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Assessing National Progress of Mediterranean Countries in Shark Governance in the Context of International Legal Obligations

Koehler, Lydia

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University of Plymouth

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**UNIVERSITY OF
PLYMOUTH**

**ASSESSING NATIONAL PROGRESS OF MEDITERRANEAN
COUNTRIES IN SHARK GOVERNANCE IN THE CONTEXT OF
INTERNATIONAL LEGAL OBLIGATIONS**

by

LYDIA KOEHLER

A thesis submitted to the University of Plymouth

in partial fulfilment for the degree

of

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Author's Declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee.

Work submitted for this research degree at the University of Plymouth has not formed part of any other degree either at the University of Plymouth or at another establishment.

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Abstract

Lydia Koehler, 'Assessing National Progress of Mediterranean Countries in Shark Governance in the Context of International Legal Obligations'

The work presented in this thesis introduces a conceptual framework for shark policy making against which national progress of Mediterranean coastal States in shark governance was assessed. A detailed assessment strategy was developed based on three distinct constructs, namely political commitment, research, and implementation effort. Based on multiple data sources (national reports under relevant conventions; policy documents; national legislation; online databases; scientific literature; and survey questionnaires to relevant government bodies, non-governmental organisations (NGOs), and national experts, designed as part of this assessment), individual differences between countries were determined and evaluated within the context of legal requirements under international and regional law. Although political commitment significantly differed between Member States of the European Union (EU) and non-EU countries, with the former displaying significantly higher values, overarching legal obligations are similar between countries, with the exception of Palestine. Such obligations concern the management of fisheries and the responsibility to protect and preserve the marine environment and species therein, including sharks.

A comprehensive review of available research literature was conducted to determine the status of existing knowledge on sharks regionally and evaluate national contributions. A total of 1,212 publications were assessed in detail on their focus, species concerned in the research, institutes involved, and funding received. Much knowledge is available on ecology

and biology of species, as well as fisheries' impact and catch compositions, while little research has been conducted on management measures, policy evaluation, and legal aspects- a gap partly filled through this work, although more research on these topics is needed. Scientific research on sharks has been driven by countries like Italy and Tunisia, which have been contributing to knowledge on these species for many decades, while other countries have only been involved in shark research in recent years.

The assessment of implemented efforts identified 208 different measures of which some apply to multiple countries. However, the majority of these measures were projects and programmes (56.3%) that focus on data collection. The application of stringent regulations applies mainly for the fisheries sector through Regional Fisheries Management Organisations (RFMOs) and the EU's Common Fisheries Policy (CFP) and concerns a few spatial and gear restrictions that benefit shark conservation. Only two marine protected areas (MPAs) relevant to shark conservation were identified, one in Turkey and one in Lebanon, demonstrating that this conservation tool remains to be under-utilised for sharks.

The insights retrieved from experts showed that problems, such as mislabelling, the impact from unregulated recreational fishing, the marketing of protected species, and an overall increase in shark meat marketing were observed in multiple countries and require further action. The thesis concludes by proposing next steps for shark governance in the region to address these challenges.

While this assessment can be used as a baseline against which future progress can be measured and can support priority setting in shark governance at national level, there are limitations to the approach taken. More research is required to further validate the national

state of shark governance and to evaluate the outcome of existing policies to further fill the gap of legal and policy research in this region.

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List of Abbreviations

ABNJ	Areas Beyond National Jurisdiction
ACEPSD	Albanian Center for Environmental Protection and Sustainable Development
ALDFG	Abandoned, lost, or otherwise discarded fishing gear
APECS	L'Association Pour l'Etude et la Conservation des Sélaciens
ASCN	Angel Shark Conservation Network
BRUV	Baited remote underwater video survey
CBD	Convention on Biological Diversity
CBDR	Principle of common but differentiated responsibility
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CMS Shark MoU	CMS Memorandum of Understanding on the Conservation of Migratory Sharks
CoC	FAO Code of Conduct for Responsible Fisheries
COFI	FAO Committee on Fisheries
DCF	Data Collection Framework of the EU
DCRF	Data Collection Reference Framework under the GFCM
EEZ	Exclusive Economic Zones
EMFF	European Maritime and Fisheries Fund

EU	European Union
EU MS	EU Member State
FAO	United Nations Food and Agriculture Organisation
FRA	Fisheries Restricted Area
GDP	Gross Domestic Product
GES	Good Environmental Status
GFCM	General Fisheries Commission for the Mediterranean
GRIS	Gruppo Ricercatori Italiani sugli Squali, razze e chimere
GSA	Geographical Subarea
HD	Habitats Directive (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora)
HDI	Human Development Index
ICCAT	International Commission for the Conservation of Atlantic Tunas
INSTM	Institut national des sciences et technologies de la mer
IPOA Sharks	International Plan of Action for Conservation and Management of Sharks
IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unreported, and Unregulated Fishing
JPOI	Johannesburg Plan of Implementation
LOSC	Law of the Sea Convention
MAP	Mediterranean Action Plan
MEA	Multilateral Environmental Agreement
MECO	Mediterranean Elasmobranchs Citizen Observation

MEDITS	Mediterranean International Trawl Survey
MEDLEM	Mediterranean Large Elasmobranchs Monitoring (database)
MER lab	Marine and Environmental Research lab
MDG(s)	Millennium Development Goal(s)
MLS	Minimum Landing Size
MoU	Memorandum of Understanding
MPA	Marine Protected Area
MSFD	Marine Strategy Framework Directive
MSY	Maximum Sustainable Yield
NDF	Non-Detriment Finding
NGO	Non-governmental organisation
NPOA	National Plan of Action for Conservation and Management of Sharks
PSMA	Agreement on Port State Measures
RFMO	Regional Fisheries Management Organisation
ROV	Remotely operated underwater vehicle
SAC	Scientific Advisory Committee
SCUBA	Self-Contained Underwater Breathing Apparatus
SDG(s)	Sustainable Development Goal(s)
Shark(s)	This term refers to all elasmobranchs (sharks, skates, rays, and sawfishes)
SPAMI	Specially Protected Areas of Mediterranean Importance
SPA/BD Protocol	Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean

STECF	Scientific, Technical and Economic Committee for Fisheries
TAC	Total Allowable Catch
TFEU	Treaty of the Functioning of the European Union
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNFSA	United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks
WCMC	UN World Conservation Monitoring Centre
WCPFC	Western and Central Pacific Fisheries Commission
WGI	World Governance Indicators
WTO	World Trade Organisation
WWF	World Wildlife Fund

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Introduction

Shark governance in the Mediterranean is a wicked complex problem, and wicked complex problems require cooperation between multiple actors, innovative solutions, and new strategies.¹ In summary, the preceding sentence reflects the focus of this thesis. Shark governance in this work was defined as the combination of legal obligations, policy commitments, research effort, and implemented action, considering all actors involved.

‘Sharks’, meaning all elasmobranchs (sharks, skates, and rays) in the context of this work, are a group of over one-thousand species, with an evolutionary history over more than 60 million years, making them one of the oldest groups of living organisms on this planet.²

Sharks inhabit all oceans from shallow, coastal waters to the deeper sea beyond 1000 m.³ As a highly diverse group of animals, sharks fulfil various functions in the marine environment such as keeping prey populations in control, and thereby contributing to the overall health and functioning of marine ecosystems.⁴ Overfishing and related pressures, such as bycatch and discards, have led to drastic declines in shark populations worldwide in the past decades.⁵ As Sir Benjamin Lockwood, played by James Cromwell, in *Jurassic World (Fallen Kingdom)* quite rightly and directly stated:

¹ Edward T Game and others, ‘Conservation in a Wicked Complex World; Challenges and Solutions’ (2014) 7 *Conservation Letters* 271 <<http://doi.wiley.com/10.1111/conl.12050>>.

² R William Stein and others, ‘Global Priorities for Conserving the Evolutionary History of Sharks, Rays and Chimaeras’ (2018) 2 *Nature Ecology and Evolution* 288 <<http://dx.doi.org/10.1038/s41559-017-0448-4>>.

³ Nicholas K Dulvy and others, ‘Extinction Risk and Conservation of the World’s Sharks and Rays’ (2014) 3 *eLife* 1 <<https://elifesciences.org/articles/00590>>.

⁴ María José Meléndez and others, ‘Historical and Ecological Drivers of the Spatial Pattern of Chondrichthyes Species Richness in the Mediterranean Sea’ (2017) 12 *PLOS ONE* e0175699 <<https://dx.plos.org/10.1371/journal.pone.0175699>>.

⁵ Nicholas K Dulvy and others, ‘Overfishing Drives over One-Third of All Sharks and Rays toward a Global Extinction Crisis’ (2021) 31 *Current Biology* 4773 <<https://linkinghub.elsevier.com/retrieve/pii/S0960982221011982>>.

“These creatures don’t need our protection. They need our absence.”⁶

Unquestionable, with a human population of over 8 billion people,⁷ absence is not a viable option and law must create norms and rules to address environmental issues, such as species disappearance. The international legal community started to recognise the importance of sharks and the need to address the continuous decline of this group through actions. One of the first considerations of sharks was within the 1982 Law of the Sea Convention (LOSC).⁸ This Convention is considered the fundamental legal instrument regulating human activities in the marine environment. The LOSC provided the basis for countries to extend their jurisdictional claims over marine space bordering their territorial waters to 200 nm for the exploitation of marine resources, but also incorporated duties to protect the marine environment. It highlighted the need to protect migratory species, including sharks, that cross borders and thereby exhibit a shared responsibility of countries to preserve and to manage.

Towards the end of the 20th century, two other legal instruments, established for the conservation of wildlife, started to integrate sharks within their listing system. These are the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)⁹ and the Convention on the Conservation of Migratory Species of Wild Animals (CMS).¹⁰ Both conventions are now listing multiple shark species within their appendices, awarding them

⁶ Jurassic World: Fallen Kingdom. (2018). Action movie, directed by J. A. Bayona and written by Derek Connolly and Colin Trevorrow.

⁷ For details see: <https://www.worldometers.info/world-population/>

⁸ United Nations Convention on the Law of the Sea (adopted 10 December 1982, entered into force 1 November 1994) 1833 UNTS 397 (LOSC)

⁹ Convention on International Trade in Endangered Species of Wild Fauna and Flora (adopted 3 March 1973, entered into force 1 July 1975) 993 UNTS 243 (CITES)

¹⁰ Convention on the Conservation of Migratory Species of Wild Animals (adopted 23 June 1979, entered into force 1 November 1983) 1651 UNTS 333 19 ILM 15 (CMS)

different levels of protection and obligating Parties to act either through protective or management measures. Under the auspices of the CMS, a new soft-law instrument was developed in 2010, the CMS Memorandum of Understanding on the Conservation of Migratory Sharks,¹¹ which sets out specific targets and objectives to help this threatened group.

Not only does overfishing drive shark populations worldwide to the edge of extinction, but habitat degradation, marine pollution, and climate change exacerbate the pressures on marine species, *ergo ipso*, sharks.¹² The former has been a concern of the Food and Agriculture Organization of the United Nations (FAO), which initiated an International Action Plan for the Conservation and Management of Sharks (IPOA Sharks).¹³ Although this voluntary plan, adopted in 1999, did not create any direct obligations, it certainly brought attention to sharks and further emphasised the need for action.

While fisheries management has experienced some success in terms of sustainable shark fisheries,¹⁴ many fisheries affecting sharks remain unsustainable.¹⁵ Within areas beyond national jurisdiction, the high seas, the responsibility of managing shared fish stocks falls within the remit of regional fisheries management organisations (RFMOs). These organisations have a duty to not only manage targeted species, such as tuna, but consider those species affected by such fisheries, including sharks. RFMOs have a crucial role in shark

¹¹ Memorandum of Understanding on the Conservation of Migratory Sharks. CMS. 2010

¹² Loren McClenachan and others, 'Extinction Risk and Bottlenecks in the Conservation of Charismatic Marine Species' (2012) 5 Conservation Letters 73 <<https://onlinelibrary.wiley.com/doi/10.1111/j.1755-263X.2011.00206.x>>.

¹³ FAO, International Plan of Action for the Conservation and Management of Sharks, (1999).

¹⁴ Colin A Simpfendorfer and Nicholas K Dulvy, 'Bright Spots of Sustainable Shark Fishing' (2017) 27 Current Biology R97 <<https://linkinghub.elsevier.com/retrieve/pii/S0960982216314646>>.

¹⁵ Michael J Barker and Vera Schluessel, 'Managing Global Shark Fisheries: Suggestions for Prioritizing Management Strategies' (2005) 15 Aquatic Conservation: Marine and Freshwater Ecosystems 325 <<https://onlinelibrary.wiley.com/doi/10.1002/aqc.660>>.

governance, but whether their contribution leads to the long-term improvement of shark populations remains to be seen.¹⁶

The problematic situation of sharks and the complexity of the applicable legal framework, both for conservation and fisheries management, have also caught the attention of legal scholars. A holistic, legal perspective on the 'International Law of Sharks', published in 2017, provides background information on legal developments relevant to shark management and conservation.¹⁷ It found that while there are several legal frameworks that provide a foundation for measures and actions, there are legal, enforcement-related, and institutional limitations.¹⁸ Whilst shark legislation and regulatory measures can be a strong conservation tool,¹⁹ the implementation of legal obligations at national level depends on the context in which governments operate, this includes, *inter alia*, national capacities to monitor and enforce, the economic and political importance of fisheries, and the diversity of sharks within national waters.²⁰

The relationship between international conventions and international organisations as relevant to sharks, has also been subject of legal research investigating the interconnectivity between legal frameworks.²¹ Some popular legal questions in relation to sharks concern finning, shark consumption, and product trade, as well as fundamental questions on the

¹⁶ Ana Barreira, 'The Protection of Sharks: A Legal and Policy Analysis' 69 <www.iidma.org>.

¹⁷ Erika J. Techera and Natalie Klein, *International Law of Sharks: Obstacles, Options and Opportunities* (First edition, Brill Nijhoff, 2017, 282 pp)

¹⁸ Erika J. Techera and Natalie Klein, *International Law of Sharks: Obstacles, Options and Opportunities* (n 17)

¹⁹ Stacie Sybersma, 'Review of Shark Legislation in Canada as a Conservation Tool' (2015) 61 *Marine Policy* 121 <<http://dx.doi.org/10.1016/j.marpol.2015.07.008>>.

²⁰ Nicholas K Dulvy and others, 'Challenges and Priorities in Shark and Ray Conservation' (2017) 27 *Current Biology* R565 <<https://linkinghub.elsevier.com/retrieve/pii/S0960982217304827>>.

²¹ Erik Franckx, 'The Relationship between CITES, FAO and Related Agreements: Legal Issues.' (2011) 1062 *FAO Fisheries and Aquaculture Circular* viii + 63.

regulation of fishing. For example, legal research in relation to the transposition of international regulations at the national level has been carried out within the context of shark finning, a cruel practice whereby shark fins are cut off on board a vessel and the shark carcass is discarded at sea, highlighting that although international law stimulated the introduction of fisheries restrictions to protect sharks at national level, legal gaps relating to the trade of fins internationally remained.²² Another example is the study by Pavone, who highlighted legal loopholes concerning shark exploitation in EU law in relation to issues of transparency, and introduced available tools for improved legislation.²³ Another study argued whether blanket bans, such as the prohibition of retaining certain species on board, are fit for purpose, or need to be supplemented by other measures, such as bycatch mitigation.²⁴ In line with this, a study by Baker-Medard and Faber highlighted that fishing bans for sharks can threaten livelihoods and, in countries where shark consumption is substantial, threaten food security.²⁵

Some evaluations focused on global progress on transposing law at national level as derived from international conventions, such as the CMS,²⁶ while other legal scholars argued the usefulness of existing frameworks and international bodies for shark conservation,²⁷

²² Sybersma (n 19).

²³ Ilja Richard Pavone, 'Race to Extinction: Shark Conservation Under International and European Law and Its Limits' (2018) 23 *Ocean and Coastal Law Journal* 45 <<https://digitalcommons.maine.edu/oclj/vol23/iss1/3>>.

²⁴ Mariana Travassos Tolotti and others, 'Banning Is Not Enough: The Complexities of Oceanic Shark Management by Tuna Regional Fisheries Management Organizations' (2015) 4 *Global Ecology and Conservation* 1 <<http://dx.doi.org/10.1016/j.gecco.2015.05.003>>.

²⁵ Merrill Baker-Médard and Jake Faber, 'Fins and (Mis)Fortunes: Managing Shark Populations for Sustainability and Food Sovereignty' (2020) 113 *Marine Policy* 103805 <<https://linkinghub.elsevier.com/retrieve/pii/S0308597X19301617>>.

²⁶ Julia M Lawson and Sonja V Fordham, 'Sharks Ahead: Realizing the Potential of the Convention on Migratory Species to Conserve Elasmobranchs' (2019).

²⁷ Stijn van Osch, 'Save Our Sharks: Using International Fisheries Law within Regional Fisheries Management Organizations to Improve Shark Conservation' (2012) 33 *Michigan Journal of International Law* 383 <<http://repository.law.umich.edu/mjil/vol33/iss2/4>>.

discussed the establishment of new treaties,²⁸ or proposed structures at international level, such as an international commission for sharks.²⁹

While legal scholars debate differences in law and its interpretation, marine scientists also struggle with legal aspects, and even publicly battle on the correct interpretation of national legislation and effective regulation of issues such as the shark fin trade,³⁰ demonstrating opposing views in the scientific community rather than a united front.³¹ There is a fundamental question between science and law to whether shark fisheries can be conducted in a sustainable manner, for which some scientist make a strong argument.³² In fact, well-informed advocates appear to support sustainable shark fisheries rather than the banning of shark fishing altogether.³³

The role of law is to provide norms and rules for policies to be realised. Policies, which are a determined course of action, can be analysed through the application of theoretical models (e.g., the policy cycle), considering specific steps in the policy making process. The role of scientists within the policy cycle has been the subject of debate and caution, as scientists often enter the policy arena with little regard to and/or knowledge of the complexity of policy making.³⁴ There is, however, an increasing awareness of the use of law and policies

²⁸ Jared R Wigginton, 'Governing a Global Commons: Sharks in the High Seas' (2014) 25 *Vill. Evntl. L.J.* 431.

²⁹ Andrew Herndon and others, 'The Case for an International Commission for the Conservation and Management of Sharks (ICCMS)' (2010) 34 *Marine Policy* 1239 <<http://dx.doi.org/10.1016/j.marpol.2010.05.001>>.

³⁰ Robert E Hueter and David S Shiffman, 'Rebuttal to "Response to 'A United States Shark Fin Ban Would Undermine Sustainable Shark Fisheries' I.F. Porcher et Al., *Marine Policy* 104 (2019) 85–89"' (2019) 110 *Marine Policy* 103601 <<https://doi.org/10.1016/j.marpol.2019.103601>>.

³¹ Ila France Porcher, Brian W Darvell and Gilles Cuny, 'Response to "A United States Shark Fin Ban Would Undermine Sustainable Shark Fisheries"' D.S. Shiffman & R.E. Hueter, *Marine Policy* 85 (2017) 138–140' (2019) 104 *Marine Policy* 85 <<https://doi.org/10.1016/j.marpol.2019.02.058>>.

³² Simpfordorfer and Dulvy (n 14).

³³ David S Shiffman and others, 'The Role and Value of Science in Shark Conservation Advocacy' (2021) 11 *Scientific Reports* 1 <<https://doi.org/10.1038/s41598-021-96020-4>>.

³⁴ Naomi A Rose and ECM Parsons, "'Back off, Man, I'm a Scientist!" When Marine Conservation Science Meets Policy' (2015) 115 *Ocean & Coastal Management* 71 <<http://dx.doi.org/10.1016/j.ocecoaman.2015.04.016>>.

within the scientific community.³⁵ Scientists have started to consider their findings in the context of existing legislation, and how they can contribute to the evaluation of effectiveness of shark-related obligations.³⁶ Researchers can also uncover behaviour breaching legal obligations.³⁷

Furthermore, there is increasing evidence globally that scientists have started to consider the application of their research in the context of policy and management, proposing policy aspects requiring consideration by decision-makers,³⁸ and even providing guidance or strategies to be applied.³⁹ One such study, conducted in 2017, considered species' conservation status and distribution in the context of existing regulations, socio-economic aspects, and available conservation tools, and extended to insights in required actions.⁴⁰ Furthermore, a global analysis of spatial protection measures for the most threatened shark species, which included parts of the Mediterranean Sea, considered such action necessary in the North-African countries of the region.⁴¹ As applicable measures, legal requirements, the contribution of science and non-governmental organisations (NGOs), as well as the overall state of protection of sharks within the Mediterranean have been disputed, a comprehensive assessment investigating the state of play was considered necessary.

³⁵ David S Shiffman and N Hammerschlag, 'Shark Conservation and Management Policy: A Review and Primer for Non-Specialists' (2016) 19 *Animal Conservation* 401 <<http://doi.wiley.com/10.1111/acv.12265>>.

³⁶ K Friedman and others, 'Examining the Impact of CITES Listing of Sharks and Rays in Southeast Asian Fisheries' (2018) 19 *Fish and Fisheries* 662 <<http://doi.wiley.com/10.1111/faf.12281>>.

³⁷ Diego Cardeñosa and others, 'CITES-Listed Sharks Remain among the Top Species in the Contemporary Fin Trade' (2018) 11 *Conservation Letters* 1.

³⁸ Graeme C Hays and others, 'Translating Marine Animal Tracking Data into Conservation Policy and Management' (2019) 34 *Trends in Ecology & Evolution* 459 <<https://linkinghub.elsevier.com/retrieve/pii/S0169534719300242>>.

³⁹ Peter Simmons and Mehmet Ibrahim Mehmet, 'Shark Management Strategy Policy Considerations: Community Preferences, Reasoning and Speculations' (2018) 96 *Marine Policy* 111 <<https://doi.org/10.1016/j.marpol.2018.08.010>>.

⁴⁰ Dulvy and others, 'Challenges and Priorities in Shark and Ray Conservation' (n 20).

⁴¹ Lindsay NK Davidson and Nicholas K Dulvy, 'Global Marine Protected Areas to Prevent Extinctions' (2017) 1 *Nature Ecology & Evolution* 0040 <<http://www.nature.com/articles/s41559-016-0040>>.

To evaluate progress in shark governance, the Mediterranean Sea was chosen as a case study. The region offers a unique case as it is divided between EU and non-EU countries, considered a biodiversity hotspot,⁴² and is influenced by political conflict.⁴³ The waters of the Mediterranean Sea are, to the largest extent, considered high seas, as national claims are still being widely disputed.⁴⁴ It is a semi-enclosed water body expanding over 2.5 million km² (surface area), bordered by 22 countries belonging to three different continents, Europe, South-West Asia, and Northern Africa. Eight of these 22 countries are EU Member States (Croatia, Cyprus, France, Greece, Italy, Malta, Slovenia, and Spain). The non-EU countries with coastal access are Albania, Algeria, Bosnia and Herzegovina, Egypt, Israel, Lebanon, Libya, Montenegro, Morocco, Palestine, Tunisia, Turkey, and Syria.⁴⁵ The political and socio-economic environment of this region is complex and shaped by the influence of different cultures, regulated under common regional frameworks and regulatory bodies. The Mediterranean Sea hosts a variety of ecosystems and species.⁴⁶ These ecosystems range from coastal reefs, sea grass meadows, and sandy bays to deep water coral assemblages, hydrothermal vents, flat, muddy areas, steep slopes, and canyons,⁴⁷ offering living space to about 86 species of elasmobranchs, both as permanent inhabitants or

⁴² Marta Coll and others, 'The Biodiversity of the Mediterranean Sea: Estimates, Patterns, and Threats' (2010) 5 PLoS ONE e11842 <<https://dx.plos.org/10.1371/journal.pone.0011842>>.

⁴³ Richard Gillespie, 'European Union Responses to Conflict in the Western Mediterranean' (2010) 15 The Journal of North African Studies 85 <<http://www.tandfonline.com/doi/abs/10.1080/13629380902920545>>.

⁴⁴ Nikolaos Koulouris, 'The Exclusive Economic Zone Is in Reality a Sovereign Right of a State? The Dispute over the Southeastern Mediterranean Natural Gas Fields' (2020) 13 The Journal of World Energy Law & Business 260 <<https://doi.org/10.1093/jwelb/jwaa024>>.

⁴⁵ Albania, Montenegro, and Turkey are EU MS candidates.

⁴⁶ Carlo Nike Bianchi and others, 'Mediterranean Sea Biodiversity between the Legacy from the Past and a Future of Change' in Noga Stambler (ed), *Life in the Mediterranean Sea: A Look at Habitat Changes* (Nova Science Publishers 2012).

⁴⁷ Roberto Danovaro and others, 'Deep-Sea Biodiversity in the Mediterranean Sea: The Known, the Unknown, and the Unknowable' (2010) 5 PLoS ONE e11832 <<https://dx.plos.org/10.1371/journal.pone.0011832>>.

migrants from the Atlantic.⁴⁸ Three skate species, namely the Maltese ray (*Leucoraja melitensis*), the speckled ray (*Raja polystigma*), and the rough ray (*Raja radula*) are considered endemic to the Mediterranean, meaning this is the only region in which those species occur. Out of all occurring species, 76 have been assessed under the 2016 Red List Assessment of the International Union for the Conservation Nature (IUCN), with more than half of the species facing an elevated risk of extinction within the categories of Threatened to Critically Endangered.⁴⁹ Therefore, the Mediterranean Sea is being considered as one of the most challenging and dangerous places for sharks, as Dulvy et al. in their 2016 analysis of the IUCN Red List status expressed it:

“[...] threat levels across all sharks, rays and chimaeras [...] revealed the Mediterranean Sea as a key hotspot of extinction risk.”⁵⁰

As stated previously, sharks fulfil an assorted range of roles within the marine ecosystem,⁵¹ which in the Mediterranean Sea ranges from bottom dwellers to apex predators controlling fish population.⁵² A more recent study showed the diversity of shark species in the deep, with species composition changing from two dominant species, namely the gulper shark (*Centrophorus granulosus*) and the velvet belly lantern shark (*Etmopterus spinax*) at about 1,500 m to over 2000 m, beyond which additional species are also abundant, including

⁴⁸ F Serena and others, ‘Species Diversity , Taxonomy and Distribution of Chondrichthyes in the Mediterranean and Black Sea Species Diversity , Taxonomy and Distribution of Chondrichthyes in the Mediterranean and Black Sea’ (2020) 87 The European Zoological Journal 497 <<https://doi.org/10.1080/24750263.2020.1805518>>.

⁴⁹ Nicholas K Dulvy and others, ‘The Conservation Status of Sharks, Rays, and Chimaeras in the Mediterranean Sea’ (2016).

⁵⁰ Dulvy and others, ‘The Conservation Status of Sharks, Rays, and Chimaeras in the Mediterranean Sea’ (n 49).

⁵¹ Claudio Barría, Marta Coll and Joan Navarro, ‘Unravelling the Ecological Role and Trophic Relationships of Uncommon and Threatened Elasmobranchs in the Western Mediterranean Sea’ (2015) 539 Marine Ecology Progress Series 225 <<http://www.int-res.com/abstracts/meps/v539/p225-240/>>.

⁵² P Ricci and others, ‘Modelling the Trophic Roles of the Demersal Chondrichthyes in the Northern Ionian Sea (Central Mediterranean Sea)’ (2021) 444 Ecological Modelling 109468 <<https://doi.org/10.1016/j.ecolmodel.2021.109468>>.

blackmouth catsharks (*Galeus melastomus*), Portuguese dogfish (*Centroscymnus coelopsis*), and bluntnose sixgill sharks (*Hexanchus griseus*).⁵³

The legal protection of marine species, including sharks, and other conservation efforts for marine biodiversity in the region are regulated under the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention), as adopted in 1995.⁵⁴ Furthermore, the 1999 IPOA Sharks stipulated the development of a regional action plan for the Mediterranean region under the Barcelona Convention in 2003.⁵⁵

All commercially exploited fish stocks are managed under the General Fisheries Commission for the Mediterranean and Black Sea (GFCM) and the International Commission for the Conservation of Atlantic Tuna (ICCAT), which cooperate on shared issues, such as those relevant for migratory sharks. The fishing sector across Mediterranean countries is defined by a predominance of small-scale fishing vessels, with the latest GFCM report stipulating a fishing fleet of close to 80,000 vessels operating in the Mediterranean Sea with 80.5 % being small-scale vessels, and the largest fleets being operated by Tunisia, Greece, Italy, and Turkey.⁵⁶ Based on the economic data, over 80 % of the revenue from fishing the region is shared between six countries: Turkey, Spain, Algeria, Tunisia, Greece, and Italy.⁵⁷ Fishing, as a livelihood, is undoubtable deeply rooted in the culture and traditions of Mediterranean

⁵³ Danovaro and others (n 47).

⁵⁴ Convention for the Protection of the Mediterranean Sea Against Pollution and its Protocols (entered into force 15 April 1978) 1976 UNTS 1102, amended and renamed in 1995 to 'Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean' (entered into force 9 July 2004) (Barcelona Convention)

⁵⁵ UNEP, 'Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea' (2003).

⁵⁶ Food and Agriculture Organisation of the United Nations, 'The State of Mediterranean and Black Sea Fisheries 2020' (2020).

⁵⁷ Food and Agriculture Organisation of the United Nations (n 56).

nations.⁵⁸ This is noting that, historically and contemporaneously, this region has been subject to extensive human activities, from shipping to fishing.⁵⁹ As a result of human-related pressures, such as overfishing, including the depletion of sharks over the past decades,⁶⁰ habitat destruction, pollution, human-induced climate change, and the spread of invasive species, marine ecosystems are changing.⁶¹

Within the context of shark conservation, it was not clear how Mediterranean countries are performing at national level. While both the fisheries and conservation framework are interconnected and reporting obligations of countries overlap, there has been no coherent, holistic approach to assess shark conservation and management progress overall. Creating an assessment framework to measure the progress in the implementation of shark conservation and management by individual countries, taking different legal obligations into consideration, as well as country-specific factors and socio-economic aspects, was therefore considered necessary and initiated this thesis.

The contribution to knowledge of this work is multifaceted. This thesis introduces a new conceptual framework for policy making for sharks, presents an assessment strategy to determine national progress, provides new insights at national level, demonstrates the contribution of key actors, while highlighting differences between countries, existing gaps, and research needs. The central questions were whether international and regional law

⁵⁸ Angelo R Mojetta and others, 'Where Sharks Met Humans: The Mediterranean Sea, History and Myth of an Ancient Interaction between Two Dominant Predators' (2018) 21 *Regional Studies in Marine Science* 30 <<https://doi.org/10.1016/j.rsma.2017.10.001>>.

⁵⁹ Fiorenza Micheli and others, 'Cumulative Human Impacts on Mediterranean and Black Sea Marine Ecosystems: Assessing Current Pressures and Opportunities' (2013) 8 *PLoS ONE* e79889 <<https://dx.plos.org/10.1371/journal.pone.0079889>>.

⁶⁰ Dulvy and others, 'Overfishing Drives over One-Third of All Sharks and Rays toward a Global Extinction Crisis' (n 5).

⁶¹ Stelios Katsanevakis, Fernando Tempera and Heliana Teixeira, 'Mapping the Impact of Alien Species on Marine Ecosystems: The Mediterranean Sea Case Study' (2016) 22 *Diversity and Distributions* 694 <<https://onlinelibrary.wiley.com/doi/10.1111/ddi.12429>>.

have initiated actions for sharks at national level, what is the best available knowledge, what obstacles may exist to impede good shark governance and, ultimately, what, if anything, can be done to improve shark governance. The overall aim of the project was therefore to evaluate the *status quo* of shark conservation and management within different countries in the context of international legal obligations, to identify differences between countries, and to communicate future action in shark governance. Some scholars claim the world is experiencing a new movement for shark conservation,⁶² while others support this claim by arguing that some aspects of shark conservation could be considered to become international customary law⁶³ - one aim of this work was thus to determine whether this is reflected in the Mediterranean region.

To evaluate progress at national level, a conceptual framework, the shark policy cycle, was established, against which progress at different stages was assessed. The assessment itself used open sources and existing evidence to determine national efforts to protect and manage sharks. It therefore forms part of the growing field of empirical legal and policy research on implementation progress.⁶⁴ It is an evidence-based approach using mixed sources of information, both quantitative and qualitative. The evidence itself was critically evaluated in the process, regarding its applicability to track and trace shark governance progress. Data collection included existing data sets available online, questionnaires to relevant actors, a literature review, and the review of national reports. Individually designed

⁶² Christopher Pepin-Neff and Thomas Wynter, 'Save the Sharks: Reevaluating and (Re)Valuing Feared Predators' (2019) 24 *Human Dimensions of Wildlife* 87 <<https://doi.org/10.1080/10871209.2018.1539887>>.

⁶³ GL Lugten †, 'Soft Law with Hidden Teeth: The Case for a FAO International Plan of Action on Sea Turtles' (2006) 9 *Journal of International Wildlife Law & Policy* 155 <<http://www.tandfonline.com/doi/abs/10.1080/13880290600728179>>.

⁶⁴ Harald Saetren, 'Implementing the Third Generation Research Paradigm in Policy Implementation Research: An Empirical Assessment' (2014) 29 *Public Policy and Administration* 84.

survey questionnaires were sent to the national regulatory entities, NGOs, and recognised national experts. Based on this assessment, gaps were identified, and guidance is provided to improve shark governance nationally.

The assessment of shark governance consisted of three pre-defined constructs: Political commitment, research effort, and implementation effort. Indicators to measure these constructs were based on international legal frameworks. Relationships between the different variables were analysed through the application of non-parametric tests, as the data was not normally distributed.

The roles and responsibilities of countries and different actors in the policy process, such as governmental institutions and NGOs, was also incorporated in the analysis, as were ecological factors related to current shark biodiversity within national jurisdictions.

Furthermore, existing good practices as well as scientific knowledge in terms of conservation and management measures were compiled to inform countries on the currently available techniques and approaches to solve conservation problems related to sharks.

To the best of my knowledge, no one has compiled a comprehensive review of measures from different sources and evaluated these sources, identifying the most suitable ones to track progress for shark governance and determine where improvement in reporting is required. Whilst this is not the first study to assess the implementation of measures following the development of legal obligations at international level, as outlined in the following paragraphs, it is the first to integrate ongoing projects by actors other than governments, namely NGOs and researchers. Some limited research explored the role of

NGOs, concerning their support in monitoring compliance with fisheries regulations;⁶⁵ and the influences of such organisations on shark listings under relevant conventions;⁶⁶ however, no one has yet assessed NGO contributions to shark conservation at national level in such depth.

Assessments of individual national progress in the implementation of measures for shark management under different legal conventions have been conducted before, with the use of national experts and reports under conventions and regional management bodies being a common approach of evaluation, for example, under the CMS,⁶⁷ or to assess the effects of shark listings under CITES.⁶⁸ Nevertheless, a comprehensive approach that not only considers and evaluates measures but also integrates key players has not been conducted: a gap this study fills.

The assessment presents insights into a region, in which policy and legal research on sharks is scarce, the Mediterranean Sea.⁶⁹ Twenty-two coastal States were assessed, providing a baseline against which future actions can be measured and evaluated. The challenge is to find the best regulatory options for each country and each species, which are flexible and feasible whilst also addressing tensions between conservation and fisheries.⁷⁰ Based on this and the outlined development of marine conservation and sustainable use, 'good' or

⁶⁵ Solène Guggisberg, 'The Roles of Nongovernmental Actors in Improving Compliance with Fisheries Regulations' (2019) 28 *Review of European, Comparative & International Environmental Law* 314 <<https://onlinelibrary.wiley.com/doi/10.1111/reel.12304>>.

⁶⁶ Daniel WS Challender and Douglas C MacMillan, 'Investigating the Influence of Non-State Actors on Amendments to the CITES Appendices' (2019) 22 *Journal of International Wildlife Law and Policy* 90 <<https://doi.org/10.1080/13880292.2019.1638549>>.

⁶⁷ Lawson and Fordham (n 26).

⁶⁸ Friedman and others (n 36).

⁶⁹ See results of Chapter Four.

⁷⁰ Erika J Techera and Natalie Klein, 'Fragmented Governance: Reconciling Legal Strategies for Shark Conservation and Management' (2011) 35 *Marine Policy* 73 <<http://dx.doi.org/10.1016/j.marpol.2010.08.003>>.

‘successful’ shark governance shall mean that these policies and measures reflect the best available science (/knowledge), and that implementation incorporates approaches that are recommended internationally, found to be working (e.g., through experience in other countries), and which are feasible and practical.⁷¹ Furthermore, such policies and measures within a country should be in place for the most threatened and vulnerable shark species, including measures for conservation and sustainable management in areas outside national jurisdiction. For other, less threatened species, management measures may be in place, with the aim to maintain and support a diverse group of elasmobranchs within national jurisdiction. If these aspects lag international standards, agreements, and current knowledge, then this can be considered ‘failing’ shark governance, as this would contribute to the continuation of problems such as overfishing, population decline, and biodiversity loss.

The thesis is structured to take the reader through the key information necessary to understand how the law for marine space developed and what instruments are relevant to shark conservation and management. The policy cycle for sharks, which defines different steps of policy making with specific reference to sharks, is followed by details on how international law started to consider sharks and how this is reflected at regional level. The thesis then presents the overall approach used to determine the status of shark governance at national level. This includes the definition of each of the constructs measured, indicators chosen to measure progress, data sources, and limitations. The following three chapters

⁷¹ Juita-Elena (Wie) Yusuf and others, ‘The Sea Is Rising... but Not onto the Policy Agenda: A Multiple Streams Approach to Understanding Sea Level Rise Policies’ (2016) 34 *Environment and Planning C: Government and Policy* 228 <<http://journals.sagepub.com/doi/10.1177/0263774X15614457>>.

present the outcomes of the assessment based on the constructs, set within the context of the policy cycle. The final chapter provides further insights from national experts and research that could guide future action, while critically reviewing the outcomes of the assessment.

This work ultimately aimed to build a bridge between law, policy, science, and the implementation of measures as stipulated by law, thereby connecting law to its intended outcome. While the analysis revealed differences that are likely connected to resource and capacity restrictions/limitations, the work created an inventory of ongoing efforts and issues and proposes improvements.

Chapter One: A Conceptual Framework for Shark Governance

This chapter introduces a policy cycle for sharks, providing a conceptual framework against which progress in shark governance can be assessed. As stated in the introduction to this thesis, in the context of this work ‘shark governance’ is understood as the combination of legal obligations, policy commitments, research contribution, and implemented measures concerning the conservation and management of sharks, including relevant actors.⁷² The policy cycle distinguishes between four stages of policy making,⁷³ and provides examples of how these relate and apply to sharks. The latter was based on shark research and shark-related developments across different regions. The roles and contributions of different actors within this cycle, including national governments and non-governmental organisations (NGOs), were also considered.

In line with the policy cycle, this chapter presents relevant legal developments and related processes, explaining how oceans and sharks made it onto the international agenda. In this regard, legal instruments aiming to regulate the use of marine resources and those with the objective to protect and conserve the environment were prioritised. Special attention was given to relevant legal frameworks for the Mediterranean Sea, including those that apply at European Union (EU) level,⁷⁴ as the assessment evaluated this region as a case study.

⁷² The term ‘sharks’ refers to all elasmobranchs (shark, skates, rays, and sawfishes), unless specifically distinguished in the text.

⁷³ Agenda setting, policy formulation, implementation, and evaluation

⁷⁴ These are introduced in Section 1.2.2.2 for marine conservation, and Section 1.2.4.1 in relation to fisheries; and further explained in detail in relation to legal obligations and relevant commitments in Chapter Three.

1.1. A policy cycle for shark governance

Marine policy is an area in which society realises the impact of human activities on the marine environment.⁷⁵ The regulation of such activities is guided by international efforts to set global principles and targets. Yet, the central responsibility for establishing national policies, creating measures, initiating action, and monitoring success remains with governments and State-controlled institutions.⁷⁶ For sharks, the two most important aspects of governance are the regulation of marine resource use and the protection of species diversity. Although governed under different legal frameworks, there is an inherent and undeniable link between biodiversity and what is referred to as 'marine resources'. In simple terms, sharks, which are considered a resource, as a source of protein, are animals which naturally form part of marine biodiversity. Therefore, one must look both ways, the progress towards more sustainable resource use and conservation efforts aimed at protecting biodiversity.⁷⁷

Policy research offers several frameworks to explain and describe how policies are developed and determined, but the policy cycle is one approach that has gained wide ranging attention and application across different strategic issues.⁷⁸ The policy cycle is based on the idea that policy making is a circular process taking place in four key stages (agenda setting, policy formulation, implementation, and evaluation). Although the circular representation of policy processes has been criticised in being too simple to explain complex

⁷⁵ Adam Cole-King, 'Marine Conservation- A New Policy Area' (1993) 17 *Marine Policy* 171.

⁷⁶ Peter Newell, 'The Political Economy of Global Environmental Governance' (2008) 34 *Review of International Studies* 507 <https://www.cambridge.org/core/product/identifier/S0260210508008140/type/journal_article>.

⁷⁷ Definitions of both terms, 'conservation' and 'sustainable use', are presented in section 1.2.1

⁷⁸ Mara S Fischer, Frank, Miller, Gerald J, and Sidney (ed), *Handbook of Public Policy Analysis. Theory, Politics, and Methods*, vol 125 (Taylor & Francis Group 2007).

policy developments, Bridgeman argues that the policy cycle remains valuable and offers a good starting point for analysis of the components of policy making.⁷⁹

To explain and investigate the policy making process related to shark governance, this assessment followed the basic idea of Kingdon’s Multiple Stream Model, with some additional considerations from policy diffusion models (Figure 1).

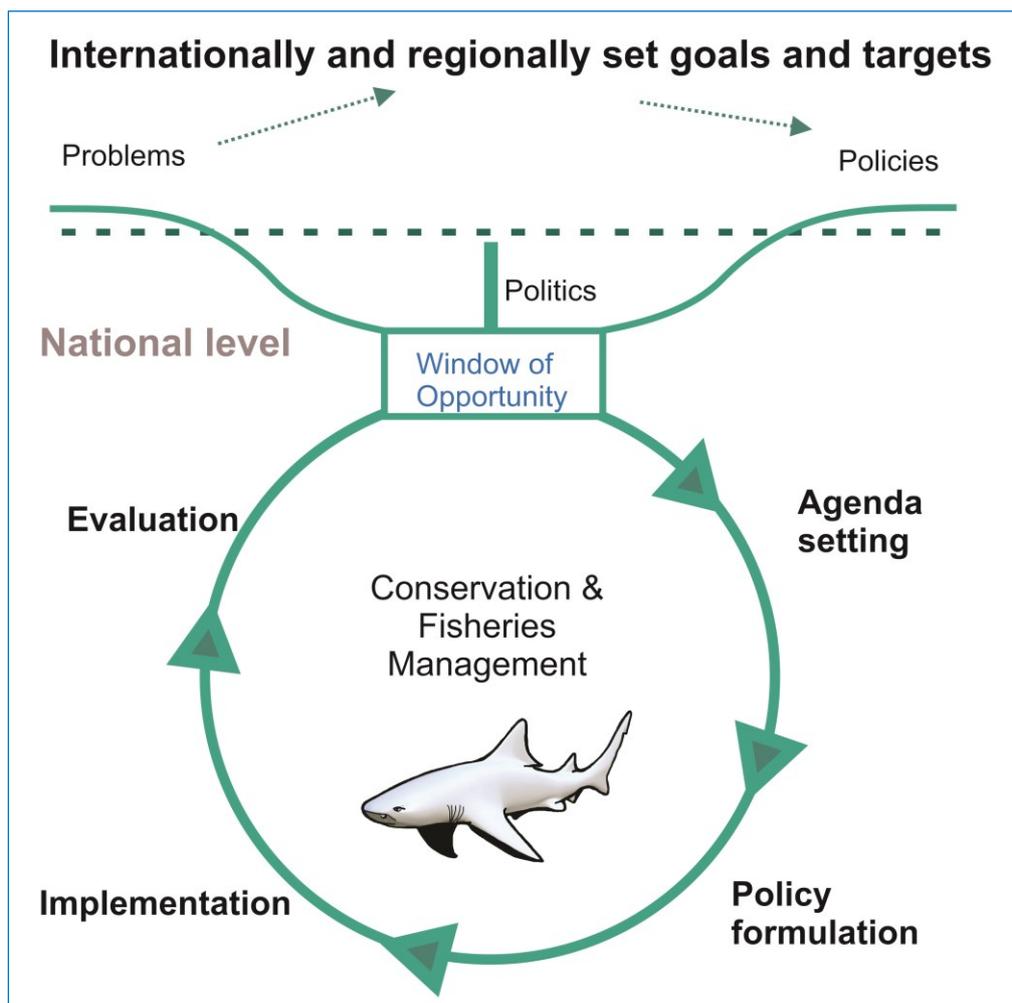


Figure 1. Policy model for shark conservation and sustainable management, based on Kingdon’s Multiple Stream Model and Berry & Berry’s model of policy diffusion, adapted from Koehler & Lowther.⁸⁰

⁷⁹ Peter Bridgeman and Glyn Davis, ‘What Use Is a Policy Cycle? Plenty, If the Aim Is Clear’ (2003) 62 Australian Journal of Public Administration 98 <<http://doi.wiley.com/10.1046/j.1467-8500.2003.00342.x>>.

⁸⁰ Lydia Koehler and Jason Lowther, ‘Policy Making for Sharks and the Role and Contribution of Non-Governmental Organisations in the Fulfilment of International Legal Obligations’ (2022) 144 Marine Policy 105228 <<https://doi.org/10.1016/j.marpol.2022.105228>>.

Kingdon's model, in which multiple streams influence policy decision-making, was first published in 1984,⁸¹ and subsequently revised.⁸² The Multiple Stream Model argues that for an emerging issue to be incorporated into policies, three streams must concur to open a 'window of opportunity'. These streams are the problem, policy, and politics stream. Within this process, governments are the central body, but multiple other actors are involved. The problem stream identifies recognised problems and brings them into the focus of policy makers, while the policy stream delivers available solutions to address problems and proposes potential courses of action, which can be based on or supported by expert advice. The politics stream evaluates the national administrative set-up and political disposition to guide the implementation of policy decisions.⁸³ The model has proven to be useful through multiple applications, including marine fisheries policies.⁸⁴ These applications are not limited to the agenda setting and policy formulation stage, but have also been applied to determine implementation factors that support or hamper implementation success.⁸⁵ The Multiple Stream Model has been used to explain policy making within both developed and developing countries, and proven its contemporary relevance, albeit that slight changes and expanded theories are sometimes required.⁸⁶ The benefits of applying Kingdon's elements of problem, policy and politics' streams was, that the model is capable of reflecting upon processes of policy development for sharks over time, as demonstrated through examples in

⁸¹ John W Kingdon and Eric Stanio, 'Agendas, Alternatives, and Public Policies', vol 45 (Volume 45, Little Brown 1984).

⁸² John W Kingdon, *Agendas, Alternatives, and Public Policies (Second Revised Ed.)* (Second Ed, Addison-Wesley Educational Publishers Tnc All 2003).

⁸³ Pragati Rawat and John Charles Morris, 'Kingdon's "Streams" Model at Thirty: Still Relevant in the 21st Century?' (2016) 44 *Politics & Policy* 608 <<http://doi.wiley.com/10.1111/polp.12168>>.

⁸⁴ Julie Wittrock and others, 'Is Fisheries and Oceans Canada Policy Receptive to a New Pacific Salmon Health Perspective?' (2019) 4 *FACETS* 615 <<http://www.facetsjournal.com/doi/10.1139/facets-2019-0015>>.

⁸⁵ Valery Ridde, 'Policy Implementation in an African State: An Extension of Kingdon's Multiple-Streams Approach' (2009) 87 *Public Administration* 938 <<http://doi.wiley.com/10.1111/j.1467-9299.2009.01792.x>>.

⁸⁶ Rawat and Morris (n 83).

Sections 1.1.1 to 1.1.4, which indicate recognised problems and available policies.

Furthermore, the model helps to explain when and how ‘windows of opportunity’ opened for sharks, as demonstrated through the development of policies and political considerations in Section 1.2.

A diffusion model was incorporated to explain how environmental policies are guided by international efforts, which, in the case of shark governance, is demonstrated in Section 1.2 and further discussed in relation to national policies in Chapter Three and Five. Policy diffusion is broadly defined as a process in which government decisions are “systematically conditioned by policy choices made in other jurisdictions”.⁸⁷ Berry and Berry’s policy diffusion model states that similar policy approaches are or may be taken across countries.⁸⁸ This is based on the idea that environmental policies are set at the global level and diffuse (or are meant to diffuse) into those at national level.⁸⁹ This aligns with the observation that several international and regional fora enable and promote cooperation among States, including requests for information exchange on best available policies and implementation measures.⁹⁰

Berry and Berry’s model adds two important consideration that are relevant to shark governance, namely that policy innovations can be driven by public pressure and learning, and the influence of national factors that can impact the realisation of such policies.⁹¹ The

⁸⁷ Fabrizio Gilardi, ‘Four Ways We Can Improve Policy Diffusion Research’ (2016) 16 *State Politics & Policy Quarterly* 8 <https://www.cambridge.org/core/product/identifier/S153244000003765/type/journal_article>.

⁸⁸ Frances Stokes Berry and William D Berry, ‘Innovation and Diffusion Models in Policy Research’ in Paul A Sabatier (ed), *Theories of the Policy Process* (Westview Press 2007) <<https://www.taylorfrancis.com/books/9780429962837/chapters/10.4324/9780429494284-8>>.

⁸⁹ Kerstin Tews, Per-Olof Busch and Helge Joergens, ‘The Diffusion of New Environmental Policy Instruments1’ (2003) 42 *European Journal of Political Research* 569 <<http://doi.wiley.com/10.1111/1475-6765.00096>>.

⁹⁰ These are further explained in Chapter Three, Section 3.2

⁹¹ Berry and Berry (n 88).

model thereby allows for comparison in similarity of approaches taken, but also difficulties faced but such diffusion, both are further demonstrated and discussed throughout Chapters Three, Five, and Six.

McGrew remarked that global policy issues are increasingly diluting into national issues, structuring the context in which States operate.⁹² A global threat which requires addressing at national level is the loss of biodiversity. This includes the decline in shark populations,⁹³ a rather diverse group of animals,⁹⁴ that mostly fall within national jurisdiction.⁹⁵ Section 1.1.1 provides some examples of global problems occurring also at national/local level.

Within the policy cycle, there are four distinct stages, as explained in the following sections:

1. Agenda setting
2. Policy formulation and decision-making
3. Implementation
4. Evaluation (and termination)⁹⁶

These stages are naturally interlinked but can be analysed separately, which is the approach taken in this assessment.

⁹² Andrew McGrew, 'Globalization and Global Politics', *Globalization and global politics* (Oxford Textbooks 2008).

⁹³ Nathan Pacoureau and others, 'Half a Century of Global Decline in Oceanic Sharks and Rays' (2021) 589 *Nature* 567 <<http://dx.doi.org/10.1038/s41586-020-03173-9>>.

⁹⁴ Stein and others (n 2).

⁹⁵ Davidson and Dulvy (n 41).

⁹⁶ Fischer, Frank, Miller, Gerald J, and Sidney (n 78).

1.1.1 Agenda setting and problem framing

Agenda setting is the stage in which a problem is recognised and put onto a formal policy agenda.⁹⁷ As described through Kingdon's Multiple Stream Model, agenda setting occurs when problems become relevant and require addressing, solutions are available, and the political set-up is supportive to carry this forward through the policy and implementation processes.⁹⁸

There are several steps in investigating policy problems. 'Problem identification and structuring' are essential first steps in analysing policy making. It encompasses not only the recognition of any given problem, but also the determination of characteristics of a problem, namely 'hierarchy', 'interdependency', 'subjectivity', 'artificiality', and 'instability'. These categories describe: who within the government structure is responsible (hierarchy); related and directly connected problems (interdependency); the way problems are defined by people (subjectivity and artificiality); and the potential of problems changing rather than being solved (instability).⁹⁹ This process considers that problem identification should incorporate the human perspective, government and institutional interests, and state of knowledge.¹⁰⁰ Problems are often the result of crisis or issues salient to the public, whereby public values play an important role.¹⁰¹ The value of sharks to humans depends on several

⁹⁷ Fischer, Frank, Miller, Gerald J, and Sidney (n 78).

⁹⁸ Kingdon (n 82).

⁹⁹ William N Dunn, *Public Policy Analysis Dunn* (5th edn, Routledge 2015).

¹⁰⁰ Dunn (n 99).

¹⁰¹ Yusuf and others (n 71).

factors, including the circumstances and reasons for encounters with sharks, for example, as attraction for tourists, including divers, study object for research, or resource for fishers.¹⁰²

Problem framing

‘Problem framing’ refers to how policy actors understand, define, and categorise issues.¹⁰³

Scientific information should be the basis for this process although naturally policy makers are unable to know every detail about all problems.¹⁰⁴ They may also be influenced by their own understanding, knowledge, and beliefs, as Cairney et al. state:

“Scientific evidence plays a part in this process, but we should not exaggerate the ability of scientists to win the day with reference to evidence”.¹⁰⁵

In relation to sharks, there are still substantial gaps in research on many non-charismatic species,¹⁰⁶ especially within developing countries.¹⁰⁷ Non-charismatic species in this context are smaller species, for example, those living in the deep sea, as opposed to species that are larger, well known, and are often subject of media attention, such as great white sharks (*Carcharodon carcharias*) or whale sharks (*Rhincodon typus*). Nevertheless, there are general, recognised problems occurring at global, regional, and national levels affecting

¹⁰² Rachel A Skubel, Meryl Shriver-Rice and Gina M Maranto, ‘Introducing Relational Values as a Tool for Shark Conservation, Science, and Management’ (2019) 6 *Frontiers in Marine Science* 1 <<https://www.frontiersin.org/article/10.3389/fmars.2019.00053/full>>.

¹⁰³ Paul Cairney, *Understanding Public Policy: Theories and Issues* (First, Palgrave Macmillan UK 2012).

¹⁰⁴ Rose and Parsons (n 34).

¹⁰⁵ Paul Cairney, Kathryn Oliver and Adam Wellstead, ‘To Bridge the Divide between Evidence and Policy: Reduce Ambiguity as Much as Uncertainty’ (2016) 76 *Public Administration Review* 399 <<http://doi.wiley.com/10.1111/puar.12555>>.

¹⁰⁶ Paolo Momigliano and Rob Harcourt, ‘Shark Conservation, Governance and Management: The Science-Law Disconnect.’ In Klein N. and Techera E. (Eds) *Sharks: Conservation, Governance and Management.*, *Sharks: Conservation, Governance and Management* (Routledge 2014).

¹⁰⁷ Alec BM Moore and R Dean Grubbs, ‘Shark and Ray Conservation Research: Absent Where the Need Is Greatest’ (2019) 29 *Aquatic Conservation: Marine and Freshwater Ecosystems* 2017 <<https://onlinelibrary.wiley.com/doi/abs/10.1002/aqc.3192>>.

multiple shark species. Such problems, which are acknowledged within several legal frameworks,¹⁰⁸ include:

- Commercial fisheries targeting or affecting sharks continue to fish at unsustainable catch levels,¹⁰⁹ with overfishing and related impacts, including bycatch and discards,¹¹⁰ remaining the main threat to shark populations.¹¹¹ This is causing a continued decline in shark populations, leading many species closer to extinction.¹¹²
- Fishing pressure on shark populations is increasingly exacerbated by recreational fisheries.¹¹³
- Illegal, unreported, and unregulated fishing exacerbates the pressures on shark populations.¹¹⁴
- Increasing human population drives an increasing demand for marine resources, including shark products, locally¹¹⁵ and globally.¹¹⁶
- Shark tourism is a growing industry,¹¹⁷ in need of better regulation.¹¹⁸
- Threatened species, in particular, require more stringent and effective conservation measures.¹¹⁹

¹⁰⁸ See section 1.2 on International Agenda Setting.

¹⁰⁹ Barker and Schluessel (n 15).

¹¹⁰ Shelby Oliver and others, 'Global Patterns in the Bycatch of Sharks and Rays' (2015) 54 *Marine Policy* 86 <<https://linkinghub.elsevier.com/retrieve/pii/S0308597X14003546>>.

¹¹¹ Dulvy and others, 'Challenges and Priorities in Shark and Ray Conservation' (n 20).

¹¹² Dulvy and others, 'Extinction Risk and Conservation of the World's Sharks and Rays' (n 3).

¹¹³ Emna Ben Lamine and others, 'Comparing Commercial, Recreational and Illegal Coastal Fishery Catches and Their Economic Values: A Survey from the Southern Mediterranean Sea' (2018) 25 *Fisheries Management and Ecology* 456.

