptors, there is huge potential to extent the application of data from fisheries monitoring to other EOs such as EO1, 4, 6 and 10.

GFCM definitions, terms and concepts

Introduction

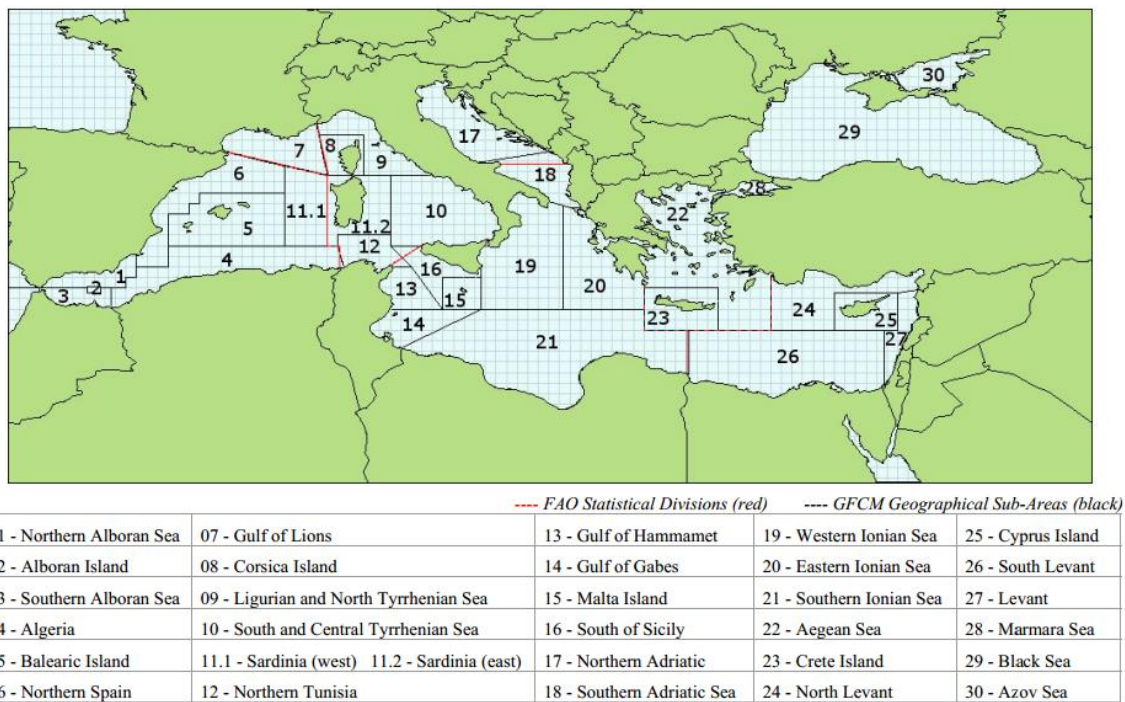
The organization entrusted with the management of Mediterranean and Black Sea marine resources is the GFCM. The objectives of the agreement establishing the GFCM are to promote the development, conservation, rational management and best utilization of living marine resources, as well as the sustainable development of aquaculture in the Mediterranean, Black Sea and connecting waters. The GFCM should develop coherent, effective and efficient precautionary management systems in line with the agreed principles of sustainability and able to take actions on the basis of target and safeguard reference points, either model based or empirical, as well as an associated system of decision control rules (GFCM 2012).

The GFCM is responsible for the sustainable management of exploited living marine resources in the Mediterranean and the Black Sea and connecting waters. These goals are to

be attained through agreement and cooperation among the 24 Members of GFCM, including all riparian Mediterranean States - with the exception of Bosnia Herzegovina - and the EU (Joint Research Agreement 2013).

Under GFCM, stock assessments are made by Geographical Sub-Areas (GSA) established as management units in 2001 and amended in 2009 (RESOLUTION GFCM/33/2009/2). The GSA delimitation is mainly based on practical considerations rather than on the stock distribution, and many stocks extend beyond the geographic limits of GSAs. However, although the concept of their delimitation still needs further consideration, the GSAs, as established by GFCM appear as the most appropriate subdivisions for stock assessments for management purposes in the Mediterranean Sea. They are also adopted for assessments at national level.

Figure 3. GFCM Geographical Sub-Areas (GSAs). Source: GFCM.



In coordination also with other Regional Fisheries Management Organizations, the GFCM is instrumental in coordinating efforts by governments to effectively manage fisheries at regional level following the FAO Code of Conduct for Responsible Fisheries. The GFCM has the authority to adopt binding recommendations for fisheries conservation and management in its Area of Competence and plays a critical role in fisheries governance in the region. For EU Member States the Common Fisheries Policy (CFP) applies along with the EU regulation 1967/2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea.

The GFCM agreement highlights the “diversity both of the multispecies fisheries and of the life-history traits of exploited stocks in the GFCM Area” and “the socio-economic importance of fisheries...” that need to be taken into account (GFCM 2012).

