



## Scientific Advisory Committee on Fisheries (SAC)

### Working Group on Marine Protected Areas (WGMPA), including a session on essential fish habitats (EFH)

FAO headquarters, Rome, Italy, 18–21 February 2019

## REPORT<sup>1</sup>

### EXECUTIVE SUMMARY

The third meeting of the Working Group on Marine Protected Areas (WGMPA)<sup>2</sup> took place from 18 to 21 February 2019 at the Food and Agriculture Organization of the United Nations (FAO) headquarters, Rome, Italy. As agreed by the forty-second session of the Commission (FAO headquarters, Italy, October 2018), the meeting addressed the following main tasks: i) review new and pending proposals for the establishment of GFCM fisheries restricted areas (FRAs); ii) assess the effectiveness of existing FRAs against their objectives and propose suitable scientific monitoring plans; and iii) advance on the implementation of Resolution GFCM/41/2017/5 on a network of essential fish habitats in the GFCM area of application. The meeting reviewed pending proposals for FRAs, in particular the proposal for a FRA in the Otranto channel (GSA 18), as well as a new proposal for a FRA in the Ligurian Sea (GSA 9). The WGMPA also discussed suitable ways to monitor the FRAs from a scientific point of view and identified the most relevant EFH for priority species. Finally, the meeting reiterated the importance of creating a scientific database collecting evidence on the existence of VME indicators and proposed a new template (based on the already existing VME template of the International Council for the Exploration of the Sea [ICES]) to populate the database with existing and new relevant scientific information.

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## **OPENING AND ARRANGEMENTS OF THE MEETING**

1. The Working Group on Marine Protected Areas (WGMPA) was held from 18 to 21 February 2019 at the Food and Agriculture Organization of the United Nations (FAO) headquarters, Rome, Italy. Sixty-two experts from Mediterranean countries, partner organizations, the European Commission, the FAO Fisheries and Aquaculture Department, the FAO regional projects and the GFCM Secretariat attended the meeting. The list of participants is reproduced in Appendix 2 of this report.

2. Mr Miguel Bernal, GFCM Fishery Resources Officer, opened the WGMPA on behalf of the GFCM Secretariat welcoming participants to Rome. He reminded the working group that this was an expert meeting with the aim of producing draft advice to help the Scientific Advisory Committee on Fisheries (SAC), and later the Commission, take decisions with respect to regional spatial management measures with the objective of avoiding significant adverse impacts (SAI) of fisheries on marine ecosystems. He introduced the agenda, which was adopted with minor changes as reproduced in Appendix 1, and invited participants to briefly introduce themselves.

3. Mr Bernal then introduced Mr Alaa Eldin El Haweet, Chairperson of the SAC, and proposed to appoint him as Chairperson of the WGMPA during the entire meeting. He also proposed each session of the meeting be co-chaired by participants with a strong expertise on the topic of the session; the meeting unanimously agreed with this proposal and appointed Mr Andy Kenny, Centre for Environment, Fisheries and Aquaculture Science (Cefas) (UK), Mr Fabio Fiorentino, Italian National Research Council (CNR) (Italy), Mr Jean-Noël Druon Joint Research Centre (JRC) (European Commission), and Ms Emanuela Fanelli, Polytechnic University of Marche (Italy), as co-chairpersons of sessions 2, 3, 4, and 5, respectively.

4. Mr Bernal introduced the terms of reference of the working group for 2018, namely: i) assess the benefits of fisheries restricted areas (FRAs) for the protection of Vulnerable Marine Ecosystems (VMEs), vulnerable species and sensitive habitats and the recovery of overexploited stocks in the GFCM area of application; ii) identify potential areas for the establishment of new FRAs; and iii) review the state of implementation of Resolution GFCM/41/2017/5 on the establishment of a network of essential fish habitats in the GFCM area of application. He highlighted that this working group was established in 2014, initially in coordination with other organizations including the International Union for Conservation of Nature (IUCN) and the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS) and made reference to the extensive work produced by the GFCM Working Group on Vulnerable Marine Ecosystems (WGVME) in 2017 and 2018 on VME management-related issues. He introduced the expected outcomes of this meeting, namely producing: i) advice on the new/pending FRA proposals addressing the protection of VMEs and/or essential fish habitat (EFH) in the Mediterranean; ii) suggestions on the best ways to assess the efficacy of FRAs towards their objective; and iii) advice on the implementation of Resolution GFCM/41/2017/5.

## **SPATIAL MANAGEMENT MEASURES TARGETING FISHERIES IN THE MEDITERRANEAN AND BLACK SEA**

5. Ms Aurora Nastasi, GFCM Secretariat, presented the current state of GFCM FRAs and recent progress made by the GFCM to minimize SAI from fisheries on marine ecosystems. She began her presentation identifying the main progress achieved by the GFCM over the last three years. She recalled the definition of FRA, specifying that these could be established by the GFCM to protect any species/habitat. She displayed the various FRAs established by the GFCM so far, including the latest in the Jabuka/Pomo Pit (2017). She also reviewed progress on the management of VMEs and deep-sea fisheries (DSF), reminding participants about relevant resolutions from the United Nations that call its member States, through regional fisheries management organizations (RFMOs), to sustainably manage DSF and protect VMEs. Ms Nastasi recalled that technical elements for the management of VMEs and DSF in the

GFCM area of application were endorsed by the last session of the Commission (FAO headquarters, Italy, October 2018). She concluded recalling the text of Resolution GFCM/41/2017/5.

6. It was also recalled that the FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas, developed in 2009, were produced as a tool for RFMOs to define DSF and VMEs and develop management measures in their respective competence areas.

7. Mr Bernal recalled that the Commission had endorsed at its forty-second session (FAO headquarters, October 2018) the Protocols for the protection of VMEs in the GFCM area of application, including a VME encounter protocol mainly aiming at collecting information from GFCM countries, when sensitive benthic species are bycaught. Nonetheless, this protocol was not yet being used by Mediterranean fisheries as no binding decision was adopted by the Commission. He informed the meeting that the VME encounter reporting protocol would be used in several GFCM surveys-at-sea with observers on board carried out within the framework of the mid-term strategy (2017–2020) towards the sustainability of Mediterranean and Black Sea fisheries, in the 2018–2020 period and that the information collected would then be submitted to relevant GFCM working groups and to the SAC.

8. Some experts, including from IUCN and Regional Activity Center for the Specially Protected Areas (SPA/RAC), requested clarifications regarding the possibility to discuss, within the GFCM and the WGMPA in particular, issues related to coastal MPAs, such as the effectiveness of their management and their efficacy toward the achievement of their protection objectives, including the protection of fish stocks. It was highlighted that due to its regional nature and through the subregional approach, the GFCM focuses on issues that were relevant to the subregion, including the management of relatively large areas that may have a significant impact on fishing activities, fisheries resources and the marine ecosystem in general. With regard to local measures addressing fisheries, the GFCM Secretariat recalled that bilateral communication with its contracting parties under way in order to gather information on the establishment of national FRAs within national waters and outside the boundaries of MPAs. The WGMPA was also reminded that a GFCM working group on small-scale fisheries (WGSSF) did exist to discuss about MPAs-SSF related issues, including within the framework of the recently adopted Regional Plan of Action for Small-Scale Fisheries.

9. Some participants reported to the group that bottom-trawling activities were carried out below 1000 m in the eastern Mediterranean, despite the GFCM decision to ban such activities. Mr Bernal clarified that this should be addressed as a compliance issue and therefore brought to the attention of the Compliance Committee (CoC).

10. Mr Tony Thompson, FAO Project Consultant, provided the meeting with relevant information on the areas beyond national jurisdiction (ABNJ) Deep Seas project of FAO-Global Environment Facility (GEF) and spatial management. He highlighted the Common Oceans Programme coordinated by FAO that has many partners including the GFCM and other RFMOs. It had been operational for the last five years and consists of four main projects, including the ABNJ Deep Seas project. A follow-on project was now being developed and was looking for partners and themes of work. The ABNJ Deep Seas project focuses on legal frameworks, the reduction of impacts, planning and adaptive management and area-based planning. Focus areas include the south-eastern Atlantic and Indian Ocean.

11. The biological and ecological link existing between EFH, VMEs and the status of fish stocks was highlighted as all of this was intertwined. However the working group noted that the GFCM had already established several FRAs across its area of application and that such areas, especially those to protect EFH, would not be sufficient to counteract the overexploitation status of a given stock while allowing the sustainable exploitation of the resources. The meeting acknowledged that the establishment of a FRA should be integrated into other fisheries management measures, such as the management of fishing effort and capacity that should all together contribute to improve the status of the stocks and the sustainability of its related fisheries.

12. Mr Andrew Kenny, scientist at the Centre for Environment, Fisheries and Aquaculture Science (Cefas), introduced the approaches for assessing VME SAI in the Northwest Atlantic Fisheries Organization (NAFO) and the North-East Atlantic Fisheries Commission (NEAFC). He described the monitoring and assessment approaches being developed and implemented by NAFO and NEAFC in addition to the methods applied to assess SAI in the NAFO regulatory area. He showed that the integration of information on the distribution of VME habitat, the location of FRAs and available data from vessel monitoring systems (VMS) could be used to make an initial assessment of SAI in the GFCM area of application. Finally, Mr Kenny insisted on the fact that other sources of data could complement VMS, such as satellites, but could not be used independently as they had limitations. He also explained that VMEs were significantly different in terms of resilience to fishing activities, according to the type of species assemblage (e.g. sponges versus sea pens).

13. The working group requested clarifications on the source of the data presented. Mr Kenny explained that the bulk of the information came from ten-year or more data series from fishery-independent surveys. He pointed out that data from fisheries were few and not fully reliable, and reporting was mandatory above a certain threshold (e.g. kg of benthic species caught).

14. Mr Christos Maravelias, Policy Officer of the European Commission, asked clarifications regarding the identification of possible closures to fisheries, which criteria were used (e.g. biomass, thresholds, density) and what kind of target the scientific surveys carried out in the NAFO area had. It was clarified that biomass patterns were used to identify or predict hot spot areas, thanks to specific discontinuities found in the VME distribution maps and that the primary objective of the scientific surveys was the assessment of the status of the stocks. Data on bycatch were being recorded at the same time, allowing the mapping of VME indicator species as VMEs are also often associated to EFH and *refugia* habitats of commercial fish stocks.

15. Some participants highlighted that within the framework of the EU, data from Medits surveys on the distribution of macrobenthos were collected since 2000 and that data on VME indicator species could be therefore extracted. The GFCM Secretariat welcomed this proposal but reminded that Medits surveys only covered EU countries, not the entire GFCM area of application.

16. The Chairperson reaffirmed the importance of establishing a comprehensive picture of the distribution of VME indicator species across the Mediterranean from any kind of survey and recalled that in the eastern Mediterranean, sponges aggregations were gradually disappearing because of the impact of fisheries and other human activities. He also underlined that with VMS data made available from commercial fisheries, the management possibilities would largely increase and improve their efficacy. He regretted that, in the GFCM area of application, VMS was not widely implemented yet due to technical and financial limitations in some developing countries.

17. In this respect, Mr Bernal clarified that the use of VMS was mandatory in all GFCM fisheries for vessels above 15 m length overall (LOA) since 2009, but that some countries requested a derogation to allow more time for its full implementation and that capacity-building activities towards the use of VMS was being developed by the GFCM in select countries.

18. Ms Pilar Marin, Marine Scientist at Oceana, recalled that a lot of information regarding the distribution of VME indicator taxa from the Mediterranean was already available and that a GFCM interactive geodatabase would be the best regional tool to gather and display these data, as already advised by the WGVME in 2017 and 2018.

19. Ms Laura Robson, from the Joint Nature Conservation Committee (JNCC) and chairperson of the ICES Working Group on Deep-water Ecology (WGDEC), confirmed that the ICES VME Data Portal database showing VME distribution maps was supplied with a mix of data coming from scientific surveys, recent literature and fisheries.

20. It was therefore finally envisaged that, pending the formal adoption by the GFCM of the VME encounter protocol for fisheries, GFCM could start, as already done by ICES, compiling information on the distribution of VME indicator species in the Mediterranean, starting with data coming from scientific surveys and publications. It was reaffirmed that in displaying this kind of information, the GFCM geodatabase would be the ideal tool.

21. Ms Emanuela Fanelli, Associate Professor at the Polytechnic University of Marche (Italy), gave a presentation entitled “The criteria for the identification of deep-sea protected areas in the Mediterranean Sea: a lesson from the project IDEM (Implementation of the MSFD to the Deep Mediterranean Sea)”. Due to several limitations, including historical, logistic and funding constraints, the ecological knowledge of the deep sea and its biodiversity is limited, despite deep-sea ecosystems represent the vastest regions of the earth and are facing multiple human-related threats, such as deep-sea fisheries and mining. The Mediterranean Sea has several peculiar, heterogeneous and diversified deep-sea habitats, including submarine canyons, seamounts, biogenic reefs or cold seeps, which host a very abundant and diversified fauna, including several endemic species. The latest report from the United Nations Environment/Mediterranean Action Plan (UN Environment/MAP) reported that only 5.31 percent of the area deeper than 200 m is covered by MPAs and Other Effective area-based Conservation Measures (OECMs), while different areas hosting vulnerable marine ecosystems and species are still not protected. In this context, within the project IDEM, a huge effort was devoted to the compilation of information available on deep-sea ecosystems, encompassing the 11 descriptors of the Marine Strategy Framework Directive, in order to analyse gaps in knowledge and to identify key areas to include in monitoring programs. One of the main outcomes of the project is the definition of specific guidelines for the designation of deep-sea protected areas in the Mediterranean, after identifying deep-sea ecosystems where cumulative impacts from human activities and vulnerable ecosystems co-occur.

22. With regard to the proposal made by Ms Fanelli of closing the entire area below 600 m to bottom-contact fishing gear, some participants highlighted that this drastic measure would have a strong economic impact on bottom trawlers operating between 400 and 800 m and targeting deep-water red shrimps and would probably not be effective. They advised that it would be wiser and more acceptable for the fisheries sector to adopt a management approach for deep-water trawl fisheries distinguishing areas between 400 and 1000 m in which trawling is allowed from those in which deep-sea fishing should be closed for conservation purposes.

23. In this respect, the GFCM Secretariat recalled that the Technical Elements Protocols for the protection of VMEs in the GFCM area of application, adopted by the forty-second session of the Commission, also included provisions for the management of DSF, including the identification of DSF areas, such as DSF footprint as well as the identification of previously unfished grounds to which ad hoc spatial management measures would apply (i.e. exploratory fishing protocol), in order to prevent SAI of deep-sea fisheries on unfished benthic habitats.

24. Ms Fanelli recognized the relevance of these comments. She recalled the importance of achieving 10 percent of Mediterranean marine protection by 2020. The meeting acknowledged that the criteria to identify protected areas to take into account towards the achievement of this target was not clear, mentioning that areas such as the Pelagos Sanctuary were included while some of the FRAs were not.

25. Considering that fishing activities had often been referred to as the most impacting human activity on marine ecosystems (Kroodsma *et al.*, 2018<sup>3</sup> show that industrial fishing occurs in >55 percent of ocean area and has a spatial extent more than four times that of agriculture), and recognizing the effort of GFCM to close specific areas to fisheries, including in the high-sea, the WGMPA suggested the GFCM to engage in bilateral communications with the Convention on Biological diversity (CBD) Secretariat to request the

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<sup>3</sup> Kroodsma, D.A., Mayorga, J., Hochberg, T., Miller, N.A., Boerder, K., Ferretti, F., Wilson, A., Bergman, B., White, T.D., Block, B.A. and Woods, P., 2018. Tracking the global footprint of fisheries. *Science*, 359(6378), pp.904-908.

FRAs to be officially recognized as spatial management measures (e.g. as OECMs) to be taken into account in the objective to reach 10 percent of the Mediterranean Sea protected by 2020.

26. The presentation that followed was given by Ms Sondes Marouani, Researcher at the National Institute of Marine Sciences and Technology (INSTM), on marine protected areas as an elasmobranch fishery management tool in Tunisia. Implementing MPAs for species that show some site fidelity may be a useful approach in certain cases such as for elasmobranch species. In Tunisia, investigations showed the occurrence of several elasmobranch species along Tunisian coasts, mainly in the Gulf of Gabès (Southern Tunisia). Small-scale fleets targeting elasmobranchs are operating in the Gulf of Gabès. Among migratory sharks, three species are listed in Appendixes I and II of the Convention of Migratory Species of Wild Animals (CMS) and captured accidentally as bycatch along Tunisian coasts: the white shark (*Carcharodon carcharias*), the basking shark (*Cetorhinus maximus*) and the shortfin mako shark (*Isurus oxyrinchus*). Adults and juveniles of these species were captured as bycatch mainly in the Gulf of Gabès coasts which seems to be a nursery for many elasmobranchs. The delimitation of critical habitats is crucial to manage fisheries and reduce bycatch. MPAs may have conservation benefits for elasmobranchs population by providing protection across different species and life stages. To this day, Tunisian coasts have 5 MPAs: the Galite archipelago, Tabarka, Cap Negro Cap Serrat, Zembra and its islets and the Kuriat islands. Besides, two marine and coastal protected areas are in project: the Kneiss islands and the islands northeast of Kerkennah (Gulf of Gabès). The last area which now has the status of a coastal sensitive zone is selected to benefit from the status of marine and coastal protected area by the National Programme for the Creation of Marine and Coastal Protected Areas in Tunisia led by the Agency for Protection and Development of the Littoral. Therefore, the strategy of elasmobranch fisheries management in Tunisian MPAs is based on the collaboration between scientists, stakeholders (fishermen, recreational divers) and managers, which can be useful to implement high compliance and MPAs acceptance levels, especially when it comes to creating a future MPA network.

