



SCIENTIFIC ADVISORY COMMITTEE ON FISHERIES (SAC)

Subregional Committee for the Eastern Mediterranean (SRC-EM)

Online, 10–13 May 2022

DRAFT REPORT

EXECUTIVE SUMMARY

The fourth meeting of the Subregional Committee for the Eastern Mediterranean (SRC-EM)¹ of the Scientific Advisory Committee on Fisheries (SAC) was held online on 10–13 May 2022. The aims of the meeting were to: i) compile relevant information on the status of eastern Mediterranean fisheries and provide advice to the SAC, including on urgent actions towards sustainability and following the requests made by the Commission, in particular in relation to deep-water red shrimp fisheries in the Levant sea and round sardinella (*Sardinella aurita*) fisheries in the eastern Mediterranean; ii) identify priority topics for the subregion, including in relation to data collection, provision of advice and implementation of management measures; and iii) prepare a draft work plan to address priority issues for the consideration of the SAC.

The SRC-EM formulated draft advice on issues related to fisheries in the subregion, including small-scale and recreational fisheries, the monitoring of eastern Mediterranean fisheries, the identification of conservation priority areas hosting essential fish habitats and/or vulnerable marine ecosystems as well as a summary of the status of the stocks, the assessment and management of deep-water red shrimp fisheries in the Levant sea and round sardinella fisheries in the eastern Mediterranean, as well as on non-indigenous species. The work plan for the 2022–2024 was discussed and approved.

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BACKGROUND AND OBJECTIVES

1. The subregional committee for the eastern Mediterranean (SRC-EM) of the General Fisheries Commission for the Mediterranean (GFCM) of the Food and Agriculture Organization of the United Nations (FAO) Scientific Advisory Committee on Fisheries (SAC) was held online on 10–13 May 2022. The SRC-EM was attended by 83 participants, including scientific experts and representatives from the administrations of Mediterranean countries (Algeria, Cyprus, Egypt, Greece, Israel, Italy, Lebanon, Tunisia, Türkiye) as well as representatives of the Directorate-General for Maritime Affairs and Fisheries of the European Commission (DG MARE), the Mediterranean Advisory Council (MEDAC), the International Union for Conservation of Nature (IUCN) the FAO Fisheries and Aquaculture Division and the GFCM Secretariat.

2. Mr Eyüp Mümtaz Tirasın acted as chairperson. The meeting agenda is reproduced in Appendix 1, the full list of participants is provided in Appendix 2 and the summaries of the contributions foreseen in the agenda are available in Appendix 3.

3. In line with the meeting objectives, the SRC-EM reviewed topics of relevance for the subregion, including the outcomes of the forty-fourth session of the GFCM, which amended the recommendations on the management of giant red shrimp (*Aristaeomorpha foliacea*) and blue and red shrimp (*Aristeus antennatus*) in the Levant Sea. The SRC-EM also addressed the management of round sardinella (*Sardinella aurita*) in the eastern Mediterranean and reviewed technical issues related to spatial management, discussed priority species for small-scale and recreational fisheries, the results of monitoring activities in the subregion, issues related to non-indigenous species as well as the principles and structure of MedSea4Fish and the related ambition to step up technical assistance and capacity development in the Mediterranean. In line with its terms of reference and on the basis of scientific evidence and of discussions held, the SRC-EM agreed on the conclusions and recommendations listed hereafter.

CONCLUSIONS AND RECOMMENDATIONS

Review of main topics of relevance for the SRC-EM

Newly adopted recommendations and decisions stemming from the forty-fourth session of the GFCM relevant to the eastern Mediterranean subregion and introduction of the GFCM 2030 strategy

4. The SRC-EM acknowledged the significant number of new decisions adopted by the forty-fourth annual session of the GFCM. Relevant for the eastern Mediterranean, these included binding recommendations on the mitigation of fisheries impacts for the conservation of seabirds, sea turtles, cetaceans and elasmobranchs as well as an amendment of a previously adopted recommendation for the management of giant red shrimp and blue and red shrimp fisheries in the Levant Sea. In addition, a resolution was adopted on the definition of a minimum conservation reference size for priority stocks in the Mediterranean Sea. Importantly a resolution was adopted outlining the GFCM 2030 Strategy for sustainable fisheries and aquaculture in the Mediterranean and the Black Sea (GFCM 2030 Strategy), a ten-year strategy offering a common vision and guiding principles to achieve sustainable fisheries and aquaculture in the region, federating all efforts to deliver on national, regional and global commitments.

Outcomes of technical activities relevant for the management of fisheries in the eastern Mediterranean

Data quality

5. The SRC-EM recognized the progress made in the application of quality indicators to fisheries data transmitted by countries via the Data Collection Reference Framework (DCRF) online platform, including the summary of quality assessment results as presented by the Secretariat. The SRC-EM also welcomed the ongoing GFCM initiative (online questionnaire and virtual meetings) for technical consultations towards an effective transmission of fisheries data to the GFCM via the DCRF online platform and the consolidation of data quality assessment through the identification of priorities for streamlined summary outputs. In this regard, it was noted that four countries of the subregion already compiled and transmitted the DCRF questionnaire to the GFCM Secretariat.

Status of eastern Mediterranean fisheries, including assessments emanating from plenary and relevant benchmark sessions of the Working Groups on Stock Assessment

6. The SRC-EM noted that advice on the status of the stocks was provided for ten out of the 13 eastern Mediterranean species revised, with three stocks being considered sustainably exploited or possibly sustainably exploited – red mullet (*Mullus barbatus*) in GSA 22 and 24, and brown comber (*Serranus hepatus*) in GSA 25 – and all others in overexploitation (Appendix 4). Nevertheless, advice was provided on a qualitative basis for most stocks (seven out of ten validated assessments) and despite most eastern Mediterranean priority species being assessed, with two new assessments presented, spatial coverage was still in need of improvement.

7. The SRC-EM underlined the importance of continuing work towards increasing the number of stocks providing quantitative advice in order to assist the SAC with punctual advice especially in terms of the percentage decrease in fishing mortality required to achieve the reference point. The SRC-EM recognized that the choice of providing qualitative advice was related to the fact that in some cases the quality and quantity of data available yielded uncertainties that precluded the formulation of quantitative advice. The SRC-EM also noted the different array of stock assessment methods employed and recognized that, while a common assessment approach may be desirable for the same species across all Mediterranean subregions, this was a consequence of the data-poor or data-limited nature of the stocks in question, e.g. the lack of comprehensive information on catches for round sardinella prompted the use of length-based methods. In this sense, the SRC noted with pleasure the important work done towards improving assessments in the subregion through the constant exploration of input data, with the notable example of round sardinella for which a detailed roadmap was being followed towards finalizing the benchmark assessment with quantitative advice. In this light, the SRC stressed the need to improve data collection for most eastern Mediterranean priority species and underlined the crucial future role of the MedSea4Fish project towards enhancing both fishery-dependent and fishery-independent data in the subregion through the provision of technical assistance for the sampling of catches and the organization and implementation of surveys-at-sea.

8. In relation to the usefulness of advice on stock status towards consolidated management in the subregion, the SRC-EM underlined the need for a rationale to underpin the identification and evaluation of alternative management measures for effective management, recognizing the important role of close collaboration between scientists and managers. In this sense, the SRC-EM recognized the determinant role of i) the subregional committees that brought scientific and administration experts as well as stakeholders together around the same table; ii) management strategy evaluation methodologies to provide a tangible way of assessing alternative measures based on available data; and iii) the undergoing revision of the framework for the provision of advice which would serve to provide an underlying rationale for the assessment of stock status and possible alternative management measures in data-limited and data-poor contexts.

Spatial management

9. The SRC-EM praised the work done under the umbrella of the Working Group on Vulnerable Marine Ecosystems and Essential Fish Habitats (WGVME-EFH) towards the identification of priority areas for spatial management in terms of both vulnerable marine ecosystems (VMEs) and essential fish habitats (EFH), noting the importance of the standardized bottom trawl surveys and data collection towards the dual aim of identifying nursery and spawning areas of commercial species and mapping the presence of VME indicator species. The SRC-EM underlined the overall bias in information towards the northern part of the Mediterranean and reiterated the crucial importance of ensuring balanced coverage of the entire GFCM area of application with regular surveys towards both gaining a complete picture of the persistence of EFH over time and providing the scientific basis for the identification of priorities for spatial management through the addition of new information in the GFCM database on sensitive benthic species and habitats (e.g. from the Palmahim Disturbance Cold Water Coral Gardens and Cold Seeps). In this sense, the SRC-EM underlined both the need for continuing current efforts to perform surveys in the eastern Mediterranean, as well as extending the surveyed area to cover other potentially important and unmonitored areas. The SRC-EM commented that future efforts in this context would be an effective way of implementing the subregional approach and could be carried out

with the technical assistance of the GFCM and its subregional technical units under the umbrella of MedSea4Fish.

10. The SRC-EM commended the work done towards the creation and launch of the GFCM database on national spatial management measures for fisheries, deeming it an important tool for the collection and display of all information on measures in place at the national level and noting that information had been included for Cyprus, Egypt, Greece and Lebanon. In this respect, the SRC-EM welcomed the requests of Israel and Palestine to complement the database with information on respective national management measures.

11. In light of the outcomes of the WGVME-EFH and of the information available and towards ensuring the future effectiveness of fisheries restricted areas (FRAs), the SRC-EM agreed that more work should be done to identify priority areas for the protection of both VMEs and EFH. It endorsed the updated guidelines for the scientific monitoring of FRAs, which should be implemented in connection with other management measures and embedded within the context of multiannual management plans, towards adopting a holistic approach to management that addresses the protection of key stocks and habitats while considering socioeconomic aspects and foreseeing the implementation of scientific monitoring plans (according to the integrated guidelines proposed by the WGVME-EFH; Appendix 4 of the report of the meeting of the WGVME-EFH 2022).

12. The SRC-EM endorsed the updated roadmap to guide the work needed to analyse the overlap between VMEs and the deep-water red shrimp fishery that foresaw the need to finalize the work on mapping fishing grounds, the compilation and review of DCRF data to better understand bycatch and discards, and the establishment of linkages between the distribution of VME indicator species and the fishing grounds/vessel activity, based on the new data contained in the GFCM database on sensitive benthic habitats and species and including information stemming from modelling analyses. The SRC-EM agreed that this would also comprise a first important step to be undertaken before considering the possibility of revising the depth limits of the 1 000 m FRA (e.g. to 600 m or 800 m).

13. The SRC-EM acknowledged the initiatives by the FAO Fisheries and Aquaculture Division in collaboration with the GFCM regarding the interpretation of the Convention on Biological Diversity (CBD) criteria for other effective area-based conservation measures (OECMs) in the fisheries sector, specifically in the Mediterranean context. Participants were also informed of the outcomes of the GFCM–FAO expert meeting on Fisheries OECMs in the Mediterranean (16–17 February 2022) which performed a preliminary screening of three areas off of the Lebanese coast against a simplified array of CBD criteria for OECMs. The SRC welcomed the information collected both on the OECM process in general and the preliminary analysis done on the Lebanese case studies underlining that the exercise had been very useful towards understanding how to advance towards proposing an OECM, suggesting additional areas be identified and evaluated in other countries of the eastern Mediterranean. Nevertheless, the SRC-EM recognized the difficulties encountered in this sense, especially owing to the fact that OECMs straddle the competences of different governmental authorities, notably those dedicated to the management of the environment and biodiversity and those focusing on fisheries.

European eel

14. The SRC-EM recalled the worrying fact that the status of the global European eel (*Anguilla anguilla*) stock, including the Mediterranean portion of the population, remained critical and underlined the need to take additional measures on the basis of the impressive work done by the GFCM research programme on European eel in the Mediterranean. In this sense, the SRC-EM agreed that the toolbox of management measures compiled by the Working Group on the Management of European Eel (WGMEASURES-EEL), which included 17 existing and potential measures and their appraisal in terms of issues, implementation and potential development, represented an essential tool. It further recognized that the work done on European eel, including the dedicated research programme and the proposals stemming from it (e.g. the establishment of pilot actions to advance the implementation of measures), should be considered an example to be followed towards addressing the management of other priority species in the Mediterranean.

Red coral

15. The SRC-EM acknowledged the outcomes of the working group on red coral and the crucial importance of the GFCM research programme on red coral whose aim was to collect information towards informing the assessment of the status of populations and the management of the fishery. In this context, Egypt, whose national waters were known to host red coral populations, requested to be part of the research programme.

Small-scale fisheries and recreational fisheries

16. The SRC-EM appreciated the work carried out by the two Working Groups on Small Scale Fisheries and Recreational Fisheries (WGSSF and WGRF) and stressed the importance of continuing those activities also counting on the support and collaboration of all countries and relevant partners.

17. The SRC-EM noted the need to assess the implementation at national level of the Regional Plan of Action for Small-Scale Fisheries (RPOA-SSF) and welcomed the fact that Egypt and Lebanon had expressed the will to join the assessments.

18. Concerning small-scale fisheries (SSF), the SRC-EM revised and agreed on the proposed list of selected criteria (adapted from criteria used by WGRF 2021) to identify the list of priority species for SSF, and agreed that, as also suggested by other SRCs, the Secretariat, based on official data submitted by country through the DCRF platform, compile and perform a preliminary analysis, providing a tentative list of the main important SSF species at country level and for GFCM subregions. This list would be submitted for the consideration of the SAC. The SRC-EM also highlighted that this proposed list should not be considered permanent, but instead adaptive and flexible, to be revised once further information was compiled and analysed.

19. The SRC-EM, acknowledging the fact that several large and medium pelagic species were relevant for SSF, suggested to rekindle and strengthen the cooperation between GFCM and the International Commission for the Conservation of Atlantic Tunas (ICCAT) and agreed that medium pelagic species (e.g. *Auxis rochei* and *Auxis thazar*, *Scomberomorus* spp., *Euthynnus alletteratus*, Thunnini) could be discussed under the umbrella of the joint ICCAT/GFCM Working Group on Medium Pelagics.

20. Concerning the list of species for recreational fisheries (RF), the SRC-EM appreciated the work done by the WGRF, which took into account GFCM priority species when caught by recreational fishery as well as subregional specificities, also prioritizing species of commercial and conservation concern. The SRC-EM proposed that the list for RF species take into account the differences between countries within GFCM subregions thus allowing for inter-country variability in priority species. The SRC-EM requested the Secretariat finalize the compilation of the proposed list, incorporating all comments and inputs received from the group.

21. The SRC-EM, recalling existing crises such as the one generated by the COVID-19 pandemic, underlined the importance of carrying out an analysis of the direct and indirect impacts that this event had and/or could have on the RF (e.g. switching from a recreational to a subsistence activity).