The GFCM seeks “to achieve its mandate by taking into account the exploited populations, the socio-economic components of the living resources exploitation and the environmental and ecological framework. The importance of incorporating ecosystem objectives into the management of sustainable marine fisheries is being promoted by the GFCM through: a) The use of indicators, performance measures and targets, and limit reference points for fisheries ecosystem management objectives; and b) The use of marine protected areas in combination with management tools and measures to achieve sustainable fisheries and marine ecosystems.” (Joint Research Agreement 2013).

Definition of overarching objectives and targets

The overall operational objectives of GFCM is the sustainability of fisheries, this is, to prevent overfishing of demersal and small pelagic fish stocks, maintain their stocks at levels that can produce the maximum sustainable yield (MSY) and to facilitate the restoration of stocks to historical levels. GFCM also aims to guarantee a low risk of stocks falling outside safe biological limits and to ensure protection of biodiversity to avoid undermining ecosystems structure and functioning (GFCM 2013). Fishing mortality must be kept below safe levels to ensure long-term high yields, while limiting the risk of stock collapse and guaranteeing stable and viable fisheries (GFCM 2012). There is also the need to ensure the sustainability of exploitation to generate benefit for both current and future generations (GFCM 2012).

However, the GFCM has not established a temporal framework and intermediate global objectives to advance towards its goal of sustainability of fisheries (like achieving GES in EU waters in 2020 in the MSFD), although its mandate and aims provide some directions to what the GFCM aims in terms of environmental sustainability and ecosystem health: To “promote the development, conservation, rational management and best utilization of living marine resources” and in the 2012 guidelines for management plans the main aim is “to develop coherent, effective and efficient precautionary management systems in line with the agreed principles of sustainability and able to take actions on the basis of target and safeguard reference points, either model based or empirical, as well as an associated system of decision control rules. Furthermore, in the recently amended GFCM Agreement the following objective has been defined under Article 4: *The objective of the Agreement is to ensure the conservation and sustainable use at biological, social, economic and environmental level of living marine resources, as well as the sustainable development of aquaculture in the Area of Application*”.

Definition of indicators

GFCM plays a key role in fostering the development of assessment on shared stocks between EU and non-EU countries also in cooperation with the FAO regional projects (ADRIAMED, Med-SudMed, CopeMed, EastMed). Thus, regular stock assessments are carried out by the working groups of the GFCM using the most appropriate methods taking into account data availability.

Several indicators are being used in GFCM assessments and documents related with yield (MSY, total catch, IUU catches, etc), fishing pressure and effort (fishing mortality, fishing

capacity, etc.), exploited stock abundance (acceptable stock size, safe biological limits, etc.) and status (mean body size, minimum landing size, etc.), and ecosystem-based approach indicators (MPAs, landings of vulnerable species, composition of the catch, etc).

Although the GFCM Scientific Advisory Committee has already developed indicators and reference points for exploited populations, the latter are mainly focused on single species reference points from a short list of commercial species. This is mainly attributed to: (i) the lack of operational criteria, as accompanied with references to applicable methodological standards for assessing the extent to which good environmental status (GES) of the Mediterranean Sea is being achieved, (ii) the previously absence of a cooperation mechanism with UNEP-MAP (Joint Research Agreement, 2013), and (iii) limitations of data available to the GFCM.

Definition of reference points (targets, thresholds, limits)

According to GFCM a reference point is “a conventional value of an indicator, either model based or empirical, which represents a state of the fishery or exploited fish stocks or stocks assemblage, and whose characteristics are considered to be useful for the management of the fisheries with respect, for example, to an acceptable level of biological risk or a desired level of yield. These values may be key fishing mortality rates (F), total mortality rates (Z), exploitation rate (E), biomass levels, catch rates and related fishing effort or other set of empirical indicators that are related to the maximum potential of a stock or group of stocks and that produce the highest sustainable catches and economic viability of fisheries. (GFCM 2012).

In terms of their use, reference points can be classified as Target, Threshold or Limit reference points (GFCM 2012; GFCM 2014d):

- Target reference point: a management objective based that points to a state of fishing and/or biological resource which is considered to be desirable. Target reference points should be set sufficiently far away from a limit reference so that the probability that the limits will be exceeded is low. The trajectory toward the target(s) may be represented either on a linear plot with a single target reference point or on a two dimension plot using two target reference points or on a multidimensional plot when more than two target reference points are used.
- Threshold reference point: a precautionary reference point expressed either as fishing mortality rate or a level of biomass or another agreed indicator. They are between the limit and target reference points and used to reduce the probability that the limit reference point will be exceeded. They serve as a red flag and may trigger particular management actions designed to reduce fishing pressure and mortality. After this point, pre-negotiated management measures to reverse the situation should be initiated. The threshold reference points in GFCM should be chosen by the SAC taking into account the uncertainties in the parameters estimations and, whenever scientifically possible, provide values that result in a 5% probability that the limit reference points will be reached.
- Limit reference point: a conservation reference point expressed either as a fishing mortality rate or level of biomass or another agreed indicator that indicates to a state of a fishery and/or a resource which is considered to be undesirable and which management actions should avoid

with high probability. After this point, pre-negotiated management measures to reverse the situation should be initiated.