27. Mr Bernal considered very relevant the data presented on the presence of endangered sharks species in Tunisia and informed the meeting that recent CITES event, highlighted that some of the species that were considered absent from the catches, based on the analysis of data from European areas, were present in several Tunisian studies on the selectivity of fisheries in the Gulf of Gabès. He also agreed that where these species were present, some of them considered as threatened, adequate management measures should be implemented.

28. IUCN experts informed the WGMPA about a Mediterranean shark experts meeting due to take place in 2019 and invited the Tunisian experts to attend it.

29. Some participants suggested that in addition to the establishment of a MPA, the adoption of a GFCM FRA could be a possible effective management measure to reduce the incidental catch of vulnerable pelagic shark species in the area defined by the experts.

30. Mr Zafer Kizilkaya, Director of the Mediterranean Conservation Society, introduced Ecosystem Restoration in Turkish MPAs and Gökova Bay Case: Sustainable Fisheries Success. The Gökova Bay is one of the largest MPA in Turkey. Developed in response to marine ecosystem degradation, declining trends in fish diversity and abundance, and the related losses of fishers' incomes, the Mediterranean Conservation Society, or Akdeniz Koruma Derneği in Turkish, has created a network of “no-take zones” that put local fishing communities at the lead of marine biodiversity conservation. Focusing on the southern Mediterranean coast of Turkey, the organization is effectively communicating the value of sustainable fishing techniques to ensure the long-term viability of the local fisheries. Community-based enforcement strategies are complemented by cooperation with regional and national authorities and scientific studies to monitor ecosystem health. Fish stocks have grown significantly, so do the average incomes of cooperative members. Monitoring activities confirm rejuvenated marine species diversity and abundance in the bay, which is an important nursing ground for diverse endangered marine species, including Mediterranean monk seals and sandbar sharks.

31. The Chairperson and co-Chairperson of the sessions congratulated all the speakers for their contributions and for the interesting discussions that they had stimulated and acknowledged that in the Mediterranean Sea, several forms of spatial protection measures exist, including in the high sea, and concluded that the GFCM is advancing on this subject. Nonetheless, it was also underlined that spatial management measures alone may not be sufficient to counteract the overfishing of stocks while allowing a sustainable exploitation of resources. Accordingly, the WGMPA advocated new FRAs to be included in broader and comprehensive fisheries management plans, in order to enhance their conservation efficiency.

## **IDENTIFICATION AND PROPOSAL FOR POTENTIAL NEW FRAS**

32. The working group reviewed the proposals for new FRAs as well as the advances in the technical work in support of the establishment of FRAs previously proposed to the SAC.

33. Ms Fiorenza Micheli, Professor and co-director of the Stanford Center for Ocean Solutions, presented an update on the southern Adriatic Sea FRA proposal<sup>4</sup>: promoting the recovery of the Adriatic Sea through the protection of deep EFH. She mentioned that being one of the most productive seas of the Mediterranean, the assessed fish stocks of the Adriatic are overexploited and fisheries management measures adopted so far has failed to reverse this trend. In particular, demersal fisheries in the Adriatic have overexploited, commercial fish stocks, altered EFH and caused a loss of VMEs. Promoting the recovery of EFH and VMEs is a key priority for rebuilding fish stocks and supporting sustainable fisheries. The South Adriatic Sea makes a substantial contribution to fish production. Her presentation enabled to identify important nursery and spawning grounds of valuable deep-water stocks and VME species. The protection of EFH and VMEs would contribute to the long-term sustainability of demersal fisheries and meet the management objectives of the GFCM.

34. The GFCM Secretariat reminded the meeting that this FRA proposal was submitted for the first time to the Subregional Committee for the Adriatic Sea (SRC-AS) in 2018 and that further analysis, including on the socio-economic impact of such measure on the Albanian and Italian fleets, was requested by the concerned countries. In 2019, an updated proposal was to be submitted again to GFCM relevant meetings. It was also recalled that the WGMPA should provide inputs on the technical contents of the proposal, in particular in relation to the scientific evidence in support of the existence of VMEs or EFH to be protected, while the SRC-AS should assess the integration of socio-economic information as requested in 2018 was carried out and if the assessment of potential impacts was adequate for the proposal to be submitted for the consideration of the SAC.

35. Some participants noted that, on the basis of the maps presented, most of the demersal fish nursery areas were located at the limits of the proposed buffer zones and mostly outside these (and within national waters). Ms Micheli explained that it would be ideal to include a larger portion of national waters within the buffer zones, but for the time being the FRA proposal was focusing on protecting the high-sea.

36. Mr Fabio Fiorentino noted that only one nursery of giant red shrimp (*Aristaeomorpha foliacea*) would be protected by the FRA and that effort distribution of the Italian fleet did not indicate trawlers were having a strong impact on this nursery. If this was to be confirmed, the overall spillover would not be relevant and closing this area to protect one nursery area of one species would not seem appropriate to improve substantially the status of commercial stocks in the area.

37. Ms Micheli confirmed that this observation was correct, however although the fishing effort was not high as in other areas, the impact of trawlers on bamboo coral (*Isidella elongata*) aggregations was still very high. For this reason, the ecological impact of this FRA would be significant while the economic impact on fisheries would be low. She also added that the area proposed for the fishing closure would act

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<sup>4</sup> Complete [FRA form](#)

as a connectivity channel between VMEs and EFH occurring in the Ionian Sea (south) and in the Adriatic Sea (north).

38. Some experts asked if any forecast about the fishing effort displacement around the potential FRA had been carried out. Ms Micheli explained that they would anticipate the few trawlers active in the area to displace around the entire FRA, with no major biological impact (as observed in the Jabuka/Pomo Pit FRA). For this reason, the buffer zone was fundamental to create a gradual scale of effort pressure. Ms Micheli added that the impact of this FRA on the Albanian fleet was estimated as close to zero while it would be low for the Italian fleet, with an estimated displacement of effort of around 10 percent–20 percent.

39. Some participants found very relevant the data that indicated an overlapping between *Isidella elongata* distribution and the red shrimp nursery and considered that a FRA addressing at the same time the protection of EFH and VMEs would be an important conservation measure and a step forward for the GFCM.

40. Mr Arian Palluqi, Albanian expert, asked if the clarifications requested by the SRC-AS in 2018 about the consultation with Albanian stakeholders, namely fisher associations and the national administration, had been addressed. He also added that scientific data provided in support of this proposal was not enough. In particular, he recalled that the Malta Declaration not only called for the protection of the marine environment but also for strong data collection and scientific analysis. Considering that in his opinion, the FRA proposal was lacking sound background information under several points of view, he invited the proponents to carry out new surveys in Albania (e.g. on socio-economics of the local fishery sector, Automatic Identification System [AIS] data) before a new submission of the proposal to the SRC-AS. He also mentioned that in Albania, several MPAs and national FRAs already existed.

41. Ms Domitilla Senni, MedReact Coordinator, informed the meeting that her organization had tried to contact the National Albanian Administration but they did not receive any feedback and the stakeholder consultation could not be planned yet while the Italian administration confirmed its availability to meet before the SRC-AS.

42. Mr Anis Zarrouk, EcAp Adria & Bycatch Projects Officer at SPA/RAC, informed the meeting about two ongoing projects implemented in the Adriatic Sea, the GEF EcAp Adriatic Project, implemented by SPA/RAC and the Priority Actions Programme/Regional Activity Centre (PAP/RAC) with the coordination of UN Environment/MAP (in Albania and Montenegro), and the MSP Pilot Project supported by the Italian Ministry for the Environment, Land and Sea also implemented by SPA/RAC and PAP/RAC (in Albania). The SPA/RAC representative offered the support of his organization to facilitate the stakeholder consultation among the interested parties (i.e. Albania, Italy and MedReact [FRA proponent]).

43. Ms Marina Gomei, Regional Projects Manager at the World Wildlife Fund (WWF) Mediterranean Marine Initiative, highlighted the importance that stakeholder consultations are carried out before a FRA proposal is submitted to the consideration of the GFCM and proposed interested parties to facilitate such consultation.

44. It was also highlighted that part of the analysis carried out among fishers came from questionnaires that addressed the Jabuka/Pomo Pit FRA, and that those results could not be extrapolated to the Otranto Channel proposal.

45. In light of the discussions, the WGMPA suggested the FRA proponent to clarify the main objectives of the proposal, whether it was aiming at the protection of VMEs or the protection of EFH, and provide clear links between the objectives proposed and the scientific basis in support of the proposal. It was also suggested that tailor-made questionnaires should be prepared and disseminated to compile fishers' views in relation to the Otranto Channel FRA proposal. The meeting also advised to assess the potential impact of the closure on the status of the red shrimp stock and provide figures on the socio-economic impact of such measure in terms of economic loss or gain instead of relative information such as “low” or “high”.

With such integrations, including the results of the stakeholder consultation with both countries, the proposal could be submitted for the consideration of the SRC-AS in 2019.

46. Ms Maria del Mar Otero, Project Officer at IUCN-Med, provided an update on the Bari Canyon FRA proposal submitted to the SAC and the Commission in 2018. She explained that the proposal was considered complete from a scientific point of view, but a deeper socio-economic assessment of the effects of the FRA on local fisheries, including small-scale fisheries, was requested by the Commission. The fisheries affected by the FRA and its proposed management measure (i.e. prohibition to fish with bottom-contact gear) would be demersal longliners mainly as few trawlers operate in the area. The socio-economic assessment was currently being carried out, in consultation with local stakeholders, on around 50 percent of the entire fleet operating in the area (around 178 fishing vessels in total). She also said that data on small-scale fisheries were being collected also according to the GFCM methodology to survey small-scale fisheries. The results of such analysis would be submitted to the next session of the Subregional Committee for the Adriatic Sea (SRC-AS), in May 2019. She also mentioned the upcoming meeting organized by the University of Bari, COISPA, ISMAR CNR and IUCN with fisher stakeholders from the region of Bari to discuss the proposal.

47. The WWF expert informed that WWF was organizing a series of meetings with the Monopoli fleet (Apulia, Italy) on a WWF ongoing project about shark bycatch reduction. She added her organization would also like to be informed on upcoming meetings for the FRA.

48. The GFCM Secretariat welcomed the efforts that were being done in order to meet the request of the Commission and underlined the importance of presenting again the FRA proposal, including the new results of the socio-economic assessment with the stakeholders, in advance of the SRC-AS meeting in order to allow time for the subcommittee to review the FRA proposal.

49. Ms Senni commented that involving stakeholders in consultation, in particular national administrations, should be a bilateral process and not only an initiative of the proponent, and that contracting parties and cooperating non-contracting parties (CPCs) should facilitate access to the data needed to complete a FRA proposal (e.g. fleet information).

50. Ms Covadonga Orejas Saco del Valle, Senior researcher at the Instituto Español de Oceanografía (IEO), then took the floor for the follow-up on the study around the Balearic seamounts in order to complete the information presented to the WGVME 2018. The Ausias March and Ses Olives features are two seamounts located close to the Balearic Islands which host important benthic communities and fisheries resources. An outstanding population of the critically endangered *Isidella elongata*, inhabits this area. She presented some of the advances that have been done in collecting and mapping AIS data from 2015, 2016 and 2017 in the area, highlighting the places where trawling take place, including some areas that are protected since 2014 under Spanish legislation. This was the case for the Ausias March seamount summit. Ms Orejas Saco del Valle highlighted the current lack of efficiency of the protection measures since suspicious Illegal, Unreported and Unregulated (IUU) fishing activity was taking place following AIS data preliminary analyses. She also presented the ecologically valuable benthic communities dominated by *Isidella elongata* as structuring species, as well as where potential nursery areas are located. She also stressed the need to take action to establish protection and management measures as the species is included in Annex II of the Barcelona Convention, binding for the signatory countries, including Spain. She also explained that further analysis to be carried out throughout the year would include the study of the current fishing effort and footprint (with the use of both VMS and AIS data if available), a possible assessment of IUU fishing and of the potential displacement of the bottom trawler effort around the area that might be potentially proposed to be closed.

51. Some participants noted that a potential FRA in this area would have a surface of around 1000 km<sup>2</sup>, similar to the Jabuka/Pomo Pit FRA and that this should be appropriate for the protection and recovery of the EFH of the area (e.g. surmullet [*Mullus surmuletus*], European hake [*Merluccius merluccius*] and blue and red shrimp [*Aristeus antennatus*]) in association with *Isidella elongata* gardens.

52. Ms Marin presented “*Isidella elongata*, new findings in Aeolian Islands”. New records for *Isidella elongata* came from a research expedition Oceana conducted in May-June 2018 in the Aeolian Islands archipelago, Italy (GSA 10). *Isidella elongata* fields were documented in different locations around the islands using a remotely operated vehicle (ROV) as sampling technic. Colonies occurred in a depth range between 280 and 920 m in bathyal muddy bottoms. The densest aggregations, seemingly in a good healthy status, were found around 800 m depth to the northeast off Lipari Island. She also stressed that this is a remarkable finding, together with the one found in the Balearic Islands, both form the largest forests found in the Mediterranean to date. However, Ms Marin also highlighted that dead and damaged colonies were also documented, which evidenced the impacts from bottom-trawling since gear marks were identified too. Due to this evidence and considering the critically endangered status of the species, she proposed the implementation of precautionary fisheries management measures to avoid significant adverse impacts from fishing activity on this VME indicator species. It was also proposed to update the known-occurrence map of *Isidella elongata* elaborated by experts last year.

53. Mr Bernal recalled that the data submission form proposed by the WGVME in 2018 had not been used yet with the purpose of collecting scientific information on the presence of VME indicators in the GFCM geodatabase of VME indicators. In that respect and taking into account the experts requests to include various types of information on the database, he asked the WGMPA on its views on the process to compile such information and about possible proposals of modification to the data submission form adopted in 2018.

54. The ICES expert informed the WGMPA about a spreadsheet (excel format) used in the NEAFC area to collect such type of information and feed the ICES database. She also said that an annual ‘data call’ was made to ICES relevant parties to collect updated data for the database. Once received and included into the database, the new information was presented and discussed by the ICES WGDEC, with a validation process and anticipation of new closures to fisheries.

55. Some participants underlined that the final purpose of mapping *Isidella elongata* was to understand where these occur in massive aggregations and patches on soft bottom with relative high densities and therefore were more prone to suffer from SAI from fisheries. Experts underlined the extreme importance for GFCM of mapping deep-sea fishing grounds in order to understand where current fishing activities (especially for deep-water red shrimps) overlap with known *Isidella elongata* gardens.

56. Based on the scientific evidence presented about the distribution of *Isidella elongata* gardens, the WGMPA agreed that precautionary management measures should be considered by the SAC to prevent these vulnerable benthic ecosystems from being irreversibly compromised by bottom trawling fishing.

57. The meeting also suggested that systematic reporting of *Isidella elongata* bycatch could be considered within the GFCM Data Collection Reference Framework (DCRF) and EU Data Collection Framework (DCF). In this respect, the GFCM Secretariat clarified that for the time being, the reporting of benthic species was not included in the DCRF, but the Technical manuals<sup>5</sup> prepared by the GFCM Secretariat for the surveys-at-sea, the monitoring of incidental catches of vulnerable species and discards, carried out within the mid-term strategy comprised the reporting of macrobenthos species, including *Isidella elongata*.

58. Mr Francesco Enrichetti, PhD candidate from the Università degli Studi di Genova (Italy), presented a new FRA proposal<sup>6</sup>: deep-sea sensitive habitats from the Ligurian Sea (north-western Mediterranean). VMEs are characterized by peculiar topographical and biocoenotic features, which make them particularly sensitive and poorly resilient to mechanical damages, such as those inflicted by demersal

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<sup>5</sup> Forthcoming. *Monitoring incidental catch of vulnerable species in the Mediterranean and the Black Sea: Methodology for data collection*. FAO Fisheries and Aquaculture Technical Paper No. 640. Rome, FAO. 72 pp.

<sup>6</sup> [Complete FRA form](#)

fishing activities. Spatial management is considered among the most effective measures for the protection of VMEs and for improving the long-term sustainability of commercial stocks. In particular, the protection of nurseries and spawning grounds has been advocated as an urgent measure, particularly the closure of fisheries in areas identified as sensitive habitat and essential fish habitats. The Maledetti Shoal – sensitive habitat, located in the GSA 9 (Ligurian Sea and North Tyrrhenian Sea), is herein proposed as fisheries restricted areas due to the unique topographic and biocoenotic characteristics, including the largest mesophotic red coral population of the Ligurian Sea, and for its important role in supporting relevant assemblages of commercial and non-commercial species. The proposed area has been selected on the basis of: i) extensive scientific knowledge about the benthic biocoenosis inhabiting the shoal; ii) the ecological and biological relevance of the assemblages thriving here, including species with critical life history stages; and iii) the strong impact of demersal fishing activities on vulnerable habitats and species, highlighted by ROV explorations and direct assessment. Therefore, the permanent closure of this area to any demersal fisheries, would safeguard a unique ecosystem and its stocks, in particular spiny lobster and European lobster, allowing for the long-term sustainability of the local fisheries. The establishment of this FRA would be a pioneering case study for the mesophotic Mediterranean region, prone to restoration and monitoring activities and would clearly be in accordance with the ecosystem approach, in line with the management objectives of GFCM, and based on the best available scientific information.

59. The WGMPA noted that most of the impact on these sensitive benthic habitats was deriving more from ghost nets (traps and trammel nets) than from direct active fishing gear. Mr Thompson underlined that the coralligenous habitat was still well conserved apart from the strong occurrence of ghost nets that became encrusted with sessile organisms, including corals.

60. Mr Enrichetti underlined that the lost nets were affecting the gorgonian community, with colonies significantly smaller than in adjacent unfished areas. He also confirmed that the area, due to its particular topography, was well-known for destroying fishers' gears and that the name of the shoal "Maledetti" was chosen for this reason as in Italian it means "damned". Fishers were progressively leaving the area because they often lost their expensive fishing gear. Only around 4 of them were still fishing there. Mr Enrichetti also added that a project to clean the area from lost gear was currently in progress (FEAMP 2014-2020 Measure 4.63). The cleaning would be done by divers and ROVs paying particular attention not to impact coral assemblages.

