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Report of the

**FAO WORKSHOP ON THE MANAGEMENT OF DEEP-SEA
FISHERIES AND VULNERABLE MARINE ECOSYSTEMS IN THE
MEDITERRANEAN**

Rome, Italy, 18–20 July 2016

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PREPARATION OF THIS DOCUMENT

This is the report of the FAO workshop on the management of deep-sea fisheries and vulnerable marine ecosystems of the Mediterranean, organized in collaboration with the General Fisheries Commission for the Mediterranean (GFCM), which took place at FAO headquarters in Rome, Italy, from 18 to 20 July 2016. In total, 30 participants attended the workshop in their individual capacities as regional experts on the subjects of deep-sea fisheries and benthic habitats of the Mediterranean.

The workshop was organized as part of the FAO Deep-sea Fisheries Programme that supports the implementation of the International Guidelines for the Management of Deep-sea Fisheries in the High Seas. These guidelines provide guidance to States and regional fisheries management organizations or arrangements (RFMO/As) to ensure the long-term conservation and sustainable use of marine living resources in the deep seas including preventing significant adverse impacts of fisheries on vulnerable marine ecosystems.

FAO. 2016.

Report of the FAO Workshop on Deep-sea Fisheries and Vulnerable Marine Ecosystems of the Mediterranean, Rome, Italy, 18–20 July 2016.

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ABSTRACT

The FAO Workshop on the Management of Deep-sea Fisheries and Vulnerable Marine Ecosystems in the Mediterranean took place from 18 to 20 July 2016 at FAO headquarters in Rome, Italy. The workshop was organized in close collaboration with the General Fisheries Commission for the Mediterranean (GFCM). The meeting addressed issues relating to the definition and management of deep-sea fisheries and vulnerable marine ecosystems (VMEs) in the Mediterranean, within the framework of the International Guidelines for the Management of Deep-sea Fisheries in the High Seas (2008). These guidelines provide guidance to States and regional fisheries management organizations or arrangements (RFMO/As) on the long-term conservation and sustainable use of marine living resources in the high seas. This includes preventing significant adverse impacts on VMEs by bottom-contact fishing gear. The meeting reviewed current global and regional practices on the management of deep-sea fisheries, and discussed relevant international processes and instruments related to deep-sea fisheries and VMEs. The workshop characterized deep-sea fisheries in the Mediterranean, reviewed the current GFCM management measures specific to deep-sea fisheries and biodiversity protection, and addressed specific issues related to VMEs (such as the use of VME indicator species lists and encounter protocols), with the aim of providing inputs to ongoing discussions within GFCM about required management measures to sustainably harvest deep-sea stocks and protect vulnerable habitats.

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ACRONYMS AND ABBREVIATIONS

ABNJ	Areas Beyond National Jurisdiction
AIS	Automatic Identification System
CBD	Convention on Biological Diversity
EAF	Ecosystem Approach to Fisheries
FRA	Fisheries Restricted Area
GFCM	General Fisheries Commission for the Mediterranean
SAC	General Fisheries Commission for the Mediterranean Scientific Advisory Committee on Fisheries
GSA	Geographical Sub-Area
IEO	Instituto Español de Oceanografía
IUCN	International Union for Conservation of Nature
IUCN-Med	International Union for Conservation of Nature – Mediterranean
MCS	Monitoring, Control, and Surveillance
MEDITS	International Bottom Trawl Survey in the Mediterranean
MPA	Marine Protected Area
NAFO	Northwest Atlantic Fisheries Organization
RFMO/A	Regional Fisheries Management Organization or Arrangement
SDG	Sustainable Development Goal(s)
SEAFO	South East Atlantic Fisheries Organisation
UNEP/MAP-RAC/SPA	United Nations Environment Programme Mediterranean Action Plan for the Barcelona Convention – Regional Activity Centre for Specially Protected Areas
UNFSA	United Nations Fish Stocks Agreement
UNGA	United Nations General Assembly
VME	Vulnerable Marine Ecosystem
VMS	Vessel Monitoring System

WORKSHOP ARRANGEMENTS AND OPENING SESSION

1. The Food and Agriculture Organization of the United Nations (FAO) Workshop on the Management of Deep-sea Fisheries¹ and Vulnerable Marine Ecosystems in the Mediterranean, organized in collaboration with the General Fisheries Commission for the Mediterranean (GFCM), took place from 18 to 20 July 2016 at FAO headquarters in Rome, Italy. Thirty experts from Mediterranean countries attended the meeting, in addition to representatives from Oceana, the International Union for Conservation of Nature – Mediterranean (IUCN-Med), UNEP/MAP-RAC/SPA², and staff of the FAO Fisheries and Aquaculture Department and the GFCM Secretariat. Appendix A of this report contains the full list of participants.

2. Ms Merete Tandstad, FAO Fishery Resources Officer, welcomed participants and recalled the several meetings organized by FAO on vulnerable marine ecosystems (VMEs) and deep-sea fisheries in other regions of the world, and noted the importance of this meeting dedicated to the Mediterranean Sea. Ms Tandstad also thanked the GFCM for their collaboration in organizing this workshop.

3. Mr Miguel Bernal, GFCM Fishery Resources Officer, thanked FAO colleagues and recalled the GFCM's commitment to managing deep-sea fisheries and protecting vulnerable marine habitats. Mr Bernal mentioned a recently adopted multi-annual management plan for deep-sea Mediterranean fisheries in the Strait of Sicily, and the several fisheries closures established by the GFCM to protect vulnerable ecosystems and fishery resources. He also informed the meeting about the newly adopted GFCM mid-term strategy (2017-2020) towards the sustainability of Mediterranean and Black Sea fisheries adopted by the Commission in May 2016, which included a specific output on the protection of VMEs.

4. Mr Bernal underlined the importance of the FAO workshop, which provided the opportunity to discuss such relevant issues with both Mediterranean and non-Mediterranean experts from other regional fisheries management organizations or arrangements (RFMO/As). He also recalled that the last session of the GFCM requested to organize an ad hoc meeting on VMEs during the intersessional period 2016-2017, and noted that the conclusions of the FAO workshop would be submitted to the next session of the GFCM Scientific Advisory Committee on Fisheries (SAC) in 2017.

5. Mr Othman Jarbouï, Chairperson of the GFCM SAC, was unanimously appointed Chair of the workshop. Mr Jarbouï welcomed participants while expressing his gratitude to FAO and GFCM for the invitation to participate in such an interesting joint initiative. He further recalled the significant progress made within the remit of the GFCM SAC, including early-stage discussions on the adoption of an encounter protocol for VMEs in Mediterranean fisheries.

6. The Chair introduced the agenda that was adopted with minor changes (as provided in Appendix B) and invited participants to briefly introduce themselves. Ms Jessica Fuller and Ms Aurora Nastasi (FAO and GFCM consultants) were appointed as rapporteurs, together with Mr Luis López-Abellán (Spanish Institute of Oceanography).

7. Ms Fuller briefly presented the main objectives and expected outputs of the workshop. In the last five years, FAO has conducted regional VME workshops of this nature, of which this workshop is the fifth in this series. These workshops were organized in collaboration with regional fishery bodies of the western central Atlantic, southeast Atlantic, North Pacific, Indian Ocean and now the Mediterranean. The workshop for the Mediterranean reviewed current global practices on the management of deep-sea fisheries, through relevant international processes and instruments such as the United Nations General Assembly (UNGA) resolutions and the FAO International Guidelines for the

¹ Note: Deep-sea fisheries for the Mediterranean Sea are here regarded as fisheries that use bottom contact gear or use deep pelagic trawls that fish on species associated with the sea floor between 400 m and 1 000 m (GFCM Recommendation 29/2005/1 prohibits the use of towed dredges and trawl nets beyond 1 000 m depth). Shallower fisheries may be considered if they also extend below 400 m. Much of what is discussed in deep-sea fisheries is also relevant to other fisheries (FAO Deep-sea Fisheries Guidelines, paras 8–11).

² United Nations Environment Programme Mediterranean Action Plan for the Barcelona Convention (UNEP/MAP) – Regional Activity Centre for Specially Protected Areas (RAC/SPA).

Management of Deep-sea Fisheries in the High Seas³ (hereafter, FAO Deep-sea Fisheries Guidelines). In doing so, the workshop will: i) present the VME concept and management of deep-sea fisheries; ii) compare VME and related management measures in the Mediterranean with other regions; iii) identify future requirements to establish measures to protect VMEs; and iv) support regional collaboration, and the collection and sharing of information.

8. The expected outputs of the workshop were foreseen to be an increased understanding of the global processes to manage deep-sea fisheries and VMEs; an improved understanding of FAO's initiatives on deep-sea fisheries and the Areas Beyond National Jurisdiction (ABNJ) Deep Seas Project⁴, of which the GFCM is a partner; and contributions to a framework that can assist GFCM in the management of deep-sea fisheries and VMEs.

SETTING THE SCENE: RELEVANT GLOBAL AND REGIONAL INSTRUMENTS AND MEASURES

9. Ms Tandstad presented international instruments relevant to deep-sea bottom fisheries, highlighting both binding and non-binding instruments such as the UNGA bottom fisheries resolutions, the FAO Deep-sea Fisheries Guidelines, the conservation and management measures and recommendations of RFMO/As, and other relevant processes such as the Convention on Biological Diversity (CBD), Sustainable Development Goals (SDGs)⁵, and the Convention on International Trade in Endangered Species of Wild Fauna and Flora, among others. The United Nations Convention on the Law of the Sea⁶ is the major binding international instrument and is the principal legal document that governs activities in the ocean and sets out responsibilities and the rights of States for the oceans, defines maritime zones, and addresses fisheries, shipping, deep-sea mining, and protection of the marine environment. The UN Convention on the Law of the Sea also provides for the primary responsibilities of managing and conserving living marine resources on the high seas, through regional fisheries organizations.