Operational objectives

Within the context of the GFCM, multiannual management plans should be designed to counteract and prevent overfishing, while providing high long-term yields and maintaining, to the extent possible, the stocks size of harvested species at levels which can produce the maximum sustainable yield and with a low risk of stocks falling outside safe biological limits (GFCM 2012).

Management plans should include management scenarios that may evaluate, as appropriate, different measures including: a) Fishing gear selectivity, fishing effort regulation, and/or spatio-temporal closures with their time frame of implementation; b) The probability and timeframe for the recovery of the stock(s) based on adequate reference points; and c) the socio-economic impacts on fishing activities (GFCM 2012).

The general objectives of a management plan adopted should be attained on the basis of specific target reference points and, whenever possible and appropriate, on the basis of thresholds and/or limit reference points, to be chosen along with a range of management actions on a case by case basis depending on the available scientific and socio-economic advice by the SAC (GFCM 2013).

Fisheries management measures need to be revised and adapted to the evolution of both the state of exploited stocks and of the scientific knowledge and an appropriate method to this end should be established (GFCM 2012).

The specific objective may be to keep, with high probability, and throughout an accepted range of management actions and associated timeframe for their implementation, the fishing mortality and/or the exploitation rate and/or levels of biomass on the most relevant key stock(s) at levels able to deliver long-term high yields while reducing the risk that stock sizes fall below minimum biological acceptable level in order to avoid undermining their production potentials. The key stock(s) may be chosen taking into account in a proportionate manner either the catch composition and/or the economic value as well as, whenever appropriate, the vulnerability of stock(s) (GFCM 2013).

The multiannual management plans should consider both a reduction of fishing pressure and an improvement of the protection of juveniles, for example through marine protected areas (Fisheries Restricted Areas) (GFCM 2013). Management plans at Mediterranean level should therefore address both the fishing effects and other anthropogenic and non-anthropogenic effects (GFCM 2013).

Precautionary management systems should be in line with the agreed principles of sustainability and able to take actions on the basis of target and safeguard reference points, either model based or empirical, as well as an associated system of decision control rules. (GFCM 2012).

Where SAC advice indicates that the specific targets of the multi-annual plan are not being met the GFCM should decide a revision of management measures to ensure the sustainable exploitations of the stock(s) (GFCM 2012).

The importance of incorporating ecosystem objectives into the management of sustainable marine fisheries is being promoted by the GFCM through: a. The use of indicators, performance measures and targets, and limit reference points for fisheries ecosystem management objectives; and b. The use of marine protected areas in combination with management tools and measures to achieve sustainable fisheries and marine ecosystems.” (Joint Research Agreement 2013).

Contracting Parties and Cooperating non-contracting Parties of the GFCM (CPCs), whose vessels carry out fisheries in the GFCM Area, agreed to cooperate with a view to gradually develop and implement, whenever advisable, multi-annual management plans for the fisheries concerned and in accordance with these guidelines. Such guidelines should not affect the possibility for CPCs to develop their own multiannual management plans, provided that objective and measures therein are not less strict or in contradiction with GFCM measures (GFCM 2012).

As appropriate, the GFCM and its CPCs should, individually and collectively, engage in capacity building efforts and other research cooperative activities to improve knowledge on fisheries and exploited stocks and to support the effective implementation of these guidelines including, as adequate, entering into cooperative arrangements with other appropriate international frameworks (GFCM 2012).

The role of observers on board would be important for the quantification of the level of discards and by-catch (GFCM 2013). Some concerns have been raised regarding the negative impact of bottom trawlers on habitat (GFCM 2013).

Tools for the scientific monitoring and data collection

Within the GFCM mandate a series of stocks are assessed on an annual basis. The data, results including stock status and advice produced by scientists are gathered in Stock Assessment Forms (SAFs) which are data files managed and stored within the GFCM Information System. SAFs prepared by scientist from Mediterranean countries are reviewed by the Scientific Advisory Committee (SAC) of GFCM through its Sub-Committee on Stock Assessment (SCSA) with the view of assessing the stocks status and proposing management recommendations for the consideration and eventual adoption by the Commission (UNEP-MAP 2013). Every year or every two years, a series of commercial species are being assessed by the GFCM Members.

The number of stocks assessed by GFCM has recorded an important increase in recent years, with around 40 stocks being assessed in the last two years. Overall, validated assessment of stock status is available for around 80 stocks (although stock identification is an issue that difficult estimating the exact number of unique stocks assessed). Nevertheless, the characteristics of Mediterranean fisheries (high diversity of commercial species and multispecific fleets) imply that the existing number of stock assessment covers a small percentage of the total catch in Mediterranean and Black Sea fisheries.

