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Scenarios to recover biodiversity and rebuild fish stocks in the Mediterranean
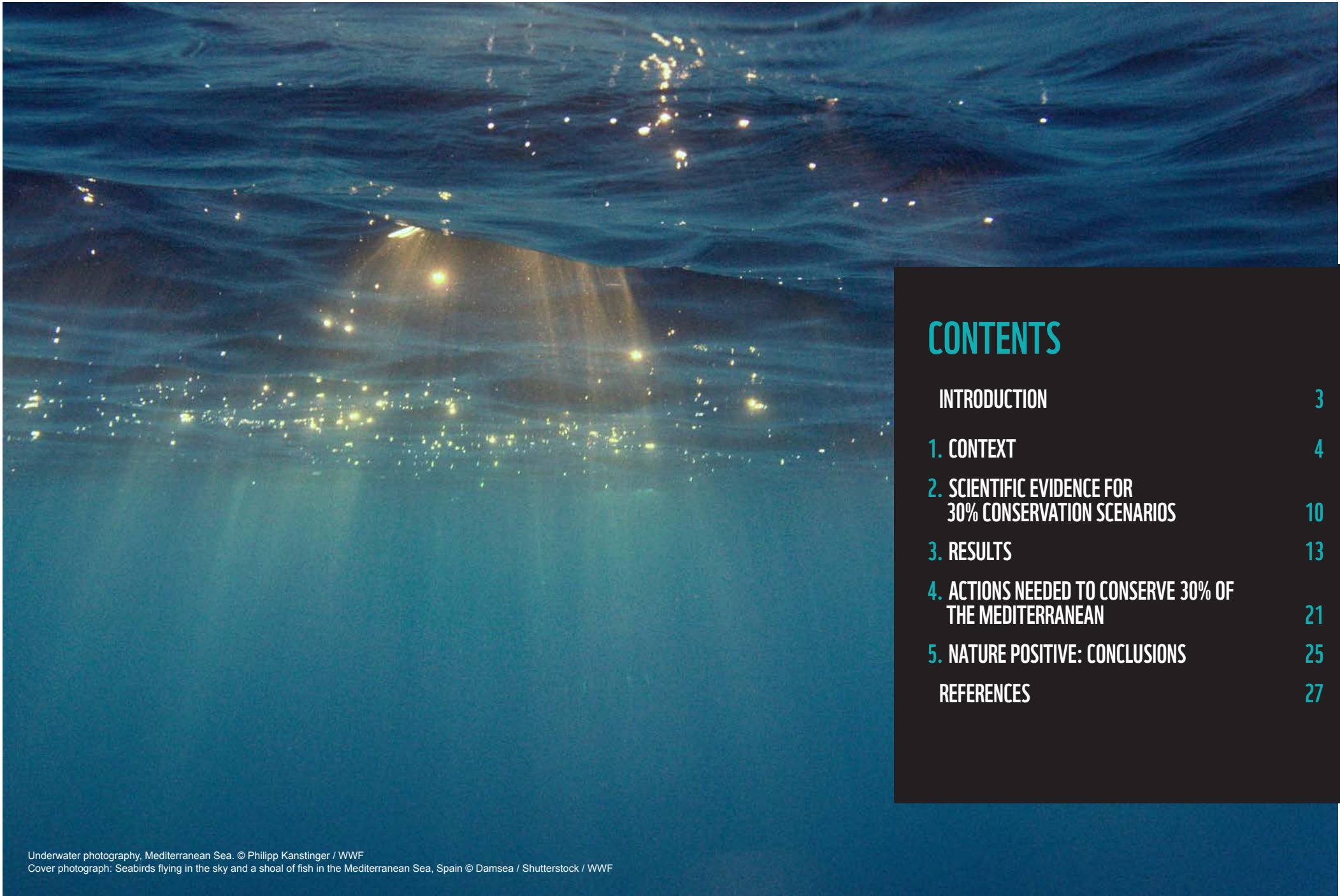
CONTENTS

Underwater photography, Mediterranean Sea. © Philipp Kanstinger / WWF
Cover photograph: Seabirds flying in the sky and a shoal of fish in the Mediterranean Sea, Spain © Damsea / Shutterstock / WWF

INTRODUCTION

The economy in the Mediterranean depends on healthy marine ecosystems, especially in the fishing and tourism sectors. Yet biodiversity and fish stocks have declined dramatically, and climate change and rapid economic development threaten further losses. To secure the future of the region and its communities, WWF and others are calling for a network of effective marine protected areas (MPAs) and other effective area-based conservation measures (OECMs) covering 30% of the Mediterranean Sea by 2030.

Designated MPAs now cover 9.68% of the Mediterranean Sea, but effectively managed ones make up just 1.27%. **Conserving in an effective way at least 30% of the Mediterranean Sea will be crucial to maintain and restore biodiversity,** which is the foundation of marine ecosystems and their capacity to:

- **Rebuild fish stocks**
- **Mitigate the impacts of climate change**
- **Secure the future of sustainable fisheries and tourism**
- **Guarantee food, livelihoods and well-being for local communities.**

WWF collaborated with marine research institutes to provide the first scientific study on how a proposed 30% conservation target would change the marine biodiversity and the fish stocks of the Mediterranean Sea. These scenarios propose candidate areas to protect that will contribute to reaching the 30% target by 2030. They show also how removing unsustainable industrial fishing and other damaging activities from these areas would reverse the current trend of decline in the marine ecosystem.

This report summarizes the key findings of this research, and outlines a series of actions to support Mediterranean countries to achieve the 30% target.

WWF CALL FOR A POST-2020 GLOBAL BIODIVERSITY FRAMEWORK

Worldwide, governments, businesses, leaders and civil society are calling for a New Deal for Nature and People to put nature on a path to recovery by 2030 and transition to a nature-positive world that safeguards human health and livelihoods.

WWF is calling for a strong and ambitious post-2020 global biodiversity framework under the UN Convention on Biological Diversity (CBD) to be agreed in 2021, with a set of established transformative principles and delivery mechanisms to guide its effective implementation, to:

PROTECT AT LEAST 30% OF THE PLANET
AND SUSTAINABLY MANAGE THE REST

WORK TO RESTORE NATURAL HABITATS
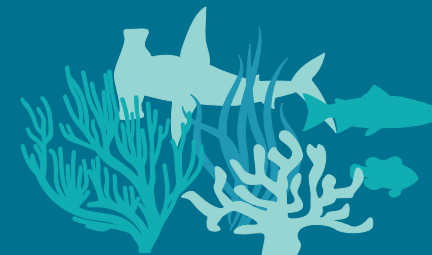
RECOGNIZE PEOPLE'S LAND & WATER RIGHTS

1. CONTEXT

THE ENVIRONMENTAL AND CLIMATE CRISIS IN THE MEDITERRANEAN SEA AND ITS SOCIO-ECONOMIC IMPACT

The Mediterranean is one of the most economically important seas in the world, generating an estimated annual economic value of US$450 billion from ocean-related activities.

THE CURRENT BLUE ECONOMY MODEL IS UNSUSTAINABLE AND LIKELY TO JEOPARDIZE THE SAME ASSETS THAT IT DEPENDS ON.

Trawler operating in the Mediterranean Sea © Isaac VEGA / WWF
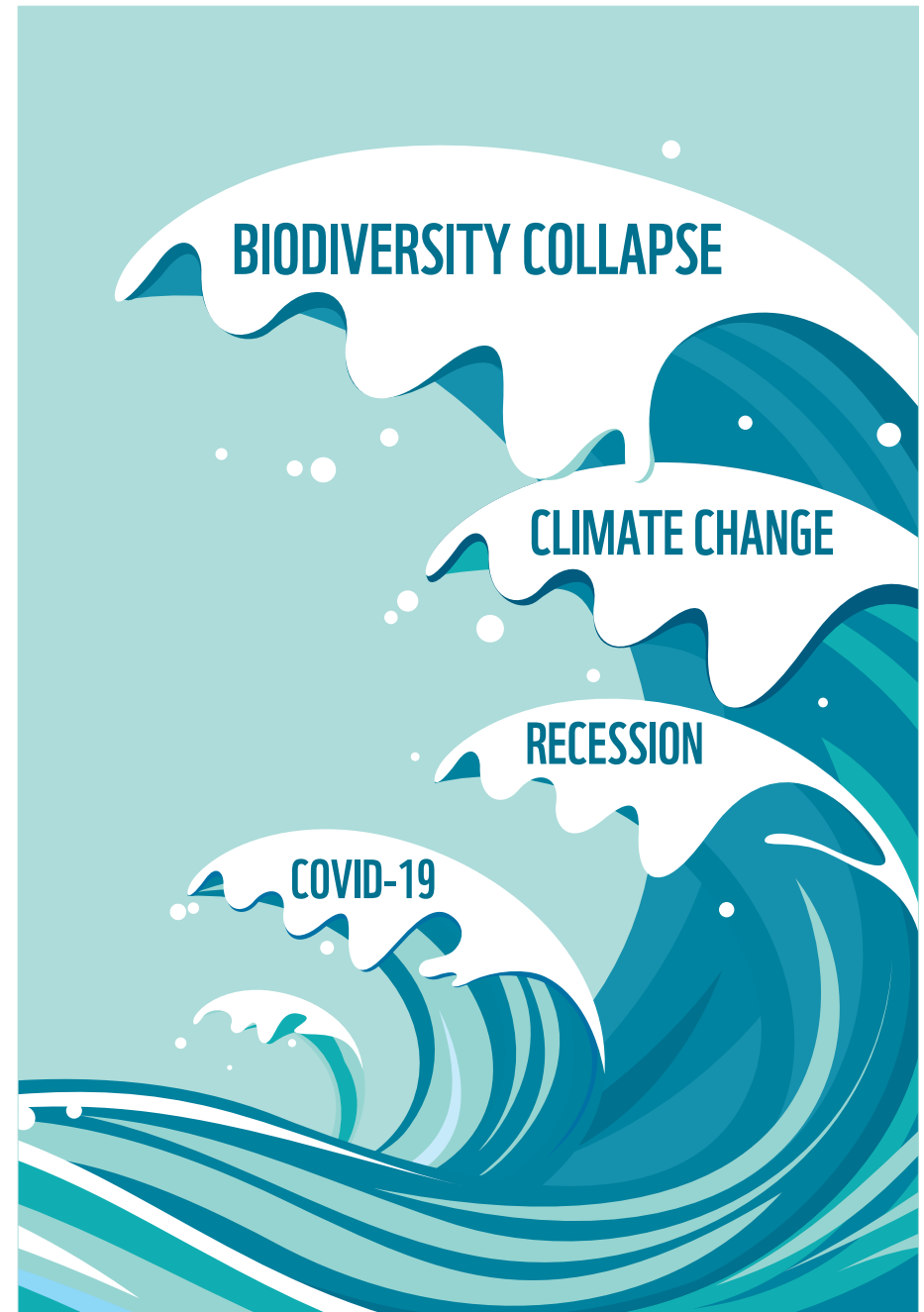
MEDITERRANEAN BLUE ECONOMY

The Mediterranean is one of the most economically important seas in the world, generating an estimated annual economic value of US$450 billion from ocean-related activities (Randone et al., 2017).