¹¹⁴ Lindsey A Carr and others, 'Illegal Shark Fishing in the Galápagos Marine Reserve' (2013) 39 *Marine Policy* 317 <<http://dx.doi.org/10.1016/j.marpol.2012.12.005>>.

¹¹⁵ Mahatub Khan Badhon and others, 'Identifying Priorities for Shark Conservation in the Bay of Bengal, Bangladesh' (2019) 6 *Frontiers in Marine Science* 1 <<https://www.frontiersin.org/article/10.3389/fmars.2019.00294/full>>.

¹¹⁶ Felix Dent and Shelley Clarke, 'State of the Global Market for Shark Products. FAO Fisheries and Aquaculture Technical Paper No. 590.' (2015).

¹¹⁷ Austin J Gallagher and Neil Hammerschlag, 'Global Shark Currency: The Distribution, Frequency, and Economic Value of Shark Ecotourism' (2011) 14 *Current Issues in Tourism* 797 <<http://www.tandfonline.com/doi/abs/10.1080/13683500.2011.585227>>.

¹¹⁸ Techera, Erika J., & Klein, Natalie. Regulatory tools for shark conservation and management: improving legal governance and harnessing eco-tourism. (2012) In O. P. Jenkins (Ed.), *Advances in zoology research* (Vol. 3, pp. 1-26). Hauppauge, N.Y.: Nova Science Publications.

¹¹⁹ Rima W Jabado and others, 'Troubled Waters: Threats and Extinction Risk of the Sharks, Rays and Chimaeras of the Arabian Sea and Adjacent Waters' (2018) 19 *Fish and Fisheries* 1043 <<http://doi.wiley.com/10.1111/faf.12311>>.

- Research has begun to show potential impacts as a result of climate change on sharks, including physiological impacts on their breathing,¹²⁰ deterioration of their skin,¹²¹ and changes in shark distribution due to shifts in area use.¹²²

The impact of those problems on shark populations differs.¹²³ While some populations remain in good condition and are not threatened with extinction, others struggle and continue to decline, making prioritisation a necessary exercise when determining which species require most attention for conservation and management. Agenda setting, therefore, should consider the population status and prioritise actions for sharks that face elevated risk levels, as those species are the most vulnerable and threatened.¹²⁴

1.1.2 Policy formulation and decision making

The stage of ‘policy formulation and decision making’ determines the course of actions to be taken for shark conservation and management, and thereby sets out the path for implementing measures. Due to the complexity of problems that governments have to deal with, the involvement and guidance of social and natural scientists in the development of policies is crucial.¹²⁵ As recognized by Lindblom, the evaluation of all circumstances and variables of complex problems is impossible, and policy decisions vary with circumstances; therefore, one must focus on selected aspects to compare policies.¹²⁶ In line with Lindblom’s

¹²⁰ Rui Rosa and others, ‘Neuro-Oxidative Damage and Aerobic Potential Loss of Sharks under Elevated CO₂ and Warming’ (2016) 163 *Marine Biology* 119 <<http://link.springer.com/10.1007/s00227-016-2898-7>>.

¹²¹ Jacqueline Dziergwa and others, ‘Acid-Base Adjustments and First Evidence of Denticle Corrosion Caused by Ocean Acidification Conditions in a Demersal Shark Species’ (2019) 9 *Scientific Reports* 18668 <<http://www.nature.com/articles/s41598-019-54795-7>>.

¹²² Charles W Bangle and others, ‘Increased Abundance and Nursery Habitat Use of the Bull Shark (*Carcharhinus Leucas*) in Response to a Changing Environment in a Warm-Temperate Estuary’ (2018) 8 *Scientific Reports* 6018 <<http://www.nature.com/articles/s41598-018-24510-z>>.

¹²³ Dulvy and others, ‘Extinction Risk and Conservation of the World’s Sharks and Rays’ (n 3).

¹²⁴ Dulvy and others, ‘Challenges and Priorities in Shark and Ray Conservation’ (n 20).

¹²⁵ Dunn, William N. *Public policy analysis*. Routledge, 2015.

¹²⁶ Charles E Lindblom, ‘The Science of “Muddling Through”’ (1959) 19 *Public Administration Review* 79.

observations in 'Politics and markets', the economy can take a leading role in influencing policy decisions.¹²⁷ For example, the fishing sector can influence policy making at national level depending on its contribution and relevance to the economy (trade and consumption).¹²⁸ In countries where the economic value of shark products is negligible and does not substantially contribute to securing food, conservation efforts may supersede economic interests, which can help to curb global drivers for shark products.¹²⁹

Conservation management and resource use often have different objectives, which makes it even more complex and somewhat difficult to align and find common ground and effective solutions.¹³⁰ When looking at fisheries alone objectives might vary between economic, social, ecological, and political interests, which may not be compatible with each other at times.¹³¹ Yet, with increasing concerns for sustainability the fishing sector obviously has a high responsibility to safeguard natural resources, and thereby biodiversity. This is reflected in modern developments; so, whilst historically fisheries frameworks targeted the maximum utilisation of marine resources,¹³² environmental concerns, and the need for sustainability have increasingly been incorporated into fisheries legislation and related policies.¹³³ Such

¹²⁷ Charles E. Lindblom, "Politics and Markets: The World's Political-Economics Systems." (1983).

¹²⁸ Andy Thorpe and others, 'When Fisheries Influence National Policy-Making: An Analysis of the National Development Strategies of Major Fish-Producing Nations in the Developing World' (2005) 29 *Marine Policy* 211 <<https://linkinghub.elsevier.com/retrieve/pii/S0308597X04000314>>.

¹²⁹ Francesco Ferretti and others, 'Shark Fin Trade Bans and Sustainable Shark Fisheries' (2020) 13 *Conservation Letters* 1 <<https://onlinelibrary.wiley.com/doi/abs/10.1111/conl.12708>>.

¹³⁰ Both terms are defined in detail under section 1.2.1

¹³¹ Ray Hilborn, 'Defining Success in Fisheries and Conflicts in Objectives' (2007) 31 *Marine Policy* 153 <<https://linkinghub.elsevier.com/retrieve/pii/S0308597X06000613>>.

¹³² TJ Pitcher and others, "'Back to the Future": A Method Employing Ecosystem Modeling to Maximize the Sustainable Benefits from Fisheries', *Ecosystem Approaches for Fisheries Management* (Alaska Sea Grant, University of Alaska Fairbanks 1999) <<http://seagrant.uaf.edu/bookstore/pubs/AK-SG-99-01.html>>.

¹³³ K Friedman, SM Garcia and J Rice, 'Mainstreaming Biodiversity in Fisheries' (2018) 95 *Marine Policy* 209 <<https://doi.org/10.1016/j.marpol.2018.03.001>>.

legislation can further be streamlined with objectives related to the protection of biodiversity and ecosystems, providing a basis for improved management.¹³⁴

While there may be strong connections between species conservation, public concern, and scientific research in some countries,¹³⁵ there is a general disconnect between science and policy in shark conservation and management,¹³⁶ and a need to incorporate public knowledge in policy making.¹³⁷ The use of science in policy formulation is not always sufficiently clear or transparent, and interactions between scientists and policy makers could be improved.¹³⁸ Science certainly is an important factor in policy and decision making, but is most certainly not the only one, and there are potential pitfalls for scientists trying to enter the policy arena.¹³⁹ As explained above, policy makers are not always able to consider all information available and may exercise judgements based on their beliefs and understanding of the problem.¹⁴⁰

There are a number of regulatory options in marine policy that policy makers can consider, including technical, activity-based measures related to resource management, and environmental measures that are either area-based (spatial) or feature-based (species).¹⁴¹ In relation to sharks, policies and related regulatory measures can, for example, be catch and

¹³⁴ Friedman, Garcia and Rice (n 133).

¹³⁵ Martín-López, Berta, Carlos Montes, Lucía Ramírez, and Javier Benayas. "What drives policy decision-making related to species conservation?". *Biological Conservation* 142, no. 7 (2009): 1370-1380.

¹³⁶ Momigliano and Harcourt (n 106).

¹³⁷ Meri Juntti, Duncan Russel and John Turnpenny, 'Evidence, Politics and Power in Public Policy for the Environment' (2009) 12 *Environmental Science & Policy* 207 <<https://linkinghub.elsevier.com/retrieve/pii/S1462901108001391>>.

¹³⁸ John Holmes and Rebecca Clark, 'Enhancing the Use of Science in Environmental Policy-Making and Regulation' (2008) 11 *Environmental Science & Policy* 702 <<https://linkinghub.elsevier.com/retrieve/pii/S1462901108000956>>.

¹³⁹ Rose and Parsons (n 34). Such pitfalls may include that scientist do not consider the precautionary approach and argue for further investigations being required, which can delay action and missing out on opportunities; or that scientist do not understand policy processes and are not aware of how scientific information could be misinterpreted in such processes; or scientists are not considerate enough when presenting science that could have policy implications.

¹⁴⁰ Cairney, Oliver and Wellstead (n 105).

¹⁴¹ Cole-King, Adam. "Marine conservation: A new policy area." *Marine Policy* 17, no. 3 (1993): 171-185.

finning bans, the declaration of shark sanctuaries, or species-specific catch mitigation.¹⁴²

Some policy analysts and conservation scientists argue that although conservation measures are important for sharks, fisheries management measures should be prioritised over spatial conservation ones, as they will be more effective and quicker in delivering results.¹⁴³ A more comprehensive overview of relevant measures for sharks is listed in Chapter 2 (Section 2.5.3). The listing of sharks in Annexes of legal instruments, as explored in Section 1.2.2, is often the first step in initiating further measures.

In any case, regulatory and conservation measures should consider socio-economic factors to ensure that the intended outcome does not conflict with human livelihoods and basic needs, which is an aspect not well integrated and considered in current shark-related policies.¹⁴⁴ Other economic sectors, albeit less lethal *per se*, may require regulation to support conservation efforts and sustainability. Another form of exploitation that, unlike fishing and product trade, does not focus on their consumption, is shark-based tourism, such as diving and wildlife tours.¹⁴⁵ Regulatory options for this economic sector may include voluntary 'Codes of Conduct' for activities, and the licensing of operations following set standards.¹⁴⁶

Exploring regulatory options for the conservation and management of one species is rather complex, let alone the highly diverse group of sharks. With as many as a thousand species of

¹⁴² Shiffman, D. S., and Neil Hammerschlag. "Shark conservation and management policy: a review and primer for non-specialists." *Animal Conservation* 19, no. 5 (2016): 401-412.

¹⁴³ Dulvy and others, 'Challenges and Priorities in Shark and Ray Conservation' (n 20).

¹⁴⁴ Hollie Booth, Dale Squires and EJ Milner-Gulland, 'The Neglected Complexities of Shark Fisheries, and Priorities for Holistic Risk-Based Management' (2019) 182 *Ocean and Coastal Management* 104994 <<https://doi.org/10.1016/j.ocecoaman.2019.104994>>.

¹⁴⁵ Dobson, John. "Sharks, wildlife tourism, and state regulation." *Tourism in marine environments* 3, no. 1 (2006): 15-23.

¹⁴⁶ Erika J Techera and Natalie Klein, 'The Role of Law in Shark-Based Eco-Tourism: Lessons from Australia' (2013) 39 *Marine Policy* 21 <<https://linkinghub.elsevier.com/retrieve/pii/S0308597X12002011>>.

sharks, regulation and conservation at global level is extremely difficult, necessitating action at national level.¹⁴⁷ Interest groups and NGOs tackling this complex issue have formed over time. A few examples are the Shark Trust, a British NGO that was established in 1997;¹⁴⁸ the Shark Alliance, a coalition of NGOs formed in 2006;¹⁴⁹ and Shark Advocates International, a project formed as part of the Ocean Foundation in 2010.¹⁵⁰ Furthermore, the IUCN has formed a specialist group for sharks¹⁵¹ to assess their conservation and population status (through the IUCN Red List of Threatened Species).¹⁵² Through their work such experts and NGOs often collaborate, provide guidance, and propose national policies. Examples of such policy guidance include, *inter alia*, a global shark conservation strategy,¹⁵³ a sustainable tourism guide,¹⁵⁴ as well as regional action plans.¹⁵⁵ As noted by Quental et al., in the new era of marine policies: “[o]ne of the greatest challenges... [is to] ... transform the meritorious ideas and goals of sustainability into reality”,¹⁵⁶ which is the next stage of the policy cycle, namely implementation.

¹⁴⁷ Techera, Erika. ‘Advancing the Global Governance of Sharks.’ (2013) Australian Environment Review 28.

¹⁴⁸ SharkTrust <<https://www.sharktrust.org/>> accessed 23 January 2020

¹⁴⁹ PEW Charitable Trust <<https://www.pewtrusts.org/en/projects/archived-projects/shark-alliance>> accessed 23 January 2020

¹⁵⁰ Shark Advocates <<http://www.sharkadvocates.org/>> accessed 23 January 2020

¹⁵¹ IUCN ‘IUCN Shark Specialist Group’ <<https://www.iucnssg.org/>> accessed 23 January 2020

¹⁵² IUCN ‘IUCN Redlist of Threatened Species’ <<https://1/www.iucnredlist.org/>> accessed 23 January 2020

¹⁵³ A Bräutigam and others, ‘Global Priorities for Conserving Sharks and Rays: A 2015-2025 Strategy’ 28.

¹⁵⁴ A Lawrence and Others, ‘Responsible Shark and Ray Tourism - A GUIDE TO BEST PRACTICE’ (WWF International, Project AWARE, Manta Trust 2016)

<https://sharks.panda.org/images/PDF/Best_Practice_Guide/sharkandrays_bestpracticeguide_2017_hires.pdf>.

¹⁵⁵ WWF MMI, ‘Sharks in Crisis: A Call to Action for the Mediterranean’ (2019).

¹⁵⁶ Nuno Quental, Júlia M Lourenço and Fernando Nunes Da Silva, ‘Sustainable Development Policy: Goals, Targets and Political Cycles’ (2011) 19 Sustainable Development 15 <<http://doi.wiley.com/10.1002/sd.416>>.

1.1.3 Implementation

Implementation can be defined as actions taken to solve a policy problem, a process that often involves multiple actors.¹⁵⁷ Implementation, as used within the policy cycle to assess national progress in shark governance, refers to the stage in which States and other key actors take specific actions to improve management and protect sharks. In this assessment, ‘implementation’ and ‘implemented measures’ refer to any actions taken at national level, in alignment with legally binding obligations and commitments made through non-binding instruments, such as ‘Action plans’, and policies.

While implementation of environmental and fisheries policies is mainly State responsibility,¹⁵⁸ there is increasing evidence of non-State actors taking on public functions in the regulation and stewardship of nature,¹⁵⁹ especially in those countries facing political challenges and conflicts, or lacking capacity and resources to effectively govern, thereby leading to limited statehood and governance.¹⁶⁰ Fragmented governance, the delayed development of measures, and a non-holistic approach to shark conservation have led to limited success in conservations efforts and require harmonisation of efforts across all levels.¹⁶¹ Although several countries have agreed on and integrated shark conservation efforts into their legal systems,¹⁶² the decline in shark landings over the past decades is

¹⁵⁷ Laurence J O’Toole, ‘Research on Policy Implementation: Assessment and Prospects’ (2000) 10 *Journal of Public Administration Research and Theory* 263.

¹⁵⁸ Stig S Gezelius and Maria Hauck, ‘Toward a Theory of Compliance in State-Regulated Livelihoods: A Comparative Study of Compliance Motivations in Developed and Developing World Fisheries’ (2011) 45 *Law & Society Review* 435 <<http://doi.wiley.com/10.1111/j.1540-5893.2011.00436.x>>.

¹⁵⁹ Newell (n 76).

¹⁶⁰ Tanja A Börzel and Thomas Risse, ‘Governance without a State: Can It Work?’ (2010) 4 *Regulation & Governance* 113 <<http://doi.wiley.com/10.1111/j.1748-5991.2010.01076.x>>.

¹⁶¹ Techera and Klein (n 70).

¹⁶² van Osch (n 27).

more likely related to the ineffectiveness or delayed response-effect of such instruments rather than improved management.¹⁶³ Timely implementation, considering the species-specific life history traits,¹⁶⁴ is therefore of utmost need.¹⁶⁵ Implementing an ecosystem-based approach to fisheries, which encompasses relationships between people, species, and the functionality of the ecosystem,¹⁶⁶ requires a detailed and realistic strategy and operational plan for sustainable management.¹⁶⁷

Scientific evidence for the effectiveness of such policies is needed to further guide global action,¹⁶⁸ as are creative solutions and potential trade-offs for these wicked, complex conservation problems.¹⁶⁹ An example is the trade in shark fins. The social and cultural drivers for shark products need to be understood before the market can be diverted or stopped.¹⁷⁰ In exploring this, it is of note that the use of shark fins is deeply rooted within Chinese cultural identity.¹⁷¹ As a result, diverting and eventually stopping demand, thereby closing the market, requires new strategies including, for example, public campaigns to

¹⁶³ Lindsay NK Davidson, Meg A Krawchuk and Nicholas K Dulvy, 'Why Have Global Shark and Ray Landings Declined: Improved Management or Overfishing?' (2016) 17 *Fish and Fisheries* 438 <<http://doi.wiley.com/10.1111/faf.12119>>.

¹⁶⁴ Such traits include, for example, the life span, age at maturity, gestation time, and number of pups that can be produced per reproduction cycle.

¹⁶⁵ John A. Musick and others. 'Management of sharks and their relatives (Elasmobranchii).' (2000) 3 *American Fisheries Society Fisheries* 25.

¹⁶⁶ R.D. Smith and E. Maltby. (2003). *Using the Ecosystem Approach to Implement the Convention on Biological Diversity: Key Issues and Case Studies*. IUCN, Gland, Switzerland and Cambridge, UK. x + 118 pp.

¹⁶⁷ Serge M Garcia and Kevern L Cochrane, 'Ecosystem Approach to Fisheries: A Review of Implementation Guidelines' (2005) 62 *ICES Journal of Marine Science* 311 <<https://academic.oup.com/icesjms/article/62/3/311/658728>>.

¹⁶⁸ Emily Nicholson and others, 'Making Robust Policy Decisions Using Global Biodiversity Indicators' (2012) 7 *PLoS ONE* e41128 <<https://dx.plos.org/10.1371/journal.pone.0041128>>.

¹⁶⁹ Game and others (n 1).

¹⁷⁰ Shelley Clarke, EJ Milner_Gulland and Trond Bjørndal, 'Social, Economic, and Regulatory Drivers of the Shark Fin Trade' (2007) 22 *Marine Resource Economics* 305 <<https://www.journals.uchicago.edu/doi/10.1086/mre.22.3.42629561>>.

¹⁷¹ Gordon CK Cheung and Chak Yan Chang, 'Cultural Identities of Chinese Business: Networks of the Shark-Fin Business in Hong Kong' (2011) 17 *Asia Pacific Business Review* 343 <<http://www.tandfonline.com/doi/abs/10.1080/13602380903461623>>.

expose these problems.¹⁷² Two examples of approaches to assess implementation progress are as follows.

In 2018, the Food and Agriculture Organization of the United Nations (FAO) and a group of experts developed a fisheries evaluation framework to assess the effects of species listings under the Convention on the International Trade of Endangered Species (CITES)¹⁷³ and their implementation in several Asian countries.¹⁷⁴ They worked together with appointed national specialists to identify actions that have been taken, and what compliance and enforcement capacities existed. They also investigated each country's shark fisheries, as well as market set-up for shark products, and concluded that there is a need for better data collection and cooperation among countries, especially for migratory species.¹⁷⁵ To be selected by governments, implementation measures should be practical and feasible.¹⁷⁶

Also in 2018, Shark Advocates International conducted an evaluation of progress on the implementation of measures under the Convention on the Conservation of Migratory Species of Wild Animals (CMS),¹⁷⁷ based on national reports and questionnaires to locally appointed experts. It found that although progress had been made, more actions, better reporting, improved monitoring, additional conservation measures, as well as enhanced

¹⁷² Elaine Jeffreys, 'Translocal Celebrity Activism: Shark-Protection Campaigns in Mainland China' (2016) 10 *Environmental Communication* 763 <<https://www.tandfonline.com/doi/full/10.1080/17524032.2016.1198822>>.

¹⁷³ See Section 1.2.2 on the meaning of CITES listings

¹⁷⁴ Friedman and others (n 36).

¹⁷⁵ Friedman and others (n 36).

¹⁷⁶ Irfan Yulianto and others, 'Practical Measures for Sustainable Shark Fisheries: Lessons Learned from an Indonesian Targeted Shark Fishery' (2018) 13 *PLOS ONE* e0206437 <<https://dx.plos.org/10.1371/journal.pone.0206437>>.

¹⁷⁷ Convention on the Conservation of Migratory Species of Wild Animals (n 10)

engagement of nations in the CMS Shark Memorandum of Understanding (CMS Shark MoU)¹⁷⁸ are required.¹⁷⁹

Such efforts have increased in recent years in relation to the designation of shark-specific marine sanctuaries.¹⁸⁰ However, the effectiveness of such areas is still to be evaluated.¹⁸¹

There is evidence that even within such designated areas, illegal fishing activities remain a threat.¹⁸² Therefore, any measures for the implementation of shark conservation policies and sustainable management require both effective monitoring and enforcement.¹⁸³

Monitoring in this regard refers to the continued observation of compliant behaviour, while enforcement contemplates actions to ensure rules are followed and that non-compliance is punishable. Non-compliance is a very complex, global issue that occurs at different levels for different reasons.¹⁸⁴ Understanding drivers of non-compliance can help to prevent such behaviour and support the effective design of conservation measures.

Non-compliance is a multi-factorial behaviour, which can be driven by the lack of consideration of socio-economic factors and top-down approaches in decision-making, as well as individuals' interest in securing survival through illegal exploitation at local level, which can further be increased if capacity and resource limitations hinder effective

¹⁷⁸ See Section 1.2.2 on the Sharks MoU under the CMS

¹⁷⁹ Lawson and Fordham (n 26).

¹⁸⁰ Christine A Ward-Paige and Boris Worm, 'Global Evaluation of Shark Sanctuaries' (2017) 47 *Global Environmental Change* 174 <<https://doi.org/10.1016/j.gloenvcha.2017.09.005>>.

¹⁸¹ Christine A Ward-Paige, 'A Global Overview of Shark Sanctuary Regulations and Their Impact on Shark Fisheries' (2017) 82 *Marine Policy* 87 <<http://dx.doi.org/10.1016/j.marpol.2017.05.004>>.

¹⁸² Carr and others (n 114).

¹⁸³ CA Ward-Paige and others, 'Recovery Potential and Conservation Options for Elasmobranchs' (2012) 80 *Journal of Fish Biology* 1844 <<http://doi.wiley.com/10.1111/j.1095-8649.2012.03246.x>>.

¹⁸⁴ Jennifer N Solomon, Michael C Gavin and Meredith L Gore, 'Detecting and Understanding Non-Compliance with Conservation Rules' (2015) 189 *Biological Conservation* 1 <<http://dx.doi.org/10.1016/j.biocon.2015.04.028>>.

enforcement and monitoring.¹⁸⁵ In fact, the lack of sufficient enforcement may be the main driver of non-compliance, followed by the lack of education and awareness of rules, and monetary gain.¹⁸⁶

Generally, enforcement costs are difficult to calculate,¹⁸⁷ but can expand to several million dollars,¹⁸⁸ which can limit effective enforcement at national level if a country cannot 'afford' these costs. However, costs may be reduced through fostering compliance using, for example, incentives,¹⁸⁹ which can redirect public behaviour and demand for shark products.¹⁹⁰ Furthermore, the benefits derived from effective enforcement may exceed the costs for it, as illegal fishing is far more harmful to an economy.¹⁹¹ This noting that there is an increasing use of criminal law to combat illegal fishing activities,¹⁹² which allows for case law to reflect on enforcement of State regulations in relation to non-compliance. An example is the case of the Chinese fishing vessel 'Fu Yuan Leng', which, in 2017, entered the Galapagos Marine Reserve and was boarded for control by the Ecuadorian navy. They found about 300 tonnes of sharks on board, which are protected under national law. The Case of the *Fu Yuan Leng 999* was held in the provincial court of Galapagos, which decided to cease

¹⁸⁵ Janne R Rohe and others, 'Multiple Drivers of Local (Non-) Compliance in Community-Based Marine Resource Management: Case Studies from the South Pacific' (2017) 4 *Frontiers in Marine Science*.

¹⁸⁶ Josephine C Iacarella and others, 'A Synthesis of the Prevalence and Drivers of Non-Compliance in Marine Protected Areas' (2021) 255 *Biological Conservation* 108992 <<https://doi.org/10.1016/j.biocon.2021.108992>>.

¹⁸⁷ Natalie C Ban and others, 'Promise and Problems for Estimating Management Costs of Marine Protected Areas' (2011) 4 *Conservation Letters* 241 <<http://doi.wiley.com/10.1111/j.1755-263X.2011.00171.x>>.

¹⁸⁸ Jon G Sutinen and Peder Andersen, 'The Economics of Fisheries Law Enforcement' (1985) 61 *Land Economics* 387 <<http://www.jstor.org/stable/3146156?origin=crossref>>.

¹⁸⁹ Eduard Niesten, Heidi Gjertsen and Patrick S Fong, 'Incentives for Marine Conservation: Options for Small Island Developing States' (2013) 18 *Environment and Development Economics* 440 <https://www.cambridge.org/core/product/identifier/S1355770X12000484/type/journal_article>.

¹⁹⁰ Jeffreys (n 172).

¹⁹¹ David J Agnew and others, 'Estimating the Worldwide Extent of Illegal Fishing' (2009) 4 *PLoS ONE* e4570 <<https://dx.plos.org/10.1371/journal.pone.0004570>>.

¹⁹² Gezelius and Hauck (n 158).

the vessel, arrest the crew, who was sentenced to four years in jail, and issue a fine of an equivalent to 6 million US dollars.¹⁹³

Whether these instruments and actions will lead to long-term improved of shark governance remains to be evaluated, which is the final stage in the policy cycle.

1.1.4 Evaluation and termination

At the stage of evaluation, the policy cycle determines intended and/or unintended outcomes of any action taken at the implementation stage. Such outcomes are assessed against the original objectives of the policy that has been created during the policy formulation stage.¹⁹⁴ Based on these objectives and the results achieved during implementation, the evaluation stage determines whether a policy is maintained, amended, or terminated. A change in policy requires not only political will and public support, but also evidence to support alternative policies.¹⁹⁵

To be truly successful, any approach to management should not only consider the general public¹⁹⁶ but also consider people (potentially) affected by the implementation of measures ('stakeholders').¹⁹⁷ The more stakeholders have a say in the decision-making process, the more likely it is that they will accept the policy outcome, even if their interests may not be fully accommodated.¹⁹⁸

¹⁹³ Case 'Fu Yuan Leng 999'. Fiscalía General del Estado Ecuatoriano. Boletín de Prensa FGE N. 096-DC-2019: Corte Nacional aceptó recurso de casación por delito contra la flora y fauna silvestres en Galápagos

¹⁹⁴ Fischer, Frank, Miller, Gerald J, and Sidney (n 78).

¹⁹⁵ Nicholson and others (n 168).

¹⁹⁶ Simmons and Mehmet (n 39).

¹⁹⁷ Booth, Squires and Milner-Gulland (n 144).

¹⁹⁸ Börzel and Risse (n 160).

An interesting development in relation to fisheries is the rise in public initiatives aimed at making the sector more sustainable. An example is the Sustainable Seafood Movement, which arose in reaction to fishery management bodies' inertia and failure to prevent overfishing, overcapacity,¹⁹⁹ and impacts on the ecosystem.²⁰⁰ The Movement involves fishing projects aimed at sustainability. These projects are led by NGOs and can support government objectives and obligations.²⁰¹ As governments often struggle to implement fisheries regulations and conservation measures in time to reach globally agreed targets, and thereby cause frustration within the conservation community, NGOs may be set up as a response to drive change and take further action to inform the public, and 'activate' consumers and market actors to demand change.²⁰²

In relation to sharks, existing measures taken at different levels are yet to be capable of full evaluation in terms of their effectiveness.²⁰³ This is based on two factors. Firstly, shark conservation and management are relatively recent developments, that have entered the policy agenda only in the past 20 to 30 years.²⁰⁴ Secondly, sharks' life history traits, including slow growth, late maturity, and low fecundity, require time for any effects to be realised.²⁰⁵

Policy implementation can be evaluated on different levels as the legal framework for sharks is divided into species conservation (including habitat protection), and fisheries

¹⁹⁹ This term refers to unsustainable fishing effort exercised by the fishing fleet, which is characterised by the number of and type of vessels, and the extent to which they fish.

²⁰⁰ Alexis T Gutiérrez and Siân Morgan, 'Impediments to Fisheries Sustainability – Coordination between Public and Private Fisheries Governance Systems' (2017) 135 *Ocean & Coastal Management* 79 <<https://linkinghub.elsevier.com/retrieve/pii/S0964569116302563>>.

²⁰¹ Gutiérrez and Morgan (n 200).

²⁰² Kenneth W Abbott, 'Engaging the Public and the Private in Global Sustainability Governance' (2012) 88 *International Affairs* 543 <<https://academic.oup.com/ia/article-lookup/doi/10.1111/j.1468-2346.2012.01088.x>>.

²⁰³ Ward-Paige (n 181).

²⁰⁴ This is demonstrated in section 1.2.

²⁰⁵ JA Musick and others, 'Management of Sharks and Their Relatives (Elasmobranchii)' (2000) 25 *Fisheries* 9 <[http://doi.wiley.com/10.1577/1548-8446\(2000\)025%3C0009:MOSATR%3E2.0.CO;2](http://doi.wiley.com/10.1577/1548-8446(2000)025%3C0009:MOSATR%3E2.0.CO;2)>.

regulations.²⁰⁶ Within conservation and fisheries management, success may be measured by outcomes rather than input/investment.²⁰⁷ In relation to sharks this would, for example, refer to:

- An increase/recovery in shark populations for which conservation measures have been established;²⁰⁸
- A measurable and documented decrease in bycatch and discards;²⁰⁹
- An increase or stability in abundance of sharks within protected areas;²¹⁰ and/or
- An improvement in the ecosystem condition due to shark presence and strict conservation measures.²¹¹

Any conservation measure may need to accommodate behaviour or ecological aspects of the species to be effective.²¹² It is noteworthy that evaluating the impact of any regulation in such a complex network is extremely difficult. Unfortunately, only few studies exist that have evaluated the implementation of measures for sharks. Examples include well-managed and enforced marine protected areas (MPAs) for sharks that make an essential contribution to conservation, even though success output can take much longer,²¹³ and retention bans, which can reduce shark catches and catch mortality.²¹⁴

²⁰⁶ Erika J. Techera and Natalie Klein, *International Law of Sharks: Obstacles, Options and Opportunities* (n 17).

²⁰⁷ Charles N Ehler, 'Indicators to Measure Governance Performance in Integrated Coastal Management' (2003) 46 *Ocean & Coastal Management* 335 <<https://linkinghub.elsevier.com/retrieve/pii/S0964569103000206>>.

²⁰⁸ Tim P Lynch and others, 'Conservation of the Critically Endangered Eastern Australian Population of the Grey Nurse Shark (*Carcharias Taurus*) Through Cross-Jurisdictional Management of a Network of Marine-Protected Areas' (2013) 52 *Environmental Management* 1341 <<http://link.springer.com/10.1007/s00267-013-0174-x>>.

²⁰⁹ RJ Richards and others, 'Permanent Magnets Reduce Bycatch of Benthic Sharks in an Ocean Trap Fishery' (2018) 208 *Fisheries Research* 16 <<https://doi.org/10.1016/j.fishres.2018.07.006>>.

²¹⁰ Mark E Bond and others, 'Abundance and Size Structure of a Reef Shark Population within a Marine Reserve Has Remained Stable for More than a Decade' (2017) 576 *Marine Ecology Progress Series* 1 <<http://www.int-res.com/abstracts/meps/v576/p1-10/>>.

²¹¹ George Roff and others, 'The Ecological Role of Sharks on Coral Reefs' (2016) 31 *Trends in Ecology & Evolution* 395 <<https://linkinghub.elsevier.com/retrieve/pii/S0169534716300477>>.

²¹² Andrew M Futerman, 'At the Intersection of Science & Policy: International Shark Conservation & Management' (2018) 28 *Duke Environmental Law and Policy Forum* 259.

²¹³ Ashley J Frisch and Justin R Rizzari, 'Parks for Sharks: Human Exclusion Areas Outperform No-take Marine Reserves' (2019) 17 *Frontiers in Ecology and the Environment* 145 <<https://onlinelibrary.wiley.com/doi/abs/10.1002/fee.2003>>.

²¹⁴ Eric Gilman and others, 'Standardized Catch and Survival Rates, and Effect of a Ban on Shark Retention, Palau Pelagic Longline Fishery' (2016) 26 *Aquatic Conservation: Marine and Freshwater Ecosystems* 1031 <<http://doi.wiley.com/10.1002/aqc.2599>>.

A study in 2018 took a closer look into the legal aspects of shark conservation and management in relation to how international law and EU law relate. This study established that progress had been made but lessons could be learnt at the international level: for example, the introduction of EU Regulation 605/2013,²¹⁵ prohibiting the finning of sharks on board a vessel,²¹⁶ could be optimised by a more rigorous international approach, such as a total ban of the practice, even if only on the high seas.²¹⁷ It remains however questionable whether total bans would be effective, noting that even smaller scale bans prohibiting the fishing of certain species, have shown no or little effect, and are almost impossible to control globally.²¹⁸

While successful conservation and reduction of fisheries' impact may help the species at first, it can also lead to secondary, unintended conflicts, which can include a perceived increase in 'shark attacks', and depredation in fisheries (sharks 'steal' catches from fishers).²¹⁹ A case in point was the reported increase in shark attacks in 2012/13 in Western Australia, which led to the policy response of deploying culling lines to target potentially dangerous shark species.²²⁰ A legal analysis conducted to determine whether the Western Australian shark culling programme was contrary to principles and obligations under the CMS,²²¹ found it difficult to reconcile the two.²²² This shark cull received attention by many

²¹⁵ Regulation (EU) No 605/2013 of the European Parliament and of the Council of 12 June 2013 amending Council Regulation (EC) No 1185/2003 on the removal of fins of sharks on board vessels, OJ L 181, 29.6.2013, p. 1–3.

²¹⁶ The practice of 'finning' refers to the removal of shark fins on board of a fishing vessel and discard of the remaining body at sea. This EU regulation is further explained in Chapter Five, section 5.2.4.7.

²¹⁷ Pavone (n 23).

²¹⁸ Tolotti and others (n 24).

²¹⁹ John K Carlson and others, 'Are We Ready for Elasmobranch Conservation Success?' (2019) 46 *Environmental Conservation* 264 <https://www.cambridge.org/core/product/identifier/S0376892919000225/type/journal_article>.

²²⁰ Carlson and others (n 219).

²²¹ The purpose and context of this convention are explained in section 1.2.

²²² Arie Trouwborst, 'Aussie Jaws and International Laws: The Australian Shark Cull and the Convention on Migratory Species' (2014) 2 *Cornell International Law Journal Online* 41.

scholars, who found that: the educated public prefers non-lethal measures to avoid shark attacks;²²³ the media has an important role to play in correctly communicating shark-human interactions;²²⁴ policies require the support of the public to be accepted and supported;²²⁵ and policies need to be based on solid science.²²⁶

Without public support, policies will inevitably face difficulties, to the point of potentially being publicly opposed. Public support is thus essential, and it is of note that there has been a general improvement in public attitude towards sharks.²²⁷ In general, the public are people that may be affected by a policy decision, while other key actors are more directly involved in development and implementation of policies, as explained in the next section.

1.1.5 Actors within the policy process

As demonstrated throughout the stages of the policy cycle, there are various actors involved in shark governance, globally, regionally, and nationally. Key actors, in policy making for sharks operate within the following sectors:

National governments. Within the policy cycle, the central decision-making responsibility remains with the State's government, which in relation to marine conservation and sustainable use of marine resources can take on roles as: Flag State;²²⁸ State representation at international fora to agree on common goals; and/or regulatory body determining the

²²³ Simmons and Mehmet (n 39).

²²⁴ Sam Fraser-Baxter and Fabien Medvecky, 'Evaluating the Media's Reporting of Public and Political Responses to Human-Shark Interactions in N.S.W, Australia' (2018) 97 Marine Policy 109 <<https://doi.org/10.1016/j.marpol.2018.08.020>>.

²²⁵ Christopher L Neff and Jean YH Yang, 'Shark Bites and Public Attitudes: Policy Implications from the First before and after Shark Bite Survey' (2013) 38 Marine Policy 545 <<http://dx.doi.org/10.1016/j.marpol.2012.06.017>>.

²²⁶ Coco Cullen-Knox and others, 'The Social Licence to Operate and Its Role in Marine Governance: Insights from Australia' (2017) 79 Marine Policy 70 <<http://dx.doi.org/10.1016/j.marpol.2017.02.013>>.

²²⁷ Neff and Yang (n 225).

²²⁸ The Flag State is the State under which a vessel is registered or licensed and thereby has jurisdiction over the vessel.

national course of action. However, in some cases dominant State-power in conventional regulation may be complemented, or even by-passed, by supranational arrangements.²²⁹ An example of a supranational arrangement imposing regulations, such as fisheries quotas, and conservation measures, is the EU.

Non-governmental organisations (NGOs). NGOs not only play a part in pushing agendas, e.g., through advocating listings of species on convention annexes,²³⁰ but also influence and work on policy formulation, implementation, and evaluation. Various marine NGOs and interest groups, which either exclusively focus on sharks (e.g., the Shark Trust), or have shark-related projects within their work programme (e.g., Large Marine Vertebrates Research Institute Philippines),²³¹ have been established over time. Such projects and NGOs do not only contribute to the collection of valuable data, but also implement aspects of regulatory obligations, and often have an educational and awareness component through which they try to improve and increase public knowledge on sharks, the threats they are facing, and how individuals can contribute to conservation and sustainable management.²³² Another example of NGO contribution are fishery projects, which can complement regulatory fisheries measures.²³³

Scientists/researchers. Without researchers gathering and publishing the necessary information for policies, shark conservation and management would not have been on any

²²⁹ Arthur PJ Mol, 'Environmental Governance in the Information Age: The Emergence of Informational Governance' (2006) 24 *Environment and Planning C: Government and Policy* 497.

²³⁰ Challender and MacMillan (n 66).

²³¹ LAMAVE <<https://www.lamave.org/sharks>> accessed 25 January 2020

²³² Jill Hepp and Elizabeth Griffin Wilson, Shark conservation efforts: as diverse as sharks themselves, in '*Sharks: conservation, governance and management*' (Routledge, 2014).

²³³ Gutiérrez and Morgan (n 200).

policy agenda and could not work.²³⁴ Research projects not only collect necessary data based on which governments can act, researchers may also directly propose actions, investigate effects of policies, and suggest ways forward.²³⁵ For example, two studies, one published in 2014 and one in 2017, looked at the *status quo* of shark conservation management and determined global priorities for shark conservation,²³⁶ as well as extensions of MPAs required to support the conservation of the most threatened species.²³⁷ Scientists may also expose knowledge gaps to set the course for future research.²³⁸

Fishing sector. The facets of fishing in relation to sharks are complex and revolve around competing interests, including for example livelihood dependencies, the impact of fishing on shark populations, and the regulation of marketing shark products.²³⁹ The fishing sector can influence agenda setting,²⁴⁰ but it should be part of the policy formulation process, as it is essential in the effective implementation of regulations.²⁴¹ Conversely, fishers are not only at the root of the problem but are themselves affected by both the decline in sharks and conservation actions taken in reaction.²⁴² However, they are not the only players in this game: fishing regulations do involve the national governments as regulators, as well as economic players in the subsequent marketing and trade of products. Furthermore, ‘fishing’

²³⁴ Collin A Simpfendorfer and others, ‘The Importance of Research and Public Opinion to Conservation Management of Sharks and Rays: A Synthesis’ (2011) 62 *Marine and Freshwater Research* 518 <<http://www.publish.csiro.au/?paper=MF11086>>.

²³⁵ Hays and others (n 38).

²³⁶ Dulvy and others, ‘Extinction Risk and Conservation of the World’s Sharks and Rays’ (n 3).

²³⁷ Davidson and Dulvy (n 41).

²³⁸ Joshua D Stewart and others, ‘Research Priorities to Support Effective Manta and Devil Ray Conservation’ (2018) 5 *Frontiers in Marine Science* 1 <<https://www.frontiersin.org/article/10.3389/fmars.2018.00314/full>>.

²³⁹ Dent and Clarke (n 116).

²⁴⁰ Thorpe and others (n 128).

²⁴¹ Booth, Squires and Milner-Gulland (n 144).

²⁴² Vanessa F Jaiteh, Neil R Loneragan and Carol Warren, ‘The End of Shark Finning? Impacts of Declining Catches and Fin Demand on Coastal Community Livelihoods’ (2017) 82 *Marine Policy* 224 <<https://linkinghub.elsevier.com/retrieve/pii/S0308597X17301720>>.

not only involves commercial scale exploitation, but also recreational fishers, who can pose a threat to sharks in some regions.²⁴³ In many countries, recreational fishing for sharks currently remains unregulated, which should be factored into policy and management considerations.²⁴⁴ Another consideration is artisanal fishing, which can be conducted for both commercial gain and subsistence. Although this form of fishing concerns small-scale, traditional methods, carried out in waters close to shore, it can compete with industrial fishing over available fisheries resources.²⁴⁵ In the Mediterranean artisanal fishing is widely commercialised and regulations for commercial fishing therefore apply.²⁴⁶ Artisanal fishing, although increasing, is a non-commercial activity and thereby rules for recreational fishing would need to be followed.²⁴⁷

Tourism sector. Shark tourism is a growing industry generating millions of US dollars worldwide.²⁴⁸ Tourism involves actors such as divers, non-diving tourists (e.g., snorkelers), and tour operators. While such operations can be in conflict with fisheries,²⁴⁹ they can also provide alternative livelihoods for fishers, thereby offering an incentive for the conservation of populations, as opposed to their exploitation.²⁵⁰ There are several ways through which

²⁴³ Kátia Meirelles Felizola Freire and others, 'Estimating Global Catches of Marine Recreational Fisheries' (2020) 7 *Frontiers in Marine Science* 1 <<https://www.frontiersin.org/article/10.3389/fmars.2020.00012/full>>.

²⁴⁴ Robert Arlinghaus and others, 'Opinion: Governing the Recreational Dimension of Global Fisheries' (2019) 116 *Proceedings of the National Academy of Sciences* 5209 <<http://www.pnas.org/lookup/doi/10.1073/pnas.1902796116>>.

²⁴⁵ Pranovi Fabio and others, 'Present and Future Status of Artisanal Fisheries in the Adriatic Sea (Western Mediterranean Sea)' (2016) 122 *Ocean & Coastal Management* 49 <<http://dx.doi.org/10.1016/j.ocecoaman.2016.01.004>>.

²⁴⁶ S Matić-Skoko and others, 'Effectiveness of Conventional Management in Mediterranean Type Artisanal Fisheries' (2011) 91 *Estuarine, Coastal and Shelf Science* 314 <<https://linkinghub.elsevier.com/retrieve/pii/S0272771410003719>>.

²⁴⁷ Toni Font and Josep Lloret, 'Biological and Ecological Impacts Derived from Recreational Fishing in Mediterranean Coastal Areas' (2014) 22 *Reviews in Fisheries Science and Aquaculture* 73.

²⁴⁸ Gallagher and Hammerschlag (n 117).

²⁴⁹ Julia Bentz and others, 'Shark Diving in the Azores: Challenge and Opportunity' (2014) 10 *Tourism in Marine Environments* 71 <<https://www.ingentaconnect.com/content/10.3727/154427314X14056884441789>>.

²⁵⁰ Judi Lowe and Johann Friedrich C Tejada, 'The Role of Livelihoods in Collective Engagement in Sustainable Integrated Coastal Management: Oslob Whale Sharks' (2019) 170 *Ocean and Coastal Management* 80 <<https://doi.org/10.1016/j.ocecoaman.2018.10.018>>.

shark tourism can contribute to the conservation of sharks, if regulated and enforced well enough.²⁵¹ It can, for example, influence public behaviour by creating a connection between people and sharks that can lead to attitude and behaviour change in participants.²⁵² Furthermore, such operations can support research by facilitating and contributing to data collection.²⁵³ However, in order to avoid negative impacts on target species and participants, shark tourism is in need of effective regulation.²⁵⁴

Media.²⁵⁵ When evaluating public attitudes towards sharks, the media plays an important role by creating a visible and easy-to-engage-with platform, especially in countries with extensive media presence.²⁵⁶ Media, which includes, for example, TV programmes, social media posts (e.g., on Facebook), and newspaper articles, can also communicate advances in science to the public and thereby contribute to educating them,²⁵⁷ if proper and positive language is used.²⁵⁸ An example of the latter is the terminology used by media in relation to ‘shark attacks’, for which Neff and Hueter in 2013 published a guidance on improved and more precise terminology.²⁵⁹ They proposed four categories: ‘shark sightings’, ‘shark

²⁵¹ Catherine Macdonald and others, ‘Conservation Potential of Apex Predator Tourism’ (2017) 215 *Biological Conservation* 132 <<https://linkinghub.elsevier.com/retrieve/pii/S0006320717309126>>.

²⁵² Kirin Apps, Kay Dimmock and Charlie Huvneers, ‘Turning Wildlife Experiences into Conservation Action: Can White Shark Cage-Dive Tourism Influence Conservation Behaviour?’ (2018) 88 *Marine Policy* 108 <<https://doi.org/10.1016/j.marpol.2017.11.024>>.

²⁵³ Ward-Paige, Christine A. "The role of the tourism industry." *Sharks: Conservation, Governance and Management*, eds EJ Techera and N. Klein (Milton Park: Routledge) (2014): 157-175.

²⁵⁴ Austin J Gallagher and Charlie PM Huvneers, ‘Emerging Challenges to Shark-Diving Tourism’ (2018) 96 *Marine Policy* 9 <<https://doi.org/10.1016/j.marpol.2018.07.009>>.

²⁵⁵ Media contributions are incorporated here for completeness, but were not assessed in this work, as explained in Chapter two, noting that this would exceed the scope of this PhD.

²⁵⁶ Brianna Le Busque and others, ‘An Analysis of Australian News and Current Affair Program Coverage of Sharks on Facebook’ (2019) 1 *Conservation Science and Practice* 1 <<https://onlinelibrary.wiley.com/doi/abs/10.1111/csp2.1111>>.

²⁵⁷ Jason R O’Byrhim and ECM Parsons, ‘Increased Knowledge about Sharks Increases Public Concern about Their Conservation’ (2015) 56 *Marine Policy* 43 <<http://dx.doi.org/10.1016/j.marpol.2015.02.007>>.

²⁵⁸ Rainer Panoch and Elissa L Pearson, ‘Humans and Sharks’ (2017) 25 *Society & Animals* 57 <https://brill.com/view/journals/soan/25/1/article-p57_4.xml>.

²⁵⁹ Christopher Neff and Robert Hueter, ‘Science, Policy, and the Public Discourse of Shark “Attack”: A Proposal for Reclassifying Human–Shark Interactions’ (2013) 3 *Journal of Environmental Studies and Sciences* 65 <<http://link.springer.com/10.1007/s13412-013-0107-2>>.

encounters', 'shark bites', and 'fatal shark bites', which provide a more precise reflection of such 'human-shark interactions'.²⁶⁰ In its role to reflect public opinion,²⁶¹ different media can influence policy formulation or evaluation,²⁶² and communicate public responses to the implementation of shark related policies,²⁶³ as well as subsequent policy changes,²⁶⁴ as demonstrated in Section 1.1.4 on the example of the shark culling programme in Western Australia.

The contributions of different actors formed part of the evaluation for the respective policy step, to see whether we really are witnessing the 'arrival of a new shark saving movement' as claimed by Neff and Wynter.²⁶⁵ Shark-relevant developments in relation to law and policy are explained in the following sections.

1.2 International agenda setting for oceans and sharks

This section describes the underlying developments at international and regional level that have led to the determination of the conceptual framework of the shark policy cycle and how sharks made it onto the international agenda. Within the shark policy cycle, international legal frameworks set the agenda for action through legally binding obligations as well as commitments established within wider targets and policies. Starting this section are definitions of two key terms, which are used throughout this work, namely

²⁶⁰ Neff and Hueter defined these interactions as follows: sightings do not entail any physical contact with sharks, as opposed to encounters where such contact does not cause any injury. 'Shark bites' clearly indicate that the interaction between shark and human caused an injury, which was not lethal. Whereby the last category clearly was.

²⁶¹ Fraser-Baxter and Medvecky (n 224).

²⁶² Christine McCagh, Joanne Sneddon and Dominique Blache, 'Killing Sharks: The Media's Role in Public and Political Response to Fatal Human-Shark Interactions' (2015) 62 Marine Policy 271 <<http://dx.doi.org/10.1016/j.marpol.2015.09.016>>.

²⁶³ Cullen-Knox and others (n 226).

²⁶⁴ McCagh, Sneddon and Blache (n 262).

²⁶⁵ Pepin-Neff and Wynter (n 62).

‘conservation’ and ‘sustainable use’. Both are essential terms for the understanding of shark-related actions.

Following these definitions, subsequent sections present historical legal developments in conservation and fisheries management, and how these became relevant for marine issues, and in this regard, sharks. To understand the development of marine policy, and how shark conservation and management came to be part of an international, regional, and ultimately national agenda, different processes were analysed. These processes are explained in the following sections, with special reference to the Mediterranean region. At the end of this section, special reference is made to contemporary challenges for sharks.

1.2.1 Defining ‘sustainability’ and ‘conservation’

When attempting to define conservation and sustainability/sustainable use, one must also explain the concept of environmental or marine management and governance. While ‘management’ concerns action and means to achieve an objective, ‘governance’, in general, refers to the processes of how these objectives are set, which actors are involved and thereby can be held accountable, and what course of action is decided,²⁶⁶ as integrated in the definition of shark governance in the introduction to this chapter.

Before looking at international processes and developments, it is useful to investigate what ‘conservation’ and ‘sustainable use’ mean. In terms of the former, there is not a commonly accepted definition, yet conservation is commonly perceived as a concept based on the

²⁶⁶ Grazia Borrini-Feyerabend and Rosemary Hill, ‘Governance for the conservation of nature’, in G. L. Worboys, M. Lockwood, A. Kothari, S. Feary and I. Pulsford (eds) *Protected Area Governance and Management*, (ANU Press, Canberra, 2015, pp. 169–206).

relationship of humans with nature, and the use of its resources and ecosystem services.²⁶⁷

The latter referring to a wider range of benefits provided by the environment, such as areas for recreational uses, mean of transportation, oxygen through photosynthesis, and carbon sequestration in the ocean.²⁶⁸

In 2018, Bob Earl asked several leading experts, who had dedicated their lives to this cause, what 'marine conservation' meant to them. While noting that a formal definition might not be useful, or even possible due to its enormous scope, the consensus of these experts was the need for action to achieve desired outcomes.²⁶⁹ From a marine perspective, such outcomes should ensure that marine biodiversity is protected and maintained indefinitely through effective actions reducing human impact. When Sarah Fowler, an individual instrumental in bringing shark conservation into the international arena, was asked to define the term, she referred to sustainable use and the role of humans as stewards of marine resources, species, and processes.²⁷⁰ In that respect, shark conservation has also been defined as actions that concern people and their relationship with sharks.²⁷¹ The definition of conservation in the context of this work, refers to processes and actions taken to improve the conservation status of sharks, including key actors involved.

Any debate on 'sustainability', 'sustainable use', 'sustainable development', or 'sustainable management' must refer to the 1987 Brundtland report by the United Nations World

²⁶⁷ Chris Sandbrook, 'What Is Conservation?' (2015) 49 *Oryx* 565
<https://www.cambridge.org/core/product/identifier/S0030605315000952/type/journal_article>.

²⁶⁸ Edward B Barbier, 'Marine Ecosystem Services' (2017) 27 *Current Biology* R507
<<http://dx.doi.org/10.1016/j.cub.2017.03.020>>.

²⁶⁹ Bob Earl, *Marine Conservation: People, Ideas and Action* (First ed, Pelagic Publishing Ltd 2018).

²⁷⁰ Chapter 14. Page 147. Earl, Bob. *Marine Conservation: People, Ideas and Action*, (Pelagic Publishing Ltd, 2018).

²⁷¹ F Bargnesi, S Lucrezi and F Ferretti, 'Opportunities from Citizen Science for Shark Conservation, with a Focus on the Mediterranean Sea' (2020) 87 *European Zoological Journal* 20 <<https://doi.org/10.1080/24750263.2019.1709574>>.

Commission on Environmental Development.²⁷² In Part 3 under Article 27 of this report, sustainable development is understood as:

“Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs”.²⁷³

This report also notes existing limitations to achieving sustainable development in relation to the availability of technological solutions, the shape of social organisation, and the ability of the environment to cope with certain uses and impacts. Further reference to sustainability was used in line with the definition by Brundtland.

As mentioned before, conservation in terms of effective, sustainable, long-term management and the preservation of marine resources and services, is a complex system or ‘wicked problem’; one that requires an interdisciplinary approach, creativity in finding solutions, and the consideration of trade-offs, to achieve set objectives.²⁷⁴ Whether available solutions are indeed creative and consider these aspects is demonstrated in Chapter Five, which explains implemented measures. Before that, the next sections illustrate what relevant legal frameworks envision for conservation and sustainable use.

1.2.2 Environmental law and conservation treaties

The consideration of sharks within international, environmental law is presented in the following sections, starting with the 1972 Conference on Human Environment held in Stockholm.²⁷⁵ This conference can be considered as the historical steppingstone into a new

²⁷² G Brundtland, ‘Brundtland, G. (1987). Report of the World Commission on Environment and Development: Our Common Future. [Hereinafter Brundtland Report] United Nations General Assembly Document A/42/427’ (1987).

²⁷³ Brundtland (n 272).

²⁷⁴ Game and others (n 1).

²⁷⁵ UN General Assembly, United Nations Conference on the Human Environment, 15 December 1972, A/RES/2994

era of environmental law. It subsequently triggered the United Nations Conference on Environment and Development (UNCED),²⁷⁶ and the development of three fundamental agreements and subsequent processes that would become relevant for marine conservation, *ipso facto*, sharks. These agreements, as referenced in the previous sections, are the CITES,²⁷⁷ the United Nations Regional Seas Programme,²⁷⁸ and the CMS,²⁷⁹ which are explained in chronological order as follows.

On 3 March 1973, the **Convention on International Trade in Endangered Species of Wild Fauna and Flora** (CITES) was signed in Washington.²⁸⁰ It entered into force after the tenth ratification, on 1 July 1975. CITES operates through the listing of threatened species in appendices, for which different trade criteria apply.²⁸¹ Appendix I lists species in which international commercial trade is prohibited, as these are highly threatened with extinction. Appendix II identifies species that are vulnerable and may become threatened with extinction unless trade is regulated. Trade in these species requires Parties to conduct an assessment referred to as Non-Detriment Finding (NDF) to ensure that the trade is sustainable and will not further the threat to those species. Such trade may then be regulated through set limits (quotas) and requires an export permit. Appendix III species are listed at the request of Party States that control trade and want to ensure that other Parties also apply trade control measures to prevent unsustainable use and endangerment of these

²⁷⁶ United Nations, 'United Nations Conference on Environment and Development (UNCED)' (1992) <<https://sustainabledevelopment.un.org/milestones/unced>> accessed 19 September 2020.

²⁷⁷ Convention on International Trade in Endangered Species of Wild Fauna and Flora (n 9).

²⁷⁸ United Nations Environment Programme, 'Regional Seas Programme' (1974) <<https://www.unep.org/explore-topics/oceans-seas/what-we-do/regional-seas-programme>> accessed 20 November 2020.

²⁷⁹ Convention on the Conservation of Migratory Species of Wild Animals (n 10).

²⁸⁰ Convention on International Trade in Endangered Species of Wild Fauna and Flora (n 9).

²⁸¹ CITES, <<https://www.cites.org/eng/app/index.php>> accessed 12 January 2020

species. In the context of sharks, Resolution 9.17,²⁸² which was adopted through decision 10.48 of the 10th meeting of the Parties,²⁸³ expressed concern of an increasing, uncontrolled, and unmonitored trade in shark products. The Resolution opened an opportunity to lists sharks,²⁸⁴ which has been used to underpin continued shark trade interventions through CITES ever since.²⁸⁵ While listings of shark species is the first step in the regulation of trade under CITES, the implementation of CITES-stipulated measures for sharks differs between Parties.²⁸⁶ Although progress has been made, the need for external support (outside national capacities) for implementation and continued supply of information on implementation progress, as well as integration of new science, remain in demand.²⁸⁷ In addition, while CITES stipulates strong regulatory responses, issues with its implementation and continued illegal trade still pose a threat to these species, requiring continued assessment and enhanced implementation efforts across the trade chain.²⁸⁸ This was demonstrated in the case of manta rays in Indonesia,²⁸⁹ where the effect of national regulations following CITES listings of the species was assessed. The study found that these regulations correlated with changes in manta ray landings and fishing effort, as well reduction in trade, which was supported by interviews with local fishers. However, it also

²⁸² CITES Resolution Conf. 9.17 (6 November 1995).