61. Some participants noted that the area proposed as a FRA was very small (0.52 km<sup>2</sup>) and entirely located within national waters and considered that the protection of this area from fisheries could be achieved with internal bilateral communication between the University of Genova and the Italian Authorities. Possible management options included the establishment of a *Zona Tutela Biologica (ZTB)* (biological protected zone), which could act like a FRA, or the inclusion of the Maledetti shoal area within the boundaries of the adjacent MPA of Isola di Bergeggi.

62. Mr Enrichetti explained that the process to establish a FRA was considered more straightforward and simple as the only target of the proposal is to close the area to all fisheries (professional and recreational) and therefore the FRA tool matched fully with the proponent's conservation objective.

63. The GFCM Secretariat clarified that neither the total surface area of a FRA or its location within national waters would prevent a proposal from being submitted to the GFCM and that the procedure was monitored properly in the case of the Maledetti shoal FRA proposal. It was recalled that the mandate of the WGMPA was to assess the proposal from a scientific point of view only. Management measures and socio-economic aspects of the proposal should be further analysed at the level of subregional committees, and in this case at the upcoming Subregional Committee for the western Mediterranean (SRC-WM), recalling that the next meeting of the SRC-WM would take place in France in April 2019.

64. Experts from the Italian administration present on the first day of the meeting provided information in relation to the FRA proposals in the Otranto Channel, Bari Canyon and in the Maledetti shoal, as follows: in relation to the Otranto Channel and Bari Canyon, they recalled that the Italian administration had not

been contacted by the proponents since the presentation of the initial proposal in 2018 and that the involvement of Italian stakeholders in providing feedback was non-existent or limited. In relation to the proposal for the Maledetti shoal, dialogue with the Italian administration had not been initiated yet.

65. A presentation on the distribution of Mediterranean cold-water corals: hotspots worthy of protection was then given by Mr Giovanni Chimienti, Researcher, University of Bari (Italy). Cold-water corals (CWCs) are among the main habitat formers of the deep Mediterranean Sea, hosting a diversity of species and playing a crucial ecological role. The term CWC *sensu lato* gathers taxa of cnidarians with a more or less pronounced frame-building ability with forest-forming anthozoans both on hard and soft bottoms. CWC species and their occurrence in the Mediterranean Sea were reviewed and discussed from a biogeographic point of view, considering the geographical areas of occurrence and the bathymetric ranges of distribution. This overview of present knowledge can represent a solid base for the identification of potential and strategic FRAs. The need to protect the last living gardens of the bamboo coral *Isidella elongata* is particularly urgent. Whereas they were considered almost common until fifty years ago, they are now critically endangered due to trawl fishing. The position and the features of the last *Isidella elongata* gardens were presented to highlight their priority in terms of protection. Due to the interactions between particular topography and a combination of cold, oxygenated and trophic-carrying water masses, CWC communities develop in a mosaic-like situation along the main paths that such currents follow within the basin. This aspect has to be taken into account to plan proper management strategies needed in the near future, for a desirable network of FRAs.

66. The WGMPA noted the relationship between the distribution of CWC communities across the Mediterranean and the sea surface productivity patterns, however most of the experts agreed that it was very difficult to understand the ecological rules governing the connectivity among these communities, at least at the basin scale.

## **WORK TOWARDS THE ASSESSMENT OF THE EFFECTS OF EXISTING FRAS AGAINST THEIR OBJECTIVES, INCLUDING THE PROTECTION OF RELEVANT SPECIES AND ECOSYSTEMS**

67. The GFCM Secretariat presented a short overview of the scientific requirements of existing FRAs in terms of scientific monitoring. Among all the FRAs established so far by the Commission, only for the Jabuka/Pomo Pit FRA an official scientific monitoring plan to assess the efficacy of the FRA towards its objectives was designed and being launched.

### **Potential methodologies to assess the effectiveness of FRAs**

68. Mr Thompson started with a presentation on the monitoring of fisheries management areas by RFMOs. The GFCM adopts spatial management measures in the Mediterranean and Black Sea to protect sensitive benthic habitats and EFH under the designation of “fisheries restricted areas”. The presentation listed spatial management measures adopted in other regions and compared these to the areas adopted by the GFCM. Monitoring of managed areas has been difficult in most regions and has been undertaken mainly at a compliance level. Closed areas for VMEs have been reviewed to ensure the boundaries cover the significant concentrations of vulnerable habitats and enlarged as necessary. In other regions, EFHs have been less commonly used as a management tool and always as part of an integrated suite of measures. EFH have been more of a challenging to assess against purpose. He recalled that a particular VME (the Nerida area) was closed after an extensive data series from VME scientific surveys, as the use of ‘thresholds’ has always been controversial in many RFMOs.

69. The difficulty to assess the efficacy of a closure was highlighted by the WGMPA, especially with regard to stock assessment. In many areas, even when many studies and scientific data were available, understanding the effects of any kind of protection measure on the marine environment *sensu lato* (e.g. MPAs) was one of the most complex topic to address and uncertainty would always exist. However,

participants agreed efficacy assessment should be planned on a case-by-case basis as it would be very difficult to adapt one monitoring plan proposal to all FRAs. For this reason, the objectives of the assessment of the efficiency of a FRA had to be clearly defined beforehand. A roadmap to understand how to monitor the FRA and how to assess their efficacy could be proposed by the meeting.

70. Some participants highlighted that for VME-FRAs, and therefore from the environmental point of view, the positive effects of a closure in the protection of the VME should clearly appear if the measure is fully implemented in terms of compliance. Monitoring could be easily carried out to understand, for example, if a VME structure is in a healthy status. Obtaining a baseline to understand the status of an area before and after the establishment of a FRA would be important. The initial FRA proposal, in which information on the status of the area before the closure are reported, could be considered as a baseline.

71. The GFCM Secretariat proposed to identify different monitoring plans and efficacy assessments starting from the main objective of a FRA (i.e. EFH-FRA or VME-FRA). Mr Bernal recalled that in the Strait of Sicily, first attempts to simulate the effects of the FRA on local demersal stocks, in the medium- and long- terms, were carried out within the GFCM Working Group on Management Strategy Evaluation (WKMSE) in 2018.

72. Oceana experts commented that the first step, in any FRA efficacy-monitoring plan, should be to know the level of compliance at the national level, including monitoring, control and surveillance (MCS) implemented by countries to prevent IUU fishing activities. The meeting agreed that without compliance, attempting to evaluate the efficacy of GFCM FRAs would be vain.

73. The GFCM Secretariat recalled the meeting that the review of MCS and compliance measures in place would fall under the remit of the CoC and that the WGMPA could only address issues related to scientific monitoring of FRAs, however the importance of compliance should be also brought to the attention of the SAC.

74. The WWF experts commented that for any kind of MPA, both efficacy and management should be evaluated in the same way as they equally contribute to achieve the objectives of a given MPA.

75. Mr Serge Garcia, Chair of the Fisheries Expert Group of the IUCN Commission of Ecosystem Management (IUCN-CEM-FEG), presented “Area-based fishery management measures (ABFMs): typologies, performance factors and elements to consider for effectiveness”. Mr Garcia presented a typology of ABFMs restricting fishing activities in space and time, of various extensions and durations. Their primary objective is stock and fisheries sustainability and they may also contribute to biodiversity conservation. Their effectiveness can only be objectively assessed against stated objectives with agreed indicators and reference values. Effectiveness varies significantly due to design, intrinsic factors, governance and external drivers (including fishery management around the ABFM) and may be assessed *ex ante* (in planning) or *ex post* (in performance evaluation), in data-rich or data-limited situations. Risk-assessment and management needs to be considered. The ABFM needs to be integrated in the fishery management plan, and good governance principles need to be applied, in the ABFM and around it. ABFMs with significant positive effects on biodiversity may be identified as Other Effective Area-Based Conservation Measures (OECM) in the CBD Framework and reported under Aichi Target 11.

76. The meeting acknowledged that fishers are often those who retain the best knowledge (i.e. local ecologic knowledge [LEK]), which scientists try to obtain over the years with scientific studies, as they know the ecosystem and resources better than anyone does.

77. Making reference to the Aichi Target 11 and to other effective OECM, as defined by the CBD, the meeting agreed that FRAs should be taken into account towards the Aichi coverage targets, and experts renewed the invite to the GFCM Secretariat to find a way to report about FRAs to CBD.

78. Mr Jean-Noel Druon, Scientific officer of the Joint Research Centre (JRC) of the European Commission, introduced the real time dynamic protection of European hake nurseries as a ready-to-use

science to take action on overexploited species. The European hake is one of the most important overexploited species in the Mediterranean Sea with a significant impact of fishing in nurseries by bottom trawling. The recruits of this species are widely distributed along the shelf and shelf break, however environmental preferences of the most abundant nurseries were identified and interannual variability of preferred habitat in space and time was shown to be high (up to  $\pm 30$  percent.). The general negative trend of -12 percent per decade of preferred habitat for age-0 hake for the whole Mediterranean after the increase of seabed temperature furthermore highlights the need to actively protect nurseries. The accuracy of the most abundant nurseries habitat was estimated to be of about 70 percent in the entire Mediterranean Sea. Habitat-derived avoidance maps are produced daily and made available on the web by the JRC (<https://fishreg.jrc.ec.europa.eu/web/fish-habitat>) with the aim to actively limit catch of undersized fish by bottom trawlers. Alternatively, daily maps are available to fisheries authorities for better targeting control. This information may also be used to evaluate the location of new FRAs and the effects of existing ones. This real-time avoidance information is an example of dynamic fisheries management that replies to both EU mandatory needs of protecting recovery areas (Article 8 of the EU Common Fisheries Policy) and reducing bycatch after the implementation of the landing obligation in 2019. The use of such operational product would proactively and sustainably allow increasing the protection of juveniles and so further recruitment, fishing yields, fisheries profits, fishermen acceptance as well as compliance. Mr Druon finally remarked that only data from European countries (from Medits surveys) were used to produce the nurseries maps presented.

79. Some participants asked about the criteria used to simulate the displacement of nurseries over time in the model. It was explained that six months of environmental conditions prior each Medits haul were investigated to characterize the ecological niche of European hake nurseries. Influential environmental variables were found to be, in decreasing order of importance, seabed temperature, food availability (frequency of chlorophyll-a fronts) and seabed currents. Overall, suitable and stable environmental conditions for four to six months would be needed to find a productive European hake nursery in a given area. Only data from European countries were used (see Appendix 7) but these occurred in a wide range of environmental conditions (from Spain to Cyprus and from Malta to northern Adriatic) so that the overall niche of European hake nurseries was likely to be captured and, in turn, the extrapolation to the southern basin and to the summer/autumn period is likely to be reliable. A validation of the habitat model using more recent years of data in the Strait of Sicily produced the same accuracy than for calibration (~70 percent of correct match-ups).

80. Ms Fanelli underlined that one of the key factors affecting the distribution of European hake juveniles was dissolved oxygen and this environmental variable should be also taken into consideration in the model. Climate change was also strongly affecting some stocks. For example, *the giant red shrimp* disappeared since the 1960s from the Catalan basin probably due to a synergistic effect between change in deep-water masses (i.e. increase in the water temperature) which alter the availability of red shrimps' preys and fishing pressure, causing a drop in the species (Cartes et al. 2011)<sup>7</sup>.

81. Some participants underlined that if the nurseries moved, a GFCM FRA may decrease its efficacy of a percentage equal to the displacement of the nurseries and that the conservation objective of the FRA could fail if the nurseries were to move outside the FRA boundaries. In light of this, it would be important to forecast the probability nurseries move outside a given area. Fisheries scientists considered that so far, only well-known and resilient fish nurseries had been protected by GFCM FRAs, like European hake nurseries, and that only this type of nurseries known as stable would be considered for future FRAs. A recurrent efficacy assessment (such as every 5 years) could be performed.

82. Ms Chryssi Mytilineou, Associate Researcher from the Hellenic Centre for Marine Research (HCMR), noted that the results of the model in the Saronikos Gulf are not so precise because of the time

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<sup>7</sup> Cartes, J.E., Maynou, F. and Fanelli, E., 2011. Nile damming as plausible cause of extinction and drop in abundance of deep-sea shrimp in the western Mediterranean over broad spatial scales. *Progress in oceanography*, 91(3), pp.286-294.

limitations of Medits data used in the model and considered that Medits data only would not be sufficient to predict the distribution of nurseries. She advised to include data from fishery-dependent surveys as well. She also noted that according to Bartolino *et al* (2008), for European hake age group 0, two length aggregations are discriminated by bathymetric distribution; the smaller sized group (< 16 cm TL; the true recruits) concentrated in the nursery area over the upper slope (at depths between 170-220 m) and the larger sized group (especially individuals of 18-20 cm; the juveniles that are no longer true recruits) dispersed over the continental shelf (at depths between 70-100 m). Similarly, Ms Sandrine Vaz, Ifremer, noted that for the distribution of nurseries in the Gulf of Lion, she obtained different distribution patterns, including on the continental shelf.

83. Mr Druon acknowledged that the accuracy of the model run with Medits data (using TL < 15 cm) was around 70 percent and performed well for most European GSAs, however uncertainty for some particular areas, like the Adriatic and the Aegean seas, could exist due to horizontal processes in winter not accounted for and a complex geomorphology respectively. Regarding the Gulf of Lion, the presented annual composite was misleading as the seasonal variability was high and the nurseries in spring are mostly shown to occur in the outer shelf in agreement with Medits data.

84. The WGMPA convened that data from scientific surveys should match, to the extent possible, with fisheries data and that direct monitoring and observations at sea, including from local ecological knowledge, were needed to complement and compare the results of any kind of model.

#### **Identification and description of initiatives for the scientific monitoring of FRAs**

85. The monitoring plan for the Jabuka/Pomo Pit FRA was presented by Mr Enrico Arneri, AdriaMed/MedSudMed Coordinator. The initiative of a monitoring plan for the Jabuka/Pomo Pit FRA was proposed by the AdriaMed Study Group on Jabuka/Pomo in early 2018, and subsequently approved by the SAC and Commission. The main objective of the monitoring plan (2018–2020) for the Jabuka/Pomo Pit FRA is to assess the effectiveness of the FRA towards: i) contributing to the rebuilding of the stocks of the Adriatic Sea through the protection of EFH; ii) protecting VMEs in the area and; iii) enhancing the densities of organisms in term of biomass and abundance within the FRA. The methods to achieve the objective would rely on existing monitoring activities currently in place, on existing historical datasets to be made available to the Jabuka/Pomo AdriaMed Study group and on additional monitoring and surveys, such as: additional trawl hauls to be conducted during summer MEDITS survey in the Jabuka/Pomo area, to refine the biomass indexes of commercial species and improve the monitoring of juveniles of European hake which specifically concentrate in the area; an additional bottom trawl monitoring in winter limited to the Jabuka/Pomo area using MEDITS methodology to improve the monitoring of juveniles of European hake which specifically concentrate in the area; analysis of logbook data as well as VMS/AIS data for the authorized fleets, to monitor CPUE of trawlers and bottom long-liners, in order to quantify the potential displacement of the fishing fleets in the neighboring areas as well as local changes in CPUE. Stock assessment for European hake, Norway lobster (*Nephrops norvegicus*) and deep-water rose shrimp (*Parapenaeus longirostris*) would be performed in the framework of the Working group on stock assessment of demersal species (WGSAD), to finally evaluate the effects of the closure on the main stocks in the area. Data limited stock assessments of blackbellied angler (*Lophius budegassa*) and other commercially important species in the area based on trawl surveys and landing data, to increase the understanding of the multispecific fisheries exploiting the area and detect potential additional side effects of the establishment of the FRA will also be carried out.

86. The GFCM Secretariat informed the meeting that some of the demersal fish species mentioned in the monitoring plan became GFCM priority species since 2018 for the subregion, and a benchmark assessment would be carried out in the near future for these species. All the information gathered through the monitoring plan would be duly reported to GFCM relevant meetings (e.g. WGSAs, SRCs).

87. Acknowledging the presence of some VME-like habitats in the FRA, some participants advised that monitoring of sea pens occurring in the area could also be included in the plan to assess their biomass and size structure. Participants considered that monitoring of VME indicators in the FRA could be done using ROVs every three years, to avoid major economic monitoring costs. The acoustic surveying of benthic resources – carried out in other regions of the world – was also mentioned as an alternative monitoring option.

88. IUCN experts asked whether the main fish species were being assessed independently or considering the prey-predator relationship existing between European hake and Norway lobster.

89. Mr Arneri added that for the time being no ROV survey was foreseen as this was not available on the vessel used to carry out the monitoring plan. With regard to the prey-predator relationship, he clarified that the main demersal species were assessed independently as a starting point. Regarding the use of acoustic surveys to monitor benthic resources, it was not considered a suitable tool due to the occurrence of many benthic species at the same time, with relative low biomass and in a volume of water very close to the bottom.

90. The GFCM Secretariat also added that in the Strait of Sicily FRAs, some assessment attempts were also done considering the prey-predator relationship between European hake and deep-water rose shrimp. It was also recalled that in the Mediterranean Sea no biomass reference points ( $B_{MSY}$ ) were available and stocks were managed acting on control of fishing effort and fishing mortality (F).

91. The WGMPA agreed that the scientific monitoring plan for the Jabuka/Pomo Pit FRA was complete, accurate and suitable to assess the efficacy of EFH-FRAs in general.

92. The expert from DG MARE noted that the scientific monitoring of the Jabuka/Pomo Pit FRA carried out by AdriaMed was useful and recalled that this activity should be conducted under the direct control of the SAC and in accordance with Recommendation GFCM/41/2017/3 on the establishment of a fisheries restricted area in the Jabuka/Pomo Pit in the Adriatic Sea.