But this economy depends on healthy marine ecosystems and biodiversity, especially in the fishing and tourism sectors. The fishing sector directly or indirectly employs 505,000 people, 55% of them small-scale fishers, while 16% of the Mediterranean population works directly or indirectly in tourism (Randone et al., 2017, FAO/GFCM, 2020).

Today, from south to north, from east to west, local economies in the Mediterranean countries have been gravely hit by the **COVID-19 pandemic**. Lockdown and travel restrictions have led to a sharp contraction of tourism with a significant impact on the local economy, and the sector is expected to remain weak in the near future. Similarly, the small-scale fishing sector has been affected by the drastic closure of the market and the continued uncertainty, economic downturn, and the fall in tourism (FAO/GFCM, 2020).

Unfortunately, the current **socio-economic crisis** rests on deeper structural problems. Rapid, unsustainable development is increasing pressures on an already fragile environment, with a continuing **loss of biodiversity** (FAO/GFCM, 2020). About 75% of the assessed Mediterranean fish stocks are overfished. Mediterranean seagrass (*Posidonia oceanica*), an important carbon sink and buffer against sea acidification (Hendriks et al., 2014), has decreased by 34% over the past 50 years (Telasca et al., 2015). More generally, habitat loss and degradation, pollution, overexploitation of marine resources, introduction of alien species and **climate change** have dramatically reduced marine diversity (Coll et al., 2010).

Future trends look even more dramatic than those of the past. The Mediterranean region is facing a "blue gold rush" where a range of maritime activities, including wind farms, oil and gas extraction, shipping routes and mass tourism, are predicted to expand substantially by 2030 (Randone et al., 2017). The parallel development of all these sectors will likely result in conflicts in the use of marine space and cumulative negative impacts on natural resources and marine ecosystems.
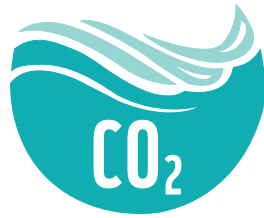
505,000
PEOPLE EMPLOYED IN THE FISHING SECTOR

55%
ARE SMALL-SCALE FISHERS

16%
OF MED POPULATION EMPLOYED IN THE TOURISM SECTOR

BIODIVERSITY COLLAPSE

CLIMATE CHANGE

RECESSION

COVID-19

IMPACTS OF CLIMATE CHANGE IN THE MEDITERRANEAN SEA

OCEAN WARMING

Water temperatures are expected to increase between +1.8°C and +3.5°C by 2100
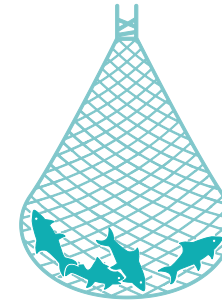
OCEAN ACIDIFICATION

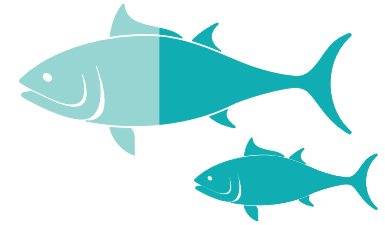The sea is expected to become 0.018 to 0.028 pH units more acidic per decade

REDUCED INCOME

Climate change is already significantly altering the ability of marine fisheries to provide food and income in the region

DECREASED FISH STOCKS

Ecosystem models have predicted reduced fishery productivity in temperate regions

REDUCED BODY WEIGHT

The average maximum body weight of fish is expected to shrink by 4 to 49% from 2000 to 2050

With temperatures increasing 20% faster than the global average (MedECC, 2019), **the Mediterranean is a hotspot of climate change.** Water temperatures are expected to increase by between +1.8°C and +3.5°C by 2100, while the sea is expected to become 0.018 to 0.028 pH units more acidic per decade as it absorbs carbon dioxide (MedECC, 2019). These alterations would lead to changes in species composition, abundance and distribution (Moatti and Thiébault, 2016), with ramifications on food web dynamics and ecosystem functioning. More specifically, climate change is already significantly altering the ability of marine fisheries to provide food and income in the region (IPCC, 2019). Ecosystem models have consistently predicted reduced fishery productivity in tropical and temperate regions (Lotze et al., 2019). In the Mediterranean, the average maximum body weight of fish is expected to shrink by 4 to 49% from 2000 to 2050 due to warming water and decreased oxygenation, in combination with overfishing (MedECC 2019).

Against this backdrop, it is vital to ensure that economic development does not cause further damage to the Mediterranean's natural assets. Biodiversity must be preserved and restored, as it is the foundation for marine ecosystems and their capacity to provide food security, jobs, climate regulation and human wellbeing. Rebuilding marine resources to a healthy status is a precondition for securing a future for the region and its communities and achieving the Sustainable Development Goals (SDGs).

MORE AMBITIOUS CONSERVATION TARGETS FOR THE MEDITERRANEAN

The World Economic Forum and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) have both identified biodiversity loss as one of the main threats to global economic prosperity. In particular, increasing concern regarding the ongoing depletion of marine ecosystems has led to urgent calls to increase the global networks of MPAs, one of the key tools to preserve and restore biodiversity and the functioning of marine ecosystems (Claudet et al., 2008; Edgar et al., 2014). In addition, the Intergovernmental Panel on Climate Change recommends protecting and restoring coastal and marine ecosystems that are able to sequester and store atmospheric carbon – so-called "blue carbon" ecosystems – as one of the five areas of ocean-based climate actions (Hoegh-Guldberg et al., 2019).
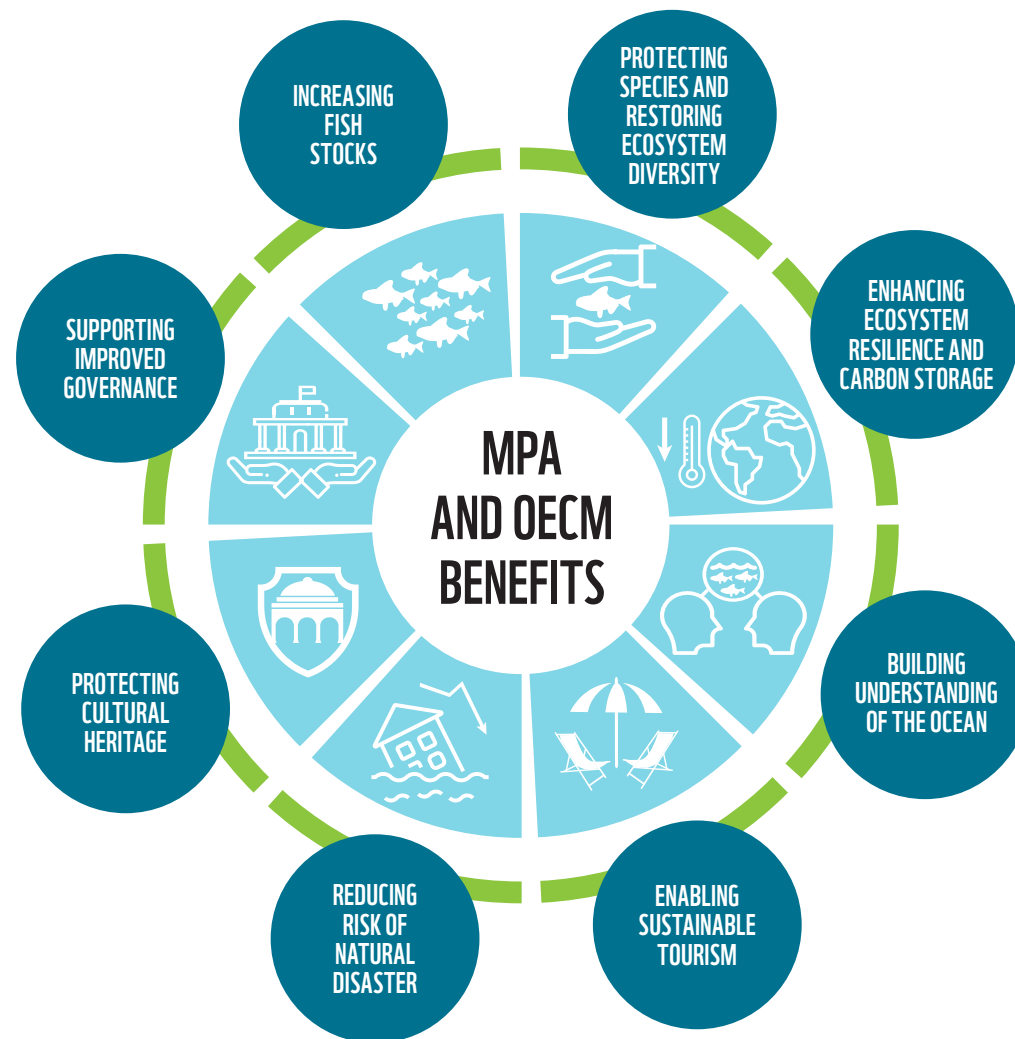