²⁸³ CITES, <<https://www.cites.org/sites/default/files/eng/cop/10/E10-Decisions.pdf>> accessed 12 January 2020

²⁸⁴ Willem Winjstekers, *The Evolution of CITES A Reference to the Convention on International Trade in Endangered Species of Wild Fauna and Flora - 9th Edition* (2011) <http://www.cites.org/common/resources/Evolution_of_CITES_9.pdf>.

²⁸⁵ CITES, <<https://cites.org/eng/prog/shark/history.php>> accessed 12 January 2020

²⁸⁶ Friedman and others (n 36).

²⁸⁷ Friedman and others (n 36).

²⁸⁸ Hollie Booth and others, 'Assessing the Impact of Regulations on the Use and Trade of Wildlife: An Operational Framework, with a Case Study on Manta Rays' (2020) 22 *Global Ecology and Conservation* e00953 <<https://doi.org/10.1016/j.gecco.2020.e00953>>.

²⁸⁹ *Mobula alfredi* and *Mobula birostris*

noted that the reliance on limited data and fishers' commentaries inherits high uncertainties in determining the real extent to which national regulations led to effective measures.²⁹⁰

With the set-up of a new United Nations (UN) body in 1972, the **United Nations Environmental Programme (UNEP)**, a collaborative approach for marine conservation and sustainable management was initiated in the form of the **UNEP Regional Seas Programme**.²⁹¹ This programme was developed between 1974 and 1976. The programme's aim is to support countries with the implementation of international agreed targets and treaties in a regional context, by developing regional conventions and actions plans. Implementation is monitored by secretariats, regional coordinating units, and/or activity centres. Today, there are 18 such regional programmes which support over 140 countries in marine conservation and management.²⁹² Regional Seas Conventions have supported the development of strategic frameworks to address contemporary issues, including ecosystem monitoring, integrated marine management, spatial conservation, stakeholder engagement and integration into decision-making, as well as intersectoral and cross-country cooperation. They contribute substantially therefore to achieving resilient and healthy oceans.²⁹³ A key mandate of all regional conventions is the protection of the marine environment from pollution. Depending on regional priorities, the regional secretariats and contracting parties have taken action to address marine litter (e.g., Mediterranean), oil pollution (e.g., in the wider Caribbean), effects from nitrogen and phosphorus (Baltic), and

²⁹⁰ Booth and others, 'Assessing the Impact of Regulations on the Use and Trade of Wildlife: An Operational Framework, with a Case Study on Manta Rays' (n 288).

²⁹¹ United Nations Environment Programme (n 278).

²⁹² The Regional Seas Programme for the Mediterranean is explained in section 1.2.2.2.

²⁹³ UNEP, 'Contributions of Regional Seas Conventions and Action Plans to a Healthy Ocean' (2022)

<<https://www.unep.org/resources/report/contributions-regional-seas-conventions-and-action-plans-healthy-ocean>>.

waste management (Pacific). In fact, eleven regional seas have adopted actions plans to address the issue of marine litter.²⁹⁴ Through coordinated efforts by UNEP, these programmes provide support structures for the implementation of obligations established through regional instruments, which are aligned with developments in international environmental law. Although Regional Seas Conventions cover aspects of sustainable resources use, their mandate does not include the management of fisheries, which are governed by regional fisheries bodies, as described in Section 1.2.4. However, Regional Seas Programmes have a mandate to coordinate and cooperate with the latter and support their efforts to combat illegal fishing activities.²⁹⁵ These conventions also contribute to the realisation of Part XII of the Law of the Sea Convention, as described in Section 1.2.3, regarding protection of marine biodiversity areas beyond national jurisdiction, which are covered currently by five Regional Sea Programmes in the North-East Atlantic, South and South-East Pacific, Antarctic, and Mediterranean.²⁹⁶

Emerging from a recommendation of the 1972 Stockholm Conference on Human Environment, the **1979 Convention on the Conservation of Migratory Species of Wild Animals** (CMS) was designed to protect species that migrate across the world and therefore require international protective cooperation.²⁹⁷ With this aim, the CMS introduced an important new concept, the concept of 'Range States',²⁹⁸ in which such species periodically

²⁹⁴ UNEP, 'Contributions of Regional Seas Conventions and Action Plans to a Healthy Ocean' (n 293).

²⁹⁵ UNEP, 'Contributions of Regional Seas Conventions and Action Plans to a Healthy Ocean' (n 293).

²⁹⁶ Darius Campbell and others, 'Regional Seas Programmes Covering Areas Beyond National Jurisdictions' <www.unep.org/regionalseas>.

²⁹⁷ Convention on the Conservation of Migratory Species of Wild Animals (n 10).

²⁹⁸ Convention on the Conservation of Migratory Species of Wild Animals (n 10) art 1(1)(h): "Range State" in relation to a particular migratory species means any State (and where appropriate any other Party referred to under subparagraph (k) of this paragraph) that exercises jurisdiction over any part of the range of that migratory species, or a State, flag vessels of which are engaged outside national jurisdictional limits in taking that migratory species.

occur on their migration routes. Any State, whether it is a Party to the CMS or not, can identify itself as a Range State for migratory species. The identification as Range State remains with the national government, as considered in the national reporting to the CMS Secretariat.²⁹⁹ Important for the understanding of the function of the CMS are the two appendix listings and their relevance for conservation. Appendix I-listed species are meant to receive the highest protection level throughout their range, as they are threatened with extinction. Species listed in Appendix II require international cooperation in conservation management to prevent worsening of their conservation status.³⁰⁰ While agreements under the CMS started rather slowly and ineffectively,³⁰¹ the Convention today has proven its value in the conservation of marine species, especially sharks.³⁰² The listing of sharks under the CMS began in 1999³⁰³ and continues today,³⁰⁴ with the most recent proposals at the CMS Conference of the Parties in India being approved.³⁰⁵ However, listing alone naturally does not guarantee effective conservation, and unfortunately many of the listed species continue to decline, including sharks.³⁰⁶ In 2010 a new voluntary instrument, the **CMS Memorandum of Understanding on the Conservation of Migratory Sharks** (CMS Sharks MOU),³⁰⁷ was created with the aim of establishing a better connection between science and policy-making for selected migratory shark species. The Shark MoU follows an agreed

²⁹⁹ Convention on the Conservation of Migratory Species of Wild Animals (n 10) art VI (2)

³⁰⁰ CMS <<https://www.cms.int/en/species/appendix-i-ii-cms>> accessed 25 January 2020

³⁰¹ Lyster, Simon. "The convention on the conservation of migratory species of wild animals (The Bonn convention)." *Nat. Resources J.* 29 (1989): 979.

³⁰² Lawson, J. M., and S. V. Fordham. "Sharks ahead: Realizing the potential of the Convention on Migratory Species to conserve elasmobranchs." *CMS/Sharks/MOS3/Inf 21* (2018).

³⁰³ Whale shark (*Rhincodon typus*) listed on Appendix II

³⁰⁴ <https://www.cms.int/sharks/en/species>

³⁰⁵ Listing of Tope shark (*Galeorhinus galeus*) and Smooth Hammerhead (*Sphyrna zygaena*) on Appendix II.

<https://in.one.un.org/un-press-release/cms-cop13-concludes-in-india-with-major-new-actions-for-migratory-species/>

³⁰⁶ https://www.cms.int/en/news/cms-present-preliminary-review-conservation-status-migratory-species?fbclid=IwARODguR1bmIKYf4S03BYbEcP8MvTqm6sPLYVHN-4otrgrvcgsPT_QMR5_KSI

³⁰⁷ CMS Shark MoU (n 11)

conservation plan and cooperation is established through regular meetings of the forty-nine (including the EU) signatories to the MoU.³⁰⁸

CITES currently has 184 parties³⁰⁹ and the CMS 133,³¹⁰ all of which have a duty to cooperate for the protection of threatened and endangered species. All three frameworks, the UNEP Regional Seas Programme, CMS, and CITES, require regularly reporting to the respective secretariats, which allows interested parties to monitor the implementation progress of different countries.

1.2.2.1 The UNCED process: where conservation concerns and a drive for sustainable development meet

Reflecting the global community's increasing awareness of human impacts on the environment and the dependency of human well-being and the economy on it, are augmented international efforts to preserve the environment and the placing of marine conservation on the international agenda.³¹¹ The below outlines UNCED and other related UN processes (as relevant to marine conservation), their outcomes, values, and limitations. The first UN Conference on Environment and Development or 'Earth Summit' took place in 1992, in Rio de Janeiro, Brazil. There are three major outputs of this summit that formed a

³⁰⁸ CMS Shark MoU (n 11) Annex III

³⁰⁹ CITES <<https://www.cites.org/eng/disc/parties/index.php>> accessed 15 January 2020

³¹⁰ CMS <<https://www.cms.int/en/parties-range-states>> accessed 15 January 2020

³¹¹ Lee A Kimball, 'UNCED and the Oceans Agenda' (1993) 17 Marine Policy 491 <<https://linkinghub.elsevier.com/retrieve/pii/0308597X9390012R>>.

foundation for marine conservation. These are the Rio Declaration on Environment and Development,³¹² **Agenda 21**,³¹³ and the **Convention on Biological Diversity**.³¹⁴

The **Rio Declaration on Environment and Development** (Rio Declaration) sets out 27 fundamental principles for sustainable development focusing on both the rights of humans to a healthy environment and the duty to protect it and prevent harm from human activities, such as through environmental pollution. The principles outlined in the Rio Declaration therefore reflect international customary law, including, for example, State responsibility to prevent pollution within their jurisdiction and not to let any such harm threatened waters under other jurisdictions (Principle 2). The Declaration defines, under Principle 15, a precautionary approach to prevent environmental degradation, which was then reinforced in Agenda 21. Another important principle of environmental law, is the principles of Common but Differentiated Responsibility (Principle 7), as further explained and discussed in Chapter Two, Section 2.6.

Agenda 21 is a non-binding action plan that was developed to guide States on actions required to achieve sustainable development and foster conservation of the environment. While it does not suggest specific measures, it can be regarded as the first step in laying the path for future ocean conservation. Chapter 17 of Agenda 21 concerns the protection of the marine environment and the sustainable use of living resources therein. It acknowledges the importance of State regulation of waters within their territorial jurisdiction. It also urges States to set up an integrated approach to policy and decision making as well as resource

³¹² United Nations, 'A/CONF.151/26/Vol.I: Rio Declaration on Environment and Development.', vol I (1992) <<http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm>>.

³¹³ United Nations Conference on Environment and Development, Agenda 21 (1992), (Rio Declaration, United Nations).

³¹⁴ Convention on Biological Diversity (adopted 5 June 1992, entered into force 29 December 1993) 1760 UNTS 79 (CBD)

management, involving relevant sectors, with a call for the transparent flow of information to all actors, whether individuals or groups, as the State deems appropriate. The chapter proposes several grounds for actions and encourages application of the precautionary approach. In the report of the first Earth Summit, the precautionary approach is defined in Article 15 as follows:

“Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”³¹⁵

However, Agenda 21 lacks the status of a treaty, and therefore as a non-legally binding ‘statement of intent’, does not oblige States to act.

The **Convention on Biological Diversity** (CBD) was the second outcome of the first Earth Summit.³¹⁶ In 1989, a group of international experts, set up through the initiative of UNEP, started drawing up a legally binding instrument on biological diversity. The 1992 CBD was one of three major conventions opened for signature at the first Earth Summit and entered into force in December 1993. The Convention gave meaning and value to the protection of biodiversity, which is defined in Article 2 as:

“[...] the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems”.

The CBD does not discriminate between species and therefore applies to sharks. However, there is a distinction made for those species of value to humans, which are also considered to be ‘biological resources’ under Article 2. Beside the conservation of biological diversity,

³¹⁵ United Nations, ‘Report of the United Nations Conference on Environment and Development’, https://www.un.org/Depts/los/consultative_process/documents/A21-Ch17.htm, accessed 21 January 2020

³¹⁶ Convention on Biological Diversity (n 314).

the CBD intends to promote the sustainable use of biological resources and ensure a fair and equitable approach to the sharing of benefits related to the use of genetic resources. The Convention requires State Parties to set up national biodiversity action plans,³¹⁷ which are in line with global targets as agreed by the Conference of the Parties (CoP), such as the Aichi targets (2011-2020).³¹⁸ These targets include, *inter alia*, the sustainable management of fish stocks (Target 6), a global ten percent goal for marine protected area coverage (Target 11), as well as saving threatened species from extinction (Target 12). All three are relevant and important measures capable of supporting shark conservation and management. A regular CoP as constituted under Article 23 of the CBD,³¹⁹ monitors progress in the implementation of the CBD and subsequent agreements. The CBD CoP also serves as platform to negotiate new programs and targets, not only between Parties, but also NGOs, such as the IUCN.

The commitments made during the first Earth Summit were reaffirmed during the second Earth Summit in 2002, which took place in Johannesburg, South Africa. The **Johannesburg Plan of Implementation** (JPOI)³²⁰ is another guidance document for action that aimed to strengthen the commitment to the implementation of Agenda 21. Whilst the JPOI failed to actually generate stronger commitments to support implementation efforts,³²¹ within it, oceans are recognised as playing a central and essential role in future development, with an

³¹⁷ Convention on Biological Diversity (n 314) art 6(a)

³¹⁸ CBD, <https://www.cbd.int/sp/targets/>, accessed 21 January 2020

³¹⁹ Convention on Biological Diversity (n 314) art 23

³²⁰ World Summit on Sustainable Development, Johannesburg Declaration on Sustainable Development and Plan of Implementation of the World Summit on Sustainable Development (2003) (New York, United Nations Department of Public Information).

³²¹ Antonio GM La Vina, Gretchen Hoff and Anne Marie DeRose, 'The Outcomes of Johannesburg: Assessing the World Summit on Sustainable Development' (2003) 23 SAIS Review 53
<http://muse.jhu.edu/content/crossref/journals/sais_review/v023/23.1la_vina.html>.

associated need to protect the resources living within marine areas, which naturally extends to sharks.³²²

The third Earth Summit, held in 2012 in Rio de Janeiro, Brazil, produced a Declaration titled **‘The Future We Want’**.³²³ It was another UN declaration committing participating States to previously agreed targets under the JPOI, highlighting the need for ocean protection.³²⁴ This Declaration sought to achieve such protection by committing States to restoring and rebuilding ocean health. At the time, scientists made an appeal to governments to make even stronger commitments, especially in relation to the sustainability of global fishing, noting a lack in the implementation progress of previous commitments.³²⁵

The UNCED process depicted above started to build the foundation of what would become a global approach to environmental governance, with the participation of many actors.³²⁶ It highlighted that sustainable use and conservation are not separate but intertwined. UNCED showed that international instruments guide or are meant to guide national developments. On the other hand, national implementation depends on the socio-economic context and ecosystems present within each country.³²⁷ However, despite a potential for creating policy change for oceans, the ‘Future We Want’ provides little practical guidance on how to

³²² Johannesburg Declaration on Sustainable Development and Plan of Implementation of the World Summit on Sustainable Development (n 320) art 30

³²³ United Nations. The Future We Want –Declaration of the UN Conference on Sustainable Development, Rio (2012).

³²⁴ In paragraphs 158 to 177

³²⁵ Liane Veitch and others, ‘Avoiding Empty Ocean Commitments at Rio+20’ (2012) 336 Science 1383.

³²⁶ O’Neill, Kate. "From Stockholm to Johannesburg and beyond: the evolving meta-regime for global environmental governance." In Amsterdam conference on the human dimensions of global Environmental change, pp. 24-26. 2007.

³²⁷ Kimball (n 311).

achieve the objectives of the Declaration, thereby leaving room for potential failure at national level in defining conservation policies and implementation of measures.³²⁸

The UNCED process also inspired the development of global goals for conservation and sustainable development, with the UN adopting eight **Millennium Development Goals** (MDGs) in 2000.³²⁹ Although Goal 7 was specifically targeted at achieving environmental sustainability, it can be argued that the overall aim of the MDGs was to address and ultimately eradicate poverty and related problems within developing nations, which is reflected in the outcome report.³³⁰ This report states that the only achievement related to improving marine protection was connected to an increase in protected area designation. In September 2015, after the end of the implementation phase, the UN's 193 Member States adopted new global goals, the so-called **Sustainable Development Goals** (SDGs), for a period of 15 years (2016-30) to continue the fight against poverty, address inequalities, and combat climate change.³³¹ Unlike the development of the MDGs by UN experts guided by the UN Secretary General, the SDGs were a results of negotiations by governments over a period of nearly one year (March 2013 – July 2014). Seventeen goals were set to be implemented and oceans, this time, were not part of an overarching environmental target, but were given priority under Goal 14. This specifically addresses the need to protect oceans, seas, and their resources, incorporating, *inter alia*, a target of a minimum of ten

³²⁸ Philipp Pattberg and Ayşem Mert, 'The Future We Get Might Not Be the Future We Want: Analyzing the Rio+20 Outcomes' (2013) 4 Global Policy n/a <<http://doi.wiley.com/10.1111/1758-5899.12044>>.

³²⁹ United Nations, 'The Millennium Development Goals Report' (2015).

³³⁰ Ki-Moon, B. (2015). The millennium development goals report 2015. United Nations Publications.

³³¹ United Nations <<https://www.un.org/sustainabledevelopment/summit/>> accessed 21 January 2020

percent marine protected area coverage by 2020 (Target 14.5), and the prohibition of harmful fisheries subsidies (Target 14.6).

1.2.2.2 Conservation frameworks at regional level

Following the establishment of UNEP, the **Mediterranean Action Plan** (MAP) initiated a platform for cooperation and was adopted in 1975 as a multilateral environmental agreement (MEA). Approved by Mediterranean countries and the EU, a framework convention was set up in 1976 aimed at the protection of the Mediterranean against Pollution, which, following the 1992 Rio Conference, was amended to become the **Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean** (Barcelona Convention), as adopted in 1995.³³² Together, UNEP MAP and the Barcelona Convention have progressively built a comprehensive institutional, legal, and implementation framework. The Barcelona Convention is implemented through various protocols, one of which is the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol).³³³ Under this Protocol, two Annexes for species listing were established. Annex II lists species considered endangered or threatened and which require the highest conservation efforts, including the establishment of MPAs, which under the Protocol are referred to as 'Specially Protected Areas of Mediterranean Importance' (SPAMI). Currently, twenty-four species of elasmobranchs are listed under this Annex. Annex III under the SPA/BD Protocol lists species of conservation concern requiring management measures to avoid further decline. This Annex currently includes nine species

³³² Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (n 54)

³³³ The Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (adopted on 10 June 1995, entered into force on 12 December 1999).

of elasmobranchs. Both Annexes integrate species listed under CMS (see below) and CITES Appendices, as relevant to the Mediterranean region. Furthermore, a regional action plan for sharks was adopted under the SPA/BD Protocol in 2003,³³⁴ which will further be explained in Chapter Three. The implementation of the Barcelona Convention, its Protocols and the regional action plan is monitored through the Regional Activity Centre for Specially Protected Areas (RAC/SPA).

In 1979, the Council of Europe adopted a treaty for the conservation of the environment in Europe, the **Convention on the Conservation of European Wildlife and Natural Habitats** (Bern Convention).³³⁵ This Convention, like the CMS and CITES, determines different levels of protection and management within appendices. Article 6 of the Bern Convention prohibits any deliberate, harmful action against species listed in Appendix II, which also extends to important breeding or resting sites and includes the trade of any part of these species within Europe.³³⁶ Article 7 of the Bern Convention defines the obligations of Parties for Appendix II species as follows:

“1. Each Contracting Party shall take appropriate and necessary legislative and administrative measures to ensure the protection of the wild fauna species specified in Appendix III.

2. Any exploitation of wild fauna specified in Appendix III shall be regulated in order to keep the populations out of danger, taking into account the requirements of Article 2.”

³³⁴ UNEP, ‘Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea’ (n 55).

³³⁵ Convention on the Conservation of European Wildlife and Natural Habitats (adopted 19 September 1979, entered into force 01 June 1982) ETS 104 (Bern Convention).

³³⁶ Convention on the Conservation of European Wildlife and Natural Habitats (n 335) art 6

The reference to Article 2 implies a duty on Parties to maintain healthy populations of these species, considering ecological, but also societal needs.³³⁷

At EU level, there are two main types of legislation: ‘regulations’ and ‘directives’, which were considered in this assessment. The former creates legally binding provisions applicable to all EU Member States (EU MS) which do not require transposition into national law.

Directives, on the other hand, are also legally binding for EU MS, but their implementation is at the discretion of the MS in terms of achievement of the goals and objectives laid down in the respective directive.³³⁸ In 1992, the EU adopted the Habitats Directive (HD),³³⁹ of which the main objective was to support the conservation of threatened species and habitats,³⁴⁰ ensuring a biodiverse environment, through the establishment of a network of protected sites. This network is defined under Article 3(1) of the HD, as:

“A coherent European ecological network of special areas of conservation shall be set up under the title Natura 2000. This network, composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range”.

However, as demonstrated in the previous sections and further explained in relation to fisheries in Sections 1.2.3 to 1.2.4.2, in 1992 sharks had not yet gained the attention of the international community, and the HD did not include any shark species in its Appendices.

This gap was partly filled in 2008 through the adoption of the **Marine Strategy Framework**

³³⁷ Convention on the Conservation of European Wildlife and Natural Habitats (n 335) art 2

³³⁸ European Union, ‘Types of Legislation’ <https://european-union.europa.eu/institutions-law-budget/law/types-legislation_en> accessed 14 July 2020.

³³⁹ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, OJ L 206, 22.7.1992, p. 7–50.

³⁴⁰ The term ‘habitat’ refers to the living space occupied by species.

Directive (MSFD).³⁴¹ The Directive’s aim is to achieve ‘Good Environment Status’ (GES) through the development of national plans, referred to as ‘programme of measures’ (PoMs). Based on eleven descriptors,³⁴² EU MS must define a national PoMs to achieve GES, under which MS should also consider a wider regional approach, as stated in Article 5(1) of the MSFD:

“Each Member State shall, in respect of each marine region or subregion concerned, develop a marine strategy for its marine waters [...]”.

This provides an opportunity for EU MS to consider sharks in their national programmes.

However, under paragraph 11 of the preamble of the MSFD it states:

“[...] Member States should not be required to take specific steps where there is no significant risk to the marine environment, or where the costs would be disproportionate taking account of the risks to the marine environment, provided that any decision not to take action is properly justified”.

In paragraph 27 of the preamble, the MSFD incorporates a duty to apply, *inter alia*, the precautionary principle in the design of PoMs.³⁴³ The integration of shark species at national level is further assessed in Chapter Five, which includes the establishment of PoMs in Mediterranean countries.

The legal frameworks for the conservation of the marine environment, as demonstrated above (entire Section 1.2), although complex, built a basis for action for the protection of

³⁴¹ Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive), OJ L 164, 25.6.2008, p. 19–40.

³⁴² Annex I of the MSFD sets out qualitative descriptors (D) which aim to: Maintain Biodiversity (D1); Prevent ecosystem alterations through non-indigenous species (D2); Ensure healthy populations of commercially fishes species (D3); Sustain food webs (D4); Reduce Eutrophication to a minimum (D5); Maintain sea floor integrity (D6); Ensure that permanent, man-made alterations to the seabed do not adversely affect the marine ecosystem (D7); Control concentrations of contaminants to a level where there is no effect on marine life and ecosystems (D8); Limit contamination in seafood (D9); Reduce the impact of marine litter (D10); and control the introduction of energy, including underwater noise (D11).

³⁴³ Directive 2008/56/EC (n 341) para 27: “Those measures should be devised on the basis of the precautionary principle and the principles that preventive action should be taken, that environmental damage should, as a priority, be rectified at source and that the polluter should pay”.

sharks globally and regionally. Obligations deriving from these frameworks are further explained in Chapter Three (Section 3.2). Whether fisheries management presents an equally complex legal environments is described in the following sections.

1.2.3 A new Law of the Sea

Changing perspective from conservation to sustainable use and fisheries management, this and the following sections focus on international and regional developments aimed at achieving sustainability in the use of marine resources. While the UNCED process defined a new agenda for environmental protection and development, the fundamental legal instrument regulating activities in marine spaces is the **1982 Law of the Sea Convention** (LOSC),³⁴⁴ often also referred to as the 'constitution of the seas'. The negotiation process that ultimately led to the adoption of the LOSC encompassed three preceding conferences on the Law of the Sea. The first conference on the Law of the Sea (UNCLOS I) was held in Geneva between 1956 and 1958 and established four separate conventions: one on the Territorial Sea and Contiguous Zone, one on the Continental Shelf, one on High Seas, and one on Fishing and the Conservation of Living Resources of the High Seas. The second UNCLOS in 1960, which also took place in Geneva, did not further the efforts towards one overarching convention. The final conference, UNCLOS III, convened in New York 1973 and involved representatives of over 160 States, led to the adoption of the LOSC.³⁴⁵ This Convention originated out of the need to regulate unilateral national claims and uncontrolled expanding use of oceans, at a time where new States saw the potential to

³⁴⁴ United Nations Convention on the Law of the Sea (n 8)

³⁴⁵ United Nations, 'The United Nations Convention on the Law of the Sea. (A Historical Perspective)'

<https://www.un.org/depts/los/convention_agreements/convention_historical_perspective.htm> accessed 12 May 2020.

develop their economies by making use of marine space and resources.³⁴⁶ The mentality under which the LOSC was developed thus focused on the potential of the oceans to fulfil the development needs of nations. This included newly independent countries, which strived to claim their right to sovereign use of the resources under their jurisdiction.³⁴⁷ This mentality was a turning point from the 'freedom of the seas doctrine' to the jurisdictional expansion of national rights over marine resources.³⁴⁸ However, with increased use and expansion of activities, concerns grew on their impact on the marine environment and sustainability of such use.³⁴⁹

The negotiations that led to the conclusion of the Convention are defined by compromise between States' rights to explore and exploit and a duty to protect and preserve the marine environment. Part V of the LOSC contains provisions related to the Exclusive Economic Zone (EEZ), with Article 56 defining the rights of coastal States within these areas, while Article 61 contains the duty to ensure that exploitation of living resources within the EEZ is managed in a way to avoid overexploitation, including species affected by fisheries taking place, to ensure that populations are maintained at healthy levels or restored to such. Article 64 refers to species considered 'highly migratory', as detailed in Annex I of the Convention, as those require cooperative efforts and should be managed through international organisations in areas within and beyond national jurisdiction to ensure a common

³⁴⁶ United Nations 'Oceans and the Law of the Sea'
<https://www.un.org/depts/los/convention_agreements/convention_historical_perspective.htm> accessed 02 February 2020

³⁴⁷ Jean-Pierre Levy, 'Towards an Integrated Marine Policy in Developing Countries' (1988) 12 *Marine Policy* 326
<<https://linkinghub.elsevier.com/retrieve/pii/0308597X88900188>>.

³⁴⁸ Philip Allott, 'Mare Nostrum : A New International Law of the Sea' (1992) 86 Cambridge University Press 764
<<https://www.jstor.org/stable/2203793>>.

³⁴⁹ Cole-King (n 75).

approach in regulating exploitation. Such organisations with the mandate to manage straddling and migratory stocks are further explained in Section 1.2.4.

The preamble of the LOSC recognises three distinct aims of the Convention: the establishment of a legal foundation for international communication and cooperation, an efficient utilisation of marine resources, and the conservation of the marine environment.³⁵⁰

While assigning rights to nations and legitimising economic claims made over an area of 200 nautical miles,³⁵¹ the LOSC also incorporates a fundamental responsibility of stewardship and good governance over marine resources. It achieves this by placing obligations on States to create measures to maintain and restore populations, conserve living resources and cooperate in areas of national jurisdiction to the extent of the EEZ,³⁵² and as applicable to nationals on the high seas.³⁵³

Part XII of the LOSC concerns duties to protect the marine environment. Article 192 entails a general duty to protect marine environment, while Articles 197 to 206 stipulate administrative procedures and rules for controlling, reporting, and monitoring pollution of the marine environment with the requirement for international cooperation.

Cooperation and coordination are also required in relation to marine scientific research, as stipulated in PART XIII of the Convention. Such research is a universal right (Article 238) but does not generate a basis for jurisdictional claims (Article 241) and must be conducted for peaceful purposes and shared widely. Although not directly defined, marine scientific

³⁵⁰ United Nations Convention on the Law of the Sea (n 8) preamble

³⁵¹ United Nations Convention on the Law of the Sea (n 8) part V

³⁵² United Nations Convention on the Law of the Sea (n 8) art 61

³⁵³ United Nations Convention on the Law of the Sea (n 8) art 117

research can be interpreted as any form of scientific activity to gather information in the marine space. The Convention lays down principles for such research in respect of States' rights to regulate and control scientific projects within waters under national jurisdiction. The importance of marine research and how cooperation among States and knowledge sharing are approach in the Mediterranean Sea was assessed and is described in Chapter Four.

Although the LOSC distinguishes between the exploitation of living resources and the impact on other, non-commercial species when establishing measures for management and conservation, the focus of the convention is clearly to ensure long-term, optimal utilisation of these resources. Within the LOSC, sharks are mentioned once, in Annex I, including three species and four shark families.³⁵⁴

1.2.4 International and regional regulation of fisheries

In the process of establishing global agreements and a global economy related to fisheries, fundamental principles were integrated into relevant instruments. This includes, *inter alia*, the precautionary approach and sustainable use,³⁵⁵ which derived from the need to address unsustainable practices and overexploitation of marine resources.³⁵⁶ Given that fisheries and fishing rights have been a central concern within international discussions,³⁵⁷ the UNCED process recognised the need for State cooperation to manage shared living

³⁵⁴ United Nations Convention on the Law of the Sea (n 8) Annex I (16.) Oceanic sharks: *Hexanchus griseus*; *Cetorhinus maximus*; Family Alopiidae; *Rhincodon typus*; Family Carcharhinidae; Family Sphyrnidae; Family Isurida.

³⁵⁵ As defined in section 1.2.2.1 and section 1.2.1. respectively

³⁵⁶ Daniel Pauly, 'Global Fisheries: A Brief Review' (2008) 9 Journal of Biological Research 3.

³⁵⁷ Edward L Miles and William L Burke, 'Pressures on the United Nations Convention on the Law of the Sea of 1982 Arising from New Fisheries Conflicts: The Problem of Straddling Stocks' (1989) 20 Ocean Development and International Law 343.

resources in high sea areas, specifically for species that cross multiple jurisdictional boundaries as they migrate through international and national waters or straddle across.³⁵⁸

The UN body leading on the development of this regime is the United Nations Food and Agriculture Organisation (FAO).³⁵⁹ Over time, the following agreements and subsequent processes have created a regulatory regime for international and regional fisheries (in chronological order):

The **1993 Compliance Agreement** entered into force in 2003.³⁶⁰ It focuses on the responsibilities and role of Flag States,³⁶¹ which are to ensure that vessels flying their flag comply with internationally agreed conservation and management measures when fishing in areas beyond national jurisdiction, areas in which multiple shark species are caught.³⁶²

The **1995 FAO Code of Conduct (CoC)**,³⁶³ which incorporated the rules and principles of the Compliance Agreement, is a non-binding guidance for relevant actors involved in fishing at international, regional, and national levels, with the aim of ensuring that practices are executed in a sustainable manner for the long-term preservation of living resources.

Following the CoC, a number of action plans were developed, of which one focuses on sharks: the **1999 International Plan of Action for Conservation and Management of Sharks (IPOA Sharks)**.³⁶⁴ The IPOA Sharks encourages States to adopt national plans of actions to

³⁵⁸ Agenda 21 (n 313) art 17

³⁵⁹ The FAO was established in 1945.

³⁶⁰ Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (approved by the FAO Conference at its 27th session in November 1993, entered into force on 24 April 2003) 2221 UNTS 91

³⁶¹ States under whose flag fishing vessels are registered.

³⁶² Timothy D White and others, 'Predicted Hotspots of Overlap between Highly Migratory Fishes and Industrial Fishing Fleets in the Northeast Pacific' (2019) 5 Science Advances eaau3761 <<https://advances.sciencemag.org/lookup/doi/10.1126/sciadv.aau3761>>.

³⁶³ FAO, Code of Conduct for Responsible Fisheries (1995)

³⁶⁴ International Plan of Action for the Conservation and Management of Sharks (n 13)

protect and sustainably manage shark species under their jurisdiction. The implementation and development of such national action plans is monitored by the FAO.³⁶⁵ However, following the IPOA Sharks, only a few countries have yet created and/or started implementing national plans of action for these species.³⁶⁶ The IPOA Sharks was reviewed in 2012 to evaluate national and regional progress on the creation of measures, and advise priorities for required action.³⁶⁷

1995 United Nations Fish Stock Agreement (UNFSA).³⁶⁸ The UNFSA is a supplementary agreement to the LOSC that derived from the failure of the LOSC in addressing fisheries-related issues for highly exploited, commercial fish stocks crossing EEZ and high sea borders across multiple jurisdictions, which had led to increased conflicts between States over these resources.³⁶⁹ It provides a binding set of rules and principles for State cooperation in setting management and conservation measures for straddling and migratory fish species, including sharks, which may be exploited by multiple States within areas beyond national jurisdiction. Under Article 5 of the Agreement such exploitation shall be based on the application of best available information and precaution:

“[...] coastal States and States fishing on the high seas shall, in giving effect to their duty to cooperate in accordance with the Convention:

(a) adopt measures to ensure long-term sustainability of straddling fish stocks and highly migratory fish stocks and promote the objective of their optimum utilization;

³⁶⁵ FAO, <<http://www.fao.org/ipoa-sharks/database-of-measures/en/>> accessed 20 January 2020

³⁶⁶ FAO <<http://www.fao.org/ipoa-sharks/national-and-regional-plans-of-action/en/>> accessed 25 January 2020

³⁶⁷ ‘Fischer, J., Erikstein, K., D’Offay, B., Guggisberg, S. & Barone, M. 2012. Review of the Implementation of the International Plan of Action for the Conservation and Management of Sharks. FAO Fisheries and Aquaculture Circular No. 1076. Rome, FAO. 120 Pp.’, vol 1076 (2012) <<https://www.fao.org/3/i3036e/i3036e.pdf>>.

³⁶⁸ Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (adopted 8 September 1995, entered into force 11 December 2001) 34 ILM 1542 (UNFSA).

³⁶⁹ Miles and Burke (n 357).

(b) ensure that such measures are based on the best scientific evidence available [...];

(c) apply the precautionary approach in [...] “.

The UNFSA opened for signature on December 4, 1995, following its adoption at the UN conference on straddling and highly migratory fish stocks.³⁷⁰ One year later, it had been signed by 59 States. In accordance with Article 40 (1) of the Agreement, it entered into force 30 days after the thirtieth instrument of ratification or accession deposited, which was the accession deposited by Malta on the 11th of November 2001.

Regional management. The UNFSA also lays the foundation for establishing regional management bodies to facilitate the process of State cooperation on commercially exploited, shared fish stocks in high sea areas. However, most **Regional Fisheries Management Organisations** (RFMOs) had been set up prior to the UNFSA but were then updated to align with the requirements of the Agreement. RFMOs fulfil a central role in managing straddling and migratory fish stocks and in creating and implementing conservation efforts for non-target species that are affected by the fisheries they manage, which does, among others, include sharks.³⁷¹

Across ten regional fisheries bodies covering most the world’s high seas,³⁷² of which eight are considered RFMOs, fisheries in areas beyond national jurisdiction is regulated with the mandate for sustainable fishing and a duty to protect the marine environment from

³⁷⁰ United Nations Fish Stock Agreement (n 368)

³⁷¹ François Poisson and others, ‘Technical Mitigation Measures for Sharks and Rays in Fisheries for Tuna and Tuna-like Species: Turning Possibility into Reality’ (2016) 29 *Aquatic Living Resources* 402 <<http://www.alr-journal.org/10.1051/alr/2016030>>.

³⁷² See Figure 1 in James B Bell, Elena Guijarro-Garcia and Andrew Kenny, ‘Demersal Fishing in Areas Beyond National Jurisdiction: A Comparative Analysis of Regional Fisheries Management Organisations’ (2019) 6 *Frontiers in Marine Science* 1 <<https://www.frontiersin.org/article/10.3389/fmars.2019.00596/full>>.

detrimental impacts of such activities.³⁷³ So called 'Tuna RFMOS' are those managing highly migratory species that straddle or cross multiple State jurisdiction, including species listed in Annex I of the LOSC. There are also those regional fisheries bodies that manage bottom fisheries, an example of which is the General Fisheries Commission for the Mediterranean and Black Sea (GFCM), as further explained in Section 1.2.4.1. The GFCM is exceptional in the way that its mandate to regulate regional fisheries is not limited to high seas but extends to waters under national jurisdiction.³⁷⁴

In line with the UNFSA, these organisations should apply a precautionary approach to fisheries management, but the approach and integration of this principles differs.³⁷⁵ The UNFSA stipulates, that negotiations on the exploitation of such stocks, especially where there are concerns about sustainability, are held in good faith.³⁷⁶ Membership to these organisations is not limited to bordering coastal States, but open to any State with an interest in fisheries regulated and managed by these bodies.³⁷⁷ The two RFMOs that manage fish stocks in areas of the Mediterranean are further explained in the next section (1.2.4.1).

The value of these international instruments for marine conservation and sustainable management of living resources, including sharks, is relative to the success of implementation, yet there is little guidance on the establishment and implementation of specific measures. While the LOSC incorporates the word 'conservation' over 30 times,

³⁷³ James B Bell, Elena Guijarro-Garcia and Andrew Kenny, 'Demersal Fishing in Areas Beyond National Jurisdiction: A Comparative Analysis of Regional Fisheries Management Organisations' (2019) 6 *Frontiers in Marine Science* 1 <<https://www.frontiersin.org/article/10.3389/fmars.2019.00596/full>>.

³⁷⁴ Bell, Guijarro-Garcia and Kenny (n 373).

³⁷⁵ Paul de Bruyn, Hilario Murua and Martín Aranda, 'The Precautionary Approach to Fisheries Management: How This Is Taken into Account by Tuna Regional Fisheries Management Organisations (RFMOs)' (2013) 38 *Marine Policy* 397.

³⁷⁶ United Nations Fish Stock Agreement (n 368) art 8 (2)

³⁷⁷ United Nations Fish Stock Agreement (n 368) art 8 (3)

there is no clear definition of what this entails and what ‘conservation and management measures’ should look like, a deficit that is mirrored in the UNFSA.³⁷⁸ There thus remains room for interpretation in setting standards and little to no guidance on how States should implement their obligations, especially when in relation to the application of the precautionary approach.³⁷⁹ A critique that was also expressed by Juda, who summarised it quite precisely as follows:

“...it was clear that not only was conservation an issue but so, too, was the sensitive matter of allocation—that is, who will get the fish?”³⁸⁰

While the legal regime examined above attempted to hold States responsible and control actions conducted under their jurisdictional reach, the international community recognised the continuing threat posed by Illegal, Unreported and Unregulated Fishing (IUU). IUU fishing is defined in paragraph 3 of the **International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing** as fishing activities that do not comply with the national and international regulations and conservation measures in the waters they fish, not or misreport catches, and are not regulated, thereby contradictory on international obligations to manage and conserve marine resources.³⁸¹

To combat IUU fishing, the 2009 **Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (PSMA)**,³⁸² was drafted. This legally binding treaty came into effect in 2016 and aims to eradicate IUU fishing through Port State

³⁷⁸ Ellen Hey, ‘Global Fisheries Regulations in the First Half of the 1990s’ (1996) 11 *The International Journal of Marine and Coastal Law* 459.

³⁷⁹ Hey (n 378).

³⁸⁰ Lawrence Juda, ‘The 1995 United Nations Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks: A Critique’ (1997) 28 *Ocean Development and International Law* 147.

³⁸¹ FAO, *International Plan of Action to prevent, deter and eliminate illegal, unreported and unregulated fishing*, (2001).

³⁸² *Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing* (opened for signature 22 November 2009, entered into force 05 June 2016) 129 Stat. 664 (PSMA)

control measures. It manifests provisions of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, developed as part of the CoC, into a legally binding instrument on the responsibilities and role of Port States to control the point of landing of catches and prevent the transfer of illegally caught fish.

The implementation status of the CoC and other FAO agreements, as explained above, is monitored through the FAO Committee on Fisheries (COFI). Since the UNFSA was signed in 1995, RFMOs have progressed in their approach to both integrate ecosystem-based principles, and to generate information on fisheries.³⁸³ As Evelyn Meltzer and Susanna D. Fuller, commissioned to assess the progress of RFMOs, stated so eloquently:

“[...] the window of opportunity for long-term conservation, restoration, and sustainable development of these fisheries is quickly closing”.³⁸⁴

This entails not only the need for rigorous action at an international and regional level, but more so nationally. Several RFMOs, especially the ones established to manage the fisheries of tuna and tuna-like fishes, have taken first steps to prevent or reduce shark bycatch.³⁸⁵ A closer look into the RFMOs managing fish stocks in the Mediterranean Sea is provided in the next section.

1.2.4.1 Fisheries management in the Mediterranean Sea

In 1949, the Agreement for the Establishment of the General Fisheries Commission for the Mediterranean (GFCM) was approved at the fifth session of the FAO Conference,³⁸⁶ under

³⁸³ Meltzer, Evelyn, and Susanna D. Fuller. *Quest for Sustainable International Fisheries: Regional Efforts to Implement the 1995 United Nations Fish Stocks Agreement: An Overview for the May 2006 Review Conference*. NRC Research Press, 2010.

³⁸⁴ Meltzer, Evelyn, and Susanna D. Fuller. *Quest for Sustainable International Fisheries: Regional Efforts to Implement the 1995 United Nations Fish Stocks Agreement: An Overview for the May 2006 Review Conference* (n 383)

³⁸⁵ Futerman (n 212).

³⁸⁶ Agreement for the Establishment of the General Fisheries Commission for the Mediterranean (adopted 24 September 1949, entered into force 20 February 1952) subsequently adopted by the UN on 5 April 1952) 1691 UNTS 268.

the provisions of Article XIV of the FAO Constitution.³⁸⁷ The Agreement came into force in 1952. Since then, the GFCM has amended its basic texts several times. Four amendments were made: in 1963, 1976, 1997 and, lastly, in 2014, with the most recent amendments to the rules of procedure and financial regulations in 2015.³⁸⁸ Amendments concerned the change of the name of the GFCM (previously General Fisheries Council for the Mediterranean); changes of the obligations for Contracting Parties in relation to budgetary contributions and compliance; as well as improved mechanisms for cooperation among Mediterranean countries.³⁸⁹ Article 3 of the Agreement defines its area of application to be both the entire Mediterranean and Black Sea, managing all commercially fished stocks. It is noteworthy to highlight that many coastal States have not claimed, or are still in dispute over, an EEZ;³⁹⁰ therefore, a large part of the Mediterranean remains high sea areas.³⁹¹

The GFCM manages commercial fish stocks through the development of multiannual fisheries management plans.³⁹² In 2020, the GFCM had nine management plans in place regulating fishing for commercially exploited stocks.³⁹³ Although these plans exclude sharks, through incorporation of sustainable fishing practices, as set out in the FAO CoC,³⁹⁴ they embed the precautionary approach for species affected by fishing. For the purpose of fisheries management and data collection, Resolution GFCM/33/2009/2 divides the

³⁸⁷ Agreement for the Establishment of the General Fisheries Commission for the Mediterranean (n 386).

³⁸⁸ Basic texts of the General Fisheries Commission for the Mediterranean of the FAO 2016 64.

³⁸⁹ Basic texts of the General Fisheries Commission for the Mediterranean of the FAO.

³⁹⁰ Koulouris (n 44).

³⁹¹ Stelios Katsanevakis and others, 'Marine Conservation Challenges in an Era of Economic Crisis and Geopolitical Instability: The Case of the Mediterranean Sea' (2015) 51 *Marine Policy* 31 <<http://dx.doi.org/10.1016/j.marpol.2014.07.013>>.

³⁹² Agreement for the Establishment of the General Fisheries Commission for the Mediterranean (n 386) art 6

³⁹³ Food and Agriculture Organisation of the United Nations (n 56).

³⁹⁴ Code of Conduct for Responsible Fisheries (n 363).

Mediterranean Sea’s regions (Western, Central, Eastern Mediterranean, and Adriatic) into 27 geographical subareas (GSAs), as shown in Figure 2.³⁹⁵

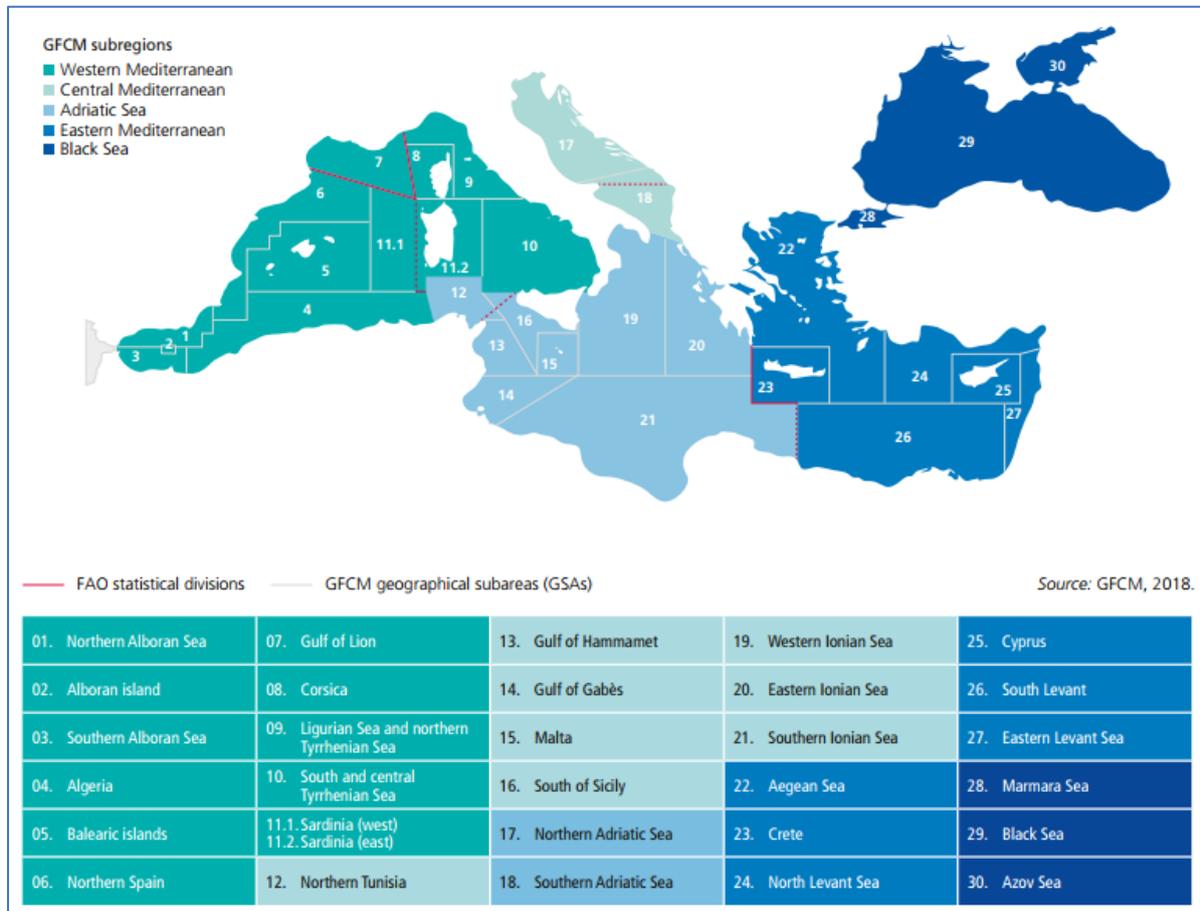


Figure 2. GFCM Geographical subareas (Source: GFCM Report State of Mediterranean and Black Sea Fisheries, 2020).³⁹⁶

As part of the powers of the GFCM, it can establish legally binding recommendations. These require a majority vote by two-thirds of the Contracting Parties, as stipulated in Article 13 of the Agreement. Article 14(2) requires Parties to transpose the provisions of these recommendations into national law:

“Each Contracting Party shall transpose, as appropriate, adopted recommendations into national laws, regulations or appropriate legal instruments of the regional economic integration organization. They shall report annually to the Commission

³⁹⁵ Resolution GFCM/33/2009/2 on the establishment of geographical subareas in the GFCM area of application, amending Resolution GFCM/31/2007/2 (2009).

³⁹⁶ Food and Agriculture Organisation of the United Nations (n 56).

indicating how they have implemented and/or transposed [...] The Commission shall use this information to assess whether the recommendations are uniformly implemented”.

Two recommendations concerning the conservation of sharks have been adopted through the GFCM.³⁹⁷ These are described further in Chapter Three.

The management of tuna and tuna-like species within the Mediterranean,³⁹⁸ falls within the remit of the Convention for the International Commission for the Conservation of Atlantic Tunas (ICCAT).³⁹⁹ The Convention’s area of jurisdiction expands across the Atlantic and adjacent waters, including the Mediterranean and Black Sea. This RFMO was set up in 1966 and began its fisheries management activities in 1969. Similar to the GFCM, ICCAT’s basic text has been revised multiple times, with the latest revision in 2018 to amend regulatory procedures and voting mechanisms.⁴⁰⁰ In accordance with Article 3(3) of ICCAT, decision making within this RFMOs is done through majority (two-thirds) vote. Over time, multiple legally binding recommendations by ICCAT that concern sharks have been adopted (see Annex 1, Table 1). The GFCM and ICCAT cooperate, and ICCAT recommendations are referenced and integrated, as applicable, in GFCM recommendations.⁴⁰¹

As a member to both ICCAT and the GFCM, the EU transposes legally binding recommendations by these RFMOs into EU law. In terms of EU policy, the main instrument regulating fisheries for EU MS is the Common Fisheries Policy (CFP). The CFP was introduced

³⁹⁷ By the end of 2020, which is the time frame concerned in this work.

³⁹⁸ ICCAT manages over 30 species, those most relevant to the Mediterranean Sea are: Atlantic bluefin (*Thunnus thynnus thynnus*), yellowfin (*T. albacares*), albacore (*T. alalunga*) swordfish (*Xiphias gladius*), Management also concerns species caught in association with/ affected by those fisheries, including sharks.

³⁹⁹ International Commission for the Conservation of Atlantic Tunas (adopted on 14 May 1966, entered into force 20 May 1969) 9587 UNTS 64 (1969).

⁴⁰⁰ International Commission for the Conservation of Atlantic Tunas. Basic Texts. 7th Revision. 2019 124.

⁴⁰¹ GCFM, ‘Compendium of GFCM Decisions. Revised Version 3.0’ (2019).

in the 1970s with the objective to create an EU-wide approach to fisheries regulation, intending to govern EU fisheries through common rules. Through multiple revisions, the CFP expanded its objective towards conservation and sustainable use, considering an ecosystem-based approach for the benefit of society and the economy.⁴⁰² The last reform of the CFP led to the adoption of a new policy through Regulation (EU) No 1380/2013.⁴⁰³ This policy gives equal access to EU MS to resources within EU waters, as stated under paragraph 18 of the preamble:

“Union fishing vessels should have equal access to Union waters and resources subject to the rules of the CFP”.

Every year, the EU determines fishing limits for EU MS in form of EU Regulations, which, in line with Article 26 of said Regulation (No 1380/2013), should be based on scientific advice provided by the Scientific, Technical and Economic Committee for Fisheries (STECF),⁴⁰⁴ as shown in Figure 3.

⁴⁰² European Union, ‘Common Fisheries Policy’ <<https://www.europarl.europa.eu/factsheets/en/section/197/common-fisheries-policy>> accessed 13 July 2020.

⁴⁰³ Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC, OJ L 354, 28.12.2013, p. 22–61.

⁴⁰⁴ Regulation (EU) No 1380/2013 (n 403).



Figure 3. Organisational chart for fisheries advice by Scientific, Technical and Economic Committee for Fisheries (STECF), and subsequent policy processes. [Source: STECF website]⁴⁰⁵

Specific regulations may be issued by the European Commission to support the implementation of the CFP, for example, in relation to technical measures improving the conservation of marine resources and ecosystems, such as Regulation (EU) 2019/1241,⁴⁰⁶ which also incorporates measures relevant to sharks, as explained in Chapter Three, Section 3.2.10. Another noteworthy development at EU level, was the 2009 EU action plan for sharks,⁴⁰⁷ which, among other action plans, formed part of the assessment, as outlined in Chapter Two and applied in Chapter Three and Five.

⁴⁰⁵ STECF, <https://stecf.jrc.ec.europa.eu/> <accessed 20 February 2020> used under the EU Creative Commons Attribution 4.0 International license (https://ec.europa.eu/info/legal-notice_en)

⁴⁰⁶ Regulation (EU) 2019/1241 of the European Parliament and of the Council of 20 June 2019 on the conservation of fisheries resources and the protection of marine ecosystems through technical measures, amending Council Regulations (EC) No 1967/2006, (EC) No 1224/2009 and Regulations (EU) No 1380/2013, (EU) 2016/1139, (EU) 2018/973, (EU) 2019/472 and (EU) 2019/1022 of the European Parliament and of the Council, and repealing Council Regulations (EC) No 894/97, (EC) No 850/98, (EC) No 2549/2000, (EC) No 254/2002, (EC) No 812/2004 and (EC) No 2187/2005, OJ L 198, 25.7.2019, p. 105–201.

⁴⁰⁷ European Commission, ‘European Community Action Plan for the Conservation and Management of Sharks’ (2009).

1.2.4.2 *Status quo* and contemporary challenges regarding sustainability in fisheries

The frameworks outlined in this Chapter have demonstrated the consolidation of general principles such as the precautionary approach, the use of best available science, and the importance of conservation and management measures in resource use. At the same time, these instruments and processes acknowledged global problems that require regional cooperation and national implementation.⁴⁰⁸ Therefore, it is not surprising that most of the convention secretariats and institutions in some way support and cooperate with each other. For example, ‘overfishing’ has found its way into contemporary international law and changed both the application and use of some legal conventions in cases where unsustainable use of marine species threatens their existence. A case in point is shark listings in the CITES appendices. CITES was not intended to list commercially used or valuable species⁴⁰⁹ but has become a forum for the conservation of sharks, which are commercially important. It is not surprising that therefore the FAO and CITES work closely together; a relationship formalised through a Memorandum of Understanding (MoU).⁴¹⁰ CITES also supports the implementation of the CBD, and is linked to the CMS, especially for sharks, such as whale sharks (*Rhincodon typus*) and white sharks (*Carcharodon carcharias*).⁴¹¹ Furthermore, for its implementation and monitoring, CITES works with

⁴⁰⁸ Daniel C Dunn and others, ‘The Importance of Migratory Connectivity for Global Ocean Policy’ (2019) 286 Proceedings of the Royal Society B: Biological Sciences.

⁴⁰⁹ Franckx (n 21).

⁴¹⁰ CITES. Twelfth meeting of the Conference of the Parties, Santiago, Chile, 3–15 November 2002, Establishment of a Memorandum of Understanding between CITES and the Food and Agriculture Organization of the United Nations (FAO) (Decision 12.7).

⁴¹¹ Winjstekers (n 284).

established organisations, such as INTERPOL and TRAFFIC,⁴¹² to track and trace wildlife trade and international criminal activities in protected species trade.⁴¹³

The application of a precautionary approach to fishing is still lacking in many countries and demands further commitment.⁴¹⁴ A report issued in 2016 by the PEW Charitable Trusts, an organisation funding and implementing conservation projects worldwide, on the progress of the implementation of the UNFSA by RFMOs, found that severe gaps still exist regarding shark conservation, including Port State control measures.⁴¹⁵ An example of the failure to follow scientific advice is the denial for further protection measures for threatened shortfin mako sharks (*Isurus oxyrinchus*) in the Atlantic⁴¹⁶ through ICCAT.⁴¹⁷ On the other hand, there are also positive examples, such as the increase in protection measures for rays through the Western and Central Pacific Fisheries Commission (WCPFC).⁴¹⁸

An analysis of commitments made by governments and NGOs at an ocean-dedicated conference on sustainable fisheries, showed that while some pledges made at this conference have been implemented, implementation is and has taken a long time.⁴¹⁹

Although overall there was some positive progress on the implementation of commitments

⁴¹² CITES <<https://www.cites.org/sites/default/files/common/disc/sec/CITES-TRAFFIC.pdf>> accessed 03 January 2020

⁴¹³ Wijnstekers, W. (2011): The Evolution of CITES - 9th edition. International Council for Game and Wildlife Conservation.