93. Mr Fiorentino presented a preliminary assessment of protection of EFHs in the Mediterranean. The MANTIS approach to the FRAs in the Strait of Sicily. MANTIS is a European funded project aimed at investigating how a network of Marine Managed Areas (MMAs) can contribute to improve sustainable fisheries and reach MSY target in the central Mediterranean. Within the project activities, dynamics of red mullet, deep water rose shrimp, European hake and giant red shrimp stocks in the Strait of Sicily were assessed under different management scenarios, including the implementation of the three FRAs adopted by the GFCM to protect nurseries of European hake and deep water rose shrimp. An updated version of the SMART model (Russo *et al.*, 2014) was used to simulate the potential effects of different management approaches using spatially-resolved fishery-dependent and fishery-independent data. Stock dynamics were modelled in terms of demography and yield considering also larval dispersal, adult migrations and trophic relationships. Displacement of trawlers from the FRAs to other areas was modelled maximizing the income and minimizing the cost of fishing operations. Although the model calibration is still in progress, preliminary results suggested that the implementation of the three FRAs alone does not seem sufficient to improve substantially the status of the four target stocks in the Strait of Sicily. Furthermore, other FRAs should be adopted off the African coast of the Strait of Sicily and the distribution and size of FRAs should be optimized to reduce the undersized catch and contribute to reach the MSY goals.

94. In reply to some comments of the meeting, Mr Fiorentino further clarified that the closure of trawling in the FRA area should be joined to a reduction of fishing mortality in areas where hake juveniles move when growing. He also added that the simulation was carried out assuming full compliance to the measure (i.e. no fishing occurring in the FRA and the *status quo* was the same area with no FRAs in place). He noted that Data from the Tunisian fleet were not integrated in the model as well as that of any other closure such as coastal MPA or the seasonal closure of the Gulf of Gabès. Finally he recalled that so

far, no specific monitoring plan was in place in the Strait of Sicily FRAs and that the available fishery independent data came from Medits surveys.

95. Mr Houssine Nibani, Association de Gestion Intégrée des Ressources (AGIR) of Morocco, presented a report on the state of conservation and restoration of habitats of threatened species and marine resources in the marine zone of Al-Hoceima National Park. It focused on descriptions of the approaches, systemic analyses and measurable results achieved under the program of activities of the projects. The concerted management approach of the Al Hoceima National Park was led by the Moroccan High Commission for Water and Forests and the Fight against Desertification and AGIR. The work focused on seven targets, of which the flagship species is the Osprey, the viability of each target was analyzed using key ecological attributes in terms of size, conditions and geographical context. The selected indicators enabled to measure traced objectives on one hand, and to achieve measurable results on the other hand, using real-time data from the high technology of the Operating a network of integrated observatory systems in the Mediterranean Sea (ODYSSEA) project. The factors generating the most important threats, such as dynamite and illegal trawling, were identified. The microsystemic analysis, which was based on measuring indicators according to the objectives of the action plan, allowed the achievement of measurable result chains, which objectives converge on improving the health status of targets, at either the species or biotope levels. The result chains obtained describe the evolution of the status of the ecosystem from a highly deteriorated status in 2012 to a deteriorated status in 2018 in the project area.

#### **Discussion on effective scientific monitoring of FRAs and roadmap for the assessment of the efficacy of FRAs in achieving their objectives**

96. Oceana experts informed the meeting about the SPA/RAC–UN Environment/MAP, Oceana Guidelines for Inventoring and Monitoring of Dark Habitats, and proposed the GFCM to use these guidelines as reference with a view to establishing monitoring plans for FRAs. The GFCM Secretariat recalled that proposing monitoring plans for the FRAs was one of the objectives of the WGMPA and invited participants to discuss on this and other existing guides in order to come up with a proposal for scientific monitoring for the consideration of the SAC.

97. To wrap up the session, the WGMPA agreed that within the GFCM FRA process, the identification of clear objectives was one of the first steps when drafting a FRA proposal. For both EFH- and VME-FRAs, the ultimate objective would be to avoid significant adverse impact of fisheries on sensitive habitats and resources. Compliance and MCS were considered fundamental to ensure FRAs reach their conservation objectives, especially for the VME-FRAs. The meeting further underlined that EFH-FRAs alone would not be sufficient for the stocks to achieve maximum sustainable yield (MSY), but that monitoring plans should be always put in place to collect data on the EFH that are subject to protection measures. The monitoring plan adopted for the Jabuka/Pomo Pit FRA should be applicable to all EFH-FRAs.

98. It was agreed that monitoring FRAs would be a very challenging and expensive task for the GFCM, especially for those already established that did not foresee an initial monitoring plan, however EFH-FRAs and VME-FRAs would have different monitoring approaches. New FRA proposals should include a feasible multiannual monitoring plan to assess the efficacy of the FRA towards its main conservation objectives. In any case, experts convened that sampling, especially for VME-FRAs and when VMEs occur also in EFH-FRAs, should be carried out with non-destructive methods only (ROV, glider, divers, etc.).

99. Mr Maravelias informed the meeting that the EU was ready to encourage VME scientific surveys in the GFCM area of application to start collecting data in a standardized way. The GFCM Secretariat welcomed this proposal and thanked the EU for this important initiative that would allow collecting scientific data in a systematic manner, including from fishery-independent surveys. The information gathered through these surveys would eventually feed the GFCM database on VME Indicators in support of the GFCM VME/DSF management process.

## **WORK TOWARDS THE ESTABLISHMENT OF A NETWORK OF EFH IN THE MEDITERRANEAN SEA**

100. Mr Bernal then gave an overview of Resolution GFCM/41/2017/5. He also recalled the advice provided by the twentieth session of the SAC (Morocco, June 2018). He summarized the objectives of the resolution that requests to review the existing information on the distribution of essential fish habitats and sensitive habitats in the Mediterranean, namely: i) to identify possible knowledge gaps and provide advice on measures to overcome these, including through predictive modelling and mapping of habitat suitability, showing the likelihood of their presence; ii) to define a consistent network of essential fish habitats which would also consider sensitive habitats; and iii) to provide advice on the way to ensure the protection of this network in order to effectively contribute to achieve the MSY and implement the ecosystem approach to fisheries management, in line with the GFCM objectives. He also recalled that the last meeting of the WGVME (FAO headquarters, February 2018) proposed a two-step roadmap to provide advice as requested by the above mentioned resolution, as follows: i) collection of ongoing projects and existing information to determine the location of EFH and SH in the Mediterranean (already initiated in 2018); and ii) determining how these habitats are connected, in order to provide advice on EFH and SH networks.

101. He finally reminded that the SAC specifically requested the WGMPA to advance towards the objectives of the resolution and welcomed all the contributions that were submitted to facilitate the discussion and he expected that tangible conclusions and recommendations could be submitted to the SAC on this topic.

### **Contributions addressing the roadmap towards the establishment of a network of EFH**

102. Participants presented their works addressing the roadmap towards the establishment of a network of EFH.

103. Mr Nicolas Fournier, Policy Advisor of Oceana, presented to the WGMPA the list of conclusions from the Workshop on essential fish habitats which took place during the FishForum 2018 entitled “Essential fish habitats as key elements to establishing area-based management measures”. He highlighted that several cases studies from different Mediterranean areas were presented on that occasion, together with a valuable perspective on EFH protection on the west coast of the United States. A list of 10 priorities for the coming decade were identified and grouped under three main themes to be addressed by decision-makers, related to research and lastly linked to socio-economics. The most remarkable priorities were related, among others, to the need to complete the network of EFH, the inclusion of EFH considerations in GFCM multiannual plans for fisheries and the need to take a precautionary approach according to the scientific information available.

104. Some participants called for clear definitions of EFH to be provided before discussing the way to establish a network of EFH (i.e. nursery, feeding ground, spawning ground). They noted that no univocal understanding of EFH existed and that in any case, they changed according to the species considered. The GFCM Secretariat clarified that the definitions of EFH were those commonly accepted by the scientific community and also reported in the text of Resolution GFCM/41/2017/5. It was also recalled that only EFH of commercially-exploited fish species were currently under discussions.

105. Fisheries experts noted that identifying an EFH network would be an ecological objective, and that for fisheries managers, trying to achieve MSY by means of other management measures would be more useful and effective (e.g. improve the selectivity of fisheries to decrease the impact on vulnerable life stages).

106. The GFCM Secretariat recalled that the establishment of EFH-FRAs was considered by experts as a way to improve fisheries selectivity, at least partially, by avoiding nurseries areas. In this context, it was

recalled that in the context of the SAC and the Commission, it would be extremely important to identify those EFH areas that would deserve protection, as this would allow to reduce F on a given stock.

107. The WGMPA advised not to use EFH-FRAs as the only tool to achieve MSY, as effort and capacity of fisheries should be managed in parallel. It was suggested to envisage the possibility to integrate new EFH-FRAs within comprehensive multiannual management plans, as for the case of the Strait of Sicily.

108. Experts convened that connectivity of EFH (e.g. between larval stages, nurseries) was still unclear, even within an area and stock, and no sufficient data were available to make strong conclusions. On the other hand, the ecological coherence/representativeness/resilience criteria should be put forward before the connectivity. In that sense, networks of EFH could be more easily identified by ensuring that a series of EFH for a given species are protected throughout the Mediterranean. This would ensure geographical and habitat coverage and a balanced protection among all GSAs.

109. The WGMPA agreed to start proposing a list of priorities in the definition of an EFH network for the consideration of the SAC. The first step to be discussed would be:

- identification of priority species/stocks;
- identification of priority EFH (e.g. nurseries vs spawning grounds);
- identification of the EFH at the subregional/GSA level.

110. Ms Orejas made a presentation, on behalf of Mr Vincent Rossi and Mr Manuel Hidalgo, on “connectivity tools to inform essential fish habitats: embracing temporal and spatial scales of European hake dynamics”. Permanent closures can have important socio-economic implications for the fisheries sector and adaptive tool scientifically informed must be provided. While static closures are currently considered as required urgent actions due to the widely recognized overfished status of most commercial Mediterranean stock, adaptive and dynamic spatial management measures, such as partial (in space and/or time) closures or other protection initiatives, might be considered once stocks show some recovery signals. Connectivity tools have long been used to successfully design networks of MPAs but rarely in the context of fisheries, despite a few recent studies suggesting that the dispersal of early-life stages can have deep impacts on fish recruitment success and population dynamics. She presented two examples focusing on European hake which show that the development of novel connectivity metrics computed at the appropriate biological, temporal and geographical scales allow extracting from operational ocean models the relevant quantitative information to use in fisheries management. The first one relates the interannual variability of recruitment to the ones of both larval connectivity and hydrographic conditions across several management units in the north-western Mediterranean. The second one investigates how highly variable larval dispersal and habitat availability affect population dynamics and stocks complexity over the whole Mediterranean. The results of these studies show that the design of spatial protection measures (closures, MPAs, essential fish habitats) could rely on these advanced connectivity metrics that integrate information about population structure, spawning patterns, larval dispersal patterns and nursery availability. They also suggest that connectivity-based modelling framework and synthetic metrics are becoming ready to be incorporated into temporal assessment exercises as well as spatial management measures as it provides information for an adaptive and dynamic implementation.

111. Mr Iosu Paradinas, Post-doctoral researcher, provided a summary on his work on the identification of European hake and red mullet essential habitats in the northern Spanish Mediterranean using a Bayesian spatio-temporal modelling approach. His work analysed the occurrence, conditional-to-presence abundance and median size of the species using MEDITS data in the western Mediterranean from 2000 to 2016. He also assessed the level of persistence of their distributions along the years to better assess marine spatial planning.

112. Participants noted that the various studies presented had outlined that different approaches to identify EFH existed and they proposed that a standardized way to identify EFH should be adopted by the

fisheries experts in the region. This would allow comparing maps of nurseries distribution obtained from different national institutes and GSAs.

113. Mr Andreas Reul, Professor at the University of Malaga (Spain), presented a spatial risk approach towards integrated marine spatial planning: a case study on European hake nursery areas in the north Alboran Sea (Muñoz *et al.*, 2018<sup>8</sup>). He described the work done in this study towards modelling the spatial distribution of nursery areas of European hake in the Alboran Sea, using General Additive Models (GAM) and overlaying those with European Nature Information System (EUNIS) habitats. A sensitivity analysis of European hake nursery areas to cumulative human impacts identified the Bay of Malaga as the most sensitive area with trawling frequencies up to 60 times higher than the habitats recovery time. The spatially explicit assessment framework which was used is transparent and transferable to other Mediterranean regions.

114. Ms Sandrine Vaz, Researcher at Ifremer, gave an overview on integrating essential fish habitats into fisheries management and marine conservation: an ongoing process in France. In France a national law aiming at biodiversity protection resulted in the creation of a new type of MPA in 2017: the «fishery conservation zones». These aim to protect or restore functional zones that are important for the completion of the life cycle of fishery resources and therefore protect EFH. Different types of functional categories were defined according to their usefulness for the renewal of the resources. Criteria allowing assessing the importance of functional zones were proposed to help the designation process. An inventory of available quantitative maps describing EFH was undertaken and presented. When survey data are not available, a new methodology to identify EFH from VMS/catch/sales data is proposed. Finally, the use of spatial planning tools to define EFH network while reducing socio-economic impacts was also discussed.

115. Ms Vaz further clarified that these potential EFH-MPAs were not yet formally established by the French Government and that it was not clear whether management would fall under the remit of the Environmental or Fisheries Ministries.

116. Mr Bernal remarked that national FRAs or MPAs established to protect EFH should be part of the GFCM EFH network and that the GFCM Secretariat would make extra efforts to gather all the information possible from its contracting parties to know the exact location of these protected areas.

117. Ms Giulia Prato, Marine Officer at WWF Italy, presented spatial fisheries management scenarios in the north-western Mediterranean Sea, tools and preliminary results of the SafeNet project. SafeNet, a research project funded by the Directorate-General for Maritime Affairs and Fisheries of the European Commission (DG MARE), aims at identifying coherent networks of MPAs whose emergent properties (i.e. the interactive effect of scaling-up MPAs in networks) can help achieve fisheries MSY and maximize over the long-term socio-economic benefits for the stakeholders in the north-western Mediterranean. After assessing the current system of MPAs, we tested the capacity of normative and target-seeking scenarios at improving fisheries sustainability at local, subregional and regional scales, using ecosystem, fisheries, and socio-economic outputs. Scenarios were built using a mix of ecosystem-based, meta-population and bio-economic modelling approaches. Overall, 30 local qualitative food web models were developed, in addition to one for the whole western Mediterranean. Quantitative, temporal and spatial food web models were obtained at regional, subregional and local scales. A set of habitat suitability models for keystone species was used in Lagrangian and meta-population simulations. A bio-economic model with the Bemtool platform was also developed. To complement existing data on biological, fisheries, legal and economic aspects of the professional fisheries, field surveys were carried out in 163 sites inside and outside 11 MPAs and 117 small-scale fisheries landings were sampled. In addition, data on recreational fishing from 20

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<sup>8</sup> Muñoz, M., Reul, A., Gil de Sola, L., Lauerburg, R.A.M., Tello, O., Gimpel, A., Stelzenmüller, V. 2018b. A spatial risk approach towards integrated Marine Spatial Planning: a case study on European hake nursery areas in the North Alboran. Sea. Mar. Environ. Res. 142, 190-207. 10.1016/j.marenvres.2018.10.008

coastal areas were collected and the impact of these activities on vulnerable species was studied. Stakeholders' perceptions on fisheries management measures were also collected throughout the north-western Mediterranean through 187 questionnaires. Preliminary results show that current MPA settings contribute modestly to fisheries sustainability, while plausible modifications to such settings could positively impact fisheries. Local closures, especially for European hake, may provide win-win solutions at the local scale, however multiple local fisheries closures, either simultaneously or in rotation, which allow a more equitable distribution of benefits. Modelling results and stakeholders' perceptions show that only through true enforcement and a major involvement of stakeholders in decision-making, protected areas will be effective. Ms Prato also added that, regarding the models of local closures for European hake in GSA 9, the effort displacement was homogeneously distributed around the closure.

118. The WGMPA acknowledged the multi-stakeholder approach adopted in the project (involvement of fishers' representatives and associations) and its positive results in terms of perception of the MPA by the local community. Some participants considered that the results obtained on the expected increased catches and biomass level on the long term, after the establishment of the MPA, were unrealistic if compared with the area subject to the closure.

119. Nonetheless, fishery experts noted that no direct relationship between the surface closed to fisheries and the expected increase in yield could exist, as the closure of an area of any dimensions alone, as already remarked on several occasions, would not be a sufficient measure to contrast overfishing and allow the stocks to recover if, at the same time, effort and capacity levels are not managed.

120. The SPA/RAC representative underlined that the protection of EFH should be also considered a priority objective in MPAs.

121. Connectivity models in the Adriatic Sea to support the design of EFH were introduced by Ms Donata Canu, Researcher at OGS. Within the framework of the MANTIS project, their work explored oceanographic and biological connectivity in the Adriatic Sea, under a large and representative variety of oceanographic conditions, with reference to Norway lobster and common sole (*Solea solea*), two important commercial resources whose recruitment is strongly related to larval dispersal from spawning to nursery areas. The knowledge of the biological connectivity among subpopulations is a fundamental parameter for sustainable fisheries management, for the identification of the appropriate geographical management scale, the assessment of the potential effects of selective spatial fishery closures and for the identification of areas of greater retention rate. The project used a modelling suit based on MITgcm hydrodynamic model, LTRANS-v.Zlev (Lagrangian particle tracking model) and a Larval behaviour model, species-dependent. 3D current data were computed for the 2006–2012 period, with 1/64° horizontal resolution. The current fields were used to track the larval migration, by simulating the trajectories of particles released from specific nursery areas and driven by ocean currents in GSA 17 and GSA 18 management areas. The connection between spawning, nursery and harvesting grounds and between species were assessed. The numerical particles — representing the larvae of a target species — are released from the spawning grounds, close to the seabed, according to the biology of each species. Larval growth is set time and temperature dependent while larval movement is subject to advective transport, and to diel vertical migration that varies at different larval stages. At the end of the larval stage, organisms start searching for a seabed substrate suitable for settlement and if they don't find the suitable sediment within the time limit, they die. A sensitivity analysis is performed exploring the model response to uncertain parameters (i.e. length of searching time at the bottom, temperature tolerance, sediment grain size tolerance). Preliminary results highlighted the existence of isolated subpopulations of Norway lobster and the area of greater retention and of greater dispersion. The Jabuka/Pomo Pit area hosts a subpopulation which is connected with the other Adriatic subpopulations. Concerning the common sole, results evidenced the connectivity between spawning and recruitment sites. Assuming a uniform density of larval release, an efficient design of recruitment sites can be discussed and proposed.