Figure 2: Benefits of MPAs and OECMs

Under the CBD Aichi Targets, countries were supposed to protect 10% of their seas by the end of 2020. Thanks to increased regional efforts to reach this target, designated MPAs now cover 9.68% of the Mediterranean Sea. But only a small part of this total is being effectively managed: a recent assessment showed that MPAs where a management plan is being implemented cover just 1.27% (Gomei et al., 2019). As the map below clearly shows, most of the Mediterranean is left unprotected. But the 10% target is far short of what is needed to protect and restore our seas. Scientists to business leaders, civil society to countries' high-level representatives are calling on governments to make an ambitious global commitment to restore nature through the CBD's post-2020 global biodiversity framework.
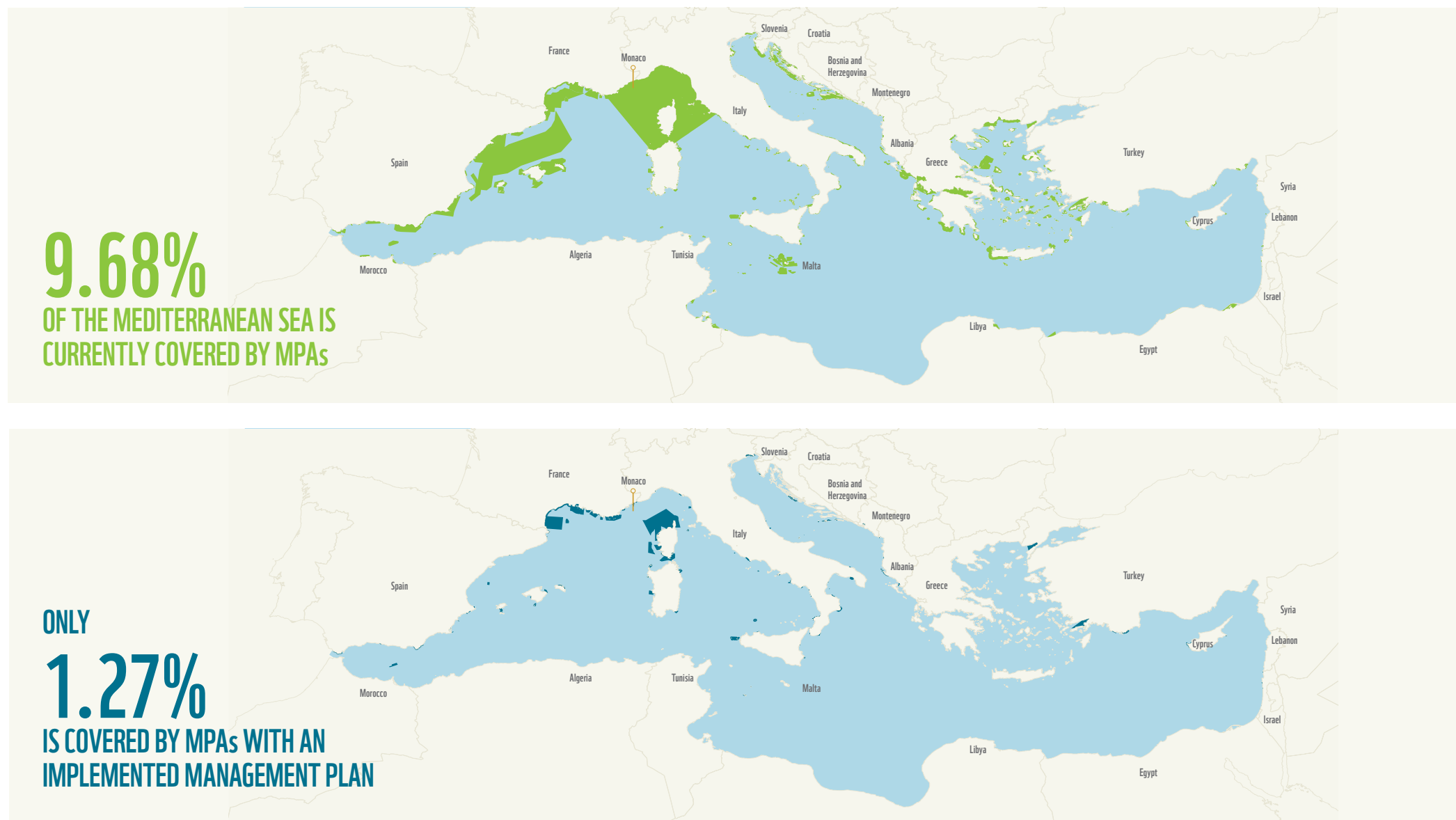

Figure 3: Designated MPAs currently cover 9.68% of the Mediterranean (above), while those operating with a management plan cover just 1.27% (below)

© Wild Wonders of Europe / Zankl / WWF

WWF is calling for a strong and ambitious post-2020 global biodiversity framework, with a set of established principles and delivery mechanisms to guide its design and implementation. This new framework needs to include a target to conserve 30% of the planet as follows:

By 2030, conserve at least 30% of land, inland waters, coastal and marine areas respectively, through ecological networks of effectively and equitably managed, ecologically representative and well connected protected areas and other effective area-based conservation measures (OECMs), integrated into wider land- and seascapes, ensuring especially the value of areas of particular importance for biodiversity and ecosystem services such as Key Biodiversity Areas (KBAs), and Ecologically or Biologically Significant Marine Areas (EBSAs) is documented and conserved.

MORE AMBITIOUS CONSERVATION TARGETS FOR THE MEDITERRANEAN

Setting targets on protected area coverage can be controversial. Sometimes targets have proven useful, but in too many cases, the effort made to fulfil targets is not translated into real progress in conservation, especially when new areas are only declared as protected areas in national law without the means to become operational (Agardy et al., 2016). Nevertheless, international targets have driven international and national policy and collective action to increase conservation both on land and at sea (Lubchenco and Grorud-Colvert, 2015). While undoubtedly political, such targets should be based on robust scientific evidence if they are to meet their environmental objectives.

Considering the extent of unprotected marine habitats and wildlife, the record level of overexploited fish stocks, the increasing threat of warming sea temperatures and the increasing economic pressures, the Mediterranean Sea stands out as a key area where conserving 30% of the sea by 2030 is an urgent priority. How to identify these areas in a way that delivers the highest ecological benefits while supporting the sustainable socio-economic prosperity of the region will be a key challenge over the next few years.

Conserving in an effective way at least 30% of the Mediterranean Sea with MPAs and OECMs will be crucial to maintain and restore the biodiversity which is the foundation of marine ecosystems and their capacity to:

- **Rebuild fish stocks**
- **Mitigate the impacts of climate change**
- **Secure the future of sustainable fisheries and tourism**
- **Guarantee food, livelihoods and well-being for local communities.**

OTHER EFFECTIVE AREA-BASED CONSERVATION MEASURES (OECMS)

The CBD defines an **other effective area-based conservation measure** (OECM) as: "A geographically defined area other than a protected area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in situ conservation of biodiversity with associated ecosystem functions and services and where applicable, cultural, spiritual, socio–economic, and other locally relevant values." The difference between protected areas and OECMs is that the primary objective of protected areas is conservation, whereas OECMs deliver effective in situ conservation of biodiversity, regardless of their objectives (IUCN-WCPA, 2019). **For example, a commercial fishing closure established through a long-term management plan and delivering positive biodiversity outcomes could be reported as an OECM and contribute to both the CBD and SDG targets.**

2. SCIENTIFIC EVIDENCE FOR 30% CONSERVATION SCENARIOS

WWF and partners have carried out the **first scientific analysis on how the proposed 30% conservation target would change the marine biodiversity and fish stocks of the Mediterranean Sea.** This initiative aims to provide the science-based analysis needed to ensure effective policymaking and implementation.

SCIENTIFIC MODELLING AIMS TO DEVELOP A SERIES OF SPATIAL CONSERVATION SCENARIOS FOR THE MEDITERRANEAN SEA TO MEET THE 30% TARGET BY 2030.

Rocky Mediterranean seashore, Corsica, France © Michel Gunther / WWF

OBJECTIVES OF THE SCIENTIFIC MODELLING

WWF Mediterranean Marine Initiative collaborated with French National Centre for Scientific Research (CNRS)-Centre de Recherches Insulaires et Observatoire de l'Environnement (CRIOBE), the Ecopath International Initiative (EII) and the Institute of Marine Science (ICM-CSIC) to develop a series of spatial conservation scenarios for the Mediterranean Sea to meet the 30% target by 2030.

The objectives of the study were to:

- Propose, on the basis of scientific evidence, a series of candidate areas to create new MPAs that would deliver ecological benefits to cover 30% of the Mediterranean Sea;

- Identify new OECMs that could contribute to effective protection and sustainable management of the Mediterranean.

The scenarios assume that the MPAs making up the 30% target are all fully or highly protected areas – categories that have proved to be able to reverse biodiversity loss and replenish local fish stocks, providing tangible ecological benefits and socioeconomic advantages for local communities (Zupan et al., 2018; Horta e Costa et al., 2016). While scientific modelling inevitably simplifies the complexity of the natural environment, the scenarios attempt to predict how marine ecosystems will change if fishing pressure and other damaging activities are removed from these areas.

The scenarios modelled provide a set of options of marine macro areas in which candidate MPAs and OECMs should be proposed, and can inform policy discussion at national and regional level (including through the UNEP Mediterranean Action Plan, the Barcelona Convention and the General Fisheries Commission for the Mediterranean – GFCM). They aim to give policymakers the best available evidence on the spatial alternatives to discuss how to set and implement the internationally proposed CBD targets within the context of the Mediterranean.

The present extract is based on the report *Support to develop a series of scenarios for the Mediterranean under the 30NetMPA target* by Jeroen Steenbeek and Marta Coll (2019), available upon request.

METHODOLOGY

In the past, research teams, United Nations organizations and NGOs have identified a number of priority areas for conservation in the Mediterranean Sea, based on various standards, prioritization processes and/or planning tools. **The current study tested how the ecological status of the Mediterranean is predicted to change if fishing and other destructive activities are excluded from these areas.**

The conservation scenarios were tested on the following priority or management areas identified in the Mediterranean:

- **Natura 2000 marine sites (EU, 2019):** Natura 2000 is the European network of sites to protect selected species and habitats listed in the Habitats and Birds Directives. Natura 2000 sites cover 2.4% of the Mediterranean Sea.

- **Ecologically or Biologically Significant Areas (EBSAs)** (CBD, 2019): EBSAs have been identified through an expert consultation process and internationally agreed scientific criteria, endorsed by contracting parties and recognized at global level by the CBD. EBSAs cover 46.1% of the Mediterranean Sea.

