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Preparation of this document

This document has been prepared by the Secretariat of the General Fisheries Commission for the Mediterranean (GFCM) of the Food and Agriculture Organization of the United Nations (FAO).

It presents the main outcomes of the Forum on Fisheries Science in the Mediterranean and the Black Sea (Fish Forum 2018). Organized by the GFCM at FAO headquarters in Rome, Italy, from 10 to 14 December 2018, the Fish Forum 2018 gathered over 450 participants from around the world, including scientists, researchers, engineers, academics, practitioners, managers and decision-makers, as well as more than thirty partner organizations. Over 230 abstracts on technical and scientific research were prepared and presented at this event.

The content and conclusions contained in this document stem from the active discussions on the three themes of Fish Forum 2018: 1) Better science for better advice; 2) Healthy seas and sustainable fisheries; and 3) Economic analysis and technology for societal benefit, as well as from the expert round tables on prominent issues held at the event. This report presents the main challenges borne from these discussions, as well as highlights from the seven workshops and nine side-events that took place during the forum.

All the materials and documents of the Fish Forum 2018, including the Book of abstracts, are available at the following webpage: http://www.fao.org/gfcm/fishforum2018/en/

This outcome document was prepared and edited by the GFCM Secretariat, under the overall supervision of Mr Abdellah Srour, GFCM Executive Secretary. The materials were prepared and collected by Ahmed Siliman, Fish Forum Coordinator, Anna Carlson, GFCM Fishery Officer for Socioeconomic Issues, Edgar Mushegyan, GFCM Legal Consultant and Silvia Fagiolini, GFCM Intern. The editing, graphic layout and publishing were coordinated by Dominique Bourdenet, GFCM Knowledge Management Officer, with the support of Julia Pierraccini, GFCM publications specialist, Ysé Bendjeddou, GFCM Publications Coordinator, and of Alix Hautreux, Lauriane Palopoli, Manuela Patricia Diabi, Matthew Kleiner and Amandine Abraham, GFCM interns. Creative graphics and visual identity were produced by Iolanda Bellone and Gianluca Manna.

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Development (OECD), the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic area (ACCOBAMS), ICES, the African Union InterAfrican Bureau for Animal Resources (AU-IBAR), the Mediterranean Advisory Council (MEDAC), the International Union for the Conservation of Nature (IUCN), the MAVA Foundation for Nature, the International Center for Advanced Mediterranean Agronomic Studies (CIHEAM), the Convention on Biological Diversity (CBD), the World Wide Fund for Nature (WWF), Oceana, the Association of National Organizations of Fishing Enterprises in the European Union (europêche), OceanCare, the Centre Scientifique de Monaco (CSM), the Low Impact Fishers of Europe (LIFE), the International Ocean Institute (IOI), the Marine Stewardship Council (MSC), the New Economics Foundation (NEF), Pelagic Data Systems, exactEarth, TrackWell, Collecte Localisation Satellites (CLS) and SRT Marine Systems.

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Abbreviations and acronyms

ACCOBAMS	Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area
AIS	Automatic Identification System
ASI	Accobams Survey Initiative
CBD	Convention on Biological Diversity
CCH	Cetacean Critical Habitats
CLS	Collecte Localisation Satellites
CMEMS	Copernicus Marine Environment Monitoring ServiceCNR National Research Council of Italy
COISPA	Coispa Tecnologia e Ricerca
CSA	BLUEMED Coordination and Support Action
CSIRO	Commonwealth Scientific and Industrial Research Organization
EBSA	Ecologically or biologically significant marine area
EFH	essential fish habitat
FAO	Food and Agriculture Organization of the United Nations
FRA	fisheries restricted area
GFCM	General Fisheries Commission for the Mediterranean
GIS	geographic information system
ICES	International Council for the Exploration of the Sea
IEO	Spanish Institute of Oceanography
IMMA	Important marine mammal area
INAT	Institut National Agronomique de Tunisie
IOC	Intergovernmental Oceanographic Commission
IOC-UNESCO	Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization
ISPRA	Italian National Institute for Environmental Protection and Research
IUCN	International Union for Conservation of Nature
IUU fishing	illegal, unreported and unregulated fishing
MCS	monitoring, control and surveillance
MPA	marine protected area
MSC	Marine Stewardship Council
MSP	marine spatial planning
NGO	non-governmental organization
NIS	non-indigenous species
NOAA	National Oceanic and Atmospheric Administration (United States)

OECM	other effective area-based conservation measure
OGS	National Institute of Oceanography and Applied Geophysics (Italy)
RAC/SPA	Regional Activity Centre for Specially Protected Areas
RFB	regional fishery body
RFMO	regional fisheries management organization
RSO	Regional seas organization
SDG	Sustainable Development Goal
SOCIB	Balearic Islands Coastal Ocean Observing and Forecasting System
SOI	Sustainable Ocean Initiative
SPAMI	Specially Protected Area of Mediterranean Importance
SponGES	Deep-sea Sponge Grounds Ecosystems of the North Atlantic project
SR	stock recruitment
SRIA	BlueMed Strategic Research and Innovation Agenda
SSF	small-scale fisheries
TAF	Transparent Assessment Framework
UNEP	United Nations Environment Programme
VME	vulnerable marine ecosystem
VMS	vessel monitoring system

Foreword

The Fish Forum 2018 marked an important occasion for the GFCM. The event was conceived within the GFCM mid-term strategy (2017–2020) towards the sustainability of Mediterranean and Black Sea fisheries and was organized with a view to reinforcing the science–policy–stakeholder interface and finding innovative solutions to revert alarming trends in the status of Mediterranean and Black Sea fish stocks.

With roughly 80 percent of scientifically assessed stocks currently subject to overfishing, as well as an ever-increasing demand for scientific and technical advice on fisheries management and unprecedented advances in fisheries science being made every day, it is essential that experts, stakeholders and decision-makers stay up to date on best available knowledge and cutting-edge innovations in order to address the challenges of the region. The Fish Forum 2018 provided an opportunity for just that, offering the scientific community, policymakers, stakeholders and representatives of non-governmental organizations (NGOs) the chance to keep abreast of developments, build relationships and incubate new ideas.

A rich agenda of keynote speeches, workshops, oral contributions and poster sessions, guided by the expertise of an international scientific committee composed of 15 renowned experts, filled the five days of the Fish Forum 2018. As a result of the stimulating discussions that took place, conclusions were presented on the final day of the Fish Forum 2018 on a variety of topics. They included proposals for improving the science and data collection behind sound environmental advice, new emerging technologies, mitigating and adapting to the impacts of climate change, assessing interactions between marine living resources and human activities, enhancing seafood traceability and improving stakeholder representation and organizational structures. These conclusions laid the foundations for the development of new regional strategies and set the tone for future work to be carried out in the Mediterranean and the Black Sea region by a network of experts that is now expanded and strengthened thanks to the Fish Forum 2018. This document presents each of these conclusions in detail.

Perhaps the most telling conclusion of the Fish Forum was a unanimous agreement that the event should be held annually. This desire speaks to the region's immediate need for a forum to exchange innovative ideas and cutting-edge research on fisheries science, build capacity and engage young scientists and to inspire and ensure an open and compelling dialogue among interested parties. It is through events like the Fish Forum 2018 that we will set our course to address the challenges facing the sustainable management of our region's fisheries.

Abdellah Srour

Executive Secretary

General Fisheries Commission for the Mediterranean

Fish Forum 2018 overview

Background

The Fish Forum 2018, an original and innovative initiative, gathered over 450 scientists, researchers, engineers, academics, practitioners, managers and decision-makers from 45 countries, various international organizations and non-governmental organizations (NGOs) and other stakeholders to share and discuss oceanographic, social, scientific and economic perspectives on fisheries research in the Mediterranean and the Black Sea.

The objective of this initiative was to build an enduring and engaged network of scientists whose primary goals are to identify and discuss research trends, distinguish priorities and integrate scientific knowledge into decisions regarding the future of Mediterranean and Black Sea fisheries.

At a time when about 90 percent of scientifically assessed Mediterranean and Black Sea fish stocks were considered to be fished outside biologically sustainable levels, the Fish Forum 2018 represented a welcome intervention. Indeed, the event not only directed attention towards the importance of protecting these resources, but it also took stock of the progress made towards achieving relevant United Nations Sustainable Development Goals (SDGs) (in particular SDG 14) regarding the conservation and sustainable use of seas, oceans and marine resources. In addition, the event recognized various emerging technologies and highlighted their importance in relation to the region's pressing environmental challenges. This platform offered scientists and managers the opportunity to be included in decision-making processes for fisheries management technologies.

Organization

The Fish Forum 2018 lasted five days and was structured around three main themes:

1. Better science for better advice
2. Healthy seas and sustainable fisheries
3. Economic analysis and technology for societal benefit

Each thematic session was introduced by keynote speakers and consisted of three simultaneous sessions spotlighting leading research in the field.

In addition, a round-table discussion with industry experts was held for each of the three themes. These round tables each addressed specific issues relevant to their respective themes and inspired dynamic discussions amongst the experts.

Each thematic session ended with a "wrap-up" discussion, wherein participants offered their own conclusions and defined priorities for the coming decade. In addition, a poster session was organized at the end of each day in connection with each theme.

Apart from the thematic discussions and presentations, nine side-events and seven workshops were organized in collaboration with technical partners. Their summaries and conclusions can be found in the Event Highlights section of this publication.

The programme, opening and closing speeches, list of participants and list of posters are also included in the appendices of this report.

Partners

The Fish Forum 2018 was organized with the financial support of several donors, in particular the Government of Spain and the European Union, and in collaboration with 30 technical partners:

- United Nations Environment Programme Mediterranean Action Plan (UN Environment-MAP)
- Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO)

- Commission on the Protection of the Black Sea Against Pollution (BSC)
- Prince Albert II of Monaco Foundation
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Convention on the Conservation of Migratory Species of Wild Animals (CMS)
- Union for the Mediterranean (UfM)
- Organisation for Economic Co-operation and Development (OECD)
- Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)
- International Council for the Exploration of the Sea (ICES)
- African Union InterAfrican Bureau for Animal Resources (AU-IBAR)
- Mediterranean Advisory Council (MEDAC)
- International Union for Conservation of Nature (IUCN)
- MAVA Foundation for Nature
- International Center for Advanced Mediterranean Agronomic Studies (CIHEAM)
- Convention on Biological Diversity (CBD)
- World Wide Fund for Nature (WWF)
- Oceana
- Association of National Organizations of Fishing Enterprises in the European Union (Europêche)
- OceanCare
- Centre Scientifique de Monaco (CSM)
- Low Impact Fishers of Europe (LIFE)
- International Ocean Institute (IOI)
- Marine Stewardship Council (MSC)
- New Economics Foundation (NEF)
- Pelagic Data Systems
- exactEarth
- TrackWell
- Collecte Localisation Satellites (CLS)
- SRT Marine Systems

International scientific committee

In preparation for the Fish Forum 2018, an international scientific committee was established. The committee was tasked with supervising all scientific elements of the event, as well as with selecting abstracts based on the technical quality of the documents and on their relevance to the topics of discussion. In total, more than 230 abstracts were reviewed by the international scientific committee.

The committee consisted of the following members:

- Michel Bariche, American University of Beirut, Lebanon

- Trond Bjørndal, Norwegian School of Economics, Norway
- Antonio Cervantes, European Commission, DG-MARE
- Marta Coll, ICM-CSIC, EII, Spain
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- Patrick Lehodey, CLS, France
- Snejana Moncheva, Institute of Oceanology, Bulgaria
- Beatriz Morales-Nin, Mediterranean Institute for Advanced Studies (IMEDEA), Spain
- Chedly Rais, Okeanos Foundation, Tunisia Overview 5
- Evelina Sabatella, NISEA, Italy
- Tamara Shiganova, Shirshov Institute of Oceanology, Russian Federation
- Olivier Thébaud, Institut français de recherche pour l'exploitation de la mer (IFREMER), France

Conclusions

Theme 1 – Better science for better advice

Improving knowledge and data for better advice

- Although there is sufficient information available on methodologies for the implementation of spatial ecological processes, these data must be integrated into stock assessments.
- Data quality must be improved to promote data sharing.
- Additional questions on topics such as environmental impacts, estimates of illegal, unreported and unregulated (IUU) catches and recreational and small-scale fisheries (SSF) catches must be further addressed.
- Fishery-independent data availability must be improved in order to address data-limited situations.
- Social and economic information must be integrated in order to provide robust advice.

Management issues

- Accounting for the high number of drivers in and pressures on Mediterranean and Black Sea ecosystems should be considered of the utmost importance.
- Simultaneously managing a diverse set of environmental and anthropogenic issues indirectly related to fisheries (e.g. climate change, pollution, eutrophication, mining, invasive species, etc.) requires creative solutions to ensure biodiversity conservation and fisheries sustainability.
- Predicting the effects of alternative management measures aimed at integrating biological and socioeconomic metrics should be considered a responsible approach to compromising between conflicting objectives.

Emergence of new technologies

- New technologies should be put to use across a variety of fields, such as in the surveillance of fishing vessels and species (vessel monitoring systems [VMS], satellites, aerial surveys, etc.) and in the analysis of spatial data, using artificial intelligence (AI).
- New geographic information system (GIS) platforms and other emerging technologies, as well as new research on fishing gear design and improved selectivity, should be tested for effectiveness and eventually incorporated into management measures.

Enhancing cooperation

- Involving all concerned actors in the implementation of management measures is necessary to develop ownership and trust and to increase all parties' chances of success.
- The role of the GFCM in promoting cooperation in the Black Sea basin between contracting parties and cooperating non-contracting parties has been shown as an essential step towards improved governance in the region and should continue forwards in the same direction.
- In spite of the initial concerns raised by the scientific community, certain policy initiatives, such as the Marine Strategy Framework Directive and the landing obligation, have proven to be effective drivers of new science developments and standards.
- Networking between research organizations cooperating on international research projects and on delivering scientific products demonstrates the willingness in the region to establish such cooperation on a more permanent basis. In this regard, transfer of know-how between countries appears to be a valuable tool and should be encouraged.

Theme 2 – Healthy seas and sustainable fisheries

Addressing climate change

- Acidification and warming both affect the vertical distribution of pelagic and demersal species. This distribution becomes spatially more constrained in regions with strong thermal gradients and is affected by the complex species interactions (prey-predator relationships, trophic interactions, adaptation strategies, invasive species) that dominate the marine environment. These dynamics call for improvements in the knowledge of the vertical distribution of species, particularly through an ecosystem and multi-parameter approach.

Tackling environmental challenges

- Populations of non-indigenous and invasive species are growing across the Mediterranean and the Black Sea, and there is a need to take stock of their presence and to adopt actions towards managing them, including within fisheries intentionally targeting them. Continued and enhanced data collection through sampling landings, making the most of existing scientific survey programmes and using techniques such as DNA barcoding to improve species identification is important for the management of these species. New methods to evaluate their impacts (e.g. size-spectra and the use of ecosystem models such as Ecopath with Ecosysim) provide a good basis for future work, which should put particular emphasis on the use of methodologies addressing multispecies impacts of multiple cumulative stressors, including climate change and fisheries.
- Initial efforts are being made in the fishing sector towards mitigating the effects of marine litter, from incentivizing the use of recyclable and compostable packaging used in fisheries (e.g. biofoam fishing boxes) to supporting the participation of fishers in ocean cleaning initiatives. The creation of a strong legal framework for the management of marine litter will allow conditions to improve in the future.

Safeguarding vulnerable species

- Most studies evaluating interactions between vulnerable species and human activities concentrate on vertebrate vulnerable species, while much less effort is devoted to invertebrate species (e.g. habitat-forming species). Though information is available on bycatch and catch of vulnerable species and good methodologies exist to collect this data, the general lack of data on the different fleets interacting with these species (data is especially lacking from SSF) and a shortage of standardized data and poor knowledge of animal movement, aggregations and spatial distributions must be improved.
- Beyond fisheries impacts, other interactions between vulnerable species and human activities, including pollution and depredation effects, represent emerging issues that require further study. Potential actions and solutions include the protection of key areas, the implementation of active or passive devices in fishing gear and the use of tracking devices and multispecies integrated approaches, including oceanographic observational systems.

Theme 3 – Economic analysis and technology for societal benefits

Improving knowledge on the social and economic impacts of fisheries

- To sustain healthy SSF, which are essential for economic development and the achievement of SDGs, action is needed to address the challenges they face, such as the decline of stocks, poor working conditions, lack of market power and limited inclusion in decision-making, especially in southern and eastern Mediterranean countries.
- Effective organizational structures for fishers should be supported as they can offer powerful tools to achieve fisheries management strategies tailored to local needs, improve trust and

compliance, fill the gaps between supply and demand and increase fishers' representation in the economy.

- There is a need to address the overall gap in the ability of small-scale fishers to access financing.

Mapping value chains

- Better seafood traceability, at all stages of the supply chain, is important for the sustainability of marine resources worldwide. To support the trend of improving seafood traceability, certification schemes should continue to become standardized and independent. However, as this task represents a serious challenge, particularly to developing countries, cooperation between countries to achieve policy improvements is needed.
- Many factors can influence consumers and convince them to purchase sustainable seafood products, although price remains the most important. Additional activities to raise awareness of the benefits of sustainable seafood are therefore necessary to change consumer preferences and to underline that the benefits of sustainable seafood outweigh potential increases in price compared to less sustainable products.
- The debate continues over whether or not the responsibility for sustainable exploitation should be shifted onto consumers and away from those directly responsible for unsustainable fishing (policymakers, monitoring, control and surveillance [MCS] officers, fishers and their associations). Despite a growing number of market tools available to consumers (certification schemes, consumer guides), easily accessible information must increase if they are expected to be able to make sustainable seafood choices.
- The introduction of new seafood products into markets (e.g. jellyfish) to improve the overall sustainability of the global fisheries sector should be considered. For example, jellyfish could be used for both human consumption and as feed for aquaculture.