⁴¹⁴ Chomariyah, 'Oceans Governance: Implementation of the Precautionary Approach to Anticipate in Fisheries Crisis' (2015) 14 *Procedia Earth and Planetary Science* 94 <<http://dx.doi.org/10.1016/j.proeps.2015.07.089>>.

⁴¹⁵ The Pew Charitable Trusts, 'Global Progress Toward Implementing the United Nations Fish Stocks Agreement' (2016).

⁴¹⁶ David W Sims, Gonzalo Mucientes and Nuno Queiroz, 'Shortfin Mako Sharks Threatened by Inaction' (2018) 359 *Science* 1342.1 <<https://www.sciencemag.org/lookup/doi/10.1126/science.aat0315>>.

⁴¹⁷ SharkTrust <<https://www.sharktrust.org/news/iccat-outcome-2019>> accessed 23 January 2020

⁴¹⁸ Mongabay News <<https://news.mongabay.com/2020/02/small-steps-aim-to-make-a-large-ocean-safer-for-rays/>> accessed 23 January 2020

⁴¹⁹ Geir Huse and others, 'Assessment of Commitments on Sustainable Fisheries to the Our Ocean Conferences. Rapport Fra Havforskningen NR. 2019-43', vol 43 (2019).

by national governments, there is and remains a substantial discrepancy between developed and developing countries in terms of sustainable fisheries management.⁴²⁰

While countries continue to negotiate, develop, agree, commit to, and implement conservation policies, the problems, as recognised by the outlined processes of this Chapter, remain. According to the most recent report on the sustainability of global fisheries, one third of commercially-used fish stocks are fished unsustainably ('overfished'), and the real picture may be worse given that data reporting to the FAO remains full of gaps and uncertainty.⁴²¹ The continued issuing of harmful fishery subsidies does little to reduce overexploitation, on which the World Trade Organisation (WTO) has been called upon for urgent action.⁴²² IUU fishing remains a significant issue, which is exacerbated by insufficient or ineffective national governments.⁴²³ Since not only does it undermine any fisheries regulation success, it also entails other illegal practices, namely the transshipments of catches in areas lacking clear jurisdiction,⁴²⁴ which makes it nearly impossible to effectively track fishing impact.

An evaluation of fisheries sustainability in 2009 was based on existing empirical data on fishery landings and feedback from over 1000 fisheries experts worldwide, who were asked whether they thought the current regulatory regime was working. The analysis revealed that only a few countries developed a strong, science-based approach to fisheries

⁴²⁰ Huse and others (n 419).

⁴²¹ FAO, 'The State of World Fisheries and Aquaculture' (2020).

⁴²² U Rashid Sumaila and others, 'Updated Estimates and Analysis of Global Fisheries Subsidies' (2019) 109 *Marine Policy* 103695 <<https://doi.org/10.1016/j.marpol.2019.103695>>.

⁴²³ Agnew and others (n 191).

⁴²⁴ Nathan A Miller and others, 'Identifying Global Patterns of Transshipment Behavior' (2018) 5 *Frontiers in Marine Science* 1 <<https://www.frontiersin.org/article/10.3389/fmars.2018.00240/full>>.

management.⁴²⁵ Although experts concluded that national approaches follow and implement the CoC, they called for stronger fisheries regulations. Such regulations might not be popular in the sector itself but are necessary and need strong public support.⁴²⁶ Policy cannot solely base decisions on our need for resources and services provided by the environment and associated monetary benefits but must foster and instil a 'love' for nature in people, which is not mutually exclusive with financial benefits resulting from the protection of nature.⁴²⁷

Several assessments have focused on different levels of shark catches,⁴²⁸ or trade in shark products of different countries.⁴²⁹ Lack and Sant's 2009 review of shark management revealed that the top twenty shark-catching nations either lack sufficient information on management, or lack management efforts *per se*.⁴³⁰ These nations were Indonesia, India, Taiwan, Argentina, Mexico, Pakistan, Malaysia, Thailand, Brazil, Sri Lanka, Nigeria, Iran, and South Korea.⁴³¹ The review also identified 'hotspot' countries for the conservation of threatened species, with proposed urgent actions are required in Argentina, Australia, Brazil, Colombia, Indonesia, Japan, Madagascar, Mozambique, South Africa, Uruguay, and Taiwan.⁴³² A 2018 report from TRAFFIC identified shark catching and trading nations based on the most recent FAO data, which identified Indonesia, Spain, India, Mexico, and the USA

⁴²⁵ Camilo Mora and others, 'Management Effectiveness of the World's Marine Fisheries' (2009) 7 PLoS Biology e1000131 <<https://dx.plos.org/10.1371/journal.pbio.1000131>>.

⁴²⁶ Yumiko Kura and others, 'Fishing for Answers Making Sense of the Global Fish Crisis. World Resources Institute' (2004) <<http://www.wri.org/publication/fishing-answers-making-sense-global-fish-crisis>>.

⁴²⁷ Douglas J McCauley, 'Selling out on Nature' (2006) 443 Nature 27 <<http://www.nature.com/articles/443027a>>.

⁴²⁸ Mary Lack and Glenn Sant, 'Trends in Global Shark Catch and Recent Developments in Management. TRAFFIC International.' (2009).

⁴²⁹ Nicola Okes and Glenn Sant, 'Shark Traders Catchers and Species. TRAFFIC, Cambridge, UK.' (2019).

⁴³⁰ Mary Lack and Glenn Sant, 'The Future of Sharks: A Review of Action and Inaction. TRAFFIC International and the PEW Environment Group.' (2011).

⁴³¹ Mary Lack and Glenn Sant (n 430).

⁴³² Bräutigam and others (n 153).

are the top five shark catching nations.⁴³³ Shifting the focus from some of the assessed larger shark catching nations, the present work investigated the *status quo* in the Mediterranean, as one of the ‘most dangerous’ regions for sharks globally,⁴³⁴ but first the final section of this chapter reflects on the general aspects of shark governance, as presented in the previous sections.

1.3 Reflecting on the context of policy and law for shark governance

The last decade of the 20th century certainly demonstrated the development of a new policy arena, namely marine conservation and sustainable use of marine resources. This new policy field caught the attention of pressure groups through increased environmental awareness and created a new consciousness of anthropogenic impacts on marine ecosystems.⁴³⁵ International law creates norms (rules and principles) agreed between and applicable to multiple States,⁴³⁶ and thereby provides a legal basis for determining policies at national level.⁴³⁷ There is a distinction in law between those instruments that create legally binding provisions and those that incorporate non-legally binding commitments. While legally binding treaties or agreements are enforceable through mechanisms and institutions, such as international courts,⁴³⁸ non-binding instruments have the advantage of being more flexible and therefore easier to be agreed upon.⁴³⁹ Albeit there is no overarching

⁴³³ Okes and Sant (n 429).

⁴³⁴ Dulvy and others, ‘Extinction Risk and Conservation of the World’s Sharks and Rays’ (n 3).

⁴³⁵ Cole-King (n 75).

⁴³⁶ Peter Malanczuk, *Akehurst’s Modern Introduction to International Law* (Seventh ed, Routledge 1997).

⁴³⁷ Kenneth W Abbott and Duncan Snidal, ‘Hard and Soft Law in International Governance’ (2000) 54 *International Organization* 421 <https://www.cambridge.org/core/product/identifier/S0020818300441111/type/journal_article>.

⁴³⁸ Or other entities, such as tribunals, panels, etc.

⁴³⁹ Abbott and Snidal (n 437).

legal instrument concerning sharks in particular, the range of international treaties, multilateral environmental agreements (MEAs), and voluntary instruments to which countries committed certainly have become valuable pathways for the conservation of this species group, be it through the effective lobbying of NGOs, scientists, or governments for the listing of sharks or by default purpose of any such instrument.

However, the use of such MEAs through, *inter alia*, the listing of disappearing shark species or species requiring urgent action to prevent such disappearance, was and remains a gradual process, which took the opening of 'windows of opportunities' for sharks to be considered. The Bern Convention, which was one of the first European wide conservation instruments, listed the first shark species, great white shark (*Carcharodon carcharias*), in its Appendix II (strictly protected species) in 1996, applicable to the Mediterranean population.⁴⁴⁰ Only a year later, additional species were added to said appendix for the Mediterranean region, namely basking shark (*Cetorhinus maximus*) and mobula rays (*Mobula mobular*); while Appendix II, which incorporate species requiring management to prevent further decline, listed another 5 Mediterranean species.⁴⁴¹ As the only Mediterranean country, Malta made reservations for some provisions of the Bern Convention against the listing of three shark species in 1997.⁴⁴² However, in parallel the SPA/BD Protocol became relevant for shark species with listing initiated on Annex II, with was amended in 2013 following the 18th Ordinary Meeting of the Contracting Parties.⁴⁴³ At

⁴⁴⁰ Convention on the Conservation of European Wildlife and Natural Habitats (n 335).

⁴⁴¹ *Lamna nasus, Mobula mobular, Prionace glauca, Raja alba, Squatina squatina*

⁴⁴² *Lamna nasus, Squatina squatina, Raja alba*

⁴⁴³ 'Decision IG.21/6 Amendments to Annex II to the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean, UNEP (2013) UNEP(DEPI)/MED IG.21/9' (<https://www.unep.org/unepmap/fr/meetings/decisions>) UNEP(DEPI)/MED IG.21/9.

this point Annex II included twenty-four species, and Annex III nine species, which remained the same following amendment to Annex II in 2017.⁴⁴⁴ These processes are not detached from international convention listing under CITES and CMS. CITES, which was not designed for species that are of commercial relevance, but the increasing concern over the decline of sharks opened a window of opportunity for shark listings in 1999 through Resolution 9.17, and subsequently CITES listing started in 2000. The CMS listed the great white shark (*Carcharodon carcharias*) in Appendix II in 2002 and the basking shark (*Cetorhinus maximus*) in 2005.⁴⁴⁵ However, listing alone does not guarantee conservation actions being taken.⁴⁴⁶ But it is certainly a starting point.⁴⁴⁷

The agenda setting at international level cascaded to regional level through the development of action plans, the only instruments particularly designed for sharks. The 1999 IPOA Sharks stipulated the 2003 regional action plan, and the 2009 EU action plan. While the latter has never been updated, the international plan, as well as the regional plan were subject to periodic reviews, with the latter being updated in 2020.⁴⁴⁸

Lutgen provides several arguments for benefits of such soft law instruments, comprising good faith in the drafting and implement of non-binding provisions, and reduced bureaucracy offering a faster and easier transition for taking action. Drawing attention to specific problems, soft law can serve as a pre-stage for hard law development, and Lutgen

⁴⁴⁴ Decision IG.23/10 Amendments to Annex II to the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (2017) UNEP(DEPI)/MED IG.23/23

⁴⁴⁵ An overview of all Mediterranean species and applicable convention listings is provided in Annex 1, Table 4.

⁴⁴⁶ Cardeñosa and others (n 37).

⁴⁴⁷ Booth and others, 'Assessing the Impact of Regulations on the Use and Trade of Wildlife: An Operational Framework, with a Case Study on Manta Rays' (n 288).

⁴⁴⁸ RAC/SPA, 'Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea' (2020).

argues that IPOAs themselves may, in future, offer a source of customary international law, if States act upon them and accept a duty to so.⁴⁴⁹ Lugten describes this process as follows:

“State conduct to adhere with the sustainability provisions of both the Code of Conduct and the existing IPOAs occurs with varying degrees of commitment, but in a majority of coastal states. That is, most states in the world are taking steps (at least within their domestic legislation and often through regional agreements) to address the FAO principles relating to (inter alia) coastal zone management, overfishing, IUU fishing, bycatch, fishing gear, processing, and trade in fish and fishery products. The extent of action to be taken is dependent upon the impact on states. Thus, while few states appear to be actively implementing the entire Code of Conduct and the four IPOAs, a majority of states are actively addressing elements of the Code and the IPOAs in their domestic legislation by their participation in regional agreements and/or adherence to hard law treaties. Thus, the marine life sustainability measures taken by the community of states are evidence of customary law conduct.”⁴⁵⁰

One question that arose in the international community was whether more legal instruments are needed.⁴⁵¹ Klein and Muir debated the added value of another non-binding instrument, the CMS Shark MoU, in consideration of the adoption of the IPOA Sharks over ten years prior.⁴⁵² They also highlighted the advantages of soft law in terms of flexibility and noted that the CMS Shark MoU emphasised sharks as marine organisms in need of protection as opposed to a marine resource under the IPOA Sharks. A key point of their analysis, was the increasing use of soft law instruments internationally, which can encourage States to craft their own laws for sharks and contribute to the “[...] thickening international environmental law to the benefit of species conservation”.⁴⁵³

⁴⁴⁹ Maurice W Clarke, ‘Sharks, Skates and Rays in the Northeast Atlantic: Population Status, Advice and Management’ (2009) 25 *Journal of Applied Ichthyology* 3.

⁴⁵⁰ Lugten † (n 63).

⁴⁵¹ Herndon and others (n 29).

⁴⁵² Laura Muir and Natalie Klein, ‘From IPOA Sharks to Sharks MoU under the Convention on Migratory Species: Progress or Clutter in International Environmental Law?’ (2018) 21 *Journal of International Wildlife Law and Policy* 190 <<https://doi.org/10.1080/13880292.2018.1485957>>.

⁴⁵³ Muir and Klein (n 452).

As demonstrated in Section 1.2.4.2, challenges, such as overfishing, remain a contemporary issue in need of addressing.⁴⁵⁴ Fisheries management through international law and policies has been subject to critique internationally, regionally, and nationally, in view that long-standing issues have not been resolved.⁴⁵⁵ In this regard, it is noteworthy to consider while these challenges have been ongoing for several decades, their extent expanded with the exponential increase in human population and related resource needs.⁴⁵⁶ Although these drivers are not the only reason for continued overfishing, as overfishing in itself is a complex problem with multiple root causes,⁴⁵⁷ and, as such, remains the main driver for continued shark declines.⁴⁵⁸

While some legal scholars would argue for the use of RFMOs for shark conservation,⁴⁵⁹ others would argue against it.⁴⁶⁰ Even though RFMOs have taken steps to reduce the impact of the fisheries under their management on sharks, they might not be the best gateway for action. RFMOs, as explained above, rely on majority votes, but aim for consensus on decision making.⁴⁶¹ This may ensure a greater buy-in on provisions of legally binding recommendations, but can generate other problems. An insight into formal discussions under ICCAT has shown that the aim for such consensus comes with challenges and inherits a problematic distinction in voices from developing and developed members – the results is

⁴⁵⁴ Pacoureaux and others (n 93).

⁴⁵⁵ Sarika Cullis-Suzuki and Daniel Pauly, 'Failing the High Seas: A Global Evaluation of Regional Fisheries Management Organizations' (2010) 34 *Marine Policy* 1036 <<http://dx.doi.org/10.1016/j.marpol.2010.03.002>>.

⁴⁵⁶ John Cleland, 'World Population Growth; Past, Present and Future' (2013) 55 *Environmental and Resource Economics* 543 <<https://doi.org/10.1007/s10640-013-9675-6>>.

⁴⁵⁷ Elena M Finkbeiner and others, 'Reconstructing Overfishing: Moving beyond Malthus for Effective and Equitable Solutions' (2017) 18 *Fish and Fisheries* 1180 <<https://onlinelibrary.wiley.com/doi/10.1111/faf.12245>>.

⁴⁵⁸ Pacoureaux and others (n 93).

⁴⁵⁹ van Osch (n 27).

⁴⁶⁰ Nikolas Sellheim, 'The CITES Appendix II-Listing of Mako Sharks — Revisiting Counter Arguments' (2020) 115 *Marine Policy* 103887 <<https://doi.org/10.1016/j.marpol.2020.103887>>.

⁴⁶¹ Personal communication by the GFCM Secretariat. Also noting that there are no objections by GFCM Parties on GFCM Recommendations for sharks.

a play of power in which economic interests can triumph over conservation concerns.⁴⁶² The criticism of an overpowering economic interest, is also levelled at the EU CFP, which continues to fail to apply a precautionary approach in determining catch limits, to fund overfishing through subsidies, and to seemingly ignore scientific advices even if available, thereby breaching fundamental principles of international law.⁴⁶³

Boyes and Elliot showed the complex network of applicable laws and policies for marine management at international, regional, and national level in the case of the UK, which arguable would be similar across countries.⁴⁶⁴ Their ‘horrendogram’ highlights two main concerns, the complexity of problems in need of solutions, and the fragmented, difficult to navigate legal and policy landscape trying to find such solutions. The above review of applicable laws and policies,⁴⁶⁵ demonstrates that such complexity and fragmentation also applies to shark governance.⁴⁶⁶ Not only does this require increased coordination and cooperation among existing instruments and processes, but also between countries.⁴⁶⁷ International decision making for the creation of measures is often grounded in compromise to secure agreement amongst countries that have divergent priorities and interests, as the

⁴⁶² Jennifer E Telesca, ‘Consensus for Whom? Gaming the Market for Atlantic Bluefin Tuna through the Empire of Bureaucracy’ (2015) 33 *The Cambridge Journal of Anthropology* <<http://berghahnjournals.com/view/journals/cja/33/1/ca330105.xml>>.

⁴⁶³ Alexander Proelss and Katherine Houghton, ‘The EU Common Fisheries Policy in Light of the Precautionary Principle’ (2012) 70 *Ocean and Coastal Management* 22 <<http://dx.doi.org/10.1016/j.ocecoaman.2012.05.015>>.

⁴⁶⁴ Suzanne J Boyes and Michael Elliott, ‘Marine Legislation - The Ultimate “Horrendogram”: International Law, European Directives & National Implementation’ (2014) 86 *Marine Pollution Bulletin* 39 <<http://dx.doi.org/10.1016/j.marpolbul.2014.06.055>>.

⁴⁶⁵ Section 1.2.

⁴⁶⁶ Techera and Klein (n 70).

⁴⁶⁷ Muir and Klein (n 452).

ongoing development of the United Nations' agreement on measures for the conservation of biological diversity in areas beyond national jurisdiction (ABNJ) demonstrates.⁴⁶⁸

A systematic review of whether international treaties have achieved their intended outcomes, showed the majority remained unsuccessful, especially those considering the environment.⁴⁶⁹ The main reason for this has been identified as the lack of enforcement processes, which is well-recognised by legal scholars.⁴⁷⁰ Disappointment in the deployment of international treaties to improve shark conservation has also been expressed.⁴⁷¹ Some scholars have argued for an international agreement for the conservation of sharks in response to the lack of enforcement capacities under existing frameworks.⁴⁷² Indeed, such an approach may well be more effective than the current, somewhat cluttered and complex, legal setting.⁴⁷³ However, whether the current efforts led to an increase in conservation and management efforts in the Mediterranean, was assessed in the following chapters.

⁴⁶⁸ UNGA, 'Summary of the Fifth Session of the Intergovernmental Conference on an International Legally Binding Instrument under the UN Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biodiversity of Areas Beyond National Jurisdiction: 15-26 August 2022', (2022) A/CONF.232/2022/L.3

⁴⁶⁹ Steven J Hoffman and others, 'International Treaties Have Mostly Failed to Produce Their Intended Effects' (2022) 119 *Proceedings of the National Academy of Sciences* 1 <<https://pnas.org/doi/full/10.1073/pnas.2122854119>>.

⁴⁷⁰ David S Arida, 'Does the Emperor Have No Clothes? Enforcement of International Laws Protecting the Marine Environment' (1998) 19 *Michigan Journal of International Law* 1.

⁴⁷¹ van Osch (n 27).

⁴⁷² Herndon and others (n 29).

⁴⁷³ Further discussed in relation to suggestions on improved policies in Chapter Six.

Chapter Two: Assessment Strategy

This chapter introduces the methodological approach for assessing shark governance progress at national level. The assessment strategy is based on three main constructs, namely: 'Political commitment', 'Research effort', and 'Implementation effort'. Selected indicators for each of the constructs are presented and explained, including the subsequent data analysis. The first section describes some context and introduces general aspects of how the data was classified. Construct-specific indicators are then explained in individual sections for each of the constructs. It should be noted that the assessment framework was designed to apply to any country, therefore general examples and indicators were chosen. Additional sections explain the integration of socio-economic information in the assessment.

2.1 Introducing measurable constructs for shark governance

To determine whether a country has made progress in shark governance, multiple factors and underlying assumptions must be considered. Despite their economic value, when determining shark management and conservation actions and measures, countries also need to consider the ecological impact of shark removal which can lead to the degradation of marine ecosystems and shifts in food webs.⁴⁷⁴ As previously identified, while sharks naturally support the functioning and stability of marine ecosystems, they are threatened by unsustainable fishing methods, lack of, ineffective and mis-management.⁴⁷⁵

⁴⁷⁴ Francesco Ferretti and others, 'Patterns and Ecosystem Consequences of Shark Declines in the Ocean' (2010) 13 Ecology Letters no <<http://doi.wiley.com/10.1111/j.1461-0248.2010.01489.x>>.

⁴⁷⁵ Boris Worm and others, 'Global Catches, Exploitation Rates, and Rebuilding Options for Sharks' (2013) 40 Marine Policy 194 <<http://dx.doi.org/10.1016/j.marpol.2012.12.034>>.

Several legal instruments, as discussed in Chapter One, therefore incorporated actions for sustainable fisheries management and the conservation/protection of threatened species. Sustainability, as defined under Chapter One, Section 1.2.1, in this context is the aim to use and manage resources in a way that does not jeopardise the long-term existence and stability of shark populations. A sustainable approach is to be favoured, as unsustainable use can lead to overexploitation of populations and ultimate extinction, loss of ecosystem services, and habitat deterioration by using destructive fishing methods such as trawling.⁴⁷⁶

In shark governance a link between fisheries and conservation management must be established, considering ecological factors, as well as the control and regulation of fishing effort, while holding involved sectors accountable for implementation.⁴⁷⁷ Defining governance depends on the perspective and sectors to be governed and is never a one-dimensional concept but rather a combination of constructs of multiple variables.⁴⁷⁸

This chapter focuses on the policies in place (agenda setting and policy formulation) and actions taken (implementation) on a national level to assess countries' progress in shark conservation and management, which form part of governance, as defined in Chapter One. To assess a country's progress in relation to shark governance, it must fulfil at least one of the following criteria. The country must be engaged in fisheries that affect sharks, exercising an impact on shark populations; and/or has a conservation responsibility as sharks occur in their waters. While this assessment framework of shark governance on a national scale was

⁴⁷⁶ Margot L Stiles and others, 'Impacts of Bottom Trawling on Fisheries, Tourism, and the Marine Environment' [2010] *Oceana* 12 <<http://oceana.org/reports/impacts-bottom-trawling-fisheries-tourism-and-marine-environment>>.

⁴⁷⁷ Edward L Miles, 'The Concept of Ocean Governance: Evolution Toward the 21st Century and the Principle of Sustainable Ocean Use' (1999) 27 *Coastal Management* 1 <<http://www.tandfonline.com/doi/abs/10.1080/089207599263875>>.

⁴⁷⁸ David Givens, 'Defining Governance Matters: A Factor Analytic Assessment of Governance Institutions' (2013) 41 *Journal of Comparative Economics* 1026 <<http://dx.doi.org/10.1016/j.jce.2012.09.005>>.

designed to be applied to all countries, the indicators and additional information, as outlined in the following sections, have been collected for the Mediterranean region as a case study. The three constructs which were measured to reflect upon the national state of action in relation to shark conservation and management, include:

- Political commitment, which entails the number of legal instruments and policies applicable at national level.
- Research effort, which focuses on the national contribution to knowledge.
- Implementation effort, which reflects actions taken that contribute to the conservation and management of sharks.

The central question was whether the international legal framework and respective policies have driven the creation of measures for shark conservation and management at national level. Furthermore, the following key aspects were addressed:

- the contribution of different actors to shark governance aspects nationally;
- the factors that could potentially influence shark governance at national level;
- the overall state of shark conservation and management in the Mediterranean Sea.

Intelligence in the above key aspects, as well as limitations and challenges at national level were collected from NGOs and experts through survey questionnaires, explained further below. The selection of indicators for each construct was based on respective reference targets under international, regional, and national policies, and sustainability goals.

Indicators can be defined as “an observable variable assumed to point to, or estimate, some other (usually unobservable) variable”.⁴⁷⁹ An overview of different components of shark governance is shown in Figure 4.

⁴⁷⁹ Mario Bunge, ‘What Is a Quality of Life Indicator?’ (1975) 2 Social Indicators Research 65 <<https://doi.org/10.1007/BF00300471>>.

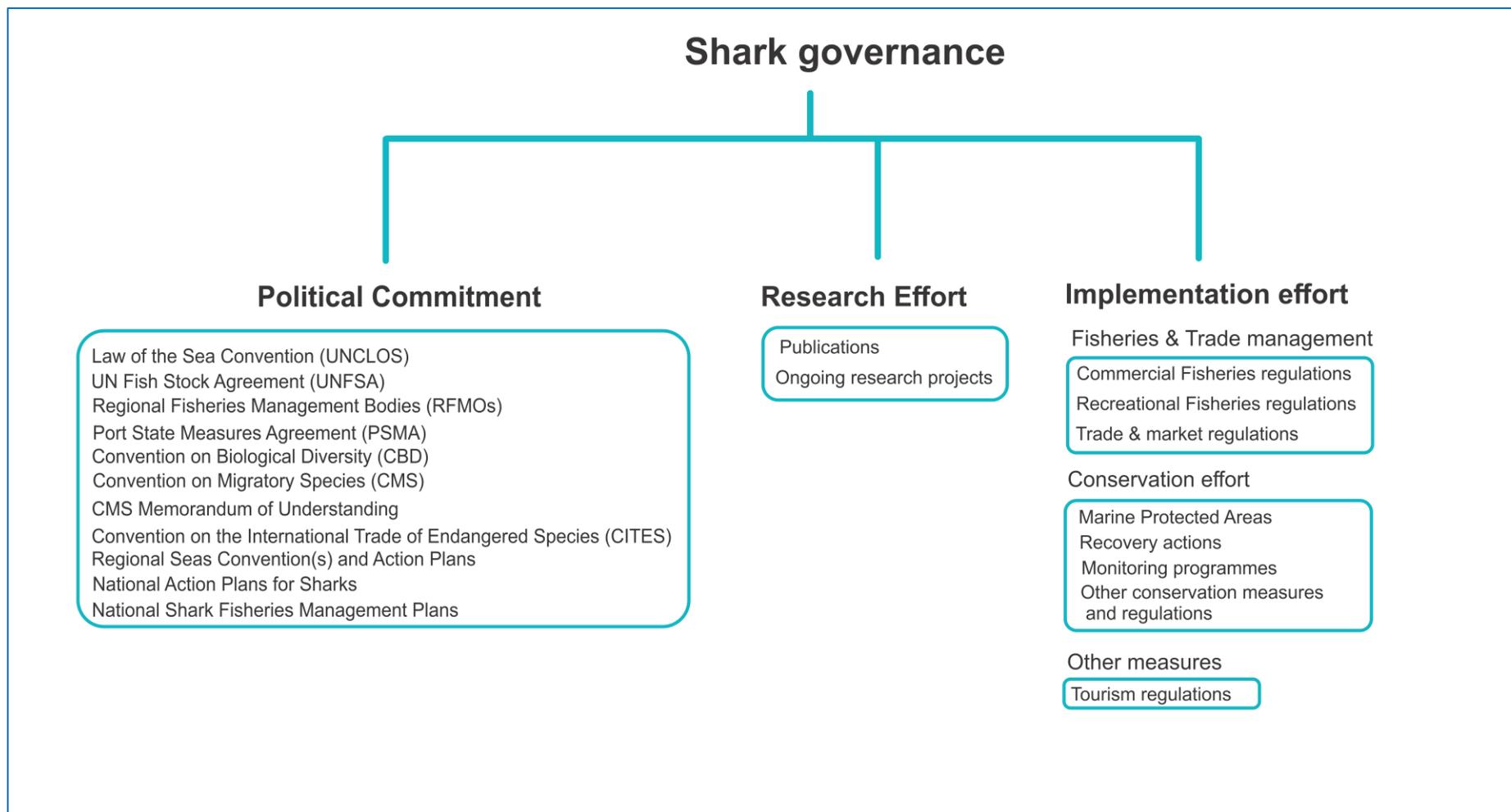


Figure 4. Indicators of governance performance for sharks, based on the contribution of selected (key) sectors.

Selected indicators are explained in the following sections. The evaluation incorporated relevant existing data sources, such as convention reports and United Nations databases, which are issued regularly and are publicly available. Such databases have the benefit of being designed for the purpose of tracking national implementation progress, facilitate national reporting, and can be used to reassess future progress in shark governance. These sources were supplemented with data collected through questionnaires for target groups involved in shark governance. This determined where countries lack regulation and those players that potentially take the lead in terms of shark conservation and management nationally. It also revealed where international support, resource sharing, capacity building, and transnational cooperation are needed.⁴⁸⁰

2.2. General considerations and definitions

Within the assessment of each construct, there are general considerations on which data classification was based. These considerations include:

- **Shark relevance.** This considered whether an indicator was directly created for sharks (shark specific) or was determined relevant to for the protection and management of these species (shark relevant), even if it was not specifically created for sharks.
- **Key actor contribution.** This entailed the collection of information on who was/is involved in the implementation or creation of the indicator/measure. The main actors identified and for which this was applied include the roles of governmental institutions (Government), and non-state actors including the categories of NGOs, and researchers. For the indicators for implementation effort, direct involvement of the fishing sector (Fishers) and the public (Citizen) were entered into the database if information was available. This only concerned the direct partners (1st level involvement but not multilevel involvement).

⁴⁸⁰ For further discussion on aspects of limitations nationally, see Chapter Three, Section 3.2.

- **Indicator timelines.** Indicator evidence was considered from the time legal instruments came into force. Thus, national reports, which formed the basis of the data collection, were reviewed for the respective timelines.
- **Surveyed groups.** As part of the data collection, group specific survey questionnaires were sent to three target groups. These groups included governmental/regulatory institutes, national shark experts, and NGOs. In relation to the latter, an NGO had to fulfil at least one of the following criteria: : is cooperating partners of the CMS Shark MoU; is recognised and listed by the IUCN Shark Specialist Group; has been represented at the Conference of the Parties meetings of the CMS and/or the CITES (including admission as observers); is a member of a larger (e.g., regional) shark organisation, coalition, or network, such as the European Elasmobranch Association (EEA); and/or is registered within the respective national registry for NGOs, in line with Koehler and Lowther (2022).⁴⁸¹ The selection of State-controlled, regulatory institutes was based on the national reporting entities, and the list of SPA/RAC focal points. National experts were chosen based on the member list of the regional IUCN shark specialist group.⁴⁸²

2.2.1 Scale/ Classification

The following classification was based on identified key players, as described in Chapter One,⁴⁸³ and the review of data sources in the status of ongoing activities and measures.

Implementation leads and collaborators:

1. Government
2. NGO(s)
3. Researcher(s)
4. Citizen
5. Fishers

Implementation status of measures:

1. **Planned** (to start in 2021, but no certainty that the measure will be implemented)
2. **Under development** (clear indication that steps have been taken to implement this measure in the near future)

⁴⁸¹ Koehler and Lowther (n 80).

⁴⁸² IUCN, 'IUCN Shark Specialist Group (SSG)' <<https://www.iucnssg.org/region-mediterranean.html>> accessed 17 February 2020.

⁴⁸³ This excludes to contribution of media, as this is outside the scope of this thesis. This is further discussed in Chapter Six.

3. **Ongoing** (finite measure with an end date that was ongoing at the time of data collection)
4. **Applied** (implemented measures with no specific end date, (indefinite))
5. **Completed**
6. **Unknown** (no evidence on the status of implementation at the time of data collection, but some evidence that the measure was either under development, completed or applied)
7. **Not implemented** (evidence indicated that the measure is currently not applied)

2.2.2 Definition of 'projects'

Projects were defined as measures that run over a defined, finite period. In this assessment 'projects' were classified into two different types, one was 'research projects' which were included under the construct 'research effort', and 'conservation projects', those included within the construct of 'implementation effort', including projects for conservation and fisheries management. The difference between research and conservation projects is that the latter has multiple components (e.g., awareness raising activities, data collection, policy drafting, and measure proposals) and a clear conservation target, including large scale national surveys and monitoring projects to assess populations, a specific impact resulting from human activities, and/or create an inventory, and are therefore directly linked to conservation management. In contrast, research projects aim to answer a specific research question.

The assessment of projects focused on currently ongoing initiatives and those carried out in the past five years (2015-2019) before the final year of assessment (2020). Research initiatives carried out prior to the assessment were assumed to have been published and thus contributed to the construct of 'research effort'. Similarly, conservation projects implemented prior to the assessment timeframe were considered to have led to improved

policies or other implemented measures. Information on planned projects to start in 2021 was also recorded.

2.2.3 Limitations

The approach outlined above excluded small interest groups, and non-registered NGOs, as well as smaller projects conducted by concerned and interested individuals. As the assessment was focused on absolute values of the quantity and diversity of programmes in place, countries with fewer NGOs and/or NGOs with smaller budgets were at a disadvantage. To determine the overall contribution/level of operation of NGO(s) nationally, data from all participating NGOs was accumulated and considered equal to the overall effort within a country, even though the quality of educational programmes or activities may have differed.

2.3 Construct: political commitment

2.3.1 Justification

The use of international, regional, and national legal instruments, and management bodies was justified as these instruments incorporate measures and actions applicable to shark governance.⁴⁸⁴ International and regional conventions support transparency through reporting, obligate countries to create and implement measures, set global targets, and foster cooperation, while providing administrative structures for support and capacity building.⁴⁸⁵ The selected legal frameworks are relevant to shark conservation for two

⁴⁸⁴ Mary Lack and Glenn Sant (n 430).

⁴⁸⁵ Winjstekers (n 284).

reasons, the aim to reach sustainable use of marine resources, to which sharks belong, and the conservation of biodiversity. Participation in such instruments can show whether a country is willing to approach a sustainable course of action, protect biodiversity, and aims for the responsible and sustainable use of resources. In short, if a country becomes party or signatory to international and regional instruments in support of sustainable development and species conservation, enters voluntary commitments, and supports the listing of shark species on conservation instruments, then that country is likely to be committed to this course of action.⁴⁸⁶

2.3.2 Definition

Political commitment was defined as the number of legal instruments and regional management bodies a country participates in and commits itself to. This commitment included being party to international conventions, agreements, and treaties relevant to marine conservation and fisheries; membership of regional programmes and fisheries management bodies by means of ratification, accession, succession, or formal confirmation; and national commitments. Thus, political commitment included national legislation and strategies reflecting internationally agreed and required actions to resolve problems that hamper marine conservation and sustainable management related to sharks. National commitments incorporated, *inter alia*, national biodiversity strategies, fisheries management plans, and voluntary commitments such as a National Plan of Action for Sharks (NPOA), as well as being party to the Shark Memorandum of Understanding (Shark MoU)⁴⁸⁷

⁴⁸⁶ Huse and others (n 419).

⁴⁸⁷ Memorandum of Understanding on the Conservation of Migratory Sharks (n 11).

under the Convention of Migratory Species (CMS),⁴⁸⁸ as described in Chapter One. A full list of the legal instruments, regional programmes, and management bodies considered in this assessment with details on their relevance and examples are listed in Annex 1, Table 2.

2.3.3 Indicators

The indicators in Annex 1, Table 2 are relevant to shark conservation and management. They include environmental and fisheries legal frameworks, as well as RFMOs, as these have an impact on global shark population decline and thereby management responsibility.⁴⁸⁹ Furthermore, indicators for national commitments have been selected. These indicators were chosen based on the applicable legal and policy framework, as introduced in Chapter One.

Regulatory frameworks for general ocean use and fisheries management:

- Law of the Sea Convention (LOSC)⁴⁹⁰
- United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA)⁴⁹¹
- Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (Compliance Agreement)⁴⁹²
- Regional Fisheries Management Bodies (RFMOs)
- Agreement on Port State Measures (PSMA)⁴⁹³

⁴⁸⁸ Convention on the Conservation of Migratory Species of Wild Animals (n 10).

⁴⁸⁹ The Pew Charitable Trusts (n 415).

⁴⁹⁰ United Nations Convention on the Law of the Sea (n 8).

⁴⁹¹ Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (n 368).

⁴⁹² Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (n 360).

⁴⁹³ Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (n 382).

Conservation conventions and regional programmes:

- Convention on Biological Diversity (CBD)⁴⁹⁴
- Regional Seas Conventions and Action Plans. For the Mediterranean, this refers to the Barcelona Convention⁴⁹⁵
- Convention on the Conservation of Migratory Species of Wild Animals (CMS)⁴⁹⁶
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention)⁴⁹⁷ – applicable to continental Europe
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)⁴⁹⁸

National commitments (evaluation of obligatory and voluntary legal commitments):

- CMS Shark Memorandum of Understanding (Shark MoU)⁴⁹⁹
- National Plan of Action for sharks (NPOA)
- National Fisheries Management Plan

Additionally, ‘policy developments’, which are commitments that are in progress of being drafted were identified and analysed.

2.3.4 Data sources

Parties/member lists and status of ratification (or accession) were retrieved from the respective treaty websites, as listed in Annex 1, Table 2. Additional information on national legislation was sourced through questionnaires to the respective government institutions. Furthermore, national and international reports were analysed to investigate national policies and commitment status.

⁴⁹⁴ Convention on Biological Diversity (n 314).

⁴⁹⁵ Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (n 54).

⁴⁹⁶ Convention on the Conservation of Migratory Species of Wild Animals (n 10).

⁴⁹⁷ Convention on the Conservation of European Wildlife and Natural Habitats (n 335).

⁴⁹⁸ Convention on International Trade in Endangered Species of Wild Fauna and Flora (n 9).

⁴⁹⁹ Memorandum of Understanding on the Conservation of Migratory Sharks (n 11).

2.3.5 Scale/ classification

This construct considered two forms of commitments, those creating legally binding obligations, such as conventions, and those related to strategic policy documents (e.g., action plans). The classification was based on whether those two apply to the respective country or not (Yes/No). The scale of political commitment depended on the number of indicators applicable for one country and the regional context. Policy developments were investigated, but not further classified.

2.3.6 Limitations

Commitment is often related to weighing the advantages and disadvantages of participation, as well as national capacity and resources to implement obligations under certain legal requirements.⁵⁰⁰ While membership of treaties, conventions, agreements, and management bodies cannot be said to imply political will and interest in sharks specifically, it does reflect commitment to internationally agreed measures and principles relevant to shark conservation and management. Implementation of such measures and actions was assessed through the other constructs.

⁵⁰⁰ EJ Molenaar, 'Non-Participation in the Fish Stocks Agreement: Status and Reasons' (2011) 26 *The International Journal of Marine and Coastal Law* 195 <https://brill.com/view/journals/estu/26/2/article-p195_1.xml>.

2.4 Construct: research effort

2.4.1 Justification/context

The scientific interest in sharks originated during World War II, following reports of drifting soldiers from sunken vessels being ‘attacked’.⁵⁰¹ The attacks initiated an interest in shark deterrents, which slowly grew into a general interest in shark biology and ecology in the 1960s to 1970s.⁵⁰² Since the development of Self-Contained Underwater Breathing Apparatus (SCUBA) diving around the same time, the field of underwater and thereby shark research has grown rapidly, expanding into various fields of research. However, whether it is research on the reduction of human impact through bycatch mitigation measures⁵⁰³ or the understanding of reef shark populations and ecosystem function, many questions remain, such as those related to species life history, population dynamics, and consequences of declines.⁵⁰⁴ Research on both a national scale and through international cooperation is fundamental to enable the development of scientifically sound policies, strategic priorities for required action, and to keep policies informed so they can be amended and adapted to better fit their purpose. In short, scientific knowledge is a crucial component of problem framing and policy formulation, as well as evaluation of policies, as shown in Chapter One.

⁵⁰¹ Pamela M Henson, ‘Shark Attack Tracks’ (2008) <<https://siarchives.si.edu/blog/shark-attack-tracks>> accessed 2 June 2021.

⁵⁰² Perry W Gilbert, ‘Two Decades of Shark Research: A Review’ (1977) 27 *BioScience* 670 <<http://www.jstor.org/stable/1297551>>.

⁵⁰³ Juan M Molina and Steven J Cooke, ‘Trends in Shark Bycatch Research: Current Status and Research Needs’ (2012) 22 *Reviews in Fish Biology and Fisheries* 719 <<http://link.springer.com/10.1007/s11160-012-9269-3>>.

⁵⁰⁴ Michelle R Heupel and others, ‘Reef Shark Science – Key Questions and Future Directions’ (2019) 6 *Frontiers in Marine Science* 1 <<https://www.frontiersin.org/article/10.3389/fmars.2019.00012/full>>.

2.4.2 Definition

Research effort was used a collective term for the number of publications generated, as well as information collected on ongoing research projects. It did not include the collection of data for national reporting, as this is an obligation under various instruments, and thus such reporting was incorporated under the construct of implementation efforts.

2.4.3 Indicators

To determine the research effort on a national scale, two indicators were chosen: first, the number of research publications produced, and second, currently ongoing research projects by selected institutions.⁵⁰⁵

Additional parameters that were considered are:

- International and inter-Mediterranean cooperation (determined by the evaluation of involved institutes)
- Species focus of research
- Topical focus of research
- Applied research methods
- Information on funding sources
- Geographical focus areas

As a valuable reference for conservation and management,⁵⁰⁶ the conservation status of species covered by the respective research was considered, as determined through the status IUCN's Red List classification of species, which includes the following categories: Data Deficient, Vulnerable, Near Threatened, Threatened, Endangered, and Critically

⁵⁰⁵ Such selected institutions are those represented by the NGOs and national experts contacted for the survey questionnaire, as indicated under Section 2.2. above (general considerations and definitions).

⁵⁰⁶ Ana SL Rodrigues and others, 'The Value of the IUCN Red List for Conservation' (2006) 21 Trends in Ecology & Evolution 71 <<https://linkinghub.elsevier.com/retrieve/pii/S0169534705003320>>.

Endangered.⁵⁰⁷ This status was based on regional assessments, where available, or, otherwise, the global assessment scale.

2.4.4 Data sources

Data collection on research efforts was conducted through a web-based literature search and questionnaires. The data on published work was mainly sourced through Web of Science,⁵⁰⁸ while data on ongoing research was collected from 1) funding sources,⁵⁰⁹ and 2) questionnaires to NGOs and national experts. Bibliographic research was conducted through Web of Science (all databases) used a combination of keywords and Boolean characters. The keyword search included the terms ‘elasmobranch’, ‘shark’, ‘skate’, and ‘ray’, in combination with ‘Mediterranean’. Additionally, relevant taxonomic terms, namely the relevant species families, were also searched for. This search was complemented using the same search terms on Google scholar,⁵¹⁰ and the ResearchGate platform.⁵¹¹

All search results were reviewed and cross-checked to avoid false positives and duplication, an approach in line with previous literature reviews for this region.⁵¹² Only primary literature was analysed- this was not extended to secondary sources such as reports, books, guides, conference proceedings, and posters. This approach was based on the assumption that contributions to conferences would eventually have led to publications, and that wider regional reports rely on previous published science. Similar to the approach by Bradai et

⁵⁰⁷ IUCN ‘The IUCN Red List of Threatened Species’ <<https://www.iucnredlist.org/>> accessed 23 August 2020

⁵⁰⁸ Web of Science can be accessed through: <https://www.webofscience.com/>

⁵⁰⁹ Charlie Huvneers and others, ‘Future Research Directions on the “Elusive” White Shark’ (2018) 5 *Frontiers in Marine Science* 1 <<https://www.frontiersin.org/article/10.3389/fmars.2018.00455/full>>.

⁵¹⁰ Google Scholar can be accessed through: <https://www.scholar.google.com>

⁵¹¹ ResearchGate can be accessed through: <https://www.researchgate.net>

⁵¹² Hakan Kabasakal, ‘A Review of Shark Research in Turkish Waters’ (2019) 29 *Annales, Series Historia Naturalis* 1.

al.,⁵¹³ the analysis of literature for this review assessed different data sources, contributions by species, and areas in which research has been carried out, as mentioned above.

2.4.5 Scale/ classification

The publications and research projects were categorised into the following to determine in which scientific fields research effort is dominant/ distributed.

Topic classification (ten classes):

1. **Ecology and biology.** This included the research of biological traits of species (e.g., growth, age, reproduction), species occurrences/distribution, habitat use, nursery areas, trophic ecology, and food-web interactions. This category also incorporated studies on genetics, behaviours, physiology/ biochemistry, migrations, parasites, and diseases. Such research underpins the basic understanding of the life of species and provides relevant information to management on where species occur and what role they play in the environment, and their vulnerability,⁵¹⁴ which can help to determine priority actions and species.⁵¹⁵
2. **Taxonomy and morphology.** This category focused on studies describing taxonomic and morphological characteristics that determine species classification. Such research supports the exact classification of species and can inform conservation efforts through correct taxonomy.⁵¹⁶
3. **Conservation measures and management.** This encompassed studies with a clear intention and conservation aim/message in the context of shark governance, and research that focused on specific measures, such as MPAs, excluding fisheries-related tools and approaches. It also included studies on education and awareness raising programmes, Citizen Science, as well as studies on population recovery, overall population status, and conservation management.

⁵¹³ Mohamed Nejmeddine Bradai, Bechir Saidi and Samira Enajjar, 'Elasmobranchs of the Mediterranean and Black Sea: Status, Ecology and Biology. Bibliographic Analysis' (2010).

⁵¹⁴ Gabriele La Mesa and others, 'Bycatch of Myliobatid Rays in the Central Mediterranean Sea: The Influence of Spatiotemporal, Environmental, and Operational Factors as Determined by Generalized Additive Modeling' (2016) 8 Marine and Coastal Fisheries 382 <<http://dx.doi.org/10.1080/19425120.2016.1167795>>.

⁵¹⁵ Ricci and others (n 52).

⁵¹⁶ Georgina M Mace, 'The Role of Taxonomy in Species Conservation' (2004) 359 Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences 711 <<https://royalsocietypublishing.org/doi/10.1098/rstb.2003.1454>>.

4. **Contamination and pollution.** This extended to studies on environmental contaminants, for example, through the analysis of shark meat from local fish markets, and the impact of plastic pollution, including that posed by lost and abandoned fishing gear.
5. **Fisheries research.** This included research related to fisheries, embracing bycatch, fishing gear, fisheries management tools and applications, shark landings, the impact of fishing on sharks and their habitats, and illegal fishing activities. It additionally incorporated bycatch mitigation tools and trials.
6. **Humans and sharks.** This category included research on media reporting, public perceptions, and interactions between humans and elasmobranchs, including research on shark attacks. In this regard, research on shark repellents was also incorporated. Furthermore, it extended to cultural relationships with sharks where cultural views were the focus of the research.
7. **Shark product trade and meat consumption.** This encompassed research that focused on trade in shark products, including shark meat and its consumption/use. The analysis of marketed products through genetic tools was also included here.
8. **Policy and legal research.** This category contained research investigating the implementation of specific legal instruments, such as CITES and CMS, political problems, comparison between different policies, regulatory approaches, and analyses of political actions.
9. **Tourism.** Studies relating to touristic activities that involve sharks, such as whale shark tours, diving with sharks, and cage diving were covered in this category. This extended to the impact and influence of these activities on both people and elasmobranchs. It did not include studies that focused on the regulations of this sector, since this was were included under policy and legal research.
10. **Other.** This extended to remaining fields outside of the above, such as, for example, Paleontological studies.

Subcategories for research:

Across multiple of the above main categories, several subcategories were considered. These included the following topics:

Abnormalities (in appearance); Abundance-Distribution; Behaviour; Biochemistry & Histology; Bycatch mitigation; Catch composition/Bycatch/Discards; Citizen Science; Diseases; Ecosystem (structures and roles of sharks); Education & Awareness; Genetic study;

Habitat (use); Impact assessment (of different pressures); Interspecific relations; Life history traits (such as age, length-weight relationships, etc.); Management (measures for fisheries and conservation); Morphological characteristics; Nursery areas; Palaeontology; Parasites; Physiology (e.g. breathing rates); Plastic (consumption and entanglement); Pollutants (such as methyl mercury, polychlorinated hydrocarbons, etc.); Population (assessments); Research overview (summaries); Shark attack; Taxonomic remarks; and Trophic ecology.

In consideration of how data was obtained by the researchers, data sources were classified as follows.

Date source classification:

1. **Fisheries dependent (lethal to sharks).** This included data from catches and bycatch/discards analysis from commercial, artisanal, and recreational fishing operations, as well as landings and market analysis.
2. **Fisheries independent fishing (partially/potentially lethal).** This included sources from experimental survey- fishing for sharks, such as the Mediterranean International Trawl Survey (MEDITS). These surveys can have an impact on the species fished, as it is not guaranteed that all specimen fished will survive and be released; some specimen might be hurt by the actual fishing method, which lowers their chance of post-release survival; and some species are targeted to investigate fertility, which requires the specimens to be dissected. Although applicable guidelines may incorporate the requirement to release species which are subject to conservation measures, such as legal protection,⁵¹⁷ there is no guarantee these species will survive post-release. Another potential impact of fishing stress can be abortion, which has been recorded in multiple shark species.⁵¹⁸
3. **Fisheries independent.** This encompassed non-lethal operations that minimise the impact on the species investigated. This included, *inter alia*, dive surveys; baited, remote underwater video surveys (BRUVs); literature reviews (including grey

⁵¹⁷ *International Bottom Trawl Survey in the Mediterranean. Instruction Manual.* (9th edn, MEDITS Working Group 2017).

⁵¹⁸ N Wosnick and others, 'Impacts of Fisheries on Elasmobranch Reproduction: High Rates of Abortion and Subsequent Maternal Mortality in the Shortnose Guitarfish' (2019) 22 *Animal Conservation* 198.

literature);⁵¹⁹ the analysis of existing databases; strandings; interviews and surveys, Citizen Science programmes; field observations; aerial surveys; and media analysis.

The classification of financial support of the research was based on funding statements in published work. Where available, funding information was classified into one or a combination of the following categories.

Funding categories:

1. **Government funds**, which included established environmental funds by State institutions, project-based government funding, as well as any other form of financial contribution by the national government.
2. **EU funds** entailed project-based funding sources, such as Horizon 2020,⁵²⁰ as well as EU contract funds, social and research grants.
3. **Education/ research funds** were another category, which encompassed funding sources such as fellowships, financial support from research associations, and specific research grants not related to EU budgets.
4. **Foundations and philanthropic organisation funding** was considered, which also included funding from/raised by NGOs.
5. **Companies**, which represent the economic sector, supporting research were assigned another funding source category.

2.4.6 Limitations/bias

There is a profound bias when using Web of Science or focusing on peer-reviewed literature.

While some scientists may argue the peer review is the only way to ensure quality, other non-peer reviewed journals still offer solid and sound science, but simply lack the administrative capacity and financial resources to engage in the peer-review process. There is also an English-search term bias, which must be acknowledged. The Web of Science,

⁵¹⁹ 'Grey literature' refers to reports, books, stories, and other material published outside the scope of what accounts for scientific literature.

⁵²⁰ Horizon 2020 was the EU's research and innovation funding programme from 2014-2020, as explained here: https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-2020_en

although used in many of these comparisons, relies on English search terms. Although excluding publications in other languages, the use of English across such reviews is also a way of ensuring consistency in data collection. Finally, it is of note that resource and budget are factors that may restrict the research output of a country, something particularly witnessed in the output from developing nations.⁵²¹ This bias is further discussed in Chapter Four, Section 4.3.

2.5 Construct: implementation effort

This is the most complex construct, as it included the widest range of indicators and measured/actions in the context of all the political commitments.

2.5.1 Justification

As shown in Chapter One and further applied to the Mediterranean in Chapter Five, ‘implementation effort’ at national level was assessed in the context of international legal obligations and related policies.⁵²² As the international community recognised existing problems threatening vulnerable species, such as sharks, and put them onto an international agenda, legal obligations stipulated the need for action. In the context of the legal and policy framework, ‘implementation effort’ assessed the implementation of measures at national scale and how they relate to recognised problems. Overfishing is the main threat to shark populations globally, which also entails the subsequent marketing and trade of shark meat and other shark products.⁵²³ Therefore, these sectors require regulation

⁵²¹ Khalid Zaman and others, ‘Research Productivity and Economic Growth: A Policy Lesson Learnt from across the Globe’ (2018) 22 Iranian Economic Review 627 <https://ier.ut.ac.ir/article_66633.html>.

⁵²² Applicable legal obligations for Mediterranean countries are explained in more detail in Chapter Three, Section 3.2.

⁵²³ Davidson, Krawchuk and Dulvy (n 163).

to ensure that the impact of these activities is reduced or eliminated, and to reach sustainability. Another industry, exhibiting growth globally, is shark tourism.⁵²⁴ Although tourism can substantially contribute to a country's economy,⁵²⁵ unregulated operations can harm both humans⁵²⁶ and sharks.⁵²⁷ However, although there is no overarching international or regional legal framework for the regulation of tourism operations related to sharks,⁵²⁸ there are aspects that may be regulated to support a sustainable approach to these operations.⁵²⁹

For the assessment of implemented measures, there are different approaches to determine effective shark governance, which reach across disciplines, from conservation, fisheries, marketing, trade, and tourism, as outlined in the following sections.

2.5.2 Definition

This construct focused on measures in place to regulate selected economic sectors that contribute to and influence shark governance, namely fishing/fisheries, shark meat and product trade, shark meat and product marketing (nationally), and tourism, as well as measures related to conservation management. Fisheries, trade, and shark product markets are inevitably and inherently linked, but often are regulated separately, as shown in Chapter One. Sustainable fishery refers to well-regulated and monitored fisheries that try to avoid

⁵²⁴ Teleah Joy Healy and others, 'A Global Review of Elasmobranch Tourism Activities, Management and Risk' (2020) 118 *Marine Policy* 103964 <<https://doi.org/10.1016/j.marpol.2020.103964>>.

⁵²⁵ Gallagher and Hammerschlag (n 117).

⁵²⁶ Eric EG Clua, 'Managing Bite Risk for Divers in the Context of Shark Feeding Ecotourism: A Case Study from French Polynesia (Eastern Pacific)' (2018) 68 *Tourism Management* 275 <<https://doi.org/10.1016/j.tourman.2018.03.022>>.

⁵²⁷ Freya C Womersley, Savinien T Leblond and David RL Rowat, 'Scarring Instance and Healing Capabilities of Whale Sharks and Possible Implications', *The 4th International Whale Shark Conference* (Hamad bin Khalifa University Press (HBKU Press) 2016) <<https://www.qscience.com/content/papers/10.5339/qproc.2016.iwsc4.67>>.

⁵²⁸ Momigliano and Harcourt (n 106).

⁵²⁹ Gallagher and Huvneers (n 254).

negative impacts on the overall target population, reduce bycatch, and do not or limit damage to the marine environment. Trade of fishery products was another central concern, so were market regulations and port-control measures. Measures for these divisions were assessed in relation to the applicable international and regional requirements, as listed in Annex 1, Table 2.

However, there are various regulatory measures that can be applied to reduce risks and potential impacts of these activities.⁵³⁰ The five divisions that were evaluated were defined as follows:

- **Fisheries.** This can be regulated on multiple levels such as fishing methods, landings measures, area closures, and port control measures. The two sectors this study considered were commercial, including artisanal, and recreational fisheries. Measures applied to fisheries catching sharks, either as target species or as bycatch, can include the following: entry restrictions; catch limits; spatial and temporal closures; or bag and trip limits.⁵³¹ Such regulations are usually set on a supranational level (e.g., EU), by RFMOs (which incorporate principles of e.g., the UNFSA), through agreements (e.g., PSMA), or national fisheries bodies. Recreational fishing was included in this study since it can have a substantial impact on shark species, which in some countries surpasses commercial catches.⁵³²
- **Trade.** There are two aspects of trade forming part of this evaluation, import and export control measures for shark meat and other products. Both are related to whether a country engages in trading shark products internationally, thereby supporting shark product markets.
- **Markets.** The analysis of market regulations included market controls, and marketing regulations, including labelling of shark products and meat.
- **Conservation.** In addition to fisheries-related measures aiming to ensure the optimal use of commercial species, incorporating obligations for the conservation and management of sharks, there are distinct conservation-focused measures. These are designed either on a spatial scale or for specific species.⁵³³ One of the

⁵³⁰ Healy and others (n 524).

⁵³¹ Mary Lack and Glenn Sant (n 430).