- **Consensus areas:** These comprise five areas, encompassing 19% of the Mediterranean Sea, that have been consistently identified as important areas of conservation from different prioritization initiatives (Micheli et al., 2013).

- **Priority Areas for Conservation of species at risk (PACs):** These are areas where the diversity of species at risk (based on the IUCN Red List) is high and threats are low, so protection measures have a higher chance of proving effective (Coll et al., 2015). PACs cover 9.4% of the Mediterranean Sea.

- **Essential Fish Habitats (EFHs):** These are habitats identified as essential to the ecological and biological requirements of exploited fish species, and which may require special protection to improve stock status and long-term sustainability (STECF, 2006; Giannoulaki et al., 2013). EFH area covers 14.69% of the Mediterranean Sea.

- **Important Bird and Biodiversity Areas (IBAs):** These are areas identified using an internationally agreed set of criteria as being globally important for the conservation of bird populations. IBAs cover 3.6% of the Mediterranean Sea.

- **Random assignment of protection:** This scenario was created for this study by using a mathematical model (Ecopath with Ecosim) to randomly choose different areas in order to reach the 30% target (together with existing protected areas).

- **Spatial optimization:** This scenario was created by using a mathematical model (Ecopath with Ecosim) to select the geographic areas that provide the highest ecological value to reach the 30% target (together with existing protected areas).

30% TARGET BY 2030

ECOLOGICAL MODELLING TOOL

The biomass of commercial species represents a proxy of the potential fishery catch © Isaac VEGA / WWF

To test the consequences of protecting different spatial scenarios, we applied the **"Ecopath with Ecosim"** ecosystem model. This model, based on robust ecological indicators, has been developed to quantify the overall environmental status of ecosystems and inform management decisions, including within the context of the EU SafeNet project. Ecopath with Ecosim takes into account the complex dynamics of marine species, both commercial and non-commercial (including species growth and mortality, interactions and movement) and explores which changes happen over space and time when modifying the impact of fishing activities.

The model is based on available biological, ecological and fisheries data from a large number of species ranging from phytoplankton and invertebrates to top predators (large fishes, marine mammals and seabirds), collected over time. The model also considers ontogenetic stages of single species (juvenile/adult) or groups of species sharing similar biological (e.g. predators/prey) or ecological (e.g. habitat use such as pelagic/demersal) characteristics and different fishing activities.

The ecological and fisheries benefits of the alternative conservation scenarios derive from the complex interactions among species that the model integrates. For the purposes of this report, the biomass of commercial species represents a proxy of the potential fishery catch.

TESTED SCENARIOS

In this study, existing MPAs in the Mediterranean have been assigned to different protection levels: fully, highly, moderately, poorly and non-classified protected areas . The analysis compared the ecological benefits of moving from the current status of protection (what we call the status quo) towards different scenarios for effectively conserving 30% of the Mediterranean.

FROM STATUS QUO

The status quo comprised:

- All existing MPAs designed in the Mediterranean; and

- A series of other areas, like fisheries restricted areas where bottom trawling is limited or banned.

TO CONSERVATION SCENARIOS

In our hypothetical conservation scenarios, existing areas (the status quo) are combined with new additional areas to achieve full and effective protection of 30% of the Mediterranean Sea. We assume these areas are all either:

- **Fully protected areas** with no extractive activities allowed; or

- **Highly protected areas** which allow small-scale (non-industrial), highly selective, low-impact recreational, commercial or subsistence fishing.

Simulations were performed with the Ecospace spatial-temporal module of Ecopath with Ecosim and results were used to extract a series of ecological indicators (Coll and Steenbeek, 2017). To help compare alternative conservation scenarios, results were presented using indicators related to the environmental status of ecosystems, and more specifically those associated with fishing impact (e.g. biomass as a proxy of potential catch of commercial species) and biodiversity impact (e.g. biomass of predators).

The modelling exercise was deployed for the whole Mediterranean Sea, with a focus on the western Mediterranean Sea where more data is available. In general, data for the south-eastern Mediterranean is harder to find or simply not available, and fewer protected areas exist. This limits the results of our study for this region and calls for alternative management proposals to be tested for the south-eastern Mediterranean.

3. RESULTS

Here we report the results for those scenarios that are predicted to deliver the most positive effects. These scenarios should be read as a set of options of marine macro areas in which candidate MPAs and OECMs should be proposed to reach the 30% target.

BIOMASS OF ECOLOGICALLY IMPORTANT AND COMMERCIAL SPECIES WILL DECREASE IN 2030 UNDER BUSINESS AS USUAL.

Small-scale tuna fishing, Tarifa, Spain. © Jorge Bartolome / WWF

The model showed that the biomass of ecologically important and commercial species will decrease in 2030 under the status quo.

FINDING 1

The current network of MPAs and OECMs in the Mediterranean does not and will not deliver the required conservation benefits. Although many studies have already proved this at a local level, we now have evidence at the scale of the whole Mediterranean: we need effective management in MPAs to protect biodiversity and nature's contributions to sustaining people.

FINDING 2

If we don't limit the fishing effort, fish catches are expected to continue to decline.

Only by increasing the level of effective conservation effort in strategic areas can the loss of marine biodiversity be reversed by 2030. A random designation of full or high protection levels would not provide significantly more benefits than the status quo. The different scenarios show the functional areas that can provide the highest benefits.

FINDING 3

To reverse the current declining trend, new conservation areas should be selected in under-represented areas of particular importance for biodiversity and ecosystem services.

The analysis confirmed that the best ecological and fishery outcomes are delivered by closing priority areas to all kinds of fishing activity.

FINDING 4

To be effective, multiple-use protected areas in the Mediterranean should be combined with fully protected areas (also called no-take zones).

The analysis used in this report could not be combined with a socioeconomic analysis. Considering the costs associated with the closure of fishing areas, fishers and the fisheries sector should be fully engaged in the decision-making processes to ensure that spatial closures, fishery management plans and other management solutions to avoid unsustainable fishing are agreed and fully implemented.

Local fishermen with a catch of fresh sardines, Tabarka, Tunisia.
© Michel Gunther / WWF

The analysis produced scenarios of marine macro areas in which candidate MPAs and OECMs should be proposed to protect 30% of the Mediterranean Sea. The four scenarios predicted to provide the largest biodiversity and fishery benefits are the protection as highly or fully protected areas of:

- **Ecologically or Biologically Significant Areas** covering 46.07%
- **Consensus areas** covering 19.1%
- **Essential Fish Habitats** covering 14.7%
- **Spatial optimization** to cover 30% of the sea
+ **turning all existing MPAs into fully/highly protected areas.**

The Mediterranean spatial areas that are predicted to provide the greatest conservation benefits are: Alboran Sea, north-western Mediterranean, Sicily Channel, Adriatic Sea, Hellenic Trench, Aegean Sea and Levantine Sea.
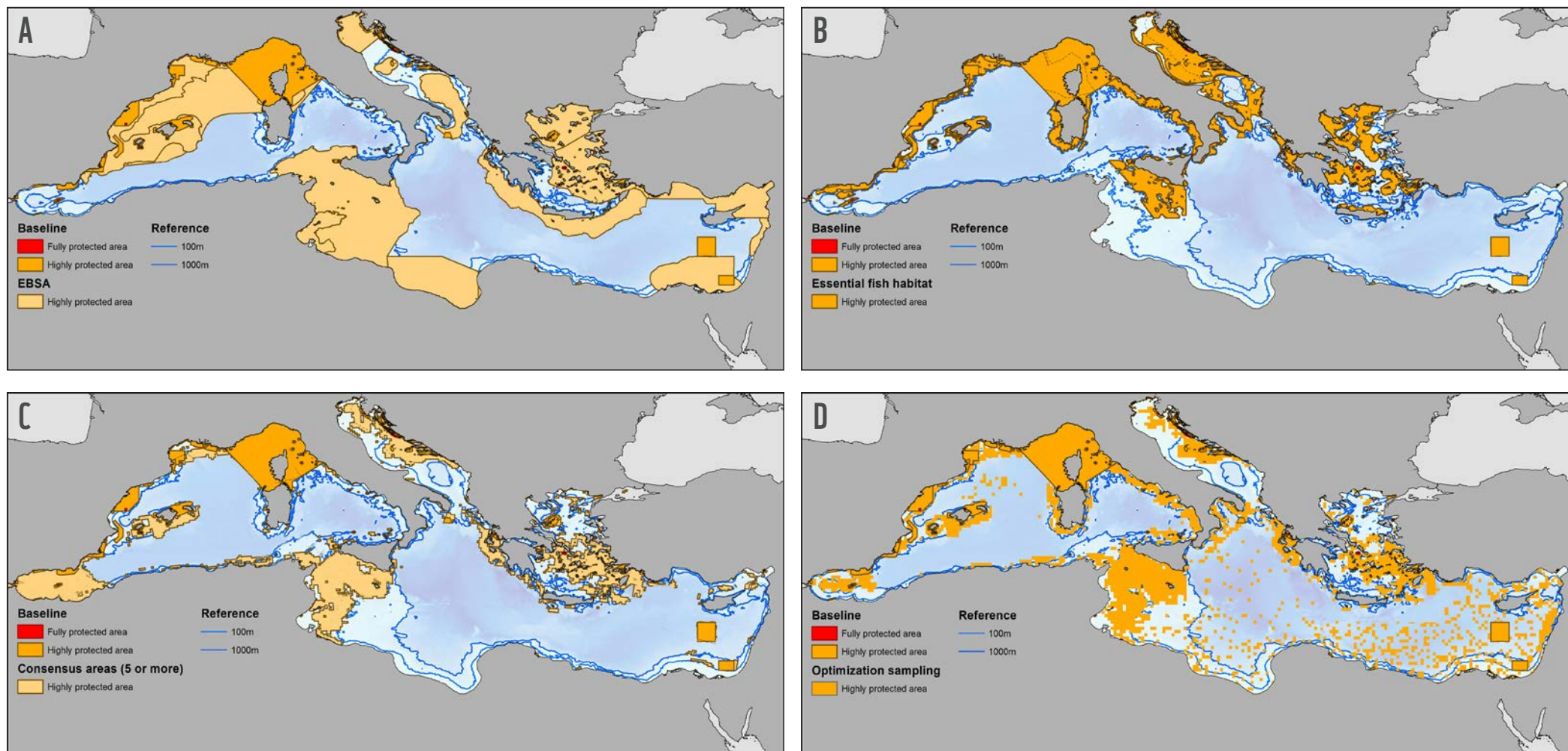
Figure 5: Scenarios for marine protection based on A) Ecologically or Biologically Significant Areas, B) Consensus areas, C) Essential Fish Habitats, and D) Spatial optimization

ECOLOGICAL AND FISHERY BENEFITS DELIVERED BY SELECTED CONSERVATION SCENARIOS

The biomass of predatory species and large pelagic fish showed noticeable increases. Predatory species included groups like cetaceans, monk seals and predatory fishes; large pelagic fish included, among others, swordfish, tunas and sharks. Some of these species are currently threatened. The biomass of **predatory species** is predicted to increase up to 4% and **large pelagic fish** up to 9% compared to the status quo scenario.