The GFCM Priority Species includes Fishes: 39, Molluscs: 6 and Crustaceans: 6

FISHES	<i>Pagellus erythrinus</i>
<i>Acipenser gueldenstaedtii</i>	<i>Pomatomus saltatrix</i>
<i>Acipenser stellatus</i>	<i>Psetta maxima</i>
<i>Acipenser sturio</i>	<i>Raja alba</i>
<i>Auxis rochei</i>	<i>Sarda sarda</i>
<i>Boops boops</i>	<i>Sardina pilchardus</i>
<i>Coryphaena hippurus</i>	<i>Sardinella aurita</i>
<i>Engraulis encrasicolus</i>	<i>Scomber scombrus</i>
<i>Euthynnus alletteratus</i>	<i>Solea solea</i>
<i>Huso huso</i>	<i>Sprattus sprattus</i>
<i>Katsuwonus pelamis</i>	<i>Squatina squatina</i>
<i>Lophius budegassa</i>	<i>Thunnus alalunga</i>
<i>Lophius piscatorius</i>	<i>Trachurus mediterraneus</i>
<i>Merlangius merlangus</i>	<i>Trachurus trachurus</i>
<i>Merluccius merluccius</i>	<i>Anguilla anguilla</i>
<i>Micromesistius poutassou</i>	<i>Isurus oxyrinchus</i>
<i>Mullus barbatus</i>	<i>Lamna nasus</i>
<i>Mullus surmuletus</i>	<i>Prionace glauca</i>
<i>Orcynopsis unicolor</i>	<i>Thunnus thynnus</i>
<i>Pagellus bogaraveo</i>	<i>Xiphias gladius</i>
MOLLUSCS	CRUSTACEANS
<i>Eledone cirrosa</i>	<i>Aristaeomorpha foliacea</i>
<i>Eledone moschata</i>	<i>Aristeus antennatus</i>
<i>Loligo vulgaris</i>	<i>Nephrops norvegicus</i>
<i>Octopus vulgaris</i>	<i>Palinurus mauritanicus</i>

<i>Pecten jacobaeus</i>	<i>Parapenaeus longirostris</i>
<i>Sepia officinalis</i>	<i>Palinurus elephas</i>

The GFCM has also a specific data requirement in force since 2010, the Task 1 data submission protocol that all its members must comply with. Task 1 includes protocols and standards for qualitative and quantitative data notification/submission by its Members regarding fishing capacity by fleet segment (Task 1.1), fishing activity descriptors and resources exploited by Operational Units (Task 1.2), economic parameters by fleet segment (Task 1.3), catch, effort (Task 1.4) and biological information of the catch (Task 1.5) by operational unit and fishing period.

However, data availability is still scarce and thus GFCM Members and cooperating non-Members endeavour to improve the implementation of data collection and provision to the SAC. For this purpose a new framework for data collection and submission is being elaborated (GFCM 2014a, 2014b).

In relation to the lack of validated assessment for some stocks, the Secretariat of the GFCM highlights that a precautionary management plan, including necessary actions to improve knowledge on the status of the stocks could be developed in order to prevent the risk of endangering the stocks and the fisheries (GFCM 2013).

Comparison of the three frameworks

After the revision of the three frameworks by the EC - MSFD, UNEP-MAP with EcAp and GFCM, a conceptual comparison of these three frameworks identifying commonalities and differences, and highlighting missing elements in each framework, has been produced below.

Table. Conceptual comparison of the three frameworks by EC-MSFD, UNEP-MAP EcAp and GFCM.

Comparison	EC MSFD	UNEP-MAP EcAp	GFCM
(a) Overall aims	Implement an Ecosystem approach to management of human activities impacting European Seas	Implement an Ecosystem approach to management of human activities impacting the Mediterranean	Achieve the sustainability of fisheries by preventing overfishing of demersal and small pelagic fish stocks, maintain their stocks and facilitate the restoration of stocks to historical levels in the Mediterranean and the Black Sea
(b) Geographic framework	28 European Member states	Contracting Parties to the Barcelona	22 Mediterranean and Black Sea riparian states