22. The SRC-EM appreciated the work done by the Secretariat in compiling the preliminary list of national legislation and management measures on RF in force in each contracting party and cooperating non-contracting party (CPCs) (Appendix 5), noting that the list should be revised and checked in detail by CPCs and submitted to the SAC, both to inform future analyses and to serve as background information for the discussion on the pending recommendation on recreational fisheries, expected to take place at the forty-fifth session of the GFCM.

Non-indigenous species

23. Following a presentation on outcomes of the RELIONMED project, on the management of lionfish (*Pterois miles*) in the Mediterranean, centered around a field study carried out in Cyprus, the SRC-EM noted the fast expansion of this NIS in the Mediterranean since its first appearance through the Suez Canal and acknowledged that similar studies were being carried out in other eastern Mediterranean countries, notably in Greece, Lebanon and Türkiye. The SRC-EM acknowledged the

potential of reducing lionfish in the Mediterranean through fishing, culling and the important development of a market for the species. The SRC-EM discussed the potential need, for the very invasive NIS, to allow targeted and legal fishing in marine protected areas as well as to advance, in the case of lionfish, on the development of gear that could be used in deeper waters where spearfishing was not possible.

24. Following a presentation on the application of a standardized local ecological knowledge (LEK) study in eastern Mediterranean countries performed in 2021, the SRC-EM reiterated the growing importance and prevalence of NIS in the eastern Mediterranean to the detriment of native species (e.g. *Salpa salpa*) and underlined the effectiveness of specific LEK protocols in reconstructing historical changes through the important process of involving stakeholders and the participatory approach. In fact, a very (temporally) limited study based on questionnaires had produced surprising results and an impressive amount of information. Involved countries all underlined their willingness to continue and expand the study in the future.

25. Considering the joint efforts of the GFCM and United Nations Environment Programme Mediterranean Action Plan (UNEP/MAP) Secretariats in 2017 and 2018 to establish a subregional monitoring plan on NIS in relation to fisheries and recalling the fact that the twenty-second session of the SAC agreed on the need to launch an in-depth reflection as well as a dedicated research programme to, *inter alia*, consolidate an observatoire with the aim of integrating all available information, foster engagement between relevant actors at the Mediterranean level, improve the understanding of the interactions of NIS with receiving ecosystems, as well as investigate effective management through fisheries management tools and/or nature-based solutions, the SRC-EM proposed to undertake a research programme on NIS in the eastern Mediterranean subregion, which could then serve as an example to be exported in and complemented by other subregions. The SRC-EM underlined the need to start by taking into account all efforts made to collect data on NIS via several avenues (e.g. monitoring programmes and the DCRF) and complement them with an exhaustive LEK study in the subregion. To this end, a draft concept note for such pilot research programme was proposed for the consideration of the SAC (Appendix 6).

Monitoring programmes

26. Following presentations of results emerging from the different monitoring programmes covering discards (in Egypt, Lebanon and Türkiye), incidental catch of vulnerable species (in Türkiye), surveys-at-sea (Lebanon) and on the work underway on the implementation of mitigation measures (in the framework of the MedBycatch project), the SRC-EM enthusiastically welcomed these advances and recognized the significant efforts made to produce these positive outcomes in line with the standard GFCM–FAO methodologies^{2,3}. The SRC-EM appreciated all the work done, through these programmes, in covering also different aspects related to monitoring the impact of fisheries on ecosystems (e.g. on collecting information on marine litter, on VMEs).

27. The SRC-EM stressed the importance of continuing these activities into the future, including maintaining good relationships with fishers and fostering the network of experts and partners working on these topics. In this light, the SRC-EM expressed its hope that this kind of monitoring programme, as well as the implementation of mitigation measures, could be replicated and consolidated in several areas of the subregion.

WGMSE session on round sardinella and deep-water red shrimp fisheries

28. The SRC-EM praised the proposal for a common operational framework comprising six steps to advance on identifying and evaluating current and potential management measures while contributing towards monitoring the effectiveness of existing management plans as well as providing technical advice for the update of current or drafting of future management plans, noting it was a useful approach to facilitate the work of the SRCs in collecting all the relevant information and understanding strengths

² FAO. 2019a. *Monitoring the incidental catch of vulnerable species in Mediterranean and Black Sea fisheries: Methodology for data collection*. FAO Fisheries and Aquaculture Technical Paper No. 640. Rome.

³ FAO. 2019b. *Monitoring discards in Mediterranean and Black Sea fisheries: Methodology for data collection*. FAO Fisheries and Aquaculture Technical Paper No. 639. Rome

and weaknesses of current management measures as well as identifying additional ones. In this context, the SRC-EM noted the importance of the historical analysis emerging from the construction of timelines coupling important events relevant for the fishery or the stock in question (e.g. the introduction of management measures and specific regulations, any incentives that may have determined a change in the fishery or the fleet and any significant environmental events) with the time series of catches and suggested it would comprise an important starting point for the evaluation of all fisheries.

Data-limited management strategy evaluation

29. In light of the general paucity of data on key fisheries in the eastern Mediterranean (e.g. deep-water red shrimp and round sardinella fisheries) and recognizing the important need to advance on the assessment of alternative potential management measures while continuing the collection of data, the SRC-EM welcomed two presentations delineating two different frameworks for the performance of data-limited management strategy evaluations (MSE) – OpenMSE and Fisheries Library in R (FLR). The SRC-EM noted that the two frameworks provided two different ways of tackling the same issue that could be matched to the different capabilities across the Mediterranean region, with FLR being a potential tool to be developed for the many assessments performed using FLR and OpenMSE providing a tool to approach MSE from the consideration of expert judgement alone, building upon it as more data became available. The SRC-EM underlined that an interesting component of the MSE approach was that it allowed for the determination of the value of collecting more and better data giving a good measure of the trade-offs between risk and investment in data collection. The SRC-EM recommended the organization of capacity-building opportunities to familiarize and train both scientific experts and managers in this kind of approach.

Round sardinella fisheries in the eastern Mediterranean Sea

30. Regarding the timeline for round sardinella, the SRC-EM welcomed such comprehensive analysis, which was developed as an individual analysis by geographical subarea (GSA) and country and later merged into a combined timeline. The SRC-EM highlighted that this approach had achieved, for the first time, an integrated view of the available information on the time series of catches for small pelagic fisheries, particularly for round sardinella, in the eastern Mediterranean. Importantly, the SRC-EM pointed out the value of linking the time series of catches to relevant events, such as possible environmental drivers and the management regulations in place, towards better explaining the dynamics of the fishery and the stock. For example, in the case of round sardinella, the possible effects of the Nile flood of 1998 on Egyptian catches and the fuel tax concession and buyback programme on Turkish catches were highlighted. The timeline is provided in Appendix 7.

31. In order to encourage potential future discussions on the management of this resource, which is considered in overexploitation on a precautionary basis in GSAs 24 and 26+27 (Palestine), the SRC-EM discussed the current management measures in place at country level, performing an appraisal of the issues associated to each, the level of implementation and potential associated needs, as well as possible future developments. This allowed for the formulation of a toolbox of measures for future reference and discussion (Appendix 8). The exercise, for example, highlighted issues related to the catch of small individuals and therefore the difficulty in implementing fishery measures to reduce them, suggesting that the way forward may lie in finding measures to reduce demand – e.g. through awareness campaigns at the consumer/retail level and the implementation of a minimum size at market level – rather than supply.

Deep-water red shrimp fisheries in the Levant Sea

32. The SRC-EM acknowledged the impressive amount of work done towards providing a solid scientific basis for the management of deep-water red shrimps in the eastern–central Mediterranean, including capacity-building activities, noting that future actions should concentrate on enhancing and improving fishery-dependent and fishery-independent data collection (including a scientific survey in Egypt) and the finalization of the roadmap for the assessment and determination of fishing grounds as well as a greater involvement of CPCs. The SRC-EM commented positively on the finalization of part one of the FAO technical paper “Synthesis of the biology, ecology and fisheries of deep-water red shrimps *Aristaeomorpha foliacea* and *Aristeus antennatus* in the central-eastern Mediterranean

(GSA 12 – 16, 18 – 27)” and suggested the possibility of foreseeing a third part that takes into account the knowledge base developed in the western Mediterranean.

33. The SRC-EM praised the contribution of the work done towards building the understanding of the biological population units of giant red shrimp and blue and red shrimp in the Mediterranean, based on an array of different analyses and methodologies performed in a standardized manner covering the entire Mediterranean. In light of the results, which showed a generalized light differentiation into western, central and eastern population units, the SRC-EM commented that they were in line with the spatial approach to management set by the current recommendations for the Strait of Sicily, and the Ionian and Levant Seas. The SRC underlined that more work was required to improve the accuracy of results but also in retrieving additional crucial information, notably on the origin of catches.

34. Based on the results obtained in the framework of the MedBycatch project in Türkiye, and in the context of monitoring observations carried out on trawlers targeting deep-water red shrimps (both *Aristaemorpha foliacea* and *Aristeus antennatus*), the SRC-EM acknowledged the fact that the opportunities for managing this fishery were enhanced by the relatively well-defined fishing grounds and noted the potential effectiveness of the use of some mitigation measures (i.e. grids) towards a more selective fishery. The use of turtle excluder devices (TEDs), during the implementation of the MedBycatch project, had resulted for example in fewer elasmobranchs (i.e. sharks and rays) caught in deep-water red shrimp fisheries. Further experiments using TEDs, should be undertaken to better quantify the effect on both catch composition and on the impact on different groups of vulnerable species.

35. In light of the noticeable differences regarding the level of data transmission compliance in response to Recommendation GFCM/42/2018/3 on fisheries management measures for the conservation of sharks and rays in the GFCM area of application, amending Recommendation GFCM/36/2012/3, the SRC-EM encouraged CPCs to strengthen their efforts towards the timely submission of complete datasets, in order to provide accurate information for the evaluation of the effectiveness of existing management measures/plans as well as towards the fulfilment of accessory objectives, e.g. the publication of the State of Mediterranean and Black Sea Fisheries (SoMFi). The SRC-EM requested the Secretariat perform the same analysis at a GSA level, which was particularly relevant for the deep-water red shrimp fisheries in the Levant Sea; the country analysis was complemented with GSA-specific information and provided as Appendix 9 of this report.

36. The SRC-EM acknowledged the data collation and analysis towards the construction of a timeline of events for the deep-water red shrimp fisheries in the Levant Sea (Appendix 7) based on which all available indicators by country were collated and compared versus possible major management and environmental drivers. The SRC-EM commented that, the lack of validated stock assessments notwithstanding, there were strong indications that the stocks of the two key species were overexploited, implying that further efforts should be devoted to improving input data and assessments towards the provision of annual advice on stock status. The SRC-EM again recognized the usefulness of the timeline approach on the MSE framework which showed the possible effect of the Turkish buyback program and the improvement in Turkish data collection as well as the potential significance of the Eastern Mediterranean Transient.

37. Based on the information provided, on the current recommendation on a multiannual management plan for bottom trawl fisheries exploiting giant red shrimp and blue and red shrimp in the Levant Sea, and the discussions held in the context of the SRC-CM, the SRC-EM discussed current and potential management measures and proposed technical elements for a long-term multiannual management plan designed as a stepwise manner starting with a transitional period (2–3 years) during which a restricted set of initial measures would be implemented while gathering scientific support and information towards the identification of long-term adaptive management measures based on future advice on the evolution of the state of resources and fisheries, for the consideration of the SAC, as reproduced in Appendix 10.

MedSea4Fish

38. The SRC-EM welcomed the establishment of MedSea4Fish as the appropriate response to the need to continue reinforcing data collection and technical capacity at the national level, capitalizing on the successes of the subregional approach and enabling GFCM countries to actively participate in strategic initiatives as well as meet GFCM requirements. In reviewing the proposed principles and structure of MedSea4Fish, the SRC stressed the importance of effectively targeting the different stakeholders, and fishers especially, in relevant activities and of appropriately framing work that is transversal, in particular suggesting to account for the possibility to organize exchanges between institutes on techniques, equipment and training, thus capitalizing on the programme's network and maximizing its potential. As MedSea4Fish was established taking inspiration from the GFCM BlackSea4Fish project, it was noted that, based on the experience in the Black Sea, flexibility was key in ensuring an efficient operationalization of linkages between national activities and strategic objectives and that, considering the wider area covered, MedSea4Fish coordination mechanisms needed to be thoroughly designed. The SRC also reiterated the importance of continuing to rely on the contributions of partner organizations and how open cooperation with other projects and initiatives in the area would be crucial to avoid duplicities, maximize synergies and create opportunities.

PROPOSED WORK PLAN 2022–2024

39. In addition to the overall mandate of the SRC-EM to compile technical inputs and prepare draft advice for the SAC on priority topics for the subregion, including on the status of stocks of priority species and potential measures for the management of fisheries and conservation of biodiversity, as well as to provide support to the implementation of relevant regional activities in the eastern Mediterranean, the SRC-EM proposed the following actions, addressing priorities for the subregion:

- Review and enhance data collection efforts for priority species in the eastern Mediterranean.
- Compile relevant information on priority species towards increasing the coverage and quality of stock assessment for the eastern Mediterranean.
- Organize training on data-limited MSE applicable to round sardinella and/or deep-water red shrimp in the eastern Mediterranean.
- In the context of round sardinella:
 - Improve round sardinella input data.
 - Finalize the benchmark assessment of round sardinella in GSAs 24, 26 and 27 according to the agreed roadmap.
- In the context of deep-water red shrimp fisheries:
 - Advance towards annually assessing the status of deep-water red shrimp stocks.
 - Finalize the work plan for the identification of fishing grounds using all data available and perform an overlap analysis with the distribution of the two species.
 - Provide the technical information for the adoption of additional management measures and work towards filling current gaps in scientific knowledge (refer to the technical elements in Appendix 10 for details).
 - Perform an assessment of alternative management scenarios in a data limited context.
 - Finalize the synthesis on the biology, ecology and fisheries of deep-water red shrimps (*Aristaeomorpha foliacea* and *Aristeus antennatus*) (technical paper) in the central–eastern Mediterranean (GSAs 12–16 and 18–27), Part one in 2022 and Part two in 2022/2023 and consider the planning of a third part putting together information from western Mediterranean fisheries.
 - Implement the roadmap to guide the work needed to analyse the overlap between VMEs and the deep-water red shrimp fishing grounds.