Increases of predatory fish were mostly predicted in coastal areas and continental shelves, whereas large pelagic fish increased especially in open sea areas in the northern and western Mediterranean. This shows the need to consider increased conservation effort in these areas.

The biomass of commercial species like **sea breams** (Sparids) and **European hake** (large commercial demersal fish) showed substantial increases. Considering the change in biomass, potential catches of sea breams are predicted to increase by 4-20% and of large commercial demersal fish by up to 5%. These catches are predicted to increase substantially in coastal areas.

FINDING 6

Overall, increasing conservation efforts in new and larger areas in the Mediterranean Sea will deliver healthier and more productive ecosystems by 2030.

Shark biomass is projected to increase by up to 10% with greater marine protection in the Mediterranean. © naturepl.com / Nuno Sa / WWF

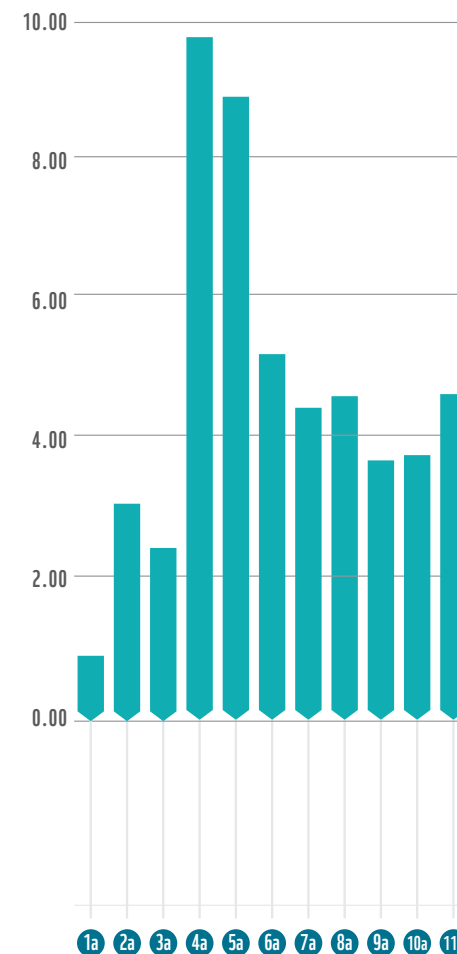HAKE   GROUPER   UP TO 5%
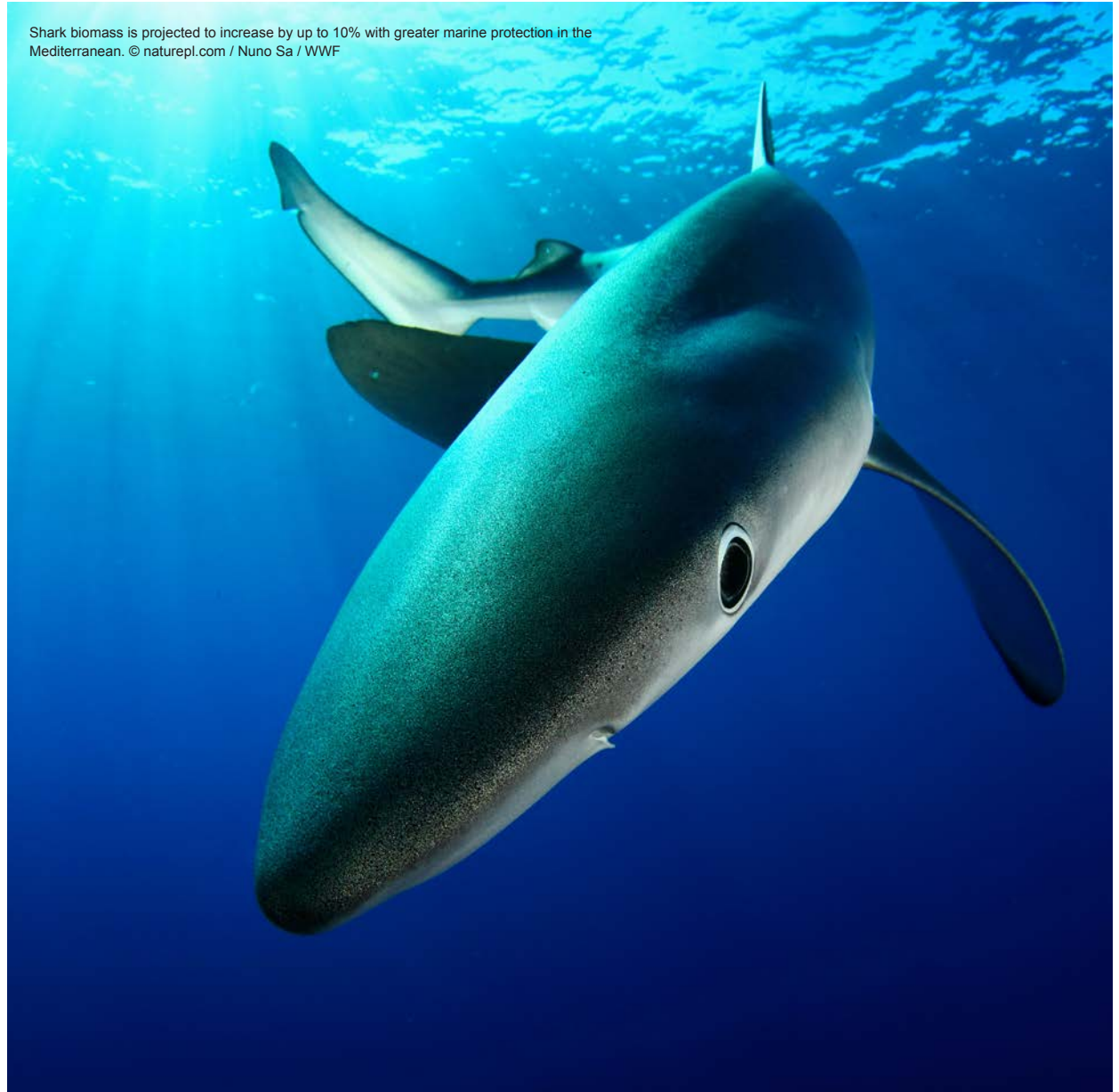
BIOMASS OF PREDATORY SPECIES
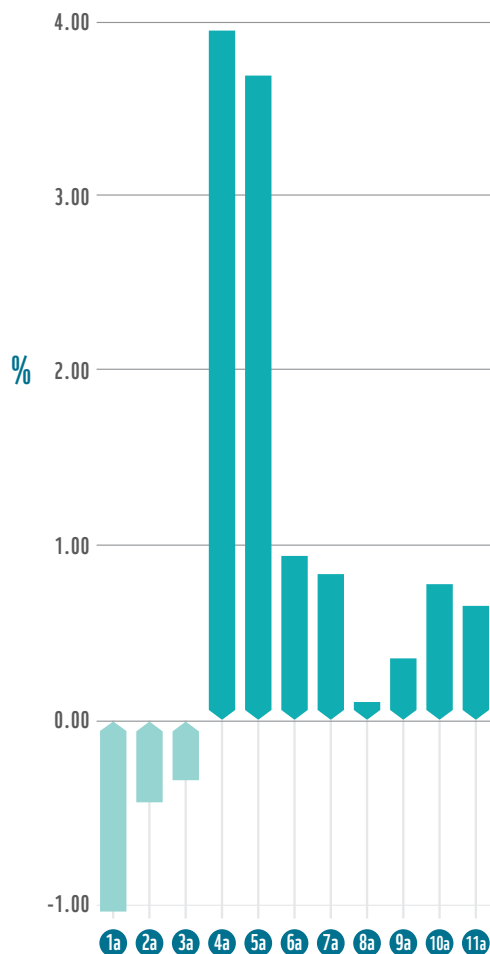
BIOMASS OF LARGE COMMERCIAL DEMERSAL (E.G. HAKE AND GROUPERS)
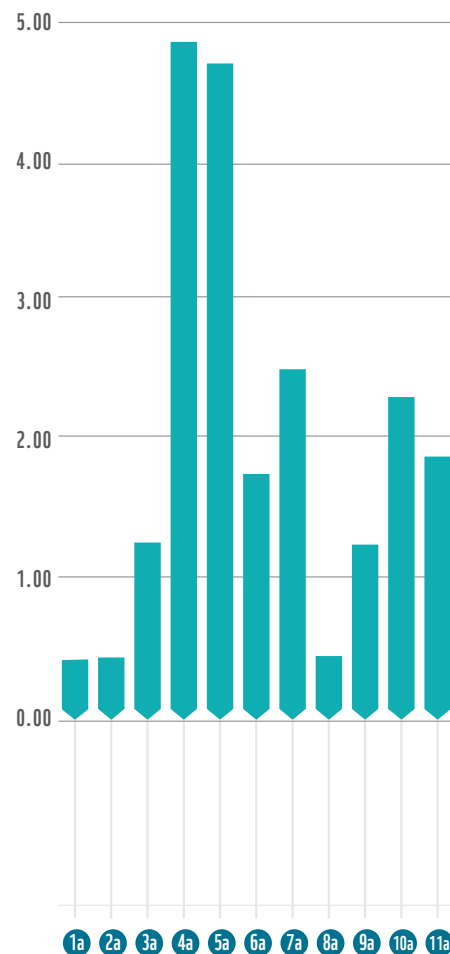
BIOMASS OF SPARIDAE
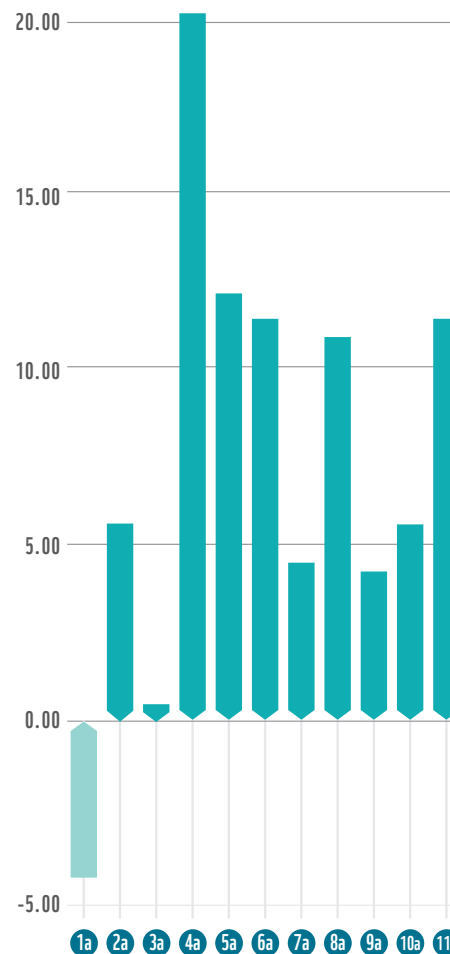
BIOMASS OF LARGE PELAGIC FISH (E.G. BLUEFIN TUNA AND SWORDFISH)