Marine technology promoting economic and environmental sustainability of fisheries

- A great deal of reliance is placed upon automatic identification systems (AIS) as the primary source of data in the fight against IUU fishing. Expectations of this technology should be carefully managed, particularly in the context of SSF.
- Standardization of data formats and transmission methods, such as the Fisheries Language for Universal eXchange (FLUX), will be increasingly useful to facilitate data sharing and the reception of data from different sources.
- Novel methods for assessing catch, effort and biomass are increasingly being adopted and standardized. Tools such as GIS databases and automated workflows that are helping in the collection and processing of fisheries data must continue to be enhanced and utilized.
- Innovative approaches are allowing management plans and assessments to cover recreational fisheries, which, in some countries, can be much larger than commercial fleets in terms of total participants, effort or even catch. The use of these approaches should be more broadly applied with a view to improving assessments at the regional level.
- Cooperation and partnerships between commercial technology providers and scientists represent key opportunities for innovation. However, clarity on the needs of fisheries managers and officers is essential for both development and advice.

Expert round table 1 – Promoting stakeholder dialogue towards harmonized fisheries management: Boosting the science–policy–stakeholder interface

- Involving fishers in the sustainable management of resources goes beyond asking them to contribute to reporting: they should feel respected and that their own opinions and approaches are taken into consideration. Once they are better integrated into the entire management process, they should be contacted and consulted routinely in order to foster consensus.
- Information requested from fishers and requiring processing should not concern only catch and fishing effort data. It is necessary to also investigate issues related to fishers' revenue, such as how it may be affected by policies and management solutions, and, through the use of modern processing technologies, to forecast future tendencies in the resource-related and socioeconomic aspects affecting fishers' lives.
- Identifying all actors and involving them in long-term consultations and consensus building through professional facilitation are key to fisheries management. Once results of management measures and analysis become available, it is important to provide feedback to all stakeholders and to collaborate with them in proceeding to the next level of management and consensus building.
- When working with stakeholders towards the development of management solutions, it must be established that they share responsibility for addressing the issues at hand, thus promoting management practices in which they see themselves as part of the solution.
- Communication with, and integration of, fishers and other stakeholders are not the only bottlenecks: a lack of communication and common understanding of priorities at the intra-institutional and inter-institutional levels are often problems as well, and appropriate governance must therefore be ensured.

Expert round table 2 – Natural and anthropogenic impacts: Effects of climate change, pollution and non-indigenous species on fish and fisheries

- Understanding that adaptation represents a more sustainable solution to climate change than attempting to catch up to anthropogenic damage via mitigation measures is fundamental. It is not possible for ecosystems to adapt to stresses on command; instead humans must act on their behalf and enact appropriate measures.
- Data is fundamental, but researchers must be aware that data are only useful when shared. There is a need to collaborate, invest in future generations of researchers and ensure that reviews reach policymakers in a timely fashion. If shared/transboundary stocks are to be monitored, data sharing is essential.
- Biodiversity is not defined by only the number of species present; rather, it represents a complex concept in which both the species and their effects on the ecosystem must be analysed. Biodiversity provides the foundations of marine ecosystems and the services they provide, so any changes in biodiversity may affect these services. Misunderstandings surrounding the definition of biodiversity must be clarified in order to avoid any resulting confusion that could complicate its management.
- Further study is required on how to deal with non-indigenous species (NIS). In terrestrial science, changes can be directly observed, while for ocean science, there is a need to better identify and understand this complex problem.
- Marine litter, particularly plastic pollution, represents a critical problem facing the Mediterranean and Black Sea region, and work is underway at FAO to address the issue of abandoned fishing gear and microplastics. Trade-offs need to be made, however, in

addressing these issues. Similarly, ocean noise, including from seismic surveys, constitutes an additional form of pollution that must be addressed.

Expert round table 3 – Technological future: High-tech advancements in fisheries research, management and fleet modernization

- Using all available technology, such as VMS and logbooks, does not automatically result in sustainable, well-managed fisheries. Instead, effort must be appropriately planned and targeted in order to provide valid data for decision-making. If high-quality data cannot be systematically made available, models cannot perform. It is therefore crucial that new, innovative technologies such as AI and Big Data management be made available and affordable for those countries and institutions with limited resources.
- Technologies can be considered to belong to one of two broad categories:
    - those that are made compulsory through regulation and whose efficacy is therefore a matter of proper application; and
    - those that are not compulsory and are introduced through individual economic or productivity decisions, thus requiring proper support or controls on their use through additional regulations.
- Effects of technologies not directly related to fisheries are extremely important to consider. For example, oil and gas exploration techniques may have strong repercussions on cetaceans and mammals, leading to important secondary effects on ecosystems, stocks, fishing practices and fishing conditions.
- The progress of technology cannot be halted and its effects on fisheries must be well understood and addressed, including any resulting structural changes, such as reductions in fleet size following increases in efficiency.
- To optimize its performance, technology must be combined with appropriate structures and accompanied by a willingness to comply with relevant regulations. Using technology not only as a means for control, but also for deterrence and to involve related industries, such as insurance and finance, may encourage strong compliance and provide a framework for effective incentives.

The challenges ahead

State of affairs in science

- Two key publications were issued: *The State of Mediterranean and Black Sea Fisheries 2018* (FAO, 2018) and *Impacts of Climate Change on Fisheries and Aquaculture* (FAO, 2018). There is a need to continue producing and sharing similar publications using high-quality data on fisheries and aquaculture.
- The Fish Forum 2018 was organized as a platform to encourage collaboration and should continue to be held on a regular basis.
- As fisheries were acknowledged as one of the pillars of the Blue Economy, there is a need to ensure their sustainability.
- Coordination between and actions of all actors/stakeholders should be improved.
- Data quality and availability should be improved to conduct better science and achieve better advice.
- Communication of scientific results should be clearer to facilitate policy actions.

State of affairs in management

- Some SDG 14 targets are ambitious, but they remain valid and should continue to be pursued.
- The question of "paralysis by analysis?", i.e. whether excessive focus is placed on procedures instead of on the real issues to be solved, is an important one. Perhaps less than in the past, regulations should still result in tangible outcomes improving governance and, in the end, foster environmental sustainability.
- Today, there is a need for credible, visible and effective science.
- Investments of time and effort differ between policymakers and scientists. It is necessary to develop trust and a common language and to increase the involvement of stakeholders from the beginning so that they feel co-ownership and co-design.

Priorities for moving forward

- Clear action points should be identified for politicians to manage the oceans better than we are today.
- A scientific initiative for ocean stewardship of the Mediterranean and the Black Sea, bringing all actors together (scientists, policymakers and stakeholders) should be developed.
- The international cooperation framework for science, governance and capacity building must be reinforced.
- Awareness and education must be increased at all levels.

Science for the future

- It is important to invest resources to adapt science and research to Mediterranean and Black Sea needs and to sustain this commitment.
- More interdisciplinary science is needed to:
    - help reinforce alternative methods for stock assessment; and
    - highlight trade-offs between different options (including in the definition of reference thresholds levels).
- There is a need to provide novel conceptual and modelling frameworks to incorporate ecological and physical complexities into fisheries sciences and to improve cumulative impact analyses in the future (e.g. spatial management, connectivity and stock structure, risks and vulnerabilities, species interactions, environmental influences and small pelagic species of the Black Sea).
- Cooperation among all concerned stakeholders and between scientific disciplines and sub-disciplines (e.g. behavioural economics) is necessary to generate more concrete suggestions for policymakers.
- New models must be used and developed to complement existing stock assessment models.
- Time series integrity and monitoring (landings, etc.) must be maintained, while also remaining flexible and adapting to emergent needs.
- A common data platform must be created for better data sharing; high-quality data checks must be applied in a basin-wide context.
- Better scientific knowledge should be made available to all decision-makers and stakeholders.

- The scope of research activities should be widened to include the collection of environmental information and the updating of managers when establishing measures, all while continuing to advance research on products and markets.
- Tools and analysis should be improved to gain an understanding of the decline in fish populations and the cumulative effects of environmental and anthropogenic stresses (e.g. climate change, ocean acidification, plastic and ocean noise pollution) on the balance of natural mortality versus fishing-caused mortality at the various life stages (larval, juveniles, adults). Comparative studies in different areas and between species with similar life-history traits should be assessed.
- There is a need to collect information at the country level on coastal fish stocks, since fishing pressure by SSF is still scattered.
- Algorithms using data from the Marine Strategy Framework Directive should be exploited as useful tools to identify areas in need of special protection, particularly in deep-water marine ecosystems.
- Innovative methods should be used to address problems of taxonomy (barcoding).
- New technologies should be used for the collection of data on stocks and human pressure by region and/or subregion.

Managing the ocean better

- There is a need for effective ecosystem-based management that guarantees healthy marine ecosystems (on a national and regional level).
- Decision-makers should shift to multispecies fisheries management.
- More trust should be placed in scientific advice, which can be partly achieved through enhancing platforms such as the Fish Forum.
- Marine spatial planning (MSP) is greatly required, as ecosystems and fisheries are impacted by other activities (e.g. tourism and renewable energy developments, exploration of mineral resources).
- Monitoring, control and sanctioning for IUU should be improved through the use of newly available and emerging technologies.
- Sustainable fisheries management plans should be developed to help depleted stocks recover at the basin level.
- Cooperation between scientists and stakeholders at all stages should be enhanced in order to develop ownership over management measures. A more accessible language must be used (basic, valid scientific statements, but not overly simplistic).
- Resources should be provided for education and capacity-building programmes involving all countries (also using a sub-regional approach).

Developing a science initiative for ocean stewardship

- Successful management of invasive species and their impacts must be achieved, while work on wider spatial and trans-boundary contexts is needed in order to allow stakeholders in the management scheme to claim ocean stewardship of invasive species.
- Marine protected areas (MPAs) and other effective area-based conservation measures (OECMs) should be developed at the country (and also international) level, and a network of connected area-based conservation measures should be established to protect ecologically significant habitats, ecosystems and fisheries resources.

- Partnerships must be developed between all actors (including the Convention on Biological Diversity [CBD]) from all countries to identify innovative and sustainable solutions to support progress towards achieving SDGs as well as blue growth.
- The GFCM should connect with the Intergovernmental Oceanographic Commission (IOC) and the UN Decade of Ocean Science for Sustainable Development (2021–2030) by assisting with the design process of the initiative for the Mediterranean and Black Sea basins. This collaboration will help to:
    - promote efforts made by Mediterranean and Black Sea scientists to reverse the cycle of declining ocean health;
    - gather ocean stakeholders from the two basins within a common framework; and
    - raise awareness and communicate results and future needs.
- An association of the directors of the main institutes involved in fisheries across the two basins should be created to foster better interactions with the marine environment and achieve greater cohesion and coordination between science and research.
- Future Fish Forums should be organized at regular intervals, helping to make science credible, visible and effective, to connect it with relevant stakeholders and to build and capitalize on priority actions.

Awareness, capacity building and education

- Awareness, capacity building and education should be realized at all levels.
- Special resources should be assigned for capacity building.
- Scientific results must be formulated in a way that facilitates comprehension by non-scientists.
- All stakeholders in the process must be involved.
- Social media should be used to increase awareness.
- Citizens must be actively involved.

Event highlights

Technical workshops

Workshop 1 – Essential fish habitats as key elements for the establishment of area-based management measures

Organized by Oceana

Panelists

John Stadler, Essential fish habitat coordinator for the West Coast, National Marine Fisheries Service (NOAA Fisheries), USA

Pilar Marin, Oceana

Jean-Noël Druon, Joint Research Centre, European Commission

Fabio Fiorentino, Istituto per le Risorse Biologiche e le Biotecnologie Marine (IRBIM), National Research Council (CNR), Italy

Maria Teresa Spedicato, COISPA Tecnologia & Ricerca, Stazione Sperimentale per lo Studio delle Risorse del Mare, Italy

Olivier Le Pape, AGROCAMPUS Ouest, France

BACKGROUND

This workshop aimed to describe the current framework for the protection of essential fish habitats (EFH) and provide an overview of the state of play in the Mediterranean context. To this end, Oceana relied on a variety of experts to analyse the subject from the perspectives of different Mediterranean areas. The chairperson of the National Marine Fisheries Service (NOAA Fisheries) moderated the debate, with contributions from the audience and experts. The workshop was organized in three sessions: introduction, case studies and debate/conclusions.

The workshop consisted of six presentations covering a wide range of topics relevant to protecting EFHs through area-based management. The topics included: i) how EFHs are being protected on the United States of America's west coast (John Stadler); ii) a framework for protecting EFHs in the Mediterranean Sea (Pilar Marin); iii) the development of ready-to-use EFH tools to take action on overexploited species (Jean-Noël Druon); iv) how to use EFHs (nursery habitats) to improve the status of fishery resources in the Strait of Sicily (Fabio Fiorentino); v) the characterization of deep-water EFHs in the southern Adriatic Sea and central-southern Tyrrhenian Sea and their potential role in fisheries management (Maria Teresa Spedicato); and vi) integrating EFHs into fisheries management and marine conservation in France (Olivier LePape).

The presentations illustrated the diversity of current work on EFHs across several Mediterranean subregions and elsewhere. Some of the work presented focused more on research topics revolving around EFHs, such as the identification of sensitive habitats (deep-sea coral [*Isidella elongata*]) and of specific assemblages with spawning and nursery grounds for red shrimps (*Aristaeomorpha foliacea* and *Aristeus antennatus*), while other work focused on predicting EFH mapping for European hake (*Merluccius merluccius*) and the identification of time-area closures using data from satellites and operational ocean models (avoidance areas for bottom trawling). Policy-driven work was also presented in an American case study based off a participatory process that involved fishers implicated in EFH work led by the Pacific Fisheries Management Council and in a study from France, where the environment ministry commissioned work to develop inventories of EFHs in its waters and make them publicly available. In addition, elements to support and improve fisheries management in the Strait of Sicily were outlined, such as updated information on nurseries of European hake and the importance of connectivity between spawning and nursery grounds for red mullet (*Mullus barbatus*), taking into account the knowledge and involvement of local fishers. Moreover, a number of commitments have

been made by the GFCM to protect EFHs, but progress has been slow and limited; there is still a need to bridge the gap between science and decision-making.

CONCLUSIONS

Following presentations, Q&A discussion and subsequent analysis, a total of ten priorities on EFH protection for the coming decade were identified in the region. Such priorities have been grouped under three main themes according to the level of stakeholder involvement that recommended actions would require. They are outlined in the following paragraphs.

Priorities to be addressed by decision-makers aim to: i) complete and expand the network of Mediterranean EFHs as a guarantee for stock sustainability and to reduce fishing mortality; ii) systematically include EFH considerations in fisheries management decisions, such as GFCM multiannual plans; and iii) bring science into policy actions by using existing EFH data (even if it is neither perfect nor complete) and adopt a precautionary approach if necessary ("avoidance of areas"). It was additionally underlined that much information is already available (e.g. from the Mediterranean Sensitive Habitats project) to put protection measures in place.

Priorities related to research consist of developing publicly available inventories (e.g. France's inventory) of EFH maps and underlying data (e.g. substrates) and continuing research to improve the understanding of EFHs to inform management decisions on EFH protection (e.g. refining closures, new gear types). Improved knowledge on EFHs is indeed critical, especially regarding EFH functionalities, gear impacts, overlaps with sensitive habitats/vulnerable marine ecosystems (VMEs), larval/spawner connectivity and spill-over, and climate change. Another important aspect is the collection of data in areas where little information exists, which leads to the last research priority: cooperation and research in order to develop projects to test these concepts in specific GFCM contexts.

Finally, priorities in connection with socioeconomics aim to: i) recognize the importance of EFHs in sustainable fisheries and proactively inform stakeholders; ii) engage with fishers to raise awareness, ensure two-way communications and adapt language; ii) develop robust collaboration between scientists and fishers to build trust and create real win-win situations (best available knowledge versus best available science); and iv) make sure that the same rules apply to everybody and that impacts are not disproportionately felt by fisheries operating in the same subregion/region (level playing field).

Workshop 2 – Future perspectives after the revolution: the rise of tracking devices for monitoring and modelling fisheries

Organized by the University of Tor Vergata and CSIRO

Panelists

Chris Wilcox, CSIRO Marine and Atmospheric Research, Hobart, Australia

Tommaso Russo, Laboratory of Experimental Ecology and Aquaculture, Department of Biology, University of Rome Tor Vergata, Rome, Italy

Jessica Ford, CSIRO Marine and Atmospheric Research, Hobart, Australia

Denise Hardest, CSIRO Marine and Atmospheric Research, Hobart, Australia

Ahmed Dyat, CSIRO Marine and Atmospheric Research, Hobart, Australia

Stefanos Kavadas, Hellenic Centre for Marine Research, Athens, Greece

Irida Maina, Hellenic Centre for Marine Research, Athens, Greece

Maurizio Gibin, Joint Research Center, ISPRA, Varese, Italy

Bernardo Patti, National Research Council, Torretta Granitola, Frazione di Campobello di Mazara, Italy

Lorenzo D'Andrea, Laboratory of Experimental Ecology and Aquaculture, Department of Biology, University of Rome Tor Vergata, Rome, Italy

Stefano Cataudella, Laboratory of Experimental Ecology and Aquaculture, Department of Biology, University of Rome Tor Vergata, Rome, Italy

BACKGROUND

Tracking devices and systems for the electronic monitoring of vessels at sea, such as vessel monitoring systems (VMS) and the automatic identification system (AIS), provide critical data for the monitoring, modelling and management of fisheries. These systems provide real-time or archival information on vessel position, speed and direction, sometimes extending to activities such as gear deployment or recovery. Moreover, this data can be linked to environmental data, as well as catch and landing data. Over the last decade, the appearance of these tools has inspired the development of several modelling approaches and suites for data processing, even though such systems generate long records that can make the extraction of important patterns complex and sometimes difficult.