⁵³² Ben Lamine and others (n 113).

⁵³³ Cole-King (n 75).

most applied conservation tools is the creation/designation of MPAs.⁵³⁴ The 2020 global goal for the designation of MPAs is ten percent for the protection of highly diverse and vulnerable areas.⁵³⁵ While new global targets are currently being discussed, some scientists argue that within the next decade this number should be increased to 30 percent of the ocean.⁵³⁶ MPAs can have different targets and objectives and may be designated for the protection and conservation of habitats, ecosystems, and/or species. MPAs considered in this assessment included those that have the potential to protect important habitats for sharks;⁵³⁷ protect specific shark populations; and support overall marine ecosystem protection in areas where sharks occur, contributing directly or indirectly to shark conservation. While there are different approaches to shark conservation, which often and reasonably focus on reducing the impact from human activities on the environment, protected areas can make a substantial contribution to habitat and species conservation, including sharks.⁵³⁸ The level of regulation as well as set objectives for MPA designation can lead to successful shark conservation. No take areas have been proven to be effective for this purpose.⁵³⁹ Besides MPAs, there may be other conservation measures that are applied by countries for conservation of this group of species. Such measures include, *inter alia*, recovery plans for threatened species, habitat restoration projects,⁵⁴⁰ and reintroduction programmes.⁵⁴¹ An additional consideration under this construct were programmes designed to monitor conservation efforts, population status and implementation progress, which are significant in their continuous contribution to knowledge.

- **Tourism.** This sector evaluation included activities such as diving, shark watching tours, and cage diving with sharks. While shark tourism is a growing industry⁵⁴² there is currently no specific international or regional convention promoting and establishing obligations with the objective to manage this sector sustainably and reduce potentially harmful effects, especially on sharks.⁵⁴³

⁵³⁴ Ward-Paige and Worm (n 180).

⁵³⁵ Convention on Biological Diversity, < <https://www.cbd.int/sp/targets/rationale/target-11/>> assessed 28 May 2020

⁵³⁶ Julie Hawkins and others, 'How We Can Protect 30% of Our Oceans by 2030' <<https://storage.googleapis.com/planet4-international-stateless/2019/03/5db0f88b-greenpeace-30x30-blueprint-report.pdf>>.

⁵³⁷ Charlotte A Birkmanis and others, 'Shark Conservation Hindered by Lack of Habitat Protection' (2020) 21 *Global Ecology and Conservation* e00862 <<https://doi.org/10.1016/j.gecco.2019.e00862>>.

⁵³⁸ Ward-Paige and others (n 183).

⁵³⁹ Ward-Paige and others (n 183).

⁵⁴⁰ Ward-Paige and others (n 183).

⁵⁴¹ Dutch Shark Society 'Sharks and Rays back into the North Sea' <<https://www.dutchsharksociety.org/sharks-and-rays-back-into-the-north-sea/>> accessed 18 August 2020

⁵⁴² Gallagher and Hammerschlag (n 117).

⁵⁴³ Techera and Klein (n 146).

2.5.3 Indicators

Within fisheries management and related economic sectors that consider marketing of shark products and trade, there are a number of applicable measures that were considered as indicators. Reference to 'threatened' and 'vulnerable' species was made in line with the IUCN Red List assessment and encompassed the following IUCN categories, as explained above.⁵⁴⁴ The following measures are described in a wider context of available options for each division. These were then classified based on the actual data collected, as indicated in the last part of this section under 'Scale/ Classification'.

Fishery-related measures:

- **Finning and finning bans.** Finning, the cutting of fins from the shark on board of a vessel, and subsequent discarding of the body, is an unsustainable practice. There are two applied policy approaches to prevent this practice, which are distinguished by their practicality and reliability. The first is a fin-to-carcass ratio, which refers to a species-specific bodyweight ratio to ensure all fins on board of a vessel are accounted for by the present shark body count. The second is a 'fins naturally attached' policy, which requires fishing vessels to land sharks complete, with their fins attached. The latter is thus easier to enforce whilst also supporting better data collection.⁵⁴⁵
- **Fishing and retention bans.** Fishing bans refer to the prohibition of fishing for certain species. Some countries have declared all or parts of their Exclusive Economic Zone (EEZ) as no-shark-fishing areas,⁵⁴⁶ for example, Palau.⁵⁴⁷ Retention bans prohibit the retention and landing of selected shark species. In the context of this work, fishing bans did not include fishing restrictions within MPAs. These were included under 'conservation effort'.
- **Stock assessments** (for shark species subject to fishing pressure). Stock or population assessments for commercially exploited species are conducted by

⁵⁴⁴ IUCN, < <https://www.iucnredlist.org/> > accessed 20 August 2020

⁵⁴⁵ NR Hareide and others, 'Strengthening European Fisheries Management : Options for Enforcing the Shark Finning Ban Conclusions of an Expert Workshop on European Shark Fisheries, Trade and Markets' (2007).

⁵⁴⁶ Baker-Médard and Faber (n 25).

⁵⁴⁷ Ward-Paige (n 181).

RFMOs and other management bodies such as STECF,⁵⁴⁸ but sharks are not necessarily considered commercial species if there is no target fishery. However, stock assessments are recommended for those nations fishing sharks in their waters under the IPOA sharks.⁵⁴⁹ These assessments allow the determination of maximum sustainable yields or total allowable catch for these species and support management and conservation through population monitoring, if carried out regularly.

- **Bycatch mitigation/ elimination** (incl. post-capture release). The word ‘bycatch’ refers to species that are caught as un-targeted and unwanted catch. These may be landed and marketed or discarded. Some species are discarded as they cannot be landed due to protective status under national legislation. Measures to reduce, avoid or eliminate the accidental catch of non-target species are part of the Code of Conduct for Responsible Fisheries⁵⁵⁰ and thereby integrated in RFMOs. Such bycatch mitigation tools can also be applied in national waters to avoid unwanted catch and reduce fishing impact on vulnerable species. Therefore, bycatch mitigation is considered supportive of sustainable management and conservation. To reduce shark- bycatch several options are available, which include, among others, gear modifications, and area avoidance.⁵⁵¹ An alternative is the release of sharks that are still alive when brought on board.⁵⁵²
- **Port controls.** Inspections at port are required under the PSMA to identify and prevent illegally caught fish from entering the market.⁵⁵³
- **Reporting of fisheries data.** This is crucial for policy to determine the need for and type of future actions that may be necessary. Reporting to the FAO allows for transparency and the fulfilment of legal obligations.⁵⁵⁴ However, there are differences in quality, which thereby were considered separately.
- **Gear restrictions** refer to the prohibition of certain fishing gear to reduce environmental impact on vulnerable species or habitats.
- **Minimum landing size/conservation size.** Size regulations like ‘minimum landing size’ (MLS), which is the smallest total length a species is allowed to be landed at, can help to ensure immature animals are not landed/marketed. This can have beneficial impact if animals are released and survive.

⁵⁴⁸ STECF, ‘Review of Scientific Advice for 2014 Consolidated Advice on Fish Stocks of Interest to the European Union (STECF-13-27)’ (2014).

⁵⁴⁹ International Plan of Action for the Conservation and Management of Sharks (n 13) art 6

⁵⁵⁰ Code of Conduct for Responsible Fisheries (n 363).

⁵⁵¹ Molina and Cooke (n 503).

⁵⁵² Justin David Bell and Jeremy Martin Lyle, ‘Post-Capture Survival and Implications for By-Catch in a Multi-Species Coastal Gillnet Fishery’ (2016) 11 PLOS ONE e0166632 <<https://dx.plos.org/10.1371/journal.pone.0166632>>.

⁵⁵³ PSMA (n 382) art. 12(1)

⁵⁵⁴ Such obligations are described in detail in Chapter Three, Section 3.2.

- **Catch limits/quotas.** These measures, such as ‘total allowable catch’ (TAC) or ‘maximum sustainable yield’ (MSY), restrict fishing by setting a maximum amount of certain species allowed to be landed during a set period, usually a year/season, to combat overexploitation.⁵⁵⁵ However, these can only be effective if they are based on sound scientific knowledge.⁵⁵⁶
- **Closures.** The closure of areas that host, for example, nursery or foraging grounds for juvenile sharks during a certain time of the year, excludes such areas from fishing pressure so they can serve as refugia.⁵⁵⁷

Trade-related measures:

- **Regulation through permits.** CITES regulates trade of endangered species, including CITES-listed sharks, and determines that Appendix II and III-listed species require an export (but not import) permit for trade. In the case of Appendix II species, this trade cannot be detrimental to their survival.⁵⁵⁸
- **Non-Detriment Finding (NDF).** Linked with the issuance of permits for trade of CITES-listed species, the Convention requires States to conduct NDFs, a concept which ensures that the trading of the species does not jeopardize the future existence of a species population and the function of the ecosystem.⁵⁵⁹
- **Trade ban/prohibition.** CITES Appendix I-listed species are not to be traded at all for commercial purposes. However, if traded under the allowed exceptions, e.g., for scientific purposes, they require import and export permits.⁵⁶⁰ Further to CITES regulations as applicable to CITES Parties, countries can establish their own national trade bans and prohibitions.
- **Export taxes.** Another regulatory tool to support conservation and management efforts for sharks are fees and applied taxes to trade in shark products. An example is Ecuador, which imposed a fee for the sale and export of sharks that was used to contribute and support data collection and monitoring efforts.⁵⁶¹

⁵⁵⁵ Shiffman and Hammerschlag (n 35).

⁵⁵⁶ Corey JA Bradshaw and others, ‘Predicting Sustainable Shark Harvests When Stock Assessments Are Lacking’ (2018) 75 ICES Journal of Marine Science 1591.

⁵⁵⁷ JORDAN T WATSON and others, ‘Trade-Offs in the Design of Fishery Closures: Management of Silky Shark Bycatch in the Eastern Pacific Ocean Tuna Fishery’ (2009) 23 Conservation Biology 626 <<https://onlinelibrary.wiley.com/doi/10.1111/j.1523-1739.2008.01121.x>>.

⁵⁵⁸ CITES <<https://www.cites.org/eng/app/index.php>> accessed 24 August 2020

⁵⁵⁹ CITES, <<https://www.cites.org/eng/prog/ndf/index.php>> accessed 24 August 2020

⁵⁶⁰ CITES <<https://www.cites.org/eng/app/index.php>> accessed 24 August 2020

⁵⁶¹ Ecuador, Ministerial Agreement 001 (2008)

Market-related measures:

- **Labelling.** This entails legal requirements to correctly label shark products, which is a crucial component in marketing as it ensures transparency by providing information on the origin of and the species that is marketed/sold, and thus serves to support consumers in making informed decisions. However, recent research has shown that labelling can often be inaccurate, undermining such efforts.⁵⁶² Labelling requirements can only be considered an effective means of regulation if applied fully and correctly, meaning no mislabelling or consumer deception occurs on marketed products.
- **Market inspections.** Market controls, such as regular inspections or market surveys, support compliance and can assist in enforcing regulations, such as the protection of legally protected species. These inspections may also be combined with science tools, such as genetic sampling, to ensure that marketed products do not contain protected species.⁵⁶³
- **Government/State promotional campaigns.** Government initiated campaigns to promote sustainable fishing and inform consumers can support shark management and conservation, if based on the best available science. This can also be considered problematic if promoted unsustainable fishing.⁵⁶⁴
- **Product certification.** This can support consumers in making sustainable choices through visual guidance, such the example of the Marine Stewardship Council product label.⁵⁶⁵ However, caution must be applied when evaluating the quality of such certificates and their scientific basis for evaluation.⁵⁶⁶

Other measures:

- **Regulatory measures related to tourism.** There are two different approaches to regulate tourism operations, either through voluntary, non-binding measures

⁵⁶² Patrizia Marchetti and others, 'Determining the Authenticity of Shark Meat Products by DNA Sequencing' (2020) 9 Foods 1194 <<https://www.mdpi.com/2304-8158/9/9/1194>>.

⁵⁶³ Julia LY Spaet and Michael L Berumen, 'Fish Market Surveys Indicate Unsustainable Elasmobranch Fisheries in the Saudi Arabian Red Sea' (2015) 161 Fisheries Research 356 <<http://dx.doi.org/10.1016/j.fishres.2014.08.022>>.

⁵⁶⁴ Lydia Koehler, Ioannis Giovos and Jason Lowther, 'The Application of Precaution in Elasmobranch Conservation and Management in the Mediterranean Sea' (2022) 135 Marine Policy 104830 <<https://doi.org/10.1016/j.marpol.2021.104830>>.

⁵⁶⁵ Stefano Ponte, 'The Marine Stewardship Council (MSC) and the Making of a Market for "Sustainable Fish"' (2012) 12 Journal of Agrarian Change 300 <<https://onlinelibrary.wiley.com/doi/10.1111/j.1471-0366.2011.00345.x>>.

⁵⁶⁶ Frédéric Le Manach and others, 'Small Is Beautiful, but Large Is Certified: A Comparison between Fisheries the Marine Stewardship Council (MSC) Features in Its Promotional Materials and MSC-Certified Fisheries' (2020) 15 PLOS ONE e0231073 <<https://dx.plos.org/10.1371/journal.pone.0231073>>.

such as a Code of Conduct,⁵⁶⁷ or through enforced, obligatory measures (e.g. feeding bans,⁵⁶⁸ and licensed permit requirements).⁵⁶⁹ Other regulatory measures include the limitation of visitor numbers and certification of sustainable operations.⁵⁷⁰ Furthermore, educational programmes during these activities can contribute to increased awareness and knowledge among participants, potentially generating and enhancing conservation support and interest.⁵⁷¹

- **Education and awareness activities.** These are defined as activities that aim to increase public knowledge and awareness on sharks, their biology/ecology, threats, etc. Such activities include, for example, exhibitions, public awareness events, and school presentations.⁵⁷²
- **Training activities.** These may include species identification, surveying techniques, species handling (e.g., release), as well as the offering of volunteer programmes and internships.
- **Conservation projects.** Such time-bound projects to support conservation, include recovery and release programmes,⁵⁷³ shark rescues,⁵⁷⁴ and conservation work with local fishing communities.⁵⁷⁵ These projects do not have research as their main objective, but the protection of species through specific actions.
- **Policy campaigns.** This includes petitions, public calls, and campaigns for shark conservation.⁵⁷⁶ The quality of such campaigns may differ.

Additional factors to be considered:

- **Governmental cooperation.** Such a cooperative approach can support implementation success and the exchange of information between NGOs and governments. It can also support the initiation of further conservation efforts.

⁵⁶⁷ Kirsty Richards and others, 'Sharks and People: Insight into the Global Practices of Tourism Operators and Their Attitudes to Shark Behaviour' (2015) 91 Marine Pollution Bulletin 200 <<http://dx.doi.org/10.1016/j.marpolbul.2014.12.004>>.

⁵⁶⁸ Karen N Topelko and Philip Dearden, 'The Shark Watching Industry and Its Potential Contribution to Shark Conservation' (2005) 4 Journal of Ecotourism 108 <<http://www.tandfonline.com/doi/abs/10.1080/14724040409480343>>.

⁵⁶⁹ Roland Mau, 'Managing for Conservation and Recreation: The Ningaloo Whale Shark Experience' (2008) 7 Journal of Ecotourism 213 <<http://www.tandfonline.com/doi/abs/10.1080/14724040802140550>>.

⁵⁷⁰ Healy and others (n 524).

⁵⁷¹ Apps, Dimmock and Huveneers (n 252).

⁵⁷² JP Richards and J Heard, 'European Environmental NGOs: Issues, Resources and Strategies in Marine Campaigns' (2005) 14 Environmental Politics 23.

⁵⁷³ Lydia Koehler, Lauren E Smith and Gregory Nowell, 'Recovered and Released - A Novel Approach to Oviparous Shark Conservation' (2018) 154 Ocean and Coastal Management 178 <<https://doi.org/10.1016/j.ocecoaman.2018.01.018>>.

⁵⁷⁴ Lydia Koehler, 'New Records of Angular Rough Sharks *Oxynotus Centrina* in the Coastal Waters of Malta, with Observations on Post-Capture Resilience and Release Behaviour' (2018) 92 Journal of Fish Biology 2039 <<http://doi.wiley.com/10.1111/jfb.13641>>.

⁵⁷⁵ Juan Martín Cuevas, 'Final Report: Involving Anglers as Key Stakeholders in a Shark Conservation Programme. CLP Project N ° 02147113' (2015).

⁵⁷⁶ An example would include the ongoing 'Stop Finning' campaign: <https://stop-finning-eu.org/>

- **International cooperation.** Participation in international projects, networks and programmes was considered beneficial as it enables the streamlining of research efforts, effective use of resources, sharing of information and the building of networks across countries.

2.5.4 Data sources

Data was gathered from various sources, including national reports, online data bases and published literature, as well as target questionnaires to relevant authorities/entities.

National reports under international conventions and regional management bodies were considered suitable for this construct since they fulfil the purpose of tracking and tracing progress towards sustainable management and conservation of species. Additional sources, such as publications that specifically focused on shark sanctuaries, e.g., the global evaluation by MacKeracher⁵⁷⁷ and the review of regulations in shark sanctuaries by Ward-Paige,⁵⁷⁸ were also considered. The number of programmes/projects in place was determined through questionnaires and website information from selected NGOs.

Use of the FAO database on the trade in shark products alongside relevant publications was justified for this purpose as the FAO specifically collects data on sharks.⁵⁷⁹ Reviewing RFMO country reports in relation to measures developed for shark conservation and management is a useful way to assess the regulation of high sea fisheries that involve the catching of sharks and to reflect upon national regulations.⁵⁸⁰ Convention reports such as those submitted under the CMS, and expert questionnaires were also helpful,⁵⁸¹ as the knowledge

⁵⁷⁷ Tracy MacKeracher, Amy Diedrich and Colin A Simpfendorfer, 'Sharks, Rays and Marine Protected Areas: A Critical Evaluation of Current Perspectives' (2019) 20 Fish and Fisheries 255
<<https://onlinelibrary.wiley.com/doi/10.1111/faf.12337>>.

⁵⁷⁸ Ward-Paige (n 181).

⁵⁷⁹ Dent and Clarke (n 116).

⁵⁸⁰ Futerman (n 212).

⁵⁸¹ Lawson and Fordham (n 26).

of local experts has proven valuable to assess sustainability in fisheries at national level.⁵⁸²

The FAO also keeps a database on shark fisheries related measures in line with the IPOA Sharks, which fitted the purpose of this evaluation.⁵⁸³

Reports and sources used:

Convention reports and reports to the relevant RFMOs are publicly available and were sourced directly from the applicable instruments' website.

International reports were sourced as follows:

- CBD reports are publicly available through the CBD's website.⁵⁸⁴ The 6th National Reports were reviewed, if available, including those that had been submitted using the online reporting tool, as accessed through the Clearing-House Mechanism.⁵⁸⁵
- National reports under the CMS and CMS MoU were downloaded from the CMS' website.⁵⁸⁶
- Biennial reports to the CITES Secretariat for the implementation of provision under CITES were obtained from the CITES website.⁵⁸⁷

Annual reports from RFMOs were sourced from the following websites:

- ICCAT biennial reports are available online.⁵⁸⁸
- GFCM Scientific Advisory Committee (SAC) and GFCM Compliance Committee reports were obtained from the FAO's website, which contains a specific section for the GFCM.⁵⁸⁹

⁵⁸² Mora and others (n 425).

⁵⁸³ FAO <<http://www.fao.org/ipoa-sharks/database-of-measures/en/>> accessed 29 September 2020

⁵⁸⁴ Data source (CBD reports): <https://www.cbd.int/reports/>

⁵⁸⁵ Data source 2 (CBD reports): <https://chm.cbd.int/database>

⁵⁸⁶ Data source (CMS reports): <https://www.cms.int/en/documents/national-reports>

⁵⁸⁷ Data source (CITES reports): <https://cites.org/eng/resources/reports/biennial.php>

⁵⁸⁸ Data source (ICCAT reports): https://www.iccat.int/en/pubs_biennia

⁵⁸⁹ Data source (GFCM reports): <https://www.fao.org/gfcm/statutory-meetings/en>

EU relevant reporting was obtained as follows:

- Reports to the Scientific, Technical and Economic Committee for Fisheries (STECF), are publicly available online and were chosen as considered appropriate.⁵⁹⁰
- Reports under the MSFD were reviewed, as available from the EU repository, for all EU countries.⁵⁹¹

Where reports were issued in a language other than English, a translator app was utilised to determine the content of the report.⁵⁹² Translation was cross-checked with native speakers for validation.

2.5.5 Scale/ Classification

The classification for regulatory measures depended on the regional framework in which the assessment was carried out. Scale to determine conservation effort on a national level was determined once data collection was completed, as this was based on the overall regional scope of conservation effort.

Superseding measures: If a species is subject to multiple, overlapping measures, the strongest measures took precedence. For example, if there was a fishing ban for a species by ICCAT, such as the one for porbeagle sharks (*Lamna nasus*),⁵⁹³ which is a species listed as protected species in the Mediterranean under Annex II of the SPA/BD protocol,⁵⁹⁴ then legal protection would entail that this species cannot be fished and superseded the fishing ban as legal protection was considered a stronger measure.

⁵⁹⁰ Data source (STECF reports): <https://stecf.jrc.ec.europa.eu/reports>

⁵⁹¹ Data source (MSFD reports): <https://cdr.eionet.europa.eu/>

⁵⁹² Microsoft Translator App for Windows. Version 5.6.0.0

⁵⁹³ Recommendation by ICCAT on Porbeagle Caught in Association with ICCAT Fisheries (2015) REC 15-06.

⁵⁹⁴ The Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (n 333).

Summarised measures: If one legal obligation originated from multiple, overlapping legal frameworks, these were combined. This included for example reporting obligations on shark landings, which are required under various instruments, such as the GFCM and EU data collection framework and therefore 'reporting' was listed as one measure. This is also noting that the data submitted to both the EU and the GFCM originates from the same source and therefore is likely to be the same.⁵⁹⁵

Source classification:⁵⁹⁶

1. **Report:** Official national reports under CMS, CBD, CITES, as well as other analysed reports such as GFCM SAC and ICCAT reports, reports of the Regional Activity Centre (SPA/RAC), and EU reports under the MSFD
2. **National policy document:** National plans of action, fisheries management plans, or other strategic policies
3. **Legal review:** Applicable legal obligations (e.g., such as EU regulations), and national laws determined by the review of legal instruments
4. **Survey:** Reply to survey questionnaire from this thesis' survey questionnaire.
5. **Publication:** This source category was used when measures were identified through the literature review and validated through review of national websites and legislation.
6. **Web-based research:** Supplementary web-based research on projects reviewing wider network webpages (e.g., Medpan) and funding sources (e.g., Save our Seas Foundation, Rufford Foundation) that are known to engage in shark conservation.⁵⁹⁷

Measure type classification:

Measure type classification was based on the indicators and included the following 22 types (in alphabetical order):⁵⁹⁸

⁵⁹⁵ Reporting obligations are further explained in Chapter Three, Section 3.2.6.

⁵⁹⁶ This refers to the primary source/first record of identified implementation measures.

⁵⁹⁷ Berta Martín-López and others, 'What Drives Policy Decision-Making Related to Species Conservation?' (2009) 142 *Biological Conservation* 1370 <<https://linkinghub.elsevier.com/retrieve/pii/S000632070900069X>>.

⁵⁹⁸ Specific details and examples for each measure type are given in Chapter Five, Section 5.2.

1. **Additional legal protection** (species protected by law other than those listed under international or regional conventions)
2. **Application** (e.g., phone apps, websites for data submission)
3. **Assessment** (evaluation of impacts from human activities and populations status of shark species)
4. **Database** (organised data collection stored in a repository)
5. **Finning ban** (Regulation prohibiting the practice of cutting shark fins off)
6. **Fishing ban** (incl. retention ban; prohibition of targeting specific species)
7. **Fisheries Restricted Area** (FRA; spatial measures prohibiting certain types of fishing; this refers to the process under which these areas are established under the GFCM)⁵⁹⁹
8. **Gear restriction** (technical measures prohibiting certain fishing activities in relation to the type of gear used)
9. **Guide** (e.g., identification guides, posters, and other material containing species information to educate target audiences)
10. **Inventory** (species records nationally)
11. **Minimum Landing Size** (MLS; defined total length at which species can be landed)
12. **Marine Protected Area** (MPA; spatial measure for species/ habitat protection)
13. **Product labelling** (Legal requirement to label shark products))
14. **Programme** (long-term initiative with multiple components)
15. **Project** (see definition in Section 2.2.2)
16. **Reduction in fishing effort** (e.g., reducing number of commercial fishing boats, or limiting fishing effort)
17. **Regulated trade** (legal obligations applying technical aspects to trading specific species)
18. **Reporting** (as measure; this refers to the submission of national landings data for sharks)
19. **Species Protection** (species listed as ‘protected’ in national law, based on international obligations)
20. **Stranding network** (reporting system for stranded animals)
21. **Temporal closure** (spatial restriction to limit fishing over a defined period within a specific area)
22. **Trade prohibition** (laws limiting the trade of certain species and parts thereof)

Additionally, for the measure ‘conservation projects’, which is a multicomponent measure, as defined in Section 2.2.2, individual project composition based on component analysis was

⁵⁹⁹ See Section 3.2.10 for the legal basis.

conducted. The following project components were considered: capacity increase, education (including training of fishers, awareness raising activities, teaching sessions, and involvement of the public); measure proposal; informed management decision-making; and policy strategy, with the latter supporting policy development and improved management; as well as research, which refers to project activities in which data is collected and analysed; and recovery, meaning sharks were being recovered and subsequently released. These naturally overlap with some of the overarching classification terms as per below.

'Class' of measures classification (ordered alphabetically):

In line with the indicators, overarching classes, which indicate the focus of a measures were determined as follows:

1. **Bycatch mitigation:** any measure with the objective to reduce the bycatch of sharks.
2. **Citizen Science:** any measure targeting citizens for data collection on sharks.
3. **Education and awareness:** any measure that focuses on increasing public knowledge.
4. **Genetic tools:** measures gathering genetic information.
5. **Impact assessment:** assessments that determine the impact of a human activity such as fishing or pollution.
6. **Important areas:** measures that focus on determining which areas have conservation potential for sharks.
7. **Monitoring:** measures collection long-term data.
8. **Policy development:** measures with the objective of improving national policies.
9. **Population assessment:** measures determining the status of shark populations.
10. **Recovery and release:** measures involving the recovery of a species and subsequent release, including the recovery of egg cases.
11. **Regulation:** measures based on legal obligations.
12. **Training:** measures that increase capacity in relevant skills, technologies, etc.

'Category' (aim of the measure) classification:

1. Capacity building
2. Data collection

3. Impact reduction
4. Law (legal obligations)
5. Management
6. Material (production of education, awareness, or training material)
7. Recovery actions

'Sub-construct' classification:

1. Commercial fisheries management
2. Conservation effort
3. Fisheries management (general)
4. Recreational fisheries management
5. Trade management

2.5.6 Limitations/ bias

In relation to spatial protection, there are other factors, beside level of regulation, which determine the effectiveness of MPAs, which are size and age.⁶⁰⁰ These factors on national claims over marine areas and were not included in this evaluation to avoid bias towards countries that have designated areas within their waters but have less jurisdictional reach/smaller EEZs as other nations. For example, Australia has an EEZ of 8,148,250 km² and established shark sanctuaries for nurse sharks since 2001, after fishing pressure had drastically decimated these sharks.⁶⁰¹ MPAs in Australia have proven successful for shark conservation.⁶⁰² On the other hand, there are smaller⁶⁰² countries like Malta. Malta has a Fisheries Management Zone of 11,980 km² and established the first MPAs in 2008 for specific species listed under the EU Habitats Directive,⁶⁰³ of which some may be relevant for

⁶⁰⁰ Graham J Edgar and others, 'Global Conservation Outcomes Depend on Marine Protected Areas with Five Key Features' (2014) 506 Nature 216 <<http://www.nature.com/articles/nature13022>>.

⁶⁰¹ Lynch and others (n 208).

⁶⁰² Conrad W Speed, Mike Cappo and Mark G Meekan, 'Evidence for Rapid Recovery of Shark Populations within a Coral Reef Marine Protected Area' (2018) 220 Biological Conservation 308 <<https://doi.org/10.1016/j.biocon.2018.01.010>>.

⁶⁰³ Environment & Resources Authority Malta 'Marine Protected Areas' <<https://era.org.mt/>> accessed 09 November 2020

sharks.⁶⁰⁴ Comparing the percentage of MAP coverage, Australia has a total coverage of 40.8 % of their EEZ,⁶⁰⁵ while Malta has about 35 % of their waters under national jurisdiction designated as MPAs,⁶⁰⁶ demonstrating that despite a significant difference in geographical coverage based on km², in % terms they are far more aligned.⁶⁰⁷ Therefore, any assessment of MPAs relative coverage should focus on the area of water under national jurisdiction covered by MPAs relevant for shark conservation in relation to total area of marine waters under national jurisdiction, and level of management, as indicated above, if such information is available. As research has shown, many shark- relevant areas, that could support the conservation and management of these species, remain outside currently designated MPAs.⁶⁰⁸

Other limitations included that trade and marketing within a country were extremely difficult to determine and track as there are no commitments to specifically report on national-scale trading in shark products. However, product trade related to catches and imports did form part of this evaluation.⁶⁰⁹

Furthermore, the long-term effect and suitability of many measures remains to be evaluated and require further research in the field. It should also be noted that this evaluation focused on any measures implemented, but qualitative differences in the application could not be assessed in detail as this would require field studies, noting that not

⁶⁰⁴ Sharklab-Malta, pers. comm.

⁶⁰⁵ Protected Planet <<https://www.protectedplanet.net/>> accessed 1 October 2020

⁶⁰⁶ Environment & Resources Authority Malta, 'Marine Protected Areas', <<https://era.org.mt/>> accessed 09 November 2020

⁶⁰⁷ This is a generic comparison for the application of this assessment strategy. The Mediterranean Sea will be used as a case study to apply it, as demonstrated in Chapters Three to Six.

⁶⁰⁸ Birkmanis and others (n 537).

⁶⁰⁹ Nathaniel Grimes, 'Institutions in the Shark Fin Market: Externalities and Incentives' (2018) 38 Review of Business: Interdisciplinary Journal on Risk and Society 44.

all measures are in fact suitable for all shark species as there are differences in ecology and biology that can render some measures unsuitable for certain species.⁶¹⁰ Further to the selected the indicators, mitigating measures to reduce human-shark conflicts could be considered for countries, where sufficient evidence exists.

2.6 Additional information on biodiversity, the socio-economic context, and challenges

The socio-economic parameters that influence the conservation and economic importance/use of sharks vary between countries. To integrate socio-economic factors and determine differences in responsibility in shark conservation, management, and contribution to existing problems, additional information was collected. It was assumed that countries with a higher shark biodiversity within their jurisdiction have a greater responsibility to protect this group. This is in line with the following consideration that countries fishing larger amounts of sharks have a greater impact on shark populations than countries fishing smaller amounts, and thus in such countries there is a greater need for regulatory measures to ensure sustainability.

The principle of common but differentiated responsibility (CBDR) is one that has been integrated in various MEAs.⁶¹¹ It also formed part of the development of the 2030 Agenda⁶¹² (although application is still lacking).⁶¹³ CBDR not only acknowledges differences between

⁶¹⁰ Michael G Frisk, Thomas J Miller and Michael J Fogarty, 'Estimation and Analysis of Biological Parameters in Elasmobranch Fishes: A Comparative Life History Study' (2001) 58 Canadian Journal of Fisheries and Aquatic Sciences 969 <http://www.nrc.ca/cgi-bin/cisti/journals/rp/rp2_abst_e?cjfas_f01-051_58_ns_nf_cjfas58-01>.

⁶¹¹ Tuula Honkonen, 'The Principle of Common but Differentiated Responsibility in Post-2012 Climate Negotiations' (2009) 18 Review of European Community and International Environmental Law 257.

⁶¹² Jiang Ye, 'The CBDR Principle in the UN 2030 Agenda for Sustainable Development' (2016) 2 China Quarterly of International Strategic Studies 169.

⁶¹³ Pamela S Chasek and others, 'Getting to 2030: Negotiating the Post-2015 Sustainable Development Agenda' (2016) 25 Review of European, Comparative and International Environmental Law 5.

the contribution of countries to an environmental impact,⁶¹⁴ but also their capabilities and capacities to deal with them.⁶¹⁵ Its recognition led to the development of various international initiatives to support countries with capacity needs, mostly developing countries, on the implementation of environment obligations.⁶¹⁶ Nevertheless, the ultimate decision how to approach sustainable development remains at State level.

Although there are no clear guidelines how to apply the CBDR principle, it has two main forms by which it is realised: the allocation of rights and redistribution of resources.⁶¹⁷ Both aspects were incorporated in this assessment's approach through country jurisdictional extent and fisheries reach; and determination of national capacities. The CBDR principle also notes that the degree to which a country contributes/causes a problem differs.⁶¹⁸ With the aim to determine a country's contribution to the problems faced by sharks and to assess its responsibility for shark governance, this assessment integrated information on:

- 1) Shark biodiversity under national jurisdiction;
- 2) Fisheries, trade in shark products, and tourism characteristics. This included any occurrence of (illegal) activities hampering shark conservation and management;
- 3) Marine areas and economic status (in form of countries' Gross Domestic Product (GDP) per capita); and
- 4) Potentially influential factors. Factors influencing governance included are the World Bank's Worldwide Governance Indicators (WGI): government effectiveness, regulatory quality, rule of law, and control of corruption.⁶¹⁹ Such indicators have also been used to determine '(shark) conservation likelihood' in previous studies.⁶²⁰ In addition, the Human Development Index (HDI)⁶²¹ was incorporated into the evaluation to put the overall score into perspective. The

⁶¹⁴ Chasek and others (n 613).

⁶¹⁵ Ye (n 612).

⁶¹⁶ Ye (n 612).

⁶¹⁷ Honkonen (n 611).

⁶¹⁸ Chasek and others (n 613).

⁶¹⁹ Agnew and others (n 191).

⁶²⁰ Davidson and Dulvy (n 41).

⁶²¹ United Nations Development Programme <<http://hdr.undp.org/en/data>> accessed 29 May 2020

HDI is a combination of three indexes: life expectancy, education, and Gross National Income.⁶²² Lower scores represent lower development within a country in these categories. The HDI has been used in two relevant studies related to the likelihood of enforcement within MPAs⁶²³ and of the public to support conservation efforts.⁶²⁴

[2.6.1 National shark biodiversity and conservation responsibility](#)

2.6.1.1 Justification

The responsibility of a country in terms of biodiversity protection, which includes sharks, was determined as means of putting regulatory, research, and conservation efforts into perspective. A country with higher biodiversity is responsible for more species within their jurisdiction and therefore should have more and/or enhanced regulatory measures, which, in turn, requires wider reporting and research to determine policy actions.

2.6.1.2 Definition

‘Species diversity’ can be interpreted in several ways, such as the number of species present, while ‘rarity’, another important concept when assessing conservation potential and a main factor for gaining political attention and action, lacks a clear definition.⁶²⁵ This was overcome by using the IUCN Red List classification, whereby the most threatened categories were considered the rarest (lowest populations). Currently, as mentioned previously, there are over one-thousand confirmed species of sharks. The number of sharks was used as a proxy because data on the population size of each species within national

⁶²² United Nations Development Programme < http://hdr.undp.org/sites/default/files/hdr2019_technical_notes.pdf> accessed 29 May 2020

⁶²³ John J Bohorquez, Anthony Dvarskas and Ellen K Pikitch, ‘Categorizing Global MPAs: A Cluster Analysis Approach’ (2019) 108 *Marine Policy* 103663 <<https://doi.org/10.1016/j.marpol.2019.103663>>.

⁶²⁴ Davidson and Dulvy (n 41).

⁶²⁵ C Margut Es and MB Usher, ‘Criteria Used in Assessing Wildlife Conservation Potential : A Review’ (1981) 50 *Wildlife Conservation*.

waters was not available for the Mediterranean Sea, where national claims are being debated and larger parts remain high seas.⁶²⁶

2.6.1.3 Indicators

In line with a study conducted by Davidson and Dulvy⁶²⁷ two factors were considered for the evaluation of the construct of conservation responsibility: species diversity (number of species recorded in national waters) and conservation status.

2.6.1.4 Data source

To establish consistency across species records, species diversity nationally was based on the IUCN Red List assessment, which confirms presence in national waters. From the same source, species' conservation status was taken. Species data was obtained from the IUCN Red List assessment website.⁶²⁸

2.6.1.5 Limitations/ bias

The bias was that countries with larger marine areas are likely to host a higher number of species and habitats, and thereby have a greater responsibility than countries with smaller marine areas.

⁶²⁶ Katsanevakis and others (n 391).

⁶²⁷ Davidson and Dulvy (n 41).

⁶²⁸ 'IUCN 2020. The IUCN Red List of Threatened Species. <<https://www.iucnredlist.org>> ISSN 2307-8235. © International Union for Conservation of Nature and Natural Resources.'

[2.6.2 Fisheries, markets, and related problems](#)

2.6.2.1 Justification

It is also important to understand how and for how long economic sectors have been established. Commercial fisheries, for example, if deeply rooted culturally and economically, can have a lasting impact on national policies.⁶²⁹ Tourism, on the other hand, can contribute to the economy and put value to sharks being alive rather than dead. This can be a positive driver for conservation policies and measures nationally.⁶³⁰ The selected criteria describe the economic sectors relevant for shark governance on a national scale. Further to general characteristics, it was determined whether unsustainable practices occur nationally. By determining in which way countries contribute to problems, solutions were identified as point of required action.

2.6.2.2 Definition

To assess whether there is a need for regulations and to which extent, it is important to understand how different economic sectors are characterised within a national context. This characterisation includes the extent to which shark fisheries are conducted, how the market is shaped, and if shark-related tourism is relevant to the economy. To characterise the fishing sector, information on fisheries statistics (e.g., landings, fleet size) was collected. In relation to markets and product trade, the analysis encompassed how sharks are marketed and to what extent products are traded (export/ import statistics). It was also determined

⁶²⁹ Thorpe and others (n 128).

⁶³⁰ John Dobson, 'Sharks, Wildlife Tourism, and State Regulation' (2006) 3 *Tourism in Marine Environments* 15.

whether the country has an established shark-related tourist industry (e.g., shark diving and/ or shark watching activities are actively promoted).

The information collected also examined the occurrence of problems on a national level. Problems included were those illegal and unsustainable practices recognised by published work, and as acknowledged in international legal instruments. These can threaten shark populations and hamper effective shark management and conservation. The problems considered are listed below.

2.6.2.3 Indicators

To evaluate if and how a country contributes to unsustainable practices/problems, the following indicators were selected.

Fishing:

- General characteristics of national fisheries and fish product trade, including amount and species fished and traded.
- There was evidence of illegal activities within national waters, for example, national fishing vessels are engaged in illegal fishing practices, such as, finning of sharks if finning is prohibited, or fishing in no-take zones.
- Harmful subsidies are in place that support overfishing and unsustainable fishing practices, hindering conservation management success.⁶³¹
- Recreational fishing is unregulated, causing harm to shark populations in national waters.⁶³²

Markets:

- Mislabelling and masking (consumer deception) of shark products, which results in consumers being unable to make informed choices.

⁶³¹ Robert Arthur and others, 'The Cost of Harmful Fishing Subsidies. IIED Working Paper' (2019) <<https://pubs.iied.org/pdfs/16654IIED.pdf>>.

⁶³² Ben Lamine and others (n 113).

- Evidence of the illegal marketing of protected species.⁶³³

Other considerations:

The capacity to enforce and monitor the implementation of regulatory measures and policies determines the success of management and conservation.⁶³⁴ Both enforcement actions and monitoring controls were incorporated in the assessment's survey questionnaire (Annex 2). Additionally, to assess prosecution for non-compliance as a measure of compliance,⁶³⁵ analysis of the following two components was considered: seizures reported, and prosecutions undertaken. An example, although from outside the region assessed, would be the 'Shark-dragging case' in United States.⁶³⁶

2.6.2.4 Data sources

To determine whether a country contributes to illegal and unsustainable practices, a number of sources were combined, including information gathered through survey questionnaires, publications, and national reports.

Fisheries data

Landing and trade data, as well as information on fishing gear, was sourced from the FAO's database,⁶³⁷ which has been created for the purpose of compiling country data on fisheries.

The database allows access to the data for research purposes. Additionally, published

⁶³³ Fernanda Almerón-Souza and others, 'Molecular Identification of Shark Meat from Local Markets in Southern Brazil Based on DNA Barcoding: Evidence for Mislabeling and Trade of Endangered Species' (2018) 9 *Frontiers in Genetics* <<http://journal.frontiersin.org/article/10.3389/fgene.2018.00138/full>>.

⁶³⁴ Ward-Paige and others (n 183).

⁶³⁵ Friedman and others (n 36).

⁶³⁶ Tampa Bay Times, < <https://www.tampabay.com/news/crime/2019/09/12/last-man-sentenced-in-shark-dragging-case-hell-spend-weekends-in-jail/>>, accessed 30 May 2020

⁶³⁷ 'FAO-GFCM. 2021. Fishery and Aquaculture Statistics. GFCM Capture Production 1970-2019 (FishstatJ). In: FAO Fisheries Division [Online]. Rome. Updated 2021. www.Fao.Org/Fishery/Statistics/Software/Fishstatj/En'.

literature was assessed to complement the data collection, e.g., for information on the tourism sector.⁶³⁸ Data filter parameters were applied, retrieving only the data for the Mediterranean GSAs and countries assessed for both fishery landings and shark product trade.

The shark landings data available was classified based on the available 'Commodity names' (ASFIS species)⁶³⁹ and summarised into the following categories:

1. **Protected species** Includes listed ASFIS species and groups of species as follows: Angelsharks, Basking sharks, Bigeye thresher, Blue skate, Guitarfishes, Hammerhead sharks, Porbeagle shark, Longnose skate, Smalltooth sandtiger, Shortfin mako, Tope shark, White skate, Sandtiger shark.
2. **Catsharks:** includes all catshark specific ASFIS species and species groups (Blackmouth catshark, Catsharks, etc. nei, Catsharks, nursehounds nei, Nursehound, Small-spotted catsharks).
3. **Squalidae (dogfish):** This includes two ASFIS categories, namely Picked dogfish, and Longnose spurdog.
4. **Small deepsea sharks:** This category summarises following ASFIS species: Kitefin shark, Little sleeper shark, Lantern sharks nei, Gulper shark, Velvet belly, Sharpnose sevengill shark.
5. **Rays and skates** category includes FAO groups as follows: Rays, stingrays, mantas nei Eagle rays nei Common eagle ray Common stingray Stingrays nei Stingrays, butterfly rays nei Marbled electric ray Spiny butterfly ray Torpedo rays; Is a summary groups of aggregated categories (Raja rays nei) and species (Rough ray, Mediterranean starry ray, Blonde ray, Speckled ray, Spotted ray, Undulate ray, Thornback ray, Brown ray, Cuckoo ray, rays and skates nei
6. **Charcharinidae...** refers to the group called 'Requiem sharks nei' and Sandbar shark
7. **Smoothhound sharks** is a summary group of the terms: Smooth-hound (Smooth-hounds nei, Starry smooth-hound, Houndsharks, smoothhounds nei, Blackspotted smooth-hound, Sharks undetermined, Sharks, rays, skates, etc. nei

Individual species listed are:

8. Thresher sharks

⁶³⁸ Healy and others (n 524).

⁶³⁹ ASFIS are the FAO's 3-Alpha Species Codes as explained here: <https://www.fao.org/fishery/en/collection/asfis/en>

9. *Prionace glauca*

10. *Hexanchus griseus*

While trade data from the FAO database was re-classified, to reduce the number of categories, as follows:

1. **Prionace glauca:** all blue shark products, including fillets, meat, and uncategorised blue shark parts (fresh, chilled or frozen).
2. **Catsharks** refers to all catshark species products (Catsharks, nursehounds, fresh or chilled or frozen).
3. **Dogfish (Squalidae):** just includes products from dogfish (Squalidae).
4. **Dogfish and other sharks:** All products categories as originating from dogfish and species thrown in summary categories associated with the term dogfish, which includes other species of shark products and includes shark fillets, meat (fresh, chilled, frozen).
5. ***Squalus acanthias* and *Scyliorhinus* spp.:** Included are those categories of products determined to originate from *S. acanthias* and *Scyliorhinus* spp.
6. ***Lamna nasus*** All product assigned to this species of Porbeagle shark (*Lamna nasus*)
7. **Rajidae** Products listed in the aggregated grouping of 'Rays and Skates'
8. **Shark fins: includes** all shark fin products (dried, preserved, smoked, frozen).
9. **Sharks undetermined:** includes products from all remaining, aggregated summary groups of sharks.

2.6.2.5 Limitations/bias

There are multiple linkages between economic sectors integrated in this construct and subsequent industry and trade chains such as fish processing, storage, marketing, and consumption, that were not included due to capacity and resource limitations. Such an in-depth assessment of related and connected industries would require an immense amount of research on national level, as well as complex information sourcing from private companies, which was outside the scope of this assessment. In addition, the actual scale of

relevance could be determined in detail as this would have required a full evaluation of all related and associated economic processes.⁶⁴⁰

Furthermore, it should be noted that FAO reporting does not distinguish whether sharks were sourced from sustainable or non-sustainable fishing practices. There are also qualitative differences in landings data which must be acknowledged. Secondary aspects related to fishing, which are outside the scope of this thesis, included: impacts from fisheries-related debris, such as abandoned fishing nets in which sharks can get entangled;⁶⁴¹ the impact and extent of transshipments,⁶⁴² where fish catches are transferred onto carrier ships at sea; and the extent of fishing vessels fishing under a 'flag of convenience',⁶⁴³ which is the registration of a fishing vessel in a country other than the country of ownership, that usually have lesser, if any, regulations and controls on fishing and thereby offer countries a loophole to increase their unofficial catches, reduce taxes, etc. The overall magnitude of each country's contribution to these problems could be assessed in detail, as this would require individual studies on each aspect of state behaviour and in relation to the overall, global impact. Another limitation faced by this assessment was the dependency on government responses to determine enforcement and monitoring capacities at national level.

⁶⁴⁰ Junning Cai, Hui Huang and PingSun Leung, 'Understanding the Contribution of Aquaculture and Fisheries to Gross Domestic Product (GDP). FAO Fisheries and Aquaculture Technical Paper 606' (2019).

⁶⁴¹ KJ Parton, TS Galloway and BJ Godley, 'Global Review of Shark and Ray Entanglement in Anthropogenic Marine Debris' (2019) 39 *Endangered Species Research* 173 <<https://www.int-res.com/abstracts/esr/v39/p173-190/>>.

⁶⁴² Claire van der Geest, 'Transshipment: Strengthening Tuna RFMO Transshipment Regulations' [2020] *International Seafood Sustainability Foundation* 1 <<https://iss-foundation.org/download-monitor-demo/download-info/issf-2020-03-transshipment-strengthening-tuna-rfmo-transshipment-regulations/>>.

⁶⁴³ Jessica H Ford and Chris Wilcox, 'Shedding Light on the Dark Side of Maritime Trade – A New Approach for Identifying Countries as Flags of Convenience' (2019) 99 *Marine Policy* 298 <<https://doi.org/10.1016/j.marpol.2018.10.026>>.

2.6.3 Other relevant information

To support a more holistic picture on the national socio-economic and governance related factors, additional data was retrieved from third party sources, as follows.

Marine/terrestrial area:

The area sizes for each country were obtained from the same source, an open access database created by the UN World Conservation Monitoring Centre (WCMC) and the IUCN.⁶⁴⁴ This database allows access to and use of the data, including further publication, if the source is acknowledged.

GDP per capita (in US Dollar):

The GDP for each country was sourced from the data catalogue of the World Bank.⁶⁴⁵ This data can be used under a Creative Commons Attribution 4.0 International License.

Government indicators:

These indicators include government effectiveness, regulatory quality, rule of law, and control of corruption; and were sourced from the public database of the World Bank.⁶⁴⁶ The so called 'World Governance Indicators' are a combination of over 30 data sources.⁶⁴⁷ The most recent indicators, as available for the time of data collection, were used (2019). For

⁶⁴⁴ 'UNEP-WCMC and IUCN (2021), Protected Planet: [The World Database on Protected Areas (WDPA)] [On-Line], [December/2021], Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.Protectedplanet.Net.' (2021).

⁶⁴⁵ 'World Bank National Accounts Data, and OECD National Accounts Data Files.' <<https://datacatalog.worldbank.org/>> accessed 20 September 2021.

⁶⁴⁶ Daniel Kaufmann and Aart Kraay, 'Worldwide Governance Indicators' <<https://info.worldbank.org/governance/wgi/>> accessed 28 May 2020

⁶⁴⁷ Kaufmann and Kraay (n 646)

government indicators the range is approximately -2.5 (weak) to 2.5 (strong) governance performance. This data set is licensed under Creative Commons Attribution 4.0.

2.7 Data analysis

The data collected for the evaluation of each construct represents a small sample size of 22 countries. This limited the available, applicable statistical tests and reduced the opportunities to make wider assumptions about the results and statistical significance of the analysis. However, it did allow to determine the *status quo* in individual countries and for comparisons between them. The results are thus primarily presented in form of summary statistics offering an overview of the data. The data collected was a mixture of qualitative (ordinal and nominal) and quantitative data (ratios and intervals). The data sets analysed did not fulfil the criteria of normal distribution, which required the application of non-parametric statistical test for the analysis of relationships between two or more variables. For results, the significance level threshold was set at a 95 percent confidence interval ($p < 0.05$), meaning there is less than a five percent probability that the results are due to chance. The choice of statistical test was dependent on the data.⁶⁴⁸ All data analysis was conducted with IBM SPSS statistics programme.⁶⁴⁹

There are four basic statistical tests that were applied to the data sets generated.⁶⁵⁰ These were either applied to determine a relationship between variables (Chi-square and

⁶⁴⁸ The term 'significant' through this work refers to statistical significance.

⁶⁴⁹ Version 25

⁶⁵⁰ For more information on these standard statistical, see: Feinstein CH and Thomas M, Making History Count: A Primer in Quantitative Methods for Historians (Cambridge University Press 2002)

Spearman correlation test) or a difference (in mean) between two or more independent groups (Mann-Whitney U and Kruskal Wallis test). The applied tests are defined as follows:

- **Chi-square test/ Fisher's exact test** compares two nominal variables (categories) and determines whether the difference between the two can be attributed to a relationship between the variables based on what was expected from the data (e.g., that there is no difference between categories). Fisher's Exact Test is applied when at least one cell of a 2x2 table has less than five observations, which is often the case in small sample sizes (i.e., below 20).
- The **Mann-Whitney U test** is a non-parametric test that compares means between two independent groups and computes p-values against the null hypothesis that distribution is equal. The test ranks all values before computing a p-value that is dependent on the discrepancy between mean ranks of the two groups. This test was applied as it also accounts for ties (same values) within data sets, which was relevant to this assessment.
- The **Kruskal Wallis test** is a non-parametric test to determine whether samples display the same distribution. It is applied to compare three or more independent groups of samples of equal or different sample sizes.
- The **Spearman correlation test** is the non-parametric alternative to a Pearson correlation test (for normally distributed data).⁶⁵¹ Both aim to determine whether there is a correlation between two variables and which direction this relationship takes. The variables must be at least at ordinal level for the test to be applicable and it is assumed that the relation is monotonic (only goes in one direction). The result of the Spearman correlation test will indicate the strength of this relationship. Moderate correlation is assumed with correlation coefficient (R) above 0.4. Below this value there is a low or no correlation between variables. High or strong correlation is set to start above an R-value of 0.6.

Results of the data analysis were partly displayed in graphs using a logarithmic scale (log scale), because a logarithmic scale can display numerical data over a wide range of values in a compact graph. This scale is typically used when the highest values are a hundred (or even a thousand) times larger than the smallest value in the data set. The log scale reduces the

⁶⁵¹ Standard test to determine if variable display a correlation/ relationship but can only be applied to normally distributed data sets.

space between these values over an equally spaced increase, i.e., by multiplication by the factor 10 from one to another (from 10 to 100 to 1000, and so on).

2.7.1 Data standardisation

Data standardisation was applied to reduce the effect of an underlying bias between the countries. For the purpose of this analysis, the assessed constructs and related factors were standardised as follows:

Political commitment (PC):

$$\text{Standardised PC} = (\text{Total number of relevant legal instruments signed by a country} / \text{Total number of relevant legal instruments})$$

Shark fishing relevance/commercial impact:

The average landings in tonnes (t) of the past ten years were used for analysis:

$$\text{Economic relevance} = (\text{Elasmobranchs landed (t)} / \text{Total Landings (t)})$$

For the purpose of data standardisation, Bosnia and Herzegovina and Monaco, which did not report shark landings and have negligible fisheries, were set at zero. An overview of trends and changes in shark landings across the Mediterranean can be found in Annex 1, Figure 1.

Relative area (standardised area) for each country was calculated as follows:

$$\text{Relative area} = (\text{Marine area (km}^2\text{)} / \text{Land area (km}^2\text{)})$$

The data for terrestrial and marine area was sourced from the same data source, as per below. There was however no area size for Palestine's marine area (Gaza Strip), which was set at zero. The UNEP-WCMC database provides a global data set based upon which national territorial spatial dimensions are based, which might have led to slight differences in

numbers used at national level but follows an aligned approach combining EEZ data and the countries terrestrial boundaries.⁶⁵²

Research output/effort:

Research output in the form of the number of publications a country was involved in, was standardised by GDP, as GDP indicates economic strength and reflects the availability of financial resources for research at national level.⁶⁵³ The average GDP of the past 20 years (2000-2019) was used, as this is the most consistent data available (i.e., without gaps).

$$\text{Standardised Publication Effort} = (\text{Number of publications} / \text{Average GDP (2000-2019)}) \times 1000$$

Implementation effort:

GDP can also reflect the conservation potential of a country to act;⁶⁵⁴ therefore, implementation effort was standardised as follows:

$$\text{Standardised Implementation Effort} = (\text{Number of measures} / \text{Average GDP (past 20 years)}) \times 1000$$

However, there was a noteworthy limitation to this standardisation as, based on the evidence,⁶⁵⁵ most measures implemented by NGOs received financial support from outside sources.⁶⁵⁶

Based on the assessment strategy presented in this chapter, which was designed to be used for any given country, the following chapters assess the three constructs on a case study basis for coastal Mediterranean countries, beginning with their political commitment.

⁶⁵² Thomas M Brooks and others, 'Analysing Biodiversity and Conservation Knowledge Products to Support Regional Environmental Assessments' (2016) 3 Scientific Data 160007 <<http://www.nature.com/articles/sdata20167>>.

⁶⁵³ Zaman and others (n 521).

⁶⁵⁴ Davidson and Dulvy (n 41).

⁶⁵⁵ Answers received by NGOs through the survey questionnaire.

⁶⁵⁶ Response to the survey questionnaire and the web-based research indicated outside funding sources, such as from philanthropic foundations.

Chapter Three: National Political Commitment

One fundamental consideration when assessing national progress towards shark conservation is political commitment and with it the obligations that States are bound by under legal instruments. As stipulated in the theoretical policy cycle for sharks, political commitment guides a nation's duty to act and underpins development of national policies.⁶⁵⁷

Political commitment (PC) was determined based on signature and ratification, accession, or succession of a legal instrument, as well as commitment to voluntary measures, such as action plans.⁶⁵⁸ The central questions of this assessment relating to PC, were:

1. Is there a difference in PC between countries?
2. Is there a relationship between PC and country-specific factors?⁶⁵⁹
3. What policy developments are in place nationally?
4. What are the related obligations and commitments of a country in relation to the legal instruments it signed up to?

The chapter introduces the PC of Mediterranean countries, followed by national and regional policy developments. The third section of this chapter provides an insight into the legal obligations and policy commitments resulting from national PC, with specific examples. The latter were further assessed in relation to their implementation in Chapter Five. At the end of this Chapter, a critical view on the PC of assessed countries and commitments is presented.

⁶⁵⁷ Agenda setting and policy formulation stage.

⁶⁵⁸ Details for the assessment of PC are described in Chapter 2, Section 2.3.

⁶⁵⁹ These factors are described in Chapter Two, Section 2.6. For the purpose of assessing PC, marine area, fisheries, GDP, government effectiveness, and regulatory quality were considered.