KEY:

1a Status quo

2a Turn baseline (MPAs+Natura 2000) to FPAs

3a Turn baseline (MPAs+Natura 2000) to HPAs

4a Ecologically or Biologically Significant Areas into FPAs

5a Ecologically or Biologically Significant Areas into HPAs

6a Consensus areas into FPAs

7a Consensus areas into HPAs

8a Essential Fish Habitats into FPAs

9a Essential Fish Habitats into HPAs

10a Spatial optimization 30% into FPAs

11a Spatial optimization 30% into HPAs

Figure 6: Change of biomass of species or functional group indicators by 2030 by creating new highly protected areas (HPAs) and fully protected areas (FPAs) in four alternative conservation scenarios.

FOCUS ON THE WESTERN MEDITERRANEAN

As more data is available for the western part of the Mediterranean, we focused on this region to better identify the future ecological and fishery benefits.

The model predicts that by conserving all priority areas previously identified in the region, the health status of the marine ecosystem improves.

The following four conservation scenarios provide the highest outcomes:

- **Essential Fish Habitats** (23% of the western Mediterranean)
- **Ecologically or Biologically Significant Areas** (47.4%)
- **Consensus areas** (22.57%)
- **Spatial optimization** to cover 30% of the sea
  + turning all existing MPAs into fully/highly protected areas.
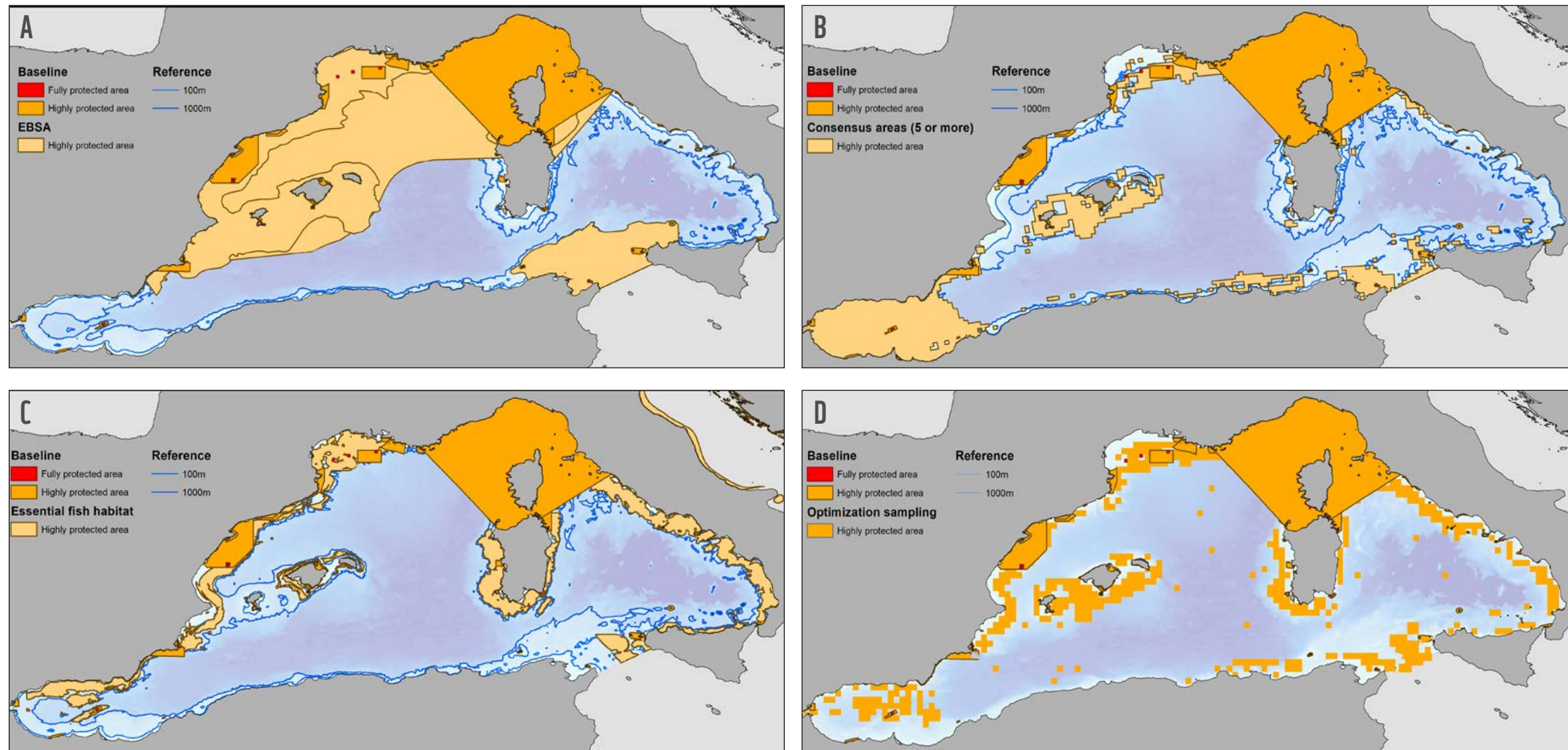
Figure 7: Scenarios for marine protection in the western Mediterranean based on A) Ecologically or Biologically Significant Areas, B) Consensus areas, C) Essential Fish Habitats, and D) Spatial optimization.

For these four scenarios, we highlighted the positive outcomes predicted by creating new highly and fully protected areas.

- The biomass of **predatory species** (e.g. marine mammals, large sharks, large pelagic fish, large demersal fish) is predicted to increase by 10-45% compared to the status quo. Increases were predicted in the northern and eastern part of the study area.

- In general, biomass of **commercial species** increases by 10-23%.

For the western Mediterranean, an in-depth analysis explored the changes in biomass (and so in potential catches) of particular species:

- Predatory species at the top of the food web like groupers, European hake and bluefin tuna showed noticeable increases in biomass. **European hake** increased by 70% to almost 100%; groupers increased by 10-50% and, interestingly, showed the greatest difference between outcomes in creating fully protected areas compared to highly protected areas; **bluefin tuna** increased substantially, up to 120-140%, from conserving EBSAs and EFHs.

- Contrary to the results above, white seabreams showed no increase. This result can be explained by a trophic cascade effect calculated by the model at such large geographical scale, where the increase of highly targeted large predators causes the reduction of prey species like white seabreams.

FINDING 7

The decrease of certain species due to the increase of large predators is a natural phenomenon. Conservation and fishery management decisions should integrate these effects of predation and competition and, together with local communities, find a trade-off based on the ecological characteristics of the areas and on conservation and fishery objectives.