This workshop covered a wide range of topics, from the reconstruction of spatial catch patterns using VMS data (in combination with logbooks, surveys, etc.) to the inference of unobserved compliance issues such as unauthorized transhipments at sea. The topics were organized into two frameworks: i) backwards analyses using the suite of models for the *a posteriori* computation of fishing footprint, statistics on fishing effort and related impacts and the analysis of dynamic interactions among fishers and between fishers and resources; and ii) forward analyses, such as the real-time forecasting of fishing vessels' behaviour at sea for enforcement purposes and the monitoring of compliance with fisheries regulations.

CONCLUSIONS

This workshop provided an opportunity for researchers working with tracking devices, both in the GFCM area of application and worldwide, to present research and analytical tools to recover important fisheries management and enforcement information.

The workshop was attended by about 40 participants, whose discussions covered a wide range of fleet and spatial scales, with several talks addressing AIS data at the global and regional scales, others highlighting the use of national VMS data and two discussions specifically focused on small-scale fisheries.

Workshop participants were drawn from a wide variety of professional contexts, ranging from cooperative tracking systems on small-scale vessels in Indonesia to catch reconstruction for industrial trawlers in the Mediterranean Sea and the International Council for the Exploration of the Sea (ICES) region. Methods and open-source tools developed by researchers around the world were discussed, with the goal of maximizing the accessibility and utility of low-cost VMS analysis capacity and taking into account feedback from stakeholders.

A number of key questions were raised about statistical approaches, recent advances in machine learning and other approaches. Statistical and machine learning processes showed a significant diversity in modelling approaches, ranging from agent-based models to expert elicitation and social sciences methods such as the analytical hierarchy process. The panel members discussed a number of these approaches, including the difference between approaches aimed at understanding versus those aimed at prediction.

Workshop 3 – Promoting co-management as an innovative tool for the sustainable use of coastal and marine natural resources

Organized by Interreg Med PANACeA

Panelists

Dania Abdul Malak, PANACeA Project Leader, ETC-UMA, University of Malaga, Spain

Luca Santarossa, FISHMPABLUE2 project, Federparchi – Europarc, Italy

Antonio di Franco, University of Nice, France

Francesco de Franco, MPA Torre Guaceto, Italy

Anamaria Štambuk, CONFISH project, University of Zagreb, Croatia

Sasa Raicevich, Italian National Institute for Environmental Protection and Research, Italy

Marco Costantini, PHAROS4MPAs project, WWF

Alessandro Melillo, TOURISMED project, PRISM, Italy

Anna Carlson, GFCM,

Gilles Van de Walle, FARNET, Belgium

Antoni Maria Grau, Regional Government of the Balearic Islands, Spain

BACKGROUND

This workshop was organized by the PANACeA project to showcase experiences of co-management best practices from several Interreg Mediterranean co-financed projects (FishMAPBlue2, CONFISH and PHAROS4MPAs) of the Mediterranean Biodiversity Protection Community, as well as research results and recommendations from other relevant initiatives, such as DESTIMED, and other actors involved in co-management, such as universities (University of Nice and University of Zagreb), research institutes (Italian National Institute for Environmental Protection and Research [ISPRA]), networks (FARNET), NGOs (World Wide Fund for Nature [WWF]), regional authorities (Government of the Balearic Islands) and MPA managing bodies (Torre Guaceto MPA).

Round table 1 focused on why, and to what extent, co-management represents a key tool and an opportunity for the sustainable development of Mediterranean small-scale fisheries. Panelists provided insights on the definition of co-management as a mechanism to balance powers and responsibilities among local stakeholders, namely artisanal fishers and MPA managing bodies. The discussions revealed that stakeholder participation during co-management processes is considered a key factor in building trust between artisanal fishers and MPA managers. Best practices of co-management are predicated on the active part played by artisanal fishers in the sound management of protected areas. This role includes their contribution to discussions about ecosystem-based management approaches outside Natura 2000 areas and their co-design, and the adoption of measures that decrease the negative impacts of their fishing activities. This process becomes socioeconomically viable when linked to re-compensation instruments such as the FISHMPABlue2 project, which is currently testing this strategy in 11 protected areas. Through the concrete involvement of the fisher community in monitoring or patrolling, fishers can take ownership of, and responsibility for, the sustainable use of natural resources within a designated area. Moreover, co-management models geared towards small-scale fisheries should take into consideration recreational fishing activities, which place strong pressure on MPAs. Specific rights given to local artisanal fishers versus recreational fishers can ease the process and favour local small-scale fisheries.

Round table 2 focused on multi-stakeholder involvement and the participatory approach, as well as on how to move from theory to practice and how to create ownership and raise awareness for integrated MPA management. CONFISH results proved that involving social scientists, finding the right

language and translating scientific and technical language into a comprehensive and pedagogical one are requirements for the success of the co-management model. A good and neutral facilitator is also clearly needed and can support the achievement of a successful co-management model. Other means are also essential, such as the establishment of a good code of conduct. Successful co-management is also dependent on the boundaries established, especially where an ecosystem-based delimitation favours the use of ecological borders rather than administrative ones. Concerning the replicability of co-management models, replication is not always directly possible, and adaptation of models should rather be based off local, cultural and socioeconomic models, especially in the Mediterranean.

Round table 3 focused on how to expand and transfer best practices in order to reach a common integration of co-management in the Mediterranean region. Engaging stakeholders lies within the agenda of the GFCM and its management plans, as it is also considered within specific activities, such as capacity building and training. In terms of financial mechanisms, there is a need to fund more small initiatives enabling real engagement and raising awareness at the local level to test the viability of these models. Networking is also a key factor in easing the transferability of good practices. Networks, such as the Med Biodiversity Protection Community and fisheries local action groups convey good practices to a larger audience, raise consumer awareness and promote local and sustainable fishing. A sustainable management of natural resources includes the consideration of socioeconomic issues. Training socioeconomists in fisheries activities and bringing them to the discussion table is very important. In some cases, top-down approaches for co-management could present a bottleneck, while bottom-up approaches can provide a way forward. Changing habits is difficult; nonetheless, progress must be made in weakening resistance, and communication between stakeholders needs to be encouraged.

CONCLUSIONS

This workshop promoted sharing experiences of co-management in SSF and identified the following characteristics as ways to improve and further develop these practices in the Mediterranean region. The pillars of an effective co-management model are engagement, trust and the availability of adequate tools between MPA managers and local fishers throughout the process. Speakers agreed that building trust and being completely transparent, as well as addressing expectations around the table, are key to success. To encourage the endorsement of co-management by different stakeholders, a good starting point is to find win-win scenarios that connect MPA managers, scientists, fishers and authorities in overcoming a common problem, creating ownership and building trust along the way. Cooperative actions and engaging neutral ambassadors are key ingredients for effective co-management implementation. The representation and leadership of local fishers is also an important aspect to consider in the development of co-management models.

Considerations of systemic resistance and multi-level governance play a major role in the adoption and implementation of effective co-management mechanisms. In every layer of stakeholder involvement, co-management efficiency has to be promoted as a mixed approach that allows switching from a one-way top-down approach to a multilevel governance model. Multilevel governance models implementing a transversal approach between top-down and bottom-up approaches are key and need to be promoted.

Local co-management plans are linked to local ecological, socioeconomic and cultural patterns. Therefore, their transferability is not automatic and needs to be adapted to local circumstances across the Mediterranean. Involving multiple stakeholders in co-management models is not a simple “copy-paste” recipe. Flexibility, consideration of readjustments based on local experiences and the presence of feedback loops are key to successful co-management plans.

The need for data, but above all, the need for comprehensive information and capacity building obtained through innovative tools and practices, are also essential to ease the decision-making process. Research needs to provide information for quick and adapted decision-making. MPAs play the role of sentinels to test and identify fine-tuned tools and practices that work best for nature conservation and sustainable natural resource management, while allowing for adaptation to local communities.

Finally, co-management would support effective trans-boundary natural resource management for regions or countries sharing common ecosystems/natural resources.

Workshop 4 – Priority actions to prevent and reduce the generation of marine litter

Organized by UN Environment/MAP MED POL and OceanCare

Panelists

Gaetano Leone, Coordinator, UN Environment/MAP Barcelona Convention Secretariat

Fabienne McLellan, Director International Relations, OceanCare

Iryna Makarenko, Pollution Monitoring and Assessment, Black Sea Commission Permanent Secretariat

Joanna Toole, Fishing Operations and Technology Branch, FAO

Andrea Stolte, Project Manager Derelict Fishing Gear, WWF Germany

BACKGROUND

This workshop considered the issue of marine litter not only in the Mediterranean but also in the Black Sea, highlighting initiatives already underway in the region and building on the best practices of the United Nations Environment Programme Mediterranean Action Plan (UN Environment/MAP) Regional Plan on Marine Litter Management in the Mediterranean, as well as on initiatives led by NGOs, case studies and scientific findings, which also included experiences from other relevant regions. It involved the discussion of potential ways to strengthen and complement these frameworks and ongoing work from a fisheries perspective in relation to the development of the Marine Litter Adaptation Strategy of the GFCM as foreseen in the GFCM mid-term strategy (2017–2020) towards the sustainability of Mediterranean and Black Sea fisheries, Output 4.2 "Healthier marine ecosystems and more productive fisheries".

The workshop commenced with five panel presentations followed by a constructive discussion among workshop participants and panelists. Different themes and recommendations were discussed. However, these recommendations do not represent an endorsement by the participants.

Some key challenges were underlined. First, in the Mediterranean, a sixth gyre has formed: the average density of plastic in the Mediterranean is comparable to that of open-ocean gyres. The Mediterranean is distinguished from other gyres by its higher proportion of larger plastic items. Plastic fragments dominate in the Mediterranean Sea, accounting for 87.7 percent of floating plastic debris. The basin is vulnerable to the accumulation of floating debris due to its specific flow patterns. There is growing evidence that microplastics are increasingly ingested by fish and invertebrates in the Mediterranean Sea. Second, abandoned, lost or otherwise discarded fishing gear is an issue of concern in the region: significant amounts of marine litter lie on the Mediterranean seafloor, with estimations numbering them at more than 0.5 billion items, with certain areas sometimes exceeding densities of 100 000 items/km^2. Third, trends in plastic production and consumption undermine efforts to achieve SDG 14, in particular Target 14.1 ("by 2025, prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution"), which will contribute to sustainable development and sustainable fisheries. With global plastic production projected to increase by up to 33 percent, the achievement of SDG Target 14.1 is at risk, adding even greater urgency to the call to action. Finally, there are some barriers ahead, including: i) the lack of best practice incentive programmes, which would encourage fishers to tackle fishing gear litter; ii) the continued accumulation of litter in the Mediterranean Sea and the Black Sea; iii) poor enforcement mechanisms; and iv) societal patterns of behaviour.

CONCLUSIONS

Several recommendations were outlined for consideration by the GFCM. The Regional Plan on Marine Litter Management in the Mediterranean provides a strong basis for cooperation and for the establishment of synergies with the GFCM Marine Litter Adaptation Strategy towards providing a coordinated response against the generation of marine litter from fisheries. The reduction and prevention measures provided in the regional plan and strategy and the different best practices

presented during the workshop comprise a good set of priority actions against marine litter generation from fisheries and aquaculture.

Regarding policy and governance, there is a need to harmonize and coordinate efforts and approaches, including regional action plans (in particular, the Regional Plan on Marine Litter Management in the Mediterranean Sea and the Black Sea), at the regional and international levels and to cooperate with relevant regional fisheries management organizations (RFMOs). Such coordinated efforts should incentivize best practice approaches towards a measurable reduction of marine litter, both through preventing litter from entering the marine environment (through reductions) and removing marine litter from within. Marine litter reduction and prevention measures should appear in national waste management laws. The GFCM could prepare ad hoc recommendations for fisheries and aquaculture issues such as abandoned, lost or otherwise discarded fishing gear. There is also a need to promote comprehensive science-based policies and enforce existing laws to prevent marine litter generation.

There is enough scientific knowledge and information to take remedial action without delay. However, ongoing research must continue in order to find the most effective and appropriate policies and to establish standardized protocols for debris sampling procedures, detection, retrieval and disposal. Collaboration with the scientific community and researchers was recommended to better understand and evaluate the scope, origins (i.e. the main causes) and impacts of marine litter and to explore possible solutions. Continued investigation of the impacts of marine litter on all trophic levels of marine biota on a similar temporal and spatial scale (e.g. ingestion, bio-accumulation and possible transfer through the food web), as well as the promotion of ad hoc workshops and training courses on prevention, reduction, recycling and reuse of marine litter were also advised.

The influx of marine litter into the ocean should be reduced through prevention and reduction of marine pollution and waste generation of all kinds, particularly from land-based activities (including marine debris and nutrient pollution). Collaboration and coordination across the Mediterranean and Black Sea region should be improved to address the marine litter issue and to prepare a common frame of reference for action among countries, as well as a tool to develop and monitor marine debris programmes and projects. Port reception facilities and waste management solutions need to be improved for fishing gear and other marine litter items retrieved from the sea. The development of best practice incentive programmes needs to be encouraged, including incentives for active removal. Best practice management of fishing gear needs to be considered at all stages of the fishing gear life cycle, from manufacture to disposal, as well as the potential for gear re-use/recycling or even circular economy possibilities. Recycling schemes could provide income to fishers, including to small- and medium-sized enterprises at the local or regional scale. Solutions to macro and microplastics in the marine environment need to go far beyond waste and must be examined from a full life-cycle perspective, including producer responsibility. Working with local fishers is key to identifying marine litter hotspots and accumulation areas where subsequent retrieval operations should, in an environmentally sound way, be focused. Fishers need to be involved as key stakeholders in all aspects of the management of marine litter, including data collection, retrieval and disposal. The implementation of projects and pilot activities that include funding and/or different kinds of incentives should be considered.

In order to raise awareness, initiatives will target and involve a wide range of different stakeholders. Such initiatives will involve: i) collaboration with fishers and fishing communities; and ii) educational and awareness-raising programmes targeting young people with age-specific activities and information. Consumer awareness campaigns promoting a sustainable lifestyle focused on litter prevention and reduction, as well as the avoidance of single-use plastic consumption, should be intensified. Local coastal authorities need to facilitate specific awareness-raising programmes and activities for different stakeholders and help to spread knowledge regarding eco-efficient waste management systems and practices. Methods to recover plastic products for recycling and energy recovery should also be improved.

Workshop 5 – Towards operational fisheries oceanography in the Mediterranean Sea: Gaps, challenges, opportunities from open-access data and integrated tools

Organized by IEO and OGS

Panelists

Manuel Hidalgo, IEO, Spain

Cosimo Solidoro, OGS, Italy

Diego Alvarez-Berastegui, IEO, Spain

Gianpietro Cossarini, OGS, Italy

Stefano Salon, OGS, Italy

Simone Libralato, OGS, Italy

Davide Agnetta, OGS, Italy

BACKGROUND

This workshop was divided into two sections. The first section focused on the integration of environmental variability into fisheries assessments, with participants recognizing that this integration is still incomplete. Chairs presented the Bluefin tuna project, a joint research initiative conducted by the Balearic Islands Coastal Observing and Forecasting System (SOCIB) and the Spanish Institute of Oceanography (IEO) in the Balearic Islands, as an example of a successful case study. The group discussed how to apply the same approaches to other case studies, acknowledging their strong potential to improve fisheries assessments conducted within the framework of the General Fisheries Commission for the Mediterranean. In particular, the approach would increase the quality of input parameters such as catch per unit effort and stock-recruitment (SR) relationships (by moving from density-dependent SR towards environment-dependent SR) in fisheries such as the European hake (*Merluccius merluccius*) fishery or small pelagic fisheries, and would also open up new opportunities in assessment methods and scientifically informed spatial dynamic management. The group agreed that the most pertinent activity would be to focus on linking experts of species ecology, fisheries assessment and operational oceanography in order to create a multidisciplinary network. Such expert groups should aim to achieve the specific goals of i) better identification and understanding of the environmental drivers affecting key species ecological processes; ii) adequate parameterization of the key environmental drivers identified (through the definition of appropriate indicators); iii) development of best practices for the integration of those indicators in current assessment models; iv) fostering capacity building; and v) identification of successful case studies and the promotion of new ones.

The objective of the workshop's second section was to provide information on the data available through the Copernicus Marine Environment Monitoring Service (CMEMS) regarding environmental variables useful for fisheries science. Recent efforts to collate, integrate and model physical and biogeochemical data resulted in the availability of parameters beyond those of satellite surface observations. Through advanced, complex models assimilating available data, CMEMS provides three-dimensional characterization of the water masses with increased accuracy (also by means of downstream services). This allows for daily, high-resolution vertical and horizontal patterns of the Mediterranean and Black Sea basins in their entirety, including biogeochemical variables (e.g. nutrient concentrations, oxygen, particulate organic carbon and phytoplankton primary production). Such variables might be useful to complement fisheries tools for assessment and for ecological studies, from single to multispecies approaches.

CONCLUSIONS

Discussions evidenced that fisheries data in the Mediterranean region can be limited at times: although these constraints may discourage the adoption of environmental variables into assessments, it is also true that including environmental drivers has a potential for improving assessments. Rich fisheries data cases can be used to test eventual improvements and to identify relationships between environmental conditions and marine resources. Though challenges might arise from the time span of CMEMS products, analyses could also be extended into the past to consider historical fisheries dynamics and data. Seasonal forecasts and climate projection products are required for future management scenarios. An important challenge may regard the design, development and implementation of ocean monitoring indicators, derived from CMEMS and other observation systems, that might prove useful in improving the representation of processes regarding juvenile/larval stages (dispersion, mortality, recruitment). Expert fisheries scientists implementing CMEMS products can provide reviews to CMEMS User Support, which facilitates the identification of those ocean monitoring indicators with mutual benefits.