(<u>common states underlines</u>)	(Austria, Belgium, Bulgaria, <u>Croatia</u> , <u>Cyprus</u> , Czech Republic, Denmark, Estonia, Finland, <u>France</u> , Germany, <u>Greece</u> , Hungary, Ireland, <u>Italy</u> , Latvia, Lithuania, Luxembourg, <u>Malta</u> , Netherlands, Poland, Portugal, Romania, Slovakia, <u>Slovenia</u> , <u>Spain</u> , Sweden, United Kingdom) and the <u>European Union</u> .	Convention: 21 Mediterranean, riparian countries (Albania, Algeria, <u>Cyprus</u> , <u>Croatia</u> , Bosnia & Herzegovina, Egypt, <u>France</u> , <u>Greece</u> , Israel, <u>Italy</u> , Lebanon, Libya, <u>Malta</u> , Morocco, Montenegro, Monaco, <u>Slovenia</u> , <u>Spain</u> , Syria, Tunisia and Turkey) and the <u>European Union</u> .	(Albania, Algeria, Bulgaria, <u>Croatia</u> , <u>Cyprus</u> , Egypt, <u>France</u> , <u>Greece</u> , Israel, <u>Italy</u> , Lebanon, Libya, <u>Malta</u> , Monaco, Montenegro, Morocco, Romania, <u>Slovenia</u> , <u>Spain</u> , Syria, Tunisia, Turkey), Japan, and the <u>European Union</u> .
(c) Final targets	Achieve Good Environmental Status	Achieve Good Environmental Status	Sustainability of fisheries at basin scale
(d) Temporal target and roadmap	MSFD roadmap with temporal overall targets to 2020	EcAp Roadmap with temporal overall targets to 2020	There is no temporal target or intermediate objectives
(e) Operational targets	Each Descriptor is linked with indicators to achieve GES in each Member state, but GES definition is heterogenic and definitions differ by country	Each Ecological Objective (EO) is linked with operational objectives and indicators to achieve GES, still under definition	Implementation of management plans that ensure sustainability of selected fisheries, in groups of countries for shared stocks
(f) Indicators	11 Descriptors organised in indicators to assess GES (1-Biological diversity. 2-Non-indigenous species, 3- Population of commercial fish / shell fish, 4- Elements of marine food webs, 5- Eutrophication, 6- Sea floor integrity,	11 Ecological Objectives (EO) organised in common indicators to assess GES (1- Biological diversity is maintained; 2- Non-indigenous species do not adversely alter the ecosystem; 3- Commercially exploited fish and	Stock assessment indicators in place although there are several data-limited stocks so there is a need to develop alternative methods. Ecological indicators to be established

	7-Alteration of hydrographical conditions, 8- Contaminants, 9- Contaminants in fish and seafood for human consumption, 10-Marine litter, 11- Introduction of energy, including underwater noise)	shellfish are within biological limits; 4- Alterations of marine webs do not have long term adverse effects; 5- Human-induced eutrophication is prevented; 6-Sea-floor integrity is maintained; 7- Alterations of hydrographic conditions does not affect ecosystems; 8- Natural dynamics of coastal areas are maintained and natural coastal habitats are not degraded or lost due to human activities; 9-Contaminants cause no significant impact; 10-marine litter does not affect ecosystems; 11-, noise causes no impact.	
(g) Reference levels	Levels, targets and limits to be defined by each country, under revision after first assessment by the EC	Levels, targets and limits to be defined by the expert groups and to be commonly applied to all Contracting Parties	Levels, targets and limits to be defined by the SAC, following approved guidelines, are under discussion for commercial stocks
(h) Indicators for fisheries	Descriptor 3 with 3 criteria and 8 primary and secondary indicators	To be defined in collaboration with GFCM and approve by Contracting Parties	To be defined by Secretariat and approved by SAC
(i) Data collection	European Data Framework Collection in place and Member state mechanisms to be	Aiming to prepare and implement a cost effective integrated monitoring programme in	Task 1 data collection in place, a new GFCM Data Framework Collection being implemented with the aim to improve data

	further developed. Possible collaboration with Regional Seas Conventions and international organizations.	collaboration with European Data Framework Collection and Member state mechanisms.	availability
(j) Monitoring mechanisms	To be implemented by the Member states. JRC to collect and harmonize the data.	To be implemented by the Member states and international organizations (e.g. GFCM, ICCAT)	To be implemented by the Member states.
(k) Compliance mechanisms	In place to persecute infringements	In place a compliance committee with a consultancy/supportive role	Committee of Compliance responsible to oversee the compliance of Members with existing recommendations
(l) Harmonization mechanisms	RSC participate in definition of indicators by descriptor (OSPAR, HELCOM). ICES is working on Descriptor 3. Not clear harmonization of tools, definitions and targets.	Collaboration with RSC, and starting collaboration with international organizations (e.g. FAO, GFCM, BSC, ICATT, ACCOBAMS, IUCN).	Starting collaboration with UNEP-MAP EcAp, and with EC MSFD framework. Internal mechanisms clear but less flexible for Member states.
(m) Regional cooperation	Participation in RSC. Mechanisms in motion to strengthening regional cooperation within EU, third countries and international organizations (e.g., ICES, GFCM)	Collaboration with RSC in place, establishment of collaborations with international organizations (e.g. FAO, GFCM, BSC, ICATT, ACCOBAMS, IUCN).	Annual Scientific Meetings and 11 memoranda of understanding signed with other organizations, to strength regional cooperation. For the purpose of GES definition, starting collaboration with UNEP-MAP EcAp, and with EC MSFD framework.