The differences in results from the alternative spatial protection scenarios between the western and the whole Mediterranean are partially due to:
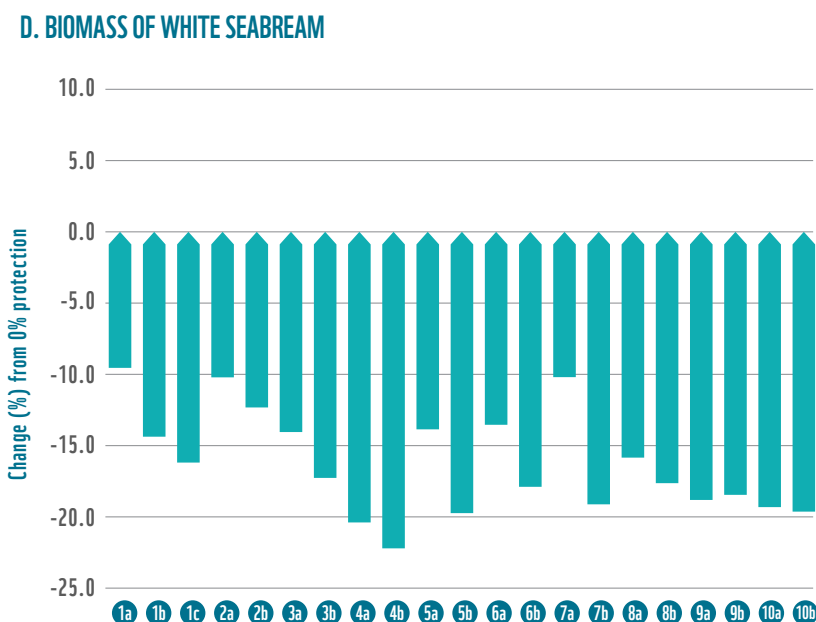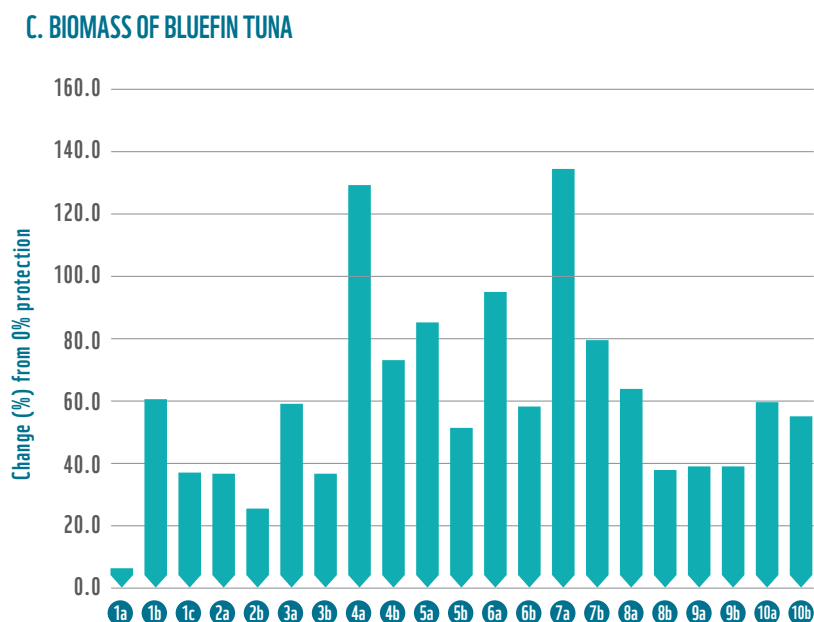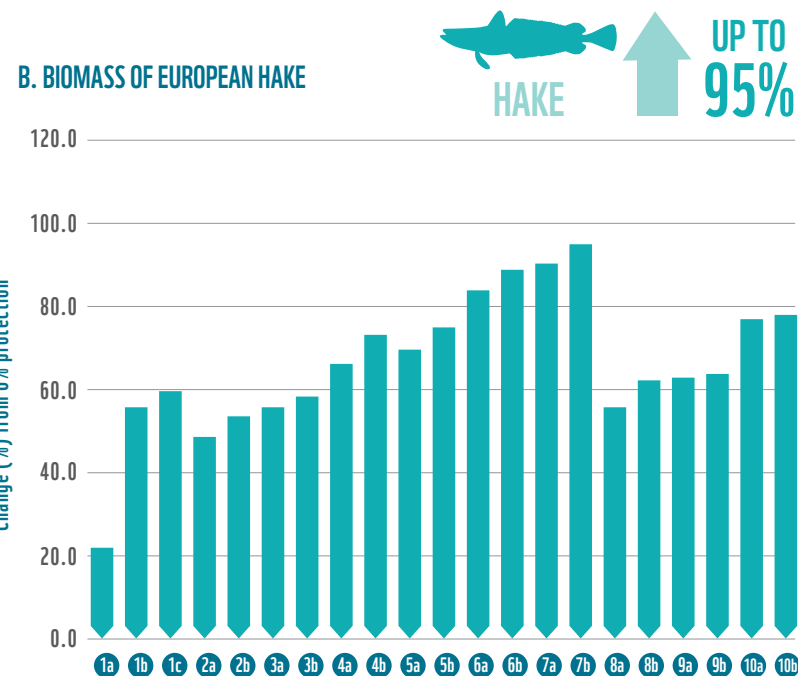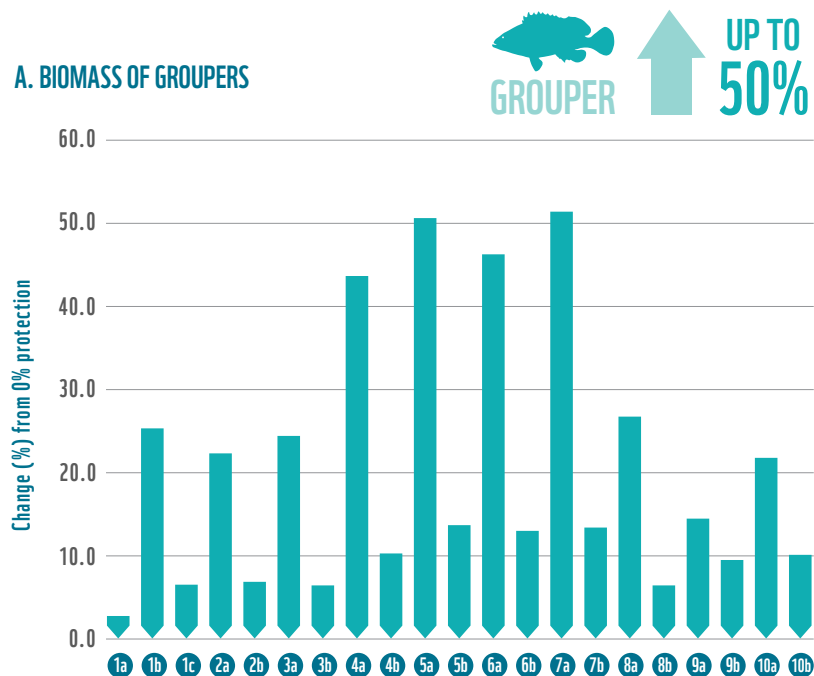
- The different environmental gradients, such as productivity, of the Mediterranean Sea

- The large pelagic habitat against coastal and shelf ecosystems

- The lack of coverage of protection in the south-eastern Mediterranean region in several scenarios

- Data paucity for the south-eastern Mediterranean, which hampers in-depth analysis and highlights the need for further studies.

FINDING 8

Scientific modelling provides clear results for the western Mediterranean, where data is more robust. Marine observation and research should be scaled up in the eastern part of the Mediterranean to better inform decision-makers, but the absence of scientific data should not prevent new conservation initiatives. Comprehensive research in a few representative sites should be combined with surveys of traditional knowledge and scientific modelling at finer geographical scale.

Loggerhead turtle (*Caretta caretta*) in the Mediterranean Sea © Michel Gunther / WWF

Figure 8: Change in biomass of species or functional group indicators by 2030 by creating new highly and fully protected areas in all conservation scenarios tested in the modelling.

4. ACTIONS TO CONSERVE 30% OF THE MEDITERRANEAN

To enable the recovery of marine ecosystems and to provide benefits to people in the long term, at least 30% of the Mediterranean Sea area should be protected and effectively and equitably managed through an ecologically representative and well-connected network of MPAs and OECMs. The following steps can help turn this aspiration into reality and move the discussion from science to policy and implementation.

WWF PROPOSES A TRANSFORMATIVE POST-2020 STRATEGIC ACTION PROGRAMME FOR THE CONSERVATION OF BIODIVERSITY

© F. Bassemayousse / WWF France

## 1. TRANSLATE EXISTING POLICY AND LEGISLATION INTO ACTION

Policy and legislation to support the conservation of the marine environment already exists at the international, regional and national levels, but is not effectively implemented. Bold commitments are needed to unlock financial resources, improve governance frameworks, strengthen capacity, and increase cross-sectoral cooperation to effectively implement, monitor and enforce the existing and planned MPAs and OECMs in the Mediterranean.

2. INCREASE AND IMPLEMENT BIODIVERSITY CONSERVATION TARGETS

At least 30% of the Mediterranean Sea should be protected. The target should comprise a coherent mosaic of tools, combining highly and fully protected areas together with OECMs (such as locally managed marine areas, local no-take zones, fishery restricted areas, ecological corridors and protected vulnerable marine ecosystems) that result in long-term and effective conservation of biodiversity.

In order to be counted in the 30%, MPAs and OECMs need to effectively implement, monitor and enforce integrated conservation and management measures, with a zoning plan and site-specific measures to manage all marine activities. Specifically, MPAs and OECMs should include fully protected areas to allow recovery and restoration of biodiversity.
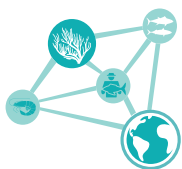
3. INTEGRATE THE MPA NETWORK INTO HOLISTIC ECOSYSTEM-BASED OCEAN MANAGEMENT

Our study identifies the priority conservation areas of the Mediterranean as the Alboran Sea, the north-western Mediterranean, the Sicily Channel, the Adriatic Sea, the Hellenic Trench, the Aegean Sea and the Levantine Sea. Protecting these areas is predicted to provide the most positive conservation and fishery outcomes by 2030. At the same time, these areas are also blue economy hotspots with the highest concentration of current and expected maritime activities.

Sea birds and tuna feeding in the Mediterranean Sea © Frédéric Bassemayousse / WWF-Mediterranean

Priority should be given to the conservation and sustainable management of these areas in order to mitigate the negative impact of increasing industrial activities and to allow the replenishment of fish stocks. The implementation of ecosystem-based integrated management in the Mediterranean Sea (marine spatial planning, integrated coastal zone management) must have the network of MPAs and OECMs at its core, while supporting the achievement of a sustainable and inclusive blue economy for the whole region.

Additionally, to ensure the recovery of Mediterranean fish stocks, the fishing effort outside the network of MPAs and OECMs should be reduced through effective long-term management plans and the prevention of illegal, unregulated and unreported fishing.

4. SCALE-UP NATURE-BASED SOLUTIONS TO MITIGATE CLIMATE CHANGE IMPACTS

To mitigate the impacts of climate change and fulfil the Paris Agreement, marine protection should be coupled with nature-based climate solutions, by:

- Enhancing the resilience of marine ecosystems and restoring their natural biodiversity, which in turn supports climate adaptation, mitigation and disaster risk reduction.

- Protecting and restoring "blue carbon" ecosystems to provide coastal protection, carbon storage and resilient biodiversity. In particular, seagrass beds are highly productive ecosystems that remove carbon dioxide from the atmosphere and store it in the seabed.

- Protecting vital habitats of large marine animals, including fish and marine mammals, that accumulate carbon in their bodies during their long lives: once they die, their biomass and captured carbon often sinks to the deep sea.

- Mitigating the changes in fishery productivities and spatial distributions of economically important species due to climate change by implementing climate-adaptive fisheries management reforms.