The group discussed how to proceed with the implementation of "operational fisheries oceanography" and agreed to develop a specific network on operational fisheries oceanography to resolve links between environmental variability and fisheries assessments. This network will facilitate the inclusion of operational oceanography into fisheries stock assessments as a first step and its specific objectives will be to:

1. identify and disseminate information on successful case studies in which the integration of environmental variability has improved fisheries assessments and management, as well as promote new ones (for small pelagic, demersal and littoral species), including for the conservation of threatened species (e.g. marine mammals and turtles);
2. design common working schemes and best practices from successful case studies in order to maximize the transfer of knowledge to other cases (species/fisheries/areas);
3. align strategic plans in fisheries, conservation and operational oceanography to ensure that advances in these fields benefit the most from each other;
4. provide an evaluation of how operational fisheries oceanography improves advice in terms of quality, accuracy and precision and allows for advances both in qualitative and quantitative approaches; and
5. establish a direct communication link with environmental data producers, such as the CMEMS team, in order to access preliminary products as well as provide guidance on products and services (product format, access to products, etc.) that are foreseen to be important tools in the fisheries sector.

Updates on the network activities and results will be delivered to the GFCM in 2020. On that occasion, a request for a dedicated working group on operational fisheries oceanography may be made by the GFCM.

Workshop 6 – Complementarities between MPAs and fisheries spatial measures for area-based management (including specially protected areas of Mediterranean importance, fisheries restricted areas and national fishing reserves)

Organized by UN Environment/MAP

Panelists

Khalil Attia, Director, UNEP/MAP-SPA/RAC

Joseph Appiott, CBD Secretariat

Miguel Bernal, Senior fishery officer, GFCM Secretariat

Daniel Cebrian, UNEP/MAP-SPA/RAC

Raffaele Mancini, UNEP/MAP-PLANBLEU/RAC

Puri Canals, President, MedPAN

Leonardo Tunesi, ISPRA, Italy

Mohamed Malouli Idrissi, INRH, Morocco

Gaetano Leone, Coordinator, UNEP/MAP

BACKGROUND

This workshop was attended by regional and national specialists on both marine protected areas (MPAs) and Mediterranean fishing reserves, as well as by expert representatives from global and regional organizations, such as the Convention on Biological Diversity (CBD), the General Fisheries Commission for the Mediterranean, the United Nations Environment Programme Mediterranean Action Plan – Regional Activity Centre for Specially Protected Areas (UNEP/MAP-RAC/SPA) and UNEP/MAP-Plan Bleu-RAC. An exchange of contributors' experiences was followed by a further round table on spatial measures for both biodiversity conservation and fisheries management purposes.

Experiences exchanged included the process of defining and listing ecologically or biologically significant marine areas (EBSAs) around the world and the use of EBSA information to support long-term monitoring and research, which have so far focused more on features than on pressures, threats or impacts. Fisheries restricted areas (FRAs) were presented as examples of scientific evidence and priority management spatial tools that are always associated with tailored management measures (other examples include area-based protection of VMEs. The priority conservation areas in the Mediterranean defined by UNEP/MAP were geographically consistent with EBSAs and aligned with different conservation needs from different perspectives (biodiversity conservation, fisheries, etc.). Since their definition in 2010, these zones have been considered for different management tools and frameworks such as FRAs and specially protected areas of Mediterranean importance (SPAMIs). At present, the services provided by MPAs are receiving more and more recognition and include cultural, provisioning, and functional regulation components. MPA managers provide support to fisheries resources management through their networking in different marine areas of the world, despite the scarcity of available data on small-scale fisheries (SSF).

In sharing national experiences from northern Mediterranean countries, multiple issues were brought forth to the debate, including the limited distribution of fishing permits in marine protected areas (MPAs), which are usually given only to SSF in certain countries. Other issues involved the importance of establishing buffer areas around MPAs and the need for European Member States to set clear fishing measures in Natura 2000 sites and to extend those sites' coverage to the deep seas in order to ensure fair ecological representation.

The southern Mediterranean experience was constricted by the low percentage of marine surface area under protection. However, the area has also seen advances in recent years as far as the correct choice

of new areas to be preserved, respecting sound parameters (such as accurate ecological mapping), socioeconomic factors and topics of future area governance feasibility. The recent agreement on a definition of other effective area-based conservation measures (OECMs) at the last CBD Conference of the Parties was welcomed as a needed step towards improving understanding of their role and accurately parameterizing the category within countries´ plans for achieving their target values in line with both UN Sustainable Development Goal (SDG) 14 and CBD Aichi Targets. The benefit of constant support from international and regional organizations to southern and eastern Mediterranean countries in their efforts towards spatial management and conservation of the seas was emphasized.

A round table followed on how marine living organisms and ecosystems in the Mediterranean can be sustainably managed through spatial measures linking biodiversity and fisheries-driven approaches in a more innovative way.

CONCLUSIONS

Participants at the round table proposed an ecosystem approach, with biodiversity protection and fisheries management as the focus of action targets. The deep sea remains a top priority due to its under-representation, and therefore, large enough no-take zones must be further developed to facilitate visible fisheries recovery effects. Available tools should be used in a complementary way to increase planning and management efficiency through a participatory approach. In order to do so, the involvement of fishers has to be facilitated across all management activities, including monitoring. Voluntary protection activities promoted by fishers need strong support from accompanying regulatory measures. Recognition of local ecological knowledge supports users' feelings of ownership and fosters support of MPAs in their areas.

It is necessary to capitalize on lessons learned at both the regional and global levels. Economic actors must be involved by means of supporting mechanisms. In many cases, MPAs are managed as areas closed off to fishing communities. Further integration of fishers in socioeconomic activities within these MPAs is necessary, including in management bodies, in order to ensure regular, informative involvement. In terms of MPAs established for fisheries purposes, this requirement is notably important. It was determined that, where appropriate, tourism operators should take on a participatory role, albeit always with the technical support of scientific assessment.

Managing the sea in terms of threats and human activity impacts through MPAs and OECMs, however, is not enough. The whole marine environment needs to be managed in such a crowded area as the Mediterranean. Therefore, in addition to spatial tools, an ecosystem approach is needed for all maritime activities through appropriate national and subregional marine area management plans that clearly define how different stakeholders can intervene and contribute to better management.

A further recommendation for advancing towards SDGs and Aichi Targets regarding protected areas and life underwater was that enforcement and compliance now take a stronger form at the national level. Subnational and supranational support is important, but countries should also be encouraged to sign their own written engagements and obligations towards more effectively supporting activities managed by regional bodies and stakeholders.

Workshop 7 – The MSC Project Pre-Assessments model: a multi-stakeholder collaborative approach to improve fisheries sustainability

Organized by the Marine Stewardship Council (MSC)

Panelists

Carlos Montero Castaño, Accessibility Manager, MSC, Spain

Amanda Lejbowicz, Project Manager, MSC

Margaux Favret, Senior Fisheries Manager, MSC, France

Ilaria Vielmini, Fisheries Manager, MSC Italy
Maria Cristina Mangano, Fisheries research Manager, Bangor University, United Kingdom

BACKGROUND

Almost 35 percent of assessed fish stocks worldwide are considered to be overexploited. This figure is the result of overcapacity, lack of scientific data to inform adequate regulations, insufficient political will, scarce involvement of the fishing sector in decision-making processes and weak market engagement to promote a sustainable exploitation of natural resources. The Marine Stewardship Council (MSC) certification programme is based on its sustainable fisheries standards, which provide a global framework of fisheries management best practices.

The MSC third-party assessment process allows for recognition of those best practice actions, as well as for identification and analysis of challenges within the specific fisheries management system, which are needed to inform and define measures in order to achieve and maintain sustainable management over time. The MSC programme often focuses on the value of certification–market incentives driving at-sea environmental improvements, as well as increased traceability and transparency throughout supply chains. Beyond the direct benefits of certification and market recognition, however, the MSC's standards and assessment process offer powerful tools to diagnose and identify improvement needs from a more holistic level, whether guided by a final certification goal or not. Using this approach, management authorities are beginning to utilize the MSC standard as an independent, credible ground-truthing model before they make sweeping adjustments to their management framework, with the aim of benefitting all fisheries, not just those seeking certification. This approach is now known as the multi-fisheries pre-assessment.

This multi-stakeholder, collaborative approach is already helping to improve fisheries in the Mediterranean region, Australia, Indonesia, Mexico, South Africa, Japan and the United Kingdom. Through a combination of mapping and pre-assessment exercises, the multi-fisheries pre-assessment model offers governments, fishers, scientists, market actors and local non-governmental organizations (NGOs) the chance to collectively determine the most efficient route to making environmental improvements at the most appropriate scale. It is inherent within a multi-fisheries pre-assessment that its intended impact extends beyond the immediate project and aims to improve management more generally, especially for small-scale fisheries. For fisheries that wish to pursue certification when their performance allows, engagement through a multi-fisheries pre-assessment offers a streamlined stakeholder-supported approach to sustainability. For those that choose not to pursue MSC certification directly, value is gained through pre-assessment projects by optimizing management efficiencies at the broadest level possible. The goal of this workshop was to share the methodology applied by the current pre-assessment projects under development, to learn from the experiences of different stakeholders involved in different multi-fisheries pre-assessment projects around the world and to collect all inputs, ideas and critiques from the audience in order to improve the model for future projects in new countries, particularly in the Mediterranean region.

Two pre-assessment projects currently ongoing across the Mediterranean region – Medfish (in France and Spain) and Blufish (in Italy's southern and central regions) – were presented. The Medfish project has already undertaken the pre-assessment of, and action plan formulation for, 14 fisheries (seven on

the French side and seven on the Spanish side of the study area). Blufish, after more accurately mapping all fisheries within the study area, will initiate a stakeholder consultation to select a list of eight to ten fisheries that will be pre-assessed against the MSC fishery standard by a conformity assessment body over the next few months.

CONCLUSIONS

During the pre-assessment projects, Medfish and Blufish, two main issues were encountered: i) the need to fill data gaps when working with data-poor fisheries; and ii) the need for stronger engagement from scientists during multi-fisheries assessments, something on which MSC has been working very hard in recent years.

In terms of working with data-poor fisheries, more support should be provided, and on-board data collection programmes linked to officially available databases should be developed, from which new, easily sharable and downloadable integrated databases could be created. These integrated databases could then be used during fisheries assessments and to inform both management plans and certification standards in a more effective and tailored way. Additionally, social media and apps (vetted and validated, of course, for data reliability and credibility) could be developed to fill knowledge gaps, and user-friendly communication tools for fishers and managers could be created and promoted. A core issue is the need for capacity building (e.g. the integration of all the different components of fishery management and certification into a new Master's degree), as this step is crucial to harmonize the dialogue and understanding across the various actors within a multi-fisheries pre-assessment model (e.g. governments, fishers, scientists, market actors and local NGOs). More capacity-building trainings and courses could be used as tools to increase the chances of collectively determining the most efficient route to making environmental improvements at the most appropriate spatial and temporal scale.

Regarding the engagement of scientists during multi-fisheries assessments, scientists need to be encouraged and scientific tools need to be promoted in order to overcome barriers related to data-limited fisheries. Scientists should also be present within the advisory groups of multi-fisheries pre-assessment projects. This latter step will allow stakeholders to be informed on scientific issues (models, methods, etc.). As suggested during the workshop, when dealing with pre-assessment projects, cultural and traditional buying criteria and the MSC standard certification should be taken into consideration.

The points that arose from the active moment of dialogue and reflection during the workshop were reported both at the end of the Fish Forum 2018 and internally at MSC (through a shared forum report) and were considered useful cornerstones for future developments. The Mediterranean pre-assessment projects, Medfish and Blufish, along with other MSC activities in the Mediterranean context, have been welcomed with optimism and wide interest.

Side-events

Side-event 1 – Launch of the State of Mediterranean and Black Sea Fisheries 2018 (SoMFi 2018)

Organized by the GFCM

Panelists

H.E. Hassan Abouyoub, Ambassador, Permanent Representative of the Kingdom of Morocco to FAO

Valerie Lainé, Head of Unit, European Commission, DG Mare

Vera Agostini; Deputy-Director, FAO Fisheries and Aquaculture Department

Joseph Appiott; Associate Programme Officer Secretariat of the Convention on Biological Diversity, United Nations Environment Programme

Vladimir Mamaev, Regional Team Leader and Regional Technical Advisor, UNDP/GEF

BACKGROUND

Fisheries have always been essential to the economic survival of Mediterranean and Black Sea riparian countries. They provide direct employment for about 250 000 people in the region and generate an estimated annual revenue of USD 2.8 billion. However, there is a clear imbalance between fisheries sectors: small-scale fisheries (SSF) account for more than half of onboard jobs, while they generate only 26 percent of the total revenue; trawlers and purse seiners, on the other hand, represent more than 60 percent of the total revenue and create only 34 percent of onboard jobs.

The significance of fisheries in the region is evidenced by the high number of reported fishing vessels, which in 2017 amounted to around 86 500 in the Mediterranean and the Black Sea. It is noted that small-scale fishing vessels make up the majority of the fishing fleet in the region, reaching 78 percent in the Mediterranean and 91 percent in the Black Sea.

Catch levels have been stable, with 1 220 000 tonnes of caught fish registered in 2016, with 830 000 tonnes recorded in the Mediterranean and 390 000 tonnes in the Black Sea. From 2014 to 2016, Türkiye accounted for 26 percent of total landings and 321 000 tonnes of fish caught, making it the country with the highest capture fisheries production.

As for the overexploitation of marine resources, a 10 percent decrease in overfishing has been observed between 2014 and 2016. Fishing pressure went from 88 to 78 percent, and European hake represented the most overfished species in both maritime basins.

A total of 275 000 tonnes of fish are discarded every year, accounting for about 18 percent of the total catch in the region; that figure divides into 230 000 tonnes for the Mediterranean and 45 000 tonnes for the Black Sea. Among the different fisheries sectors, the trawling sector is responsible for over 40 percent of discards in some areas. In comparison, the SSF sector generates less than 10 percent of discards.

Incidental catch of vulnerable species is another major concern for Mediterranean and Black Sea fisheries. Although it occurs rarely, bycatch presents an alarming conservation concern. Sea turtles were found to account for most incidental catches, reaching 80 percent. Sharks, rays and skates altogether account for 16 percent of bycatch, while seabirds and marine mammals are the least affected, at 4 percent.

To address these challenges, the GFCM established a mid-term strategy in line with the United Nations Sustainable Development Goals (SDGs), with particular focus given to SDG 14, life below water. In order to ensure the sustainability of fisheries, more efforts should be made to advance scientific research and ensure the protection of vulnerable and essential habitats.

CONCLUSIONS

Efforts towards the sustainability of the fisheries sector in the Mediterranean and the Black Sea have yielded some positive results, most notably a decrease in overfishing. Catch levels have been stable in past years, and, from an economic point of view, the sector has been able to generate high revenues and create onboard jobs.

Despite a noteworthy decrease in overfishing, there is still much to do to significantly reduce fishing pressure in the Mediterranean and the Black Sea region. One practical and effective solution would be to improve scientific research, which could lead relevant stakeholders to make better decisions in relation to fish stocks.

Although stable, catch levels are noticeably below the record numbers of the 1980s, which reached 2 million tonnes per year, and they could be improved further by focusing on large, mono-specific stocks, for instance. With respect to bycatch, more efforts should be directed towards protecting vulnerable species, especially sea turtles.

Protecting vulnerable and essential habitats requires identifying and establishing new fisheries restricted areas (FRAs) in order to safeguard priority areas from harmful fisheries activities. We can distinguish between three different types of FRAs: deep-water FRAs, essential fish habitats and vulnerable ecosystems. As an environmental solution, FRAs are vital for fisheries and Mediterranean and Black Sea ecosystems. These spatial measures should continue to be developed, as they help to progressively reduce the impacts of overexploitation and to slow down marine habitat degradation.

From an economic standpoint, the SSF sector still needs to be promoted, as it provides the highest number of onboard jobs but fails to generate enough revenue when compared to the other fisheries sectors. Furthermore, the sector intrinsically stands out as contributing most organically to the sustainability of fisheries in the Mediterranean and the Black Sea. Compared to other fisheries sectors, SSF generate significantly lower discards, which prepares them to fit well within the agenda of the GFCM mid-term strategy (2017–2020) towards the sustainability of Mediterranean and Black Sea fisheries. In addition, the SSF fleet dominates the region in terms of numbers; it is clear, then, that more efforts should be invested towards supporting the SSF sector, which is highly important not only to marine capture fisheries in the Mediterranean and the Black Sea, but also to the preservation of the sector as a whole and to the environment.

Side-event 2 – Demonstration of ICES Transparent Assessment Framework

Organized by ICES

Panelists

Arni Magnusson, International Council for the Exploration Sea (ICES)

Colin Millar, International Council for the Exploration Sea (ICES)

BACKGROUND

The International Council for the Exploration of the Sea (ICES) Transparent Assessment Framework (TAF) was officially launched at a lunchtime side-event on the first day of Fish Forum 2018. The presentation began with a live demonstration of the newly published web application and landing page: taf.ices.dk. For two different fish stocks, panelists showed how TAF enables scientists, reviewers, managers, stakeholders, journalists, NGOs and others to browse the input data, the analytical source code, and the results of any stock assessment. They also demonstrated how TAF updates result dynamically when changes are made to the assessment code, so that the final functioning assessment is maintained online and any changes are documented for transparency. The entire workflow is linked together, from the preparation of underlying data all the way to the final tables and figures for the management advice sheet.