- Provide information, e.g. electronic reporting system (ERS), VMS and logbooks, to enable the estimation of catches by GSA of origin for the meeting foreseen in July 2022, as well as their length–frequency distribution to improve the quality of stock assessments for these species.
- Perform scientific trawl surveys-at-sea in Egypt.
- Contribute to key regional activities including:
 - Continue supporting the monitoring programmes for discards and incidental catch of vulnerable species in Egypt, Lebanon and Türkiye, as well as surveys-at-sea in Lebanon.
 - In cooperation with relevant partners, work on bycatch monitoring and testing of mitigation measures, continuing with the previous work carried out within the MedBycatch project.
 - Continue working towards the identification and proposal of priority EFH and/or areas hosting VMEs for which spatial and/or temporal measures could be implemented.
- In the context of NIS:
 - Launch a research programme on NIS in the eastern Mediterranean consolidating an integrated monitoring platform for NIS and expanding the preliminary LEK study carried out in the past (Appendix 6).
- In the context of SSF and RF
 - Perform a socioeconomic analysis of RF considering the direct and indirect impacts of current crises e.g. COVID-19.
 - Continue the socioeconomic survey in Lebanon.
- Contribute to the research programme on red coral in the Mediterranean, including Egypt as a partner in the programme.

Agenda

1. Opening and arrangements of the meeting
2. Review of main topics of relevance for the SRC-EM
3. Outcomes of technical activities relevant for the management of fisheries in the eastern Mediterranean
4. WGMSE session on round sardinella and deep-water red shrimp fisheries
5. Introduction to MedSea4Fish: addressing the subregional approach in line with the GFCM 2030 Strategy
6. SRC-EM work plan and discussion on subregional priorities and follow-up activities
7. Conclusions, recommendations and scientific advice
8. Any other matter
9. Closure of the meeting

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Abstracts of presentations delivered during SRC-EM 2022

Review of main topics of relevance for the SRC-EM

The GFCM Secretariat presented the newly adopted recommendations and decisions stemming from the forty-fourth session of the GFCM relevant to the eastern Mediterranean subregion and introduction of the GFCM 2030 Strategy. In particular, details were provided on Recommendations GFCM/44/2021/6⁴, GFCM/44/2021/13⁵, GFCM/44/2021/14⁶, GFCM/44/2021/15⁷ and GFCM/44/2021/16⁸ as well as Resolutions GFCM/44/2021/2⁹ and GFCM/44/2021/12¹⁰, including the GFCM 2030 Strategy for sustainable fisheries and aquaculture in the Mediterranean and the Black Sea.

Outcomes of technical activities relevant for the management of fisheries in the eastern Mediterranean

Data quality

The GFCM Secretariat presented an update of the GFCM activity on the application of quality indicators (timeliness, completeness, conformity, stability and consistency) to the fisheries information transmitted by countries through the DCRF online platform. Participants were provided with a summary of quality assessment results (21 DCRF subtasks, data reference year 2020, as transmitted in 2021) for the eastern Mediterranean (involved countries: Cyprus, Egypt, Greece, Israel, Lebanon, Syria, and Türkiye) which highlighted a slight improvement, compared to last year's situation, for timeliness, conformity and stability (although problems are present), whereas completeness (GSA-segment, species and mandatory fields) and stability still detect quality issues. In the field of data submissions and quality checks, the GFCM Secretariat informed the SRC-EM about the upcoming launch of technical consultations, via both an online questionnaire and virtual meetings to request from national experts: i) effective transmission of fisheries data to the GFCM via the DCRF online platform; and ii) the consolidation of data quality assessment through the identification of priorities for streamlined summary outputs. Appreciation was expressed for this important GFCM initiative that continues on the existing path of provision of support by the Secretariat to CPCs in their transmission duties for the sake of consolidating the GFCM fisheries databases in support of the works carried out under the umbrella of SAC.

Status of eastern Mediterranean fisheries, including assessments emanating from plenary and relevant benchmark sessions of the Working Groups on Stock Assessment

The GFCM Secretariat presented the status of eastern Mediterranean fisheries, including assessments emanating from plenary and relevant benchmark sessions of the Working Groups on Stock Assessment. Three meetings relevant to eastern Mediterranean stocks had been carried out during the intersession: the Working Group on Stock Assessment of Demersal Species (WGSAD) and the Working Group on Stock Assessment of Small Pelagic Species (WGSASP) plenary sessions (January 2022, online) as well as in an additional session on deep-water red shrimps in the eastern–central Mediterranean (2022). In total, 13 eastern Mediterranean stocks (seven demersal and four small pelagic stocks) had been reviewed, formulating advice for ten stocks, of which seven provided qualitative (precautionary) advice – hake (*Merluccius merluccius*) in GSA 22, red mullet in GSA 24 and striped red mullet

⁴ Recommendation GFCM/44/2021/6 on a multiannual management plan for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Levant Sea (geographical subareas 24 to 27), amending Recommendation GFCM/42/2018/3

⁵ Recommendation GFCM/44/2021/13 on the mitigation of fisheries impacts for the conservation of seabirds in the Mediterranean Sea

⁶ Recommendation GFCM/44/2021/14 on the mitigation of fisheries impacts for the conservation of sea turtles

⁷ Recommendation GFCM/44/2021/15 on the mitigation of fisheries impacts for the conservation of cetaceans

⁸ Recommendation GFCM/44/2021/16 on additional mitigation measures for the conservation of elasmobranchs in the Mediterranean Sea

⁹ Resolution GFCM/44/2021/2 on the definition of a minimum conservation reference size for priority stocks in the Mediterranean Sea

¹⁰ Resolution GFCM/44/2021/12 on a GFCM 2030 Strategy for sustainable fisheries and aquaculture in the Mediterranean and the Black Sea

(*Mullus surmuletus*) in GSA 25, anchovy (*Engraulis encrasicolus*) and sardine (*Sardina pilchardus*) in GSA 22 and round sardinella in GSAs 24 and in 26+27 (Palestine) – and all others quantitative advice; three were considered preliminary – marbled spinefoot (*Siganus rivulatus*) in GSA 25, giant red shrimp in GSA 26, blue and red shrimp in GSA 26. Three stocks were considered sustainably (or possibly sustainably) exploited (red mullet in GSA 22 and in GSA 24, and brown comber in GSA 25), all others in overexploitation. Two new assessments were presented – brown comber and axillary seabream (*Pagellus acarne*) in GSA 25. A summary of the salient conclusions and recommendations of the WGSA sessions was given and the benchmark assessments proposed for 2022/2023 intersession were listed.

WGVME-EFH outcomes

The GFCM Secretariat presented the outcomes of the WGVME-EFH held in February 2022. In particular, the discussions held on scientific monitoring plans for FRAs were illustrated providing the details on the updated guidelines for the development of such scientific monitoring plans. The GFCM database on national spatial management measures for fisheries was presented as was the work performed towards the identification of biodiversity priority areas and proposals for potential new FRAs and the recommendations on the revision of the limit depth of the GFCM 1 000 m FRA. The presentation continued by illustrating the advances made on mapping the distribution of bamboo coral and its interaction with deep-sea fisheries, leading into discussions on the identification of fishing grounds and the overlap with potential VMEs that resulted in an updated roadmap to guide the work needed to analyse the overlap between VMEs and the deep-water red shrimp fishery. Finally, the presentation tackled the challenges and needs towards the establishment of a network of EFH.

Identifying a road map for other effective area-based conservation measures in the Mediterranean

Ms Amber Himes-Cornell, FAO Fisheries Department, presented the work carried out by FAO towards identifying OECMs in the Mediterranean. She explained that FAO had started working on the intersection between fisheries and OECMs and how countries can achieve CBD targets. She gave a brief introduction on the international focus on area-based management since the 1990s, including the Aichi targets, the United Nations Sustainable Development Goals (SDGs), the CBD Post-2020 Framework and current negotiations on the International Agreement on Marine Biodiversity Beyond National Jurisdiction (BBNJ). She described Aichi Target 11 and the CBF Post-2020 Target 2 and pointed out that the question has always been: What are OECMs? She noted that only in 2018 was the definition of OECMs formally identified by CBD Decision 14/8. She highlighted and defined the terms “positive sustained long-term” and “biodiversity”. She explained that the main difference between the protected areas and OECMs is that protected areas have conservation as their primary objective while OECMs do not – although they do have co-benefits for biodiversity due to the management systems in place. There are many possibilities in different sectors for recognizing what OECMs could be and what they can contribute. In the fisheries sector OECMs exist, notably in Canada and Philippines, while other countries have not yet reported official OECMs. Another challenge is to define the thresholds of biodiversity conservation. She then provided the different types of area-based fisheries management measures (ABFM) and the resulting biodiversity outcomes and explained what FAO is doing to support this process. She mentioned the mandate from the Committee on Fisheries (COFI) to produce practical guidance for identification and implementation of OECMs which will come in the form of a multiple volume document and regional workshops. Two volumes are currently foreseen: i) Preparing for an OECM assessment: what you need to know before you start an OECM assessment; and ii) Undertaking an OECM assessment: a how to guide. As FAO develops the guidance, which thus far includes a draft guidance and decision tree, there have been workshops in the Baltic Sea and the Mediterranean Sea to support countries and fisheries related bodies in application of CBD criteria and FAO is working with Argentina and Uruguay. Finally, she summarized the expert meeting in the Mediterranean including its objectives, the case studies that were discussed and its main conclusion.

Recap of the eastern Mediterranean case study discussions from the expert meeting of fisheries other effective area-based conservation measures

The GFCM Secretariat presented the outcomes of the expert meeting on fisheries-related OECMs in the Mediterranean (February 2022) specifically related to the initial screening of three case studies in

Lebanon (Barbara artificial reef, a pilot area and Batroun Conserved Area) against simplified CBD OECM criteria, concluding that upon this initial screening exercise the three areas were not yet worthy of consideration for more comprehensive screening against the full set of CBD criteria.

European eel

The GFCM Secretariat provided an overview of the outcomes of the WGMEASURES-EEL (February 2022) recalling that it had: i) reviewed and discussed the outcomes of the research programme which had collected, collated and analyzed an impressive amount of information providing the scientific basis for both future actions and the management discussions carried out by the WGMEASURES in 2022; ii) agreed to host a workshop before the twenty-third SAC session, for a final evaluation of the results by the focal points including a reflection on the implications of the proposed changes to the DCRF Task VII-Eel; iii) discussed and agreed on a set of guiding principles for the choice of management measures to be adopted; iv) stressed the importance of being able to assess and monitor the effectiveness of implemented management measures in terms of reductions in mortality (fishing mortality), as well as of control and enforcement aspects that would enable implemented measures to be effective without delay; v) underlined the importance of increasing available knowledge through standardized fishery-dependent and independent monitoring of all eel life stages, as well as on environmental aspects, involving fishers; vi) advocated for cooperative interaction of bodies with different mandates, e.g. GFCM, Convention on the Conservation of Migratory Species of Wild Animals (CMS), ICES, UNEP/MAP, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); vii) recommended fisheries management efforts be concentrated on lagoons, owing to their importance; viii) proposed the establishment of pilot actions to advance the implementation of measures, e.g. trialing of fishery in specific priority areas, coupled with a socioeconomic analysis of their impacts and consequent appropriate compensation of fishers while engaging them in the collection of data; and ix) discussed and appraised current and potential management measures, producing a toolkit of 17 measures and proposed technical elements for management for the consideration of the SAC.

Red coral

The GFCM Secretariat presented a summary of the main outcomes of the most recent meeting of the Working Group on Red Coral (WGREDCORAL; 28 February – 1 March 2022) that underlined the worrying status of red coral populations with a reduction of average size in two of the main producers and the need to undertake an assessment of the current levels of illegal, unreported, unregulated (IUU) fishing. The WGREDCORAL had also agreed on the convenience of extending the deadline for both the entry into force of a permanent catch documentation scheme, beyond 2023, and the research programme to be able to carry out all the activities required to reach its objectives, including the extension of the deadline to use the remotely operated vehicle (ROV) for scientific purposes. The data submission by the countries was revised, evidencing that there were relevant gaps in particular in the parameters that were needed for the assessment of population status. An effort should be put on collecting and submitting the average diameter and the percentage of undersized colonies harvested every year.

Small-scale fisheries

The GFCM Secretariat provided an overview of SSF activities, in particular the SSF Forum which consists of workshops allowing small-scale fishers and fish workers to share good practices and exchange information, in line with the recommendations within the RPOA-SSF. The main outcomes of the high-level event on advancing the RPOA-SSF in the context of the GFCM 2030 Strategy were also presented, raising the need to consider SSF in national dialogues, economic investments and management, including at local level to support long-lasting sustainable solutions. The GFCM Secretariat presented the main outcomes of the WGSSF (March 2022), reviewing work on SSF data collection, the characterization of the sector, including through the identification of main commercial species per GFCM subregion, and the need for in-depth monitoring of the RPOA-SSF implementation. The WGSSF stressed priority actions on data collection, monitoring and control, co-management, responsible consumption, resilience of SSF through technology and innovation, among others, for the implementation of the RPOA-SSF, including a focus on gender and the next generation of SSF. The

WGSSF agreed on a workplan to: i) compile a list of main commercial species for SSF, including to assess interactions with recreational fisheries and GFCM priority species; ii) enhance the scientific monitoring of SSF activities; iii) carry out the second phase of socio-economic surveys; iv) implement activities planned within the SSF Forum, including to identify best practices in participatory processes; v) implement pilot studies for the improvement of value chain and addressing gender issues; and vi) assess implementation of the RPOA-SSF at national level.

Recreational fisheries

The GFCM Secretariat presented a summary of the main outcomes of the WGRF (8–9 March 2022) that reviewed available technical knowledge on RF in the Mediterranean and the Black Sea, as well as the advances and preliminary results from the application of the “Handbook for data collection on recreational fisheries in the Mediterranean and the Black Sea” through select pilot studies (i.e. Italy GSA 17, Lebanon, Tunisia and Türkiye Black Sea). The WGRF 2022 also examined the GFCM pending recommendation on minimum rules for sustainable recreational fishing activities in the Mediterranean Sea (GSAs 1 to 27) providing technical advice and discussed main priorities towards a regional research programme for recreational fisheries. The WGRF 2022 also agreed on the following workplan: i) finalize the ongoing pilot studies on RF data collection and provide technical assistance to additional countries interested in setting up RF data collection; ii) improve data collection and promote awareness campaign on the incidental catch of vulnerable species (i.e. sharks and rays, sea turtles, sea birds) in recreational fisheries; iii) strengthen the WGRF network of recreational fishing associations, federations and other stakeholder groups in view of facilitating their engagement in the work of the WGRF and supporting bottom-up initiatives; iv) develop a concept note towards a regional research programme for RF in the Mediterranean and Black Sea; v) update the list of management measures on RF in force in each CPC.

Pilot study on recreational fisheries in Lebanon

Mr Imad Lahoud, Lebanese Ministry of Agriculture, presented the results of a pilot study on RF in Lebanon. Recreational fishing in Lebanon was considered a minor fishing activity despite the fact that it occurs all along the Lebanese coast. However, a pilot study conducted in 2018/2019 to estimate the population of RF revealed its importance. Results of ongoing studies show a considerable estimated catch occurring from the shore in waters that are supposed to be spawning areas. While using lines from shore and spear fishing are the two forms of recreational fishing licensed from the Ministry of Agriculture, RF activity that uses traps from shore also takes place. An additional phase for this pilot study will continue to better estimate the population by using drones in addition to a market study for RF tools and kits reflecting its socioeconomic importance. Moreover, a biological study will be included in the upcoming phase.