(a) **Overall aims:** The overall aims of EC-MSFD and UNEP-MAP EcAp are very similar, only differing on the regional applicability of the concept of the Ecosystem approach to

management of human activities impacting. The overall aim of GFCM is more concrete and focusses on achieving sustainable fisheries in its regional scale.

(b) **Geographic framework:** The three frameworks include a large range of parties involved, EC-MSFD with 28 European Member states and the European Union, UNEP-MAP EcAp involving 21 Contracting Parties to the Barcelona Convention and the European Union and GFCM including 22 Mediterranean and Black Sea riparian states, Japan, and the European Union. The three frameworks shared 8 countries in common (Croatia, Cyprus, France, Greece, Italy, Malta, Slovenia and Spain) and the European Union.

(c) **Final targets:** The final target of EC-MSFD and UNEP-MAP EcAp refers to the whole Marine ecosystem, (Achieve Good Environmental Status), while GFCM is concerned only the part of ecosystem more related to fisheries (ensure sustainability of fisheries).

(d) **Temporal target and roadmap:** EC-MSFD and UNEP-MAP EcAp define a clear temporal target to achieve GES in 2020 and have established a general roadmap with specific dates. GFCM do not have a temporal target and only a roadmap through the gradual implementation of management plans but the main objective of the GFCM Agreement is for the long term.

(e) **Operational targets:** EC-MSFD has established several descriptors linked with indicators to achieve GES in each member state, UNEP-MAP EcAp has established 11 Ecological Objectives (EO) lined with operational objectives and indicators to achieve GES, while GFCM is in the process of establishing management plans with indicators and targets. The main difference is that while GFCM define target per fishery of shared stocks in groups of countries to achieve sustainability, EC-MSFD has let each Member state to define its target and thus definitions differ by country. UNEP-MAP EcAp is in the process of defining operational targets.

(f) **Indicators:** Each framework relies strongly in the definition and use of indicators. The definition of indicators is advanced under EC-MSFD (with a list of common indicators per Descriptor), while it is still being developed under UNEP-MAP EcAp (list of common indicators per EO) and is under discussion for stock assessment indicators in GFCM, although there are several data-limited stocks so there is a need to develop alternative methods. Ecological indicators to extend the context of commercial stocks to the general ecosystem need to be established within GFCM.

(g) **Reference levels:** Within the three frameworks there is a large discussion about reference levels, targets and limits. While EC-MSFD has left each Member state to define its reference levels and has recently evaluated the proposals received, UNEP-MAP EcAp is working on the establishment of common reference levels, as it seems to be the inclination of future work in GFCM.

(h) **Indicators for fisheries:** In the three frameworks there is explicit mention to fisheries indicators for commercial species. While EC-MSFD has established 3 criteria and 8 indicators (primary and secondary indicators, considering data available), UNEP-MAP EcAp and GFCM are in the process of establishing these indicators under a cooperation process (in which MedSUIT project is aiming to contribute).

(i) **Data collection:** EC-MSFD strongly relies on previous mechanisms to collect data by Member States (DFC and country initiatives) while each Member state has to further define the needs to collect data in the near future to achieve the MSFD requirements. The process to

follow by UNEP-MAP EcAp is not overall clear yet and will likely rely on collaboration with the European Union, RSC and international institutions. GFCM has a basic data collection framework that is now in the process of being revised and improved.

(j) **Monitoring mechanisms:** Regarding EC-MSFD there is general guidelines to start defining monitoring mechanisms by its Member States, similar to UNEP-MAP EcAp. GFCM relies on its Member states to establish sufficient monitoring mechanisms to report to GFCM.

(k) **Compliance mechanisms:** While EC-MSFD relies on existing mechanisms at EU scale to ensure compliance of Member States with the MSFD (e.g. the use of the European Fisheries Control Agency), UNEP-MAP and GFCM rely on the assessment of compliance prepared by ad hoc Committees (in the case of the GFCM the Compliance Committee), but leave monitoring control and surveillance to be carried out by Members. However, the recently amended GFCM Agreement is expected to enhance the capacity of the GFCM in terms of monitoring and controls, including through the possible establishment of a centralized satellite system to track down the activities of fishing vessels. This system could in the future become multifunctional. As in the case of the EU specialized Agencies EFCA and EMSA, the same systems and technologies have been used to monitor pollution as well as fishing activities.

(l) **Harmonization mechanisms:** This seems to be a very important topic for the three frameworks. EC-MSFD is clear in its will and need to establish harmonization mechanisms within Member states. This is one of the main points made in April 2014 during the first evaluation of the EC to the Marine Strategies presented by Member States in 2012. However, clear mechanisms are not clearly established within the MSFD framework yet. UNEP-MAP EcAp and GFCM are also discussing mechanisms to harmonize their actions within and between frameworks, although this is still an open point in the agendas of both institutions. Both frameworks have a clear need to harmonize their efforts with regional and international organizations.