What is TAF?

In 2016, ICES began the development of TAF, a new framework that organizes all stock assessments in a standard format that is open and fully reproducible. ICES releases advice for around 250 stocks per year, based on a very wide variety of models and related methods. After just over two years of development, the framework is now operational, and the first stock assessors are starting to run their analyses in TAF.

The TAF workflow is very general: stock assessors write four main scripts that run the assessment. The scripts are run sequentially to run the entire assessment from data preparation all the way to results tables and figures: data.R, model.R, output.R, and report.R. All required software and underlying data files are archived to support long-term reproducibility. Once the advice is released, anyone can browse the analysis online or download and run it on their own computer.

In addition to the main stock assessment, TAF users are encouraged to script the data pre-analysis, to calculate quantities such as survey indices and maturity curves, which are then used as input data for the stock assessment model. Likewise, after the main stock assessment has run, TAF users are encouraged to script the short-term forecast, which is often a key component of management advice.

In essence, a TAF assessment is a collection of R scripts, written by the stock assessor, along with two configuration files that declare the data and software required to run the analysis. This makes the analysis reproducible, so that it can run on any computer at a later time and produce the same result as the official stock assessment that was run on the TAF server.

To sum up, TAF is:

- a standardized way to structure analytical scripts;
- an online environment that can run those scripts and show the results; and
- an archive where official ICES stock assessments can be browsed.

CONCLUSIONS

Overall, TAF was well-received by the audience and following the demonstration, a general discussion proved useful and encouraging. During the discussion, acknowledging the growing demand across all the sciences to establish open and reproducible workflows, as clearly seen in fisheries science and management in recent years, participants were asked to think of a fish stock they work with and to

consider the challenging question: “Is the management of this stock based on open and transparent science?”

While stock assessors around the world are currently improving the openness and reproducibility of their assessments, a framework like TAF would provide them with a working environment that facilitates this process, making it easier to review analyses and improving quality assurance. In order to achieve these goals, however, stock assessors will need to change their work patterns – in some cases, quite substantially. To encourage this shift, the approach taken with TAF is to provide a tool with enough benefits to outweigh the costs. In this context, ICES is working to provide an easy-to-use interface, R-packages, and an accessible online archive of data and results, which should ultimately reduce the pressure on individual stock assessors and facilitate their work.

However, despite recognizing the importance of a greater openness in stock assessments, the general discussion shifted to the question of the possible consequences of such. For example, if anyone can browse and re-run an analysis, possibly changing some of the assumptions and ending up with different results than the original, this discrepancy could be used to discredit the science behind the stock assessment and ultimately undermine the management process. However, the counterargument maintained that society is already faced with copious so-called ‘fake’ news and science, and the best way to combat this issue is to open up discussions on the assumptions, models and expertise behind stock assessments. Increased scrutiny of a stock assessment should improve the quality of the assessment. There may also be wider positive implications – for example, if a stock assessment is found to be not very robust due to poor quality or lack of availability of data, then this exposure through TAF may result in a greater drive to improve the data used in the assessment. Most participants in the room agreed that society is adapting to greater access to information, and it is beneficial for everyone to see how evidence-based science is conducted and peer-reviewed.

Moving forward, members of the GFCM Secretariat expressed their eagerness to collaborate with ICES and further develop their own procedures and systems for storing stock assessments, data and results. Additional applications of TAF were also recognized during the discussion, including its potential as a capacity-building tool for non-European Union countries to improve the basis of scientific research when negotiating with the European Union on fishing opportunities.

Side-event 3 – Results of the Horizon 2020 SponGES project

Organized by FAO

Panelists

Hassan Moustahfid, Senior Fishery Resources Officer, FAO

Joana Xavier, SponGES Project Science Manager, University of Bergen, Norway

Hans Torre Rapp, Researcher, Department of Biology, University of Bergen, Norway

Ellen Kenchington, Principal Scientist, DFO, Canada

Ana Colaço, Researcher, University of the Azores

Vera Agostini, Deputy Director, Fisheries and Aquaculture Policy and Resources Division, FAO

BACKGROUND

The European Commission-funded project, Deep-sea Sponge Grounds Ecosystems of the North Atlantic: an integrated approach towards their preservation and sustainable exploitation (SponGES), is a four-year project with the objective of developing an integrated ecosystem-based approach to the preservation and sustainable use of vulnerable sponge ecosystems in the North Atlantic. The project aims to fill knowledge gaps on vulnerable sponge ecosystems and to provide guidelines for their preservation and sustainable exploitation. SponGES is divided into eight key work packages that address various components of this work. North Atlantic deep-sea sponge grounds will be mapped and characterized, and a geographical information system on sponge grounds will be developed to determine drivers of past and present distribution. Diversity, biogeography and connectivity patterns will be investigated using a genomic approach. The functions of sponge ecosystems and the goods and services they provide, such as those related to habitat provision, bentho-pelagic coupling and biogeochemical cycling, will be identified and quantified. This project will further unlock the potential of sponge grounds for innovative blue biotechnology, namely towards drug discovery and tissue engineering. It will improve predictive capacities by quantifying threats due to fishing, climate change, and local disturbances. SponGES outputs will form the basis for modelling and predicting future ecosystem dynamics under the pressures of environmental changes.

Work Package 8 from the SponGES project, focusing on resource management and conservation, aims to advance the science–management–policy interface of deep-sea sponge conservation and develop tools for improved resource management and understanding of these ecosystems, from the regional to the international level, across the Atlantic. This work package will provide decision-makers with the scientific knowledge necessary to achieve efficiency and sustainability in the use of deep-sea sponge grounds, to improve biodiversity conservation, and to guide the sustainable use of marine resources in areas outside of national jurisdictions through the systematic application of an ecosystem approach. Work package 8 consists of four main tasks:

8.1. Economic service evaluations of sponge grounds;

8.2. The promotion of dialogue between scientists, managers, policymakers, and stakeholders;

8.3. Capacity building to address sponge ground ecosystems within management frameworks; and

8.4. The development of tools for ecological risk assessments of sponge ground ecosystems.

CONCLUSIONS

From both an environmental and economic point of view, sponges represent great promise and importance. Not only do they possess filtration capacity and play a role in the recycling of organic material, but they also function as supportive, provisional, regulatory and cultural instruments and provide important economic possibilities as fisheries products and in pharmaceutical compounds. In this regard, the SpongGES project is a welcome initiative to help ensure their preservation and

sustainable use. Efforts made by the Food and Agriculture Organization of the United Nations (FAO) to define the interface between science and policy and to promote the importance of vulnerable marine ecosystems (VME) for environmental protection, particularly in fisheries, have also been well received.

Currently, conservation measures and international regulations are in place to protect sponge VMEs, as well as management-support tools, including sponge identification guides, a sponge grounds classification system and the SponGES data portal, and further tools are being developed within the scope of the SponGES project.

To assist in these conservation efforts, sponge grounds ecosystem characterization, mapping and modelling have been conducted. Data and samples, which are useful for ecosystem characterization, habitat description and mapping, have been collected. Records of past and current occurrences of sponges, together with their environmental drivers, have been registered into a SponGES database, making it possible to model and produce both hindcasts and forecasts for sponges. Coverage and high-resolution maps can be produced.

Throughout these efforts, it is important to consider potential threats to, and impacts on, sponges and sponge grounds, specifically those related to fisheries and climate change, and to assess them in relation to their effects on sponges, the community, the habitat and the services provided by sponges. Notable threats include longline and trawl fisheries, which can also reduce ecosystem services (e.g. carbon removal/recycling) due to the removal of sponge biomass, and thereby filtration capacity. Longlining bycatch can be minimized by modifying the gear, while the impacts of trawling are long-lasting, requiring a slow recovery process from tracks on the sea bottom. The simultaneity of stressors should also be taken into account, as while some sponges may be able to cope with limited stressors, multiple stressors can compromise their integrity and produce cumulative effects.

In order to mitigate and prevent these potential threats, FAO developed the International Guidelines for the Management of Deep-sea Fisheries in the High Seas in 2008, highlighting key actions, including the precautionary approach. Since then, major achievements have been made by regional fisheries management organizations (RFMOs) in applying the FAO Deep-sea Fisheries Guidelines. RFMOs, by applying the Deep-sea Fisheries Guidelines, are helping to achieve UN Sustainable Development Goals (SDGs). The FAO VME Database clearly illustrates their contribution.

Moving forward, connections with and support to European Union measures and regulations should be considered, along with sponges' importance for fisheries catch, the further development of Deep-sea Fisheries Guidelines and potential ways in which data and knowledge developed through the SponGES project for the North Atlantic can be transferred to main stakeholders working in the Mediterranean Sea.

The SponGES project has received funding from the European Union's Horizon 2020 research and innovation programme.

Side-event 4 – Implementation of the ecosystem approach at the regional level for the coordinated achievement of the SDG 14 targets

Organized by UN Environment/MAP – SPA/RAC

Panelists

Gaetano Leone, Researcher, UN Environment/MAP

Abdellah Srour, Executive Secretary, GFCM

Joseph Appiot, Associate Programme Officer, CBD

Mohamed Malouli Idrissi, Institut National de Recherche Halieutique, Casablanca, Morocco

BACKGROUND

The protection of our oceans, seas and coasts is important not only to preserve the environment but also to support livelihoods and responsible development.

The application of the ecosystem approach at the regional level through specific legal and management tools is crucial to the sustainable management of marine and coastal resources.

In the Mediterranean, cooperation between key regional institutions such as the European Union, the GFCM, the Secretariat of the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS) and the UN Environment/Mediterranean Action Plan – Barcelona Convention Secretariat (UNEP/MAP) has been instrumental in ensuring regional implementation of the ecosystem approach, with the common aim of achieving the Good Environmental Status (GES) of the Mediterranean Sea and its coasts, while contributing to the realization of the Aichi Biodiversity Targets, in particular Aichi Target 11, and providing support towards the achievement of the United Nations Sustainable Development Goals (SDG), in particular SDG 14.

The joint side-event co-organized by UNEP/MAP and the GFCM, in partnership with the Secretariat of the CBD, aimed to share best practices and lessons learned over the past decade to better implement the ecosystem approach at the regional level in a coordinated manner. The event focused on the following issues:

(1) regional and global ocean governance, key to the achievement of SDG 14;

(2) UNEP/MAP and GFCM cooperation in support of the sustainable management of marine and coastal environments, with a focus on spatial-based management measures;

(3) relevance of this cooperation and its effects on spatial-based management and sustainable development in the Mediterranean to the achievement of SDG 14 targets 14.1, 14.2, 14.4, 14.5 and 14.a;

(4) importance of science-based measures for the implementation of the UNEP/MAP Ecosystem Approach Roadmap (and for the preparation of quality status reports), for the implementation of the GFCM mid-term strategy (2017–2020) towards the sustainability of Mediterranean and Black Sea fisheries and for the implementation of Ocean Conference key recommendations, as well as the MedFish4Ever Ministerial Declaration; and

(5) further work ahead: conclusions and recommendations.

The side-event included presentations from representatives of UNEP/MAP, the GFCM and the Secretariat of the CBD; they provided examples of existing international and regional cooperation efforts towards the sustainable management of marine and coastal environment. The presentations focused in particular on the collaboration between UNEP/MAP and the GFCM on fisheries and environmental management in the Mediterranean region and on the Sustainable Ocean Initiative (SOI)

dialogue with regional seas organizations and regional fishery bodies and their contributions to the achievement of SDG goals and Good Environmental Status in the Mediterranean.

CONCLUSIONS

As demonstrated by the discussions and reflections of the side-event, presenting and exchanging viewpoints provides valuable lessons that can guide progress towards the coordinated achievement of SDG 14 in the Mediterranean.

This progress also benefits from the application of the ecosystem approach, adopted in the Mediterranean in 2008 by the Contracting Parties to the Barcelona Convention (Decision IG.17/6), which is key to the sustainable management of marine and coastal resources. The effectiveness of the method has been increasingly recognized at the global scale, particularly towards addressing climate change and improving disaster risk mitigation. Specific legal and management tools, such as the voluntary guidelines for the design and effective implementation of ecosystem-based approaches to climate change adaptation and to disaster risk reduction adopted at the CBD Conference of the Parties 14 (Sharm-El-Cheikh, Egypt, 17–29 November 2018), play a significant role in providing policy guidance for decision-makers.

Regional-level efforts, including those supporting the implementation of ecosystem-based approaches, are also important to the achievement of SDG 14. In this regard, the GFCM and UNEP/MAP launched a unique partnership including the implementation of a specific memorandum of understanding that was welcomed in recent years as a potential model for other regional seas at various key international meetings, including the SDG 14 Ocean Conference and the CBD SOI Global Dialogue. This exemplary partnership between a regional fisheries management organization (RFMO) and a Regional Sea Convention was registered as a voluntary commitment under SDG 14 in July 2017 at the New York Ocean Conference. The recent CBD SOI Capacity Building Workshop for Northern Africa and the Mediterranean, which was held in Tangiers, Morocco in August 2018, also highlighted that such efficient cooperation between a regional sea convention and an RFMO can support progress towards achieving Aichi Targets 6 and 11 at the national level in the countries of the region.

The collaboration between the GFCM and UNEP/MAP takes aim at a number of issues, including marine spatial planning, monitoring and assessment, scientific knowledge and specific environmental management goals, and thus plays an important role in supporting the implementation of the ecosystem approach in the Mediterranean and in advancing towards the achievement of GES and SDG 14 in the region. A further step would involve even closer cooperation in area-based management measures, which constitute a positive practice towards marine spatial planning following the ecosystem approach. Such measures can establish bases for further coordinated action, both to ensure harmonization of the criteria used to identify FRAs and Specially Protected Areas of Mediterranean Importance (SPAMIs) and to establish such areas in a more coordinated manner.

In order to enhance similar coordination efforts and dialogue between RFMOs and regional fishery bodies at the global level, the Secretariat of the CBD has launched the SOI, a global platform for capacity building and partnerships, which has played a key role in bringing such organizations together at the global level and promoting experience sharing, harmonization of approaches (particularly for monitoring and scientific assessments) and opportunities for collaboration.

Moving forward, stronger coordination and collaboration at the global and regional levels, underpinned by effective national-level coordination, would bring extremely valuable benefits to both countries and regional and global projects aiming to achieve SDG 14 and the Aichi Targets and ensure the sustainable management of marine and coastal environments over the long term.

Side-event 5 – ACCOBAMS Survey Initiative: preliminary results and identification of potential areas for cetaceans–fisheries interactions

Organized by ACCOBAMS

Panelists

Simone Panigada, Chair of the Scientific Committee, ACCOBAMS

Léa David, Researcher, EcoOcéan Institute

Ayaka Amaha Ozturk, Lecturer, Faculty of Aquatic Sciences, Istanbul University, Türkiye

Rimel Benmessaoud, PhD student, National Agronomic Institute of Tunisia, University of Carthage, Tunisia

BACKGROUND

The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS) was established in 1996 by the riparian countries of the Mediterranean and the Black Sea in order to create a legal basis for their cooperation towards improving the conservation status of cetacean species in both seas. ACCOBAMS was established under the auspices of the UNEP Convention on the Conservation of Migratory Species of Wild Animals (CMS, the Bonn Convention) and counts 24 contracting parties from the Mediterranean and the Black Sea as of December 2018.

This side-event featured presentations on the three main activities led by ACCOBAMS that contribute to the effort of assessing and mitigating cetaceans–fisheries interactions, in line with the GFCM mid-term strategy (2017–2020) towards the sustainability of Mediterranean and Black Sea fisheries: 1) the ACCOBAMS Survey Initiative (ASI); 2) the identification of important marine mammal areas (IMMAs) and Cetacean Critical Habitats (CCH); and 3) addressing cetaceans–fisheries interactions.

1) The ASI is the first large-scale marine megafauna survey under the coordination of the ACCOBAMS Permanent Secretariat, conducted in collaboration with all riparian countries. The presentation introduced the project and shared the preliminary results of Mediterranean aerial and ship-based surveys completed during the summer of 2018.

2) The ASI presentation was followed by two talks on biogeographical initiatives (IMMACCH) implemented in the Mediterranean and Black Seas. These complementary projects aim to identify priority areas for cetacean conservation and advance towards the definition and implementation of appropriate management and mitigation measures to reduce threats to cetaceans.

3) Two case studies focusing on cetaceans–fisheries interactions were presented, one on cetacean bycatch in the Black Sea and the other on the prevention of interactions between bottlenose dolphins and purse seiners in Tunisia (depredation).

CONCLUSIONS

The unprecedented results of the 2018 ASI carried out in the Mediterranean Sea demonstrated the importance and value of large-scale surveys to collect data on marine megafauna. Indeed, this method allows for the surveillance of areas that are usually difficult to access (offshore areas) and for which there is little information available.

While organizing regional surveys like ASI presents great challenges, they can, as discussed and highlighted during the meeting, significantly contribute to disseminating essential knowledge by providing important and robust data on vulnerable marine species (cetaceans, sea turtles, seabirds, fish and elasmobranchs) as well as on human impacts on the marine environment (e.g. floating marine litter). The ASI results will serve as a valuable baseline to monitor population trends and facilitate place-based conservation efforts and should be considered in light of existing threats to cetaceans.

The collected information is useful to assess cetaceans' distribution and abundance, to characterize their habitats and to assess the conservation status of various species. In particular, this information is useful to identify IMMAs, as per the criteria defined in UNEP/CMS Resolution 12.13. Overlaying this information with human activities and pressures will allow for the identification of CCHs, areas with specific needs for managing and mitigating the risks of interactions with human activities (e.g. high risk of collisions with maritime traffic and high risk of interactions with fisheries).