10. The United Nations Fish Stocks Agreement (UNFSA)⁷ strengthens the requirements to manage shared fish stocks and notes the importance of preserving biodiversity and maintaining the integrity of marine ecosystems with the application of the precautionary approach. The UNFSA also emphasizes flag State responsibility in supporting RFMO/As. Compliance with measures managing fisheries on the high seas is supported by the FAO Compliance Agreement⁸ and the Port State Measures Agreement⁹. The Port State Measures Agreement is a legal framework for parties to the Agreement and applies to foreign vessels seeking entry to ports. The measures of the UNFSA will, *inter alia*, contribute to harmonized port State measures, and impede the flow of illegal, unreported and unregulated (IUU)-caught fish into national and international markets. The relevant non-binding instruments include UNGA resolutions, the FAO Code of Conduct for Responsible Fisheries¹⁰, the various international plans of action, the associated technical guidance (e.g. the ecosystem approach to fisheries), and

³ FAO. 2009. *International Guidelines for the Management of Deep-sea Fisheries in the High Seas*. Rome, FAO. 2009. 73 p.

⁴ Full project title: Sustainable fisheries management and biodiversity conservation of deep-sea living marine resources and ecosystems in the areas beyond national jurisdiction

⁵ <https://sustainabledevelopment.un.org/?menu=1300>

⁶ United Nations Convention on the Law of the Sea (1982)

⁷ Formally called the United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1995)

⁸ Formally called the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (2003)

⁹ Formally the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (2009)

¹⁰ <http://www.fao.org/docrep/005/v9878e/v9878e00.htm>

relevant FAO international guidelines (e.g. Deep-sea Fisheries, flag State Performance¹¹, Bycatch¹², and others).

11. The ongoing processes of the UNGA may have specific implications for the management of sustainable fisheries, including high seas fisheries. Importantly, starting in the mid-2000s, the UNGA adopted a series of resolutions, beginning with UNGA resolutions 57/25 and 57/141 (2002) and 59/25 (2004), which called on high seas fishing nations and RFMO/As to take urgent action to protect VMEs from destructive fishing practices, including bottom trawl fishing. The discussions on the interactions between deep-sea fisheries and VMEs gained momentum, and UNGA resolution 61/105 (2006), called upon RFMOs/As with the competence regulate bottom fisheries to adopt and implement measures in accordance with the precautionary and ecosystem approaches to fisheries by 31 December 2008. In particular, the resolution called for an assessment of bottom fishing activities to ensure appropriate management measures to prevent significant adverse impacts, the identification of VMEs and their protection with the use of closures, encounter protocols, and other measures. This resolution also triggered the development process for the FAO Deep-sea Fisheries Guidelines.

12. The FAO Deep-sea Fisheries Guidelines are a set of voluntary measures that provide guidance for sustainable fisheries management and biodiversity protection in the high seas. The guidelines are intended to be used as a reference for States and RFMO/As to formulate and implement appropriate measures for the management of deep-sea fisheries in the high seas. As such, the guidelines provide: i) descriptions of key concepts (e.g. characteristics of species exploited by deep-sea fisheries, VMEs, and significant adverse impacts); ii) general management considerations and governance frameworks; and iii) management and conservation steps (e.g. data reporting and assessment, identifying VMEs and assessing significant adverse impacts, enforcement and compliance, management and conservation tools, and assessment and review of effectiveness of measures, among others). The guidelines also have special requirements for developing countries.

13. The regional fishery bodies are mechanisms through which States or organizations work together towards the conservation, management, and/or development of fisheries. Some regional fishery bodies have advisory mandates¹³ and their recommendations are not binding to their members. Other regional fishery bodies have management mandates and adopt fisheries conservation and management measures that are binding to their members (Fig. 1). RFMO/As are the main vehicles for fisheries management in the areas beyond national jurisdiction (ABNJ), and the number of RFMO/As that have a mandate to manage deep-sea fisheries in the ABNJ has increased in the last five years. While the mandates and scope of each RFMO/A differ, all address fisheries and related issues (e.g. bycatch, habitat protection).

¹¹ Formally the Voluntary Guidelines for Flag State Performance

¹² Formally the International Guidelines on Bycatch Management and Reduction of Discards

¹³ Examples include the Western Central Atlantic Fisheries Commission and the Fishery Committee for the Eastern Central Atlantic.

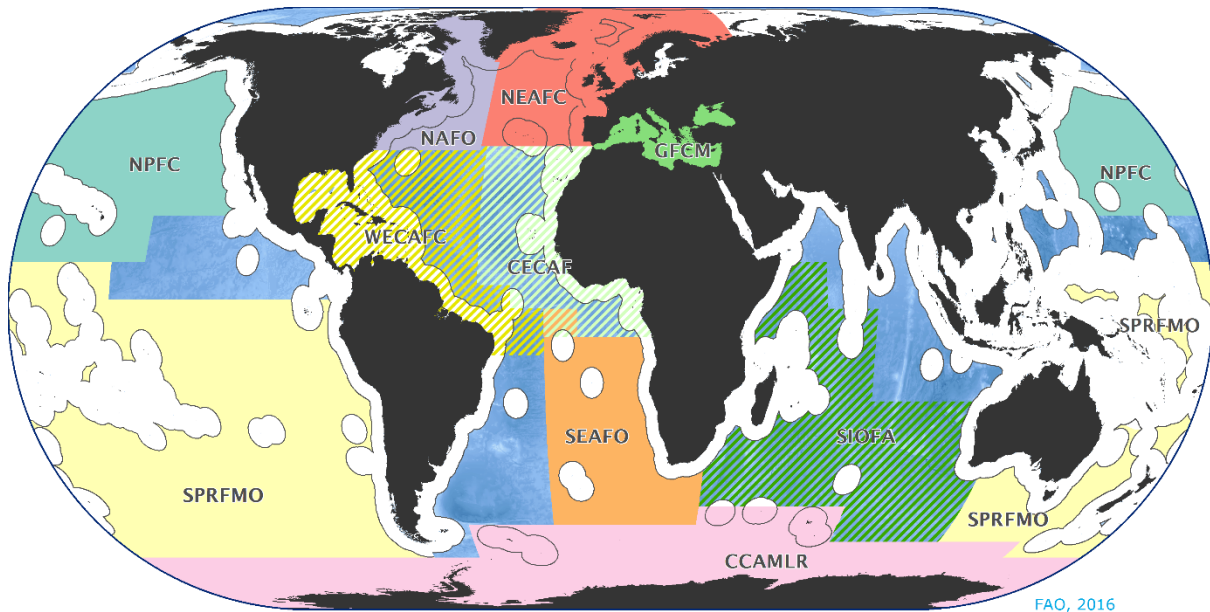


Figure 1. Regional fishery bodies for bottom fisheries in the high seas with management mandates*

*NPFC (North Pacific Fisheries Commission), SPRFMO (South Pacific Regional Fisheries Management Organisation), NAFO (North Atlantic Fisheries Organization), NEAFC (North East Atlantic Fisheries Commission), SEAFO (South East Atlantic Fisheries Organisation), GFCM (General Fisheries Commission for the Mediterranean), SIOFA (Southern Indian Ocean Fisheries Agreement), and CCAMLR (Commission for the Conservation of Antarctic Marine Living Resources). Regional fishery bodies with an advisory mandate: Fishery Committee for the Eastern Central Atlantic, and WECAFC (Western Central Atlantic Fisheries Commission).

14. Deep-sea RFMO/As generally comprise a Commission, a scientific body, a compliance body, and are supported by a Secretariat. The commission adopts conservation and management measures, which are binding to its members within its area of competence, that are formulated based on advice from the scientific and compliance bodies. The work of the scientific body is often performed intersessionally by working groups or sub-committees, whose members also participate in ad hoc workshops, such as this VME workshop for the Mediterranean. RFMO/As are often present as observers at global and regional meetings, such as United Nations and other RFMO/A meetings.

15. There are also a number of other global processes of relevance for the management of deep-sea fisheries, such as the discussions under the CBD in relation to mainstreaming biodiversity issues, and reporting of specific goals (e.g. Aichi Biodiversity Targets). The ongoing discussions on the SDGs are also highly relevant, as are the discussions at the UNGA on possible elements of a legal agreement on biodiversity beyond national jurisdiction (BBNJ process).

16. With respect to collaboration initiatives among different international organizations, participants were informed that the GFCM had been closely working with the United Nations Environment Programme / Mediterranean Action Plan (UNEP/MAP), including with the UNEP/MAP Regional Activity Centre for Specially Protected Areas (RAC/SPA), which developed a regional Joint Strategy on Mediterranean Conservation with GFCM and other relevant regional actors. The UNEP/MAP-RAC/SPA representative underlined the importance of such joint initiative as an example of synergies among different organizations with the interest on the very same area.

17. Mr Chris O'Brien, ABNJ Deep Seas Project Coordinator, presented FAO's work on deep-sea fisheries, developing partnerships, collaborative work, and opportunities. Mr O'Brien highlighted the ABNJ programme and its four projects with the overall aim of promoting efficient and sustainable management of fisheries resources and biodiversity conservation in the ABNJ. The ABNJ Deep Seas Project aims to achieve efficiency and sustainability in the use of deep-sea living resources and

biodiversity conservation in the ABNJ, through a systematic application of the ecosystem approach. To date, a number of supporting activities have been achieved under the broader FAO Deep Sea Fisheries Programme, including: the launch of the FAO VME Portal¹⁴ and DataBase¹⁵, and deep-sea cartilaginous fish species identification guides for the Indian Ocean and southeast Atlantic Ocean. Upcoming activities include a Global data collection manual for recording and collecting information on deep-sea species, including potentially vulnerable species, and technical papers that will contribute to the knowledge base for managing deep-sea species and protecting VMEs. The GFCM is a partner to the ABNJ Deep Seas Project.