Monitoring programmes

The GFCM Secretariat presented an overview of the activities carried out during the intersession 2021/2022 on issues pertaining to the interactions between fisheries and the environment, noting that work had been done on conducting exploratory scientific survey-at-sea (Lebanon), discards (Egypt, Lebanon, Türkiye), as well as on the incidental catch on vulnerable species monitoring programmes (Türkiye), introducing also the results of the first year of implementation of the DNA metabarcoding project.

Discards monitoring programme in Türkiye

Mr Gokhan Gokce, Cukurova University Fisheries Faculty (Türkiye), presented the results of the discards monitoring programme in Türkiye. The Turkish discard monitoring programme was conducted between April 2021 and March 2022, and aimed at the best possible application of the harmonized discards monitoring system methodology in demersal trawl fisheries for the collection of data on landings and discards, fish biology, vulnerable species, non-indigenous species, macrobenthos, and marine macrolitter, consistent with GFCM requirements. In total, 401 days of on-board observations, 300 days of self-sampling and 418 questionnaires were carried out during the programme. Discard percentages were calculated for each GSA and fleet segment. The minimum ratio was observed in

GSA 29 for the T11 segment as 28.4 percent and the maximum ratio was calculated in GSA 24 for the T12 segment as 47.3 percent. The overall discard ratio was calculated 33.2 percent.

Discards monitoring programme in Lebanon

Mr Imad Lahoud presented the results of the discards monitoring programme in Lebanon that began in 2019. The concept of discards prior to this pilot study did not exist and it gave an opportunity to provide capacity building and training for Ministry of Agriculture rangers and National Council for Scientific Research (CNRS) experts. The implementation of this pilot took place at the national level and the entire coastal area and all ports were included to cover the entire fishing fleet. The methodology abided by FAO–GFCM protocol of “Monitoring discards in Mediterranean and Black Sea fisheries guidelines and methodologies” through on-board observations of the fishing vessels, landing site questionnaires and self-sampling with the involvement of fishers. Results revealed an interesting percentage of discards for the first year and thus the need for an additional phase covering a second year that also yielded interesting results. Out of 409 total samples, these data collection activities resulted in 22 percent, 4 percent and 19 percent of discards emanating respectively from polyvalent vessels, purse seiners and small-scale vessels. In total, there were 13 percent discards from all segments. The percentage composition of the discard fraction showed that fish discards were the highest (7.29 percent) followed by marine litter (5.49 percent), vulnerable species (0.33 percent), and finally macro-benthos (0.015 percent). Further work will be conducted under phase 3 of this discards monitoring programme.

Experimental trawl survey in Lebanon

Mr Imad Lahoud presented the results of the experimental trawl survey in Lebanon. The first ever Scientific Trawl Survey at Sea in Lebanon was carried out in 2021, with preparations starting in 2019. The CNRS and Ministry of Agriculture teams, counting on a total of around 12 experts, went on-board the R/V Akdeniz Araştırma 1 belonging to the Mediterranean Fisheries Research, Production and Training Institute (MEDFRI, Türkiye), for 10 days at sea. The gear used had the same characteristics as the nets used in the commercial bottom trawling in the Mediterranean (cod-end 44 mm diamond). After checking sea bottom characteristics, 25 hauls were performed between 21 and 537 m depth. The sampling protocol adopted for these campaigns followed the DCRF (GFCM 2018). Results were very interesting and promising with a total of 142 species identified and a large biomass reaching more than 5 000 kg/km² in the southern region of the coast between Beirut and Tyre. This work is a starting point for the analysis of the abundance and composition, not only for marine resources but also marine litter along the sea bottom of the Lebanese coast. A further phase of experimental bottom trawling surveys will take place in 2022 towards better analyzing the fluctuations of fish stocks in Lebanese waters and building a suitable management plan according to the recommendations of FAO–GFCM.

Discards monitoring programme in Egypt

Mr Reda Fahim, College of Fisheries and Aquaculture Technology of the Arab Academy for Science, Technology and Maritime Transport (Egypt), presented the results of the discards monitoring programme in Egypt. The discards monitoring program in GSA 26 was carried out in collaboration with the College of Fisheries and Aquaculture Technology and the General Authority for Fish Resources Development of Egypt. Data were collected according to the identified methodologies as per the protocol of the GFCM discards monitoring program through onboard observations, questionnaires, and self-sampling reports from five fish landing sites: Abu Qir, Rashid, Burullus, Damietta, and Port Said along the Mediterranean coast of Egypt covering about 56 percent of the total number of landing sites. The program was conducted through two phases of data collection. In the first phase, a total number of 32 onboard observations, 15 questionnaires and 25 self-sampling operations were conducted between August 2019 and August 2020. Regarding the second phase, the total planned number of questionnaires, 50 percent of self-sampling reports and 20 percent of the onboard observations were achieved in the period from September to December 2021. The main results provided a figure about the composition and percentage of discards and bycatch for Egyptian Mediterranean fisheries. It covered a gap of knowledge regarding the species composition of the catch (landings and discards), and the length composition (whenever available) of some priority species as identified at the sub-regional level. The varied discard percentages among species might be attributed to many reasons: prohibited species, small sizes with no economic importance, and damaged or mishandled fish. Therefore, the reported

percentage of discards by species depended on the sizes caught for some species and on their quality for some others. In conclusion, the provided information about the species composition and fishing areas is a good step toward reasonable stock assessments and ultimately proper management plans of fish stocks.

Non-indigenous species

The GFCM Secretariat presented an updated on the status of the GFCM research programme on blue crabs (*Callinectes sapidus* and *Portunus segnis*) in the Mediterranean Sea noting the final concept note had been adopted by the Commission in 2021 in response to Recommendation GFCM/42/2018/7 on a regional research programme on blue crabs in the Mediterranean Sea. Eleven countries have adhered to the research programme and Cyprus, Egypt, Greece and Türkiye were among the partners from the eastern Mediterranean that nominated focal points. The research programme would be officially launched in the course of 2022, upon identification and appointment of a Regional Coordinator, which was in progress.

Lionfish management in the Mediterranean

Mr Jason Hall-Spencer, University of Plymouth, presented a guide to lionfish Management in the Mediterranean. Lionfish (*Pterois miles*) are spreading in the fastest fish invasion ever reported in the Mediterranean Sea where they are disrupting ecosystems and have the potential to impact livelihoods. First found in Lebanon in 2012, lionfish quickly became established throughout the eastern Mediterranean and are now spreading west. The management guide presented is based on lessons learnt during the European Union part-funded RELIONMED project which started in 2017. Local citizen scientists, stakeholders, divers, fishers, researchers and managers worked together to tackle the lionfish threat to conserve biodiversity in priority habitats. The Guide is designed to inform lionfish management in the Mediterranean region and key topics include: i) lionfish removals; ii) development of markets; iii) outreach; iv) research and monitoring; and v) regional cooperation.

Local ecological knowledge as an effective tool to operationalize a non-indigenous species observatory in the eastern Mediterranean

Mr Ernesto Azzurro, Institute for Marine Biological Resources and Biotechnology of the National Research Council (CNR-IRBIM) Ancona (Italy), presented a study on LEK as an effective tool to operationalize a NIS observatory in the eastern Mediterranean. The knowledge that local people, such as fishers, have about the local ecosystems has many interesting potentials for tracking the evolution of NIS, assessing their impacts and exploring adaptation strategies. This idea is also reinforced by recent scientific advances that demonstrate the possibility of scaling up LEK by engaging national research teams at the subregional or even regional scale. The presentation provided an insight on the outcomes of the training course organized by the FAO–EastMed project in November 2021. This activity aimed to develop capacities on the application of LEK in the eastern Mediterranean, involving research teams from five different countries (Egypt, Türkiye, Cyprus, Lebanon and Palestine). Participants were trained with the “LEK 1 protocol” to reconstruct historical changes in the abundance of species and included also a practical session for field data collection. Overall, the participants interviewed a total 32 fishers from the five different countries. Historical series were displayed by each team through heatmaps and analysed with the breakpoint analyses performed in R and based on these perceptions, participants reconstructed the temporal evolution and outbreaks of invasive species (such as *Lagocephalus sceleratus* and *Pterois miles*) and the decline of the native *Sarpa salpa*, which provided a quite coherent signal of regression in all eastern Mediterranean countries with a unique population rise in Egypt. This study that provided an impressive quantity of results demonstrated the effectiveness of LEK studies in reconstructing historical changes through the important process of involving stakeholders and the participatory approach. The consolidation and operationalization of the *Observatoire* on NIS in the eastern Mediterranean can leverage LEK protocols and its effectiveness.

Introduction to MedSea4Fish: addressing the subregional approach in line with the GFCM 2030 strategy

MedSea4Fish, established by the GFCM at its forty-fourth session in 2021, aims at furthering capacity-building and technical assistance mechanisms enshrined in the GFCM mandate and moving faster

towards achieving sustainable fisheries in the region in the context of the newly adopted GFCM 2030 Strategy. It is a multi-donor multi-partner initiative capitalizing on the benefits of GFCM subregional approach with one umbrella programme and one project per subregion. MedSea4Fish is divided into three components. Component 1: Monitoring of fisheries and ecosystems, aims to improve knowledge and regularly collect data on marine living resources and ecosystems, contributing to the formulation of comprehensive scientific advice on the status of fisheries, including economic and social aspects, and on the health of the marine environment. Component 2: Training, enhances the expertise at the national and subregional levels to collect, analyse and engage, by implementing capacity development actions tailored for relevant stakeholders and aimed at fully exploiting the potential of existing resources. Component 3: Infrastructure, supports the upgrade, expansion or new construction of relevant sites and provides the technology and tools to boost national facilities and equipment. Its key features are that it provides: i) a holistic view (three components addressing pillars of capacity development at national level); ii) an integrated approach (basic data collection needs to meet advice requirements and strategic activities aimed at complementing information); iii) two-way implementation (bottom-up starting from national priorities and top-down based on GFCM requirements and the GFCM 2030 Strategy); iv) a cohesive mechanism linking national, subregional and regional levels so information is collected and analyzed at relevant scales; v) mechanisms to assist GFCM countries on all sides of the basin, maximizing technical cooperation; vi) the application of standard methodologies to ensure comparability of results and compatibility with GFCM advisory process; vii) a biennial planning of activities to facilitate implementation, annual reporting to analyze progress. Its functioning revolves around a coordinator and a steering committee and makes use of a series of tools and mechanisms to operate, including a network of national focal points, the development of biennial national plans, performance indicators and the support of GFCM subregional technical units. Despite MedSea4Fish being already operational since its establishment, with select field activities being planned across the different subregions, the endorsement of the MedSea4Fish document is foreseen in the context of the twenty-third session of the SAC (June 2022), following a series of consultations at national level.

WGMSE session on round sardinella and deep-water red shrimp fisheries

Introduction to the WGMSE session

The GFCM Secretariat introduced the WGMSE session by recalling the work done in 2013–2015 under the umbrella of the GFCM Framework Programme (FWP) that aimed to establish multi-annual management plans in the GFCM area by identifying potential management measures for key fisheries/case studies in the Mediterranean and introducing the concepts of background technical document in support of management and the technical elements for management. The Secretariat underlined that since that initial work, MSE has been applied to or initiated for many key fisheries as a way to advance in providing advice for management plans, but in addition to that it has been decided that there is an overall need to update and expand the work done in support of the management of key fisheries as well as to start assessing, from a technical point of view, the effectiveness of measures on fisheries under GFCM management plans.

MEDAC contribution to the SRC-EM

Ms Marzia Piron, Mediterranean Advisory Council (MEDAC), presented the MEDAC contribution to the SRC-EM in terms of their advice on management measures concerning demersal species in the eastern Mediterranean. According to the MEDAC scientific experts in the area, the scientific institutions should i) address one of the most controversial aspects of the multiannual management plan due to the indication of maximum sustainable yield (MSY) achievement for both deep-water shrimps and hake (his objective is not realistic because fishing mortalities and related fishing effort with the current trawl net selectivity corresponding to the MSY of the two species are characterized by different levels); and ii) assess the possibility of a differential selectivity of the trawl net used to catch deep-water rose shrimp (*Parapenaeus longirostris*) and hake (*Merluccius merluccius*) to maximize the catchability of the first one reducing the impact on the second one. The MEDAC supported the opinion of the MEDAC scientific experts about the areas to be further improved: i) the political willingness of CPCs to reach the multiannual management plan objectives, based on the precautionary approach, MSY and the

ecosystem approach, should be verified considering the different socioeconomic state of riparian countries involved; ii) information sharing with additional efforts being devoted to enhancing sharing of information and results among all stakeholders at national and regional levels; iii) socio-economic assessment underlining the urgency of assessment studies on socio-economic impacts and implications of management measures adopted so far; iv) monitoring, control and surveillance (MCS) with an urgency of the continuation and implementation of the international joint inspections carried out in an experimental way between 2018 and 2019.

Introduction to management strategy evaluation and new open-source tools for the evaluation of management strategies for data-rich and data-poor fisheries

Mr Tom Carruthers, Blue Matter Science, presented an introduction to MSE and new open-source tools for the evaluation of management strategies for data-rich and data-poor fisheries. He started by providing a brief overview of the philosophy, concepts, and terminology of MSE. He continued by introducing the structure and features openMSE (Open Source Software for Management Strategy Evaluation) as well as its design objectives in the context of different availability in data, moving from data-limited and data-rich situations, providing examples of its application. He gave the details of the system which also includes a number of online apps for testing management procedures – method evaluation and risk assessment (MERA) – determining suitable reference points (RPC) and visualizing MSE outputs (Slick). Following this, he delved deeper into the specification of data-limited operating models (OM) using MERA, data moderate and data rich OMs using SAMtool that includes both the rapid conditioning model (RCM) as well as tools for converting various stock assessment models to openMSE OMs including Stock Synthesis 3, among others. He concluded by summarizing OpenMSE as a fast and flexible, open-sourced and well-documented tool that could be used for MSE in the full range of data-poor to data-rich situations, as demonstrated by its peer-reviewed use to develop and adopt MPs in various fisheries, with more than 30 examples for download.

Management strategy evaluation for data poor and data limited management strategy evaluation in Fisheries Libraries in R

Mr Iago Mosqueira, Wageningen Marine Research, the Netherlands, presented MSE for data-poor and data-limited MSE in FLR, a collection of packages in the R statistical language providing a domain-specific programming language for quantitative fisheries with the goals of: i) providing tools for effective and reliable implementation of simulation models of the fishery system; ii) encouraging the use of MSE for designing robust fisheries management plans; iii) facilitating the exchange of ideas and algorithms through the establishment of a lingua franca for quantitative fisheries science; and iv) doing so under the free/open source ethos of transparency, reproducibility and free exchange of ideas and algorithms. He proceeded in giving the details of the design principles (object-oriented, modular, flexible and extendable, with limited use of default values and adhering to R language conventions) and the MSE steps in FLR syntax, as well as examples of the outputs for effective presentation of results. He then delved deeper into the details of the OM and the MSE basic modules as well as the possibilities available for OM conditioning. He finally provided relevant examples, with particular reference to the management procedures for stocks in the IJsselmeer (the Netherlands) in a data-limited context.