Regarding interactions with fisheries, bycatch (the incidental capture of non-target/non-commercial species) represents a key conservation issue in both the Mediterranean and the Black Sea and particularly affects vulnerable and highly mobile species such as cetaceans and marine turtles. Depredation caused by dolphins is also a major issue in some areas of the Mediterranean (Tunisia and Morocco), leading to critical situations with fishers that potentially undermine efforts towards the conservation of cetaceans in these countries.

It has been highlighted that gillnet fisheries are the most impactful of fisheries, affecting mostly dolphins. This is particularly true for those with long nets and long soak times in coastal waters, as in the Black Sea turbot fishery. Illegal fishing activity persists as well, despite several recommendations from various international conventions and agreements.

Attention has also been called to the fact that bottlenose dolphins interact with purse seines more than any other dolphins in the North of Tunisia. 53 percent of bottlenose dolphin sightings are associated with fishing boats or fishing nets. These interactions occur most commonly during the encirclement and pursing phases and cause many holes of different sizes at different locations in the net. The mending costs associated with dolphins' rips can reach EUR 600 per month, a price that is often too high for fishers to afford. Fish catches for operations with no dolphin interactions have been significantly greater than operations with dolphin interactions.

Assessing both bycatch and depredation issues requires a clear view and knowledge of the conservation status of cetacean populations, in particular of the distribution and abundance of cetaceans, as well as good assessments of the impacts of these interactions.

Efforts to address these interactions are to be made on a case-by-case basis, first characterizing the interactions, then testing appropriate measures (technical measures or measures related to the management of the relevant fishing activities). Particular attention should be dedicated to developing a participatory approach with fishers to ensure their full involvement in the process.

Side-event 6 – Ocean noise impacts on fisheries in the context of SDG 14

Organized by OceanCare

Panelists

Fabienne McLellan, Director of International Relations, OceanCare

Linda S. Weilgart, Adjunct Research Associate, Dalhousie University, Canada

Silvia Frey, Senior Conservation Scientist, OceanCare

Nicolas Entrup, Ocean Policy Expert, OceanCare

Bjørnar Nicolaisen, Fisher, Lofoten, Norway

BACKGROUND

The purpose of this side-event was to bring the growing body of scientific research on the impacts of ocean noise on fish, invertebrates, and fisheries to the attention of the GFCM, its members and relevant stakeholders.

In the context of United Nations Sustainable Development Goal 14.1 (SDG 14.1), which seeks to achieve a significant reduction of marine pollution of all kinds by 2025, this side-event underlined the need to address noise pollution and its potential consequences on fish stocks and fisheries and on global marine ecosystems and fisheries resources.

From a regional perspective, there are specific areas within the GFCM area of application that are heavily exposed to ocean noise. A 2015 study initiated by ACCOBAMS aimed to map the spatial and temporal extent of noise-generating human activities and to identify noise hotspot areas, along with those activities in conflict with cetacean conservation. The study showed that, when overlaying seismic exploration areas with GFCM FRAs, it became clear that FRAs have been impacted in the past and will continue to be impacted in the future by seismic exploration noise, with likely effects on fish stocks. Despite some gaps in the data, the study demonstrated that the Mediterranean Sea is subject to chronic noise exposure, which has increased considerably over the last decade and will continue to do so. Furthermore, the results added strong evidence for the effects of multiple stressors acting on the Mediterranean Sea and the urgent need for conservation and mitigation measures.

Anthropogenic ocean noise is also highly relevant to the United Nations 2030 Agenda for Sustainable Development and plays a role in undermining efforts to restore fish stocks with serious implications for human livelihoods and food security. As it currently stands, actions related to SDG 14.1, whether at the international, regional or national level, have placed only limited, if any, emphasis on ocean noise, and this lack of attention presents serious challenges to achieving SDG 14.1. Also, considering that SDG 14.4 demands measures be taken to restore fish stocks as quickly as is feasible, it is crucial to consider how ocean noise might impede these efforts.

CONCLUSIONS

The side-event highlighted the most recent research revealing the impacts of ocean noise on a wide range of fish and invertebrate species. Impacts include stunted growth, body condition, feeding, reproduction, abundance, immune competency, nutritional condition, catch rates, school coordination and structure, nest-caring and territory defense. Noise led to permanently damaged ears and sensory organs, developmental delays and malformations and increased stress, metabolism, masking and mortality. However, the research also showed that impacts extend beyond individual species to include communities of species and their interactions, compromising ecosystem productivity and ecological services, with commercial consequences.

With an eye towards potential solutions, best available techniques and best environmental practices have been developed for impulsive noise sources, such as seismic surveys and pile driving, as well as continuous noise sources, such as shipping. Regarding the issue of climate change, reducing noise

levels could represent a win-win result, as significantly lowering noise levels by reducing vessel speed would also be accompanied by reductions in CO_2 emissions and fuel cost savings – although incentive programmes and mandatory solutions to keep a level playing field for the private sector would need to be developed. Additionally, phasing out hydrocarbon exploration should be the next step in line with the Paris Agreement, but explicit plans are yet to be made.

While thorough assessments of noise-generating activities are of utmost importance for preventing irreversible harm, they can be prohibitively complicated for government agencies to review. In late 2017, the more than 120 Parties to the CMS adopted the CMS Family Guidelines on Environmental Impact Assessments for Marine Noise-Generating Activities to assist decision-makers with this important task. This same year, a regional workshop that investigated mitigating the impact of underwater noise on marine biodiversity in the southeastern European waters of the Mediterranean Sea was also held. Such workshops could act as models for other regions. Additional recommended actions could also be developed by examining the issue through the context of the decisions and processes of relevant international and inter-governmental bodies.

Beyond its environmental and ecological impacts, ocean noise has severe socioeconomic effects on fisheries. For example, in northern Norway, noise resulting from a series of seismic surveys has impacted fisheries, and professional fishers have expressed concerns over the lack of accountability taken by the oil and gas industry, including in the initial lack of compensation for the economic losses suffered by the region's fishers. In this context, the spatial overlap of seismic exploration activities could potentially be considered in FRAs when mapping fish stocks.

Moving forward, fishers should continue to be viewed as important sentinels and stakeholders who can contribute information from the field, and the issue of ocean noise should be considered as part of the GFCM's next strategy, to commence in 2021.

Side-event 7 – Sustainable Ocean Initiative Global Dialogue with Regional Seas Organizations and Regional Fishery Bodies: Global Platform for Regional-Scale Collaboration and Coordination

Organized by CBD, FAO, the GFCM and UN Environment/MAP

Panelists

Abdellah Srour, Executive Secretary, GFCM

Joseph Appiott, Associate Programme Officer, CBD

Piero Mannini, Senior Fishery Liaison Officer, FAO

Nicola Ferri, Legal and Institutional Officer, GFCM

Khalil Attia, Director, Mediterranean Action Plan/ Specially Protected Areas Regional Activity Centre

Iryna Makarenko, Pollution Monitoring and Assessment Officer, Commission on the Protection of the Black Sea Against Pollution (Black Sea Commission)

Anne Christine Brusendorff, General Secretary, ICES

BACKGROUND

The SOI is a global capacity-building platform coordinated by the Secretariat of the Convention on Biological Diversity and implemented in collaboration with a wide range of partners. Under the framework of SOI, the Secretariat of the Convention on Biological Diversity, the United Nations Environment Programme (UNEP) andFAO created an initiative to provide a platform for enhanced dialogue among regional seas organizations (RSOs) and regional fishery bodies (RFBs).

This initiative, called the SOI Global Dialogue with RSOs and RFBs, is the first of its kind at the global level. Thus far, two meetings of the SOI Global Dialogue have been convened in Seoul, Republic of Korea, the first taking place in September 2016 and the second in April 2018.

These meetings gathered representatives of RSOs and RFBs, including RFMOs, the United Nations, international organizations and initiatives, as well as experts from national governments and agencies and non-governmental organizations in order to:

- share experiences both within and across regions on various issues of common interest;
- identify realistic opportunities to enhance regional-scale collaboration and coordination on fisheries and environmental issues; and
- identify opportunities for enhanced regional-scale collaboration to contribute to global goals and processes.

The SOI Global Dialogue with RSOs and RFBs has also sought to share lessons from regions that have significantly advanced on regional-scale coordination, including the Mediterranean.

The side-event included presentations on the approach and outcomes of the SOI Global Dialogue, links to global processes for fisheries and biodiversity, examples of regional-scale collaboration and coordination in the Mediterranean and the Black Sea, and the role of scientific support to regional and global processes.

CONCLUSIONS

Since the establishment of the SOI Global Dialogue with RSOs and RFBs, there have been numerous experiences of cross-sectoral regional-scale dialogue, coordination and collaboration. These experiences are important as regional-scale collaboration plays a role in supporting the translation of global goals onto the regional and national levels and in facilitating monitoring and reporting to support global deliberations.

For example, the GFCM is working to achieve the United Nations SDG 14 and the Aichi Biodiversity Targets at the regional level in the Mediterranean and the Black Sea through its mid-term strategy and a Memorandum of Understanding with UNEP/MAP. This cooperation offers a leading example of cross-sectoral collaboration on areas of common interest and can be highly instructive to other regions struggling with similar challenges. Similarly, ICES is also working to enhance regional-scale collaboration by building knowledge to provide best available scientific advice to decision-makers (including at the regional scale in the northeastern Atlantic) on various marine issues, such as fish stocks, bycatch, and marine protected areas (MPAs).

Moving forward, as regions vary greatly in their political, economic, geographic, social and environmental characteristics, one-size-fits-all approaches may not be appropriate. Nevertheless, across the diverse regions, many of the experiences and lessons learned are transferable and applicable to other regional contexts. Additionally, several regions boast an array of bodies and agencies involved in marine and fisheries issues. This division of functions is driven by the economic and geopolitical realities of the regions, as well as by historic funding streams. However, proper coordination could capitalize on such complex networks of responsibility as a strength rather than a weakness.

Side-event 8 – Research and innovation initiative for blue jobs and growth in the Mediterranean area

Organized by the European Commission (DG RTD) and the UFM Secretariat

Panelists

Marta Iglesias, European Union

Alessandra Sensi, UfM Secretariat

Angelo Bonanno, CNR, Italy

Margherita Cappelletto, CNR, Italy

Marta Iglesias, Eueopean Union

Giuseppe Provenzano, UfM Secretariat

Marta Iglesias, European Union

Nayrah Shaltout, National Institute of Oceanography and Fisheries, Egypt

Mamoon Al-Rshaidat, University of Jordan, Department of Biological Sciences, Jordan

Dor Edelist, University of Haifa, Israel

Lotfi Ben Abdallah, Tunisia

Mustafa Yucel, Türkiye

Marta Iglesias, European Union

Alessandra Sensi, UfM Secretariat

BACKGROUND

The BlueMed Initiative offers a shared strategic framework for working towards a healthy, productive and resilient Mediterranean Sea. It aims to tap into the full potential of the marine and maritime sectors, as well as to reinforce transnational cooperation in order to create new blue jobs and to promote and improve social wellbeing, sustainable prosperity and the environmental status of the region and its surroundings. The initiative seeks to promote joint actions for research and innovation, including coordination, planning and programming of relevant research and innovation priorities, and to foster integration of the marine and maritime research industries and academia to maximize the leverage of research investments, both commercially and with respect to public policy at the regional, national and European Union levels.

Since 2017, the BlueMed Initiative has been formally opened to all Union for the Mediterranean (UfM) and European Union Member States. The Initiative will achieve its goals by implementing the BlueMed Strategic Research and Innovation Agenda (SRIA), the “soul” of BlueMed. The Agenda identifies key challenges and related actions and goals, according to three main pillars: i) enabling knowledge for the Mediterranean; ii) sectorial enablers in the Mediterranean; and iii) enabling technology and capacity creation for the Mediterranean.

The three main pillars of the SRIA take different aspects of fisheries and aquaculture into account, as the ecosystem-based management of Mediterranean aquaculture and fisheries represents one of the key challenges for the sectorial enablers. The Mediterranean stands out among European ecosystems in terms of biodiversity and links between human activity and environmental characteristics. It is experiencing rapid changes in response to both natural and anthropogenic pressures, and fisheries management is becoming more and more challenging. The Mediterranean’s unique features, however, also provide major local opportunities for blue growth and jobs.

A global perspective is essential to implement efficiently tailored actions leading to safe, secure and sustainable development for all. The UfM Blue Economy Ministerial Declaration and the Valletta Declaration call for the extension of the BlueMed Initiative to all countries of the UfM (European Union and non-European Union), and a specific BlueMed Working Group has been established within the EURO-MED Group of Senior Officials.

With a focus on its blue economy axis, namely under the 2015 Ministerial Declaration on Blue Economy, the UfM works to link the BlueMed Initiative with many other initiatives active in the region. Relevant UfM projects include Plastic Busters MPAs, which focuses on addressing hotspots, as well as cleaning up MPAs, and Med Coasts for Blue Growth (MedCoast4BG), which focuses on marine spatial planning (MSP), integrated coastal zone management and sustainable tourism. The UfM is also moving towards a potential Ministerial Meeting on Environment and Climate Change and Blue Economy.

CONCLUSIONS

The results of the wide consultation process (revised SRIA) show how national priorities from European Union and non-European Union Mediterranean countries were integrated into a shared Euro-Mediterranean/UfM research agenda for blue growth.

In Egypt, research and innovation priorities under the BlueMed initiative were defined, and the Egyptian national strategy for research and innovation 2030 was developed. The initiatives found that fisheries and aquaculture priorities will require, *inter alia*, developing aquaculture technologies through international partnerships, studying the factors affecting fish populations, growth and productivity, introducing effective management policies and applying modern approaches in fisheries management in order to protect fish stocks and increase fish productivity.

Jordan, with its unique coastal situation of just 27 km of seacoast under increasing pressures to respond to competing needs (transportation vessels, tourism, MPAs, etc.), also actively participates in the SRIA for Blue Growth. In fact, of the eight top priorities identified at the national level, the top three (water security, food security and energy security) align with SRIA priorities and those of the European Union. Moving forward, Jordan aims to tackle a number of key issues, including microplastics, and is active through a range of relevant projects, namely the Enterprise Europe Network EEN, Erasmus+ and the European Neighborhood Instrument Cross Border Cooperation in the Mediterranean.

Similarly, Israel has also identified its top research and innovation priorities, namely shipping, pollution, aquaculture and mariculture, marine spatial planning (MSP) (i.e. governance, stakeholder engagement, integrated coastal zone management and ecosystem-based management) and regional cooperation. Israel has also implemented reforms in the fisheries sector and identified the urgent need to improve monitoring, stock assessment, and fisheries research.

In Türkiye, BLUEMED Day was held in June 2018, and a detailed national consultation process has been at work. In this regard, Türkiye also identified its key priorities, including food systems, aquaculture, cultural heritage, biotechnologies and invasive species, and underlined the value of the SRIA as a tool to drive national efforts on blue growth and to address knowledge gaps.

In order to facilitate the sharing, updating, and implementation process of the SRIA, the BLUEMED Coordination and Support Action (CSA) project will support its next steps, engaging all Mediterranean stakeholders in the process through four BlueMed platforms (knowledge, economy, technology, and policy). The platforms are conceived as tools to facilitate cross-national communication and interplay among the research and private sectors, public administrations and civil society, aiming to consolidate the SRIA and determine its implementation plan. These platforms will be fed by each of the Member States working on the CSA and will help to improve the original SRIA.

In addition to the SRIA and CSA projects, BlueMed will launch a pilot initiative on a healthy plastic-free Mediterranean Sea in 2019, ideally supported and organized by the Group of Senior Officials BLUEMED Working Group countries.

With regard to other non-BlueMed projects, the European Union set forth to identify fisheries science gaps and examples of recently launched projects and initiatives. During the side-event, relevant projects dealing with climate change threats to fisheries and new technologies in fisheries (SmartFish H2020 and 'Symbiosis') were specifically highlighted.

The European Commission's proposal for Horizon Europe (the European Union Research and Innovation Programme for 2021–2027) will dedicate EUR 100 billion to research and innovation, with a focus on citizens' priorities, as well as on strengthening the European Union's scientific and technological bases and boosting Europe's innovation capacities, competitiveness and jobs. All stakeholders will be asked to participate in an open and transparent process to define priorities, including missions and partnerships, in preparation for the first work programmes under the Horizon Europe programme, due to begin in 2021.

Side-event 9 – Best practices in co-management between fishers and scientists in the European Union Mediterranean Sea

Organized by MEDAC

Panelists

Giampaolo Buonfiglio, President, MEDAC

Ana Macarena Molina Hernández, AKTEA

Marco Costantini, Fisheries Project Manager, World Wide Fund for Nature (WWF)

Bertrand Wendling, Association Méditerranéenne Organisation Producteurs

Morgane Marchand, Association Méditerranéenne Organisation Producteurs

Pier Luigi Piro, President, Pescatori di Orbetello

BACKGROUND

The side-event provided an overview of some of the best practices in co-management between fishers and scientists in the European Union Member States of the Mediterranean Sea.

In particular, some examples were presented from different Member States of projects and partnerships through which the consultation and the exchange of experiences between professionals, especially fishers in the SSF sector, have encouraged and enhanced partnerships with scientific institutions and other actors along the entire value chain.

One representative representing three Member States (France, Italy and Spain) focused his presentation on one project, explaining its main objectives and results.

CONCLUSIONS

One example of best practices in co-management between fishers and scientists is the European network AKTEA, which regroups women from 11 Member States, especially in southern Europe. The network is run on a volunteer basis with the following objectives: i) to promote the visibility and recognition of women's roles in fisheries and aquaculture; and ii) to promote women's participation in decision-making in fisheries and the acceptance of women's organizations by institutional frameworks related to the fisheries and aquaculture sectors.