18. Mr O'Brien recalled the importance of the project in addressing the needs of countries and RFMO/As to advance efforts in the management of deep-sea fisheries, and to build on experiences from different regions of the world. It was clarified that the ABNJ Deep Seas Project is developing a range of management tools in collaboration with RFMO/As and countries (in particular developing countries) to support sustainable fisheries management and biodiversity conservation.

19. Mr Tony Thompson, FAO Consultant, presented a global summary of RFMO/A measures for deep-sea fisheries and VMEs. The FAO VME DataBase provides an up-to-date overview of current global actions to address sustainable fisheries management and biodiversity conservation in the ABNJ, all of which serve to support the relevant UNGA resolutions (in particular, UNGA resolution 61/105). The implementation of the calls for action in these resolutions is the responsibility of States, either individually or through RFMO/As. Individual States can take actions for their flagged vessels in regions where no RFMO/A exists. The management process for RFMOs/As on deep-sea fisheries and VMEs is, in general, through the adoption of conservation management measures that: i) delineate existing fishing areas; ii) require habitat surveys to identify known or likely VMEs; iii) establish a list of VME indicator species and thresholds for encounter protocols; iv) develop exploratory fishery protocols that include impact assessments of fishing with bottom-contact gear; and e) review procedures for VMEs. RFMO/As are also responsible for managing the fisheries under their mandate, and this usually involves fish stock assessments and the setting of catch and effort limits.

20. While the FAO Deep-sea Fisheries Guidelines contain criteria for what can be considered a VME, many RFMO/As have agreed on their own list of species and/or species groups that may constitute VMEs, and also developed identification guides for their region, for use on board when complying with VME-related protocols and measures.

21. Ms Nastasi gave a presentation on "Habitats and deep-sea fisheries under management measures in the Mediterranean". The overview outlined the suite of GFCM management measures that concern deep-sea bottom fishing and the protection of sensitive marine habitats. Since 2005, GFCM established eight FRAs: three were established to preserve VMEs, four to preserve fishery resources (three of which were established within a comprehensive multiannual management plan for deep-sea fisheries¹⁶), and one larger closure for waters below 1 000 m, in which the use of dredges and trawl nets was permanently forbidden in the GFCM area of application. The overview also indicated that the main deep-sea fisheries in the Mediterranean targeted deep-water red shrimps (*Aristaeomorpha foliacea* and *Aristeus antennatus*), which were harvested at 400–800 m depths. In addition, important deep-sea trawl fishery targeting deep-water rose shrimp (*Parapenaeus longirostris*) and European hake (*Merluccius merluccius*) at depths of 300–500 m, gillnet fisheries and demersal longliners operating at around 400 m to target *Merluccius merluccius* and blackspot seabream (*Pagellus bogaraveo*) also existed.

22. The workshop further acknowledged the importance of the GFCM FRA as spatial-management tool for the protection of VMEs as well as for the conservation of fishery-related resources. The main features of an FRA included a linear and simple process to submit the initial FRA proposal for consideration by GFCM, which could be made by a wide range of different stakeholders.

23. It was remarked that a lack of compliance in the FRA of the Nile Delta Area had been highlighted in a review presented by the GFCM in 2014. However, the meeting recognized that

¹⁴ <http://www.fao.org/in-action/vulnerable-marine-ecosystems/en/>

¹⁵ <http://www.fao.org/in-action/vulnerable-marine-ecosystems/vme-database/en/>

¹⁶ In 2016, GFCM established a multiannual management plan for deep-sea fisheries exploiting European hake and deep-water rose shrimp in the Strait of Sicily (GSA 12 to 16).

monitoring, control and surveillance (MCS) issues and compliance were not linked to the usefulness of the FRA tool per se, and that compliance with fishery measures by States was generally recognized as one of the main problems at a global scale.

24. The meeting asked for more details about the target species of the main Mediterranean deep-sea fishery categories identified in the overview. It was clarified that the demersal longlines and gillnets targeted European hake and blackspot seabream only. On the other hand, bottom trawlers targeting red shrimps were considered a multi-target fisheries as they also caught a wide variety of other important commercial species, including adult individuals of European hake and deep-water rose shrimp. Nonetheless, it was highlighted that in the Strait of Sicily bottom-trawl fisheries, which is under a multiannual management plan¹⁶, targeted only European hake and deep-water rose shrimp.

25. It was also underlined that from the fishery management point of view, only red shrimp (*Aristaeomorpha foliacea* and *Aristeus antennatus*) landings could be linked univocally to deep-sea fishing activities, as these species were living exclusively below 400 m depth, while the other above mentioned species could also be fished (and exploited) in shallower waters.

26. The meeting also discussed the proposed depth range of 400–1 000 m, identified by the GFCM, to describe deep-sea fisheries in the Mediterranean. Some participants indicated that from a biological and ecological point of view, the deep-sea in the Mediterranean was linked to depths of light saturation, which is taken to be 200 m.

27. The GFCM Secretariat clarified that the proposed depth range of 300/400–1 000 m had no biological/ecological rationale. Instead, the depth limit was set from a fishery management perspective, taking into account the GFCM decision of prohibiting fishing operations with bottom-contact gear below 1 000 m, that the most important resources are harvested below 300 m, and that the upper limit of 400 m was identified in the FAO *Worldwide Review of Bottom Fisheries in the High Seas*¹⁷. According to Bensch et al., 2009, considering the general absence of 200 nm national jurisdictions in the region, the bottom fisheries operating beyond the territorial waters, outside the continental shelf and at depths greater than 400 m, could be classified as high seas fisheries.

28. Within the frameworks of the FAO Deep-sea Fisheries Guidelines and the UNGA bottom fisheries discussions, and for other RFMOs/As, it was noted that the definitions were related to

CHARACTERIZATION OF DEEP-SEA FISHERIES AND BENTHIC HABITATS IN THE MEDITERRANEAN

Overview of Mediterranean deep-sea fisheries

29. Mr Giuseppe Scarcella, moderator of the GFCM Subregional Committee on the Eastern Mediterranean (SRC-EM), gave a presentation “Overview of Mediterranean deep-sea fisheries”. Two main deep-sea shrimp fishing activities were identified: i) an uppermost bathyal (~200–600 m) fishery targeting *Nephrops norvegicus* and *Parapenaeus longirostris*; and ii) an upper bathyal (~400–800 m) fishery targeting *Aristaeomorpha foliacea* and *Aristeus antennatus* (red shrimps). With respect to the latter, automatic identification system (AIS) data from 2012 to 2014 of a sample of Sicilian vessels targeting red shrimps were analyzed. The analysis indicated that an important percentage of fishing effort deployed in distant areas (especially the Aegean Sea) was targeting red shrimps, which likely belonged to different stocks, as evidenced by a specific project (StockMed). However, no distinction was made in the reporting of catches for waters under national jurisdiction and in international waters. This hampered the understanding of the status of red shrimps and the options of their sustainable management, particularly in light of the possible adoption of a multiannual management plan by GFCM for these resources in the central and eastern Mediterranean. A workplan for the provision of data useful

¹⁷ Bensch, A., Gianni, M., Gréboval, D., Sanders, J.S., & Hjort, A. Worldwide review of bottom fisheries in the high seas. FAO Fisheries and Aquaculture Technical Paper. No. 522. Rome, FAO. 2008. 145p.

for stock assessment and management, utilizing a combination of vessel monitoring system (VMS) and AIS data; logbook information was also proposed and discussed.

30. The presentation also indicated that deep-sea fisheries in the Mediterranean had a direct impact on the target resources, but also on sensitive habitats (e.g. white coral) and discarded species. Moreover indirect negative effects were due to sediment re-suspension caused by bottom fishing activities, and increasing sedimentation, even at depths well beyond the ones trawled. Finally, it was well documented how deep-sea fisheries were also correlated with the presence of lost debris and litter in deep-sea habitats.

31. The GFCM Secretariat acknowledged the proposal of defining two categories of deep-sea shrimp fisheries based on whether they were caught in exclusive economic zones or international waters, but expressed concerns, from a data collection point of view, about the operational ways to distinguish those two categories of deep-sea fisheries, starting from the landing composition.

32. It was also recalled that in both the European Union Data Collection Framework (DCF) and GFCM Data Collection Reference Framework (DCRF), no direct information on the depth was provided by countries, and that deep-sea fisheries were only identified on the basis of the landing composition (resource-based identification).

33. Ms Nora Anna Tassetti of the Marine Sciences Research Institute of the Italian National Research Council (ISMAR-CNR) gave a presentation on the spatial distribution of deep-sea bottom trawl fishing effort in the Mediterranean Sea. The proposed study was developed within the “EMODnet MedSea Checkpoint” project, which aimed to evaluate the quality of monitoring in place of trawl impact on the sea floor in the Mediterranean basin. Project activities included the production of maps showing the extent of trawl fishing grounds and the changes in the level of disturbance over years, and identifying gaps in the tracking systems of fishing vessels using data from VMS, AIS, and the ESIF system (developed by ISMAR-CNR within EU project “Energy Saving In Fisheries”). Using raw AIS data that covered the Mediterranean basin for 2012–2014, the spatial distribution of fishing effort was estimated with respect to predefined bathymetric strata, seabed habitats, and substrate in order to evaluate the impact on the bottom. This formed the knowledge base for the development of a spatial planning approach for the management of fishing activities in deep-sea habitats (between 200 and 1 000 m). Results indicated important differences in spatial, bathymetric, temporal and fleet coverage for the Mediterranean Sea, and between its different users, and confirmed the suitability of this monitoring system to obtain reliable information on the extent of effort from different fishing activities.