Sardinella fisheries in the eastern Mediterranean

The GFCM Secretariat presented an analysis of the trends of indicators and timeline of relevant events for the round sardinella fishery in the eastern Mediterranean (GSAs 22–27). In order to build the timeline, all information submitted by country for the adopted management measures, historical knowledge of the fishery, as well as fishery-dependent and fishery-independent information were linked to the historical time series of catches by country. This analysis also considered the joint trend for landings among countries. The analysis was done at a country and GSA level for reaching the highest analysis level adding the advice from data-limited stock assessments for round sardinella in GSA 24, as well as, GSAs 26 and 27 (Palestine) combined. With the exception of recent years, round sardinella has been poorly reported in the eastern Mediterranean. Additionally, round sardinella is jointly harvested with other small pelagics, for instance sardine, incorporating some non-fully quantified bias in the levels of landings by species. Round sardinella is mainly targeted by purse seiners, noting that several countries implement certain temporal, spatial, and technical measures to manage the fishery for

pelagic species in general. Management measures (e.g. the Turkish government vessel buyback program) and the decrease in the spatial extent of fishing areas (e.g. Palestine) have shown to cause declines in catches of *Sardinella* sp. The northern expansion of this species could be linked to the warming of seawater, proved by the increase in landings in the north Aegean (the late 1990s). Anthropogenic events affecting the marine environment have also been shown to affect landings (e.g. Aswan Dam and fertilizer use in Egypt).

Deep-water red shrimp fisheries in the Levant Sea

The GFCM Secretariat presented an update of the work carried out during the dedicated deep-water red shrimp (DWRS) week held in February 2022, illustrating the capacity building workshop delivered on the status of the FAO technical paper “Synthesis of the biology, ecology and fisheries of deep-water red shrimps *Aristaeomorpha foliacea* and *Aristeus antennatus* in the central-eastern Mediterranean (GSA 12–16, 18–27)”, noting that it had been divided into two parts. The first part was foreseen to be finalised by the twenty-third session of the SAC and comprised five chapters: 1) biology, ecology and distribution; 2) biological population units; 3) fishery-independent data; 4) fleets; and 5) conclusions. The second part included another five chapters: 1) synthesis by country regarding catch, effort and socioeconomics; 2) stock units; 3) stock assessment; 4) management; and 5) conclusions, whose drafting and completion timeline would be decided upon completion of part one.

Deep-water red shrimp biological population units in the eastern-central Mediterranean

Ms Maria Teresa Spedicato, COISPA, Ms Rita Cannas, University of Cagliari, Ms Germana Garofalo, CNR-IRBIM (Italy) and Mr Pierluigi Carbonara, COISPA, presented deep-water red shrimp biological population units in the eastern-central Mediterranean. Stock identification provides a basis for understanding population dynamics, makes the stock assessment process more robust and thereby helps to develop tailored fisheries management strategies. In recent years, methods for delineating stocks have considerably advanced and include: genetic (or genomic) techniques, tagging, chemical markers, surveys, drift modelling, otoliths shape and microstructures (the latter only for fish). In addition, demographic features and phenotypic traits may reveal the influence of dispersal and environmental variations in the spatial structure of populations. In MED_UNITS European project¹¹ a comprehensive genetic study was conducted, allowing an unprecedented biogeographic analysis and genetic characterization of populations of priority fish and shrimp species at the Mediterranean scale. Here, we applied a multiple methods approach: i) analysis of phenotypic traits, i.e. growth and reproduction parameters; ii) results from MED_UNITS genomic characterization using genotyping-by-sequencing (GBS); iii) dispersal between areas and life stages connectivity applied for the first time to *A. foliacea* in the Strait of Sicily and western Ionian Sea. For blue and red shrimp and giant red shrimp, a low genetic differentiation was observed. The best scenario explaining population structure corresponded to three groups, in the western, central and eastern Mediterranean Sea. The analysis of life history traits also resulted in three groups of GSAs in the western, central and eastern Mediterranean, though with some differences in comparison with the genetic results, possibly because of the admixture in adjacent areas. Connectivity among areas and life stages for *A. foliacea* highlighted, in the south-western border of GSA 19, a low connectivity with GSA 15 and GSA 16 that appeared instead connected to each other by larval transport. Simulations of larval drift showed settlement areas generally close to spawning areas. Further progress on the “state-of-the-art” (or multiple methods) approach is a key point that entails investigating synchrony at demographic level, analysing indicators of life history traits and expanding the analysis of populations’ connectivity.

North-eastern Mediterranean deep-water red shrimp fishery

Mr Gökhan Gökçe, Cukurova University Fisheries Faculty (Türkiye), presented the north-eastern Mediterranean deep-water red shrimp fishery. He recalled that the need to establish multi-annual management plans for sustainable trawl fisheries exploiting giant red shrimp (*Aristaeomorpha foliacea*)

¹¹ Spedicato, M.T., Cannas, R., Mahé, K., Morales, B., Tsigenopoulos, C., Zane, L., Kavadas, S., Maina, I., Scarcella, G., Sartor, P., Bandelj, V., Russo, T. & Fiorentino, F. 2022. *Study on advancing fisheries assessment and management advice in the Mediterranean by aligning biological and management units of priority species MED_UNITS*. Final report. European Commission, European Climate, Infrastructure and Environment Executive Agency. Brussels.

and blue and red shrimp (*Aristeus antennatus*) was acknowledged during the forty-first session of the GFCM. The preliminary results provided by this presentation were expected to serve as a technical element for future management of the fishery. The data presented were collected through the onboard observations conducted under the GFCM Turkish Discards Monitoring Program during two fishing seasons (2018/2019–2021/2022). Fishing trips were carried out in the north-eastern Mediterranean (GSA 24). Data were obtained in the line with the DCRF manual. In total, 67 hauls were sampled during the 34 fishing days at depths ranging between 250 m and 600 m. With regard to the catch composition, giant red shrimp clearly emerged as the most represented species (31.5 percent) followed by greeneye fish (*Chlorophthalmus agassizi*) (24.1 percent). The giant red shrimp had the highest catch per unit effort (CPUE) with an estimated 7 kg h^{-1} , followed by blue and red shrimp with 4 kg h^{-1} . Altogether the two deep-water red shrimp species accounted for 40 percent of the total landed catch. Furthermore, the discard ratio for this fishery was calculated as 19.83 percent. To conclude, the findings indicated that the deep-water red shrimp fishery performed by a limited number of vessels for a short period of time was characterized by a low variety of species with a relatively reasonable discard ratio. Therefore, such fisheries were considered rather more straightforward in terms of monitoring and control than the mixed species fisheries whose management can be challenging.

Summary of information received by the GFCM Secretariat in response to the requests of relevant GFCM decisions and management measures in place

The GFCM Secretariat provided the participants with an overview of the data and information reported by CPCs, in line with the recommendation GFCM/42/2018/3 on a multiannual management plan for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Levant Sea (geographical subareas 24, 25, 26 and 27). Main topics (additional spatio-temporal restrictions, authorized vessels, fishing activities, landing points and maps) with detailed information were broken-down, including a final summary highlighting the percentage of data reporting obligations submitted: 40 percent. Differences have been noticed in the level of data reporting compliance among the CPCs, from fully or mostly reporting, to absence of any information from Egypt. The GFCM Secretariat has been requested to perform the same analysis at a GSA level, which was particularly relevant for the deep-water red shrimp fisheries in the Levant Sea; the country analysis was complemented with GSA-specific information.

Analysis of the trends of indicators related to the fishery and timeline of important events for the fishery in question

The GFCM Secretariat presented an analysis of the trends of indicators related to the DWRS fishery in the eastern Mediterranean and a timeline of important events relevant for the fishery in question. Information collated by country for fishery regulations, management measures, historical knowledge of the fishery, biomass and abundance indices and stock assessment results were contrasted with the historical time series of catches of the two DWRS species. Survey indices were used for EU-Greece (GSAs 22 and 23) and EU-Cyprus (GSA 25), and data available from the preliminary stock assessment process were used for GSA 25 and GSA 26 (Egypt). The reconstruction of eastern Mediterranean historical catches of vessels registered in GSA 16 was built by evaluating official data of the trawl fleet, LEK and logbooks of vessels specialized in DWRS fisheries. The outset of the new DWRS fishery in GSA 26 appeared of a certain relevance in terms of landings for the subregion. The likely effects of the Turkish buyback program started in 2013, and the improvement in Turkish data collection resulted quite noticeable. The possible effects of the Eastern Mediterranean Transient on biomass and catches of the DWRS species was also discussed. In general, the scarcity of available data and the need to continue improving data collection in the whole subregion were noted.

**Status of relevant eastern Mediterranean stocks emerging from the 2022 GFCM Working Group on Stock Assessment of Demersal Species
(Working Groups on the Assessment (WGSAD) and Working Group on Stock Assessment of Small Pelagic Species (WGSASP))**

Status of relevant eastern Mediterranean demersal stocks for 2022

GSA	Species	Method	Current levels	Reference points	Quantitative status	Stock status	Scientific advice	WG comments
22	<i>Merluccius merluccius</i>	a4a	F _c = 0.4, B _c = 20234	F _{0.1} = 0.236	--	Possibly in overexploitation	Reduce fishing mortality	Revised assessment. Qualitative advice due to missing data and poor cohorts consistency
22	<i>Mullus barbatus</i>	a4a	F _c = 0.25, B _c = 8196	F _{0.1} = 0.26	F/F _{ref} = 0.96	Sustainably exploited, with relatively high biomass	Do not increase fishing mortality	Revised assessment. Total catches and catch numbers revised. STF available.
24	<i>Mullus barbatus</i>	CMSY in addition to LBB, LBSPR and LIME	F _c = 0.32	F _{msy} = 0.377	--	Possibly in sustainable exploitation	Not increase fishing mortality	Updated assessment
25	<i>Mullus surmuletus</i>	SAM	F _c = 1.08, B _c = 70	F _{0.1} = 0.31	NA	Possibly in overexploitation	Reduce fishing mortality	New assessment
25	<i>Serranus cabrilla</i>	AMSY			F/F _{msy} = 0.69, B/B _{msy} = 1.28	Sustainably exploited, with high biomass	Do not increase fishing mortality	New assessment
25	<i>Pagellus acarne</i>	CMSY++	F _c = 0.239, B _c = 75.1	F _{msy} = 0.227, B _{msy} = 112	F/F _{ref} = 1.05, B/B _{ref} = 0.667	Overexploited and in overexploitation	Immediate action to ensure reduction in fishing mortality	New assessment

Status of relevant eastern Mediterranean small pelagic stocks for 2022

GSA	Species	Methodology used	F/F _{MSY} *(E)	B/B _{MSY} *B/B _{pa} **B/B _{lim}	Stock status	Scientific advice	WG comments
22	<i>Engraulis encrasicolus</i>	a4a*, SAM*, SPiCT	--	--	In overexploitation	Reduce fishing mortality	A4a, FLSAM and SPiCT models were run. A re-estimation of 2019 surveys was performed based on additional information on eggs and larvae, which resulted in much higher biomass. and a significantly more stable a4a model. A4a and SAM models revealed a stock in overexploitation while SPiCT a sustainably exploited stock. Taking this into consideration, the group agreed to validate the assessment with qualitative advice based on a4a and SAM. The stock was considered in overexploitation and the advice is to reduce fishing mortality. Future work should concentrate on: i) re-evaluating all input data thoroughly; and ii) exploring alternative models such as LIME or an integrated model (SS3) to accommodate the fragmented nature of the input data.
22	<i>Sardina pilchardus</i>	a4a*, SPiCT, FLSAM	--	--	In overexploitation	Reduce fishing mortality	A4a, FLSAM and SPiCT models were run. The comparison between a4a and FLSAM results was consistent in terms of message given, but not in terms of values. In all the runs, the lack of continuous surveys in the recent period largely influenced the assessment and caused uncertainties in the estimated parameters. The lack of catch-at-age data in a given period of years in the a4a model amplified the effect of the lack of surveys. This was more apparent in the behaviour of the retrospective. The FLSAM was more stable in terms of the retrospective. Thus, further work should focus on the thorough pre-evaluation of input data to reduce uncertainties. Sensitivity analysis on the reconstructed part of the time series would give further insight on the reliability of the FLSAM model. Currently, due to the high uncertainty in the retrospective the assessment was considered qualitative . The stock is in overexploitation and the advice is to reduce fishing mortality.
24	<i>Sardinella aurita</i>	LBSPR	--	--	In overexploitation	Reduce fishing mortality	Round sardinella in GSA 24 was assessed using LBSPR with an extra year of data and a significant additional amount of work compared to that presented during the

GSA	Species	Methodology used	F/F _{MSY} *(E)	B/B _{MSY} *B/B _{pa} **B/B _{lim}	Stock status	Scientific advice	WG comments
					with biomass within target		benchmark (not yet concluded). Owing to uncertainties and the need to perform more work, the assessment was validated to provide qualitative advice . The stock was considered in overexploitation with biomass within target and an improving SPR over the years. The advice was to reduce fishing mortality on a precautionary basis. A roadmap guiding future work was agreed.
26 + 27 (Palestine)	<i>Sardinella aurita</i>	LBSPR/VIT/ LIME	--	--	In overexploitation and overexploited	Reduce fishing mortality	Round sardinella in GSAs 26 and 27 (Palestine) was assessed using LBSPR, VIT and LIME with two extra years of data and a significant additional amount of work compared to that presented during the benchmark (not yet concluded). Trials were also carried out to improve LBSPR performance by merging years and introducing uncertainty on life history parameters – this significantly reduced the variability of outcomes, especially in terms of F/M. All trials and models revealed consistent results and a stock in overexploitation. Owing to the need to perform more work, the assessment was validated to provide qualitative advice . The stock as considered overexploited and in overexploitation and the advice is to reduce fishing mortality on a precautionary basis. A roadmap guiding future work was agreed.

Collection of GFCM CPCs national legislation on recreational fisheries relevant to the eastern Mediterranean

BACKGROUND

1. In recent years, the GFCM has increasingly worked on the topic of recreational fisheries, prompted by one of the outputs of Target 2 of the GFCM's mid-term strategy (2017–2020), which focused on the collection of robust and timely information on the impacts of small-scale fisheries and recreational fisheries on marine living resources and on their interactions with other human activities in coastal communities and the resulting Handbook on data collection¹². The first meeting of the GFCM Working Group on Recreational Fisheries took place in 2021 to advance the work on this topic. In addition, the forty-fourth session of the GFCM (November 2021, online) reviewed a proposal for a recommendation on the minimum rules for sustainable recreational fisheries in the Mediterranean Sea (GSAs 1 to 27), aimed at promoting the regulation of recreational fisheries activities. It is in this framework that the GFCM Secretariat compiles the national legislation on recreational fisheries of the GFCM CPCs.