The World Wide Fund for Nature (WWF) has also played a role in transforming Mediterranean SSF through the promotion of a co-management approach to fisheries, demonstrating the potential of SSF to become sustainable and improve fishers' incomes and livelihoods. The main comments that were raised centred on the involvement of public authorities in a co-management process, as the stakeholders are ready to begin the process. Meanwhile, fishers' participation must be facilitated at the institutional level. Moreover, it has been stressed that a legislation related to the co-management process does not yet exist.

Additionally, the three-year Galion Project aims to define new management methods for the trawler fishery in the Gulf of Lion (one of the most exploited areas in the Mediterranean). The project integrates several phases of data collection at sea into the framework of a proactive partnership between scientists, fishers and economists.

The PESCADOS CON ARTE (Fish with Art) project, carried out in the MPAs of the Almeria (Andalucia) and Murcia provinces, strives to raise consumer awareness of the importance of diversifying consumed species and choosing local and seasonal fish and to highlight low-impact fisheries and MPAs as sustainable management tools. It also aims to establish a network of sustainable restaurants that place value on fisheries' sustainability, including by offering low-impact fishing products.

Best co-management practices are also evident in the Orbetello Lagoon, which provides a model for the global management of the environment and resources all along the supply chain from catch to the final consumer through processing, selling, science, experimentation and surveillance. The Orbetello fishers and their products are well-established on the market and the fishers participate in co-management and decision-making processes together with local policymakers and administrative boards.

Finally, the increasing involvement of the Mediterranean Advisory Council (MEDAC) in the co-management and regionalization process significantly contributes to its implementation. More specifically, MEDAC's role in the decision-making process within the European Union serves as an example of mediation aimed at reaching a general consensus, reflecting various points of view on several subjects, and at drafting opinions incorporating ideas from a range of stakeholders (professional fishers, recreational/sport fishers, NGOs, trade unions). In fact, the European Union took some of MEDAC's opinions into consideration and transposed some elements into European regulation.

Appendix 1

Programme

Tuesday 11 December 2018

08.30–09.00 hours ***Participant registration***

09.00–09.30 hours ***Official opening***

09.30–10.30 hours ***Keynote presentations***

10.30–11.00 hours ***Coffee break***

11.00–12.00 hours ***Theme 1 – Better science for better advice***

Parallel session 1 – Improving knowledge on stock status

Parallel session 2 – Innovative strategies for the provision of advice

Parallel session 3 – The effectiveness of area-based management

12.00–14.00 hours ***Lunch break and side-events***

Launch of the State of Mediterranean and Black Sea Fisheries 2018 (SoMFi 2018)

Demonstration of ICES Transparent Assessment Framework

Results of the Horizon 2020 SponGES project

14.00–16.30 hours ***Theme 1 – Better science for better advice (cont.)***

Parallel session 1 – Improving knowledge on stock status

Parallel session 2 – Innovative strategies for the provision of advice

Parallel session 3 – The effectiveness of area-based management

16.40–17.30 hours ***Expert round table 1 – Promoting stakeholder dialogue towards harmonized fisheries management: Boosting the science–policy–stakeholder interface***

17.30–18.30 hours ***Theme 1 poster session***

Wednesday 12 December 2018

09.00–10.30 hours ***Keynote presentations***

10.30–11.00 hours ***Coffee break***

11.00–12.00 hours ***Theme 2 – Healthy seas and sustainable fisheries***

Parallel session 1 – Addressing climate change as a priority issue

Parallel session 2 – Addressing pressing environmental challenges

Parallel session 3 – Interactions between vulnerable species and human activities

12.00–14.00 hours ***Lunch break and side-events***

Implementation of the ecosystem approach at the regional level for the coordinated achievement of the SDG 14 targets

ACCOBAMS survey initiative: preliminary results and identification of potential areas for cetaceans/fisheries interactions

Ocean noise impacts on fisheries in the context of SDG 14

14.00–16.30 hours Theme 2 – Healthy seas and sustainable fisheries (cont.)

Parallel session 1 – Addressing climate change as a priority issue

Parallel session 2 – Addressing pressing environmental challenges

Parallel session 3 – Interactions between vulnerable species and human activities

16.40–17.30 hours Expert round table 2 – Natural and anthropogenic impacts: Effects of climate change, pollution and non-indigenous species on fish and fisheries

17.30–18.30 hours Theme 2 Poster session

Thursday 13 December 2018

09.00–10.30 hours Keynote presentations

10.30–11.00 hours Coffee break ATRIUM

11.00–12.00 hours Theme 3 – Economic analysis and technology for societal benefit

Parallel session 1 – Improving knowledge on the social and economic impact of fisheries

Parallel session 2 – Mapping value chains

Parallel session 3 – Marine technology promoting economic and environmental sustainability of fisheries

12.00–14.00 hours Lunch break and side-events

Sustainable Ocean Initiative Global Dialogues with regional seas organizations and regional fishery bodies: A global platform for regional-scale collaboration and coordination

Research and innovation initiative for blue jobs and growth in the Mediterranean area

Best practices in co-management between fishers and scientists in the EU Mediterranean Sea

14.00–16.30 hours Theme 3 – Economic analysis and technology for societal benefit (cont.)

Parallel session 1 – Improving knowledge on the social and economic impact of fisheries

Parallel session 2 – Mapping value chains

Parallel session 3 – Marine technology promoting economic and environmental sustainability of fisheries

16:40–17:30 Expert round table 3 – Technological future: High-tech advancements in fisheries research, management and fleet modernization

17:30–18:30 Theme 3 Poster session

Friday 14 December 2018

09.00–12.00 hours Final conclusions and priorities for the coming decade

Appendix 2

Opening and closing speeches

Opening address

Karmenu Vella, European Commissioner for Environment, Maritime Affairs and Fisheries

Ladies and gentlemen,

Thank you for giving me the opportunity to address you today. Fish stocks in the Mediterranean and the Black Sea are not doing well. Many are in a critical state. Ministers have recognized this. The recent MedFish4Ever Declaration and the Sofia Declaration affirm a strong political will to turn the situation around.

Now, we need to turn words into action. Within the GFCM, we have already enforced our management measures and we have enhanced our multilateral cooperation, but our actions need to be built on a strong foundation and that foundation needs to be sound, harmonized, global science. Only science can tell us how each stock is fairing. Only science can tell us how to best tackle stocks in bad shape. And only science will help us ensure a sustainable future for our fishers. Hard facts and data. If you want to persuade, that is the currency that counts. And not just biological data and scientific advice on fish stocks but also research on fishing technology, information on climate change and marine pollution, socioeconomic analysis of the fishing industry. In all these cases, without the input of scientists, we are fishing in the dark.

Today, it is fair to say, our scientific foundation is shaky. All too often, our visibility stops at national borders. We come across the issue of data caps. We struggle to share information across organizations and to coordinate our needs. Fisheries cannot be managed without science and science cannot happen without data and data sharing. Data collection is a crucial foundation of science and so, instead of confidently making sustainable decisions for the future, we find ourselves struggling to make a case.

We can and we must do better. Fisheries in the Mediterranean is a multibillion-euro industry. Thousands of local jobs are on the line. Our fishers are counting on us. Our very credibility as responsible fisheries managers is at stake.

The European Union is committed to the science agenda. Our research funding has already supported its calls for studies and hands-on scientific projects. For example, the Minouw project, which has improved gear selectivity. And we will continue to support data collection and scientific research at the national, European and international levels.

Today's Fish Forum is a good place to start. We need to streamline and coordinate the work carried out by different scientific bodies. We need to build new partnerships that allow us to make the most of often limited resources. So please, make the most of today's event. The future of our fish and of our fishers depends on you.

Thank you.

Opening address

Laurent Thomas, Deputy Director-General (Operations) on behalf of José Graziano Da Silva, FAO Director-General

Excellencies,

GFCM Chairperson (Mr Stefano Cataudella),

National Delegates,

Representatives of international and non-governmental organizations,

Ladies and gentlemen,

It is my honor to welcome you all today on behalf of the FAO Director-General, Mr José Graziano Da Silva, to FAO headquarters on the occasion of the GFCM Forum on Fisheries Science, which focuses on the Mediterranean and the Black Sea region but also has a global outlook.

In particular, I would like to express my thanks to the GFCM for spearheading this impressive event and to the over 30 partner organizations who have lent their support and know-how to the Fish Forum's successful realization.

This week promises to be a week of intense discussion and knowledge sharing: we have more than 300 registered participants from over 40 different countries, the expertise in this room encompasses oceanographic, social science and economic perspectives of marine research, and participants include researchers, managers, decision-makers and stakeholders themselves. You will have the chance to hear from internationally renowned scientists with solid experience in the field. However, the Fish Forum will also provide a chance to discuss innovative new ideas and hear from the future of research: namely the young scientists attending.

The oceans and their role as a source of renewable resources have been given a new impetus with the adoption of the UN Agenda 2030 and the specific Sustainable Development Goal 14 "Life Below Water", for which FAO has been appointed the custodian agency. FAO addresses SDG 14 against the background of its Strategic Objectives, particularly Strategic Objective 2, which focuses on the important role of fisheries and aquaculture in promoting sustainable development and Blue Growth. With the adoption of Agenda 2030, FAO is also achieving increased recognition by the international community as a result of its role as institutional catalyst for cross-sectoral collaboration underpinning the UN 2030 Agenda for Sustainable Development. Most recently, the UN has proclaimed a Decade of Ocean Science for Sustainable Development (2021–2030) to support efforts to reverse the cycle of decline in ocean health and gather ocean stakeholders worldwide behind a common framework that will ensure that ocean science can fully support countries in creating improved conditions for sustainable development of the Ocean.

FAO is committed to the Decade of Ocean Science for Sustainable Development as the Fish Forum demonstrates: its outcomes will directly contribute to this process. The Fish Forum is therefore an opportune occasion for putting forth strong and common priorities for the next decade of fisheries science – particularly for the Mediterranean and the Black Sea regions – helping to foster the science–policy interface. The diversity of participants in the Fish Forum attests to the crucial importance of scientific research for the future and confirms the relevance of this event in connection with the following priorities:

- Fish stocks in the Mediterranean and the Black Sea face immense challenges: 78 percent of all scientifically assessed stocks are considered over-exploited.
- Strong management measures need to be taken, and sound scientific advice is the foundation of this decision-making process.

- Building scientific capacity is key not only for current generations but also for future generations, as we have to make sure that scientists are equipped with the tools to address the ever-evolving challenges we will face.

The objective of the next days will therefore be to remove barriers to sharing knowledge and information. The Fish Forum aims to provide an overview of the latest trends and achievements in ocean sciences and technology, with a view to exploring common future needs and priorities.

Ladies and gentlemen,

The Fish Forum belongs to you, the scientists, and so I wish to cede the floor in order to ensure as much time as possible is dedicated to hearing your voices. I invite all of you to contribute actively to the discussions throughout this week and I hope you take this opportunity to strengthen your networks, exchange ideas and leave here with a renewed commitment to addressing our common goals. Please rest assured that FAO, including through the GFCM, stands ready to support you in this important task. I wish you a productive and successful Fish Forum.

Opening address

Stefano Cataudella, Chairperson, General Fisheries Commission for the Mediterranean

Excellencies,

FAO Colleagues,

Distinguished participants and friends of the oceans,

It is with pleasure that I have the honour of welcoming you, on behalf of the General Fisheries Commission for the Mediterranean of the FAO, to FAO headquarters for the celebration of the Fish Forum 2018. We have the privilege of holding this landmark conference in this building, which reminds us of the leading role that FAO plays when it comes to promoting the sustainable use of marine living resources, a commitment that now resonates through the UN Sustainable Development Goals.

The GFCM was established in 1949 pursuant to an international agreement adopted under the FAO Constitution. This agreement entered into force in 1952. Since then, the GFCM has been the regional fisheries body addressing Mediterranean and Black Sea fisheries, holding the power to adopt binding management measures. The ultimate goal of the GFCM is to promote the sustainable use of fisheries and the development of aquaculture. To this end, one of the most crucial functions enshrined in the GFCM agreement is the promotion of sound scientific research to inform the decision-making process. Most recently, as a result of the fourth amendment to the GFCM agreement in 2014, a participatory approach has been underpinned. This was possible not only through the creation of task forces gathering national representatives and several other stakeholders, but also by prompting concerted efforts in support of science. The priority was how to carry out scientific research in such a way that most quality inputs are taken into account when elaborating management measures.

Such development was instrumental to a number of changes. I would like to highlight here one particular change related to the GFCM Scientific Advisory Committee on Fisheries (SAC), namely the technical body providing the GFCM with scientific information in support of the decision-making process. The SAC held its first session in 1999, to replace a previous Committee on Fisheries Management, which at the time was criticized for giving advice tainted with political considerations. You can see how the promotion of a participatory approach fits into this institutional evolution of the SAC and why we need independent science.

The outcomes of the twentieth session of the SAC, held in Morocco this last June, showcase the success of the SAC in relying on independent science. It seems safe to affirm that today we have a more in-depth knowledge of Mediterranean and Black Sea fisheries and their ecosystems thanks to how scientific knowledge is being incorporated into the management of fisheries. However, neither the scientific knowledge honed nor the management measures adopted so far have proved enough to tackle the tremendous challenges we face. The current fishing pressure in the region is too high for the current productivity of stocks, and roughly 80 percent of the stocks scientifically assessed are currently considered to be fished outside of safe biological limits. A word of caution is thus in order: this scenario warrants the risk of a general failure, spanning from the international organizations in place to the institutes performing scientific research. This would have negative repercussions on any Blue Growth strategy which rests on sustainable fisheries as one of its pillars.

In light of this, the demand for scientific and technical advice on how to efficiently address such risk is unprecedented. It is therefore essential that all the actors concerned, from the scientific community to policymakers and NGO representatives, commit to synergies for the scientific work needed to adequately tackle the region's challenges. It begs the question: what kind of science do we need for this purpose? To me, the obvious reply is, as I have already stressed, independent science, not overshadowed by lobbies or sectoral interests. Otherwise, it simply won't be possible to adopt management measures that are based on the FAO Code of Conduct or, for what matters, credible to the eyes of those who are supposed to implement them. The event we are opening this morning is an

opportunity for us to look forward to ensure that the GFCM is provided with enhanced scientific advice in support of decision-making. This is an open call to all scientists and researchers with the skills to take on the challenge.

The Fish Forum will encompass oceanographic, ecological, social and economic perspectives on fisheries research. It will review leading work that has been carried out, while also addressing the pillars for the development of fisheries science. Consequently, it must be seen as a participatory platform to share and exchange information and as a catalyst to galvanize and organize the scientific community with a common interest in the sustainable use of fisheries. We have collected contributions from scientists in this region and beyond. Thanks to the tireless work of a devoted International Scientific Committee, more than 300 abstracts, of which 228 will be presented during the following days, were reviewed and assessed. The result is an impressive scientific programme, in which we strived to address all aspects of fisheries science, from stock assessment to marine ecosystems and socioeconomic or sustainability aspects. We'll go through these aspects in the remit of three main themes of the Fish Forum: (i) better science for better advice, (ii) healthy seas and sustainable fisheries, and (iii) economic analysis and technology for societal benefit.

With your insight into these aspects, we will have the opportunity to increase our understanding and knowledge on how the ecosystems in the ocean are changing and, among other outcomes, I envision that your expertise will contribute to defining the science we need for the future we want, to identifying action points for politicians to manage the oceans better than we are doing today and to contributing, from the Mediterranean and the Black Sea perspective, to developing a global science initiative for ocean stewardship.

Let me close by thanking the organizers of the Fish Forum: first, our co-host FAO, and then all partners for the trust they placed in us when we asked for support in the organization of this conference. My sincere thanks also go to the International Scientific Committee for their work in mobilizing the widest possible representation in the scientific teams attending the meeting and, last but not least, I would like to thank the GFCM Secretariat, the driving force behind the organization of the Fish Forum. As this is my last time speaking as Chairperson of the GFCM, I would be remiss to not acknowledge the efforts of the GFCM Secretariat to live up to the mandate they have been entrusted with and their commitment to give us the opportunity to ensure the sustainable use of fisheries.

I am looking forward to a stimulating week with all of you and I thank you in advance for your participation and contribution.

Closing address

Árni M. Mathiesen, **Assistant Director-General, Fisheries and Aquaculture Department, FAO**

Excellencies,

Honourable Ministers,

Distinguished participants,

Ladies and gentlemen,

We have reached the end of the first Fish Forum, and it is my task to provide some closing remarks. It is a privilege and an honour to be entrusted with such an undertaking. I know that this forum was the first event of this nature ever held in the Mediterranean and the Black Sea. With more than 120 talks and the same number of posters, plus the workshops, side-events and round tables, we can affirm that this forum has been an outstanding meeting to make science credible, visible and effective.

I am sure we have all benefited in some way from this Fish Forum. You have shared ideas, information, data, interpretations and visions, which will likely enrich your personal perspectives on the talent and scientific capacity that is possible to mobilize in this region. And therefore, it will help you to expand your networks and enhance your scientific accomplishment.

Numerous positions and points of view on very complex issues have been outlined and many messages have been delivered, covering the whole spectrum from science to policy action, and from the perspectives of researchers, producers, users, decision-makers and other stakeholders. I would briefly like to comment on three points aired during our deliberations that are closely related with the FAO spirit and with our commitment to achieving a sustainable future for all.

Let me start by highlighting that science is an essential element of sustainable development. Without reliable science for advice, there is no way to make real progress and attain a better and equitable future. As the European Union Commissioner of Environment, Maritime Affairs and Fisheries, Mr Karmenu Vella, has said in his message during the opening session: “Without reliable science for advice we are fishing in the dark.”