34. The workshop discussed the use of VMS vs AIS data in such studies, and it was noted that VMS data was considered less efficient as it transmitted signals with time intervals ranging from 20 minutes to 2 hours, while the AIS system sent signals every 5 minutes. However, it was also remarked that while VMS data were guaranteed to be transmitted and received with delivery costs, AIS data did not include any cost and therefore no guarantee of signal transmission and reception.

35. The importance of raw VMS data for the management decisions of RFMOs was noted and a question was raised about the existence of a VMS centralized system in the GFCM.

36. It was explained that in the GFCM area of application, the use of VMS for vessels >15 m has been compulsory since 2009. Nonetheless, some north African countries have been experiencing delays in the implementation of this decision and asked the GFCM for technical assistance, which was being provided. In parallel, the GFCM was developing the IT-Infrastructure to host a centralized system to be tested through case studies in selected countries. The GFCM centralized system for VMS is expected to be operative as soon as all countries comply with the 2009 decision and install VMS on their relevant fleets. It was also underlined that the VMS data from the GFCM area would be used for both compliance and scientific purposes (e.g. analysis of the distribution of spatial effort).

37. Mr Mahmoud Farrag, Al-Azhar University, gave a presentation on deep-sea resources in the Mediterranean Sea, Egypt. The Egyptian coast of the Mediterranean basin extends for about 1 050 km and is considered one of the longest Mediterranean shorelines in North Africa. However, there is a gap in knowledge about its deep-sea fisheries at depths of more than 400 m, from 2011 and earlier. This may be because: i) the main fishing ground is the continental shelf off the Nile Delta, which is shallow

water that mainly extends from Alexandria to Port Said; ii) the bulk of bottom trawler fleets do not operate at depths greater than 250 m, and their engine power does not exceed 450 hp (they mostly operate with 100–250 hp), and therefore there is no capacity to harvest deep-water fauna (however, there are a few boats with higher engine power, up to 800 hp, which concentrate at the mouth off the Nile Delta); and iii) there is a lack of fishing technology capable of harvesting deep-water fauna.

38. The presentation introduced the recent work on deep-sea fisheries in Egypt, particularly with deep-water shrimp trawlers using Italian trawl gear in western and eastern parts of the Nile Delta. According to Ibrahim and colleagues (2011)¹⁸, the average total catch per haul is about 62 kg for the eastern Nile Delta, and 59.9 kg/haul for the western Nile Delta. The density of shrimps and several other commercial fish species ranged between 95 and 100 kg/km², of which 55–74 kg/km² are deep-water shrimp (*Aristaeomorpha foliacea* and *Aristeus antennatus*), together representing 78–84% (as biomass) of the total trawl catch. *Aristaeomorpha foliacea* was much more abundant than *Aristeus antennatus*, with percentages from 72% to 99% of the total red shrimp catch. Bycatch constitutes about 16–22% of the landed catch, comprising 21 species dominated by *Merluccius merluccius*. Bycatch of hauls from the eastern Nile Delta was about 33% higher than in the western Nile Delta. In contrast, the hauls from the western waters contained about 7% more shrimp than the eastern hauls. The shrimp catch rate is relatively higher during sunrise and daytime operations than during sunset and night trawls in both the eastern and western waters.

39. Based on a study by Farrag (in press), an analysis of discards resulted in the inclusion of 15 new species of ichthyofauna to the deep-water fauna list, including four cartilaginous species (*Centrophorus uyato*, *Etmopterus spinax*, *Hydrolagus mirabilis*, and *Chimaera monstrosa*). The remaining 11 species were bony fishes (*Chauliodus sloani*, *Diaphus metopoclampus*, *Sudis hyaline*, *Microstoma microstoma*, *Aulopus filamentosus*, *Avocettina infans*, *Argyropelecus hemigymnus*, *Notacanthus bonaparte*, *Lampanyctus crocodilus*, *Centrolophus niger* and *Nettastoma melanurum*), as well as a few known species, thereby updating the list to more than 40 deep-water species.

40. The present data suggest the possibility of developing a deep-water shrimp fishery. The lack of information about such fisheries in Egyptian waters calls for further studies. There are current efforts to record deep-sea shrimp catches regularly by the General Authority for Fish Resources Development in Egypt, and through scientific studies by scientists at the National Institute of Oceanography and Fisheries in Egypt. In such a case, attention should be paid to avoid overfishing because of the high vulnerability of the shrimp to fishing pressure. Among the best prospects for the Egyptian marine fisheries are to introduce more modern vessels, equipment, and fishing methods for shallow and deep-waters in order to identify new species and better manage the demersal fisheries in both shallow and deep-water, with continuous monitoring and studies on deep-sea resources.

41. Participants discussed the high number of cartilaginous species caught as bycatch in the Egyptian shrimp fisheries, and although none of those shown in the presentation from Mr. Farrag are legally protected in the Mediterranean Sea, it was noted that IUCN categorized them as Threatened or Near Threatened. On the other hand, it was also inferred that the presence of such a variety of deep-sea cartilaginous species in the catch could indicate the presence of healthy and pristine deep-sea habitats that deserved protection.

42. The meeting was also informed that in other regions of the world, mitigation methods to avoid the capture of demersal sharks, such as with special metallic sorting grids (REBYC project¹⁹), were successfully implemented in shrimp fisheries.

43. Mr Kostas Kaporis, Hellenic Centre of Marine Research, gave a presentation on “Deep-water red shrimps in the Ionian and Aegean Seas”. Several scientific projects have studied the deep-water fisheries of the Greek Ionian Sea in the last few years. Deep-water fisheries are very sporadic in the eastern Mediterranean and, thus, some aspects of the biological information of the deep-water resources is lacking. In Greek waters deeper than 400 m, the red shrimps *Aristaeomorpha foliacea* and *Aristeus*

¹⁸ Mohamed A. Ibrahim; Mohamed W.A. Hassan; Alaa M.M. El-Far; El-Sayed F.E. Farrag and Mahmoud M.S. Farrag. 2011. Deep sea shrimp resources in the south eastern Mediterranean waters of Egypt. *Egyptian Journal of Aquatic Research*, 37(2): 131–137.

¹⁹ <http://www.rebyc-cti.org/>

antennatus are the target species for Greek trawlers during some annual seasons, mainly in the Ionian Sea. Data concerning the deep-water resources from the Aegean Sea are limited and sporadic, coming almost exclusively from the International Bottom Trawl Survey in the Mediterranean (MEDITS) Data Collection Framework. The lack of fishery data does not permit a stock assessment of both decapods, but no clear indications of overexploitation exist in the eastern Ionian Sea. In contrast to this, red shrimps are either overexploited or overfished in other geographic sub-areas (GSAs) in the Mediterranean Sea. A deeper study (mapping, environmental parameters, food webs, and fauna) of the deep-water resources and an investigation for the possible establishment of marine protected areas (MPAs) in the Aegean and Ionian Seas are necessary for their sustainable management.

44. Indeed, many of the studies presented to the meeting indicated that in specific Mediterranean sub-regions (e.g. Ionian Sea and Egyptian waters), the shrimp stocks' boundaries were not identified, and that probably only few parts of the stock(s) were exploited, with potential room for further expansion of the associated deep-sea fisheries.

45. The GFCM Secretariat informed the meeting that according to the GFCM decision REC.MCS-GFCM/34/2010/2 on the management of fishing capacity, fishing capacity of vessels above 15 m could not increase, and existing units (e.g. vessels) could only be replaced.

46. The workshop concluded that the most relevant deep-sea fisheries in the Mediterranean Sea, from an economic point of view, targeted shrimp species (*Parapenaeus longirostris*, *Aristaeomorpha foliacea* and *Aristeus antennatus*) and large individuals of European hake (*Merluccius merluccius*). In Spain, deep-sea fisheries with pots and traps targeting pink shrimp (*Plesionika* spp.), and with demersal longlines targeting blackspot seabream (*Pagellus bogaraveo*), were also of local importance. The meeting recognized the importance of GFCM focusing its management priorities on red shrimp fisheries (*Aristaeomorpha foliacea* and *Aristeus antennatus*).

Benthic habitats of the Mediterranean

47. Ms Emanuela Fanelli, Italian National Agency for New Technologies, Energy and Sustainable Economic Development, gave a presentation on "Key species and benthic habitats of the deep Mediterranean Sea threatened by anthropogenic impacts". Ms Fanelli noted that the deep ocean (> 200 m depth) encompasses 95% of the oceans' volume and is the largest and least explored (< 0.001%) biome on the earth. However, global change, major commercial fisheries, and increasing exploitation of seabed minerals and hydrocarbons may lead to severe impacts of global concern. The presentation focused on key species and habitats of the deep Mediterranean as case studies for deep-sea conservation. The Mediterranean Sea is a warm, deep, oligotrophic basin, with high salinity. Its overall surface area is approximately 0.82% of the world's ocean surface. Despite its limited dimensions, the Mediterranean Sea hosts approximately 7.5% of all marine species, with a high percentage of endemic species. Main gaps in the knowledge of Mediterranean biodiversity include benthic diversity, which has typically been much better investigated than pelagic diversity; the southern sector, which is lesser known than the northern sector; and the lack of knowledge on the different components of deep-sea biodiversity.