3.1 General progress and potential influencing factors

This section addresses the first two research questions. While the determination of PC is a challenge in relation to sharks since there is no global agreement or convention that specifically concerns this species group, there are those instruments included in this evaluation that were considered as relevant to the conservation and management of sharks. As laid out in the assessment strategy (Chapter Two), these are those legal frameworks aiming to preserve and protect the marine environment, and those that relate to the management and sustainability of fishing. The only shark-specific commitments are species action plans and the CMS Shark MoU. The inclusion of action plans for this analysis was based on evidence reported at the recent Focal Point meeting of RAC/SPA on the implementation of the SPA/BD Protocol.⁶⁶⁰

A summary of the commitments made by countries over time provides some insight in the progress made. In terms of commitment to conservation, all the Mediterranean countries have signed and ratified the CBD.⁶⁶¹ Ratification was completed by the majority of countries in the early or late 1990s. Bosnia and Herzegovina, Malta, Libya, and Montenegro ratified the Convention between 2000 and 2006, and Palestine did so in 2015. Provisions under both the CMS and CITES apply to all Mediterranean countries, with the exception of Palestine. Ratification of those two conventions did progress equally across countries over time, with Bosnia and Herzegovina and Lebanon ratifying the CMS most recently in 2017 and 2019 respectively. In relation to CITES, Bosnia and Herzegovina ratified it in 2009, and Lebanon in

⁶⁶⁰ Regional Activity Centre for Specially Protected Areas (SPA/RAC), 'Fourteenth Meeting of SPA/BD Thematic Focal Points. Portorož, Slovenia, 18-21 June 2019. UNEP/MED WG.461/7. Agenda Item 5: Conservation of Species and Habitats.', vol 1 (2019).

⁶⁶¹ Convention on Biological Diversity (n 314).

2013, again being the most recent States to do so. Although the EU signed the CMS Shark MoU, individual EU countries have not committed equally to this non-legally binding instrument. Italy and Monaco were the first to sign the MoU in 2011, followed by non-EU countries in the Mediterranean, namely Syria, Egypt, and Libya, which signed it in 2014. The Barcelona Convention was signed and ratified by 21 of the 22 countries (excluding Palestine), with the latest ratification by Montenegro in 2007. The SPA/BD Protocol was signed by all the assessed countries except for Bosnia and Herzegovina, Greece,⁶⁶² Israel, Lebanon, and Libya. In relation to sustainable resource use and fisheries management, commitment also differs. Not all the Mediterranean coastal States are party to the LOSC,⁶⁶³ and only a few signed the UNFSA.⁶⁶⁴ However, apart from Palestine, all countries are a Contracting Party to the GFCM.⁶⁶⁵ A detailed overview of States' commitments by year can be found in Annex 1, Table 3.

To assess the difference in commitment quantitatively and answer the first two research questions above, standardised PC was determined as indicated in Section 2.7.1. A statistical evaluation of commitments can demonstrate whether differences between countries are by chance (not statistically significant), or if other factors may have an influence. Some of these factors were tested against standardised PC. For the purpose of this analysis, action plans were summarised under one variable, so as to not disadvantage countries that may not have developed a national plan of action, but which are implementing the regional action

⁶⁶² However, the EU signed the Protocol, thereby it was considered for Greece, as explained in Section 3.3.

⁶⁶³ Israel, Libya, Syria, and Turkey are not a Party to the LOSC.

⁶⁶⁴ Parties to the UNFSA, as described in Chapter One, are Croatia, Cyprus, France, Greece, Italy, Malta, Monaco, Morocco, Slovenia, and Spain.

⁶⁶⁵ With Bosnia and Herzegovina being a Cooperating Party.

plan; and additionally, to reflect that a national scale action plan may be neither appropriate nor necessary given the number of shark species present and size of marine space governed.

The comparison excluded two commitments that only apply to some Mediterranean countries, namely the Bern Convention and ICCAT. This was because there was no added value to the overall commitment ratio, which remained unchanged integrating those instruments. Both instruments are however relevant and were considered in the implementation effort (Chapter Five). Applicable commitments and the standardised PC are summarised Table 1 below.

Table 1. Political commitment (PC) by country.

Country/ Commitment	CITES	CMS	CMS MoU	CBD	Barcelona Convention	SPA/ BD Protocol	Action Plan	LOSC	UNFSA	Compliance Agreement	GFCM	PSMA	TOTAL	Standardised PC
Albania*	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	10	83.33
Algeria	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	8	66.67
Bosnia and Herzegovina	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	No	Yes	No	7	58.33
Croatia*	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	9	75
Cyprus*	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	10	83.33
Egypt	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	9	75
France*	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	11	91.67
Greece*	Yes	Yes	No	Yes	Yes	(Yes)**	No	Yes	Yes	Yes	Yes	Yes	9	83.33
Israel	Yes	Yes	No	Yes	Yes	No	No	No	No	No	Yes	No	5	41.67
Italy*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	12	100
Lebanon	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	No	Yes	No	7	58.33
Libya	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	7	58.33
Malta*	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11	91.67
Monaco	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	10	83.33
Montenegro*	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	9	75
Morocco	Yes	Yes	No	Yes	Yes	Yes	(Yes)	Yes	Yes	Yes	Yes	No	10	83.33
Palestine	No	No	No	Yes	No	No	No	Yes	No	No	No	No	2	16.67
Slovenia*	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	10	83.33
Spain*	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	10	83.33
Syria	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No	8	66.67
Tunisia	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	No	Yes	No	7	58.33
Turkey*	Yes	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	7	58.33
TOTAL	21	20	6	22	21	16	10	18	10	11	21	12		

**EU MS; (EU Candidates: Albania, Montenegro, Turkey); ** as part of the EU*

Table 1 shows individual differences; however, these were not statistically significant, meaning that differences in standardised PC do not depend on the country itself, but may have been influenced by other factors. In addition, many countries displayed similar ratios of standardised PC. To test whether EU membership influenced PC, a Mann-Whitney U test was applied, which determined that the difference in average commitments of EU and non-EU countries was statistically significant. The test result indicated significant differences both comparing EU MS and candidates against non-EU countries ($p = .003$), and an even stronger statistical significance when comparing EU MS (only) and non-EU MS ($p = .001$). This means that EU MS showed higher values in PC than non-EU MS, which cannot be attributed to chance. EU MS displayed an average standardised PC of 86.46 % (Median = 83.33, Standard deviation = 7.63), demonstrating that EU MS committed to most of the relevant legal instruments. Non-EU countries, on the other hand, had an average standardised PC of 63.10 % (Median = 59.39, Standard deviation = 18.11), which was significantly lower. This difference was less pronounced if Palestine, a country with limited Statehood,⁶⁶⁶ was excluded from the comparison, as the average of non-EU countries increased to 66.67 % (Standard deviation = 12.73).⁶⁶⁷ This concludes the answer to the first research question, as there was a significant difference between EU and non-EU countries in relation to the defined values of PC, with EU countries having higher values than non-EU countries.

The assessment of PC further analysed whether PC could be influenced by other underlying factors, including the size of the marine area governed, and the potential influence of

⁶⁶⁶ Jure Vidmar, 'Palestine and the Conceptual Problem of Implicit Statehood' (2013) 12 Chinese Journal of International Law 19 <<https://academic.oup.com/chinesejil/article-lookup/doi/10.1093/chinesejil/jmt011>>.

⁶⁶⁷ The Standard deviation shows the variability/ range of the countries assessed, meaning that for example for EU MS, individual countries could be either 8.63% less or more committed compared to the EU average.

commercial exploitation of sharks.⁶⁶⁸ Under the assumption that political commitment to marine focused legal conventions may depend on the marine area of a country, the relative area was compared to the overall PC (standardised ratio). Although the data did not fulfil the assumptions required to conduct a statistical evaluation, the scatterplot of PC against relative area shows that there is no straight relationship/correlation between the two variables (Figure 5). The distance between the dots, scattered across the graph, indicates that marine area size did not influence States' commitment to relevant international instruments, as there seems to be no increase or decrease of PC with increasing standardised marine area size. However, the data points, which represent the different Mediterranean countries, seem to be clustering together, with most countries of medium relative area having high political commitment. The outliers to the left side of the graph with small areas are Palestine with literally no marine area; Bosnia and Herzegovina, which despite a small marine area has signed many of the relevant political commitments; and Slovenia with a slightly larger area, although still small, and high commitment. On the right-hand side, the outliers are Malta and Monaco with very large marine areas in relation to their land area and high PC. A similar graph was obtained when plotting the actual size of the marine area against political commitment, also indicating no relationship between the two variables. This means, that PC and marine area governed appear unrelated.

⁶⁶⁸ Data on marine areas and commercial impact was sourced as indicated in Chapter Two, Section 2.6.

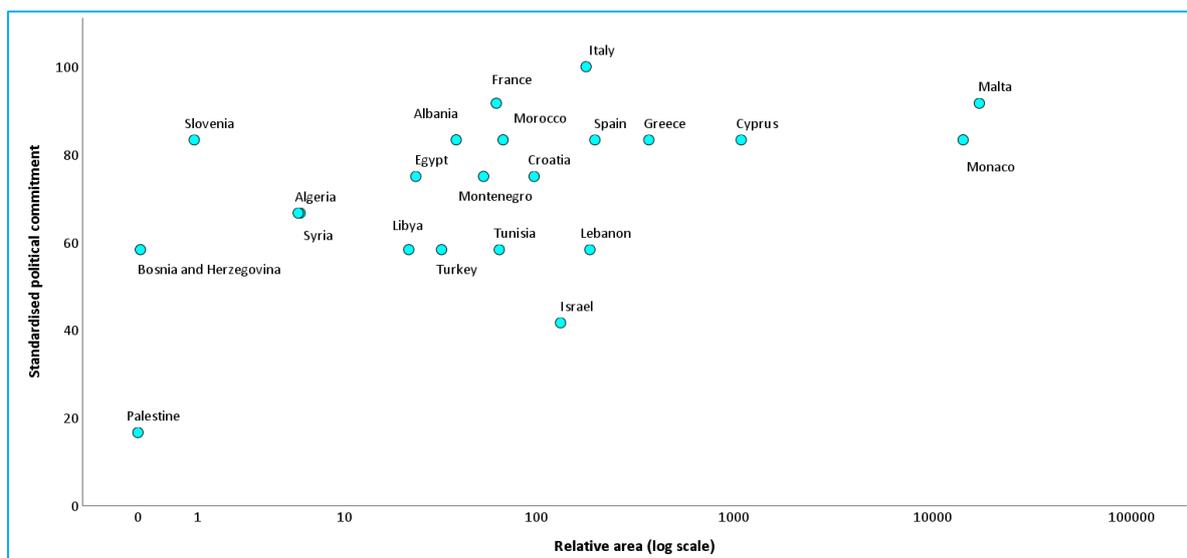


Figure 5. Standardised political commitment and relative marine area by country.⁶⁶⁹

Another potential factor assessed was whether commercial fishing, in relation to sharks landed, has had an influence on the PC of countries. Standardised landings data was mapped against standardised PC. In conducting this mapping exercise, Monaco and Bosnia and Herzegovina were set at zero for landings - this was based on the fact that whilst they do report very low fishery landings, neither report shark landings.⁶⁷⁰ The data did not comply with the assumptions required to conduct a correlation test. However, a scatterplot was mapped, which indicates that there is no relationship between standardised PC and standardised shark landings, meaning that any potential commercial interest in sharks does not relate to whether a country signs up for marine conservation and fisheries management (Figure 6). Nevertheless, it seems that data points do cluster together, showing countries with similar amounts of sharks landed having a similar PC. The outliers within this data set were Palestine with low shark landings and low commitment, and Libya, which reports relatively high landings but has relatively low PC.

⁶⁶⁹ The values for Algeria and Syria overlap (one dot).

⁶⁷⁰ Food and Agriculture Organisation of the United Nations (n 56).

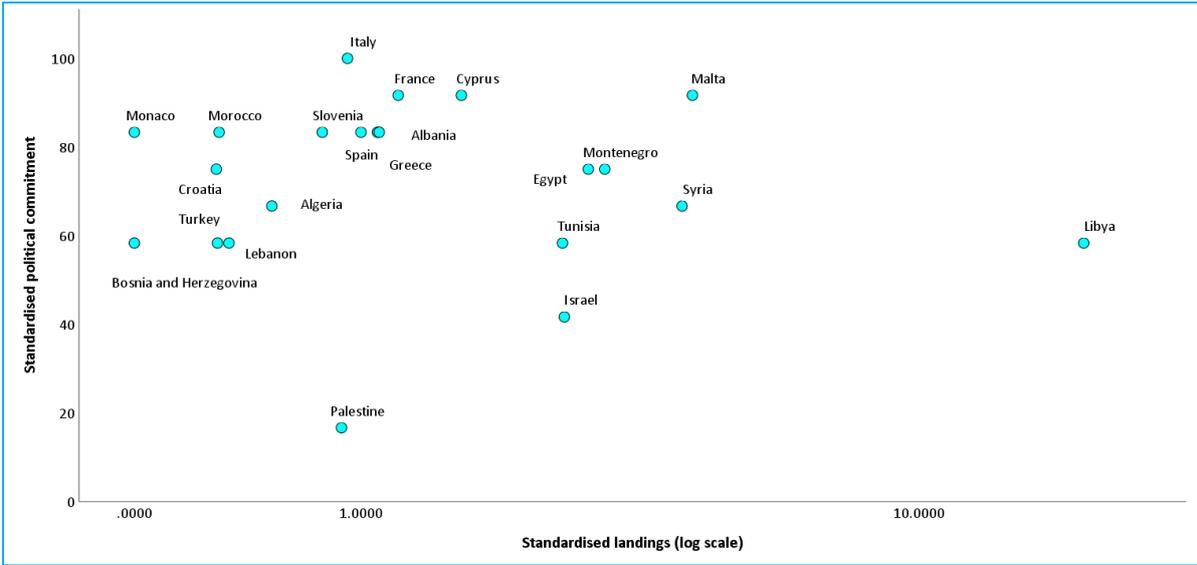


Figure 6. Scatterplot of average standardise landings against standardised political commitment.

To assess the influence of regulatory factors, both regulatory quality and government effectiveness were tested against standardised PC.⁶⁷¹ A Spearman correlation test revealed a moderately strong positive relationship between the PC of a country and government effectiveness ($r(20)=0.529$, $p= .017$), which indicates that higher values in government effectiveness correlate with higher PC (Figure 7). According to the graph, France has the highest government effectiveness score and high PC.

⁶⁷¹ As explained under Section 2.6

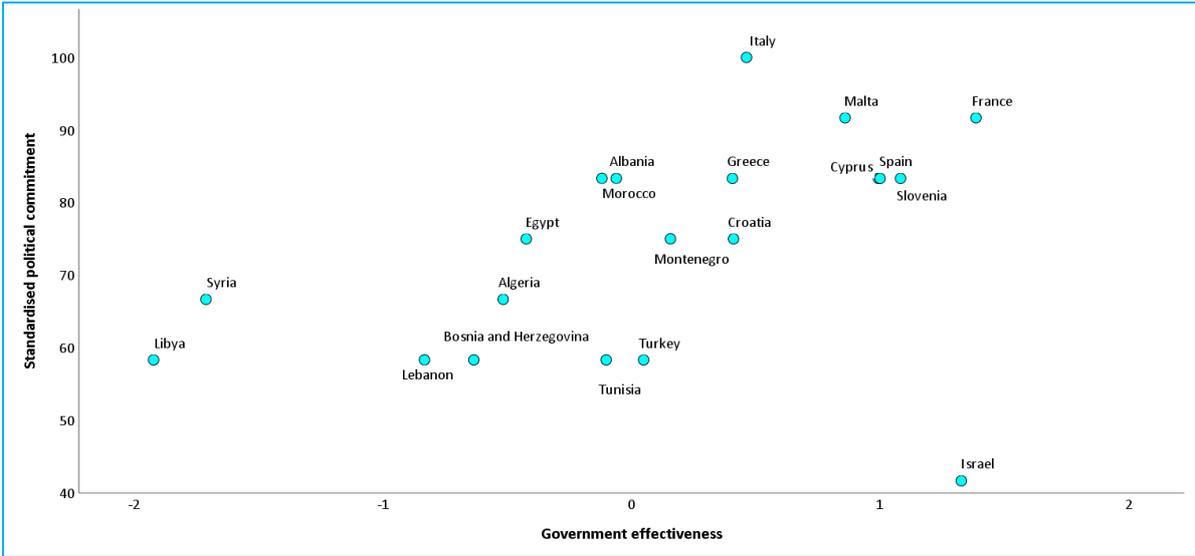


Figure 7. Scatterplot mapping government effectiveness scores against standardised political commitment.

A similar result was obtained testing the relationship between regulatory quality and standardised PC ($r(20)=0.516$, $p= .020$), showing that with increased values for regulatory quality, PC also seemed to increase (Figure 8). Interestingly the graph shows that in terms of regulatory quality, EU countries are more similar (closer together) compared to values for government effectiveness.

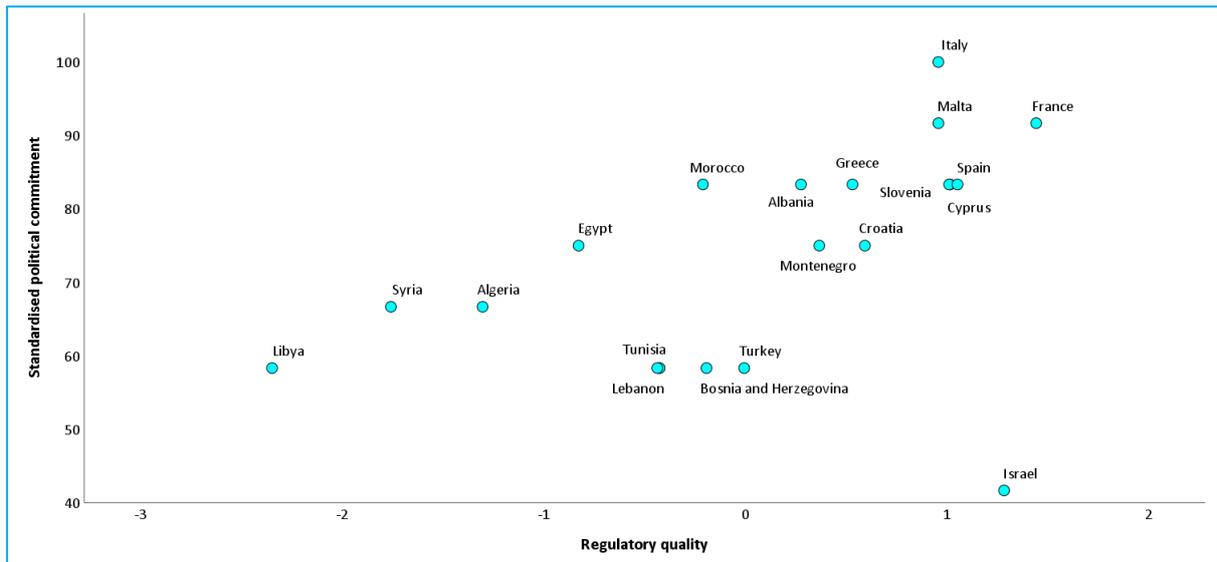


Figure 8. Scatterplot mapping regulatory quality against standardised political commitment.⁶⁷²

A slightly less pronounced relationship was indicated through a Spearman correlation test between the countries' GDP⁶⁷³ and their standardised PC ($r(20)=0.479$, $p= .024$), which still showed a statistically significant correlation; however, the correlation coefficient (0.479) indicated that relationship is moderate, meaning the increase in PC with higher GDP is weaker than the relationships to the government indicators identified above.

This concludes the answer to the second research question. While marine area size and commercial shark landings have had no effect on a country's PC, socio-economic parameters, including government effectiveness, regulatory quality, and, to a lesser extent, GDP showed a positive relationship with PC, meaning the higher these values, the more committed a country appeared to be to marine conservation and fisheries management. Whether such commitment was also reflected in ongoing policy developments nationally, is assessed in the next section.

⁶⁷² Tunisia and Lebanon overlap (one dot).

⁶⁷³ Average of the past 20 years as a proxy for wealth and economic strength as defined in Chapter Two, Section 2.7.

3.1.1 Policy developments

Policy developments, as defined in Chapter Two (Section 2.3), are strategic policy documents (e.g., action plans) relevant to the stage of policy formulation and initial implementation. This means that both adopted and implemented policies and those that were indicated as being developed were included in this analysis. Although there is an EU action plan for sharks,⁶⁷⁴ there is no compliance mechanism *per se* that monitors progress on its implementation. Therefore, the assessment focused on the regional action plan, established under the SPA/BD Protocol, for which the RAC/SPA organises Focal Point meetings every two years and asks Parties to the Barcelona Convention to report on implementation progress, with the most recent meeting in 2019.⁶⁷⁵ Based on national reporting on the implementation of the SPA/BD Protocol, nine Mediterranean countries have started to implement the regional action plan namely Albania, Algeria, Bosnia and Herzegovina, Italy, Lebanon, Malta, Monaco Montenegro, and Turkey. This is noting that Lebanon and Bosnia and Herzegovina have not actually signed the SPA/BD Protocol.⁶⁷⁶ Furthermore, in the national reports for this Focal Point meeting, Algeria, Egypt, Turkey, and Italy indicated that they were in the process of developing a national plan of action for sharks. Italy is an interesting case, as there were multiple prior attempts to adopt such a plan in 2007 and 2011, as reported under the EU's report under the CMS Shark MoU.⁶⁷⁷

⁶⁷⁴ European Commission, 'European Community Action Plan for the Conservation and Management of Sharks' (n 407).

⁶⁷⁵ Regional Activity Centre for Specially Protected Areas (SPA/RAC) (n 660).

⁶⁷⁶ Actual implementation status of actions stipulated in the regional action plan was assessed in Chapter Five.

⁶⁷⁷ European Commission Directorate-General for Maritime Affairs and Fisheries, 'CMS/Sharks/MOS3/National Report EU/Rev.3' (2018).

In Turkey, Bayram Öztürk published a national plan of action for sharks in 2018, defining six objectives,⁶⁷⁸ and proposing priority actions.⁶⁷⁹ Highest priority was given to actions increasing the sustainability of national fishing, understanding shark bycatch, and working with the respective regulatory entity to define specific monitoring programmes. Besides improving fisheries data collection, a priority highlighted in this publication was the identification of critical habitats. These efforts are in line with the ambitions of the regional action plan, as updated in 2020.⁶⁸⁰ Other countries approached a national plan for sharks as follows.

In 2016, Morocco reported the development of a management plan for pelagic and benthic shark species, through the SAC meetings of the GFCM.⁶⁸¹ Currently, Morocco has a national plan for shark fishing in place,⁶⁸² which was listed under ‘action plans’, as it contains multiple management measures for sharks, including the prohibition of target fisheries for pelagic and benthic sharks, improved reporting at species level, and the prohibition of finning.⁶⁸³

National reports by Spain indicated two policy developments, one in 2017 and one in 2019.

In its report to the CMS Secretariat in 2017, Spain stated the development of a national

⁶⁷⁸ These objectives entail improved fisheries management through the reduction of bycatch and improved data collection, also considered were the understanding of the conservation status of species nationally, expanding research on sharks, identification of critical habitat, and enhancing public awareness.

⁶⁷⁹ Bayram Öztürk, ‘National Action Plan for the Conservation of Cartilaginous Fishes in the Turkish Water of the Eastern Mediterranean Sea’ (2018) 24 *Journal of the Black Sea / Mediterranean Environment* 91.

⁶⁸⁰ RAC/SPA (n 448).

⁶⁸¹ GFCM, ‘Report of the Eighteenth Session of the Scientific Advisory Committee on Fisheries, Nicosia, Cyprus, 21–23 March 2016’ (2016).

⁶⁸² ‘Ministère de l’Agriculture, de La Pêche Maritime, Du Développement Rural et Des Eaux et Forêts, Département de La Pêche Maritime’ <<http://www.mpm.gov.ma/>> accessed 20 August 2020.

⁶⁸³ GFCM, ‘Report of the Eighteenth Session of the Scientific Advisory Committee on Fisheries, Nicosia, Cyprus, 21–23 March 2016’ (n 681).

strategy for the reduction of bycatch of vulnerable species, including sharks.⁶⁸⁴ In its sixth national report under the CBD, Spain also noted the intention to establish a recovery plan for sharks.⁶⁸⁵

One example of a regional collaboration for policy development, based upon which a regional action plan for angel sharks was developed, is the Angel Shark Project.⁶⁸⁶ This action plan was the result of the joint efforts between the partners of the Angel Shark Conservation Network (ASCN),⁶⁸⁷ led by the Shark Trust, which is a Cooperating Partner to the CMS Sharks MoU. At the 12th meeting of the CMS CoP, Concerted Actions, which is a process under the CMS to identify priority actions for highly threatened species, for angelsharks (*Squatina* spp.) were adopted. These actions were based on a previously developed strategy for the conservation of these species⁶⁸⁸ across their range.⁶⁸⁹ At the 13th CoP in 2020, the Shark Trust submitted a report on the implementation progress for Concerted Actions for angelsharks,⁶⁹⁰ reporting the development of a regional action plan for the Mediterranean Sea, which was published in 2019.⁶⁹¹ Through this regional action plan, the Shark Trust, in cooperation with the CMS Secretariat, seeks government support for the adoption of actions.⁶⁹² The intention is to develop subregional plans to be presented to and adopted by national governments,⁶⁹³ which was integrated in the updated Concerted

⁶⁸⁴ Ministerio de Agricultura y Pesca Alimentación y Medio Ambiente, '2017 CMS National Report Spain' (2017).

⁶⁸⁵ CBD, 'Spain. 6th National Report for the Convention on Biological Diversity.' (2019).

⁶⁸⁶ CA Gordon and others, 'Mediterranean Angel Sharks : Regional Action Plan' (2019).

⁶⁸⁷ More information can be found under: <https://angelsharknetwork.com/>

⁶⁸⁸ sawback angelshark (*Squatina aculeata*) smoothback angelshark (*Squatina oculata*), common angelshark (*Squatina squatina*)

⁶⁸⁹ Convention on Migratory Species, 'CONCERTED ACTION FOR THE ANGELSHARK (*Squatina squatina*) Adopted by the Conference of the Parties at Its 12th Meeting (Manila, October 2017)' (2017)

<https://www.cms.int/sites/default/files/document/cms_cop12_ca.12.5_angelshark_e.pdf>.

⁶⁹⁰ Common angel shark, (*Squatina squatina*)

⁶⁹¹ Gordon and others (n 686).

⁶⁹² Gordon and others (n 686).

⁶⁹³ Gordon and others (n 686).

Actions following the conclusion of the 13th CMS CoP.⁶⁹⁴ The CMS Secretariat also stipulated the submission of the regional action plan developed by the ASCN to the next CoP in 2022, to be formally adopted under the CMS.⁶⁹⁵ A sub-regional plan specifically for Greece in GSA 22/23 was created in 2020, assigning implementation responsibilities to NGOs, the government, and the fishing industry.⁶⁹⁶

The above answers the third research question in relation to ongoing processes related to improve and create new policies for sharks in the Mediterranean. In the context of agenda setting, it is of note that Albania and Lebanon did state that shark conservation was not considered a priority at national level, with Lebanon referring to MPAs taking priority and Albania indicating that “Marine conversation is still in the initial phases” (survey response).

Policy developments that are part of wider conservation projects were covered within the construct of implementation effort. For example, in terms of policy integration at EU level within the national PoMs under the MSFD, sharks were considered by Croatia, Greece, Italy, Slovenia, and Malta.⁶⁹⁷ The actual progress in terms of adopting and implementing such policies, was further investigated in Chapter Five. The following section takes a closer look into existing obligations.

⁶⁹⁴ CMS, ‘Concerted Action for the Angelshark (*Squatina Squatina*). Adopted by the Conference of the Parties at Its 13th Meeting (Gandhinagar, February 2020). UNEP/CMS/Concerted Action 12.5 (Rev.COP13)’ (2020) <https://www.cms.int/sites/default/files/document/cms_cop13_ca.12.5_rev.cop13_e.pdf>.

⁶⁹⁵ CMS (n 694).

⁶⁹⁶ CA Gordon and others, ‘Mediterranean Angel Sharks: SubRegional Action Plan (SubRAP) GSAs 22/23 (Aegean Sea and Crete)’ (2020).

⁶⁹⁷ The details of each countries’ national monitoring programme were assessed in Chapter Five under Section 5.2.3.2.

3.2 Legal obligations and commitments

To demonstrate what countries have actually committed to in terms of legal obligations and policy actions, this chapter introduces applicable provisions and their relevance to shark governance. As illustrated in Chapter Two, there are generic obligations, such as the duty of States to safeguard the marine environment under Article 192 of the LOSC:

“States have the obligation to protect and preserve the marine environment”.⁶⁹⁸

But there are more detailed duties and voluntary commitments on how to do so. Based on the review of shark-related and -relevant legal obligations under international and regional instruments, these were divided into ten foci.⁶⁹⁹ These foci are: cooperation, capacity building; education and awareness; research; monitoring; reporting; policy development and integration; conservation measures; sustainable management; and regulation.⁷⁰⁰ These foci summarise legal obligations and commitments in broader categories than described in Chapter Two, to reflect the wider legal framework.

Consideration was primarily given to those instruments that apply to the majority of the Mediterranean countries, namely the CBD, which provided the basis for biodiversity protection and was transferred into regional instruments, such as the Barcelona Convention (as amended in 1995), CITES, and, in relation to fisheries management, the GFCM.

Furthermore, special attention was given to obligations under EU law, to demonstrate additional commitments for EU MS. A detailed overview of relevant obligations and commitments under applicable legal instruments, both legally binding and non-binding, is

⁶⁹⁸ United Nations Convention on the Law of the Sea (n 8).

⁶⁹⁹ Koehler and Lowther (n 80).

⁷⁰⁰ In order from generic obligations to defined law (regulations)

provided in Annex 1, Table 4. Applicable species listings for Mediterranean sharks are summarised in Annex 1, Table 5.

3.2.1 Cooperation

Cooperation is essential in achieving global and regional targets.⁷⁰¹ In the context of shark governance, cooperation entails joint efforts among countries, actors involved, and institutions across different levels. Such collaboration and cooperation can reach across multiple obligations in relation to education, capacity building, conservation measures, and fisheries management, as demonstrated in Annex 1, Table 4. The CMS goes beyond the duty to cooperate on measures and obliges Ranges States to establish bi- or multilateral agreements to protect migratory species (Article IV).⁷⁰²

International cooperation for conservation and the sustainable use of nature is a duty incorporated in multiple instruments. An example is the CBD's Article 5, which stipulates that:

“Each Contracting Party shall, as far as possible and as appropriate, cooperate with other Contracting Parties, directly or, where appropriate, through competent international organizations, in respect of areas beyond national jurisdiction and on other matters of mutual interest, for the conservation and sustainable use of biological diversity”.⁷⁰³

While this provision does not create a direct obligation, it extends cooperation efforts into areas of high sea, which is particularly relevant to the Mediterranean, as demonstrated in Chapter One, Section 1.2.4.1. This provision is mirrored in the Barcelona Convention under

⁷⁰¹ Grazia Borrini-Feyerabend and Rosemary Hill, 'Governance for the Conservation of Nature. in G. L. Worboys, M. Lockwood, A. Kothari, S. Feary and I. Pulsford (Eds)', *Protected Area Governance and Management* (ANU Press, Canberra 2015).

⁷⁰² Convention on the Conservation of Migratory Species of Wild Animals (n 10).

⁷⁰³ Convention on Biological Diversity (n 314).

Article 3.⁷⁰⁴ A more specific obligation at regional level, is incorporated in the SPA/BD Protocol under Article 12:

“The Parties shall adopt cooperative measures to ensure the protection and conservation of the flora and fauna listed in the Annexes to the Protocol [..]”.

The EU Action Plan for sharks highlights the need for regional cooperation among RFMOs for effective management for migratory shark species.⁷⁰⁵ Cooperation as a duty should also be applied to efforts concerning fisheries management, such as between the EU Commission and the GFCM, stipulated in Article 23 of EU Regulation (EU) 1343/2011 on the exchange of information:

“Cooperation and information

1. The Commission and Member States shall cooperate and exchange information with the Executive Secretary of the GFCM, in particular by:

- (a) requesting information from, and providing information to, relevant databases;
- (b) requesting cooperation and cooperating in order to promote the effective implementation of this Regulation”.⁷⁰⁶

Cooperation at national level and across the Mediterranean region formed part of the assessment, as shown in the case of the ASCN, and further demonstrated in relation to research and the implementation of measures in Chapter Four and Five respectively.

3.2.2 Capacity building

Building and increasing capacity is a form of empowerment as it provides necessary knowledge, skills, and technologies to make and implement decisions and support

⁷⁰⁴ See Annex 1, Table 4.

⁷⁰⁵ European Commission, ‘European Community Action Plan for the Conservation and Management of Sharks’ (n 407).

⁷⁰⁶ Regulation (EU) No 1343/2011 of the European Parliament and of the Council of 13 December 2011 on certain provisions for fishing in the GFCM (General Fisheries Commission for the Mediterranean) Agreement area and amending Council Regulation (EC) No 1967/2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea, OJ L 347, 30.12.2011, P. 44–61.

enforcement. There are several pathways through which capacity can be established nationally. Those that have been incorporated into legal instruments concern generic training, the transfer and sharing of technologies and exchange of information. Article 16(4) of the CBD places responsibility for technology transfer not only on its Contracting Parties, but also the private sector:

“Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim that the private sector facilitates access to, joint development and transfer of technology [...] for the benefit of both governmental institutions and the private sector of developing countries [...]”.⁷⁰⁷

Under Article 12, the CBD also obliges Parties to develop and maintain programmes that provide training for the identification and conservation of biodiversity, and its sustainable use, especially for countries that are developing.

A more detailed list of capacities that should be shared and transferred widely to support the conservation of migratory species is incorporated under the CMS’s Strategic Plan for Migratory Species 2015-2023, which was adopted at the 11th meeting of the Conference of the Parties.⁷⁰⁸ Target 15 envisages information sharing and training on aspects of migratory species conservation, such as their population status and trend, habitat use, as well as the consequences of the loss of migratory species.

At Mediterranean level, the regional action plan for cartilaginous fishes under the SPA/BD Protocol includes similar capacity building activities in terms of technology transfer, training and information sharing for the conservation of sharks in the region:⁷⁰⁹

⁷⁰⁷ Convention on Biological Diversity (n 314).

⁷⁰⁸ Convention on the Conservation of Migratory Species, ‘Strategic Plan for Migratory Species 2015-2023. UNEP/CMS/Resolution 11.2’ (2012).

⁷⁰⁹ The first regional action plan was adopted in 2003 and has subsequently been updated in 2020.

“Develop training to ensure capacity-building at national and regional level, mainly in the following fields: taxonomy, biology, ecology, monitoring methods and stock assessment”.⁷¹⁰

An obligation for capacity building also forms part of the GFCM Recommendation GFCM/42/2018/2 for sharks.⁷¹¹ Under Part III, the Recommendation encourages its members to both individually and collaboratively build capacity across the region:

“As appropriate, the GFCM and its CPCs should, individually and collectively, engage in capacity building efforts and other research cooperative activities to improve knowledge on sharks and shark fisheries [...]”.⁷¹²

Capacity building was further assessed through the implemented measures at national level in Chapter Five.

3.2.3 Education and awareness raising

As explained in Chapter One, Section 1.1.4, public support is needed to ensure effective implementation of conservation efforts.⁷¹³ Beyond the scope of developing and presenting education material, these obligations also extend to the direct involvement of stakeholders in education programmes, which can lead to an increased understanding of contemporary issues and exchange of knowledge between key actors and the public. Neither conservation nor management can be successfully implemented if people do not understand their value. Article 13 of the CBD incorporates a general duty for the promotion of information on biodiversity conservation and its integration in educational programmes, as Parties to the Convention are required to:

⁷¹⁰ UNEP (n 55) part B (13.8)

⁷¹¹ Recommendation GFCM/42/2018/2 on fisheries management measures for the conservation of sharks and rays in the GFCM area of application, amending Recommendation GFCM/36/2012/3 (2018).

⁷¹² CPC refers to Contracting party or a cooperative non-contracting party

⁷¹³ Simmons and Mehmet (n 39).

“Promote and encourage understanding of the importance of and the measures required for, the conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programmes”.⁷¹⁴

Within the SPA/BD Protocol, there are two provisions of particular interest in relation to the dissemination of information to the public and their involvement.⁷¹⁵ Under Article 19 of the Protocol, Parties to the Barcelona Convention must inform the public on the designation of SPAMI’s and protection of species and related regulations. In the second part, Article 19(2) goes then further and requires Parties to share scientific knowledge for conservation purposes, and stimulates public participation in relevant organisations:

“The Parties shall endeavour to inform the public of the interest and value of specially protected areas and species, and of the scientific knowledge which may be gained from the point of view of nature conservation and other points of view. Such information should have an appropriate place in education programmes. The Parties shall also endeavour to promote the participation of their public and their conservation organizations in measures that are necessary for the protection of the areas and species concerned, including environmental impact assessments”.

The importance of such organisations was also incorporated in the regional action plan for sharks under the SPA/BD Protocol, which under section C.6 (33) includes the following:

“In this process of education and public awareness, the help of associations and other bodies involved in nature conservation should be solicited”.⁷¹⁶

Another interesting aspect of the updated regional action plan,⁷¹⁷ is the inclusion of a provision for the development of guidelines for shark activities, such as shark watching and shark diving,⁷¹⁸ a consideration that was taken into account in the implementation assessment in Chapter Five.

⁷¹⁴ Convention on Biological Diversity (n 314).

⁷¹⁵ The Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (n 333).

⁷¹⁶ UNEP, ‘Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea’ (n 55).

⁷¹⁷ RAC/SPA (n 448).

⁷¹⁸ RAC/SPA (n 448) section C.6(32)

3.2.4 Research

Research supports all stages of the policy cycle forming an integral part in problem framing, agenda setting, implementation, and evaluation.⁷¹⁹ To enable the understanding of existing and future issues, and related conservation and management needs, research is required. Scientific information can provide a basis for decision-making and should guide the design of measures applied for conservation and management.⁷²⁰ This includes research across various fields, including, among others, ecology, fisheries management, and genetic diversity. This is reflected in the fact that research obligations are wide-ranging and numerous: whether as direct obligations to support the implementation of a legal instrument, or voluntary commitments to improve it.

Part XIII of the LOSC is dedicated to marine science and Article 238 gives a uniform right to States and relevant institutions to conduct it:

“All States, irrespective of their geographical location, and competent international organizations have the right to conduct marine scientific research subject to the rights and duties of other States as provided for in this Convention”.⁷²¹

Article 239 of the Convention indeed obliges States to promote marine research.⁷²² As research is necessary for the implementation of conventions and other legal instruments, provisions of these often focus on and reflect the objectives of the relevant instrument. For example, one of the CBD’s main objectives is the preservation of genetic diversity,⁷²³ and Article 15(6) of the Convention puts a focus on the research of genetic resources:

⁷¹⁹ Examples are given in Chapter One, Section 1.1.

⁷²⁰ European Environment Agency, *Late Lessons from Early Warnings: Science, Precaution, Innovation* (2013).

⁷²¹ United Nations Convention on the Law of the Sea (n 8).

⁷²² United Nations Convention on the Law of the Sea (n 8) art 239

⁷²³ See Chapter One, Section 1.2.2 for more information on the CBD and its objectives.

“Each Contracting Party shall endeavour to develop and carry out scientific research based on genetic resources provided by other Contracting Parties with the full participation of, and where possible in. such Contracting Parties”.

RFMOs incorporate research related to fishing activities, stock assessments, bycatch

mitigation and species’ biology, both for target and non-target species. ICCAT

Recommendation 04-10, for instance, states:

“CPCs shall, where possible, undertake research to identify ways to make fishing gears more selective”.⁷²⁴

This recommendation also refers to the need for information on nursery grounds of sharks.⁷²⁵ A research gap that was also identified by the 2003 regional action plan working programme, as established under Decision IG 21/4 following the eight meeting of national Focal Point in 2013, which highlighted the need for research on important areas, such as shark nursery.⁷²⁶ This research gap was further acknowledged in the updated version of the regional action plan in 2020,⁷²⁷ as follows:

“Field studies are needed to inventory and map critical habitats around the Mediterranean”.

The actual state of knowledge in the Mediterranean and research progress over time was assessed as part of this work and is presented in Chapter Four.

3.2.5 Monitoring

Monitoring, as opposed to research, is the long-term collection of information, enabling countries to understand changes in the environment, the impact of ongoing processes, such

⁷²⁴ Recommendation by ICCAT Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT (2010) REC 04-10.

⁷²⁵ Recommendation by ICCAT Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT (n 724) art 9

⁷²⁶ UNEP, ‘Decision IG.21/4 UNEP(DEPI)/MED IG.21/9’ (2013) <<https://www.unep.org/unepmap/fr/meetings/decisions>>.

⁷²⁷ RAC/SPA (n 448).

as fishing activities, and the progress and effectiveness of measures applied. Therefore, monitoring is an essential component of management and regulation, especially during the implementation stage of the policy cycle enabling the subsequent evaluation. The monitoring requirements for biodiversity conservation extend also to the impact of human activities, as stipulated in Article 7(c) of the CBD:

“Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity and monitor their effects through sampling and other techniques”.⁷²⁸

This duty naturally applies to fishing and related pressures through bycatch and discards of species, as well as the overall impact of fishing and different gears on the marine environment.⁷²⁹ As proven through research, fishing can have adverse effects on marine biodiversity, specially sharks.⁷³⁰ The importance of monitoring such impact was recognised by the FAO, which provides guidelines for data collection.⁷³¹ Regionally, the monitoring of shark discards and bycatch is an obligation for GFCM members under GFCM/42/2018/2, under which Contracting Parties must collect:

“Information on fishing activities, catch data, incidental catches, release and/or discarding of sharks species listed either in Annex II or Annex III of the SPA/BD Protocol, is recorded by the ship owner in the logbook or in an equivalent document, [...]”.⁷³²

⁷²⁸ Convention on Biological Diversity (n 314).

⁷²⁹ Joachim Claudet and Simonetta Fraschetti, ‘Human-Driven Impacts on Marine Habitats: A Regional Meta-Analysis in the Mediterranean Sea’ (2010) 143 *Biological Conservation* 2195 <<http://dx.doi.org/10.1016/j.biocon.2010.06.004>>.

⁷³⁰ Francesco Ferretti and others, ‘Loss of Large Predatory Sharks from the Mediterranean Sea’ (2008) 22 *Conservation Biology* 952 <<https://onlinelibrary.wiley.com/doi/10.1111/j.1523-1739.2008.00938.x>>.

⁷³¹ FAO, *Monitoring the Incidental Catch of Vulnerable Species in Mediterranean and Black Sea Fisheries: Methodology for Data Collection*. (2019).

⁷³² Recommendation GFCM/42/2018/2 (n 711).

Similarly, ICCAT requires its members to monitor the release of certain shark species, for example, porbeagle sharks (*Lamna nasus*), under Recommendation 15-06.⁷³³

Reverting to international obligations related to the subsequent trade of sharks caught by national fisheries, CITES obliges its Parties to monitor imports and exports of Appendix II species through a permitting system under Article IV.⁷³⁴ The Article goes even further and assigns a duty to report concerns on the impact of trade on the conservation status of species as a means of preventing a level where it might be considered for Appendix I, which in turn entails a total trade ban.

Long-term monitoring may also include the obligation to develop national inventories of, *inter alia*, occurring species diversity, as defined in Article 3(3) of the SPA/BD Protocol:

“The Parties shall identify and compile inventories of the components of biological diversity important for its conservation and sustainable use.”

Such inventories can support conservation efforts at national scale and create a form of ‘ownership’ of ‘stewardship’ of the species occurring in national waters.⁷³⁵ Inventories created across the assessed countries are listed in Chapter Five, Section 5.2.1.2.

3.2.6 Reporting

States duty to report ranges across various instruments and entails the above duty to collect information on implementation progress through monitoring programmes, and continued submission of data. Both fisheries bodies and secretariats responsible for the

⁷³³ Recommendation 15-06 by ICCAT on Porbeagle Caught in Association with ICCAT Fisheries.

⁷³⁴ Convention on International Trade in Endangered Species of Wild Fauna and Flora (n 9) art IV(3)

⁷³⁵ Roxani Naasan Aga Spyridopoulou and others, ‘Filling the Gap of Data-Limited Fish Species in the Eastern Mediterranean Sea: A Contribution by Citizen Science’ (2020) 8 Journal of Marine Science and Engineering 107 <<https://www.mdpi.com/2077-1312/8/2/107>>.

implementation of MEAs, require Parties to report on progress. Fisheries management also requires continuous reporting on fishing to be able to adapt management, thereby such reporting fulfils an important role of the evaluation stage of the policy cycle. An overview of the most relevant reporting duties for this assessment is provided in Figure 9. Within this assessment a distinction was made between reporting on implementation progress, and continuous reporting through the submission of fisheries data to RFMOs and the STECF, the latter being considered as a measure of implementation in Chapter Five. Provisions for progress reporting are incorporated as part of the CBD, CMS, and Barcelona Convention, and information is to be submitted in frequencies determined by such conventions, which in many cases is between 1-3 years (Figure 9).

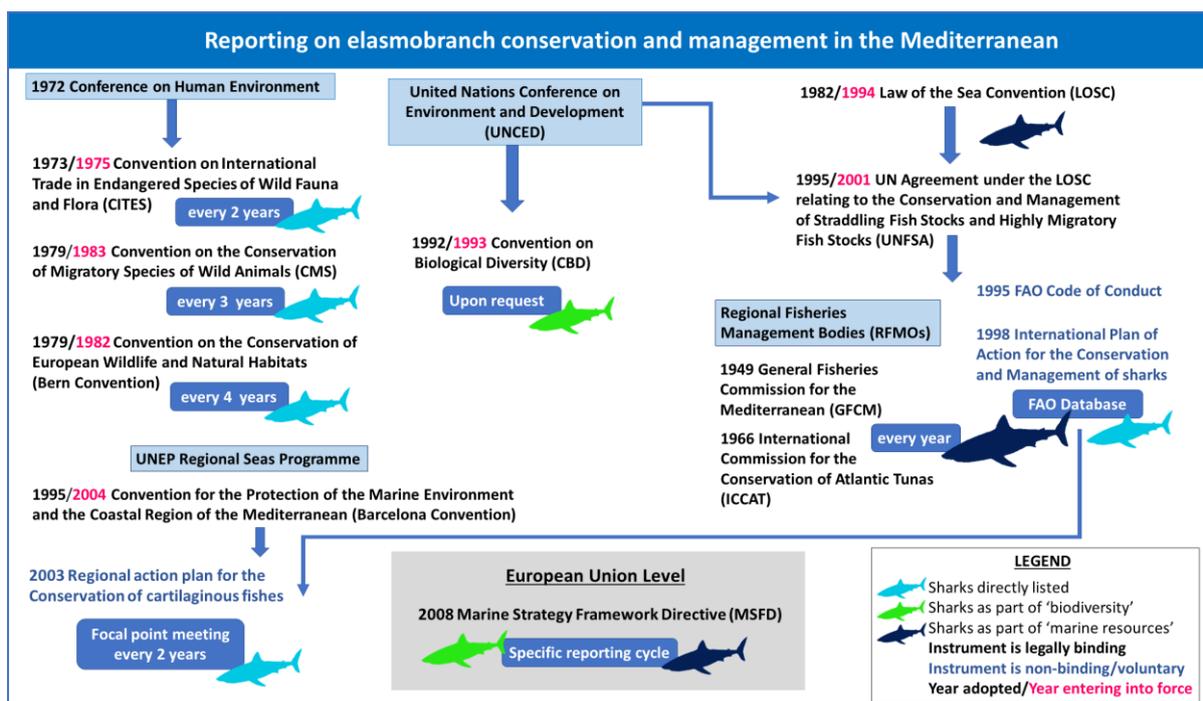


Figure 9. National reporting obligations based on international legal instruments and commitments.

In the context of trade management, CITES imposes reporting obligations under Article VIII(7). It requires Parties to submit annual reports on traded species (Article 7(a)), and the second part obliges them to submit:

“[...] a biennial report on legislative, regulatory and administrative measures taken to enforce the provisions of the present Convention.”⁷³⁶

In relation to the conservation of marine ecosystems and threatened species in the Mediterranean, Article 26(a) of the Barcelona Convention requires Parties to transmit information in the form of regular reports on:

“(a) the legal, administrative or other measures taken by them for the implementation of this Convention, the Protocols and of the recommendations adopted by their meetings;

(b) the effectiveness of the measures referred to in sub-paragraph (a) and problems encountered in the implementation of the instruments as mentioned above”.⁷³⁷

In 2017, the CMS adopted a resolution asking Parties to improve their reporting under the CMS in consideration of bycaught species and applied mitigation.⁷³⁸ Regarding fisheries, annual shark specific reporting is requested under GFCM and ICCAT Recommendations for sharks, this concerns landings, discards, release, and bycatch reporting, as well as progress on the implementation of the provision of recommendations,⁷³⁹ and is integrated in a wider context of reporting under the GFCM data collection reference framework.⁷⁴⁰ To support data collection, the GFCM established a logbook to send such information to the GFCM Scientific Advisory Committee (SAC) every year.⁷⁴¹ For EU countries, annual reporting obligations are incorporated within EU Regulations, such as Article 6 of EU Regulation

⁷³⁶ Convention on International Trade in Endangered Species of Wild Fauna and Flora (n 9) art 7(a)

⁷³⁷ Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (n 54) art 26(a)

⁷³⁸ Convention on Migratory Species, ‘Convention on Migratory Species.Bycatch.UNEP/CMS/Resolution 12.22’ 1.

⁷³⁹ See Annex 1, Table 8

⁷⁴⁰ Recommendation GFCM/40/2016/2 on the progressive implementation of data submission in line with the GFCM Data Collection Reference Framework (DCRF) (2016) REC.DIR-GFCM/40/2016/2.

⁷⁴¹ Recommendation GFCM/35/2011/1 concerning the establishment of a GFCM logbook, amending Recommendation GFCM/34/2010/1 (2011).

605/2013 on shark finning,⁷⁴² and fisheries data must be sent every year as stipulated in Article 25(3) of the CFP,⁷⁴³ in line with the European Data Collection Framework.⁷⁴⁴

3.2.7 Policy integration and development

To achieve the goals and ambitions outlined in this and the previous chapters, informed, and well-designed policies are needed to guide action. Such policies are defined and adopted during the formulation stage of the policy cycle and may include the development of national strategies, action plans, recovery plans, and management plans. Article 8 of the CBD⁷⁴⁵ saw the development of species recovery strategies as way to ensure that threatened species would not go extinct:

“[...] and restore degraded ecosystems and promote the recovery of threatened species, inter alia, through the development and implementation of plans or other management strategies”.

Under Article 6 of the Convention, the CBD promotes the development of national strategies to protect and preserve biodiversity, accounting for the national context of the country’s capabilities. Considering the need for cooperation among States for the conservation and management of migratory species, CMS Article II (3c) encourages States to:

“[...] endeavour to conclude Agreements covering the conservation and management of migratory species included in Appendix II”.⁷⁴⁶

⁷⁴² Regulation (EU) No 605/2013 (n 215).

⁷⁴³ Regulation (EU) No 1380/2013 (n 403).

⁷⁴⁴ Regulation (EU) 2017/1004 of the European Parliament and of the Council of 17 May 2017 on the establishment of a Union framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the common fisheries policy and repealing Council Regulation (EC) No 199/2008 (recast), OJ L 157, 20.6.2017, p. 1–2.

⁷⁴⁵ Convention on Biological Diversity (n 314)

⁷⁴⁶ Convention on the Conservation of Migratory Species of Wild Animals (n 10).

A cross-sectoral approach to conservation through policy plans is part of the SPA/BD Protocol under Article 3(4), which aims for the integration of marine resources into different economic sectors:

“The Parties shall adopt strategies, plans and programmes for the conservation of biological diversity and the sustainable use of marine and coastal biological resources and shall integrate them into their relevant sectoral and intersectoral policies”.⁷⁴⁷

Within the context of policy developments, it is of note that fisheries management plans for the Mediterranean Sea are established through the GFCM, ICCAT, and, for EU MS, under the CFP, as explained in Chapter One, Section 1.2.4.1. However, this does not preclude that coastal States can adopt additional management measures to ensure and increase fisheries’ sustainability and create measures concerning sharks. A path for this could be a national plan of action for sharks, which is an ambition under the IPOA Sharks.⁷⁴⁸

3.2.8 Conservation measures

Conservation measures, as introduced in this section, refer to practical actions trying to ensure that marine ecosystems and vulnerable species continue to function and exist. There are multiple options to support applied conservation. This includes, *inter alia*, measures designed to preserve genetic diversity, the recovery of species and habitats, and protective interventions through spatial restrictions.

A conservation approach that has gained traction and attention in the past decades is protection of species and habitats through spatial measures, as encompassed in many legal

⁷⁴⁷ The Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (n 333).

⁷⁴⁸ International Plan of Action for the Conservation and Management of Sharks (n 13) para 18

instruments. The CBD's Aichi Target 11 aimed for 10 % effective, meaning managed and enforced, spatial protection through MPAs by 2020.⁷⁴⁹ Even more ambitious was Aichi Target 12, which foresaw the prevention of species loss and improvement of populations that are threatened. Something that has also been a target of the Sustainable Development Goals in SDG 14, envisaging the achievement of a healthy, restored marine environment by 2020. Under the CMS' Strategic Plan for Migratory Species 2015-2-23, Goal 4, Target 12, imagines that:

“The genetic diversity of wild populations of migratory species is safeguarded, and strategies have been developed and implemented for minimizing genetic erosion.”⁷⁵⁰

Article 10 of the Barcelona Convention entails a general duty for protection, as follows:

“The Contracting Parties shall, individually or jointly, take all appropriate measures to protect and preserve biological diversity, rare or fragile ecosystems, as well as species of wild fauna and flora which are rare, depleted, threatened or endangered and their habitats, in the area to which this Convention applies”.⁷⁵¹

This Article allows for joint efforts of Contracting Parties to establish, for example, MPAs in areas beyond national jurisdiction. The SPA/BD Protocol aims to establish MPAs in the form of SPAMIs and supports cross-country cooperation in doing so through Article 5, which encourages States to cooperate with other Parties and non-Parties.⁷⁵²

Conservation measures, as shown here, are not always well-defined and little guidance is given by legal provisions on how to protect and preserve biodiversity. So, within the

⁷⁴⁹ Convention on Biological Diversity, ‘Decision Adopted by the Conference of the Parties to the Convention on Biological Diversity at Its Tenth Meeting. X/2. The Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targetst. UNEP/CBD/COP/DEC/X/2’ (2010).

⁷⁵⁰ Convention on the Conservation of Migratory Species (n 708).

⁷⁵¹ Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (n 54).

⁷⁵² The Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (n 333).

evaluation of implementation effort in Chapter Five, actions contributing to conservation were various.

3.2.9 Sustainable management

As defined in Chapter One, Section 1.2.1, sustainability, or sustainable use refers to finding a balance between human needs and the ability of nature to main ecosystem services, now and in future. Management, as explained in the same chapter, is defined by actions taken to achieve this balance. Therefore, sustainable management considers actions that aim to reduce negative impacts from human activities, especially fishing, on the marine environment, and the overall pressure on marine resources. In this context, Article 10(b) of the CBD foresees the adoption of:

“[...] measures relating to the use of biological resources to avoid or minimize adverse impacts on biological diversity”.

In relation to fisheries, as described in Chapter One, Section 1.2.4, the UNFSA incorporates sustainable use as core principle to assure fish stocks remain stable in the future. Fisheries interventions relate to measures to improve the sustainability of the sector through reducing its impacts, include, among others, the mitigation of bycatch, limitations of allowed catches, and the release of vulnerable species, such as sharks. As shown in Annex 1, Table 4, there are multiple provisions across legal instruments that incorporate such measures.

3.2.10 Regulation

The term 'regulation' within the legal context differs from the practical term used in conservation and fisheries management.⁷⁵³ According to Article 288 of the Treaty on the Functioning of the EU (TFEU),⁷⁵⁴ a 'Regulation' in the context of EU law making, is a form of legislation that creates legally binding provisions for EU MS. These are included in this section to the extent to which they regulate activities and create obligations relevant to shark governance. In connection to this work, 'regulations' or 'regulatory measures' in a wider context refer to laws aiming to implement an obligation derived from international legal instruments and other relevant commitments, which is the way in which it was used in this assessment.⁷⁵⁵ These obligations are therefore most relevant to the stage of implementation within the policy cycle. Regulations entail the obligation to adapt national legislation to reflect the provisions of the respective treaty (transposition of law), such as the legal protection of species, as well as other regulatory measures through which impacts are reduced. Such regulations overlap with measures for sustainable development but differ in the sense that these are more defined actions.

Article 8 of the CBD obligates Parties to develop regulatory measures for protection of threatened species.⁷⁵⁶ Additionally, the SPA/BD Protocol creates a framework under which Parties should create 'safe places' for such species and, as stipulated in Article 6 of the Protocol, need to apply the following:

⁷⁵³ Borrini-Feyerabend and Hill (n 701).