2. Based on the results of a questionnaire sent in 2017 to CPCs¹³, the GFCM, together with the information available in the GFCM national legislations database, prepared a compilation of such legislative measures. This compilation, available in the Annex, is purely factual and does not feature any analysis of these legislative measures.

3. This compilation, however, is incomplete as information is missing or no legislative measures regulating recreational fisheries existed at the time of collecting the information for some CPCs namely, Algeria, Bulgaria, Bosnia and Herzegovina and Ukraine.

In the interest of completing this compilation, participants of the Subregional Committee for the Eastern Mediterranean are invited to consider the compilation in Annex 1 below and complete it or update it, as relevant, with any additional information relating to legislative measures on recreational fisheries in their country.

¹² Grati *et al.* 2021. *Handbook for data collection on recreational fisheries in the Mediterranean and the Black Sea*. FAO Fisheries and Aquaculture Technical Paper 669. Rome, FAO.

¹³ Titled 'GFCM Questionnaire on National Marine Recreational Fisheries'.

Collection of GFCM CPCs national legislation on recreational fisheries relevant to the eastern Mediterranean

Country	Subregion	National legal acts	Description
EU-Greece	Central Mediterranean; Eastern Mediterranean	Presidential decree 373 of 1985	Closed areas Bag limits Fishing effort Fishing license requirement Protected species
		COUNCIL REGULATION (EC) No 1967/2006 of 21 December 2006	Fishing effort
		Royal Decree 666/66	Distinction between amateur and professional fishing licenses and authorization procedure
		LAW No. 4256 of April 14, 2014. Tourist boats and other provisions.	Fishing license
		P.D. 68/2009	Fishing effort Gear
		P.D. 228/2006	Season length Gear
EU-Cyprus	Eastern Mediterranean	ΚΕΦΑΛΑΙΟ 135 - National Fisheries Law	The legal framework covers all aspects of the recreational fishing legislation including all of the abovementioned
Lebanon	Eastern Mediterranean	Law 2775 /1929 – Fishery Law	Fishing license requirement Closed areas Fishing period
		Decision 346/1 2010 - Fishing gear regulation	Gear definition Fishing period
		Decision 15/1 of 2004 - Legal sizes relating to fishing, transporting, buying and importing fish, shellfish and crustaceans in Lebanon	Minimum fish size
Türkiye	Eastern Mediterranean; Black Sea	Notification No: 4/2 - Notification on Regulating the Fishing Activities for Amateur Purposes	Closed season Closed areas Size limits Bag limits Fishing effort

Draft elements for a research programme on non-indigenous species in the eastern Mediterranean

Background

Stemming from the priorities of the Regional Sea Conventions (RSCs), in 2017 and 2018, the United Nations Environment Programme Mediterranean Action Plan (UNEP/MAP) Secretariats joint efforts to establish a sub-regional pilot study for the eastern Mediterranean on non-indigenous species (NIS) in relation to fisheries, to revise available information from all sources and analyse it in a harmonized way using simple indicators. Following discussions held at the GFCM subregional committees in 2018, where the central and western subregions also expressed an interest in participating in a similar monitoring programme, the GFCM Scientific Advisory Committee for Fisheries (SAC) at its twentieth session in 2018, endorsed the subregional monitoring plan for NIS in relation to fisheries that foresaw it be applied in all subregions.

To further the work, at its twenty-first session in 2019, the SAC invited countries to share information on ongoing activities related to the monitoring and/or management of NIS towards advancing on the creation of a NIS observatoire in the Mediterranean Sea.

Acknowledging the growing prevalence of NIS in the Mediterranean, the twenty-second SAC in 2021 agreed on the need to launch an in-depth reflection as well as a dedicated research programme to, *inter alia*, consolidate an observatoire to integrate all available information, foster engagement between relevant actors at the Mediterranean level, improve the understanding of the interactions of NIS with receiving ecosystems, as well as investigate effective management through fisheries management tools and/or nature-based solutions.

Finally, Target 1 (Fisheries and Ecosystems) of the GFCM 2030 Strategy for sustainable fisheries and aquaculture in the Mediterranean and the Black Sea aims to achieve productive sustainable fisheries and contribute to ensuring healthy ecosystems by tackling the sustainability of fisheries from a broad perspective, integrating social, economic and environmental principles, with the objective to reach exploitation at maximum sustainable yield while addressing the conservation of biodiversity. In the specific case of NIS, the achievement of Target 1 is supported by an expected output (Output 1.4) that seeks to prevent and mitigate the threats to fisheries and the marine environment, including plastic pollution, climate change and the expansion of NIS. In particular, the first four items of the action plan of output 1.4 read as follows:

- Continue the work initiated towards the establishment of an integrated monitoring platform and monitoring plan for NIS in the eastern Mediterranean and expand it to other GFCM subregions.
- Collect data on NIS, including through local ecological knowledge studies and participatory mapping.
- Starting from the eastern Mediterranean, experiment fisheries management actions, also within marine protected areas, to understand and mitigate the impacts of NIS on receiving ecosystems (including native commercial species), with the aim to maintain their ecological integrity and resilience.
- Organize dedicated expert meetings to compile and analyse data on NIS.

Draft elements:

In light of the above elements, and considering both the extensive information collected and foreseen to be collected through the GFCM monitoring activities (e.g. surveys-at-sea, incidental catch of vulnerable species and discards monitoring programmes) and the important results emerging from a five-day training course on the application of the LEK-1 protocol (local ecological knowledge to reconstruct historical changes) in the eastern Mediterranean organized by the FAO-Eastmed project in 2021 that foresaw practical field data collection and a one-day session on data exploration, elaboration and visualization, the development of a research programme to advance and complement the work already done is proposed, including the following basic elements:

Work Package 1

Collation and analysis of all available information on NIS stemming from monitoring activities in the eastern Mediterranean, including from:

- Grey and key scientific literature
- Expert knowledge on the status of target species e.g. from GFCM stock assessment working groups
- Surveys at sea e.g. from GFCM and European surveys-at-sea
- Catches and landings
- DCRF database
- Discards e.g. from the GFCM discards monitoring programme
- Incidental catch of vulnerable species monitoring programme
- Local ecological knowledge (LEK)
- Other sources of information e.g. documented by citizens

Work Package 2

Application of LEK protocols, over the span of a whole year, in interested countries in the eastern Mediterranean to collect information on NIS and relevant indigenous species from fishers, including capacity building:

- LEK-1: exploring local ecological knowledge to reconstruct historical changes; and
- LEK-2: interviewing local experts to monitor climate-related changes on a regular basis, with a particular application on NIS.

Work Package 3

Overall analysis of the results of WP1 and WP2 to provide summaries of indicators by species and distribution/hotspot maps over time.

Work package 4

Proposal of technical recommendations for management by species.

The work will be guided by previous work done, notably by the subregional monitoring plan on non-indigenous species in relation to fisheries.

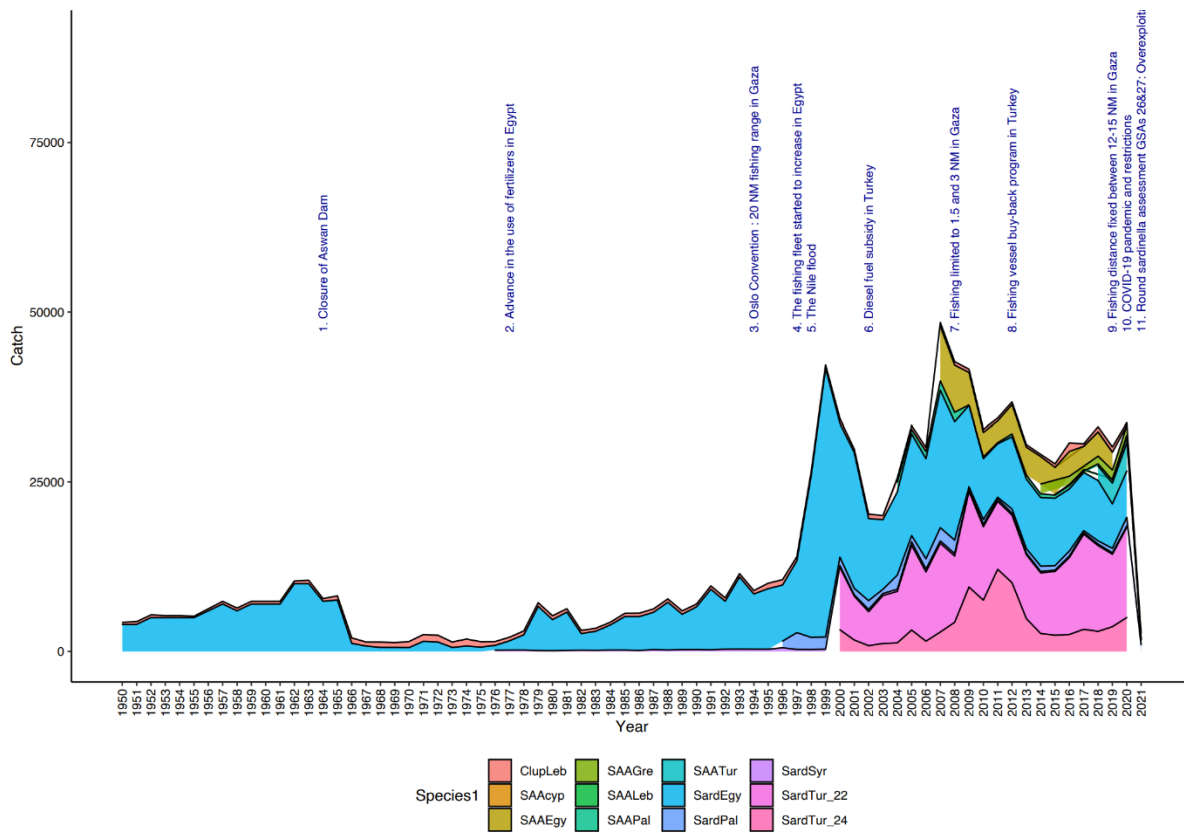
Proposed timeline:

- Twenty-third SAC (June 2022): development and endorsement of a more detailed concept note.
- June – November 2022: further development of concept note, definition of a budget and consultations with interested countries.
- November 2022 – February 2023: planning of the work, appointment of a coordinator and establishment of the teams at a country level.
- March 2023 – February 2025: execution of the work.
- April-June 2024: presentation of preliminary results at the SRC-EM and the SAC.
- February – April 2025: finalization of the report.
- April-June 2025: presentation of final results at the SRC-EM and the SAC.

Timelines of relevant fisheries

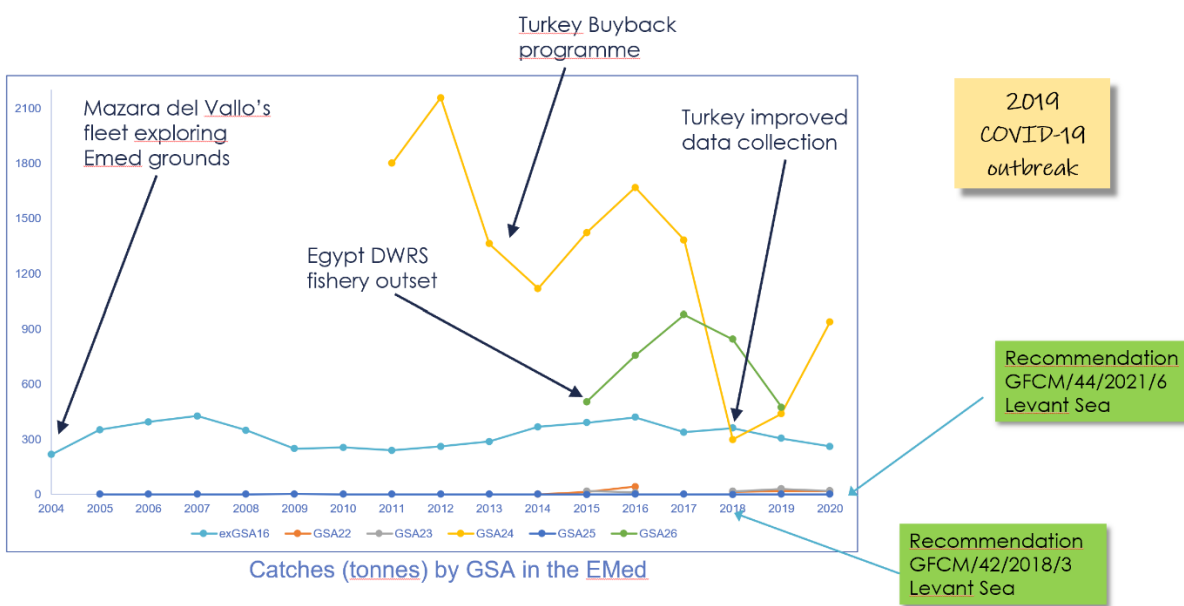
Appendix 7/A

Timeline for the round sardinella fishery in the eastern Mediterranean



Appendix 7/B

Timeline for the deep-water red shrimp fishery in the Levant Sea



Toolbox of management measures for round sardinella in the eastern Mediterranean

Scope	Eastern Mediterranean subregion
Species	Small pelagics – round sardinella
GSA's	22 to 27
Adopted	Specific regulation was issued
Planned	Text in the recommendation's section from the report of the Subregional Technical Workshop on Fisheries Multiannual Management Plans for the Western, Central and Eastern Mediterranean, 2013

Category	Measure	EGY	EU-CYP	EU-GRE	LEB	ISR	PAL	SYR	TUR	Issues	Implement'n	Develop't	Implement'n level	Notes
Temporal restrict'n	Temporal closure (protecting spawning season and/or shallow waters)	Adopted		Adopted	Adopted: there is a season but most of the time not fully respected by consumer and trade	Adopted: The fishery is closed during the spawning season in spring time			Adopted: it is not allowed to catch fish by using purse seine between 15 April and 31 August in GSA 22, and between 15 April and 15 September in GSA 24.	How can you stop the demand for small fish rather than the supply? in Türkiye they are not applicable to SSF (only trawlers and PS) also only valid in national waters. also temporal restrictions are not designed for a particular species so they may be mismatched with spawning			Partially implemented in Egypt and Lebanon with high catches of small fish also because of cultural and trade and market demands. In Türkiye it is the only reliable management tool and the spawning period actually coincides with the closure time	
Technical measures	Minimum landing size		No small individuals can be found so biology saves the day in the absence of a MCRS - leaflets on	Minimum catch (and market) size for S. aurita. It is 10 cm (Royal Decree		Adopted: MCRS for Sardinella is 11 cm			Adopted: Minimum landing size is 11 cm for sardine	Small sized sardine is very marketable so need to understand how to stop demand rather than supply - difficult to	Minimum size should be implemented at the market/ consumer/retail level (demand)	Implementation of the measure at the market/retail level - develop an awareness campaign on	partial	Should be at least 13cm for sardinella - Subregional Technical Workshop on Fisheries Multiannual management plans