48. So far, biological research has focused primarily on mesozooplankton, meiofauna and larger components (e.g. benthopelagic fauna and mega-benthos), with few investigations conducted on meso/bathypelagic fishes or megazooplankton. The latter regards the differences in information availability from the western Mediterranean vs Eastern basin (although an increased number of works have been published in the last two decades). The Mediterranean basin contains, over relatively limited spatial scales, a number of topographic features and habitats that can represent potential "hot spots" of biodiversity. A non-exhaustive list of these ecosystems include: i) a highly heterogeneous seafloor of open continental slope systems, ii) submarine canyons, iii) seamounts, iv) deep-water coral frameworks and other biogenic reefs, v) hydrothermal vents. One of the major threats to deep-sea ecosystems down to 1 000 m depth in the Mediterranean, is trawl fisheries and to a lesser extent long line fishing. Trawl fishing acts directly by removing commercial and non-target species, with several implications for the maintenance of populations because deep-sea species are generally long-lived, have low turnover rates and late sexual maturation rates. Additionally, trawling may also cause serious damage to the seafloor, causing habitat simplification and the demise of sessile species such as cold-water corals and other habitat-forming species such as the bamboo coral *Isidella elongata* or the sea pen *Funiculina*

quadrangularis. Further investigations are needed to map VMEs, and potentially representative deep-sea habitats.

49. Ms Fanelli noted that in the Mediterranean, canyons, such as those found in the Ligurian sea, could have a major ecological role in hosting VMEs as well as nurseries and spawning grounds. The possibility of protecting these canyons that have also been the focus of sea-bottom surveys was also discussed in the context of establishing coherent networks of protected areas in the deep-sea. However, it was noted that “network” implied “connectivity”, and that the establishment of an actual MPA was not a straightforward process.

50. The GFCM Secretariat noted that, according to the data presented, the Ligurian canyons hosted both potential VMEs and nurseries of commercial fish species and, therefore, a closure to relevant fisheries through the establishment of an FRA could be the easiest way to start providing protection to the identified habitats. Considering the multi-objective potential of an FRA, the proposal could be easily and quickly considered by the Commission, given the comprehensiveness of the scientific information already collected.

51. Carlo Cerrano, Polytechnic University of Marche, gave a presentation on “Benthic modular organisms as vulnerable marine ecosystem builders”. The study indicated that morphofunctional plasticity of benthic colonial organisms could have many similarities with higher order plants, mainly due to their modularity. In the marine environment, colonial organisms with a massive or vertical growth could shape animal gardens and forests, triggering a series of ecological effects that could highlight their role as ecosystem engineers and as VMEs builders. VMEs are rapidly declining owing to human activities and climate change, but there is little knowledge about the functional roles of these ecosystem engineers. In the case of high-density colonies, they likely affect edaphic conditions, and could represent important nurseries for invertebrates and fishes by providing refuges for their eggs and larvae. Despite their vulnerability and ecological importance, little is known on the distribution, ecology and biology of Mediterranean VMEs. Preliminary results on the spatial and bathymetric distribution of Mediterranean sea pens were presented, with a particular focus on species in the Adriatic Sea. In the Adriatic, presence-absence data were modeled with general additive models to identify potential suitable habitats of the sea pens *Funiculina quadrangularis*, *Virgularia mirabilis* and *Pennatula* spp., and to facilitate decision-making to protect the last habitats structured by their presence.

52. Some participants noted that many of the vulnerable species and habitats of the study, which occurred above 50 m depth and within 3 nautical miles of the coast, were already legally protected from bottom trawling. The author of the study remarked that many of the mentioned species also occurred below 50 m and were suffering from the impact of many human activities, including fisheries.

53. Gil de Sola Simarro Luis, Instituto Español de Oceanografía (IEO), gave a presentation on the “Long-term changes in demersal species in the Spanish continental Mediterranean upper-slope (400–800 m). The DCR [Data Collection Framework] and MEDITS survey”. The Mediterranean coast of Spain is 2 600 km long, from the French border of Gibraltar, including the Balearic Islands. The potential of the MEDITS survey in Spain as a source of information to comply with European Union and GFCM requests on fisheries data collection, including in relation to obtaining indicators for biodiversity, food webs, contaminants and pollution effects, contaminants in seafood, marine litter, and improvements in species identification was presented. The presentation also addressed the potential use of the Spanish MEDITS survey to identify the occurrence of VMEs, including in relation to:

- a. data recording of the nyctemeral-inshore/offshore migratory cycles of zooplankton at the benthic boundary layer with possible causes (e.g. currents in canyons, water mass stratification) and the influence of such migrations in food webs (diets of important fish such as hake using daily ration models) over the shelf-slope break;
- b. mapping of the slopes beyond fishing grounds (to 2 200 m) as a settlement zone for larvae and/or post-larvae of deep-sea species (e.g. commercial species such as *Aristaeus antennatus*) and depths or areas where spawners are aggregated, with identification of spatial patterns and relationships with associated environmental variables (turbidity,

oxygen) and with the occurrence of epibenthic, sessile communities (on seamounts, canyons).

54. In light of the information presented during the session on deep-sea fisheries and benthic habitats, the meeting concluded that a lot of valuable information on the spatial distribution of fishing effort and the distribution of sensitive habitats, especially in marine canyons, was already available and at the disposal for management purposes; nonetheless most of this information had not been presented to GFCM on previous occasions.

55. The workshop also acknowledged that the dynamics of deep-sea fisheries, and their impact below 500 m, were poorly known because most of the data presented came from upper portions of the water column. It was also considered that in the Levantine basin, there could be pristine fishing grounds above 1 000 m that had just begun to be exploited, and therefore precautionary measures to protect the related benthic habitats would be needed to avoid the destruction of those virgin habitats.

VMEs AND MEASURES TO PROTECT VMEs FROM SIGNIFICANT ADVERSE IMPACTS

Mr Thompson gave a presentation on the “Basic concepts: Deep-sea bottom fisheries, significant adverse impacts, VMEs, and other bycatch”. The presentation focused on the adaptive nature of measures used to manage deep-sea (bottom) fisheries to prevent significant adverse impacts on VMEs (and other bycatch). The fisheries are those that catch or impact benthic species that can only sustain low exploitation rates and are slow to recover. This includes certain long-lived target fish species (although many deep-water fish species have moderate life spans and are quite productive) and most deep-water corals and sponges. These fisheries are then assessed and the severity of the impacts on VMEs determined against criteria in the FAO Deep-sea Fisheries Guidelines. If they are determined to be a significant adverse impact, then common practice is to close the area to bottom fishing for some or all bottom contact gear. Bottom fisheries are permitted in areas where no VMEs are thought to occur, such as in areas that had been previously fished with bottom contact gear, and are subject to other measures, including encounter protocols, for the identification of new VME areas.

56. Mr Mariano Koen Alonso, Northwest Atlantic Fisheries Organization (NAFO) regional expert, gave a presentation on “The NAFO roadmap for an ecosystem approach to fisheries (EAF): A regional experience on managing deep-sea fisheries and vulnerable marine ecosystems”. NAFO is developing and implementing an ecosystem approach to fisheries (EAF). The path that the organization is following to achieve this goal is summarized in the NAFO roadmap towards EAF. The roadmap is based on the concept of integrated ecosystem assessment, and its core premises are: i) the approach has to be objective-driven, ii) it should consider long-term ecosystem sustainability, iii) it must be place-based, and iv) trade-offs have to be explicitly addressed. The roadmap is not a fixed plan, but rather evolves as its different components are developed and implemented. One of the elements of the roadmap is the protection of VMEs. Over the last decade, NAFO has been deploying a number of measures intended to ensure the protection of VMEs from bottom-fishing activities. This process has included identifying and delineating VMEs, mapping fishing activities, distinguishing established fishing grounds (NAFO fishing footprint) and new fishing areas, establishing protection zones and seamount closures, and establishing more stringent exploratory fishing protocols for bottom-fishing activities outside the NAFO fishing footprint. In addition to the protection of VMEs, the NAFO roadmap also includes the identification of ecosystem-based management units, and a hierarchical approach to define exploitation rates by considering ecosystem, multispecies, and stock level sustainability. Although EAF implementation is far from being complete, NAFO has made important progress to this end. This presentation describes this progress with an emphasis on the protection of VMEs, examines the challenges still ahead, and summarizes the lessons learned along the way.

57. It was clarified that in NAFO, fishers’ organizations were not involved in the decision-making process, but at the delegation level, those organizations were consulted as well as other stakeholders. However, it was noted that at the NAFO Commission, observers could only make an initial opening statement, while at the GFCM Commission they could intervene during the discussion along with the Contracting Parties.

58. Mr Luis López Abellán, IEO, gave a presentation on “Information from surveys and commercial vessels on the distribution of VMEs”, including a case study illustrating the process of detecting VMEs in the Valdivia Bank (South East Atlantic Fisheries Organisation, SEAFO area). A VME area was established in 2016 on the Valdivia Bank, based on evidence from three multidisciplinary research cruises (R/V *Vizconde de Eza* in 2008, 2009, and 2010) that looked at bathymetry, geology, biology, and hydrology and identified potential VMEs, and the R/V *Fridtjof Nansen* research survey in 2015, which corroborated this information. Other closures in the area are precautionary closures.

59. Different approaches were shown using only presence data or presence/absence data, highlighting the need for an accurate understanding of biodiversity distribution in the study area. Special attention was paid regarding the extrapolation from detailed studies through predictive modeling, when data outside the study area cannot support this exercise.

60. Three different approaches were mentioned in relation to the VME process:

- i. The southeast Atlantic (SEAFO) process and progress:
 - Building the initial footprint from historical data and protocols to develop new bottom fishing areas outside closure;
 - History of process and current situation of closures system; and
 - Definition and enforcement of encounter protocols.
- ii. The Southern Ocean (Commission for the Conservation of Antarctic Marine Living Resources) approach:
 - The use of longline fishery VME indicator taxa by-catch in defining risk areas and fine-scale rectangle; and
 - Closures based on scientific research.
- iii. The Indian Ocean (Southern Indian Ocean Fisheries Agreement) case:
 - The fishing industry (trawl) defined benthic protected areas for associates before the Southern Indian Ocean Fisheries Agreement entered into force; and
 - The Meeting of the Parties recommended in its last meeting that all Contracting Parties manage their flagged vessels when fishing in the high seas and to note the advice from the first meeting of the Scientific Committee in relation to benthic protected areas.