122. The expert from DG MARE suggested to revise the model used in the study presented to include the results of a EU project on genetic identification of the stocks in the Adriatic Sea. Mr Arneri noted that the genetic data available for Norway lobster in this area dated back to the 1990s and that further work should be carried out not considering an equal larvae production for the stock across the basin.

123. Mr Mahmoud Farrag presented “An expected FRA in the Mediterranean Sea – Egypt”. The presented data/proposal in the working group is located under publishing as integrated work to study the marine biodiversity of the area on the Egyptian coast of the Mediterranean Sea particularly off Alexandria (31°00' & 31°36'N) and (29°18' & 30°05'E). This study was applied to stand on the real effect situation of the bottom trawl operations on the habitats at depths up to 250 m. In regard to fisheries and ichthyofaunal diversity, this work was done on board a commercial bottom trawler for one year. The preliminary outputs from the investigation of the whole catch revealed that the identified species were 94 fish, 64 invertebrates and 6 benthic flora species. The ichthyofauna included only 5 Chondrichthyes species (5.3 percent), while the Osteichthyes included 89 species (94.7 percent of the fish) which belonged to 48 families and 72 genera. A lot of small-sized fish were found in the discards, including the commercial species such as red mullets and Carangid species. Regarding the demersal and benthic biota, the most abundant phylum was Mollusca (31 species) which represented by three classes (Bivalvia, Cephalopoda, and Gastropoda). Marine flora was represented by 6 species belonging to three phyla (Tracheophyta, Chlorophyta, and Rhodophyta). Sea grasses were represented by three species (*Posidonia oceanica*, *Cymodocea nodosa* and *Halophila stipulacea*). The small-sized fish and the benthic flora which were considered EFH, particularly sea grasses, reflected the negative impact of the bottom trawl on such EFH. Although the investigated area from Abu Qir to El-Hammam is large, it was noticed that the intensive operations and negative impacts were focused on the area 31°09' & 31°16'N) and (29°42' & 29°51'E) off Alexandria which is around 8 km long. Therefore, the protection of this area as EFH is suggested to be among the management actions which is needed and recommended.

124. In reply to some questions raised by participants, Mr Farrag added that the main target of the trawlers were shrimps together with red mullets and sparid fishes, caught between 40 and 150 m and that the mesh size in the cod-end was 20-22 mm diamond shape.

125. Ms Marin presented an approach to implement Resolution GFCM/41/2017/5 by prioritizing the development of EFH protection by stocks, according to overfishing (levels of biomass/levels of bycatch of juveniles) and the availability of data on EHF. The presentation identified European hake and red mullet (*Mullus barbatus*) as good candidates to prioritize action on EFH protection across the region. Both species are particularly important for bottom-trawl fisheries in all subregions, representing a large composition of the landings with a noteworthy commercial value. She also detailed the remarkable pattern of historically high level of discards across the Mediterranean and highlighted some examples in different GSAs. The Spanish case was underlined, since more than 60 percent of discards of European hake in trawling fisheries is composed by undersized fish. Juvenile bycatch for both species in trawl fisheries was also confirmed in GSA 1 and GSA 22. Ms Marin, using spatial information from the GFCM EFH catalogue endorsed last year, illustrated persistent nurseries where spatial protection for both species was lacking despite the overexploitation and with low biomass levels, although according to the information available, precautionary conservation actions were possible. Finally, Ms Marin concluded with some suggestions to develop the EFH roadmap, under the umbrella of the GFCM resolution and the MedFish4Ever commitments, such as advising the subregional committees to identify and include EFH provisions in GFCM multiannual plans. She also suggested the SAC to provide an advice on urgent precautionary measures to protect EFH for European hake and red mullet in each subregion.

#### **Identification of next steps, including technical proposals for the development of management tools and protocols related to the resolution**

126. With regard to the implementation of Resolution GFCM/41/2017/5, the WGMPA concluded that:

- New FRAs should address the protection of EFH of GFCM priority species such as *Mullus* sp. and European hake according to their high overexploitation rate. Among EFH, nurseries should be given priority in terms of conservation, due to the high level of juvenile discards in Mediterranean fisheries and to the relative advanced knowledge on their distribution.
- Mapping of EFH should be based on data collected from fisheries, scientific surveys, LEK, and habitats suitability models. Proposing closures of areas that were identified only through modelling to the SAC would not be appropriate, as no perfect model exist and direct observations should always be the primary source of information.
- Experts working in adjacent areas should collaborate to compare their results and methodologies and to find a standardized way to map EFH.
- Connectivity of EFH is a difficult issue to tackle, especially for species such as European hake. Genetic research should help in the future to assess connectivity of EFH.
- New EFH-FRAs should be included in comprehensive management plans.
- A catalogue of maps on EFH should be presented to the Commission, with clear indications on the source of information (i.e. direct observations or modelling).

## **PREPARATION OF TECHNICAL WORK IN SUPPORT OF SPATIAL MANAGEMENT FOR THE NEXT INTERSESSION**

127. Mr Bernal introduced the functioning of SAC expert groups on issues related to spatial management measures, including FRAs, VMEs and EFH management issues. He recalled that the WGMPA was created in 2013 and met three times (2014, 2015 and 2019). The WGVME was created in 2016, and met in 2017 and in 2018. The presentation outlined that the objectives of both the working groups were substantially overlapping, as well as the type of expertise of participants. Based on the existing terms of reference of both working groups as well as on the recent requests from the Commission, he summarized that future GFCM work on spatial management measures should focus on:

- FRAs: review of new proposals, analysis of data from scientific monitoring, review of efficacy and contribution to global targets and suggestions on monitoring;
- EHF: compilation of past and new information on EHF (e.g. observations, models), preparation of draft advice on priority areas to be protected (species, particular life cycles, priority areas) and work on connectivity and coverage of measures adopted;
- VME: compilation of past and new information on VMEs (e.g. scientific surveys, fisheries), preparation of draft advice on priority areas to be protected and suggestions to minimize significant adverse impacts of fisheries on VMEs.

It was also highlighted that links should be done with stock assessment/MSE working groups when needed (e.g. to test management scenarios), with other organizations (e.g. ACCOBAMS, UN Environment/MAP) to facilitate integrated analysis and/or identify priority areas for conservation and with other relevant RFMOs (e.g. NAFO, NEAFC). The new working group(s) would share the same database of georeferenced information on EHF and VMEs and a similar pool of experts.

128. The GFCM Secretariat also clarified that this/these potential new working group(s) would not tackle issues related to coastal/local MPAs and that preparatory work during the intersession should be carried out by experts attending the working group(s), as it is already happening for the working groups on stock assessments (WGSAs). A permanent Chairperson could be possibly identified by the group in the future, to facilitate the intersessional work and communication among the experts and the Secretariat.

129. After an animated debate, the meeting suggested the creation of a single working group that could address the work of the WGMPA and WGVME. Draft terms of reference (ToRs) for the new proposed Working Group on VMEs and EFH are included in Appendix 3, while experts also agreed that specific ToRs addressing priorities from the SAC and Commission should be integrated on a yearly basis.

130. FAO and WWF representatives asked whether socioeconomic aspects as well as stakeholders' involvement could be tackled within the new proposed working group. The GFCM Secretariat clarified that this kind of issues were discussed at the SRC level. Therefore it could be better to keep these aspects out of the scope of this new working group.

131. In the ensuing discussions, proposals were made on the development of a GFCM Mediterranean geodatabase on VME indicator features and species. Ms Nastasi made a brief presentation to recap its development. She recalled that the WGVME 2017 and 2018 agreed on the importance of developing a database on VME indicator features and species in the Mediterranean Sea and that this would be different and complementary to the FAO VME Database (hosting also GFCM FRAs). The FAO database shows areas currently managed by existing RFMOs or other regional fishery bodies (VMEs, FRAs, etc.), while the GFCM geodatabase would show the spatial distribution of scientific evidences related to sensitive benthic areas. Its main features were listed, the GFCM geodatabase would be: i) similar to others already developed (e.g. ICES); ii) a scientific tool to show the distribution of relevant aggregations of sensitive benthic species (corals, sponges, etc.); iii) possibly hosting maps on the distribution of EFH; and vi) fed by information shared by the experts with the GFCM during relevant meetings by means of a form asking for basic information such as: Name of the area, GSA, geographical coordinates, depth range, surface, VME Indicator feature, habitat, taxa, etc.

132. Regarding the form to collect and submit information to be included in the GFCM geodatabase, the WGMPA requested the Secretariat to change the format of the form adopted by the WGVME 2018 and proposed to use a standardized Excel sheet (adapted from the VME template created through the joint ICES/NAFO WGDEC).

133. The meeting also discussed about validation mechanisms for the data received by the GFCM Secretariat and stored in the geodatabase. It was agreed that the information received would be presented to GFCM relevant technical meeting(s) first and to the SAC on an annual basis for its institutional validation.

134. The WGMPA discussed on the way forward to develop the database and gave mandate to the GFCM Secretariat to identify an expert in geographic information system (GIS) for the digitalization of the data already gathered in 2017 and 2018. The meeting suggested to start mapping the available information on *Isidella elongata* gardens and to present this dataset for the consideration of the twenty-first session of the SAC (Egypt, June 2019).

135. Finally, the expert from DG MARE highlighted the need for the WGMPA, and any future GFCM expert meeting discussing spatial management issues, to have a balanced representation that includes strong expertise on fisheries for the relevant issues raised in the WGMPA, including, *inter alia*, on stock assessment. The discussion on the identification of nursery grounds, spawning grounds, their connectivity, the creation of the EFH network and numerous other issues discussed should involve fisheries scientists with an expertise on the specific fisheries and species, since the conclusions provided by the WGMPA advise the SAC to consider adopting potential spatial management measures.

## **CONCLUSIONS AND RECOMMENDATIONS**

### **Spatial management measures targeting fisheries in the Mediterranean and Black Sea**

136. The WGMPA recognized the importance of GFCM FRA as a tool to manage fisheries and specifically to minimize SAI of fisheries on marine ecosystems, including both sensitive benthic habitats (e.g. VMEs) and EFH (e.g. nurseries, spawning grounds).

137. In relation to FRAs for which the primary objective is the protection of EFH of overexploited stocks, the WGMPA agreed that the overall negative trend of most exploited stocks in the Mediterranean and Black Sea is very unlikely to be reverted only by the establishment of FRAs, and suggest that future FRAs should be integrated into comprehensive fisheries management plans including other regulatory measures (e.g. catch or effort restrictions), as for the FRAs in the Strait of Sicily.

138. In relation to the conservation of VMEs, the meeting recalled the results of many surveys presented to the WGVME in 2017 and 2018 and to the WGMPA and advised the SAC to consider adopting urgent protection measures, also in light of the precautionary approach, to prevent SAI of fisheries on VMEs. In particular, experts recalled and supported the previous advice from the WGVME to implement management measures to protect *Isidella elongata* gardens. A map compiling information on the presence and distribution of *Isidella elongata* is provided in Appendix 4, and a more comprehensive map compiling the presence and abundance of *Isidella elongata* using a georeferenced database is expected to be submitted to the twenty-first session of the SAC (see database section below).

139. Recalling the technical contents of the Protocols for the protection of VMEs in the GFCM area of application endorsed by the forty-second session of the GFCM, the WGMPA considered fundamental for the GFCM to start mapping the fishing footprint of DSF in its area of application in order to assess where the fishing grounds overlap with sensitive benthic ecosystems.

#### **Identification and proposal for potential new FRAs**

140. The WGMPA reviewed one pending proposal of FRA in the Otranto Channel and one new proposal in the Ligurian Sea. The meeting acknowledged that within the remit of the WGMPA, focus was to be given to the technical contents of the FRA proposal, from a biological and ecological point of view, and that socio-economics as well as management aspects should be evaluated in details at the relevant subregional committee level. With regard to the stakeholders' involvement, the WGMPA suggested FRA proposers to engage in consultations with all relevant parties (fishers' organizations, national administrations, etc.) as soon as possible during the preparation of the proposal, or at least before the submission of the proposal to the SRC. This "good practice" would enhance the possibility of a FRA proposal to be eventually adopted by the Commission.

141. With regard to the new proposal for the establishment of a FRA in the Maledetti Shoal to protect sensitive coralligenous formations in the Ligurian Sea (Italy), (GSA 9), the WGMPA recognized the existence of relevant topographic and biocoenotic characteristics in the site, based on the evidence provided in the proposal. Relevant features of the area analysed include the largest mesophotic red coral population of the Ligurian Sea, as well as the role of these populations in supporting relevant assemblages of commercial and non-commercial species. The meeting advised the proposer to engage in consultations with relevant stakeholders, including the Italian administration, and present this FRA proposal to the next meeting of the SRC-WM to take place in April 2019. Considering the limited number of fishers operating in the area and the coverage of the proposed FRA (entirely within national waters), the meeting also advised to investigate, in parallel, alternative ways to achieve the protection of the area from relevant fisheries through existing national instruments, such as the establishment of a *Zona Tutela Biologica*, or the inclusion of the area in the adjacent MPA "Isola di Bergeggi".

142. With regard to the updated proposal for the establishment of a FRA in the Otranto Channel, in the Adriatic Sea (GSA 18), the WGMPA acknowledged the relevant information supporting the existence of several VME indicators and EFH within the area proposed, and provided some suggestions to facilitate an assessment of the proposal by the SRC-AS and the SAC, namely: i) improve the definition of its main objectives (those related to the protection of EFH on one hand and those related to the conservation of VMEs on the other hand) and provide a clear identification of the scientific evidence supporting the different objectives considered; ii) assess, with updated figures, the socio-economic impact of such a closure on both Italian and Albanian fleets; and iii) engage in a consultation with all stakeholders, including fishers and national authorities from both Albania and Italy, and include the results of such a consultation

in the proposal. The WGMPA suggested all interested stakeholders to consider the points above in advance of the SRC-AS, to take place in May 2019, for additional consultation with experts and relevant administrations.

**Work towards the assessment of the effects of existing FRAs against their objectives, including the protection of relevant species and ecosystems**

143. In recognizing the importance of establishing proper scientific monitoring plans to assess the effectiveness of the existing and future FRAs, both inside the FRA and in adjacent areas, the meeting convened that any future proposal should include a clear description of the objective(s) of the FRA and a scientific monitoring plan to assess the progress toward its/their achievement. Nonetheless, the working group also noted that a certain degree of uncertainty in the assessment of the effectiveness of FRAs is likely to remain, in light of the many environmental variables that could affect the ecosystem and the difficulties to determine the particular effects of FRAs among other factors, especially when analysed at the subregional/regional scale.

144. With regard to the FRAs already established, the working group recognized that their effectiveness could be challenging to assess. For the assessment of their effect on priority species, monitoring should be based on stock assessment and other data analysis, including modelling approaches (e.g. through MSE).

145. In trying to identify a baseline for scientific monitoring plans designed for the FRAs, the WGMPA agreed that the design of the scientific monitoring plans should be in line with the main objective(s) of the FRA, and provided suggestions for the main two groups of objectives (i.e. the protection of EFH [EFH-FRAs] or the protection of VMEs [VME-FRAs]), as listed below. When a particular FRA combines different objectives, a combination of monitoring approaches is expected, taking into account the relative importance of the different objectives and potential tradeoffs.

*EFH-FRAs*

146. Regarding the scientific monitoring plans for EFH-FRAs, the WGMPA acknowledged the comprehensiveness of the pioneer Jabuka/Pomo Pit FRA scientific monitoring plan (summarized in Appendix 5) and suggested to consider it as an example of monitoring plan to assess the effectiveness of FRAs in protecting EFH and enhancing the status of priority species.

147. In light of this consideration, the meeting advised that any scientific monitoring plan addressing the efficacy of a FRA in protecting EFH, should include the following elements:

- a regular collection of direct observations of the status of priority stocks, with a focus on the stocks mentioned in the objective of the FRA, by means of surveys-at-sea;
- a regular collection of fisheries-related data, in accordance to the DCRF, ensuring the collection of comprehensive data on the stocks mentioned in the objective of the FRA;
- a comprehensive socio-economic data collection aiming at assessing the effects of changes in the volume of landings in socio-economic variables of the fisheries affected by the FRA;
- a plan to prepare and provide regular advice on the status of fisheries (including fisheries resources mentioned in the objective of the FRA, and the socio-economic assessment of the fisheries involved) through the existing expert groups (e.g. the WGSAs and WKMSE), and including LEK from fishers' direct experience and perception on the effect of the FRA on involved fisheries.

*VME-FRAs*

148. Regarding the scientific monitoring plan for VME-FRAs, the WGMPA considered it challenging to address the issue of assessing the effectiveness of those FRAs established to protect different types of

sensitive benthic habitats (e.g. cold-water coral assemblages, sponge fields, chemosynthetic communities) and recognized that for the VME-FRAs already in place, it would be difficult to establish scientific monitoring plans that were not initially foreseen when the FRAs were established.

149. Nonetheless, the meeting considered that for any VME-FRA, full compliance and MCS measures, adequately implemented by the relevant party, would be the most fundamental aspects to ensure that the FRA is effective towards its primary conservation objective (i.e. avoiding SAI of fisheries on sensitive benthic habitats, such as VMEs). In this respect, the working group encouraged the GFCM to act by means of its CoC to oversee its relevant CPCs adopting suitable measures, ensure a constant compliance and prevent IUU fishing in FRAs.