⁷⁵⁴ Consolidated version of the Treaty on the Functioning of the European Union, OJ C 326, 26.10.2012, p. 47–39 2012 47.

⁷⁵⁵ For the evaluation of implementation effort as described in Chapter Two, Section 2.5.3 and applied in Chapter Five, Section 5.4.1.

⁷⁵⁶ Convention on Biological Diversity (n 314).

“[...] the regulation and prohibition of fishing, hunting, taking of animals and harvesting of plants or their destruction, as well as trade in animals, parts of animals, plants, parts of plants, which originate in specially protected areas”.⁷⁵⁷

Article 11 of the Protocol goes one step further and requires States to manage any activity that could have adverse effects on species or their habitats. The protection of species through law is another step in the process, which is required from countries for species listed in Annexes of multiple instruments, as indicated in Annex 1, Table 4.

An activity that is regulated under various frameworks is fishing. Regulations related to fisheries are those stipulated in binding recommendations under the GFCM and ICCAT, as well as those listed within EU Regulations, e.g., those that support the implementation of the CFP.⁷⁵⁸ There are multiple regulatory options to manage fisheries, as shown in Annex 1, Table 4, including the restriction of areas and gear types, as well as the prohibition of retaining vulnerable and protected species on board of a vessel and related life release obligations. One of the largest restricted areas for fishing has been established under the GFCM’s process for ‘fisheries restricted areas’ (FRAs),⁷⁵⁹ which is the region-wide trawling ban beyond a depth of 1000 m.⁷⁶⁰

A globally recognised problem, which led to a gear type prohibition, was the impact of large-scale drifting nets on vulnerable species. In 1989, the UN adopted a resolution to address this issue.⁷⁶¹ This resolution initiated further efforts across RFMOs, such as

⁷⁵⁷ The Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (n 333).

⁷⁵⁸ See Chapter One, Section 1.2 for details on these conventions.

⁷⁵⁹ A power given to the GFCM under Article 8 (b, iv), which describes the function of the GFCM.

⁷⁶⁰ Recommendation GFCM/29/2005/1 on the management of certain fisheries exploiting demersal and deep-water species and the establishment of a fisheries restricted area below 1000 m (2005).

⁷⁶¹ UNGA, ‘Large-Scale Pelagic Driftnet Fishing and Its Impact on the Living Marine Resources of the World’s Oceans and Seas. Adopted at the 85th Plenary Meeting, 22 Dec. 1989.’

Recommendation GFCM/22/1997/1,⁷⁶² to restrict the use of driftnets, making large scale nets, beyond the extent of 2.5 km, illegal.

As part of the economic chain, market regulations such as the requirement to label products correctly are crucial, so are regulations under CITES, as explained in Chapter One, ensuring trade does not decimate species to a level where they can disappear. CITES provisions are implemented at EU level through the EU's Council Regulation (EC) No 338/97, which lays down import and export conditions and lists species in accordance with CITES, but applies stricter rules for import into the EU, while also laying down conditions for internal trade.⁷⁶³

The Regulation has several Annexes under which it integrates species listed under CITES.

The two most relevant are Annex A and B, which apply the most stringent measures. Annex A considers, among others, those species listed under CITES Appendix I, with the exception of those where EU MS issued a reservation and prohibits any commercial trade in parts or other wise of the species listed. Annex B contains CITES Appendix II species, unless any EU MS had reservations, and those CITES Appendix I species with a reservation. Each of those Annexes can list additional species, as determined by the EU. Commission Regulation (EC) No 865/2006 provisions practical guidance and detailed rules for the implementation of Council Regulation (EC) No 338/97.⁷⁶⁴ This Regulation is regularly amended to align with the

⁷⁶² Recommendation GFCM/22/1997/1 Limitation of the use of driftnets in the Mediterranean (1997) REC.CM-GFCM/22/1997/1.

⁷⁶³ Council Regulation (EC) No 338/97 of 9 December 1996 on the protection of species of wild fauna and flora by regulating trade therein, OJ L 61, 3.3.1997, p. 1–69.

⁷⁶⁴ Commission Regulation (EC) No 865/2006 of 4 May 2006 laying down detailed rules concerning the implementation of Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein, OJ L 166, 19.6.2006, p. 1–69.

developments under CITES at international level. The latest amendment was completed in 2021.⁷⁶⁵

Another consideration regulating the impact of human activity, was recreational fishing. Some broader conservation measures recognised this and despite not creating specific obligations, contemplate their adoption. An example is EU Regulation 2019/1241, which stipulated the need to regulate recreational fishing.⁷⁶⁶ However, it also provides the EU Commission with the power to adopt further measures if recreational fishing has a significant impact, under Article 2:

“Articles 7, 10, 11 and 12 shall also apply to recreational fishing. In cases where recreational fishing has a significant impact in a particular region, the Commission is empowered to adopt delegated acts pursuant to Article 15 and in accordance with Article 29 in order to amend this Regulation by providing that the relevant provisions of Article 13 or parts A or C of Annexes V to X also apply to recreational fishing”.

These articles refer to generally prohibited gear types (Article 7), protected species (Articles 10 and 11), and the protection of sensitive habitats (Article 12), while Article 13 lists minimum reference sizes applicable to selected fish species. The same regulation also prohibits the use of entangling gear to target certain species of sharks under Article 9(4):

“It shall be prohibited to use bottom-set gillnets, entangling nets and trammel nets to catch the following species:

[...]

(e) Sharks belonging to the following species or families *Hexanchus griseus*; *Cetorhinus maximus*; all species of Alopiidae; Carcharhinidae; Sphyrnidae; Isuridae; Lamnidae”.

⁷⁶⁵ Commission Regulation (EU) 2021/2280 of 16 December 2021 amending Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein and Commission Regulation (EC) No 865/2006 laying down detailed rules concerning the implementation of Council Regulation (EC) No 338/97, C/2021/9174 OJ L 473, 30.12.2021, p. 1–130.

⁷⁶⁶ Regulation (EU) 2019/1241 (n 406).

However, paragraph 5 of this article provides an exemption stating that:

“By way of derogation from paragraph 4, incidental catches in the Mediterranean Sea of no more than three specimens of the shark species referred to in that paragraph may be retained on board or landed provided that they are not protected species under Union law”.

The regulation of human activities within the international and regional legal context is a complex system and was further investigated in Chapter Five, which considers the implementation of regulations at national level.

3.3 Reflecting on political commitment of Mediterranean countries

The time it has taken for sharks to gain the international community’s attention and become an item considered in legal instrument runs over decades. Decades, in which some of these instruments also saw an increase in signatories. Not all the assessed countries signed up at the opening of each instrument, but gradually, as indicated in Annex 1, Table 3. This may be due to historical struggles of independence or reduced statehood due to existing conflict. This is an aspect that was also reflected in the number of treaties a country signed up to, which for Israel and Palestine are far less than for other Mediterranean countries.

Comparing standardised political commitment between countries revealed a significant difference between EU and non-EU countries, the latter being substantially lower than the former. Neither the size of the marine area governed by a country nor the extent of shark landings from commercial fisheries at national level, demonstrated any relationship to political commitment, but socio-economic factors, including the government effectiveness, regulatory quality, and GDP did. This is in line with prior legal research on why States commit themselves under environmental treaties. The analysis of reasons for commitments

of Mediterranean States was outside the scope of this work; however, ratification of MEAs can depend on multiple factors, including economic strength, public support, and contribution to the problems addressed by such treaties.⁷⁶⁷

There is increasing evidence in quantitative legal research supporting the theory that democracies are more likely to sign up to environmental treaties and implement them.⁷⁶⁸

This is also noting that for States to comply and implement obligations, expensive administrative structures for compliance and enforcement are required, *ergo* a lack thereof can lead to hesitation and delay of developing States to do so.⁷⁶⁹ The challenges faced by these States were also noted by Timmons et al. in relation to commitments and participation in the development of international environmental law, as follows:

“Developing countries face unique structural constraints. These include the unpredictability and long-term decline in the prices of their crucial export commodities, internally unarticulated economies, and feeble post-colonial government institutions, all of which limit their ability to implement good environmental policies and participate in treaty drafting conferences”.⁷⁷⁰

The same study highlighted the importance of public support and public demand for environment protection, and NGOs as driving forces influencing State willingness to sign up to MEAs for the protection of the environment.⁷⁷¹ These aspects were also incorporated in the analysis of implementation effort, as evaluated in Chapter Five.

⁷⁶⁷ Patrick Bernhagen, ‘Business and International Environmental Agreements: Domestic Sources of Participation and Compliance by Advanced Industrialized Democracies’ (2008) 8 *Global Environmental Politics* 78.

⁷⁶⁸ Eric Neumayer, ‘Do Democracies Exhibit Stronger International Environmental Commitment? A Cross-Country Analysis’ (2002) 39 *Journal of Peace Research* 139.

⁷⁶⁹ Richard Perkins and Eric Neumayer, ‘Implementing Multilateral Environmental Agreements : An Analysis’ <<http://direct.mit.edu/glep/article-pdf/7/3/13/1819369/glep.2007.7.3.13.pdf>>.

⁷⁷⁰ J Timmons Roberts and others, ‘Who Ratifies Environmental Treaties and Why?’ (2004) 4 *Global Environmental Politics* 22.

⁷⁷¹ Roberts and others (n 770).

Shark specific policies, including action, recovery, and management plans, although only considered by about half of the Mediterranean countries forming the basis of this assessment, revealed national efforts to enhance protection, which were in part driven by NGOs working across the region, supporting the important role these organisations have within agenda setting and policy formulation. Moreover, NGOs can stipulate policy changes through active participation in negotiations of legal instruments, whether it may be at CITES CoPs,⁷⁷² negotiations on the furthering or protection efforts in high sea areas,⁷⁷³ or advocating for more transparency at RFMO meetings, including those held under the GFCM.⁷⁷⁴ Although this role was not assessed for Mediterranean NGOs here, it is a factor of consideration for further investigation.

While signature to any legal instruments does not automatically imply commitment, it does oblige States directly to establish measures in line with the legal instrument's aim and purpose. For sharks, these include a variety of applicable measures, regulations, and duties, as listed in Section 3.2. Although the obligations among countries are not equal, the legal obligations applicable to the protection of biodiversity and management of fisheries are similar among Mediterranean countries, even if these did not start to apply for each country at the same time. Examples are Palestine signing the LOSC and the CBD in 2015, Bosnia and Herzegovina becoming a cooperating party to the GFCM in 2016, and Lebanon becoming a party to CITES in 2013. Commitment is often related to weighing advantages and disadvantages of participation, as well as national capacity and resources to implement the

⁷⁷² Challender and MacMillan (n 66).

⁷⁷³ Robert Blasiak and others, 'The Role of NGOs in Negotiating the Use of Biodiversity in Marine Areas beyond National Jurisdiction' (2017) 81 *Marine Policy* 1 <<http://dx.doi.org/10.1016/j.marpol.2017.03.004>>.

⁷⁷⁴ Matilda T Petersson, 'Transparency in Global Fisheries Governance: The Role of Non-Governmental Organizations' (2022) 136 *Marine Policy* 104128 <<https://doi.org/10.1016/j.marpol.2020.104128>>.

obligations under certain legal requirements, and legal uncertainty on aspects of the agreement.⁷⁷⁵

Political commitment in the Mediterranean also seemed to be considerably influenced by the EU, which through policy and regulation affects development in the political commitment of its MS. Consequently, if the EU becomes a Party to a treaty, all EU MS are bound to the provisions therein. This power was given to the EU through Article 216 of the TFEU,⁷⁷⁶ which states:

“1. The Union may conclude an agreement with one or more third countries or international organisations where the Treaties so provide or where the conclusion of an agreement is necessary in order to achieve, within the framework of the Union's policies, one of the objectives referred to in the Treaties, or is provided for in a legally binding Union act or is likely to affect common rules or alter their scope.

2. Agreements concluded by the Union are binding upon the institutions of the Union and on its Member States”.

Yet, countries can also sign up to any treaty individually subsequently, or in many cases, prior to the EU, as most treaties considered were signed before the EU had the capacity to do so. Nevertheless, there were two considerations where this power of the EU became relevant in the assessment of country's political commitment. One was that the EU signed the SPA/BD Protocol, which thereby applies to all EU MS. Thus, the SPA/BD Protocol was included in Greece's standardised political commitment, even though it has not individually signed the Protocol, and given there was evidence of it reporting on its implementation.⁷⁷⁷ The other consideration was in relation to the EU signing the CMS Shark MoU, which was individually signed by only a few EU MS.⁷⁷⁸ As a voluntary commitment that does not

⁷⁷⁵ Molenaar (n 500).

⁷⁷⁶ Consolidated version of the Treaty on the Functioning of the European Union (n 754).

⁷⁷⁷ UNEP/MAP, 'Twelfth Meeting of Focal Points for Specially Protected Areas Athens, Greece, 25-29 May 2015' (2015).

⁷⁷⁸ European Commission Directorate-General for Maritime Affairs and Fisheries (n 677).

contain binding provisions, there is no legal consequence to not implementing it and as such, it was excluded from the political commitment of those EU MS where there was no evidence on the implementation of the CMS Shark MoU.

In relation to the provisions introduced in Section 3.2, it is noteworthy that the ratification of a treaty binds a State Party to the requirements and provisions therein, although the transposition of individual provisions into national legislation is required to operationalise it and facilitate its implementation at national level. In this process, the transposition of provisions into national law, States need to consider that some obligations between agreements may overlap, for example, the legal protection of certain species listed under multiple MEAs (for shark-specific examples, see Annex 1, Table 4).

Similarly, recommendations under ICCAT and the GFCM are legally binding following their adoption but require the transposition of provisions into national law by State Parties (and for the GFCM,⁷⁷⁹ non-Contracting Cooperating Parties), to be applied and enforceable at national level. While States are obligated to transpose legally binding recommendations under these RFMOs, timeframes for this process are often indicated ‘as soon as possible’, leaving room for interpretation on what this period is. However, Parties to these RFMOs are obligated to report on the national progress on the implementation of recommendations on an annual basis, as explained in Section 3.2.6 above.

With the EU being Party to both RFMOs, the obligation of transposing provisions of legally binding recommendations also applies, and follows the process of creating EU Regulations, which, in turn, do not require EU MS to be transposed into domestic law and are directly

⁷⁷⁹ This also applies to non-Contracting Cooperating Parties, such as Bosnia and Herzegovina.

enforceable. On the other hand, EU Directives do require EU MS to transpose and thereby operationalise is provision of the Directive, within specific timeframe as defined by the Directive.

The applicability and transposition of legal obligations are further considered in Chapter Five. This is in consideration that, demonstrated in Section 3.2, legal instruments often give little direct guidance on how to achieve the obligations therein, as this largely depends on political circumstances, capacities, and resources, as well as national conservation priorities within each individual nation.⁷⁸⁰ Factors that were also integrated further in the analysis of research and implementation effort in the next chapters.

⁷⁸⁰ R Hill and others, 'A Social–Ecological Systems Analysis of Impediments to Delivery of the Aichi 2020 Targets and Potentially More Effective Pathways to the Conservation of Biodiversity' (2015) 34 *Global Environmental Change* 22 <<http://dx.doi.org/10.1016/j.gloenvcha.2015.04.005>>.

Chapter Four: National Contribution to Knowledge

Scientific evidence is an essential part of all stages of the policy cycle, as it provides proof of existing problems, can provide evidence to inform solutions to solve these problems, contributes to the implementation of research duties and to the evaluation of policies.⁷⁸¹

Regional and EU policies rely on scientific evidence to spark and encourage action;⁷⁸²

therefore, it was important to identify the current state of knowledge and existing gaps. A literature review can serve multiple purposes, whether as an assessment of knowledge on particular species,⁷⁸³ to help determining the distribution of species,⁷⁸⁴ or basis for a national species inventory.⁷⁸⁵ Research can also inform regulatory and conservation measures, as well as help to identify research needs and priorities.⁷⁸⁶

The specific research questions that this assessment aimed to answer were:

1. What is the individual contribution of each country to the knowledge on sharks in the Mediterranean Sea?
2. What are the main topics addressed by this research?
3. How has shark research in the region changed and progressed over time?
4. Which species are subject to research?
5. What are the knowledge gaps and research need in the region?

⁷⁸¹ Examples can be found in Chapter One.

⁷⁸² Koehler, Giovos and Lowther (n 564).

⁷⁸³ Bernard Séret, Tom Fenchel and Franz Uiblein, 'European Research Focus on Sharks and Rays' (2010) 6 *Marine Biology Research* 339 <<http://www.tandfonline.com/doi/abs/10.1080/17451001003657729>>.

⁷⁸⁴ Cecilia Mancusi and others, 'MEDLEM Database, a Data Collection on Large Elasmobranchs in the Mediterranean and Black Seas' (2020) 4 *Mediterranean Marine Science* 57 <<https://ejournals.epublishing.ekt.gr/index.php/hcmr-med-mar-sc/article/view/21148>>.

⁷⁸⁵ Elsayed Haroun Akel and Paraskevi Karachle, 'The Marine Ichthyofauna of Egypt' (2017) 21 *Egyptian Journal of Aquatic Biology and Fisheries* 81 <http://ejabf.journals.ekb.eg/article_4130.html>; Malek Ali and others, 'Occurrence of Basking Shark, *Cetorhinus Maximus* (Elasmobranchii: Lamniformes: Cetorhinidae), off the Syrian Coast (Eastern Mediterranean) with First Description of Egg Case' (2012) 42 *Acta Ichthyologica et Piscatoria* 335; Murat BİLECENOĞLU and others, 'An Updated Checklist of the Marine Fishes of Turkey' (2014) 38 *TURKISH JOURNAL OF ZOOLOGY* 901 <<http://journals.tubitak.gov.tr/zoology/issues/zoo-14-38-6/zoo-38-6-10-1405-60.pdf>>.

⁷⁸⁶ Badhon and others (n 115); DJ Bräutigam, Amie, Callow, M., Campbell, I.R., Camhi, M.D., Cornish, A.S., Dulvy, N.K., Fordham, S.V., Fowler, S.L., Hood, A.R., McClennen, C., Reuter, E.L., Sant, G., Simpfendorfer, C.A. and Welch, 'Global Priorities for Conserving Sharks and Rays: A 2015–2025 Strategy.' (2015); Stewart and others (n 238).

This chapter presents the status of research on sharks in the Mediterranean and assessed the contribution of key players and different entities across countries. Based on this assessment, future research needs were identified and are discussed at the end of the chapter.

4.1 The progress of Mediterranean shark research

The literature review identified 1,235 relevant publications between 1923 and 2020,⁷⁸⁷ with 1,212 included in the analysis.⁷⁸⁸ Overall, the review assessed 992 full size journal articles (81.8 %), 144 short communications (11.9 %), 27 review articles (2.2 %), 26 short notes (2.1 %), and 23 collective articles (1.9 %). Each publication was reviewed in terms of species investigated, method applied, and institutes involved in the publication, as well as the overall thematic focus of the work. Additionally, information on ongoing research projects was collected through the surveys but analysed separately.⁷⁸⁹

4.1.1 Research contribution by country

This section presents information on the individual contribution of countries to Mediterranean shark science, what types of entities were involved in building this knowledge, how these entities collaborate, and when countries started to do shark research.

⁷⁸⁷ End of data collection for this assessment.

⁷⁸⁸ The analysis comprised only those in which Mediterranean countries have been involved, not publications about the region from institutes outside the Mediterranean region without any involvement of Mediterranean institutes.

⁷⁸⁹ Survey questionnaires can be found in Annex 2.

To answer the first research question, publications were divided by country contribution, including roles as lead institute or collaborator. Furthermore, the standardised research output was calculated, as described in Chapter Two (Section 2.7.1). The evaluation of each country's contribution, including both roles, showed that Italy has the highest overall involvement in shark-related publications in the Mediterranean, followed, with a wide gap in between, by France and Tunisia (Table 2). The latter is primarily as results of one author Christian Capapé with a compelling contribution of 326 publications on sharks over the past decades, who has worked in multiple locations, including Tunisia and France. Spain and Turkey had a similar contribution percentage in the middle of the overall range from 31 % to 0.1 % per country. Lower contributions, in terms of absolute numbers, came from Monaco and Palestine, followed by Montenegro, Lebanon, Morocco, Albania, Libya, Cyprus, and Bosnia and Herzegovina, all contributing individually to less than 1 %. However, following the standardisation of publication involvement,⁷⁹⁰ the picture of country contribution changed, with Tunisia taking the lead while, with a major gap in between, Turkey follows, then Italy and Egypt, which are close together as third and fourth highest contributors (Table 2). This demonstrates that available financial resources may influence national research output.

⁷⁹⁰ Standardisation of research effort in relation to a country's GDP is explained in Chapter Two, Section 2.7.1.

Table 2. Publication involvement by country (including standardised publication effort)

Country	Number of publications involved in	% (out of 1212)	Standardised publication effort
Italy	370	30.53	11.065
France	229	18.89	6.157
Tunisia	225	18.56	61.988
Spain	184	15.18	6.736
Turkey	173	14.27	19.523
Greece	105	8.66	4.908
Croatia	63	5.20	5.24
Algeria	38	3.14	9.969
Israel	31	2.56	1.008
Slovenia	31	2.56	1.445
Egypt	26	2.15	11.061
Syria	18	1.49	3.708
Malta	16	1.32	0.771
Bosnia and Herzegovina	9	0.74	2.183
Cyprus	9	0.74	0.346
Libya	8	0.66	0.885
Albania	6	0.5	1.694
Morocco	5	0.41	1.976
Lebanon	4	0.33	0.623
Montenegro	4	0.33	0.7
Palestine	2	0.17	0.825
Monaco	1	0.08	0.007

The role in which countries have contributed varied, with Italy being the lead in publications more than collaborating, similarly to Tunisia, Turkey, and Spain, which also seemed to have taken on the lead in their contributions. Researchers from other countries, such as France and Cyprus, appeared to have contributed more through collaboration (Figure 10), indicating that some countries drove research more than others.

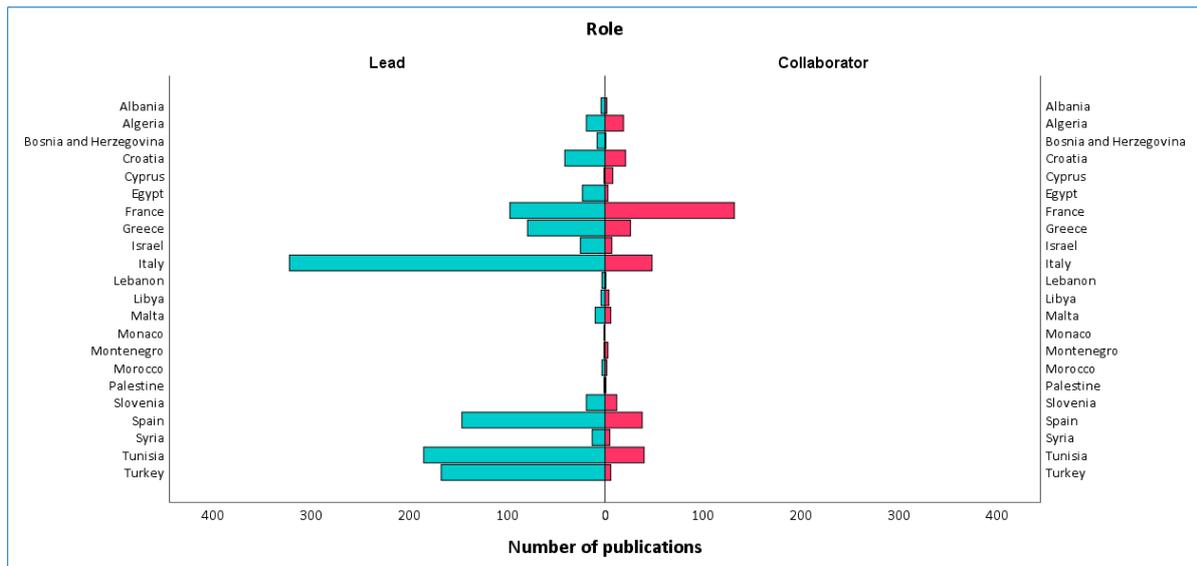


Figure 10. Country contribution in publishing scientific articles based on their role within the article.

As part of the research question on which country is leading shark research in the Mediterranean Sea, the assessment also looked at differences between EU and non-EU countries. The question of whether EU MS were involved in more publications than non-EU countries was determined by comparing both the absolute number in publications and the standardised publication involvement. This analysis excluded irrelevant publications within the subcategory of ‘Palaeontology’.⁷⁹¹ As Figure 11 demonstrates, when analysing the overall contribution by country as an absolute number of publications in which they were involved, there was a significant difference between EU and non- EU countries ($p = .017$). However, when standardising publication involvement by GDP,⁷⁹² shown in Figure 12, to reduce an underlying bias against poorer countries, and consider differences in research investment potential by country, the result of the Mann-Whitney U test was not significant ($p = .682$). The results indicate that EU countries produced more publications on sharks than

⁷⁹¹ These were determined ‘irrelevant’ as they do not provide information relevant to contemporary issues and information gaps needed for improving policies and conservation efforts.

⁷⁹² As explained in Chapter Two, Section 7.2.1.

non-EU countries in terms of absolute numbers but considering countries' available research budget, there was no measurable difference between EU and non-EU countries (Figure 12).

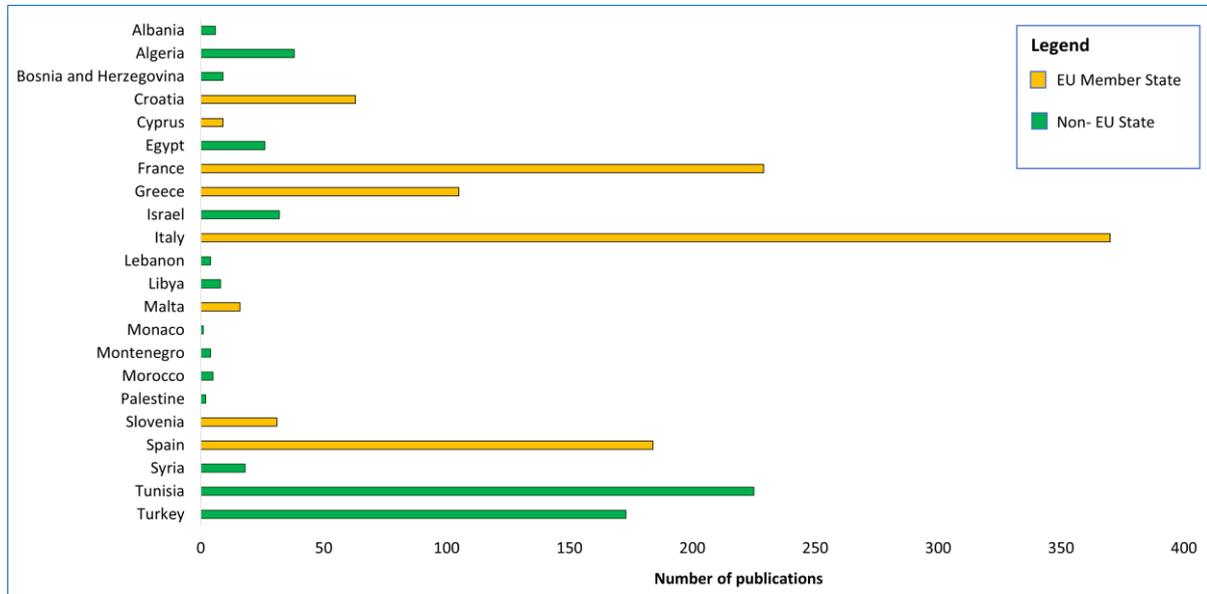


Figure 11. Country involvement in publication output (absolute values).

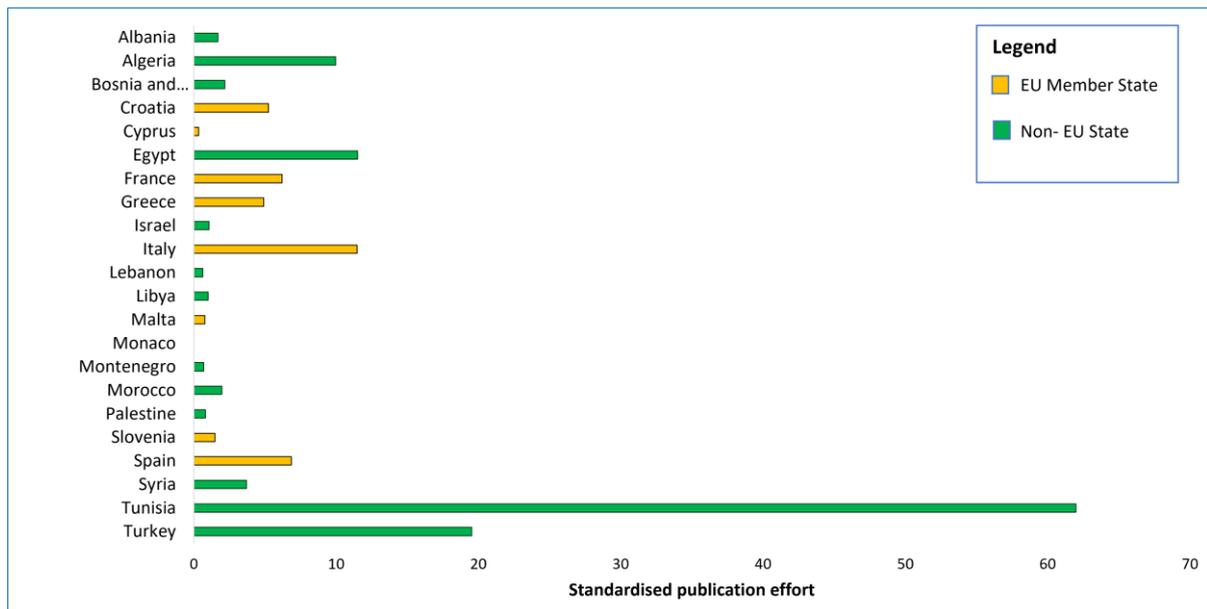


Figure 12. Standardised publication contribution by country.

Another interesting aspect of the involvement and output of publications per country, was the number of institutes that have contributed to shark research. Therefore, an analysis was

conducted to see whether the number of institutes involved in shark research influenced the number of publications a country was involved in.⁷⁹³ A closer look into the institutes involved in Mediterranean shark research revealed that there were 301 different ones across the region. However, only one third of these (95) have contributed regularly, meaning that these institutions were involved in more than 5% of the publication output nationally (Table 3). The highest number of institutes involved in shark research was found in Italy (86), followed by Spain (46), and Turkey (34) (Table 3). This order changed slightly when only those institutes that regularly contribute were considered: Turkey (9), Spain (8), and Italy (7). Generally, each country had only a few institutes that support shark research on a regular basis. The five international institutes that contributed to knowledge on sharks were the European Commission Joint Research Centre, the FAO, the ICCAT Secretariat, RAC/SPA, and the IUCN.

⁷⁹³ To avoid double counting, any institutional name changes were factored into the analysis.

Table 3. Number of institutes involved in shark research by country and those that contribute to 5% or more of the national publication output.

Country	Absolute number of. Institutes	Number of institutes contributing regularly
Italy	86	7
Spain	46	8
Turkey	34	9
France	25	4
Greece	21	6
Croatia	13	4
Israel	13	7
Algeria	7	4
Egypt	7	4
Tunisia	7	5
Malta	6	6
Slovenia	6	6
Libya	4	4
Morocco	4	4
Albania	3	3
Cyprus	3	3
Lebanon	3	3
Bosnia Herzegovina	2	2
Montenegro	2	2
Palestine	2	2
Monaco	1	1
Syria	1	1
<i>International</i>	5	NA
Total	301	95

To assess whether the number of institutes that were regularly involved in shark research within a country and the standardised publication output are related, a Spearman correlation test was applied. The test output demonstrated a highly positive relationship ($r(20) = .734, p < .000$) between the two variables. This correlation was even stronger when considering the absolute number of publications per country ($r(20) = .871, p < .000$), as shown in Figure 13. The results show that the more institutes regularly conducting shark research present nationally, the more research has been published, which seems logical.

Smaller countries, such as Monaco, Cyprus, and Palestine, had fewer institutes involved and thereby produced less publications, as shown in the graph (Figure 13).

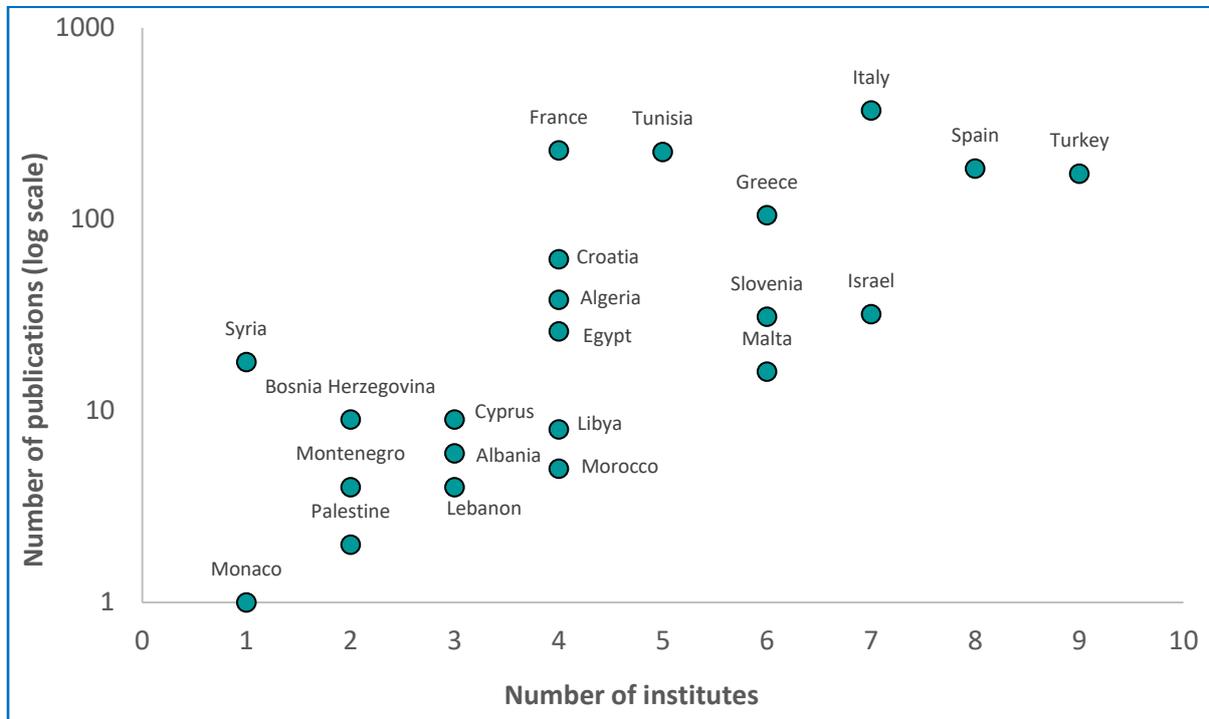


Figure 13. Scatterplot of publication involvement of countries against the number of institutes involved in regular publishing shark research at national level (i.e., involved in over 5% percent of publication output).

Investigating the type of entities engaged in shark science, universities and research institutes made up 72.4 % (Table 4). This was also reflected at national level, unless one considers only those that contributed to 5 % or more of national contributions, in which case in Malta, NGOs lead the publication involvement (Annex 1, Table 6).

In total, 35 NGOs were involved, of which nine regularly contributed at national level. To a lesser degree other institutions such as regulatory entities, museums, international bodies, companies, and aquaria produced publications (Table 4). Not surprising is that researchers from universities and research institutes were the main contributors to publications (97.4 %), while NGOs led 2.6 % of the studies conducted.

Table 4. Types of institutes involved in shark research

Type	Number
Aquarium	6
Company	4
International body	4
Museum	13
NGO	35
Regulatory entity	21
Research institute	84
University	134
TOTAL	301

As demonstrated in the previous chapter, international cooperation for research is important.⁷⁹⁴ This also includes the duty to increase knowledge through scientific research, as stipulated in many legal instruments.⁷⁹⁵ To answer the question if Mediterranean countries collaborate, the number of countries involved in shared publications in relation to geographic region was assessed. The analysis focused on the cooperative relationship of Mediterranean countries, although observations of countries engaged from outside the region are presented.

Out of the total of 1,212 publications assessed, 846 (69.8 %) did not involve another country. However, 249 of these 846 publications did embrace collaborations with other institutes within the same country. Almost one third of the publications (366, 30.2%) were based on some form of collaboration between different countries. Out of these, 262 entailed cooperation between multiple Mediterranean countries. Putting Mediterranean countries into focus, 145 publications included a cross-Mediterranean cooperation with non-bordering countries. The remaining 117 publications presented some form of

⁷⁹⁴ See Chapter Three, Section 3.2.1.

⁷⁹⁵ Koehler and Lowther (n 80).

Mediterranean country cooperation in proximity, either directly bordering countries (44), partially bordering countries (27), or those with a mix, where some countries involved are directly bordering or share a bordering GFCM GSA (46).⁷⁹⁶ It is noteworthy that 40 of the publications assessed were led by a non-Mediterranean country. This demonstrates that research questions are mainly addressed at national level; however, some research has been conducted across the region.

It is of note that shark research did not start simultaneously across countries (Figure 14). Validated records from the review identified that shark research started in 1932,⁷⁹⁷ and expanded over time, with extended numbers of contributors. Although all countries forming part of this assessment have been engaged in this research, the contributions were not equal, in either volume or time (Table 5). Countries with established long-term research on sharks are Italy, France, and Greece, while other countries have participated in shark related research over several decades, but in reality, had sporadic publications. For example, the first record of research involvement by Libya is from 1999,⁷⁹⁸ but there was no further contribution until 2012.⁷⁹⁹ Similarly, Montenegro's first publication involvement was in 1987,⁸⁰⁰ but with nothing more until 2019.⁸⁰¹ Morocco is also a country which has contributed to shark research on a less regular basis with only a few publications overall, the

⁷⁹⁶ GFCM geographical subareas (GSAs) are shown in Figure 2, Chapter One, Section 1.2.4.1.

⁷⁹⁷ S Ranzi, 'Le Basi Fisio-Morfologiche Dello Sviluppo Embrionale Dei Selaci' [1932] Pubblicazioni della Stazione Zoologica di Napoli.

⁷⁹⁸ LA. Al-Hassan and AM Busneina, 'Regional Variations of Centra in the Vertebral Column of Two Cartilaginous Fishes from Libyan Coastal Waters' [1999] *Oebalia* 111.

⁷⁹⁹ Thomas Pawellek and others, 'Discovery of an Earliest Pliocene Relic Tropical Fish Fauna in a Newly Detected Cliff Section (Sabratih Basin, NW Libya)' (2012) 266 *Neues Jahrbuch für Geologie und Paläontologie-Abhandlungen* 93.

⁸⁰⁰ F Daoudi and others, 'New Species of Coccidia Apicomplexa Eimeriidae of the Genera Eimeria Schneider 1875 and Epieimeria Dykova and Lom 1981 Parasitizing Marine Fishes From The Kotor Bay Yugoslavia' (1987) Section A *Bulletin du Museum National d'Histoire Naturelle*.

⁸⁰¹ Ilija Četković and others, 'Morphometric Measurements of Newborn Blue Shark *Prionace glauca* (Linnaeus, 1758) and Characteristics of Its Potential Parturition Areas in Coastal Waters of Montenegro (Southeastern Adriatic)' (2019) 60 *Acta Adriatica* 61.

first being in 1972,⁸⁰² then 1999,⁸⁰³ 2004,⁸⁰⁴ 2005,⁸⁰⁵ and 2017.⁸⁰⁶ There were no further publications found with Moroccan participation until the end of this assessment (2020).

Table 5. Publication output including first and most recent publication on sharks, as well as the overall number of publications in the assessment period (1932-2020).

Country	1 st publication	Most recent publication	Years since 1 st publication
Italy	1932	2020	88
France	1951	2020	69
Israel	1955	2020	65
Croatia	1961	2020	59
Tunisia	1966	2020	54
Morocco	1972	2017	48
Spain	1973	2020	47
Egypt	1974	2020	46
Greece	1974	2020	46
Montenegro	1987	2020	33
Slovenia	1991	2020	29
Algeria	1998	2020	22
Turkey	1998	2020	22
Libya	1999	2020	21
Malta	2003	2020	17
Monaco	2006	2006	14
Syria	2010	2020	10
Bosnia and Herzegovina	2012	2020	8
Lebanon	2016	2020	4
Albania	2017	2020	3
Cyprus	2017	2020	3
Palestine	2018	2020	2

⁸⁰² J Collignon and H Aloncle, 'Descriptive Catalogue of Fishes in Moroccan Seas. Part 1: Cyclostomata, Selachii, Holocephali' [1972] Bulletin de l'Institut des pêches maritimes du Maroc.

⁸⁰³ B Ouafae, C Françoise and R André, 'On the Morphological Variability of the Attachment Organ of Lernaepodidae (Copepoda: Siphonostomatoida)' (1999) 46 Folia Parasitol 65.

⁸⁰⁴ A Srour and N Abid, 'Prises Accessoires Dans La Peche de l'espardon Pris Au FMD Dans La Côte Méditerranéenne Du Maroc' [2004] Collective Volume of Scientific Papers, ICCAT.

⁸⁰⁵ Sergi Tudela and others, 'Driftnet Fishing and Biodiversity Conservation: The Case Study of the Large-Scale Moroccan Driftnet Fleet Operating in the Alboran Sea (SW Mediterranean)' (2005) 121 Biological Conservation 65 <<https://linkinghub.elsevier.com/retrieve/pii/S0006320704001673>>.

⁸⁰⁶ Alessia Cariani and others, 'Improving the Conservation of Mediterranean Chondrichthyans: The ELASMOMED DNA Barcode Reference Library' (2017) 12 PLoS ONE 1.

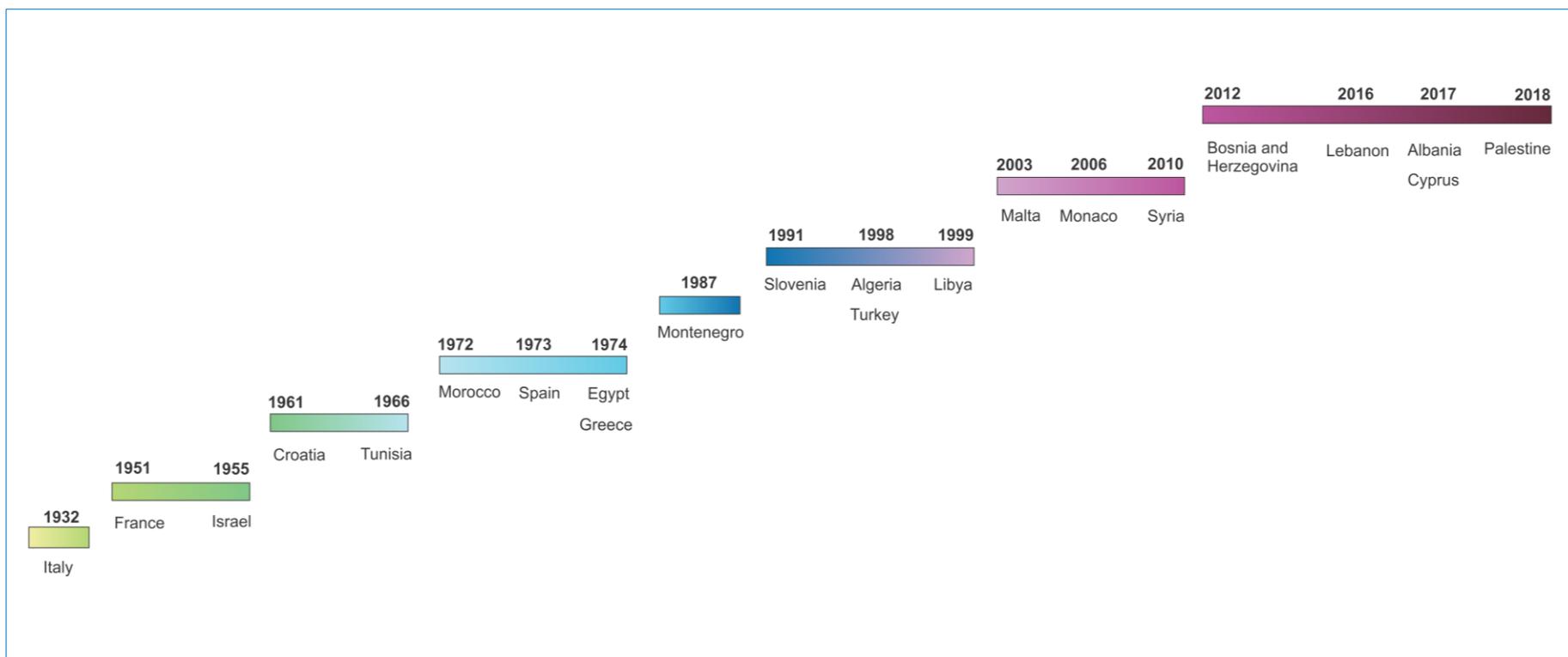


Figure 14. Timeline indicating when shark related publications emerged from Mediterranean countries.

An additional consideration of the analysis was the source of funding. To answer the question of who funds research on sharks in the Mediterranean, funding information, as stated in publications, was categorised as outlined in Chapter Two (Section 2.4.5). However, information on funding sources was only available for a small percentage of publications (29.0 %). Government funding supported 171 publications, followed by research grants (161 publications) and funding received from the EU (111 publications). Thirty-two publications received funding from philanthropic sources and two from companies. While this analysis does not provide enough evidence to make definite conclusions, it is a valuable consideration for future publication analysis, as it can quantify available budgets.

In summary, the evaluation of individual research contributions has shown that each country has their own national set up supporting shark science, with differences in the number of institutes involved, and the overall research output. A detailed overview of all institutes engaged in shark research and their individual contribution can be found in Annex 1, Table 6; and national increase in research publications can be found in Annex 1, Figure 2. This is noting that such output may have been influenced by other factors than the number of institute present, such as available resources, as the difference between countries was less prominent when standardising research effort. Additional factors that may also had an impact on national shark research were investigated in the following sections.

[4.1.2 Research trends and foci](#)

There is a considerable amount of information stored in publications that can be extracted to understand shark research across the region. This section examines the overall trends of shark science in the Mediterranean over time, and how this relates to the development of

international law on sharks. This also includes the analysis of topics covered, applied methods, and data sources.

The overall increase in research over time was assessed by grouping publications by decade. A Kruskal-Wallis H test was applied to test for difference in shark research published per decade. The test results, as shown in Figure 15, demonstrated a statistically significant difference in publications between periods ($H(5) = 49.117, p < .000$),⁸⁰⁷ meaning that shark science has gained traction in the region over time. The analysis revealed a growing research output in the period 1971-1980, which remained relatively static until a steep increase in the period after 2000.

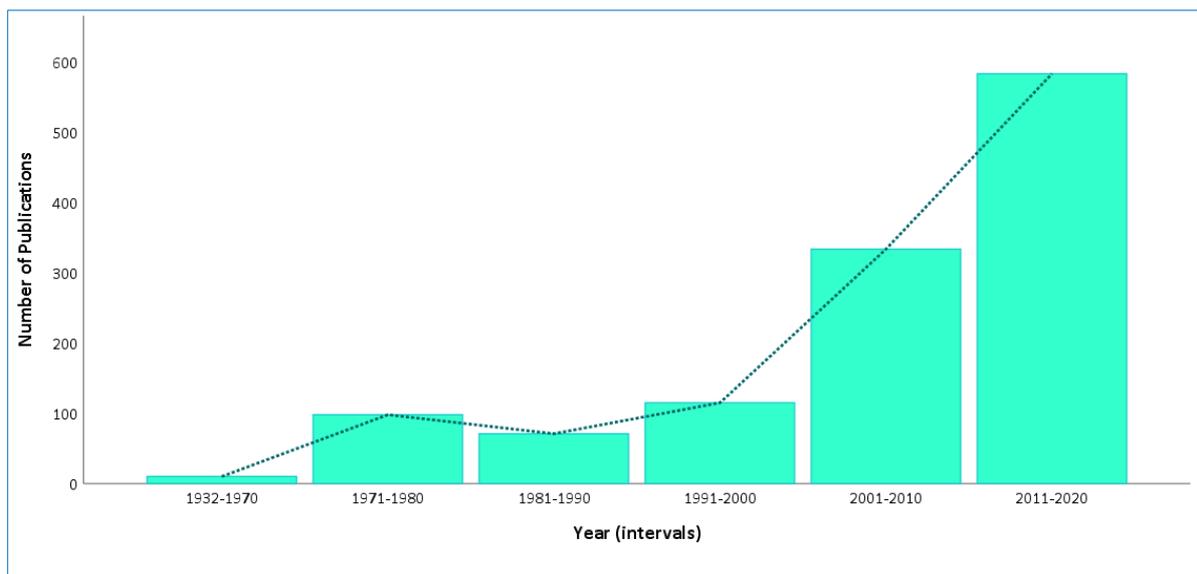


Figure 15. Bar chart of number of shark publications by decade.

To map this trend against legal developments that not only oblige countries to invest in research but also stipulate a shark-specific focus of such research and gaps in knowledge that need to be filled to advance further conservation actions, a timeline with the most

⁸⁰⁷ Mean ranks for each group were: 5.06 for the period of 1932-1970; 26.10 for the period 1971-1980; 20.35 for 1981-1990; 27.60 for 1991-2000; 45.20 for 2001-2010; and 53.20 for the time between 2011 and 2020

relevant legal developments was constructed (Figure 16).⁸⁰⁸ The graph indicates that such instruments could potentially have instigated the increase in shark science.

In short, after the Stockholm Conference in 1972,⁸⁰⁹ there was a noticeable increase in shark related publications in the region, and the sharp increase post 2000 maps against two legal developments: the 1995 SPA/BD Protocol,⁸¹⁰ and the 1999 IPOA Sharks.⁸¹¹ Interestingly however, the regional and EU action plan do not seem to have led to any corresponding increase in shark research output. Whether this is related to the fact that action plans do not create direct legal obligations, or merely reflect actions based on existing knowledge, is further discussed in Section 4.3. The increase since 2012 runs in parallel with the Recommendation GFCM/36/2012/3, which focused on these vulnerable species to support the implementation of conservation efforts established through the SPA/BD Protocol.⁸¹² Additional to the legal instruments identified in Figure 16, two other considerations are the initiation of shark listings on appendices of the CMS and CITES in 1999 and 2003 respectively,⁸¹³ after which some increase in publications was noticeable, although this trend was reversed after 2005. A strong increase in publications since 2017, may be directly related to the fact that, at this point, all Mediterranean countries were engaged in this field of research (see Figure 14 above).

⁸⁰⁸ Legal instruments are described in Chapter One, Section 1.2.

⁸⁰⁹ See Chapter One, Section 1.2 for details.

⁸¹⁰ The Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (n 333).

⁸¹¹ International Plan of Action for the Conservation and Management of Sharks (n 13).

⁸¹² Recommendation GFCM/36/2012/3 on fisheries management measures for conservation of sharks and rays in the GFCM area (2012).

⁸¹³ The whale shark (*Rhincodon typus*) was listed on Appendix II of the CMS in 1999; CITES listed the basking shark (*Cetorhinus maximus*), white shark (*Carcharodon carcharias*), the porbeagle shark (*Lamna nasus*), and the scalloped hammerhead (*Sphyrna lewini*) on Appendix III in 2000, and in 2003 started to list sharks on Appendix II (basking shark and whale shark).

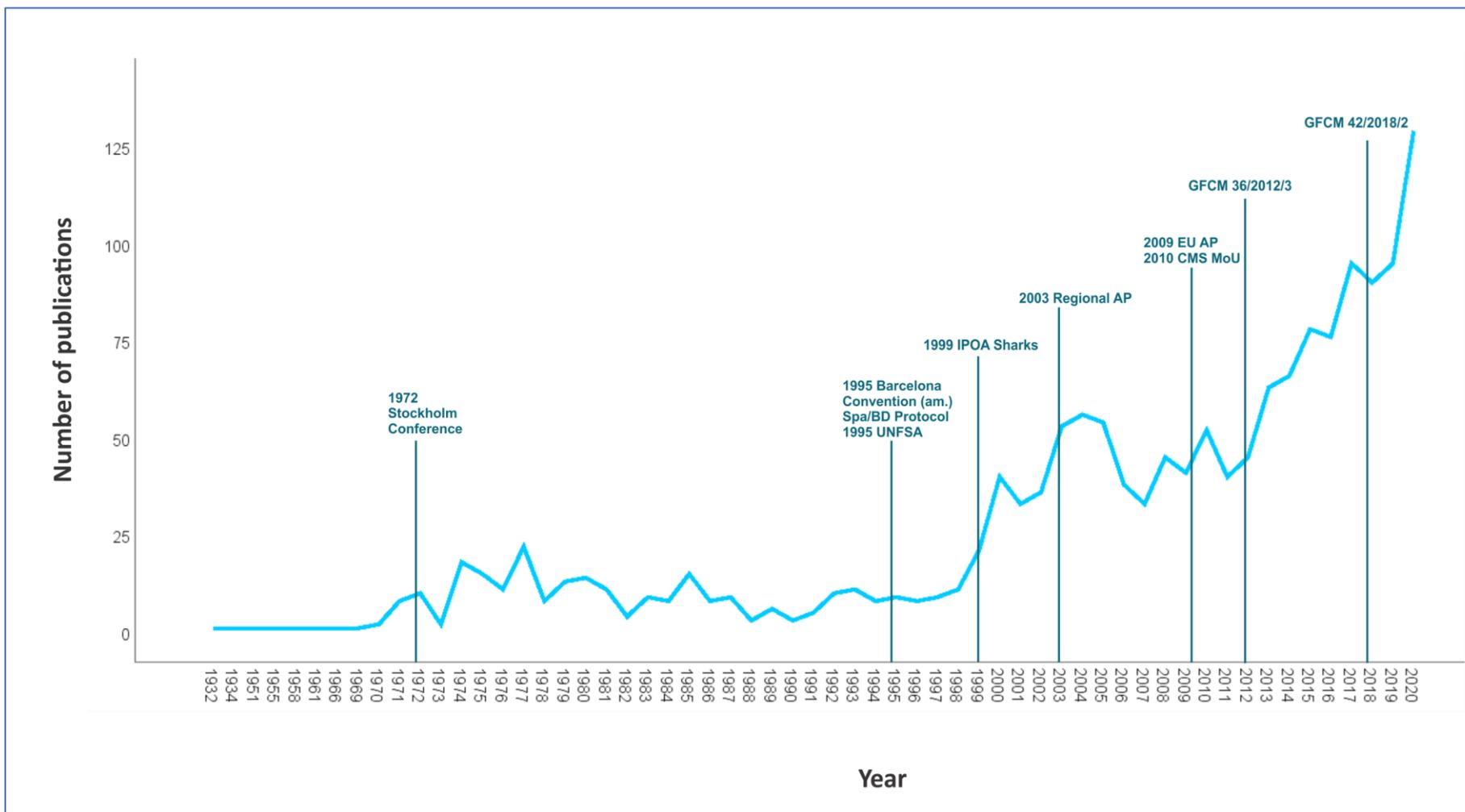


Figure 16. Trend of shark publications between 1932 to 2020 in relation to relevant legal developments.

A closer look at the focus of research in the Mediterranean was taken by analysing the composition of topics addressed (Table 6). By far the most publications dealt with information on the ecology and biology of shark species (76.2 %), which was also the most diverse topic in terms of composition of subcategories, as shown in Figure 17.

Table 6. Number of publications by topic.