61. Lessons learned from these cases indicate that although there are common elements among oceanic regions, each region itself may be special and singular and would need specific solutions. In certain cases, thresholds have been adopted at the same levels as other regions, without analysing the specificities of the new region. The final aim of the encounters-based methodology is to obtain the evidence of VME presence; and an encounter must be characteristic of each zone, each fishing method and VME taxa. The move-on rule and subsequent temporary closure has proved to be a feasible method to protect a previously unknown VME in the Southern Ocean.

62. However, when considering the detectability of habitats containing VME indicator taxa using different gear, paradoxically, the more selective fishing methods have less impact and so it would be more difficult to detect encounters. Thus, differences in catchabilities of VME taxa related to different gear types should be considered.

63. Ms Maria del Mar Otero Villanueva, IUCN-Med, gave a presentation on “Known vulnerable Mediterranean deep-sea ecosystems”, and the most recent work that elaborated on the deep-seas, which was initiated in September 2015 with a meeting organized by IUCN-Med and the French Agency of Marine Protected Areas with a group of 22 Mediterranean deep-sea experts. The objective was to examine the current and past research on the deep-sea in areas relevant to conservation issues to enhance better management and conservation policies. The presentation also gave an overview of the main gaps and the proposals to guide an effective strategy and action plan for Mediterranean deep-sea conservation, management and monitoring. The presentation offered the different policy instruments that are currently used in the Mediterranean deep-seas, the main deep-sea ecosystems and biological communities (e.g. deep-sea corals, black coral gardens, chemosynthetic communities) with spatial maps.

64. It was added that the IUCN expert group was still working on the identification and characterization of vulnerable deep-sea ecosystems, also according to biodiversity and threats criteria, and considering the definition of VMEs from the FAO Deep-sea Fisheries Guidelines. It was also clarified that the FAO VME criteria had been taken into consideration for the classification of the vulnerable marine habitats illustrated in the study, and not only the ecologically or biologically significant marine areas criteria.²⁰

65. The SAC Chairperson together with the FAO and GFCM staff invited IUCN to present the results of their work to GFCM technical groups (e.g. relevant subregional committees), with a view of starting a discussion towards the possible adoption of management measures, including FRAs.

66. The IUCN representative welcomed the invitation and informed the meeting that the results were still being processed, including the acquisition of new data. She also informed that an ad hoc IUCN meeting would follow to review the outputs of the study, and fishery experts would be invited to join in order to provide their input from a fishery perspective.

67. Ms Pilar Marin, Oceana, gave a presentation on “Defining Mediterranean VMEs: A draft list of VME indicator species”. Despite the fact that scientific information about deep-sea ecosystems has increased considerably in recent years, a list of Mediterranean VME indicator species has not yet been developed. Such a list is essential for developing basic management measures for deep-sea fisheries to ensure VME protection. This list was developed according to FAO criteria and based on scientific literature and data, including direct observations from Oceana’s at-sea research in the Mediterranean Sea. Habitats were grouped by type, and examples were provided of known VME indicator species from the families listed. A project on deep-sea areas in Lebanon,²¹ funded by Mava, was also presented.

68. Ms Marin further specified that for the compilation of the list, Oceana took into consideration ecological and biological criteria for identifying the vulnerable, benthic deep-sea species occurring below 200 m, although some of these species could also occur in shallower waters. She also added that information coming from fishery-independent surveys, such as the MEDITS survey, was taken into consideration for the compilation of the list.

69. The workshop commented that in the Mediterranean Sea, some vulnerable benthic species occurred in spread patches in soft-bottom habitats, and their protection from trawling is unlikely to be achieved because the areas to be closed would be too extensive; however, well-located and condensed aggregations could be more easily delimited and protected. Additionally, it was noted that according to the NAFO experience, it is very difficult to clearly identify the boundaries of potential VME associations, exclusively through the use of remotely operated vehicles.

70. Participants noted that according to the available effort data for the Mediterranean, 10% of fishing activities occur between 400 m and 800 m and a further reduction of effort, to protect deep-sea areas, would be acceptable.

71. Regarding the project on deep-seas in Lebanese waters, FAO and GFCM staff advised that if the project was foreseen to be under the EAF framework, national fishery experts and fishery institutions should be involved, at least as stakeholders.

72. The meeting debated the pros and cons, and the operational considerations, of having a long list of VME indicator species, compared with a shorter, more focused list of key species that can be used to identify VME ecosystems. Participants agreed that from a fishery management and operationalization point of view, the VME indicator species list presented by Oceana should be shortened to focus on the most relevant species.

73. Ms Marzia Bo, University of Genoa, gave a presentation on “Sponge and coral fauna: Reporting and tools”. Conservation issues highlight a major need to preserve both the fish stocks of the deep Mediterranean Sea and the complex benthic environment on which they depend. In order to achieve good conservation measures, it is critical to obtain reliable information on benthic biodiversity and on

²⁰ Ecologically or biologically significant marine areas are areas of the marine environment that are identified by a set of scientific criteria, developed by the Convention on Biological Diversity (<https://www.cbd.int/ebsa/about>).

²¹ <http://en.mava-foundation.org/our-programmes/mediterranean-basin/>

the types of fishing pressure and the degree of vulnerability of the target species. The main megafauna components of the deep-sea benthic Mediterranean are sponges and corals, often showing arborescent morphologies and the tendency to form aggregations — two factors enhancing their catchability and vulnerability with regards to demersal fishing gear. Taxonomy is of critical importance when trying to measure the biodiversity of these two taxa: various strategies have been developed on the basis of the results of large scientific surveys carried out throughout the basin, to obtain reliable taxonomic identifications, a challenging task when considering the deep-sea and sampling difficulties in this environment. In the same way, it is important to develop tools capable of transferring the scientific “know-how”, in the form of basic taxonomic guidelines, to all operators working in the fishing and monitoring sectors that then become sentinels for the discovery of new deep-sea VMEs. Because we are only at the beginning of deep-sea exploration, it is important to continuously integrate new records and information into the upcoming conservation strategies.

74. The participants and Chairperson concluded that the valuable information presented on deep-sea habitats and resources should be considered within a broader view of a management perspective to provide GFCM with clear indications to improve the management of deep-sea fisheries and VMEs.

75. Mr Bernal gave a presentation on “GFCM actions in relation to the use of encounter protocols, and outcomes of the 40th session of the GFCM (May 2016)”. The discussion on the possible adoption of a VME encounter protocol in GFCM, initiated in June 2015 at the GFCM Working Group on Marine Protected Areas, advised, *inter alia*, to define a comprehensive list of VME indicators for the region to identify areas where VMEs occur or are likely to occur, and to establish a precautionary VME encounter protocol (including scientifically based thresholds for triggering the move-on rule). The GFCM Secretariat investigated suitable approaches for a VME encounter protocol in the GFCM area of application, considering the Mediterranean features (e.g. lack of specialized observers and /or biologists for species identification, the need to establish regular data reporting on deep-sea benthic species). The GFCM presented a proposal for a VME encounter protocol for Mediterranean fisheries to the Commission in May 2016, which included one main provision: CPCs are to report (with weight) any catch occurring below 400 m depth of the following VME indicator species: sponge species (Group Porifera); and/or coral species (Group Cnidaria); and/or other vulnerable benthic species (Echinodermata, Annelida, Bryozoa, Brachiopoda, and others). However, the Commission considered it premature to adopt the protocol in the context of the Mediterranean, and proposed further discussing the matter in an ad hoc working group, i.e. Working Group on VMEs.

76. The meeting was informed that the first meeting of the ad hoc GFCM Working Group on VMEs would meet in 2017, although very likely not before the meeting of the Scientific Advisory Committee 2017. Therefore, in order to capitalize and to build on the discussions and outcomes of the FAO workshop, participants suggested that the GFCM Secretariat continue working over the intersessional period with the experts already involved, in order to present to the SAC some progresses and achievements, especially towards the definition of VME indicator species.

77. Mr Thompson gave a presentation on “Exploratory fishing protocols and impact assessments”, which outlined the protocols commonly adopted by RFMO/As for bottom fisheries outside of existing fishing areas or when practices change significantly within fishing areas. This is commonly known as “exploratory” fishing and there are rigorous protocols that must be followed to ensure that the fishery is sustainable, that impacts are known and within permissible limits, and that expansion does not increase beyond the knowledge required for sustainable management. Exploratory fisheries are required to submit plans to the RFMO/A on harvesting, mitigation, catch and bycatch monitoring, and VME identification, for an initial assessment prior to the commencement of any fishery. If permitted, the fishery is allocated a precautionary catch or effort allowance and monitored closely. Areas are normally closed if VMEs are encountered. The fishery is reviewed at least annually, and, if indicators show that the stock is being fished within sustainable limits and that impact assessments are acceptable with catches well below threshold levels, then after a two- to three-year period the area will likely be approved and the area will become part of the “existing fishing area”.

78. Participants concluded that the GFCM would find it easier to identify fishing footprints and manage exploratory fishing protocols if VMS data are made available to the GFCM, and therefore the

development of a GFCM VMS centralized system was considered crucial, especially for the management of deep-sea fisheries.