150. For future VME-FRAs, the WGMPA advised that any new FRA proposal should include a suggested monitoring plan specifically designed for the characteristics (biological and ecological) of the benthic habitat subject to the protection measure, giving priority as much as possible to non-destructive survey methods, such as those that rely on the use of ROVs or gliders.

151. For FRAs already adopted, the meeting noted that it may be difficult to carry out a thoughtful assessment of their efficacy but suggested to use some of the elements suggested above, in particular the regular assessment of the status of stocks in the area as well as the use of modelling approaches and MSE to infer the potential effect of the FRA could be used.

### **Work towards the establishment of a network of EFH in the Mediterranean Sea**

152. The WGMPA recognized that the available knowledge on connectivity mechanisms among different life stages of a given stock was not sufficient and that most of the available data on the distribution of EFH, derived from both modelling and direct observations, came from few countries and GSAs.

153. In addition to the above, the WGMPA recognized that some of the work presented to the working group was based on modelling approaches with different levels of uncertainties, ranging from models validated by observations to simulations of predicted habitats/distributions that had not been thoroughly compared with empirical data yet.

154. Notwithstanding these shortcomings and in line with the roadmap proposed by the WGVME in 2017 to address Resolution GFCM/41/2017/5, the WGMPA suggested that the establishment of a network of EFH in the Mediterranean Sea should advance on a precautionary basis, focusing on the establishment of protection measures for EFH in particular nurseries and/or spawning grounds of GFCM priority species with the highest overexploitation rate and low levels of biomass such as European hake and *Mullus sp.*, for which information on EFH already exist. Management measures should provide an increasing spatial protection for these two species, ensuring a geographical balance across different ecoregions, subregions, countries and GSAs. The implementation of adequate spatial management measures to other priority species would also be helpful as comprehensive information on their EFH becomes available.

155. A preliminary advice on priority stocks for which EFH-FRAs could be established, based on and complementing the outcomes of the WGSAs is included in Appendix 6, and a catalogue of existing information on the spatial distribution (modelled and observed) of EFH for those stocks is included in Appendix 7.

### **Preparation of the technical work in support of spatial management measures for the next intersession**

#### ***Organization of GFCM technical groups***

156. Considering the important technical work ahead for the provision of scientific advice in support of the effective implementation of spatial management measures, and acknowledging the substantial overlap

in topics and shared pool of experts of the WGMPA and WGVME, the WGMPA suggested to integrate the work of both working groups in a single working group. This working group should address three main topics, namely: i) the monitoring and assessment of existing FRAs and the review of new proposals; ii) the identification and provision of advice towards the protection of VMEs; and iii) the identification of EFH and provision of advice towards their protection. Proposed general terms of reference for this potential new working group as well as its potential specific terms of reference for 2020 are provided in Appendix 3.

### ***GFCM Database***

157. The WGMPA reaffirmed the importance of developing a database on VME indicator features, habitats and species in the Mediterranean Sea and agreed that this should be a scientific tool in support of the work of relevant GFCM technical groups. The WGMPA stressed that the integration of fishery-dependent and fishery-independent data into a common GFCM database would better support the SAC in providing enhanced scientific advice to the Commission towards the adoption of relevant measures in the future.

158. It was reiterated that the GFCM geodatabase would be different from and complementary to the FAO VME Database (that includes the maps of the GFCM FRAs). While the FAO database shows managed fisheries areas, the GFCM database would be a scientific repository of data about the distribution of sensitive benthic species and habitats<sup>9</sup> throughout the Mediterranean Sea, with the final objective of identifying priority areas for which fisheries protection measures would be proposed.

159. Regarding the standard form to collect and submit information to be included in the GFCM geodatabase, the WGMPA agreed to use a standardized Excel sheet (adapted from the VME template created through the joint ICES/NAFO WGDEC) instead of the Word form adopted by the WGVME 2018, considering that data inserted into spreadsheets would be more easily managed and analysed for mapping purposes. The new standard form, adapted from the ICES/NAFO template, to submit information on sensitive benthic species and habitats in the GFCM area of application, is reproduced in Appendix 8.

160. In light of the results of many studies which highlighted the high sensitivity of *Isidella elongata* to bottom trawling as well as the emergency of detecting and protecting gardens with a high density of *Isidella elongata*, the WGMPA advised to start setting up the GFCM database on sensitive benthic species and habitats by integrating all the information on *Isidella elongata* made available so far to both the WGVME and the WGMPA. The experts committed to submit to the GFCM Secretariat relevant information on the distribution of *Isidella elongata* through the new submission form. They advised the GFCM Secretariat to attempt a first official presentation of these data to the twenty-first session of the SAC.

161. Recognizing the primary importance to collect data on VME indicator distribution, experts from the European Commission expressed the need to advance in the collection of information on VMEs, through the effective implementation of the Protocols for the protection of VMEs in the GFCM area of application, endorsed by the forty-second session of the GFCM and CPCs' commitment. In this respect, they encouraged the launch of specific surveys to collect information on VME indicators in specific zones of the Mediterranean Sea through a VME pilot project. The working group expressed its strong support to the collection of scientific data, including through specific pilot projects.

162. The working group suggested issuing a call for data to relevant experts/SAC focal points in order to insert their inputs into the database. This call should be made in advance of any relevant expert meeting so that data are tentatively integrated into the database and analysed by experts.

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<sup>9</sup> As listed in the Protocols for the protection of VMEs in the GFCM area of application, endorsed by the forty-second session of the Commission.

## **CLOSURE OF THE MEETING AND ADOPTION OF THE REPORT**

163. Mr El-Haweeet closed the meeting underlining that the discussions had been very fruitful and thanked all the experts for their active participation and contribution.

164. The meeting formally adopted the conclusions and recommendations of this report on 21 February 2019. The full report was adopted by e-mail on 31 March 2019.

**Meeting agenda**

- 1. Opening and arrangements of the meeting**
- 2. Spatial management measures targeting fisheries in the Mediterranean and Black Sea**
- 3. Identification and proposal for potential new FRAs**
- 4. Work towards the assessment of the effects of existing FRAs against their objectives, including the protection of relevant species and ecosystems**
- 5. Work towards the establishment of a network of EFH in the Mediterranean Sea**
- 6. Preparation of technical work in support of spatial management for the next intersession**
- 7. Any other matter**
- 8. Formulation of conclusions and recommendations**
- 9. Closure of the meeting**

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## Appendix 3

### **Working Group on Essential Fish Habitats (EFH) and Vulnerable Marine Ecosystems (VME) General terms of reference**

- Review, develop and propose methodologies for the definition, identification and analysis of relevant benthic species and habitats, the identification of fishing footprint, and other issues relevant for the advice on FRAs
- Maintain liaison and contact with other relevant expert groups related to the provision of advice on spatial issues, including other GFCM expert groups (e.g. WG SAs) as well as relevant WGs of partner organizations (ICES, SPA/RAC, etc.)
- Address requests made from the SAC and Commission on issues related to FRAs, including on EFH and VMEs.

The GFCM work should focus on three main components, namely:

#### **FRAs:**

The working group shall:

- review the proposals for the establishment of new FRAs and identify priorities or initiate the development of new proposals;
- analyse, in coordination with other relevant expert groups (e.g. WGs on stock assessment, WKMSE) data from scientific monitoring of existing FRAs;
- make suggestions in view of establishing monitoring plan;
- assess the effectiveness of the FRAs and their contribution to global targets.

#### **EFH:**

The working group shall:

- compile the available information on EFH (e.g. from observations, models);
- prepare a draft advice on priority areas, species and critical life stages as well as suggest potential management measures;
- advance on connectivity and network issues

#### **VME:**

The working group shall:

- compile the available information on VME indicators (e.g. from surveys, fisheries);
- prepare a draft advice on priority areas and potential management measures;
- provide other suggestions to minimize significant adverse impacts of fisheries on VMEs.

### **Specific terms of reference for 2020**

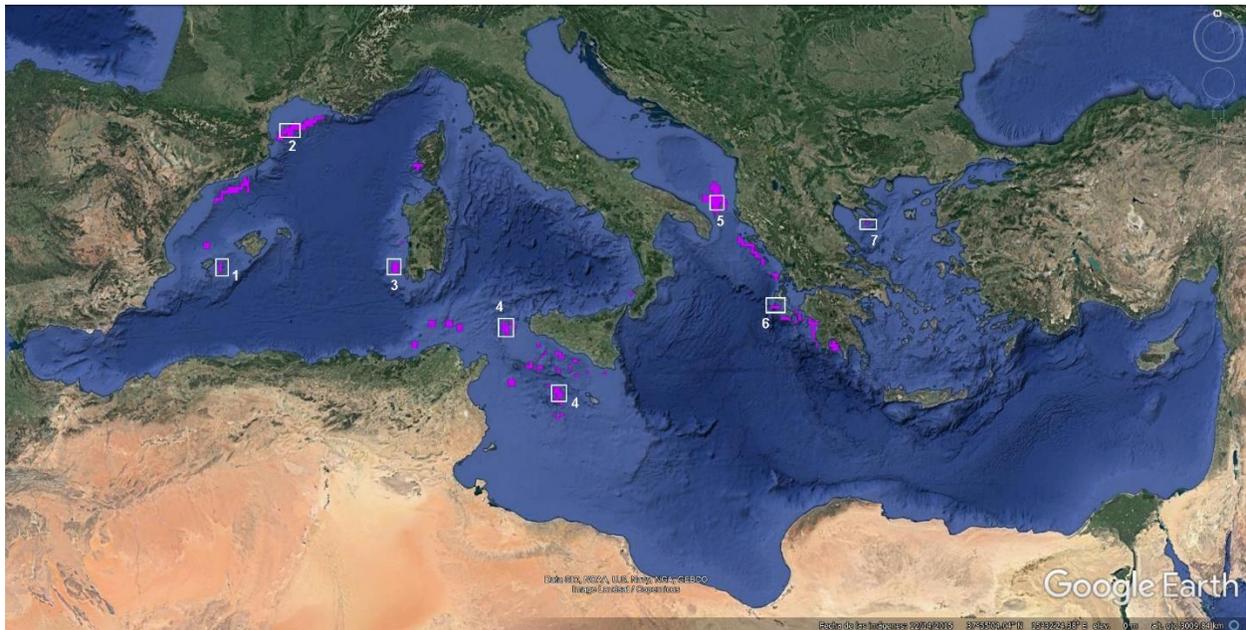
For 2020, the working group should focus on:

- review new and ongoing proposals for FRAs;
- consolidate the database on sensitive benthic habitats;
- consolidate the catalogue of EFH;
- provide suggestions on potential management measures in line with the scientific evidence compiled

#### Appendix 4

### Map showing the known distribution of *Isidella elongata*<sup>10</sup>

Known occurrence of the bamboo coral *Isidella elongata* based on scientific information available (pink polygons; see references below). Priority VME sites as presented at the WGVMs are also highlighted (white square boxes): (1) South Balearic seamounts (Ses Olives-Ausias March seamounts); (2) Canyons at Gulf of Lion; (3) Carloforte shoal; (4) Sicilian channel; (5) Otranto strait; (6) Cephalonia Island; (7) Toroneos Gulf - North Aegean Sea.



<sup>10</sup> From the report of the second meeting of the Working Group on Vulnerable Marine Ecosystems (WGVMs) (FAO headquarters, Italy, February 2018)

**Appendix 5**  
**Main phases of the Jabuka/Pomo Pit FRA scientific monitoring plan**

Proposed Additional Monitoring as per GFCM SAC Monitoring plan (2018-2020) for the Jabuka/Pomo Pit FRA	Outcomes
<i>1. 10-15 additional trawl hauls to be conducted during summer MEDITS survey in Pomo/Jabuka area, to be discussed at the next MEDITS coordination meeting in April in Split, to refine the biomass indexes of commercial species and improve the monitoring of juveniles of Merluccius merluccius which specifically concentrate in the area.</i>	10-15 additional trawl hauls done in summer 2018 MEDITS survey in Pomo/Jabuka area
<i>2. An additional bottom trawl monitoring in winter limited to the Jabuka/Pomo, area using MEDITS methodology, to improve the monitoring of juveniles of Merluccius merluccius which specifically concentrate in the area.</i>	2 research vessels (M/P Andrea--ITA+R/V BIOS DVA --CRO) MEDITS methodology March 2019
<i>3. Analysis of logbook data as well as VMS/AIS data for the authorized fleets, to monitor CPUE of trawlers and bottom long-liners, in order to quantify the eventual displacement of the fishing fleets in the neighbouring areas as well as local changes in CPUE.</i>	<ul style="list-style-type: none"> <li>• common methodology to analyse logbook to be agreed upon</li> <li>• possibility to initiate the collection/analysis of logbook data with a selected sub samples of vessels, among those authorized to fish in Jabuka/Pomo Pit area</li> </ul>
Proposed Scientific Analysis as per GFCM SAC Monitoring plan (2018-2020) for the Jabuka/Pomo Pit FRA	Outcomes
<i>1. Significant efforts are required for the standardization of scientific survey data (MEDITS and GRUND) prior to their use, to be performed on the entire existing dataset.</i>	AdriaMed Meeting on standardization of surveys data (Fano, Italy 31 January – 1 February 2019) MEDITS surveys data initiated UWTV surveys data initiated SoleMon surveys data initiated GRUND survey data in pipeline

<p>2. <i>Benchmark stock assessment for Merluccius merluccius in 2018 and Parapenaeus in 2019 to be performed in the framework of the WGSAD of SAC-GFCM, to consolidate the evaluation of these two main stocks in the area</i></p>	<p>AdriaMed Study Group on Stock Assessment (Split, Croatia 13 September 2018) preliminary preparation of input data for the benchmark assessment All the data collected and available on <i>M. merluccius</i> were made available for the benchmark assessment</p>
<p>3. <i>Development of an assessment for Nephrops norvegicus which takes into account different ecological characteristics of Nephrops norvegicus populations in the Adriatic. Nephrops is the main target species for trawlers in the area</i></p>	<p>Progresses are made and an assessment for this species has been planned for 2019</p>
<p>4. <i>Testing and application of spatial based assessment tools developed recently or under development (e.g. EU funded project MANTIS: Marine protected Areas Network Towards Sustainable fisheries in the Central Mediterranean)</i></p>	<p>The final results of the MANTIS project will be available by the beginning of 2019</p>
<p>5. <i>Historical analysis of macrobenthic data available for the area including GRUND survey data (still to be digitalized), as well as MEDITS data more recently collected at least from 2012, to provide an estimate of the past and present situation of macrobenthic communities and monitor their reaction to the trawling ban.</i></p>	<p>Maps being prepared (including GRUND survey collected benthic information , also referred as Šimunović “collection”) together with those of selected key species from MEDITS survey</p>
<p>6. <i>Data limited stock assessments of Lophius budegassa and other commercially important species in the area based on trawl surveys and landing data, to increase the understanding of the multispecific fisheries exploiting the area and detect potential additional side effects of the establishment of the FRA.</i></p>	<p>Additional important species will be identified and agreed on during next AdriaMed Working Group on Demersal Fisheries Resources (autumn 2019)</p>
<p>7. <i>Socioeconomic analysis of authorized fleets based in the authorized landing ports.</i></p>	<p>AdriaMed Working Group on Socio-Economics (session 1, FAO-HQs, 15 February 2019) Discussion initiates and future work planned for the socio-economic analysis</p>

**Appendix 6**  
**Mediterranean stocks for which EFH-FRAs should be established with priority**

GSA	SPECIES	F	STOCK STATUS	EFH INFORMATION AVAILABLE
<b>WESTERN MEDITERRANEAN</b>				
1&3	<i>Merluccius merluccius</i>	8.5	In overexploitation with relative low biomass	Yes
4	<i>Merluccius merluccius</i>	5.1	In high overexploitation	No
5	<i>Merluccius merluccius</i>	8.7	In overexploitation with relative low biomass	Yes
6	<i>Merluccius merluccius</i>	9	In overexploitation with relative low biomass	Yes
7	<i>Merluccius merluccius</i>	12.7	In overexploitation with relative low biomass	Yes
9	<i>Merluccius merluccius</i>	2.34	In overexploitation with relative low biomass	Yes
9	<i>Mullus barbatus</i>	*	In high level of overfishing and overexploited with relative high level of biomass	Yes
<b>CENTRAL MEDITERRANEAN</b>				
15&16	<i>Mullus barbatus</i>	1.2	In overexploitation with relative low biomass	Yes
12-16	<i>Merluccius merluccius</i>	3.7	In overexploitation with relative high biomass	Yes
<b>ADRIATIC SEA</b>				
17	<i>Merluccius merluccius</i>	1.52	In overexploitation with relative low biomass	Yes
17	<i>Mullus barbatus</i>	2.38	In overexploitation with relative low biomass	Yes
18	<i>Merluccius merluccius</i>	1.52	In overexploitation with relative low biomass	Yes
<b>EASTERN MEDITERRANEAN</b>				
22	<i>Merluccius merluccius</i>	1.17	In overexploitation with relative low biomass	Yes
26	<i>Mullus barbatus</i>	2.78*	In high overexploitation	No

\*Provisional data from November 2018 GFCM Working Group on Stock Assessment of Demersal Species

**Appendix 7**  
**Spatial distribution (modelled and observed) of priority stocks EFH**

1)

**Species:** *Merluccius merluccius*

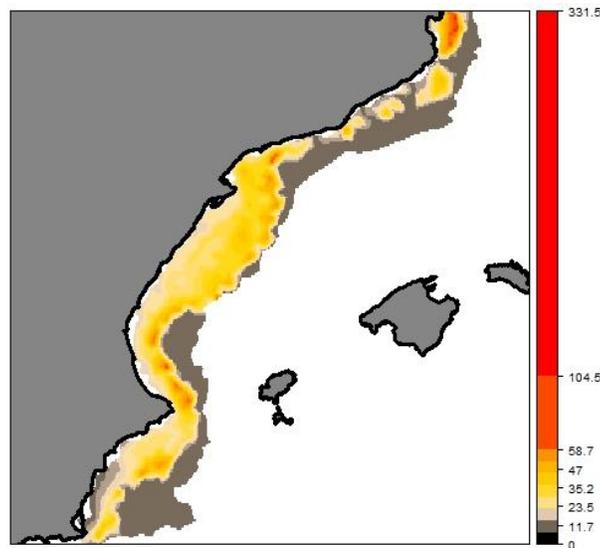
**EFH:** Nursery grounds (<15cm)

**GSA:** 06 – Northern Spain

**Source:** Asociación Ipar Perspective - Universitat de Valencia - IEO (Murcia) - [paradinas.iosu@gmail.com](mailto:paradinas.iosu@gmail.com)

**Modelling method:** Spatio-temporal modelling using R-INLA. We modelled the presence/absence and abundance of the species given their bathymetric niche and spatio-temporal patterns inferred from the MEDITS survey. Results show the combination of the probability of presence and abundance results known as delta model.