			"size does matter"	from 26-1-1954)						implement - it is difficult for the untrained eye to separate SAA from other species so it is tricky to bring a particular size limit for one species when there are many more similar ones difficult to distinguish - this is a problem for control		why you should not consume/buy undersized fish		(2013) suggested 15cm
Spatial restriction	Fishery restricted areas (FRAs). Areas, depth and/or habitats restricted to operate purse seines		50m depth / 500m from coast	Adopted	Adopted	Adopted. 500m min distance from coast + several large marine reserves			Adopted: it is forbidden to catch fish by purse seine nets in shallow waters from a depth of 24 meters from the shore					
Gear features	Mesh size	Adopted	yes	Adopted		Adopted: 10mm mesh size	Adopted							
Gear features	Gear dimensions and operation	Adopted	yes	Adopted	Adopted	Small vessels (11m LOA) + small gear			Adopted: using purse seine nets with a net depth of more than 164 meters are prohibited	Türkiye: conflicts between fishing methods used and lights attract smaller fishes				

Fishing effort	Reduction and/or control of fishing capacity (considering fleet movement across GSAs and between Atlantic and Mediterranean)	Adopted				Number of vessels and licenses are less than 20 vessels and only 6. The number of licenses is frozen			No new licences may be issued for any new fishing vessel; Shifting fishing métiers is allowed					
MCS	VMS		All vessels are equipped with VMS control can be adequate		Pilot study in 2017 and this year we will try to implement VMS trials on sardine vessels			Adopted: fishing vessels with a length of twelve meters and above must be fitted with a Fishing Vessels Monitoring System and kept in working condition						

Data and information submissions by CPCs

GFCM Subregional Committee for the Eastern Mediterranean (SRC-EM)
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Data and information submitted by CPCs
[as of 2 June 2022]

Recommendation GFCM/42/2018/3 on a multiannual management plan for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Levant Sea (geographical subareas 24, 25, 26 and 27)

Applicable CPCs (Egypt, Israel, Syria Türkiye, EU-Cyprus and EU- Italy) shall report yearly information on **authorized fishing vessels** (par.26), **fishing activities** (par. 27) and **designated landing points** (par. 42) through the DCRF online platform. Information on additional **spatio-temporal restrictions** (par. 28) and **maps of fishing grounds exploited** (par. 37) was requested on a timely basis in 2019 and 2020 respectively.

INFORMATION

CPCs	2019 ADDITIONAL SPATIO-TEMPORAL RESTRICTIONS - PAR. 28 - [One-Shot by 1 January 2019]	2020 MAPS OF FISHING GROUNDS EXPLOITED - PAR. 37 - [One-Shot by 31 December 2020]
Egypt	Not reported	Not reported
Israel	Not reported	Reported (See annex 2)
Syria	Not reported	Not reported
Türkiye	Detailed information provided (See annex 1)	Reported (See annex 3)
EU-Cyprus	No additional restrictions	Reported (not available in printable format)
EU-Italy	Not reported	Not reported

DATA

CPCs	2022 AUTHORIZED FISHING VESSELS - PAR. 26 - [DCRF Task IV.4.7 by 31 January 2022]	2021 DESIGNATED LANDING POINTS - PAR. 42 - [DCRF Task II.4.5 by 30 November 2021]
Egypt	Not transmitted	Not transmitted
Israel	16	3
Syria	Not transmitted	Not transmitted
Türkiye	78	20
EU-Cyprus	5	2
EU-Italy	34	328

CPCs	GSA	FISHING ACTIVITIES (TONNES) - PAR. 27 - [DCRF Task II.3.4 by 31 January]			
		2020		2021	
		ARA	ARS	ARA	ARS
Egypt	-	Not transmitted	Not transmitted	Not transmitted	Not transmitted
Israel	27	3	5	2.2	4.8
Syria	-	Not transmitted	Not transmitted	Not transmitted	Not transmitted
Türkiye	24	231.72 (both species)		Not transmitted	Not transmitted
EU-Cyprus	25	0	0.36	0	0.48
EU-Italy	24	5.04	60.04	Not transmitted	Not transmitted
	25	0.25	19.4		
	26	0.06	0.41		

Summary of compliance status [as of 1 June 2022]:

CPCs	NUM CPC	DATASET/ REC	NUM DATASET EXPECTED	TOTAL TRASMITTED	% T	%A
EGY, ISR, SYR, TUR, EU-CYP, EU-ITA	6	5	30	15	50%	50%

Cyprus has fully reported data and information on deep-water red shrimp fisheries in the Levant Sea. Just one dataset is missing from Israel and Türkiye, whereas some more are missing from EU-Italy. The GFCM Secretariat has not received any information/data from Egypt.

Appendix 9/Annex 1

Information on additional spatio-temporal restrictions provided by Türkiye (2019)

NOTIFICATION 4/1 REGULATING COMMERCIAL FISHING

Restrictions on trawlers

In Mediterranean;

Article 9: for all types of trawler

- In Antalya Province, Side area; in territorial waters between Selimiye Cape (36° 45.928' N - 31° 23.092' E) and Gazipaşa Province, Kesik Cape (36° 09.964' N - 32° 23.418' E)
- In Antalya Province, Finike District; in the area that is in the north of the line drawn between the coordinate point of Finike Gulf (36° 16.398' N - 30° 09.097' E) and Akçaörgü Cape (36° 16.221' N - 30° 22.094' E)

Article 10: for bottom trawler

- In Hatay Province; within 1 mile that is in our territorial waters between the border to Syria and Akıncı Cape (36° 18.456' N - 35° 46.745' E)
- Within 2 miles in our territorial waters between Akıncı Cape and Adana Province fishermen shelter (36° 45.988' N - 35° 47.471' E)
- Within 3 miles in our territorial waters between Yumurtalık Fishery Shelter and Mersin Province Karaduvar Fishermen Shelter (36° 48.546' N - 34° 41.873' E)

- d) Within 2 miles in our territorial waters between Karaduvar fishermen shelter and Susanoğlu-Atakent (36° 24.971' N - 34° 05.458' E)
- e) Within 3 miles in our territorial waters between Susanoğlu-Atakent (36° 24.971' N - 34° 05.458' E) and İncekumburnu (36° 14.044' N - 33° 56.979' E)
- f) Within 2 miles in our territorial waters between İncekumburnu and Kızılliman Burnu (36° 04.243' N - 33° 04.708' E)
- g) Within 1,5 mile in our territorial waters between Kızılliman Cape and Antalya Province, Gazipaşa District Kesik Cape (36° 09.964' N - 32° 23.418' E)
- h) Within 2 miles in our territorial waters between Kesik Cape and Aegean Sea
- i) In Mersin Province, Silifke District, within 2 miles as from the coast

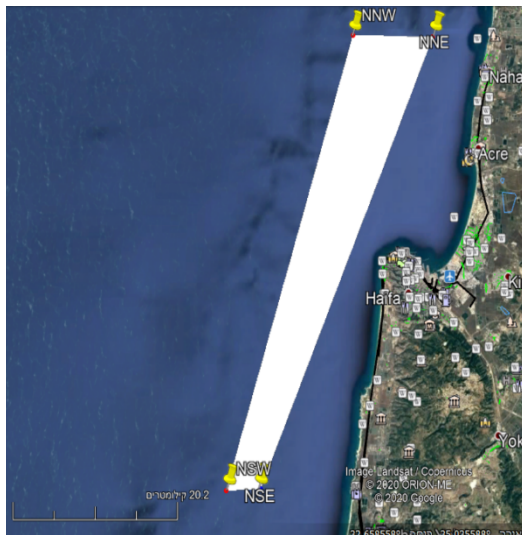
Article 26: shrimp

- Shrimp fishing with all types of fishing gear, except shrimp trammel nets, is forbidden at the Mediterranean Sea:
 - a) In Hatay Province; Inside 1 mile zone of our territorial waters between Syrian Border and Akıncı Cape (36° 18.456' N - 35° 46.745' E)
 - b) Inside the 2 Miles zone of our territorial waters between the Akıncı Cape and Yumurtalık Fishing Shelter in Adana Province (36° 45.988' N - 35° 47.471' E)
 - c) Inside the 3 Miles zone of our territorial waters between the Yumurtalık Fishing Shelter and Karaduvar Fishing Shelter in Mersin Province (36° 48.546' N - 34° 41.873' E)
 - d) Inside the 2 Miles Zone of our territorial waters between Karaduvar Fishing Shelter and Susanoğlu-Atakent (36° 24.971' N - 34° 05.458' E)
 - e) Inside the 3 Miles Zone of our territorial waters between Susanoğlu - Atakent (36° 24.971' N - 34° 05.458' E) and Cape of İncekum (36° 14.044' N - 33° 56.979' E)
 - f) Inside the 2 Miles Zone of our territorial waters between İncekumburnu and Cape of Kızılliman Burnu (36° 04.243' N - 33° 04.708' E)
 - g) Inside the 1,5 Miles Zone of our territorial waters between Cape of Kızılliman and Cape of Kesik Liman in Gazipaşa District of Antalya province (36° 09.964' N - 32° 23.418' E)
 - h) Inside the 2 Miles Zone of our territorial waters between Cape of Kesik Liman and the border of Aegean Sea
 - i) Within 2 Miles from the shore in Dana Island in Silifke District of Mersin province
- Shrimp fishing with all types of fishing gear, except shrimp trammel nets, is forbidden at the Mediterranean Sea between 15th of April and 15th of September.
- It is obligatory to land all shrimps from the designated ports.
- Shrimp fishing shall be done between 05.00 a.m. and 20.00 p.m. in the Marmara Sea

Maps of fishing grounds exploited provided by Israel (2020)

Northern polygon - 340km ²				
East		West		
Lat	Long	Lat	Long	
North	33.05°	35.02°	33.05°	34.91°
South	°32.60	34.60°	°32.60	34.75°

Southern polygon - 560km ²				
East		West		
Lat	Long	Lat	Long	
North	°32.60	34.78°	°32.60	34.75°
South	°31.80	34.40°	°31.80	34.30°



Map of fishing grounds exploited by Türkiye (red line) (2020)



Technical elements for the management of bottom trawling fisheries for deep-water red shrimps (*Aristaeomorpha foliacea* and *Aristeus antennatus*) in the Levant Sea (GSAS 24, 25, 26 and 27)

1. Scope of the management plan

- The management plans should cover the Levant Sea (GSAs 24, 25, 26 and 27)
- The plan should address commercial fisheries
- The plan should include blue and red shrimp (*Aristeus antennatus*) and giant red shrimp (*Aristaeomorpha foliacea*).
- The plan should last 8 years and envisage to be rolled out in a stepwise manner starting with a transitional period (2–3 years) during which at least all existing efficient measures should be implemented while gathering scientific support and information towards the identification of long-term adaptive management measures based on future annual advice on the evolution of the state of resources and fisheries.

2. Updated status of deep-water red shrimp stocks in the Levant Sea

GSA	Species	Ref. year	Method	Current levels	Reference points	Quantitative status	Stock status	Scientific advice
26	<i>Aristaeomorpha foliacea</i>	2020	VIT, LBSPR	Preliminary, not validated, assessments consistently revealed both stocks to be in overexploitation				
26	<i>Aristeus antennatus</i>	2020	VIT, LBSPR					

3. Objectives

Following the GFCM guidelines on management plans (GFCM/36/2012), and in line with the proposals of WGVME, the regional plan should consider inter alia the following options:

- Maintain and/or to restore, to the extent possible, the stock size of harvested species at least at levels which can produce the maximum sustainable yield.
- Reduce fishing mortality (effort regime in the transitional period working towards catch limits in the longer term).
- Increase spatio-temporal protection measures.
- Ensure protection of biodiversity to avoid undermining ecosystem structure and functioning.
- Eradicate IUU, through an adequate governance system, including a fishing authorization system and a reporting scheme of catches and discards.

Operational objectives

The plan should define, for each agreed objective, specific operational objectives that have practical interpretation, can clearly describe expected outcomes and can be measured with indicators. For example, in relation to the objective of “guarantee a low risk of stocks falling outside safe biological limits” the following operational objectives could be applied:

- Maintain the biomass of target species above agreed precautionary biological reference points ($B > B_{pa}$ and $F < F_{0.1}$).
- Maintain indicators of stock status and fishing pressure (according to the table on alternative indicators and reference points) at levels which ensure the sustainability of the fishery.
- Introduce minimum conservation reference sizes (MCRS) for the two species.

In relation to the objective of “ensuring protection of biodiversity to avoid undermining ecosystem’s structure and functioning”, the following operational objectives could be applied:

- Establish a fleet registry of active vessels.
- Map historical and potential fishing grounds and the overlap with VMEs following the recommendations of WGVME-EFH 2022.
- Decrease discards of commercial and non-commercial species, by means of the use of technical measures.
- Prevent significant adverse impacts of bottom trawling fisheries by minimizing their overlap with sensitive habitats and vulnerable marine ecosystems.

However, these operative objectives can be adapted in the future to accommodate any additional scientific evidence provided.

4. Indicators and reference points

When the analytical assessments are available, the advice should be based, if possible, on both indicators of biomass and exploitation, and for each indicator ideally target, threshold and limit (e.g. Ftgt, Fthr, Flim) reference points should be defined. When only one indicator is available, there should be clear advice to explore the possibility of having indicators for both biomass and exploitation.

In situations where stock biomass is used as indicator of the status of the stock, the following reference points could be used:

- B_{lim} : a biomass level which is considered undesirable and which management actions should avoid with high probability.
- B_{pa} : a threshold level of biomass established to reduce the probability that the limit reference point will be exceeded.
- B_{msy} : as a possible target reference point.

In situations where fishing mortality is used as an indicator of fishing pressure, $F_{0.1}$ (defined as the fishing mortality rate at which the slope of the yield-per-recruit curve is one-tenth the slope of the curve at its origin) can be used as a proxy for FMSY. If possible $F_{0.1}$ should be complemented with an additional estimate of Flim (e.g. from an independent Blim estimate) and Fthr should be defined in relation to Flim. In that case FMSY will be considered as a target. Alternatively, if only $F_{0.1}$ is available, it will be considered as Funique.

Pending the availability of stock biomass and fishing mortality estimates and the identification of appropriate reference points for some species/GSAs, the following indicators and reference points could be used.