INFORMATION, DATA AND REPORTING

79. Mr Edoardo Mostarda, FAO consultant, gave a presentation on “Identification tools for vulnerable deep-sea taxa”. The presentation focused on the work that FAO has carried out in recent years aimed at facilitating the identification of vulnerable deep-sea taxa, and on the tools and data collection requirements for VME indicator taxa that the deep-sea RFMO/As have in place. It was explained that to protect VMEs from significant adverse impacts, a number of actions are required, and the importance of fishery data collectors, the ones who report the encounters, when they are faced with the difficult task of having to identify these taxa. To assist them in this task, FAO has set up the FishFinder Programme (formerly the Species Identification and Data Programme) whose goal was, and is, to develop identification tools with the general objective of improving fishery statistics. The focus, initially on fishery species, has been extended in recent years to include that part of the catch that is not the primary target of the fishery. This is clearly expressed, for example, in article 36 of the FAO Deep-sea Fisheries Guidelines, in which training programmes for scientific observers and fishers from States, RFMO/As and the fishing industry are provided to assist with the identification of all species, including the non-commercial ones. FAO was asked to provide support for the development of field manuals to help with identification. In response to this call, FAO, through the Norway Deep Sea Fisheries Project has developed the identification tools for deep-sea cartilaginous fishes of the Indian and southeastern Atlantic oceans, and is working at the production of similar tools for deep-sea sponges and corals. The work aimed at developing identification tools for deep-sea sponges required particular dedication, and included setting up a discussion group involving 35 experts, most of whom were sponge taxonomists. The main discussion focused on the selection of species to be included, based on criteria recommended by the FAO guidelines, followed by a discussion on the most appropriate identification tools in terms of contents, structure and format.

80. From the discussions, a number of key points were raised, such as the fact that i) a number of regions are poorly studied; ii) many records are unique for a given species and constitute the species type locality; iii) even if data on the occurrence of sponge species are available, there is a lack of photos of freshly caught specimens; iv) there is very little information on the species likely to be impacted by bottom fisheries; and v) identification to the species level is often achievable only through microscopic examination and by taxonomists.

81. The second part of the presentation focused on the actions taken by the different RFMO/As for improving the collection of data on VME indicator taxa. Among these actions, the following were highlighted: i) the existence of a data collection protocol, ii) a list of taxa that are considered vulnerable in the fishery being assessed, iii) the presence of trained fishery observers on board vessels, and iv) the availability of identification tools for non-commercial species.

82. Regarding the lists of VME indicator species developed by the different RFMO/As, Mr Mostarda indicated that some RFMO/As developed and compiled their lists independently, with an internal process, while others relied on the assistance of third parties (e.g. universities, external scientists, private companies). He underlined that FAO had just started to develop a poster with a list of the main deep-sea sponge species occurring in the Mediterranean Sea.

83. Some experts pointed out that information on deep-sea sponge species from the eastern Mediterranean Sea was still missing and most studies and available knowledge came from surveys carried out in the western Mediterranean. The deep-sea sponge species compositions occurring in other parts of the Mediterranean basin could be completely different from what is found to occur in the western Mediterranean. In light of this, and for fishery management purposes, they suggested preparing Mediterranean sponge guides, with examples of sponge assemblages, without linking them strictly to the genus and species.

84. The experts further concluded that the identification of deep-sea sponges, corals, and other species at the genus or species level would be feasible only with trained and/or competent observers on board commercial vessels or on deck, and who are able to compile ad hoc forms to report such catches with taxonomic information. It was recognized that in the Mediterranean fisheries, where no scientific and trained observers were on board during fishing operations, the only feasible encounter protocol should request fishing crew to report to the GFCM the quantities of the most important benthic groups, accordingly to the proposal presented to the 40th session of the Commission.

85. Some participants suggested that the proposed simplified VME encounter protocol could also include the quantities of easily identifiable species by fishers. It was also noted that fishers from other regions were sometimes reluctant to report VME encounters as often these areas were then immediately closed by the competent RFMO/A if the reported catches were above the given thresholds and due to this, The proposal presented to the 40th session of the Commission did not imply any closure to fished areas upon reporting.

86. Ms Tassetti presented “Monitoring aspects of deep-sea bottom trawl fisheries in the Mediterranean”. The complexity of deep-sea bottom trawl fisheries targeting red shrimps in the Mediterranean represents a challenge for the evaluation of the status of target stocks. A dedicated expert group in the framework of GFCM Scientific Advisory Committee is desirable to develop specific analyses utilizing VMS and/or AIS data. The analyses carried by the group will be useful in understanding fishing grounds and catch rates in each Mediterranean sub-division or GSA of deep-sea resources for the longest time series possible. The outcomes will be useful for the development of integrated stock assessment models, taking into account stock configurations evidenced in other research projects. A precautionary approach is envisaged for areas without VMS and AIS information, taking into consideration that target stocks are shared among several fleets. The combination of identified fishing grounds with VMEs map will be a crucial step to select the areas to protect in the future.

87. The experts remarked that in deep-sea bottom fisheries, an important component of bycatch was not only benthic species but also species of demersal sharks, rays and chimaeras. The meeting suggested to develop a data collection protocol for cartilaginous species caught in deep-sea shrimp fisheries as well as on other discarded species; it was proposed that specific provisions in this sense could be easily included in the future GFCM multi-annual management plans on deep-sea fisheries.

88. Mr Fernando Nieto Conde, independent consultant, presented “Monitoring and compliance for deep-sea fisheries and VMEs”. He noted that sensitive deep-sea habitats and the fragile life cycle of deep-sea species deserve special attention. Thus, deep-sea fisheries require not only specific management, but also control measures guaranteeing the sustainable exploitation of deep-sea stocks while preserving VMEs. The European Union and North East Atlantic Fisheries Commission (NEAFC) have developed monitoring, control with MCS programmes that contribute towards sustainable deep-sea fisheries by enhancing compliance with conservation measures to the benefit of present and future generations. In this talk, MCS measures in force at the European Union and NEAFC level were presented. Special attention was devoted to issues found when implementing the control policy, where the enforceability of some measures is at stake.

89. In addition, the control of deep-sea fisheries requires high standards of international cooperation. The role of the European Fisheries Control Agency reveals a best practice to follow the activity of European Union fleets worldwide in a centralized manner by means of its joint Fisheries Monitoring Centre. Lastly, when setting the scene of deep-sea fisheries, several synergies arise between decision-making and policy implementation. Certainly, some experiences demonstrate that the best cost-effective data collection framework to both monitor and provide decision-making on deep-sea fishing with a sound scientific basis is one where a cross-sectoral approach is adopted, and there are many opportunities for this to be applied to bottom fisheries as well.

90. In light of his experience, Mr Nieto Conde suggested that the identification of deep-sea fisheries should ideally be done by cross-checking a series of information, such as VMS, bathymetry and catch composition. However, not all of this information is available to managers and, therefore, the landing composition with resources occurring exclusively below a certain depth (e.g. below 300 m) were

suggested as the best indicators of deep-sea fisheries (e.g. red and blue shrimp in the Mediterranean Sea).

COLLABORATION AND PARTNERSHIPS

91. Mr Daniel Cebrian presented the “Joint strategy between RAC/SPA, ACCOBAMS²², GFCM, and IUCN with the collaboration of MedPAN²³, for the spatial conservation and sustainable use of the marine environment in the Mediterranean”. The overall aim of the joint strategy was to pursue Aichi Target 11 at the Mediterranean level in a coordinated manner, within the application of the precautionary approach and EAF. The main objective of the joint strategy is the conservation and the sustainable use of the open sea in the Mediterranean through the adoption of spatial-based management and conservation measures in priority areas of the open sea, with a focus on fishing activities.

92. GFCM acknowledged the importance of such an initiative and recalled the importance of the GFCM decision to forbid trawling below 1 000 m, which allowed management and conservation actions to focus on shallower areas. Mr Bernal recalled that GFCM was a fishery body and its priority was to ensure the sustainable exploitation of fish stocks in order to provide valuable nutrients from fish resources. Accordingly, he suggested that the joint strategy should ensure to collect scientific evidence that support the conservation of specific priority areas, either because of their vulnerability or because their potential to facilitate healthier ecosystems and/or more productive fisheries.

93. The meeting underlined the unity of such a coordinated initiative, and participants congratulated the different actors involved in the institutional effort to build an opportunity to work as a consortium of regional organizations with different mandates but with a competence over the very same area.

94. Mr Jarboui thanked the experts for their active participation in the discussions, which were extremely useful and productive and he passed the role of Chairperson to Ms Tandstad for the closing session.

CLOSING SESSION

95. Mr Thompson presented some key points in his final talk, “Placing GFCM’s management within a global context” to wrap-up the discussions, summarizing the content and discussions of the workshop for the initial two days. He then made some suggestions that may be applied to the Mediterranean Sea that would enhance the sustainable management of certain deep-sea fish stocks to ensure that stocks were being fished sustainably and that impacts were below acceptable limits.

96. The first day of the workshop introduced the international instruments applicable to bottom fisheries globally and explained how these had been implemented in the high seas of many of the world’s ocean regions. Care was made to explain that these measures relate to the control of fisheries to ensure that stocks are maintained within sustainable limits and that impacts are below threshold levels. The concluding presentations on the first day explained the work of GFCM and the measures it has in place for its deep-water bottom fisheries.

97. The second day focused on the deep-water bottom fisheries and biodiversity of the Mediterranean Sea, and on how specific fisheries management measures could be applied to support sustainable fisheries and protect benthic habitats from significant adverse impacts resulting from fisheries using bottom contact gear types. It became apparent that, whereas measures were applied to the Mediterranean as a whole, the knowledge of the fisheries and biodiversity was stronger along the northern European coast. Most of this increased knowledge came from recent benthic survey work. GFCM also has existing management frameworks that provide a good foundation for future fisheries

²² Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area.

²³ Network of Marine Protected Area Managers in the Mediterranean

management in relation to deep-sea issues. The measures most relevant to this workshop were the FRAs, the trawl ban below 1 000 m, measures on VMS, and the set of trawling standards in the Strait of Sicily.