**Reference years:** 2010 – 2016



2)

**Species:** *Merluccius merluccius*

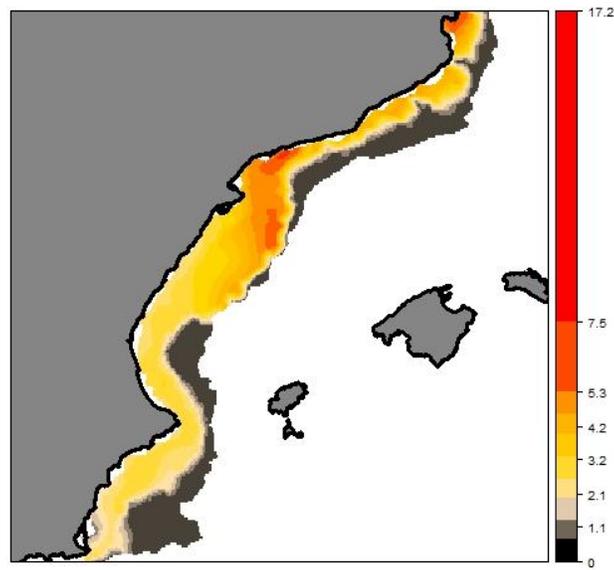
**EFH:** Juveniles and adults (>15cm)

**GSA:** 06 – Northern Spain

**Source:** Asociación Ipar Perspective - Universitat de Valencia - IEO (Murcia) - [paradinas.iosu@gmail.com](mailto:paradinas.iosu@gmail.com)

**Modelling method:** Spatio-temporal modelling using R-INLA. We modelled the presence/absence and abundance of the species given their bathymetric niche and spatio-temporal patterns inferred from the MEDITS survey. Results show the combination of the probability of presence and abundance results known as delta model.

**Reference years:** 2010 – 2016



3)

**Species:** *Merluccius merluccius*

**EFH:** Nursery grounds

**Source:** EC – Joint Research Centre – [jean-noel.druon@ec.europa.eu](mailto:jean-noel.druon@ec.europa.eu)

**Modelling method:** Deterministic Ecological Niche Modelling (Druon et al. 2015<sup>11</sup>). The JRC habitat model uses satellite data of surface chlorophyll content (CHL, MODIS-Aqua sensor) to compute daily suitable habitats for hake nurseries (length < 15 cm). Sea bottom temperature, frequency of surface chlorophyll-a fronts, sea bottom currents and water depth are the used variables for estimating the suitable hake nurseries.

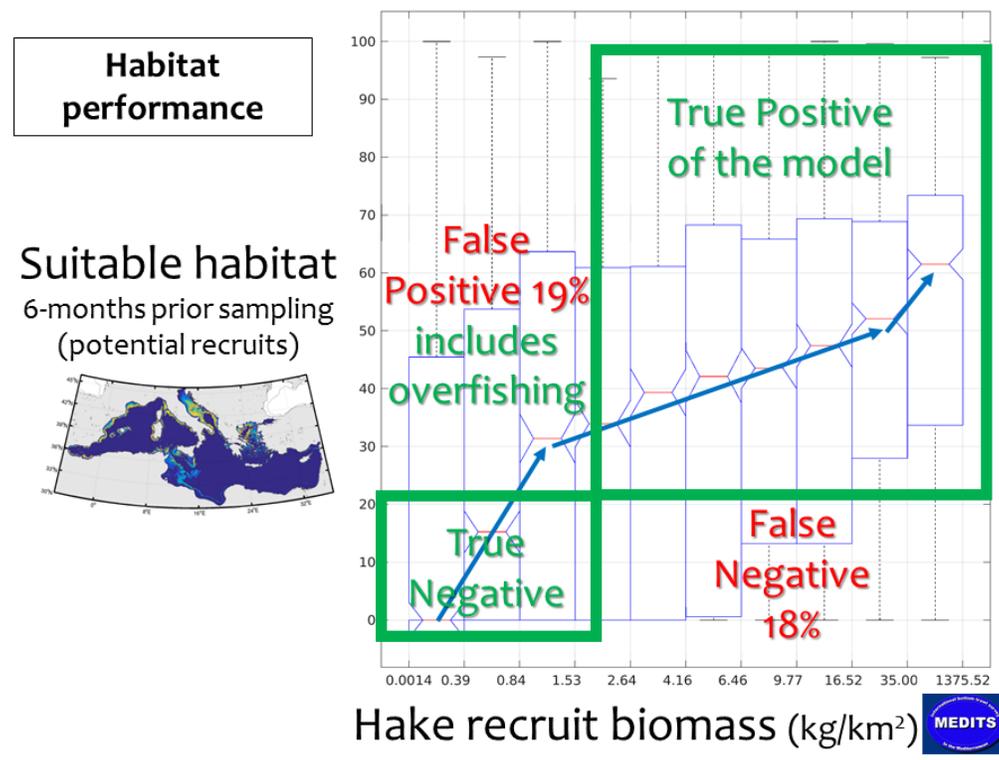
**Reference years:** 2013 – 2018

**Main findings:**

European hake nurseries' mapping,

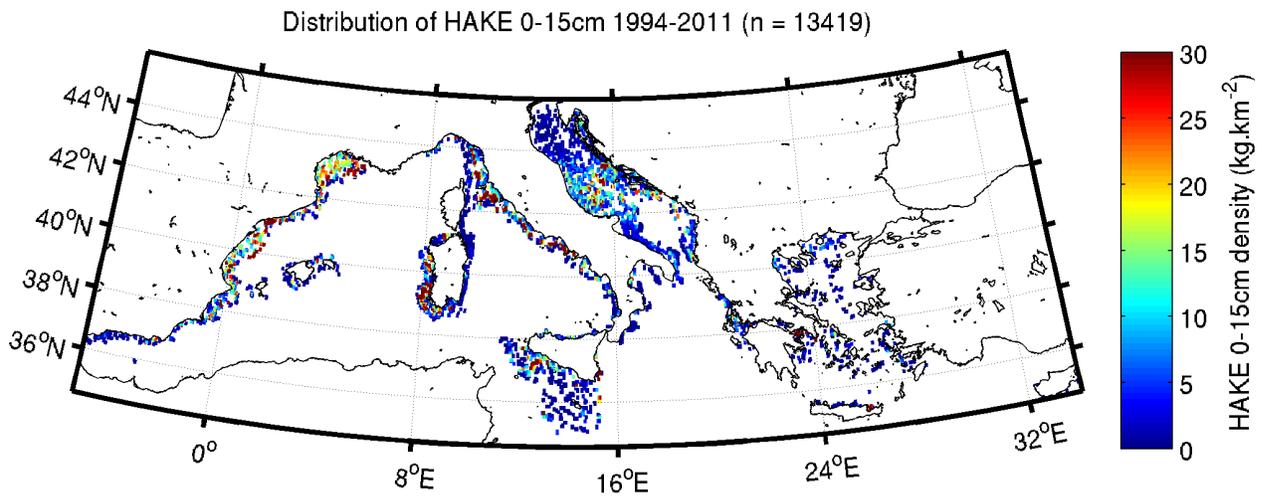
- highlights a high **climate-induced variability** and an overall **negative trend mostly induced by the increase of sea bottom temperature**,
- **is ready for use** with ~70% accuracy,
- can be used to **evaluate the efficacy of FRAs**

**Hake nurseries model performance (~70% of correct matchups including overfishing effect):**



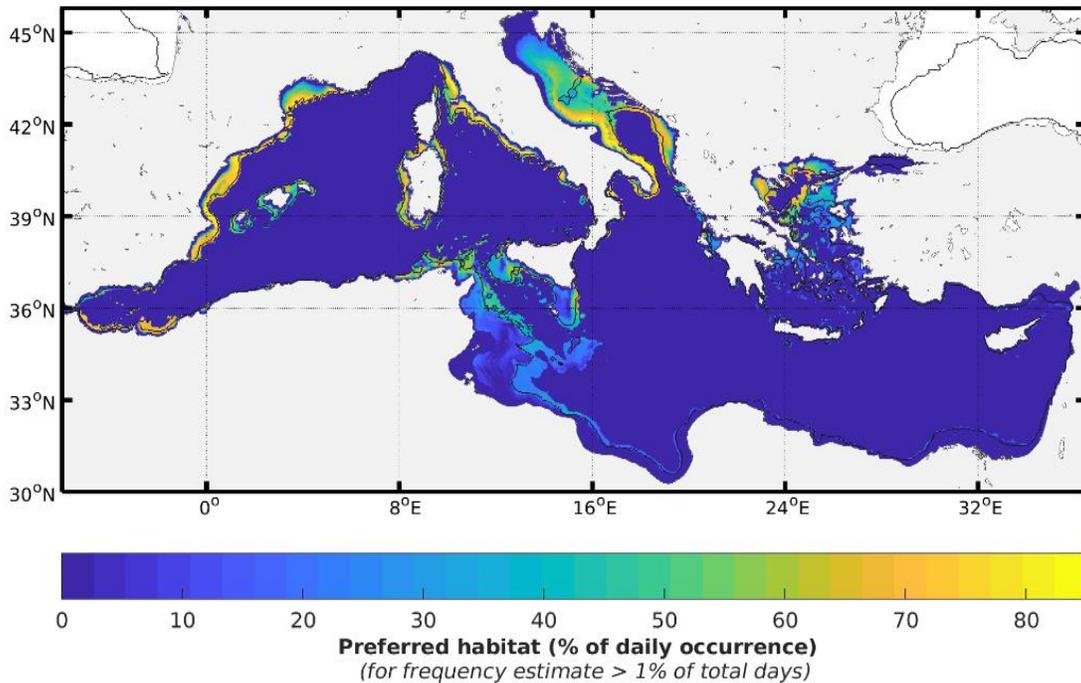
<sup>11</sup>Druon JN, Fiorentino F, Murenu M, Knittweis L, Colloca F, Osio C, Mériqot B, Garofalo G, Mannini A, Jadaud A, Sbrana M, Scarcella G, Tserpes G, Peristeraki P, Carlucci R and J Heikkinen (2015) Modelling of European hake nurseries in the Mediterranean Sea: an ecological niche approach, *Progress in Oceanography* 130:188-204 | DOI: 10.1016/j.pocean.2014.11.005

**Hake age-0 (TL < 15 cm) data from Medits surveys, only the upper biomass quartile (>8.4 kg/km<sup>2</sup>) were used to characterize the nurseries' niche:**

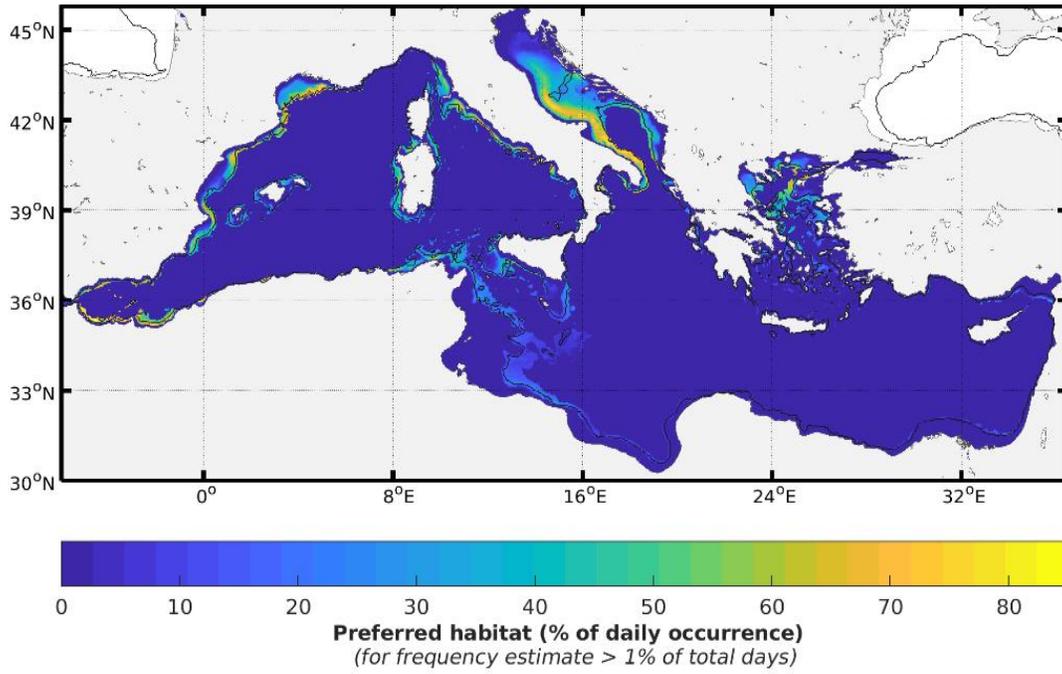


**Hake nurseries suitable habitat - Reference years: 2003 – 2018**

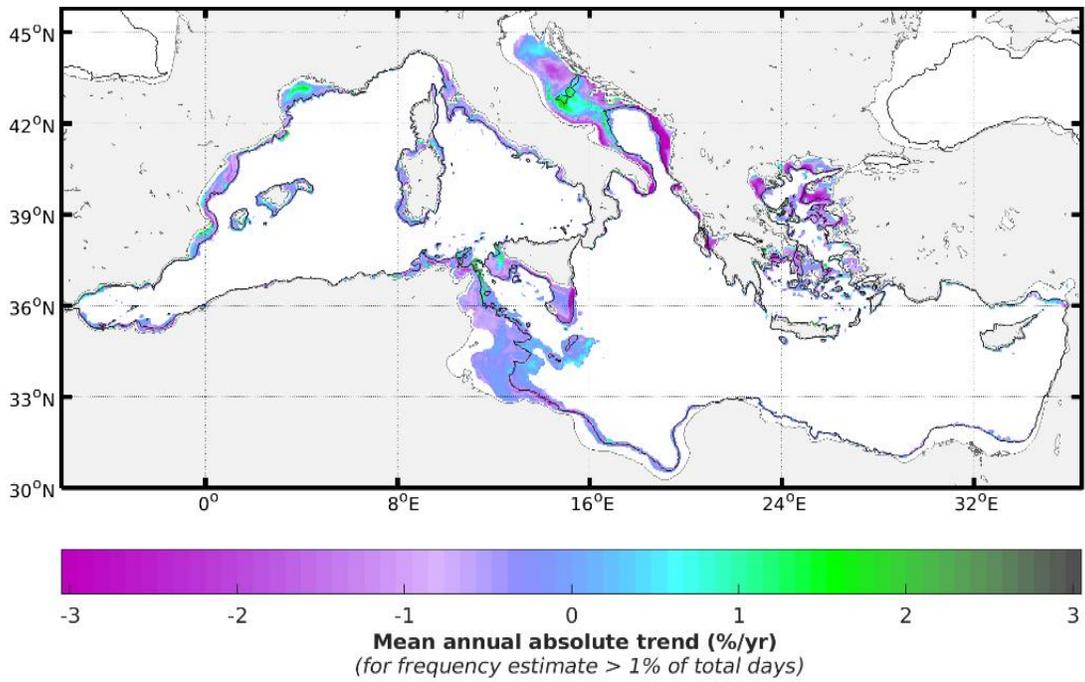
**HIGH SEASON: January to June (mostly corresponding the Medits data above)**



### LOW SEASON: July to December



### TREND 2003-2018



4)

**Species:** *Merluccius merluccius*

**EFH:** Nursery grounds

**GSA:** 01 – Northern Alboran Sea

**Source:** Muñoz, M., Reul, A., Gil de Sola, L., Lauerburg, R.A.M., Tello, O., Gimpel, A., Stelzenmüller, V. 2018. A spatial risk approach towards integrated Marine Spatial Planning: a case study on European hake nursery areas in the North Alboran. *Sea. Mar. Environ. Res.* 142, 190-207.

**Modelling method:** Model based on MEDITS observations

**Reference years:** 1994 – 2012

**Main findings:** The main European hake (*Merluccius merluccius*) nursery areas of the Alboran Sea are located in the Malaga Bay, Almeria Bay and Alboran Island (Muñoz et al., 2018; and Figure 1a). Malaga Bay lacks protection while the Almeria Bay is included in the MPA Sur de Almaría-Seco de los Olivos and the Alboran Island is included in a fishery reserve (figure 4a in Muñoz et al., 2018). Cumulative vulnerability of EUNIS habitat of the most suitable nursery area are highest in Malaga Bay, where trawling frequency is 30-60 times higher than required for habitat recovery as calculated by the Swept per Recovery Time Index (SPR, Figure 1b; for details see, Muñoz et al., 2018). Thus trawling frequency should be reduced 30-60 times in order to guarantee the habitat's capacity to support ecosystem services (supporting and provisioning services) (Muñoz et al., 2018). Baro et al. (2015), describe the Bay of Malaga as important nursery area, show the heavy fishing pressure in all fishing grounds of the bay, and suggest a fishery reserve for the Bay of Malaga.