Indicator of stock abundance*	Reference point
Standardized index from scientific surveys (when available)	- Historical level - Trend (e.g. increase by x% per year)
Standardized catch-per-unit-of-effort (CPUE) data from the fishery, taking into account changes in exploitation pattern, in catchability and availability of the resource	- Historical level - Trend (e.g. increase by x% per year)
Indicator of stock status	Reference point
Mean body size in the catch (CL), assuming that selectivity pattern is kept constant and data are comparable from year to year	$CL > CL_m$; CL_m = minimum conservation size.
Indicator of fishing pressure	Reference point
Fleet size (by operational units as defined by GFCM Task 1)	- Historical level - Trend (e.g. decrease by x% per year)

Fishing effort (accounting for capacity and activity, including vessel tonnage, power and days at sea)	- Optimal effort to reach MSY - Historical level - Trend (e.g. decrease by x% per year)
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Concerning the objective of ensuring protection of biodiversity to avoid undermining an ecosystem's structure and functioning, the following indicators and reference points could be used:

Indicator	Reference point
Discard rate (%)	- Historical - Trend (% over time)
Bycatch of protected/endangered species	- Historical - Trend (% over time)
Area of sensitive habitats under protection	- Historical - Trend (% over time)

5. Fisheries management measures

The management plan should include a first transitional period (2–3 years) during which at least all existing measures should be implemented while gathering scientific support and information towards the identification of long-term adaptive management measures based on future advice on the evolution of the state of resources and fisheries.

In order to reach the objectives of the management plan, and without prejudice to stricter measures adopted nationally, countries should consider the management measures for deep-water red shrimp in the Levant Sea contained in Table 1. The table provides additional information of the issues identified for each measure, as well as implementation requirements, future developments and salient notes.

6. Decision rules

The management plan will include decision rules with pre-agreed measures to be adopted under different conditions of the stock in relation to agreed biological reference points. The specific technical measures to be adopted under each stock status scenarios are to be defined in appropriate national and sub-regional working groups, taking into account the socio-economic impacts of the proposed measures.

7. Scientific monitoring

The Scientific Advisory Committee (SAC) of the GFCM should be responsible for regular (annual) advice on status of stocks and economic indicators of fisheries, as well as for advice on alternative management measures under the hat of the WGMSE according to the terms of reference endorsed by the forty-fourth annual session of the GFCM.

Adequate and periodic scientific monitoring of fisheries (including socioeconomic indicators) and exploited stocks at national level should be ensured so that the SAC will be in a position to provide scientific advice.

Fishery-dependent data collection should be improved, including knowledge on the origin of catches

8. Research priorities to improve the assessment and management of fisheries

Urgent data requirements to be provided by CPCs

To be made available by the meeting in July 2022, when existent:

- VMS data
- ERS
- Logbooks

The list of research priorities should be organized based on the measures implemented:

- Provide annual advice on the status of the stocks.

- Improve catch and effort data and quantify catches (and their LFDs) by their GSA of origin making use of all available information provided by CPCs (logbooks, ERS, VMS).
- Enhance and expand surveys-at-sea.
- Map the fishing grounds, based on the previously exploited areas making use of an array of data sources including principally VMS but also AIS and satellite information.
- Identify hotspots of both species as well as nursery areas.
- Work during the transitional period on the overlap between DWRS fisheries and VMEs according to the roadmap endorsed by the twenty-second SAC and updated by the WGVME-EFH 2022 towards identifying unexploited areas to be protected.
- Collection of scientific background that would allow the possible future determination of a minimum conservation reference size for each of the species in the eastern Mediterranean, taking into consideration the possible effect of warming seas and climate change, by adding the two species to the list of species covered by Resolution GFCM/44/2021/2 on the definition of a minimum conservation reference size for priority stocks in the Mediterranean Sea.
- Assessment of the biological, economic and social implications of implementing several management scenarios to restore or maintain the species population above levels that can produce MSY and towards evaluating the effectiveness of the measures already applied, through bioeconomic modelling and MSE.
- Investigation into a catch documentation scheme.
- Engage stakeholders in the discussion on management measures.

9. Fisheries monitoring, control and surveillance

To ensure compliance with the measures to be adopted in the management plan, the following actions are to be implemented:

- Develop an ad-hoc permanent international inspection scheme for the DWRS fishery in the Levant Sea.
- Concerned Parties should make efforts to implement GFCM recommendations related to MCS, including those listed below:
 - Vessel information submitted to GFCM Regional Fleet Register.
 - Record of fishing vessels authorized to fish the key species.
 - Satellite-based VMS required for vessels > 10 m.
 - Required submission of data on vessels engaged in IUU fishing (IUU Vessel List).
 - Required logbook for vessels exceeding 15 m authorized to fish in GFCM area. Logbook shall register quantities of each species caught and kept on board, above 50 kg in live weight.
- Strengthen national capacities for fisheries monitoring, control and surveillance.
- Concerned Parties are responsible for implementing the adopted management measures in their jurisdictional waters and by vessels flying their flag beyond national jurisdiction.
- Development of a specific mechanism for MCS in areas beyond national jurisdictions covered by the management plan.
- Improve the collection of fisheries statistical data, including social and economic data.
- CPCs to report results of MCS in terms of compliance with measures to scientific experts to allow for the understanding of the effects of compliance on the status of the stocks and the effectiveness of the management plan.

10. Review of the management plan

The status of giant red shrimp and blue and red shrimp stocks in the Levant Sea shall be evaluated annually maintaining as much as possible the same methodology and relative settings, and benchmark assessments revising stock assessment methods and input data shall be performed every three years.

The contents of the management plans should be periodically reviewed in order to accommodate changes in the fisheries system. Comprehensive roadmaps will be provided by the SAC for the assessment and management of the fishery.

To be done by Concerned Parties:

Management action taken based on stock status and fishery conditions (socio-economic indicators) and according to the decision rules and management tools described.

Table 1. Appraisal of management measures for the management of bottom trawling fisheries for deep-water red shrimps (*A. foliacea* and *A. antennatus*) in the Levant Sea (GSAs 24, 25, 26 and 27)

DESIGN OF THE MANAGEMENT PLAN	
	Levant Sea
Scope	GSAs 24, 25 26 and 27
Species	<i>Aristeus antennatus</i> and <i>Aristaeomorpha foliacea</i>
Sectors	Commercial
Gear	OTB
General objective	MSY in a given timeframe
Duration	8 years
Transitional period	2–3 years
Long-term measures	All transitional period measures that have worked and others based on advice of scientists and the SAC
General comments	Annual advice linked to a mechanism to manage F with catch limits
	Retain all current management measures considered effective

Category	Management measure	Issues	Implementation	Development	Notes
MAP OPERATIONAL OBJECTIVE	Maintain fishing mortality for key species within agreed precautionary reference points, with a view to achieving or maintaining fishing mortality at MSY level	These provisions are currently not met owing to the issues related to data	Need to identify a timeline for reaching MSY		
REDUCTION OF FISHING MORTALITY	Catch limits	Given the uncertainty and doubts on catches in the EM, a catch limit has to be considered with extreme caution in the Levant sea - there are places where it is difficult to estimate catches	The implementation of a catch limit should take advantage of the transitional period to collect more information and be implemented in the LT phase	Considering the fishery targets one/two species it could be a good candidate for catch limits	Experience in the western Med MAP that has a specific catch limit for DWRS, based on simulations using scenarios of catch limits and not only fishing effort.
REDUCTION OF FISHING MORTALITY	Effort regime		To be implemented in the transitional period while working towards a catch limit		

SCIENTIFIC MONITORING	CPCs and the SAC shall facilitate the collation of existing relevant data and the collection of additional relevant data (including research survey data) and organize adequate workshops	Crucial aspect for these fleets based on instruments that national administrations have in place to monitor fleets and catches (VMS, ERS and logbook information) not currently available	The origin of catches to be determined on the basis of urgently required data from CPCs through CFP (VMS, ERS, logbooks)	Foresee bilateral agreements between countries to facilitate data collection and sampling of catches that will make the sampling of catches of vessels fishing outside their GSA of origin easier	To be made available for the meeting in July 2022
FLEET MANAGEMENT	Lists of authorized vessels actively fishing for the key species		Link to the compulsory VMS on board	Possibility of linking the release of the authorization to the compulsory adoption of AIS as a complementary method which will also be useful for scientific monitoring purposes - possibility of cooperation with EFCA that has a system of controlling with AIS and VMS	This will give better information on catch and effort especially if in combination with a limit to the access of fishing grounds
	Fishing capacity	Complicated to implement a freeze in fishing capacity because there are no specific licences but just authorizations at national level - so there may be issues when DWRS is caught as bycatch	Each CPC should ensure the balance between fishing capacity and fishing opportunities; in the transitional period there should be a freeze the fishing capacity	There should be the possibility for development plans for new fisheries to be validated by the SAC and endorsed by GFCM. CPCs can use the proposed minimum elements for guiding the preparation of national fleet development plans for the deep water red shrimp fisheries endorsed by the 21st SAC as a guide	
SPATIO-TEMPORAL RESTRICTIONS	Spatio-temporal restrictions for the protection of juveniles	Relevant to ARS, as juveniles of ARA are already protected by their depth distribution (work done by mediseh); Juveniles of ARS show a gradient of size with depth with smaller individuals in shallower depths	Fishing during interdicted periods should be considered IUU. Spatial protection of nursery areas should be modulated over time	Temporal restriction to fishing in November-April to protect juveniles	Proposed by fishers
	Protection of spawning grounds in the peak season	The measure was discussed and in the eastern Med it is not clear where spawning grounds are. Not a good measures for the time being, but may be a development for the future once new information is available			
TEMPORAL RESTRICTIONS	Closed season	Makes sense for international waters but is difficult to implement in national waters and the decision should lie with the local authorities (trawlers fishing in national waters can also target	Implement this in the transitional phase. October/December-March each year to be decided		

		other species depending on where they fish)			
SPATIAL RESTRICTIONS / PROTECTION OF VMEs	Protection of unexploited deepwater fishing grounds	Need to have good maps of fishing grounds with respect to species hotspots to identify unexploited areas	Maintain current fishing grounds and limit the exploitation to these grounds with strict rules for exploratory fishing and the establishment of VME encounter protocols	Work during the transitional period on the overlap between DWRS fisheries and VMEs according to the roadmap endorsed by the 22nd SAC and updated by the WGVME-EFH 2022 towards establishing protection areas; Trawling to be allowed in those fishing grounds previously established; fishing outside these established fishing grounds should adhere to strict exploratory fishing rules	
SPATIAL RESTRICTIONS	Limit access to fishing grounds to authorised vessels	Need to have good maps of fishing grounds with respect to species hotspots to identify unexploited areas - difficult to implement in areas where DWRS fishing grounds overlap with mixed fisheries and where the depth profile is steep (e.g. Antalya Bay): need stakeholder involvement and consultation and could use depth as a driving criterion to restrict the fishery	Could use depth as a driving criterion to restrict the fishery - VMS would be needed for control and used in combination		This will improve the collection of data on catch and effort - including these rules also implicitly means that fishers need to decide what they are fishing - in conditions of developing fisheries there is the possibility to find DWRS in shallower areas, but when the fishery becomes established the DWRS abundance in shallower waters and then the fishery becomes a real DW fishery: when you see trawlers in DW grounds you can be sure that they are targeting DWRS
TECHNICAL MEASURES	Improvement of selectivity using grids to avoid catching juveniles and vulnerable species		To be investigated during the transitional period taking advantage of studies being carried out elsewhere		
	Minimum conservation reference size (MCRS) for both species	Difficult to implement a MCRS in the EM especially in areas where DWRS fisheries overlap with other fisheries - should be achieved by controlling the market/retails/consumer rather	In combination with spatiotemporal measures for the protection of nursery areas	Reflection needed on the determination of MCRS by species and subregion during the transitional period with a need to add ARS and ARA to the work requested to the	

		than the fishery – for ARS there is a gradient of size with depth with smaller individuals in shallower depths which suggest MCRS could be good		SAC in the context of Resolution GFCM/44/2021/2	
EFFORT MANAGEMENT	CPCs shall communicate to the GFCM Secretariat for the first time, no later than a given date, the list of all their authorized vessels actively fishing for the key species				
	Any fishing vessel not included in the abovementioned list shall not be allowed to fish for, retain on board or land any quantity of the key species greater than 3percent of the total live weight catch retained on board	Implementation is difficult and the effect may be dumping any higher quantities of DWRS	Implementation should be coincident with a limitation of fishing activity to DWRS fishing grounds using a depth criterion as the delimitation, which requires the use of VMS and/or AIS for control		AIS has limits (including the fact it is not compulsory) but has the advantage of not being linked to the availability of information through governments and could comprise a good additional source of information
	CPCs shall promptly notify the GFCM Secretariat of any addition to, deletion from and/or modification of the authorized fishing fleets for key species				
	The GFCM Secretariat shall maintain and update the list of fishing vessels authorized to fish for the key species and publish it on the GFCM website				
	Each CPC shall ensure the set-up of adequate mechanisms for therecording of each fishing vessel in a national fleet register, for the recording of vessel catches and fishing effort via the logbook and, remote sensing as well as for the monitoring of fishing vessel activities and landings via catch and effort sampling surveys				
IUU	CPCs shall establish a mechanism to ensure that vessels actively fishing in the Levant Sea declare all catches and bycatch of the key				

	species, irrespective the volume of the catch				
	The obligation to declare catches shall apply irrespective of the volume of the catch				
	CPCs shall communicate to the GFCM Secretariat a map of the fishing grounds exploited by their fishing vessels authorized to catch the key species. Such map shall be prepared using the VMS data transmitted to CPCs by their authorized vessels			Reliant on having a VMS fully implemented in a database for all fleets. Very detailed vms info should be available	
	Designated landing points where the landings by vessels actively fishing for key species shall take place				
	Permanent international inspection scheme		Develop a new ad-hoc international inspection scheme fro the DWRS fishery in Levant Sea, by creating a working group to discuss this development	Issue to be raised at the CoC to see if it is possible to duplicate or amend the current permanent scheme for the demersal fishery in the SoS for the DWRS fishery, including in the Levant Sea	Can be a good opportunity to also get information on catches
MCS	All vessels above 10 metres length overall actively fishing for the key species shall be equipped with vessel monitoring system (VMS) or any other geopositioning system allowing control authorities to track their activities	A level playing field should be ensured	All authorized vessels fishing for key species should be equipped with VMS	This should complement a measure limiting fisheries to known fishing grounds using depth as a criterion for the identification of fishing grounds	
	Ensure VMS data are provided as needed to scientific experts		This will be required for the determination of fishing grounds		Notwithstanding that there are also other methods of the determination of fishing grounds (e.g. MCDA)
	All the catches of key species shall be indicated in the logbook irrespectively of the live weight of the catch				
PARTICIPATORY APPROACH	Stakeholder consultations on measures should always take place				