5. CONSERVE KEY UNREPRESENTED ECOSYSTEMS

The present study provides a set of options that represent good candidates for future protection and area-based management to recover the functionality of the whole Mediterranean Sea ecosystem. Policymakers can use these spatial alternatives to set and implement the global conservation targets within the context of the Mediterranean. In particular conservation effort should be redirected to:

- **Coastal and offshore areas in the southern and eastern Mediterranean**

A large portion of the Mediterranean Sea is still left completely unprotected. In the south and east, very few and small MPAs have been established. States urgently need to develop spatial planning for conservation and sustainable use based on best available data, scientific modelling and expert knowledge. At the same time, significantly more effort and funding should be invested into research to fill the large knowledge gaps in these areas.

- **Offshore and open-sea habitats**

Existing Mediterranean MPAs are almost all small and coastal. So far, very few MPAs and fishery restricted areas have been designated in the open sea and even fewer are well enforced and managed. Inspiring examples of well-managed MPAs and fishery restricted areas exist and should be replicated and scaled up (Gomei et al. 2019; FAO/GFCM 2019). Effort is needed to enlarge the conservation effort in existing MPA, in the offshore continental shelf, and in the open sea. Migratory species such as cetaceans, sharks, turtles, seabirds and commercial fish species all pass through these areas during their life cycles, and are threatened by various maritime activities.

- **Vulnerable marine ecosystems in deep-sea and offshore environments**

Deep-sea benthic habitats such as cold-water corals, sponge grounds, cold seep and vent communities host rare and fragile species and are nursery grounds for several commercial fishes. Although still largely unexplored, deep-sea biodiversity hotspots should be protected according to both environmental policies (CBD/EBSAs, EU Habitat Directive, and Barcelona Convention/Dark Habitats Action Plan) and fishery policies (following UNGA Resolution 61/105, 2006). A network of fishery restricted areas to protect vulnerable marine ecosystems should be integrated into an ecologically representative network of MPAs. In parallel, Mediterranean countries should create additional MPAs to protect vulnerable marine ecosystems by banning any destructive activities, such as dredging, mining, offshore infrastructure, and oil and gas exploration and production.

6. IMPROVE THE INTERNATIONAL GOVERNANCE OF THE SEA

The current jurisdictional framework of the Mediterranean is fragmented and regional governance mechanisms are weak and ineffective. Disputes over water sovereignty affect large areas of the region, where it is very complex to develop and enforce regulations. Cross-sectoral and cross-jurisdictional cooperation among states and across regional bodies is needed to reinforce existing mechanisms and to develop new and integrated policy instruments for the conservation and sustainable use of marine biodiversity in areas beyond the national jurisdiction. Sectors that depend on a healthy marine environment should seek to strengthen synergies: the UN Environment Programme, GFCM and the International Commission for the Conservation of Atlantic Tunas (ICCAT) should cooperate in areas of common interest.

The new UN Ocean Treaty currently being negotiated would be applicable to areas beyond national jurisdiction in the Mediterranean Sea. Mediterranean countries should support the conclusions of an ambitious agreement in 2021 to deliver enhanced cooperation, clear governance and effective dispute resolution for creating MPAs in areas beyond national jurisdiction and applying ecosystem-based integrated management to reach sustainability in the whole of the Mediterranean Sea.
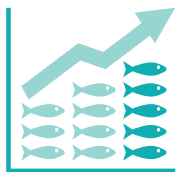
7. INTRODUCE A FAIR AND JUST TRANSITION TO ACCOUNT FOR THE COST OF INCREASING CONSERVATION TARGETS

New policies for environmental conservation and climate adaptation have social and economic consequences and costs that should be addressed beforehand. It is vital to avoid inequality and enable effective implementation. The dramatic impact of the COVID-19 pandemic on society and economies requires an urgent response. However, investments should be designed to improve long-term resilience and in a way that helps tackle social inequalities, and the climate and environmental crisis.

In the long term, the benefits of protecting nature outweigh the costs (Waldron et al., 2020). The cost of creating and implementing MPAs needs to be weighed against the potential catastrophic losses from the degradation of nature and the multiple economic benefits that healthy ecosystems generate.

To move from paper parks to effective conservation and management, any new MPAs or OECMs need the financial resources to enable effective management. This should also include developing alternative livelihood opportunities for local communities affected by new management measures.

In order to achieve a just and fair transition, the following transformative changes are required:

- **Scale up conservation financing:** Public financing for nature is the fundamental building block and needs to be significantly increased.
- **Apply the "do no harm" principle:** Governments and the private sector must redirect financial flows to economic activities that are truly sustainable and invest in those that conserve and restore ecosystems.
- **Account for natural capital:** High-level economic decision-making should incorporate the true long-term value of nature.
- **Ensure participation:** Local authorities, resource users and research centres need to cooperate to effectively integrate measures for a just transition to conservation of natural resources and local sustainable economic development.

To avoid exacerbating inequalities, the most fragile economies of the Mediterranean must not be left to bear the full financial costs of establishing and managing new protected areas. These countries are likely to face potentially larger risks from climate and environmental changes than other parts of the Mediterranean, but have limited capacity to invest in research, monitoring and conservation. Further support is therefore needed through multilateral development aid and other tools such as debt-for-nature swaps and blue bonds.

8. ENGAGE STAKEHOLDERS IN THE DECISION-MAKING PROCESS

A participatory approach is fundamental to achieving effective conservation of 30% of the Mediterranean Sea and providing benefits for people.

- A whole-of-government approach should be strengthened at local, national and regional level to engage multistakeholder and multisectoral representatives, ensuring policy coherence, coordination, transparency and effective implementation of MPAs.
- New MPAs and OECMs should be established in a fair and participatory way, specifically by engaging local communities, including women and youth, in decision-making processes that affect their livelihoods and use rights. Conservation objectives can be met only by creating ownership and by sharing the responsibility for the design and management of natural resources among different stakeholders, including fishers.

5. NATURE POSITIVE: CONCLUSIONS

This report demonstrates how to move from science to policy and provides concrete recommendations on how to reach the 30% conservation target for the Mediterranean Sea. However, this is only one part of the broader picture. Ambitious targets for nature protection, including protecting 30% of land and sea by 2030, are only one element of the global ambition that is needed.

WORLDWIDE, GOVERNMENTS, BUSINESSES, LEADERS AND CIVIL SOCIETY ARE CALLING FOR A NEW DEAL FOR NATURE AND PEOPLE TO PUT NATURE ON A PATH TO RECOVERY BY 2030 AND TRANSITION TO A NATURE-POSITIVE SOCIETY.

Healthy yellow fan coral/chameleon sea fan (*Paramuricea clavata*)
Mediterranean Sea © naturepl.com / ARCO / WWF

WWF urges Mediterranean countries to support a New Deal for Nature and People and, through the CBD, an ambitious post-2020 global biodiversity framework.

These global commitments should be translated into an equally ambitious regional plan (the post-2020 SAP BIO) to protect at least 30% of the Mediterranean Sea by 2030 in order to ensure marine assets recover, continue to generate economic benefits, and mitigate climate change impacts. We call on countries to:

1. EXPAND THE COVERAGE OF MPAs AND OECMs TO COVER 30% OF THE MEDITERRANEAN SEA BY 2030.
Our research helps to identify areas for protection that will deliver the greatest ecological and socio-economic benefits, including under-represented ecosystems in areas beyond national jurisdiction.

2. PROTECT HOTSPOTS OF MARINE BIODIVERSITY TO INCREASE FUTURE FISHING CATCHES
in the overfished areas of the Mediterranena Sea and secure seafood and livelihoods for future generations.

3. WORK WITH OTHER SECTORS TO ESTABLISH OECMs.
Steps towards OECMs should include setting new:
- Locally managed no-take zones
- Fishery Restricted Areas
- Ecological corridors
- Extended deep-water and coastal trawling bans.

4. INTEGRATE THE MPA AND OECM NETWORK INTO WIDER ECOSYSTEM-BASED INTEGRATED OCEAN MANAGEMENT
to sustainably manage all activities across the Mediterranean.

5. URGENTLY INCREASE THE LEVEL OF PROTECTION OF EXISTING AND FUTURE MPAs AND OECMs
by combining fully and highly protected areas that allow ecosystem restoration and deliver the greatest benefits.

6. ENSURE ALL MPAs AND OECMs ARE EFFECTIVELY MANAGED,
with zoning and management plans and sufficient resources to implement and monitor them.

7. EMPLOY JUST AND FAIR FINANCIAL INSTRUMENTS TO MOVE FROM BUSINESS-AS-USUAL TO EFFECTIVE CONSERVATION AND A SUSTAINABLE BLUE ECONOMY.
Lower-income countries require financial support to fund research, marine spatial planning and conservation measures.

8. INVOLVE LOCAL STAKEHOLDERS AT EVERY STAGE OF THE PROCESS THROUGH CO-MANAGEMENT AND PARTICIPATORY PROCESSES.
Fishers and other local people must be involved in the decisions that affect their rights and livelihoods and share responsibility for the management of their resources.

WWF'S PROPOSAL FOR A TRANSFORMATIVE AND AMBITIOUS POST-2020 STRATEGIC ACTION PROGRAMME FOR THE CONSERVATION OF BIOLOGICAL DIVERSITY (SAP BIO) IN THE MEDITERRANEAN REGION

By 2030, 100% of the Mediterranean Sea is sustainably managed by applying ecosystem-based approaches including biodiversity and climate change-informed marine spatial planning and by conducting environmental impact assessments and strategic environmental assessments.
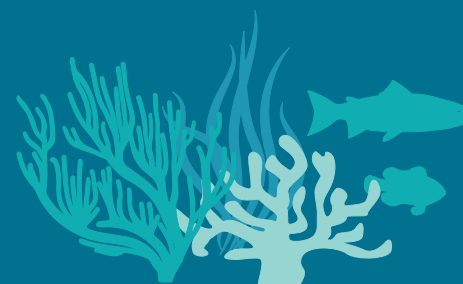
By 2030, at least 30% of the Mediterranean Sea, especially areas of particular importance for biodiversity and ecosystem services and carbon-rich ecosystems, is protected and recovering, through effectively and equitably managed, ecologically representative and well-connected networks of marine protected areas and other effective area-based conservation measures, and integrated into the wider seascape through ecosystem-based integrated ocean management.

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OUR MISSION IS TO CONSERVE NATURE AND REDUCE THE MOST PRESSING THREATS TO THE DIVERSITY OF LIFE ON EARTH.