The proposal of the Essential Fish Habitat of Malaga Bay is supported by both, (i) the importance of the area as nursery area in the Alboran Sea, and (ii) the need of reducing the high fishing pressure in that area. Along the Andalusian Mediterranean coast, the Malaga Bay bears the highest risk of not achieving the high level objective (CFP, 2013), "The sustainable biological, environmental and economic exploitation of living resources". In our case the operational objective of maintaining important ecosystem services, such as nursery areas. Protection from fishery is required where important fish areas are at risk. Thus in order to achieve sustainable exploitation of living resources and habitat recovery, the bay of Malaga is proposed to as an Essential Fish Habitat.

## References

Baro, J., Serna-Quintero, M.J., García, T., Giráldez, A., Marina, P., Rueda, J.L., Gallardo- Nuñez, M., Moya, M., Laiz-Carrión, R., García, A., 2015. Spatial distribution of fishing fleets in a future fishery protected area in the Malaga Bay (northwestern Alboran sea). In: Diaz del Rio, V., Bárcenas, P., Fernández-Salas, L.M., López-González, N., Palomino, D., Rueda, J.L., Sánchez-Guillamón, O., Vázquez, J.T. (Eds.), *Volumen de Comunicaciones presentadas en el VIII Simposio sobre el Margen Ibérico Atlántico*. Ediciones Sia Graf, Málaga, pp. 333–336.

CFP, 2013. REGULATION (EU) No 1380/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC

Muñoz, M., Reul, A., Gil de Sola, L., Lauerburg, R.A.M., Tello, O., Gimpel, A., Stelzenmüller, V. 2018. A spatial risk approach towards integrated Marine Spatial Planning: a case study on European hake nursery areas in the North Alboran. *Sea. Mar. Environ. Res.* 142, 190-207.

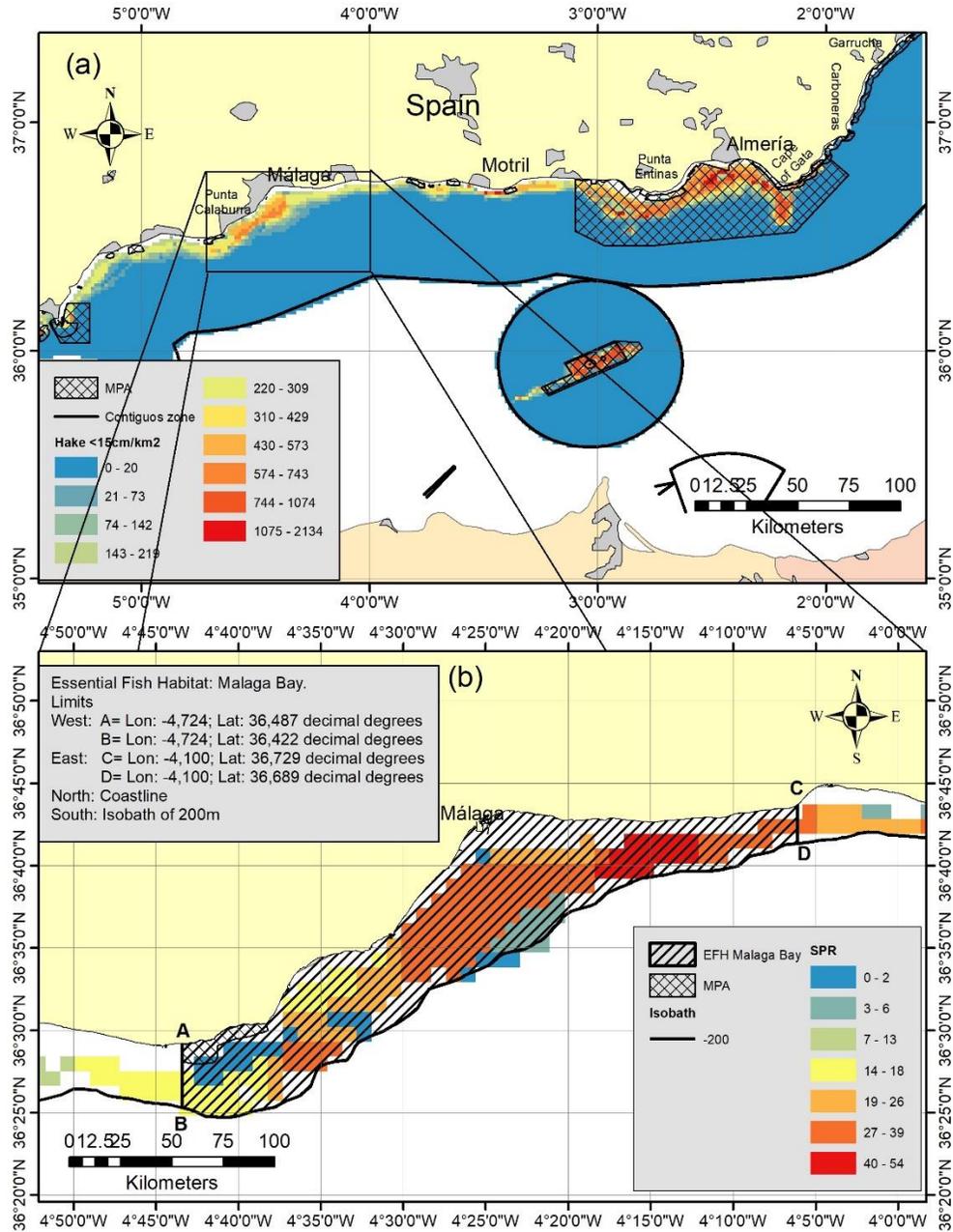


Figure 1. (a) Spatial distribution of *Merluccius merluccius* <15cm (ind/km<sup>2</sup>) along the Mediterranean Andalusian coast as calculated by a General Additive Model based on MEDITS data (Muñoz et al., 2018), and marine protected Areas (MPAs). (b) Swept per recovery time index (SPR) calculated in the most suitable nursery area. The most suitable nursery area was defined as the fifth quantile of highest abundance of hake <15 cm (>196 ind/km<sup>2</sup>). Proposed area and limits of the EFH Malaga Bay, covering the *Merluccius merluccius* nursery area with highest fishery pressure and SPR values along the Andalusian coast (details see Muñoz et al., 2018, figure 6a,b).

5)

**Species:** *Merluccius merluccius*

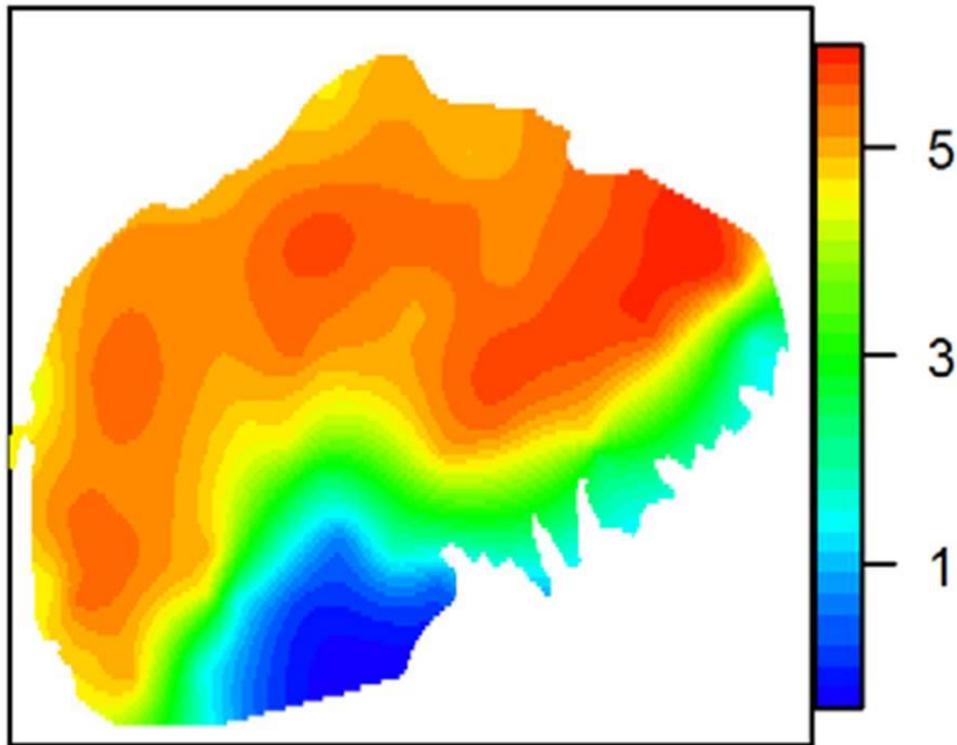
**EFH:** Nursery grounds

**GSA:** 07 – Gulf of Lion

**Source:** Ifremer – Marie.Morfin@ifremer.fr

**Modelling method:** Interpolated average maps (1994–2010) of the log-density ( $Z$ ) of juveniles of the European hake (*Merluccius merluccius*) as observed from MEDITS survey in the Gulf of Lions. This map was produced using a geostatistical approach to handle zeroinflated and non-stationary distributions and to test for the temporal stability of the spatial structures (see Morfin Marie, Fromentin Jean-Marc, Jadaud Angelique, Bez Nicolas (2012). Spatio-Temporal Patterns of Key Exploited Marine Species in the Northwestern Mediterranean Sea. Plos One, 7(5). Publisher's official version: <https://doi.org/10.1371/journal.pone.0037907> for details).

**Reference years:** 1994 – 2010



6)

**Species:** *Mullus barbatus barbatus*

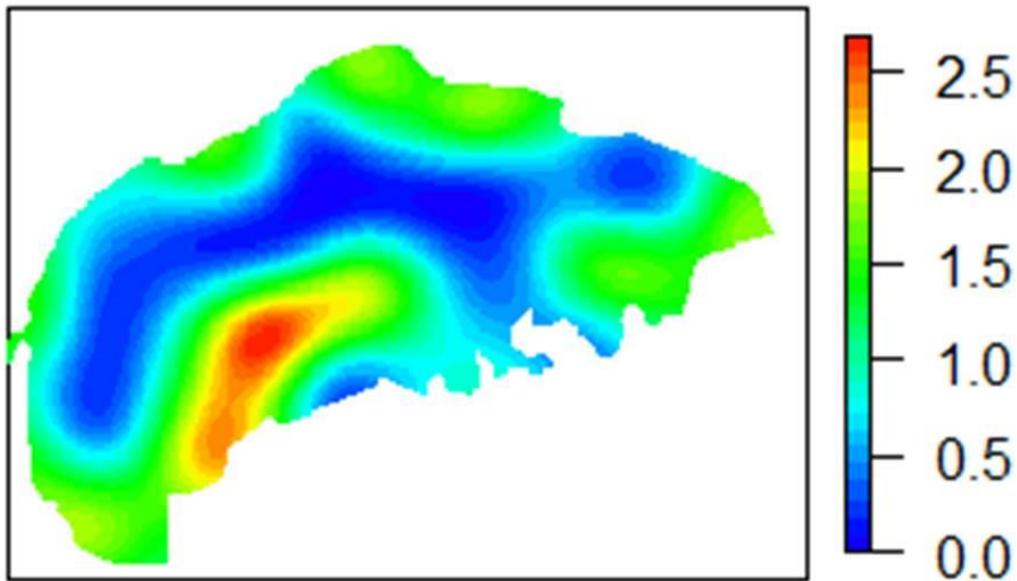
**EFH:** Nursery grounds

**GSA:** 07 – Gulf of Lion

**Source:** Ifremer – Marie.Morfin@ifremer.fr

Modelling method: Interpolated average maps (1994–2010) of the log-density ( $Z$ ) of juveniles of the Red mullet (*Mullus barbatus barbatus*) as observed from MEDITS survey in the Gulf of Lions. This map was produced using a geostatistical approach to handle zeroinflated and non-stationary distributions and to test for the temporal stability of the spatial structures (see Morfin Marie, Fromentin Jean-Marc, Jadaud Angelique, Bez Nicolas (2012). Spatio-Temporal Patterns of Key Exploited Marine Species in the Northwestern Mediterranean Sea. Plos One, 7(5). Publisher's official version : <https://doi.org/10.1371/journal.pone.0037907> for details).

**Reference years:** 1994 – 2010



7)

**Species:** *Mullus surmuletus*

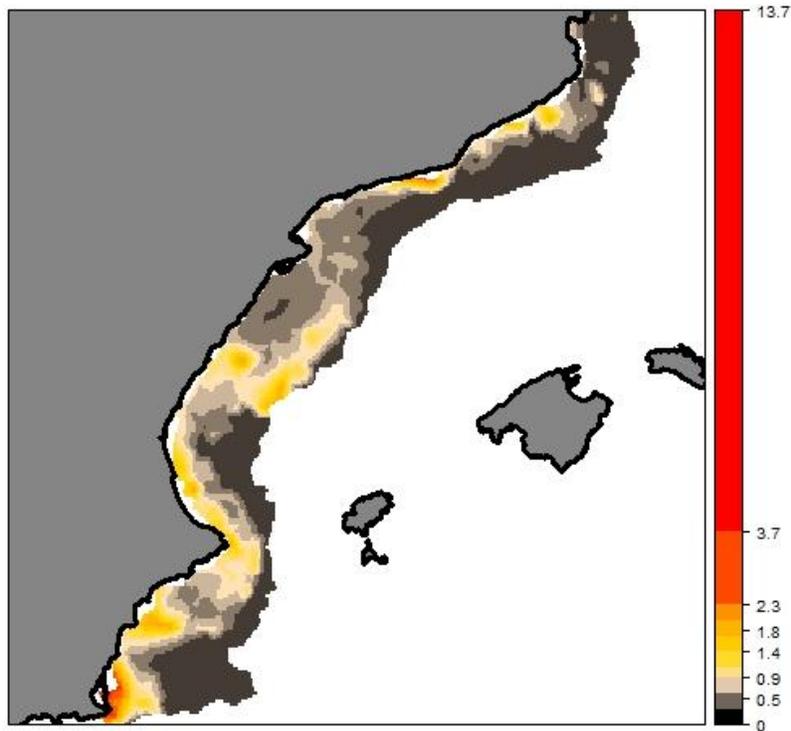
**EFH:** All sizes together (MEDITS is not a good recruitment sampler for this species)

**GSA:** 06 – Northern Spain

**Source:** Asociación Ipar Perspective - Universitat de Valencia - IEO (Murcia) - [paradinas.iosu@gmail.com](mailto:paradinas.iosu@gmail.com)

**Modelling method:** Spatio-temporal modelling using R-INLA. We modelled the presence/absence and abundance of the species given their bathymetric niche and spatio-temporal patterns inferred from the MEDITS survey. Results show the combination of the probability of presence and abundance results known as delta model.

**Reference years:** 2010 – 2016



8)

**Species:** *Mullus barbatus*

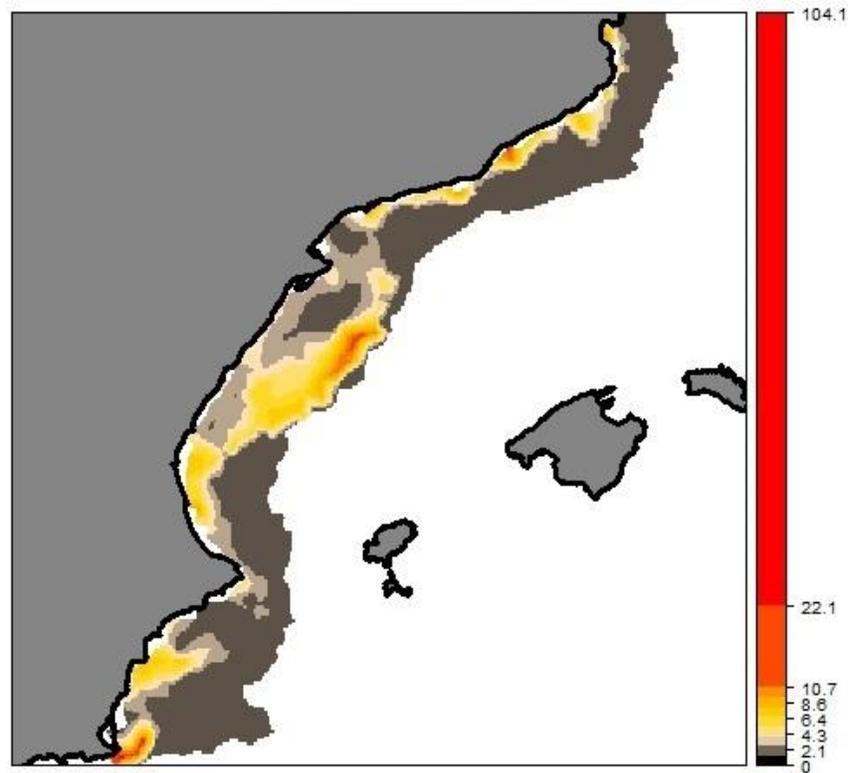
**EFH:** All sizes together (MEDITS is not a good recruitment sampler for this species)

**GSA:** 06 – Northern Spain

**Source:** Asociación Ipar Perspective - Universitat de Valencia - IEO (Murcia) - [paradinas.iosu@gmail.com](mailto:paradinas.iosu@gmail.com)

**Modelling method:** Spatio-temporal modelling using R-INLA. We modelled the presence/absence and abundance of the species given their bathymetric niche and spatio-temporal patterns inferred from the MEDITS survey. Results show the combination of the probability of presence and abundance results known as delta model.

**Reference years:** 2010 – 2016



**Appendix 8**  
**New standard form<sup>12</sup> for the submission of information on sensitive benthic species and habitats in the GFCM area of application**

[Download](#)

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<sup>12</sup> Adapted from the VME template created through the joint International Council for the Exploration of the Sea (ICES)/Northwest Atlantic Fisheries Organization (NAFO) Working Group on Deep-Water Ecology [WGDEC]