In this respect, I would like to remark on the role of the UN system, including FAO and the GFCM, in supporting and driving science for sustainability. Our organizations work very hard to reconcile ecosystems integrity with human activities and have joined forces with other UN organizations to launch several regulatory norms, some of them adopted by the Member States and other voluntaries, such as the UN SDGs. We know that many people consider that some of the SDG targets are aspirational, but we think that even so, they are still valid.

Let me quote an inspiring thought taken from Seneca, a Spanish philosopher who lived in Rome in the first century, who said:

“It is not because things are difficult that we do not dare; it is because we do not dare that things are difficult.”

This is the barrier we must remove, and this is the message I bring to you. I believe I can count on all of you to play a key role in transforming our blue planet for global sustainability. The ocean, our life support system, is threatened in many ways. We must change our way of exploiting its resources using new and existing solutions. The future must succeed, and the future starts now.

The second point I would like to remark on is that adopting a “sustainability imperative” requires that we do a much better job managing our resources, such as fisheries, while respecting the other human uses of the ocean; the need for integrative studies has never been more important.

We need a more comprehensive, a more interdisciplinary and a more robust science. Research into global sustainability must cross disciplinary boundaries and bring them together in order to understand socioecological processes and dynamics and to provide relevant knowledge and scientific

evidence. We need deeper cooperation between international organizations, governmental and non-governmental actors to secure institutional and economic support for learning as a strategy to deal with complex interactions and difficult decisions. Whereas we are gaining in complexity, we will be rewarded by having healthy oceans and wellbeing for all of us. At the same time, we will cope with the major achievement of acting with solidarity and equity both with developing countries and among different generations.

The last point I want to remark on is that we, FAO and the GFCM, are connecting science, seas, policy and people. This progress is based on a simple premise: that we, the people, can achieve a greater impact if we work together, breaking down national barriers to scientific cooperation. The new GFCM mid-term strategy 2017–2021 has provided a powerful basis for Member States to cooperate in addressing shared ocean challenges and responsibilities. The Malta declaration has also advocated for the contributions that marine and maritime sciences can make to restore the world's oceans. This is the way forward.

In fact, diversity is a source of enrichment and knowledge and may provide for the capabilities that we need to be adaptive and robust. In this regard, our extensive networks are a strong starting point for a better science–policy interface. As we discuss reshaping our governance models and the need for more inclusive decision-making processes, FAO is positioned to support this endeavor and contribute to the necessary changes, fundamental transformations and innovations that the world needs to move towards global sustainability.

We will do so by strengthening and building on our different international and intergovernmental and scientific programmes to improve access to scientific expertise, to build capacities for scientific research, including for young people and women, to innovate, adapt and learn and to promote a constructive dialogue between decision-makers and the general public.

Let me conclude by acknowledging all the participants for your dedication, commitment, and enthusiasm and for being able to produce this visioning process, which conclusions, I am sure, will guide future research projects and national strategies for the coming decade. This will be part of the Fish Forum's legacy. The momentum gained during this conference should be maintained and reinforced. I am sure that this scientific community can provide a crucial service to wider society, addressing the most pressing questions, including climate change, biodiversity, pollution and food security. I have heard that many of you have asked if the Fish Forum will be repeated soon. This is something that the GFCM has to decide internally, but I am quite confident in this respect.

Again, my sincere thanks for your commitment and let me also wish you a safe journey home.

Closing address

Stefano Cataudella, Chairperson, General Fisheries Commission for the Mediterranean

Dear Árni,

Dear participants,

I would like to say a few words to complement what Árni has just said. You have heard from him on the FishForum, the figures of this event and how successful it was. I have nothing to add to that: what we have witnessed over these four days is self-explanatory. There has been here, in this setting, unprecedented momentum to renew our commitment to science as the engine of policymaking – as I stressed at the outset of the Fish Forum, not just any science, rather good and independent science.

In this vein, I want to highlight two key outcomes of the FishForum which are tangible and knowledge-based. The first is *The State of the Mediterranean and Black Sea Fisheries 2018* issue, which was presented on Tuesday at a dedicated side-event. This publication is a lighthouse for all of us, as it brings information, data and methodologies to the fruition of the general public. We must know what we are talking about if we really want to revert the declining trend in the status of our stocks. And once again, SoMFi is about good and independent science, and I am confident it will be enhanced even further in the future.

Another publication of extreme significance that was referred to several times these days, and made available by the Fisheries Department, is the report on climate change and its effects on fisheries and aquaculture. This will be a landmark document that will hopefully inform us in making decisions to adapt to climate change and manage fisheries and aquaculture accordingly.

My main takeaway from this event is that the positive result it achieved must be an inspiration for us to strive for more. We have witnessed a strong willingness by all kind of actors to join forces in support of science in this region. The platform that was created this week ought not to be discontinued. Not only should the Fish Forum be repeated in due course, but it should be also integrated into the broader context of the GFCM. In my personal view, this platform has huge potential, partculary when it comes to feeding information to the Scientific Advisory Committee on Fisheries of the GFCM.

Dear all, as the soon-to-be former President of the GFCM, I would be remiss to not state that the Fish Forum has been one of the highlights of my eight-year tenure. Indeed, we saved the best for last.

I'd like to congratulate all of you while encouraging you to keep science at the very core of your work.

I doff my hat at all of you and I thank you once again.

Appendix 3

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List of posters

Theme 1 – Better science for better advice

Changes in life history parameters and landings trend of sardine in the Catalan coast

Author: Mr Marc Balcells Surroca, Institute of Marine Sciences (ICM-CSIC), Spain

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Decapod crustacean larvae and hydrodynamic processes in the northwestern Mediterranean Sea

Author: Ms Marta Carreton, Institute of Marine Sciences (ICM-CSIC), Spain

Co-authors: Guiomar Rotllant, Institute of Marine Sciences (ICM-CSIC), Spain

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Beatriz Nuño, Institute of Marine Sciences (ICM-CSIC), Spain

Joan B. Company, Institute of Marine Sciences (ICM-CSIC), Spain

The multidisciplinary approach to stock identification and state: case studies from the Mediterranean Sea

Author: Ms Roberta Cimmaruta, Tuscia University, Italy

Co-authors: Simonetta Mattiucci, Department of Public Health and Infectious Diseases, Section of Parasitology, Sapienza University of Rome, Italy

Giuseppe Nascetti, Department of Ecological and Biological Sciences, Tuscia University, Italy

New wrecks in the Adriatic, the beginning of a successful story on artificial reefs?

Author: Ms Barbara Čolić, Marine Explorers Society, Croatia

Co-author: Hrvoje Čižmek, Marine Explorers Society, Croatia

Parasitism in Anguillicola crassus and its impact on the fitness of Anguilla anguilla in Tonga Lake (Algeria)

Author: Mr Farid Derbal, Marine Bioresources Laboratory, Badji Mokhtar University, Algeria

Co-authors: Ariba Souheila, Marine Bioresources Laboratory, Badji Mokhtar University, Algeria

Kara Mohamed Hichem, Marine Bioresources Laboratory, Badji Mokhtar University, Algeria

Exploitation status and stock assessment by pseudo-cohort analysis of the Lepidopus caudatus in Tunisian waters

Author: Mr Troudi Dhaker, Institut National Agronomique de Tunisie (INAT), Tunisia

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Hechemi Missaoui, Institut National des Sciences et Technologies de la Mer (INSTM), Tunisia

Shaping natural mortality and stock productivity by the fish condition index in the stock assessment

Author: Ms Marilena Donnaloia, COISPA Tecnologia & Ricerca

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Pierluigi Carbonara, COISPA Tecnologia & Ricerca, Italy

Giuseppe Lembo, COISPA Tecnologia & Ricerca, Italy

Maria Teresa Spedicato, COISPA Tecnologia & Ricerca, Italy

Turbot stock management in the Turkish Black Sea coasts

Author: Mr Ertug Duzgunes, Karadeniz Technical University, Faculty of Marine Science, Türkiye

Co-author: Dr. Mustafa Zengin, Central Fisheries Research Institute, Türkiye

Fisheries biology of blue swimmer crab (Portunus pelagicus) in the Mediterranean waterfront of Egypt

Author: Mr Alaa El-Far, National Institute of Oceanography and Fisheries (NIOF), Egypt

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Madlin Habashy, National Institute of Oceanography and Fisheries (NIOF), Egypt

Assessment of Sepia officinalis population in the Egyptian Mediterranean coast

Author: Mr Alaa Eldin ElHaweet, Arab Academy for Science, Technology and Maritime Transport (AASTMT), Egypt

Co-authors: Khaleid Abd El-Wakeil, Assiut University, Faculty of Science, Egypt

Stock assessment of the red mullet (Mullus barbatus) in the Egyptian Mediterranean waters

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Otolith shape analysis as a tool for stock identification of Pagellus erythrinus in Tunisian coasts

Author: Mr Chiheb Fassatoui, Institut National Agronomique de Tunisie, Tunisia

Co-author: Mohamed Salah Romdhane, Institut National Agronomique de Tunisie, Tunisia

Environmental influence on the population dynamics of European hake in the western Mediterranean

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Discard trends in bottom trawl fishery in the Turkish Black Sea littoral

Author: Ms Aysun Gümüş, Ondokuz Mayis University, Faculty of Science, Türkiye

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A multidisciplinary approach to assess the transboundary nature of Mediterranean fish stocks: the TRANSBORAN project

Author: Mr Manuel Hidalgo, Spanish Institute of Oceanography (IEO), Spain

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Reproductive biology of turbot (Scophthalmus maximus), from the northwestern coasts of the Black Sea, Bulgaria

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Counting recreational fishing vessels from space in the Aegean Sea (eastern Mediterranean Sea)

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Biological characteristics and stock assessment of Lithognathus mormyrus along the Lebanese coast, Levantine basin

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Parasites as biological tags for Mediterranean fish stock characterization

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How small-scale fisheries (SSF) Traditional Ecological Knowledge (TEK) is used in the Marine Stewardship Council (MSC) certification programme and tools

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EMODnet Black Sea checkpoint: Framework for quality assessing fisheries management and impact data sets

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Trawl surveys to support fisheries management in the Adriatic Sea

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European hake assessment based on size frequencies and basic biological parameters in the southwestern Mediterranean

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Discards and IUU fishing in rapa whelk fisheries in the Black Sea, Türkiye

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Characterization of fisheries of Squilla mantis (L., 1758) in Tunisian waters: implications for management

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Can data mining on YouTube reliably inform about patterns of fish catch in recreational fisheries?

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MEDLEM archive to evaluate the bycatch of elasmobranchs in the Mediterranean basin

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Commercial fish population in the Romanian Black Sea area – Stock changes generated by certain diseases

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An investigation of age, growth and mortality of the red mullet (Mullus barbatus, Linnaeus, 1758) in the western Black Sea

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Artisanal small-scale fisheries in the future MPA of "Taza" (southwestern Mediterranean): A multispecies multigear fishery

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Modelling the food web of Thermaikos Gulf (northeastern Mediterranean Sea, Greece)

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Lagrangian backtracking of small pelagic larvae: assessment of spawning and connectivity

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Study about the effectivity of the artificial substrates for cuttlefish and squid lays

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Searching for patterns in Octopus vulgaris locations on pot fishing lines

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Operating a Network of Integrated Observatory Systems in the Mediterranean Sea (ODYSSEA): The role of Gökova Observatory

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Biological, economic and technical vessel use indicators: a tool for fishing capacity management?

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An environment friendly structure for enhancing economy and sustainable utilization of Mediterranean and Black Sea

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What should be the minimum landing size (MLS) and minimum mesh size (MMS) in the whiting fisheries with gillnets on Black Sea?

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The implementation of a pilot case study on the Ecosystem Approach to Fisheries in Lebanon

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Review of the state of Gulf of Gabes fisheries management

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Managing mass fish mortalities in Greece: The IMBER-adapt network approach

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Contributions of coastal MPAs to marine ecosystem recovery and fisheries sustainability in the northwestern Mediterranean

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Oceanographic and biological connectivity of Nephrops norvegicus and of Solea solea in the Adriatic Sea

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An operative tool to evaluate the environmental status of epimegabenthic communities subject to trawl activities

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Création d'une réserve marine avec les pêcheurs professionnels petits métiers dans une AMP (Agde, France)

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AIS as a useful system to support the identification of fisheries restricted areas

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Spatial modeling of trawling in the Mediterranean Sea: predicting the effects of Fisheries restricted areas

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Fish gut content analysis: gilthead seabream (Sparus aurata Linnaeus, 1758) from the Orbetello Lagoon (Central Italy)

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Hake trawlers spatial management in the Gulf of Lion: science-fisher modeling efforts for realistic scenarios

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Theme 2 – Healthy seas and sustainable fisheries

Sustainability of bioresources in the Black Sea as adaptation to climate change

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Biology and ecology of invasive flat crab, Percnon gibbesi (Crustacea, Percnidae), in the Gulf of Annaba, Algeria.

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Some biological aspects of the blue swimming crab (Portunus segnis) in the Mediterranean

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A new rapid and robust procedure for isolating microplastics ingested by fish

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uSea: A crowdsourcing app monitoring invasive alien species (IAS) in the Mediterranean Sea

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Do diet variations influence the body condition of the French Mediterranean planktivorous teleosts?

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Pilot assessment on microplastic in guts of commercially available fish species

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Biological parameters of invasive species Lagocephalus sceleratus and Pterois miles in the Lebanese marine waters

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Preliminary assessment of trace elements in Mytilus galloprovincialis from a coastal lagoon in Sardinia (Italy)

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Population structure of the Atlantic blue crab Callinectes sapidus (Rathbun, 1896) in two Albanian lagoons (South Adriatic)

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Pilot assessment of marine litter in the fishing and aquaculture areas in Tunisia

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Management, threats and opportunities of invasive rapa whelk, Rapana venosa, in the Black Sea

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Spatial variability of plastic ingestion by Boops boops (Linnaeus, 1758)

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South Aegean coasts in terms of microplastic pollution: present and future perspective

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Non-indigenous fish and crustaceans species along the Montenegrin coast (South Adriatic)

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The Impacts of ocean noise pollution on fish and Invertebrates

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Exploring overlap between microplastic ingestion in marine species and plastic in the continental shelf and slope

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Killer whale, Orcinus orca, in the Strait of Gibraltar and interactions with Spanish tuna fisheries.

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Caractérisation et estimation des rejets du chalutage benthique de la pêcherie de Mostaganem (Algérie)

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Contribution à l'analyse des captures accidentelles d'élasmobranches au port de pêche de Zarzis (golfe de Gabès, Tunisie)

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Bottlenose's dolphin depredation in the Tunisian sardine purse-seine fishery: factors that could engender depredation

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Marine megafauna bycatch in the Italian Adriatic pelagic trawl fishery

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Preliminary assessment of shark bycatch in pelagic fisheries of Southeastern Adriatic (Montenegro)

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Does DDD03-H reduce interactions between bottlenose dolphins and sardine purse seine in northeastern Tunisia?

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Genetic Diversity of White Sharks, Carcharodon carcharias, in the Gulf of Gabès (central Mediterranean Sea)

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Study and damage assessment of the interaction of cetaceans with the trammel nets in Gandia

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Implication des pêcheurs dans la conservation: le cas des petits métiers de la zone Natura 2000 Camargue

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Mediterranean angel sharks in the spotlight

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WARNING! Do not exploit before assessing their vulnerability - mesopelagics of the eastern Mediterranean

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Fish behaviour in Mediterranean demersal trawl mouth

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Conservation of the most endangered marine species under international and European law: Perspectives for future developments

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Assessment of trawling pressure in the Italian Natura 2000 network

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Technical solutions for small-scale driftnets

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Trawl selectivity of a shark-excluding grid device

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Elasmobranchs bycatch in bottom longline: Management options

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Size selection in Dyneema netting codend compared to traditional codend in Mediterranean bottom trawl

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Conflict between fisheries and cetaceans in the Bulgarian part of Black Sea

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Theme 3 - Economic analysis and technology for societal benefit

Quantifying ecosystem impacts and economic profitability of fisheries in the Strait of Sicily

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Monitoring of fisheries activity in the southern lagoon of Tunis

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Local ecological knowledge (LEK) as a support for Octopus vulgaris fisheries management

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Application of information and communication technologies for economic and environmental sustainability of fisheries

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Analysis of fishing vessels operational profiles

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Use of artificial reefs in the Black Sea

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Scalable live tracking and modular fisheries information solution beneficial and essential to all sectors and levels within the fisheries industry

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Caractérisation socioéconomique de la pêche dans la retenue du barrage Sidi Saâd (Centre de Tunisie)

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Investigation of exoparasites of Sparus aurata and Boops boops in the Syrian marine waters

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Investigation of exoparasites of Sparus aurata and Boops boops in the Syrian marine waters

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Traditional production of clam in Southern Tunisia: value chain and environmental constraints

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Potential for positive synergies important in the interactions between small-scale fisheries and other maritime activities

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Spatio-temporal fishing effort on bathymetric zones in the Aegean Sea using VMS data

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Spatial distribution of elasmobranch species in the Gulf of Gabes (GSA 14) based onboard observer method

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Some socioeconomic indicator in Algerian fisheries. Study case: Annaba port

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A framework for small-scale fisheries sustainability in the context of the UN Sustainable Development Goals

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Marine policies and vulnerability of fishing community

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Kolkheti National Park's fish diversity

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Bioeconomic modelling of the Black Sea anchovy fisheries: An age-structured model under climate uncertainty

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Fisheries buyback Programmes in Türkiye: Overall results of five-year experiences

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A bioeconomic model to test regulation measures in fisheries of the Strait of Sicily

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Italian fisheries mapping

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Sustainable fisheries on the open sea island – the island of Vis, Croatia

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