98. The final day discussed ideas for further measures that could assist in the management of deep-water fisheries. It was emphasized that working with selected fisheries would provide a suitable entry point for introducing a range of measures to sustainably manage these fisheries. It was agreed by most participants that the red shrimps (*Aristaeomorpha foliacea* and *Aristaeus antennatus*) bottom trawl fishery occurring at 400–800 m, which has expanded rapidly and is showing signs of both current overexploitation and future expansion, would be a suitable “entry point” for introducing a set of comprehensive management measures, considering there is already background knowledge of this fishery. The following options were presented for the red shrimp fishery.

Phase I

- Request members to provide map of existing fishing groups (including use of VMS, AIS and logbook information to achieve this)
- Catch and bycatch recording and reporting (including identification of shark and VME indicator species using observer support)
- Fine-scale mapping of selected fisheries near canyons (and studies on sediment flow into canyons and any SAI this causes to sedentary species in canyons).

Phase II

- Assessments of red shrimp (*Aristaeomorpha foliacea* and *Aristaeus antennatus*) stocks and estimation of total allowable catch (or proxy)
- Quota allocation of above (e.g. catch, effort)
- Mitigation measures for fishery, reducing shark catches, and VME protection
- Monitoring of fishery
- Closure when the total allowable catch was reached

99. Mr Bernal informed the meeting that a technical background document²⁴ on the establishment of a multi-annual management plan for deep-sea fisheries in the eastern Mediterranean had been already prepared by the GFCM Secretariat; he confirmed that the outputs of the FAO workshop in relation to the management of the red shrimps fishery (including phase I and II) shall be taken into account within this technical work towards the establishment of a management plan for these resources.

General information on VMEs

100. It is important that the work on the finalization of a VME indicator list continues, ensuring that the VME criteria in the guidelines are applied to both hard and soft bottom sedentary species. This should be supported by appropriate identification guides.

101. It is also important to integrate the VME indicator list with the fishery measures. The identification of many of these indicators to species level is only possible with the aid of taxonomists, and beyond the abilities of most fishers, observers and compliance personnel. Higher taxa may be more appropriate indicators in many cases, although this could be supported by a detailed list.

102. A summary table is presented below.

	2016-2017	2019+
Red shrimp	Phase I Existing fishing areas VME indicators	Phase II Allocation of total allowable catch/effort Measures for shrimp stock

²⁴ Background Technical Document in Support of the Management Plan for bottom trawl fisheries for deep-water blue and red shrimp, *Aristeus antennatus*, and the giant red shrimp, *Aristaeomorpha foliacea*, in the Eastern-Central Mediterranean (GSA 12–16, 19–27).

(400–800 m bottom trawl fishery)	Data collection and research identification guides Shrimp assessment Draft deep-water shrimp plan	Identify and close VMEs Mitigate impacts on stocks, bycatch (sharks) and VMEs (canyons, soft bottom) General bottom fishing measures Thresholds Encounter protocols Exploratory fishing protocols VME closures
Mediterranean-wide (VMEs and significant adverse impacts)	Finalize VME list Distribution of fishing effort by gear Submit list to SAC	Overlaps between fishing and benthos and analysis of severity of impacts

CONCLUDING REMARKS

103. The meeting agreed that the bottom-trawl red shrimp fisheries could be a suitable case study for deep-sea fisheries, to which GFCM could devote management priority in the near future, and through the establishment of multi-annual management plan, including precautionary ad hoc measures to:

- i. identify existing and new fishing grounds (e.g. with authorized vessels, exploitation areas and ad hoc requests to fish in new areas);
- ii. collect detailed information on bycatch, including on corals and sponges and other vulnerable groups; and
- iii. set appropriate limits to fishing (e.g. total catch quotas).

104. The meeting also recognized the importance of developing a Mediterranean “operational” list of VME indicator species or species groups according to FAO criteria. Nonetheless, it was also considered that an initial VME encounter protocol could be based on the presence or absence of the main vulnerable groups and that with simple on board guides fishers could be trained to regularly report such catches. As well, VME species catch thresholds to establish fishery closures for the Mediterranean were not considered appropriate.

105. The meeting also suggested the first GFCM Working Group on VMEs to be composed of a larger number of scientists with expertise on both deep-sea fisheries and benthos ecology (taxonomists and biologists). In order to advance before the first meeting of this ad hoc working group, the experts agreed to remain in contact with FAO and the GFCM Secretariat to engage in consultations and carry out preliminary work, by virtual communication means, in order to advance (e.g. on the definition of the VME indicator list), building upon the outcomes of the FAO workshop and the experts’ network.

106. Ms Tandstad closed the workshop, remarking on the productivity of the meeting, and thanked participants for their input. Next steps in the process include the formulation of specific tasks that will support GFCM’s upcoming work on deep-sea fisheries and VMEs.

107. Gratitude was expressed by the participants to FAO for organizing and coordinating the meeting in collaboration with the GFCM Secretariat.

Appendix A

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Appendix B

Agenda

1 Opening

1.1. Opening session

- Welcome addresses
- Appointment of Chair and Rapporteur
- Adoption of Agenda
- Introductions of participants

1.2. Workshop objectives and expected outputs (by FAO)

2 Setting the scene: relevant global and regional instruments and measures

2.1. International instruments relevant to DSF (by FAO)

2.2. FAO's work with DSF: developing partnerships, collaborative work, and opportunities

2.3. Global summary of RFMO/A measures for DSF and VMEs and overall assessment of their effectiveness (by FAO)

2.4. Habitats and DSFs under management measures in the Mediterranean (by GFCM)

3 Characterization of DSF and benthic habitats in the Mediterranean

3.1. Identification of DSF, fished areas and fish stocks in the deep-seas of the Mediterranean

- Overview of Mediterranean DSF (by Giuseppe Scarcella, GFCM, and Fabio Fiorentino, IAMC-CNR)
- Spatial distribution of fishing effort around the Mediterranean (by Nora Anna Tassetti, ISMAR- CNR)
- Deep-sea resources, Mediterranean Sea, Egypt (by Mahmoud Farrag, Al-Azhar University)
- Deep-water red shrimps in the Ionian and Aegean Seas (by Kostas Kapisir, Hellenic Centre of Marine Research)

3.2. Benthic habitats of the Mediterranean

- Deep-sea habitats: species and ecosystems (by Emanuela Fanelli, ENEA)
- Results from the MEDITS programme: long-term changes in demersal species in the Spanish Continental Mediterranean upper-slope (400-800 m) (by Gil de Sola Simarro Luis, IEO)
- Benthic modular organisms as VME builders (by Carlo Cerrano, Polytechnic University of Marche)
- *Open discussion on DSF in the Mediterranean*

4 VMEs and measures to protect VMEs from significant adverse impacts (SAIs)

4.1. VMEs

- Basic concepts: bottom fisheries, SAIs, and VMEs (by FAO)
- Management of DSF and VMEs: regional experiences (by Mariano Koen Alonso, NAFO)
- Information from surveys and commercial vessels on the distribution of VMEs (by Luis López Ábellan, IEO)
- Known vulnerable Mediterranean deep-sea ecosystems (by Maria del Mar Otero Villanueva, IUCN)
- Defining Mediterranean VMEs (by Pilar Marin, OCEANA)
- *Open discussion on indicator species, indicator elements, and characteristics of Mediterranean VMEs*

4.2. Sponge and coral fauna: reporting and tools (by Marzia Bo, Genova University)

4.3. Encounter protocols and the use of indicators and thresholds to protect biodiversity

- Introduction (by FAO)
- GFCM actions in relation to the use of encounter protocols, and outcomes of the 40th Session of the GFCM (May 2016) (by Othman Jarboui, GFCM SAC)
- *Open discussion*

4.4. Exploratory fishing protocols and impact assessments (by FAO)**5 Information, data and reporting**

- Identification tools for deep-sea sponges (by FAO)
- Monitoring aspects of deep-sea bottom trawl fisheries in the Mediterranean (by Anna Nora Tassetti, ISMAR-CNR)
- Monitoring and compliance for DSF and VMEs (by Fernando Nieto Conde, Independent Consultant)

6 Collaboration and partnerships

- Joint strategy between RAC/SPA, ACCOBAMS, GFCM and IUCN with the collaboration of MedPAN, for the spatial conservation and sustainable use of the marine environment in the Mediterranean (by Daniel Cebrian, RAC/SPA)

7 Collaboration and partnerships

- Placing GFCM's management within a global context (by FAO)
- Conclusions and recommendations
- Any other business
- Workshop closure

This document contains the report of the *FAO Workshop on the Management of Deep-sea Fisheries and Vulnerable Marine Ecosystems in the Mediterranean* took place from 18 to 20 July 2016 at the FAO Headquarters in Rome, Italy. The workshop was organized in close collaboration with the General Fisheries Commission for the Mediterranean (GFCM). The meeting addressed issues relating to the definition and management of deep-sea fisheries and vulnerable marine ecosystems (VMEs) in the Mediterranean, within the framework of the *International Guidelines for the Management of Deep-sea Fisheries in the High Seas* (FAO, adopted in 2008; FAO Deep-sea Fisheries Guidelines). The overall workshop objective was to review current global practices in the management of deep-sea fisheries, looking at relevant international processes and instruments, particularly those provided by different UNGA resolutions on deep-sea fisheries and VMEs, and the FAO Deep-sea Fisheries Guidelines. The workshop aimed to characterize the deep-sea fisheries of the Mediterranean, and address the specific issue of VMEs, with the aim to provide advice to ongoing discussions within GFCM about required management measures to protect these habitats. The workshop was financed with the support of the FAO Deep-sea Fisheries Programme, specifically, the Norway-funded project: "Support for the implementation of the International Guidelines on the Management of Deep-sea Fisheries in the High Seas". The workshop also contributed to the goal and objectives of the GEF-funded ABNJ Deep Seas Project: "Sustainable Fisheries Management and Biodiversity Conservation of Deep-sea Living Marine Resources and Ecosystems in the Areas Beyond National Jurisdiction".

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