(m) **Regional cooperation:** The need to activate initiatives to promote regional cooperation of the three frameworks is also frequently highlighted within each context. The participation in discussions with RSC, the European Commission and international organizations both from the Mediterranean and the Atlantic seems to be of first priority although a step forward has been made by GFCM when signing 11 Memoranda of Understanding, which are mechanisms relied upon to make regional cooperation operational.

Integrated proposal for GFCM

After the summary of information from the three frameworks has been presented, and a conceptual comparison has been developed, in this third part of the report a proposal with recommendations for GFCM is presented. This proposal takes into account all the information previously presented and the opportunity given under the cooperation project MedSuit to advance on the capabilities of GFCM framework to meet the regional challenges and international requirements advancing towards GES. MedSuit aims at facilitating the assessment of the environmental status of the Mediterranean and Black Sea to obtain the objectives under the MSFD, the UNEP-MAP EcAp Initiative and the UN Regular Process for the global assessment of the marine environment (Joint Research Agreement 2013).

The achievement of (or move towards) GES regarding commercial stocks and exploited ecosystems by 2020 seems the most logical global target to discuss within the GFCM context. Previously, the GFCM may move towards a global evaluation of Mediterranean commercial stocks and exploited ecosystems to establish a logical general baseline, and may quantify how many commercial stocks are currently evaluated to establish future targets.

Since data available at the stock level in the Mediterranean Sea is scarce, this process would imply the discussion and application of the new framework for data collection within GFCM and methods appropriate for data-limited stocks. Another important topic to tackle is the amount of IUU present in the Mediterranean region and how this affects the indicators using fisheries dependent data.

It is also logical to propose the need to define clear indicators, both from stock assessment analysis to inform on the health of commercial stocks, and from community and ecosystem level analysis to inform on the status of exploited ecosystems. Since both the MSFD and UNEP-MAP EcAp are building their evaluation strategies on using a series of indicators, the GFCM indicators could be defined in an harmonized way with the other two frameworks, so the Member states participating in the three frameworks can calculate the indicators once, and report to each framework in a cost-effective and efficient manner.

To start the discussion within the GFCM about the possibility to use a harmonized indicator framework, a first proposal of indicators has been conceptualized within this first report of MedSUIT. The table in annex 2 presents a preliminary proposal presented to UNEP-MAP EcAp in March 2014 and to SAC experts in April 2014, and that has to be discussed by the expert groups in SAC. This table includes indicators to be derived from stock assessment analysis and also ecological indicators to be calculated using both fisheries-dependent and independent data. Since eight countries participating to the GFCM are also participating to the MSFD and UNEP-MAP EcAp, data requirement to accomplish both types of indicators seems feasible for this first group of countries. In addition, a minimum list of indicators to be calculated by all the Member states participating at the GFCM could be discussed within SAC. These indicators are mainly dedicated to Descriptor 3 (MSFD) or Ecological Objective 3 (UNEP-MAP EcAp) regarding the exploitation of commercial fish, but are also including elements of food webs and biodiversity from other descriptors of MSFD and ecological objectives of UNEP-MAP EcAp.

Regarding ecological indicators, it is important to note that these are essential to move towards an ecosystem based evaluation of marine fisheries in the Mediterranean and Black Sea region, while taking into account the interaction of commercial species with other species and with the environment. Therefore, and even though these indicators may be more difficult to establish as default indicators at the beginning, data requirements and knowledge is already available to compute these indicators and, if harmonization with other frameworks needs to be achieved, these indicators should be given full consideration.

Taking all the above into account, the following steps to move towards a harmonization of the three frameworks and facilitate the assessment of the environmental status of the Mediterranean and Black Sea led by GFCM are proposed:

1-A case study should be developed to test the proposed indicators and identify main data and monitoring requirements. This case study should include EU and non-EU Member states to test how differences in data availability and monitoring capabilities can affect the capability to calculate common indicators, and how the utilization of different indicators deliver different results in terms of the status of commercial stocks and the exploited ecosystem.

MedSuit project aims at advancing by focusing on concrete case studies. Within the Mediterranean Sea four sub-regions, three of them, namely, the Western Mediterranean Sea, the Adriatic Sea, the Ionian Sea and the Central Mediterranean Sea are of specific interest for the Italian Ministry of Environment. Within the GFCM area of competence, candidate areas are in particular focused on the Adriatic Sea and, as appropriate, the Strait of Sicily, where exploitation of marine living resources is shared by several EU and non-EU Member states. Both areas also include several ecosystems of special interest, due to high biological diversity and/or to a number of characteristic hydrodynamic features.

2-The case study should be presented to all GFCM members for evaluation, and if the evaluation is positive, a procedure to extend the calculation of the indicators to other GFCM members should be established;

3-A final target, temporal target and roadmap within GFCM should be defined with the objective to (a) produce a first baseline evaluation of the status of Mediterranean marine stocks and exploited ecosystems, (b) establish a temporal procedure on how to advance towards the final target, and (c) define how to establish cost-efficient and effective collaborations with the other regional and international institutions and initiatives in the region;

4-In the medium-term, an Ecosystem Approach to Fisheries Working Group could be established within the GFCM umbrella. This group could revise the evaluation of the status of Mediterranean marine stocks and exploited ecosystems regularly using the set of indicators approved by SAC, could report to other regional and international institutions and initiatives (e.g. UNEP-MAP EcAp, IndiSeas international project), and could collaborate with the EAF WGs established within the EC-JRC and within ICES umbrellas to create synergies and exchange information.

Conclusions

The three existing frameworks compared in this report present several similarities, but also important differences. This poses challenges to the implementation of the three frameworks in a harmonized way within the GFCM area of competence, but also creates important opportunities for collaboration and harmonization of efforts, resources and results.

The GFCM is in a key position to be a major player in the process of the assessment of the environmental status of the Mediterranean and Black Sea by creating bridges with other institutions and establishing synergies that are essential to render the process productive, cost-efficient and effective. To become a key player, the GFCM should establish a clear overall conceptual and temporal target and a specific roadmap to lead the evaluation of the status of commercial stocks and exploited ecosystems in its area of competence.

Annex

Annex 1. An informative list on MSFD parameters and proposed indicators that can relate to monitoring parameters of the CFP (JRC 2012).

Ref. num.	CFP PARAMETER	Relevant MSFD parameter of Annex III	Relevant MSFD indicator
1	Share in unsorted landings for species and areas referred in COM DEC 2010/93/EC Chapter III B1	3, 5	1.1.1, 1.2.1, 1.7.1, 2.2.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.1, 4.3.1
2	Length distribution of species listed in Appendix VII in the catches	3, 4	1.3.1, 1.6.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 4.2.1
3	Average weight of discards of species listed in Appendix VII	3, 4	1.2.1, 1.6.1, 1.7.1, 2.2.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.1, 4.3.1
4	Length distribution of discards of species listed in Appendix VII	3, 4	1.3.1, 1.6.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 4.2.1
5	Age-reading of discards of species listed in Appendix VII	4	1.3.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2
6	Weight of catches of recreational fisheries for the species and areas referred in Appendix IV (1 to 5)	3	1.2.1, 1.7.1, 2.2.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.1, 4.3.1
7	Individual age of species listed in Appendix VII	4	1.3.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1
8	Individual length of species listed in Appendix VII	4	1.3.1, 1.6.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 4.2.1
9	Individual weight of species listed in Appendix VII	4	1.6.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.1.2, 3.2.1, 3.2.2, 4.2.1
10	Individual sex of species listed in Appendix VII		1.3.1
11	Individual maturity of species listed in Appendix VII		3.3.4
12	Individual fecundity of species listed in Appendix VII		1.3.1, 1.6.1
13	Wild salmon stocks in index rivers running to the Baltic Sea III b-d: Abundance of smolt, parr and ascending individuals	3, 5	1.2.1, 1.6.1, 1.6.2, 1.7.1, 2.2.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 4.3.1
14	Species (data from fisheries-independent research surveys)	11	1.7.1, 2.1.1, 2.1.2
15	Species length (data from fisheries-independent research surveys)	4	1.3.1, 1.6.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 4.2.1
16	Species abundance (data from fisheries-independent research surveys)	3	1.2.1, 1.6.1, 1.6.2, 1.7.1, 2.1.1, 2.2.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 2.2.1, 4.3.1
17	Individual age (data from fisheries-independent research surveys)	4	1.3.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1
18	Individual length (data from fisheries-independent research surveys)	4	1.3.1, 1.6.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 4.2.1

Annex 2. Proposal on the definition of Good Environmental Status and associated indicators and targets for commercially exploited fish and shellfish populations

19	Individual sex (data from fisheries-independent research surveys)		1.3.1
20	Individual maturity (data from fisheries-independent research surveys)		3.3.4
21	Catches of species (based on logbooks)	3, 5	1.1.1, 1.2.1, 1.7.1, 2.2.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.1, 4.3.1
22	Catches length (based on logbooks)	3, 4	1.3.1, 1.6.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 4.2.1
23	Catches abundance (based on logbooks)	3	1.2.1, 1.6.1, 1.6.2, 1.7.1, 2.2.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 4.3.1
24	Discards of species (based on observer trips)	3, 5	1.2.1, 1.6.1, 1.6.2, 1.7.1, 2.1.1, 2.2.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 2.2.1, 4.3.1
25	Discards length (based on observer trips)	3, 4	1.3.1, 1.6.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 4.2.1
26	Discards abundance (based on observer trips)	3	1.2.1, 1.6.1, 1.6.2, 1.7.1, 2.1.1, 2.2.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 2.2.1, 4.1.1, 4.3.1