Topic	Number of publications	%
Ecology & biology	923	76.2
Fisheries	120	9.9
Contamination & pollution	54	4.5
Taxonomy & morphology	46	3.8
Other	27	2.2
Conservation & management measures	26	2.1
Shark product trade & meat consumption	6	0.5
Humans & sharks	4	0.3
Legal & policy research	4	0.3
Tourism	2	0.2
Total	1212	100.0

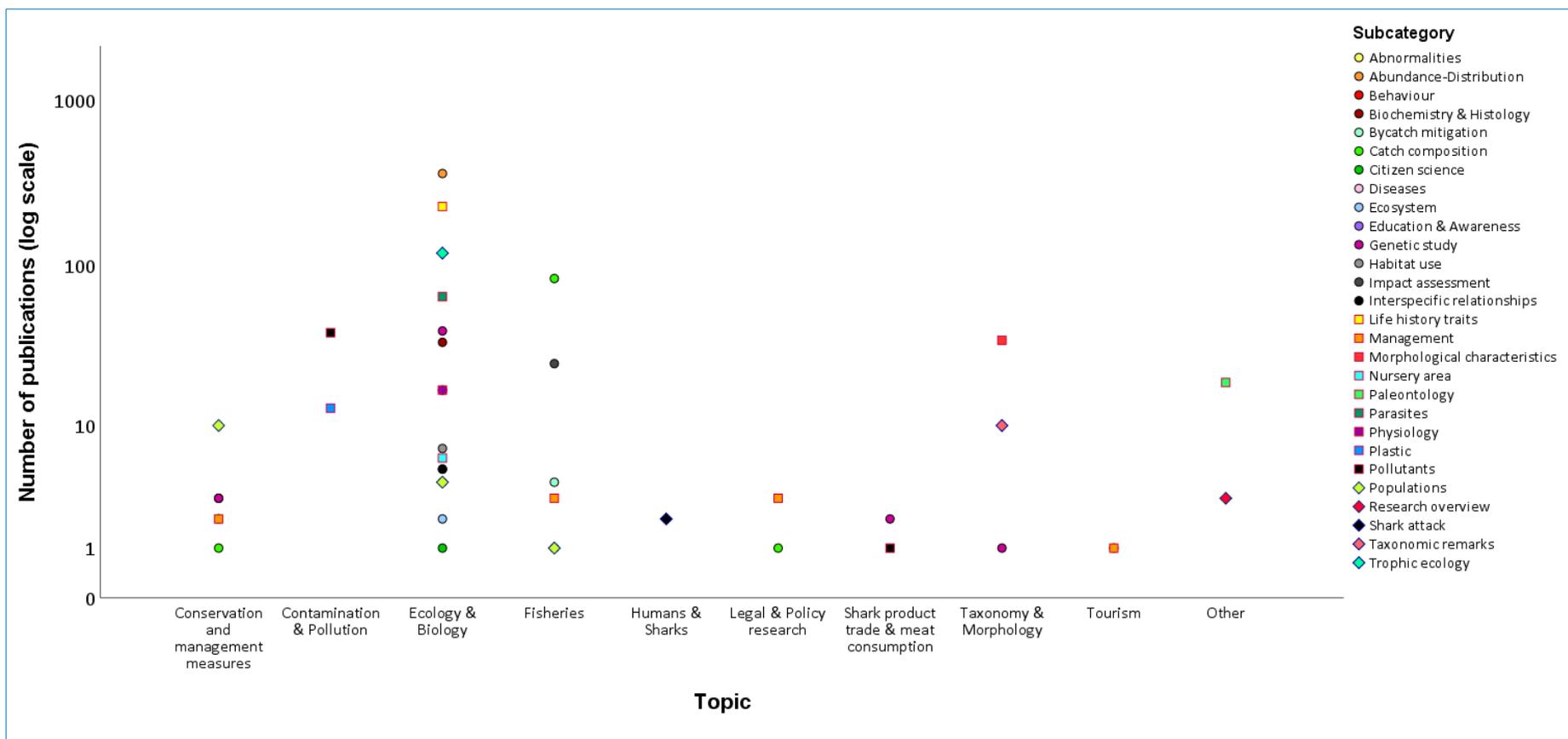


Figure 17. Topic composition by subtopic of research.

The main contribution to ecology research, with 365 publications, related to the abundance and distribution of species. This was followed by life history traits (age, growth, maturity) with 230 publications, and trophic ecology (the role a species has in the food web and the diet of species) with 120 publications. A substantial part of this research also dealt with the occurrence and diversity of parasites found in sharks (65). To a lesser extent, shark research has investigated critical and important shark areas in the Mediterranean, such as nursery areas, breeding sites, and feeding grounds. Examples include the 2003 published study on the occurrence of neonatal and juvenile sandbar sharks (*Carcharhinus plumbeus*) in the Adriatic;⁸¹⁴ the 2015 investigation on the critical areas for giant devil rays (*Mobula mobular*),⁸¹⁵ and confirmation of the Gulf of Gabés (Tunisia) nursery area;⁸¹⁶ a study on deep-sea nursery areas for small spotted catsharks (*Scyliorhinus canicula*) in 2017;⁸¹⁷ two studies in 2018, one on essential fish habitats associate with cold-water corals and deep sea canons,⁸¹⁸ and one on critical habitats for threatened guitarfishes (*Rhinobatos* spp.);⁸¹⁹ and a study in 2020 in coastal breeding sites in Lebanon for threatened shark species.⁸²⁰

⁸¹⁴ M Costantini and M Affronte, 'Neonatal and Juvenile Sandbar Sharks in the Northern Adriatic Sea' (2003) 62 Journal of Fish Biology 740 <<http://doi.wiley.com/10.1046/j.1095-8649.2003.00045.x>>.

⁸¹⁵ Giuseppe Notarbartolo di Sciara and others, 'The Devil We Don't Know: Investigating Habitat and Abundance of Endangered Giant Devil Rays in the North-Western Mediterranean Sea' (2015) 10 PLOS ONE e0141189 <<https://dx.plos.org/10.1371/journal.pone.0141189>>.

⁸¹⁶ S Enajjar, B Saidi and MN Bradai, 'The Gulf of Gabes (Central Mediterranean Sea): A Nursery Area for Sharks and Batoids (Chondrichthyes: Elasmobranchii)' (2015) 56 Cahiers de Biologie Marine 143.

⁸¹⁷ Alessandro Cau and others, 'Leiopathes Glaberrima Millennial Forest from SW Sardinia as Nursery Ground for the Small Spotted Catshark *Scyliorhinus Canicula*' (2017) 27 Aquatic Conservation: Marine and Freshwater Ecosystems 731 <<https://onlinelibrary.wiley.com/doi/10.1002/aqc.2717>>.

⁸¹⁸ Francesca Capezzuto and others, 'Cold-Water Coral Habitats and Canyons as Essential Fish Habitats in the Southern Adriatic and Northern Ionian Sea (Central Mediterranean)' (2018) 29 Ecological Questions 9 <<http://apcz.umk.pl/czasopisma/index.php/EQ/article/view/EQ.2018.019>>.

⁸¹⁹ Ioannis Giovos and others, 'Using Unconventional Sources of Information for Identifying Critical Areas for the Endangered Guitarfish in Greece' (2018) 24 J. Black Sea/Mediterranean Environment 38 <<https://blackmeditjournal.org/volumes-archive/vol24-2018/vol-24-2018-no-1/using-unconventional-sources-of-information-for-identifying-critical-areas-for-the-endangered-guitarfish-in-greece-2/>>.

⁸²⁰ Shahar Chaikin, Jonathan Belmaker and Adi Barash, 'Coastal Breeding Aggregations of Threatened Stingrays and Guitarfish in the Levant' (2020) 30 Aquatic Conservation: Marine and Freshwater Ecosystems 1160 <<https://onlinelibrary.wiley.com/doi/10.1002/aqc.3305>>.

As Figure 18 demonstrates, the topic of ecology and biology has been an integral part of shark research in the Mediterranean since the start of this research field and continued to witness growth. The second most popular topic of shark research focused on fisheries-related research (9.9 %), which primarily dealt with catch compositions and the impact of fishing on sharks. An increasingly popular area of research, since the 1980s, which coincides with emerging evidence on pollutants in the marine environment⁸²¹ and the international legal community realising the need to manage persistent organic pollutants in the environment,⁸²² was research on such pollutants and other contaminants in sharks.⁸²³ In recent years, this field has also included research on contamination of species with plastic (13 publications).⁸²⁴ Another fundamental part of research on sharks considered their taxonomy and morphology, which has been a continuous topic of publications since the 1960s, accounting for 3.8 % of assessed publications.

Some publications present historic records (palaeontology) on sharks or provide an overview of the state of knowledge in certain areas ('others' 2.2 %; Table 6, above). Only 0.5 % of the publications analysed focused on research related to the trade and consumption of shark meat. This research was initiated in 2000 in the Mediterranean,

⁸²¹ Shannon Mala Bard, 'Global Transport of Anthropogenic Contaminants and the Consequences for the Arctic Marine Ecosystem' (1999) 38 *Marine Pollution Bulletin* 356 <<https://linkinghub.elsevier.com/retrieve/pii/S0025326X99000417>>.

⁸²² For example, through the Stockholm Convention on Persistent Organic Pollutants (May 22, 2001) 2256 UNTS 119, 40 ILM 532 (2001)

⁸²³ Simonetta Corsolini and others, 'Congener Profile and Toxicity Assessment of Polychlorinated Biphenyls in Dolphins, Sharks and Tuna Collected from Italian Coastal Waters' (1995) 40 *Marine Environmental Research* 33 <<https://linkinghub.elsevier.com/retrieve/pii/0141113694000038>>.

⁸²⁴ Ilaria Bernardini and others, 'First Data on Plastic Ingestion by Blue Sharks (*Prionace glauca*) from the Ligurian Sea (North-Western Mediterranean Sea)' (2018) 135 *Marine Pollution Bulletin* 303 <<https://doi.org/10.1016/j.marpolbul.2018.07.022>>.

probably in response to the CITES listing of sharks in that year, with one publication,⁸²⁵ followed by more since 2010. One of the topics most pertinent to this work, conservation and management, started to become relevant in the Mediterranean in the same year (2000),⁸²⁶ and has increased in recent years, but still constituted only 2.1 % of total publications (Table 6, above). This research focused mainly on populations assessments, although genetic tools that provide management options and catch-related management were also included in this research (Figure 17, above). Very little research, and only in recent years, has been conducted on aspects of law and policy, with only four publications in total. This included, for example, aspects of national policy development⁸²⁷ and the effectiveness of applied policies.⁸²⁸ Shark-specific tourism, which is not an established economic sector in relation to sharks in the Mediterranean, was the focus of two publications in 2019, both dealing with the potential of tourism in Israel, where sharks aggregate near a power station. One of the shark tourism publications focused on emerging challenges,⁸²⁹ and the other on opportunities around emerging tourism.⁸³⁰ An aspect that also seemed of little research interest, or is potentially something that rarely occurs, was attacks on humans, covered in

⁸²⁵ E Bartfai and others, 'Etude de l'effet Génotoxique Des Huiles Hépatiques Brutes de Trois Espèces de Requins Méditerranéens Par Application Du Test de Numération Des Micronoyaux Dans Les Lymphocytes T Humains' (2000) 58 *Annales de Biologie Clinique* 595.

⁸²⁶ M Vacchi and N di Sciara, 'The Cartilaginous Fishes in Italian Seas, a Resource That Urges to Be Protected' (2000) 1 *Biologia marina mediterranea* 296.

⁸²⁷ Öztürk (n 679).

⁸²⁸ J Santana-Garcon, S Fordham and S Fowler, 'Blue Shark *Prionace Glauca* Fin-to-Carcass-Mass Ratios in Spain and Implications for Finning Ban Enforcement' (2012) 80 *Journal of Fish Biology* 1895 <<https://onlinelibrary.wiley.com/doi/10.1111/j.1095-8649.2012.03233.x>>.

⁸²⁹ Ziv Zemah Shamir and others, 'Evidence of the Impacts of Emerging Shark Tourism in the Mediterranean' (2019) 178 *Ocean and Coastal Management* 104847 <<https://doi.org/10.1016/j.ocecoaman.2019.104847>>.

⁸³⁰ Z Zemah Shamir and others, 'Shark Aggregation and Tourism: Opportunities and Challenges of an Emerging Phenomenon' (2019) 26 *International Journal of Sustainable Development & World Ecology* 406 <<https://doi.org/10.1080/13504509.2019.1573769>>.

just two publications, both originating from Turkey based on shark attacks on divers,⁸³¹ and historical and contemporary attacks on fishing boats.⁸³²

The assessment of research themes demonstrated there is a broad understanding of different aspects of the biology and ecology of species, which is also the most diverse category of knowledge. Another aspect in shark science that seems to be well understood, is the impact of fishing on these species. This entailed collecting information on fisheries discards,⁸³³ the identification of ecological impacts on the marine ecosystem,⁸³⁴ the effect of long-term commercial fishing pressure on sharks,⁸³⁵ but also the impact of recreational fishing on these species.⁸³⁶ To a lesser extent, but increasing in recent years, fisheries research investigated the application of bycatch mitigation methods.⁸³⁷ This research can drive and support future management. Whether research on bycatch mitigation has yet led to measures being applied, was assessed in Chapter Five under 'implementation effort'. The assessment of topics covered by shark science in the region identified research gaps and needs, as discussed in Section 4.3.

⁸³¹ Deniz Erguden, Deniz Ayas and Hakan Kabasakal, 'Provoked Non-Fatal Attacks to Divers by Sandbar Shark, *Carcharhinus Plumbeus* (Carcharhiniformes: Carcharhinidae), Off Taşucu Coast (NE Mediterranean Sea, Turkey)' (2020) 30 *Annales, Series Historia Naturalis* 1.

⁸³² Hakan Kabasakal and Sait Özgür Gedikoglu, 'Shark Attacks against Humans and Boats in Turkey's Waters in the Twentieth Century' (2015) 2 *Annals for Istrian and Mediterranean Studies Series Historia et Sociologia*.

⁸³³ A Machias and others, 'Bottom Trawl Discards in the Northeastern Mediterranean Sea' (2001) 53 *Fisheries Research* 181 <<https://linkinghub.elsevier.com/retrieve/pii/S0165783600002988>>.

⁸³⁴ Ferretti and others, 'Loss of Large Predatory Sharks from the Mediterranean Sea' (n 730).

⁸³⁵ Alberto Barausse and others, 'The Role of Fisheries and the Environment in Driving the Decline of Elasmobranchs in the Northern Adriatic Sea' (2014) 71 *ICES Journal of Marine Science* 1593 <<https://sk.sagepub.com/reference/environment/n678.xml>>.

⁸³⁶ J Lloret and others, 'Recreational and Small-Scale Fisheries May Pose a Threat to Vulnerable Species in Coastal and Offshore Waters of the Western Mediterranean' (2020) 77 *ICES Journal of Marine Science* 2255 <<https://academic.oup.com/icesjms/article/77/6/2255/5486184>>.

⁸³⁷ Jure Brčić and others, 'Selective Characteristics of a Shark-Excluding Grid Device in a Mediterranean Trawl' (2015) 172 *Fisheries Research* 352 <<https://linkinghub.elsevier.com/retrieve/pii/S0165783615300448>>.

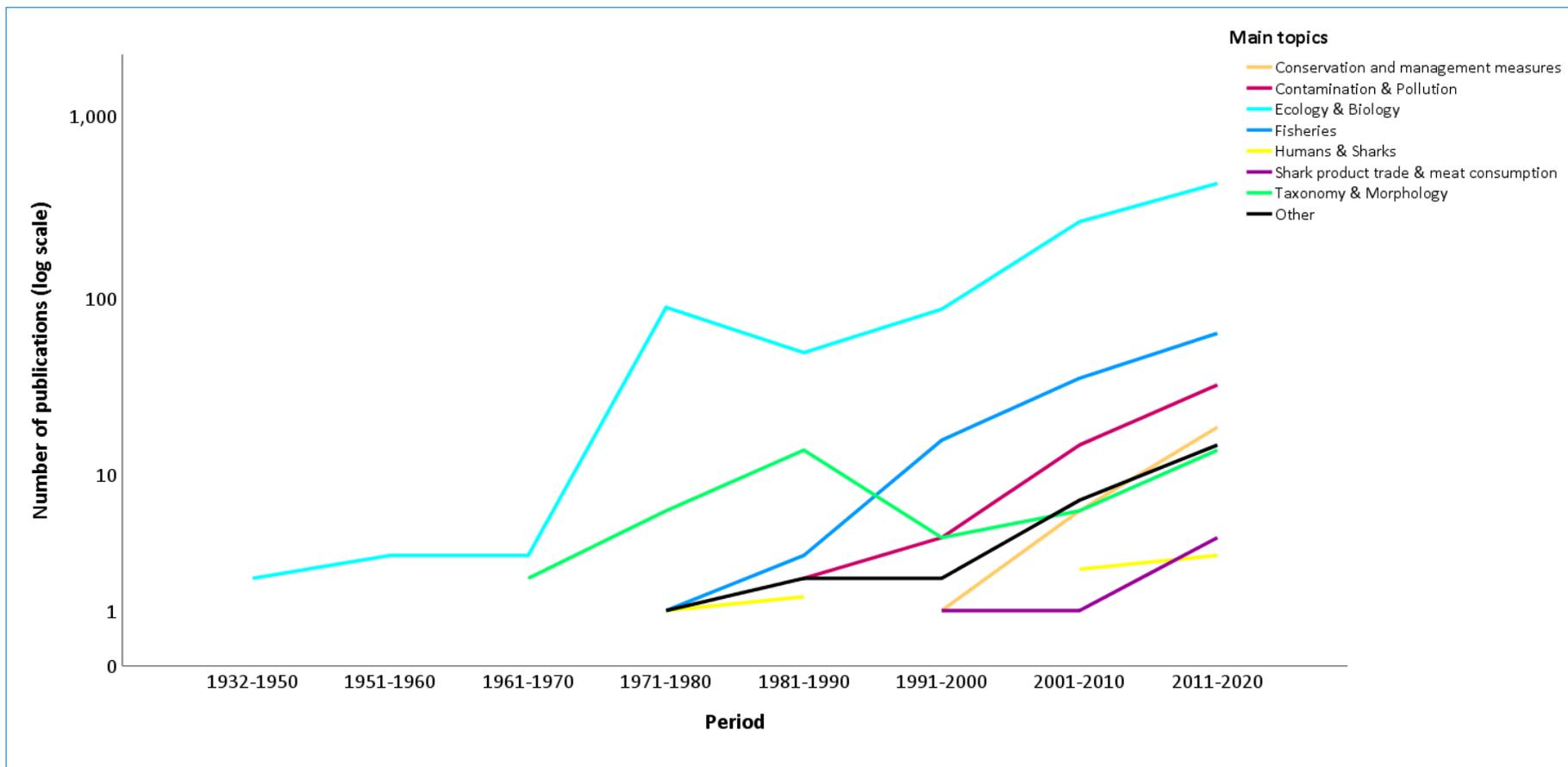


Figure 18. Published research topic distribution 1932-2020 (excluding legal/policy and tourism research, as there were only 4 and 2 respectively; all of which were published between 2011 and 2020).

The evaluation of research effort further explored the methods applied in shark research and from where the data was sourced. Each publication’s methodology was reviewed and categorised, as stipulated in the assessment strategy (Chapter Two). Methodology could be determined for the majority of publications, with only 243 publications (19.3 %) missing. In these cases, the methodology was either unclear or there was no copy of the publication available/retrievable, as it was either too old or inaccessible. For the remaining 80.7 %, the methods were classified into three major groups of which fisheries-dependent data formed the largest part and contributed to 50.5 % of the publications assessed. Fisheries-independent fishing methods were used in 25.9 % of the publications, and methods that did not rely on fishing *per se* (fisheries-independent) contributed to 24.4 %. These percentages include publications in which a combination of methods was used. An overview of the combination of data sources can be found in Table 7.

Table 7. Number of publications by data source type (including combinations of source types).

Method category	Number of publications
All source types	1
Fisheries dependent	472
Fisheries dependent and independent	32
Fisheries independent	164
Fisheries independent fishing	248
Fisheries independent fishing and Fisheries dependent	44
Fisheries independent fishing and Fisheries independent	8
Grand Total	969

The increase in research publications over past decades, was mirrored by an increase in the use of fisheries dependent methods. However, there was a clear trend that fisheries independent data sources were becoming more prominent and in the past two years and has almost caught up with the reliance on fisheries-dependent data (Figure 19). A closer look into the methods applied in shark research in the region revealed that from the

beginning commercial fishing has provided a source of information on sharks, while data retrieved from recreational fishing activities has only become relevant in the past two decades.

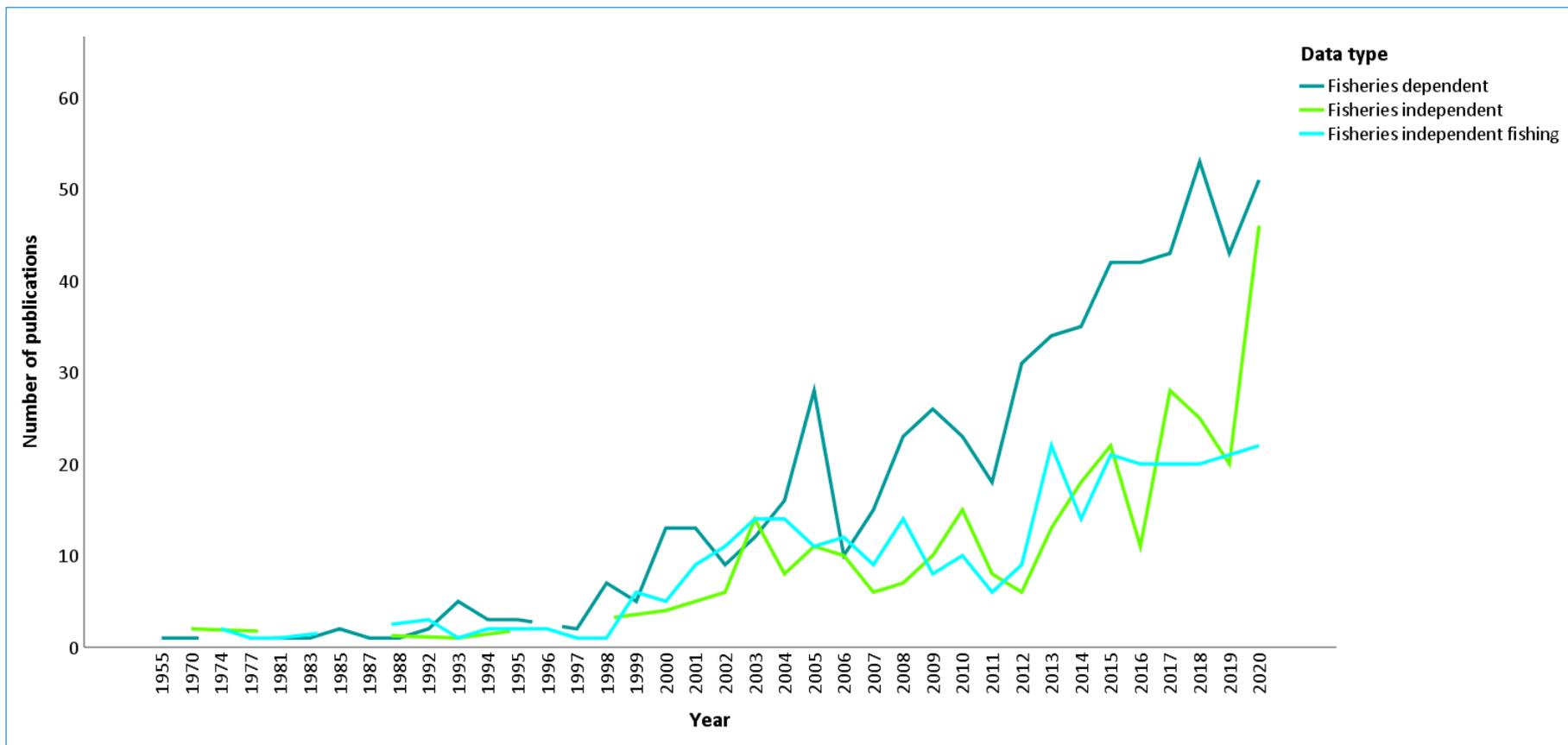


Figure 19. Data source trend 1955-2020.

Trawl surveys such as the Mediterranean-wide MEDTIS programme, have constituted another important source for scientific studies for almost thirty years.⁸³⁸ Other experimental surveys conducted to gather information on shark species, but which did not define the specific method applied, have formed part of data sources since the 1970s. More recently, only within the past two decades, alternative, non-lethal methods have become more relevant to shark research. Advanced survey techniques, such as the use of remotely operated underwater vehicles (ROVs) or baited remote underwater videos (BRUVs) are promising tools to monitor species in their habitat and gather information, without the obvious pressures caused by fishing.⁸³⁹ Furthermore, there was a trend in publications, which utilised social media platforms to collect information on the distribution of sharks,⁸⁴⁰ as well as through Citizen Science, which entails submission of sighting records through apps, for example.⁸⁴¹ As applied in this assessment, the use of existing databases, literature, interviews, and questionnaires remained a popular source of information over time, contributing to multiple publications (Table 8).

⁸³⁸ Maria Teresa Spedicato and others, 'The MEDITS Trawl Survey Specifications in an Ecosystem Approach to Fishery Management' (2020) 83 *Scientia Marina* 9
<<http://scientiamarina.revistas.csic.es/index.php/scientiamarina/article/view/1829>>.

⁸³⁹ Agusti Torres, Ana-Maria Abril and Eric EG Clua, 'A Time-Extended (24 h) Baited Remote Underwater Video (BRUV) for Monitoring Pelagic and Nocturnal Marine Species' (2020) 8 *Journal of Marine Science and Engineering* 208
<<https://www.mdpi.com/2077-1312/8/3/208>>.

⁸⁴⁰ Hakan Kabasakal and Murat BiLecenoğlu, 'Shark Infested Internet: An Analysis of Internet-Based Media Reports on Rare and Large Sharks of Turkey' (2020) 16 *Journal of Fish Taxonomy* 8.

⁸⁴¹ Naasan Aga Spyridopoulou and others (n 735).

Table 8. Data type and source methodology of publications assessed.

Data type	Source category	No.	First record	Most recent record
Fisheries dependent	Commercial trawling	230	1955	2020
	Commercial catches	168	1983	2020
	Commercial longline	87	1994	2020
	Commercial gill net	49	1998	2020
	Landings data	27	2003	2020
	Commercial trammel net	26	2004	2020
	Commercial purse seine	13	1988	2020
	Commercial drift net	5	1995	2011
	Recreational fishing	4	2001	2020
	Tuna trap/cage	4	2004	2015
Fisheries independent	Literature review	72	2002	2020
	Collection samples	30	2000	2020
	Database review	27	2000	2020
	Interviews/questionnaires	26	2004	2020
	Grey literature	20	2008	2020
	Fossil record	19	1970	2020
	Newspaper	19	2007	2020
	Photo/Video	18	2000	2020
	Sightings	12	2005	2020
	Social media	10	2010	2020
	Citizen Science	9	2017	2020
	Dive survey	9	2005	2020
	Stranding	7	2008	2020
	Aquarium experiment	5	2003	2020
	ROV	5	2010	2017
	BRUV	4	2003	2020
	Aerial survey	2	2014	2015
	Tagging	2	2003	2011
Fisheries independent fishing	Trawl survey	216	1993	2020
	Experimental survey	61	1974	2020
	Longline survey	18	2003	2020
	Gill net survey	10	2006	2020
	Trammel net survey	9	2003	2020

To answer the question how research has changed over time, the assessment demonstrated not only an increase in overall research effort, but shark science also increasingly addressed questions of conservation and management. The data source analysis showed that

opportunistic data collection through commercial fisheries and the use of landings data submitted by countries to the FAO continue to inform shark science in the Mediterranean. However, there was a noticeable change that non-lethal methods considerably contributed to shark science, which is a positive trend. Another positive aspect was that the public has been engaged to participate in shark research, which can create ownership and support for shark conservation.⁸⁴²

4.1.3 Species focus of Mediterranean shark research

To test for a relationship between the number of shark species present within national waters (as per IUCN species records) and the number of publications in which a country has been involved, a Spearman correlation test was conducted. The correlation test indicated a significant moderate positive relationship ($r(20) = .494$, $p = .019$) between the absolute number of publications a country has been involved in and species diversity within its waters (Figure 20). This means, the more species are present within a country's waters, the more research publications the country has produced.

Monaco and Egypt to the left of the graph have only a few species recorded in their waters and their involvement in the overall publications was low as well. In a lower range of overall publication involvement, but with more shark species present, were Malta, Palestine, Slovenia, Cyprus, Bosnia and Herzegovina, Syria, Lebanon, and Montenegro, and Albania. A spike in publication contribution with a higher number of sharks present, was Turkey. This trend was continued by France, Tunisia, and Spain with ultimately Italy showing the highest

⁸⁴² Bargnesi, Lucrezi and Ferretti (n 271).

number of publications and high species diversity. A few outliers to the right are countries with a high number of species present in their waters, but little publication contributions, namely Libya and Morocco, demonstrating that shark science at national level is probably less dependent on species and influenced by other factors, as indicated in previous chapters.

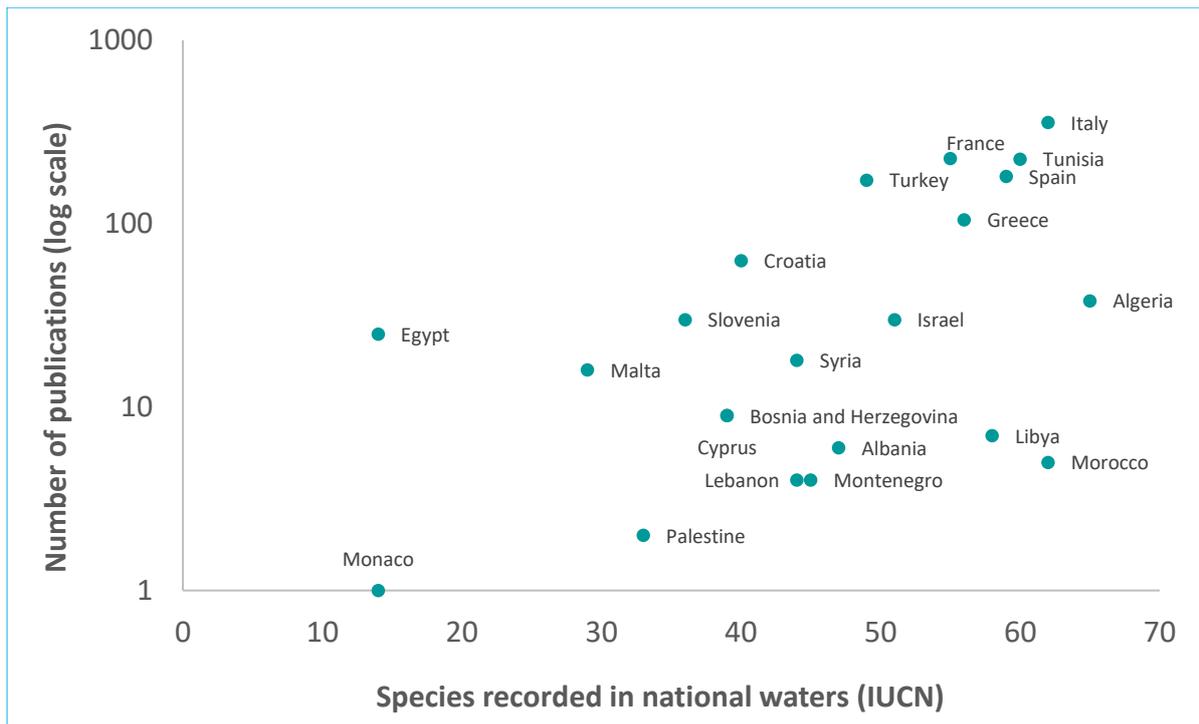


Figure 20. Number of publications a country was involved in against number of shark species present in national waters, as confirmed by the IUCN.⁸⁴³

In addition, the focus of research in terms of species' conservation status was also determined. Various legal instruments, such as the CMS, CITES, and the Barcelona Convention place threatened species as the primary focus, as shown in Chapter Three (Section 3.2.), and obligate Parties to gather information to underpin the development of actions to ensure their future existence (Annex 1, Table 4). The question was whether

⁸⁴³ The data point of Cyprus and Bosnia and Herzegovina overlap.

research provides a sufficient basis for necessary actions ensuring that those species most at risk both survive and thrive. To assess this, publications were classified into three groups, based on the IUCN Red List status as follows:⁸⁴⁴

- 0) Not Endangered (Least Concern, Data Deficient)
- 1) Near Threatened; and
- 2) Regionally Threatened (Vulnerable, Endangered, Critically Endangered).

If a publication applied to at least one species that belongs under the 'Regionally Threatened' category, then the entire measure was classified under category 2.

The results of the assessment showed that research provides a solid information basis for regionally threatened species, which were covered in 55.9 % of publications. Near Threatened species were the sole subject of 119 publications (9.8 %), while 327 publications focused solely on species that fall within the group of Not Endangered species (27.0 %). This is noting that publications classified under Near Threatened or Regionally Threatened could also include non-threatened species that would have been integrated under this category because at least one threatened species was subject of the research. Out of all publications, 89 (7.3 %) could either not be determined in their applicability to specific species or covered more generic topics that did not provide new information on a species-specific basis. A more detailed overview of publication by species and their individual status can be found in Annex 1, Table 7.

The species that appears in by far the most publications, was the small-spotted catshark (*Scyliorhinus canicula*), followed by other smaller species that are regularly caught by

⁸⁴⁴ Dulvy and others, 'The Conservation Status of Sharks, Rays, and Chimaeras in the Mediterranean Sea' (n 49).

trawling such as the blackmouth catshark (*Galeus melastomus*) and the thornback ray (*Raja clavata*).⁸⁴⁵ A larger species that appears a main subject of research is the blue shark (*Prionace glauca*) a species that is commercialised,⁸⁴⁶ and has become Critically Endangered in the Mediterranean.⁸⁴⁷ Less research was available on species that may have been abundant in the Mediterranean decades ago, but now are considered rare, such as sawfishes (*Pristis* spp.), and the blackchin guitarfish (*Glaucostegus cemiculus*).⁸⁴⁸ Overall, it appeared that four families account for the focus of the majority of research publications: Scyliorhinidae (2 species), Penchidae (2 species), Rajidae (16 species) and Carcharhinidae (10 species). Each of which has a different composition of the number of threatened species (Figure 21). This concludes the answer to which species are covered by research in the region.

⁸⁴⁵ Joan Moranta and others, 'Spatio-Temporal Variations in Deep-Sea Demersal Communities off the Balearic Islands (Western Mediterranean)' (2008) 71 *Journal of Marine Systems* 346 <<https://linkinghub.elsevier.com/retrieve/pii/S0924796307001972>>.

⁸⁴⁶ Barausse and others (n 835).

⁸⁴⁷ Dulvy and others, 'The Conservation Status of Sharks, Rays, and Chimaeras in the Mediterranean Sea' (n 49).

⁸⁴⁸ Meléndez and others (n 4).

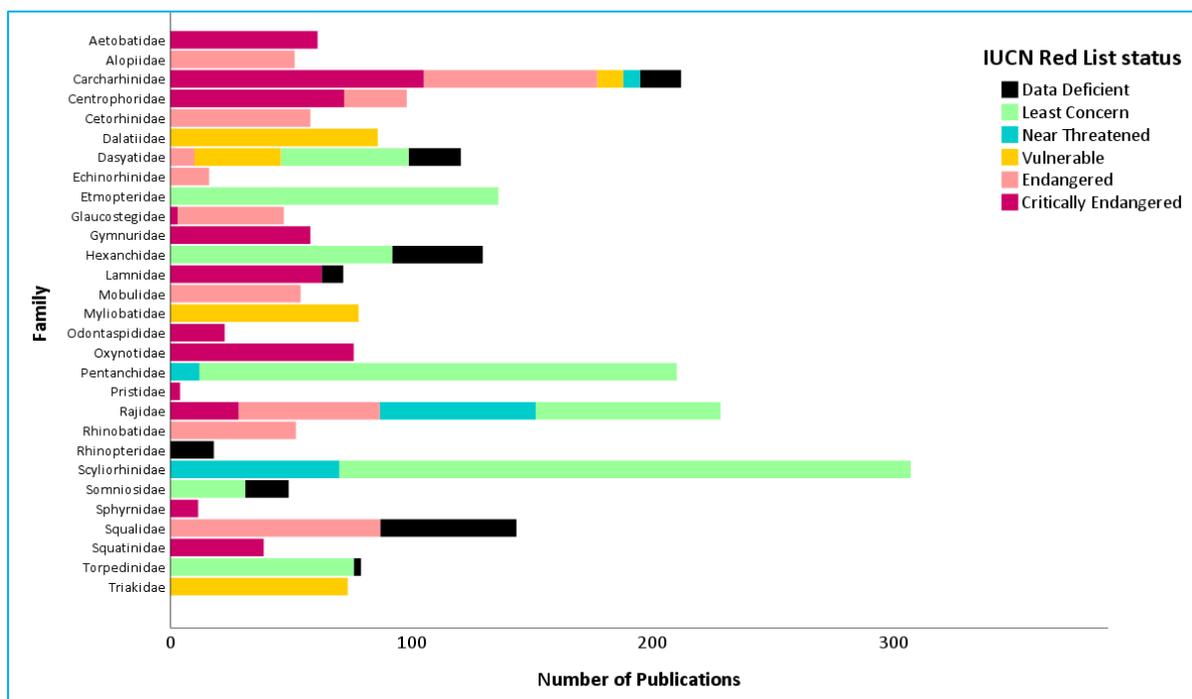


Figure 21. Number of publications by and composition of IUCN Red List status for species within the different shark families.

4.2 Research projects

Based on the survey questionnaires to regional experts and NGOs, data on ongoing research projects was collected.⁸⁴⁹ As defined in Chapter Two (Section 2.2.2), this included projects that solely focused on data collation to answer a specific research question, as opposed to projects with a wider conservation aim and multiple components, the latter were covered within the analysis of implementation effort (Chapter Five). Fourteen individual research projects were identified.⁸⁵⁰

An EU project called 'MedBlueSGen' was initiated in 2013 and completed two years later.⁸⁵¹

This project, which involved researchers from Italy, Greece, and Spain used generation

⁸⁴⁹ Questionnaire templates can be found in Annex 2.

⁸⁵⁰ This is noting the limitations indicated in Chapter Two, Section 2.4.6, that these may not be all research projects, as not all universities could be contacted,

⁸⁵¹ ICCAT, 'Report of the 2015 ICCAT Blue Shark Stock Assessment Session' (2015) <https://www.iccat.int/Documents/SCRS/DetRep/BSH_SA_ENG.PDF>.

sequencing to investigate population genetics of blue sharks (*Prionace glauca*) in the Mediterranean. In Spain, a project led by the Spanish NGO 'Associació LAMNA per a l'estudi dels elasmobranquis a la Comunitat Valenciana' focused on the determination of diet characteristics of five batoid species.⁸⁵² This project started in 2020 and was foreseen to continue until 2021. The same NGO also investigated metal pollutants in ray species from the MPA in l'Albufera. Two other projects being carried out in Spain by NGO CATSHARKS, are predominantly related to the role of sharks within the marine ecosystem (trophic ecology): one of these projects focused on a coastal ray species (*Raja polystigma*), the other more generally on the role of sharks and pelagic rays in the Western Mediterranean.

Research on trace elements and sharks' diets (*Prionace glauca*, *Carcharodon carcharias*, *Scyliorhinus canicula*, and *Hexanchus griseus*) was carried out by Centro Studi Squali, a shark specific research group that works at the Italian universities of Calabria and Siena (Italy). The same group also carries out research on parasite communities in sharks from Italian waters.

The spatial distribution of species is covered by three current projects, one carried out around the Balearics by Save the Med on aggregations of the stingray *Dasyatis pastinaca*; and one in Bosnia and Herzegovina on smooth hounds (*Mustelus sp.*) within Neum Bay; and the third on the occurrence of basking sharks (*Cetorhinus maximus*) based on plankton availability in the Gulf of Lion. Another interesting research project currently being conducted in Bosnia and Herzegovina, led by Sharklab Adria, assesses the level of micro- and nano- plastic in shark embryos. In Israel, the Morris Kahn Institute is developing new tracking technologies for sharks.

⁸⁵² *Dasyatis pastinaca*, *Myliobatis aquila*, *Torpedo torpedo*, *Torpedo marmorata*, *Aetomylaeus bovinus*

Research in relation to public attitude towards sharks included a global study over 2017-2018 in which researchers and NGOs from Greece, Cyprus, Italy, and France participated.⁸⁵³

A similar project was also conducted in Albania, which started in 2020 and run until 2021.

All of these projects further research on shark regionally and have the potential to inform future management, something that will be discussed in the next section.

4.3 Research gaps and needs

As mentioned in the introduction to this chapter, and demonstrated through the policy cycle, scientific research fulfils multiple roles in policy making. But, despite the need for science and reliance of policy decision on it, scientific information is not always made available to policy makers in a form that would facilitate its integration or transformation into management.⁸⁵⁴ The EU Action plan, published in 2009, specifically refers to:

“A gradual strategy to address sharks-related issues based on sound scientific evidence”.⁸⁵⁵

The assessment of research contribution at national level provides some interesting insights in the status of knowledge on sharks, and the relevance of research for shark governance. Spain, Tunisia, Turkey, and Italy took the lead in research studies on sharks, while also collaborating widely with other Mediterranean countries, although most studies were led by one country. Research output on sharks has been gradual, starting with the first validated record in 1932, and in terms of countries, Palestine, in 2018, being the last to contribute,

⁸⁵³ Ioannis Giovos and others, ‘Understanding the Public Attitude towards Sharks for Improving Their Conservation’ (2021) 134 *Marine Policy* 104811 <<https://linkinghub.elsevier.com/retrieve/pii/S0308597X2100422X>>.

⁸⁵⁴ Detlof von Winterfeldt, ‘Bridging the Gap between Science and Decision Making’ (2013) 110 *Proceedings of the National Academy of Sciences* 14055 <<https://pnas.org/doi/full/10.1073/pnas.1213532110>>.

⁸⁵⁵ European Commission, ‘European Community Action Plan for the Conservation and Management of Sharks’ (n 407).

therefore knowledge at national scale remains limited. Factors that may have influenced shark science progress nationally appeared to be the number of shark species present in national waters, although with a moderate correlation; but more so the number of institutes at national level that conduct shark-specific studies. Generally, each country has only a few institutes that contribute or have contributed to shark research on a regular basis and as may be expected, such research was spearheaded by research institutes and universities. Despite indicators of national political commitment to marine conservation and fisheries management, under instruments like action plans, the literature review indicated that governments have provided little funding to shark research, although this was limited to the assessment of a few publications where such information was available. In this context, it should also be noted that public research entities, which are leading most of the research, are usually publicly funded.

The question was whether legal obligations arising from different legal frameworks may have motivated this – the timeline of legal developments against the research output in the region, gives an indication this has been the case. Following the increase in environmental concerns in the 1970s where the focus of international law shifted towards environmental protection, scientists started to increase research efforts on marine species including sharks, as the trend line indicates (Figure 16, Section 4.1.2). An increase in shark research in the region seems directly linked to the adoption of the FAO's IPOA sharks,⁸⁵⁶ and thereafter may have been further influenced by additional capacity building and financial support, as sharks caught the attention of the international community at the end of the 1990s. Around the

⁸⁵⁶ Food and Agriculture Organisation of the United Nations, 'International Action Plan for the Conservation and Management of Sharks', vol 4 (1999) <<http://marefateadyan.nashriyat.ir/node/150>>.

same time CITES and CMS started to include sharks in their Appendices, a development that requires the support of scientific information on shark population status. The common basis for any Annex or Appendix listing of sharks is that the species fulfil set criteria. The proof for this relies on science as evidence, for example, a decline in species abundance. For scientific information to be generated, countries must invest and cooperate in research, as explained in Chapter Three, Section 3.2.4

The positive developments were, however, impacted by a soon Europe-wide economic crisis in 2005, following recession (2008-2009), and subsequent debt crisis, which reduced the available financial basis for developments, including research.⁸⁵⁷ This may accounted for the noticeable drop in publications from the countries assessed in this work within that timeframe as EU countries, throughout the assessed timeline, contributed to the majority of publications and thereby any impact on research funding in times of crisis would be reflected in the overall amount of published shark research.

The first shark-specific, legally binding GFCM Recommendation in 2012,⁸⁵⁸ may have acted as catalyst for a subsequent exponential increase in shark research outputs. Post 2012, shark science has gained traction and continued to increase. Other factors that may played a part in this include the programme under the regional action plan,⁸⁵⁹ and the increased presence of NGOs working on sharks.⁸⁶⁰ International developments in CITES and CMS

⁸⁵⁷ Kincsö Izsak and others, 'Impact of the Crisis on Research and Innovation Policies' [2013] Study for the European Commission DG Research by Technopolis Group Belgium and Idea Consult 1.

⁸⁵⁸ Recommendation GFCM/36/2012/3 (n 793).

⁸⁵⁹ 'Decision IG.21/6 Amendments to Annex II to the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean, UNEP (2013) UNEP(DEPI)/MED IG.21/9' (n 443).

⁸⁶⁰ For further information, see Chapter Six, Section 6.2.

listings, as explained above, may also have contributed to research increase, particularly since similar trends in shark science have been observed in other parts of the world.⁸⁶¹

Diving into the details of shark research in the Mediterranean region, indicated that fundamental research themes are ecology and biology focusing on, for example, the distribution of sharks, as well as taxonomy and morphology, but also fisheries research, which often reports the composition of landings. More recent themes included pollution impacts, as well as conservation and management. While MEDITS and other trawling data has certainly contributed to understanding and knowledge on elasmobranchs,⁸⁶² it also exercised additional pressure on the species, including death and dissection, especially for those that are considered 'rare' or 'protected'. A shift to non-lethal research methods was observed through this assessment, which is welcomed as necessary, particularly when researching vulnerable species, but it remains the case that there is reliance on more traditional data sources.⁸⁶³

Finally, the apparent research focus on threatened species may not in fact be a result of targeted, objective attention, but be a reflection of the fact more species have unfortunately reached this status.⁸⁶⁴ The focus on smaller species, including those families which mainly contain small, deep-sea sharks, was probably not a direct choice by

⁸⁶¹ Trisha Gupta and others, 'Shark and Ray Research in India Has Low Relevance to Their Conservation' (2022) 217 *Ocean and Coastal Management* 106004 <<https://doi.org/10.1016/j.ocecoaman.2021.106004>>.

⁸⁶² Spedicato and others (n 838).

⁸⁶³ Neil Hammerschlag and James Sulikowski, 'Killing for Conservation: The Need for Alternatives to Lethal Sampling of Apex Predatory Sharks' (2011) 14 *Endangered Species Research* 135 <<http://www.int-res.com/abstracts/esr/v14/n2/p135-140/>>.

⁸⁶⁴ Dulvy and others, 'The Conservation Status of Sharks, Rays, and Chimaeras in the Mediterranean Sea' (n 49).

researchers, but more related to the reliance on fisheries-data from trawling,⁸⁶⁵ and the fact of the disappearance of larger species.⁸⁶⁶

Current available scientific literature is limited on fisheries management in the context of shark conservation, including, for example, a few studies on management and bycatch mitigation. Simple occurrence records *per se*, although contributing to overall knowledge, are of little use for policy making if they do not indicate long-term use of areas that are determined as critical.⁸⁶⁷ Short term studies on fisheries catch composition and discards,⁸⁶⁸ although useful, need to be turned into applied measures. Another gap identified is the investigation on the effectiveness of new legislation and policies. Something that may be related to the countries' delayed response to create such instruments and related measures, as further investigated in Chapter Five.

In terms of the contribution of this assessment to the *status quo* of knowledge, the literature review identified 307 publications over the period 2014-2018. As such, it is more comprehensive than the one conducted prior to the 2019 Focal Point meeting, which stated that 164 papers concerning sharks were published in the same period.⁸⁶⁹ During the same meeting,⁸⁷⁰ RAC/SPA reviewed actions taken in relation to shark conservation under the regional action plan that was set up in 2003,⁸⁷¹ and concluded the need for further, time-

⁸⁶⁵ M Teresa Farriols and others, 'Bottom Trawl Impacts on Mediterranean Demersal Fish Diversity: Not so Obvious or Are We Too Late?' (2017) 137 *Continental Shelf Research* 84 <<https://linkinghub.elsevier.com/retrieve/pii/S027843431630437X>>.

⁸⁶⁶ Ferretti and others, 'Loss of Large Predatory Sharks from the Mediterranean Sea' (n 730).

⁸⁶⁷ Ward-Paige and others (n 183).

⁸⁶⁸ Machias and others (n 833).

⁸⁶⁹ Regional Activity Centre for Specially Protected Areas (SPA/RAC) (n 660).

⁸⁷⁰ Most recent in relation to this work's timeframe of data collection, which ended in 2020.

⁸⁷¹ UNEP, 'Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea' (n 55).

bound, well-defined conservation measures, noting that knowledge gaps remain.⁸⁷² This led to the conclusion of an updated action plan, which identified, among others, the following priorities:

“Identify critical habitats for their protection and restoration, especially mating areas, and spawning and nursery grounds.

Develop research programmes on general biology (feeding, reproduction, and growth parameters), taxonomy, ecology and population dynamics, with particular regard to genetic and migration studies”.⁸⁷³

Although research efforts have increased over time, it does not seem to be necessarily or promptly driven by internationally or regionally identified research gaps. For example, the 2003 regional action plan already stipulated an urgent need for research on critical habitats, yet the literature review showed that such important areas only make up a fraction of the research published with less than 10 publications on nursery areas and habitat use, as indicated above in Section 4.1.2. Thus, there exists a gap in the fundamental scientific bases for the protection of important habitats, as carried forward in the updated action plan, as per above.

In summary, whilst research in the Mediterranean has certainly increased over time, the focus remained the occurrence of species. Legal and policy research, as well as research assessing actual management, was very low. National contribution to knowledge appears unequal, with EU MS having greater output than non-EU countries. However, actual investment in research based on standardised publication effort revealed a different picture, with Tunisia clearly taking the lead, followed by Turkey, and Egypt. This shows that

⁸⁷² Regional Activity Centre for Specially Protected Areas (SPA/RAC) (n 660).

⁸⁷³ RAC/SPA (n 448).

although these countries generally have weaker economies, shark science contribution was substantial in relation to the availability of resources to conduct such research. However, the availability of financial resources based on GDP was not the only influencing factor, since it seems the more institutes at national level involved in shark research, the greater the national research output, a relationship also observed by Meo et al.⁸⁷⁴

The overall increase in shark science is unlikely to be solely a result of sharks becoming a general item of research interest, or the increasing amount of researchers focusing on sharks, or indeed as a result of the legal developments, and more likely to be a result of the intertwining of these aspects set within the economic landscape. Without going into the analysis of global politics, it is of note that milestones for environmental progress generally are made in times of prosperity, while economic concerns may win over environmental concerns in times of crisis. A fact, that has changed in recent years, as the international community has become more responsive to the principle that economy and environmental health go hand in hand.⁸⁷⁵

To answer one of the central questions in relation to the application of the policy cycle whether available science is 'sound enough' to inform regionally policies can now be answered. While shark research in the Mediterranean region certainly uncovered problems causing the decline of sharks in the regional, there is yet little direct advice from scientists in how to address these problems. Nevertheless, this field of research on management options

⁸⁷⁴ Sultan Ayoub Meo and others, 'Impact of GDP, Spending on R&D, Number of Universities and Scientific Journals on Research Publications among Asian Countries' (2013) 8 PLoS ONE e66449 <<https://dx.plos.org/10.1371/journal.pone.0066449>>.

⁸⁷⁵ Kyla Tienhaara, 'Varieties of Green Capitalism: Economy and Environment in the Wake of the Global Financial Crisis' (2014) 23 Environmental Politics 187 <<http://dx.doi.org/10.1080/09644016.2013.821828>>.

and policy evaluation seems to be growing, and although certain gaps continue to hinder conservation efforts, such as the lack of information on critical habitats, research is starting to pick up to help conservation progress. Whether this delay is reflected in the implementation of measures, is an aspect further investigated in the next chapter.

Chapter Five: Measures Implemented Nationally

This chapter presents the results of the assessment of nationally implemented actions contributing to shark governance, which aligns with the implementation stage of the shark policy cycle.⁸⁷⁶ As explained in Chapter One (Section 1.1.3), implementation effort evaluated all measures, summarised as ‘implemented measures’, and included applied measures stipulated by legal obligations (e.g., specific regulations), as well as ‘adopted actions’ by other key players, that also support the realisation of commitments made under international law and applicable policies. The methodology is explained in Chapter Two, Section 2.5.

The assessment of national effort to improve shark governance aimed to answer the following research questions:

1. What type of measures for shark governance exist?
2. What is the individual effort of countries to implement shark-specific and shark-relevant measures?
3. To what extent does implementation effort across countries differ?
4. Are there different types of measures for conservation and fisheries management?
5. What is the contribution of key actors in shark governance nationally and how involved are stakeholders?
6. Does science guide action, prioritising the most vulnerable species?
7. What are potential factors influencing national implementation effort?

This Chapter first provides an overview of the evaluated sources, before presenting specific examples of each type of identified measures. Following this is a general analysis of implemented measures at national level based on different categories, and potentially relevant factors. For this analysis, not all the identified measures were included. Measures

⁸⁷⁶ See Chapter One, Section 1.1.3

indicated as 'planned' and 'not implemented' were excluded from the analysis as implementation has not been initiated. However, they were listed in the database for completeness and to separately evaluate efforts that were either in planning or outstanding legal obligations requiring fulfilment. Measures considered 'under development' were included, as there was evidence that they have been initiated. For those categorised as 'unknown' it was assumed they are implemented (either being applied, were completed or under development), and therefore formed part of the analysis. The implementation status was determined through reported status and reported compliance with existing regulations, or the lack thereof.⁸⁷⁷ This also included updates on the implementation of measures submitted in the last Focal Point meeting of RAC/SPA.⁸⁷⁸ At the end of this chapter is a brief summary of those measures that were excluded from the analysis and additional considerations for actions taken that may improve the conservation status of sharks in the region.

5.1 Sourcing information on implementation effort

In terms of reports, focus was given to the most recent, although all available ones were reviewed for comprehensiveness. The most recent reports were assumed to have ongoing shark measures, even if they had been initiated prior to this assessment. Measures stated in publications were also considered if they could be subsequently validated. The different legal instruments and their reporting are indicated in Chapter Two, Section 2.5.⁸⁷⁹

⁸⁷⁷ The reports that were used for the analysis are listed in Chapter Two, Section 2.5.4.

⁸⁷⁸ Regional Activity Centre for Specially Protected Areas (SPA/RAC) (n 660).

⁸⁷⁹ A graphical overview of reporting obligation is shown in Chapter Three, Section 3.2.6.

A total of 264 national reports, as submitted by Mediterranean countries under CITES, CMS and CBD were reviewed. Additionally, national monitoring programmes and technical assessment reports under the MSFD were investigated, accessed for all EU MS.⁸⁸⁰ National reports for annual RFMO meetings reporting on implementation progress were also included, so were reports to STECF. A comprehensive list of reports that were used for this assessment is listed in Annex 1, Table 8.

Some general observations from the review include that reports often pointed to generic actions rather than explaining concrete measures. For example, countries often referred to the 'regulation of fisheries' but rarely provided details. Measures or actions related to fishing, especially in earlier reports, generically used the terms 'fish(es)' or 'marine fish(es)' but did not distinguish between bony and cartilaginous fishes (elasmobranchs). Within CMS reports, there are 'yes/no' questions with text boxes for explanatory detail, but in many cases, these were left blank. Furthermore, it was noted that CITES reports primarily focus on implementation and control structure, with limited information requested on additional trade measures.

For the survey, 21 NGOs were contacted, out of which 16 replied, as follows: Albania (2), Bosnia and Herzegovina (1), Cyprus (1), France (4 contacted, 3 replied), Greece (1), Israel (1), Italy (2 contacted, 1 replied), Libya (1), Malta (1), Spain (5 contacted, 3 replied), Turkey (2 contacted, 1 replied), and the World Wildlife Fund (WWF) Mediterranean Programme,

⁸⁸⁰ See Chapter Two, Section 2.5.4 for source references.

which operates in multiple countries regionally and replied generally to the survey questions.⁸⁸¹

Thirty-five independent experts from national research entities from 18 Mediterranean countries were contacted, of which 17 answered the survey questions: Algeria (1), Croatia (3 contacted, 1 replied), Cyprus (1), Egypt (4 contacted from 3 different institutes, 2 replied), France (2, no reply), Greece (1, no reply), Israel (1), Italy (4), Lebanon (2,1 replied), Malta (1, no reply), Montenegro (1), Morocco (1), Palestine (1, no reply), Slovenia (1, no reply), Syria (2, one reply), Tunisia (4 from 2 institutes, 2 from the same institute replied), Turkey (3, no reply). The extent of the response demonstrates a certain level of expertise through national experts and/or NGOs is generally present, (except for in Monaco), and in Egypt and Morocco this may be limited (the experts contacted had restricted experience on sharks *per se*).

In relation to government entities, relevant regulatory bodies within all countries were contacted, which included those responsible for both environmental protection and fisheries. From the 22 countries, replies from only seven were received, which for Malta included only the Environmental and Resources Authority, not the fisheries department. Other authorities that replied included those from Albania, Cyprus, Egypt, Israel, and Lebanon. The regulatory entity from Bosnia and Herzegovina did not complete the questionnaire, stating this was because it has a small coastline, marine area, and negligible fishing activity.

⁸⁸¹ Questionnaire templates are included in Annex 2.

5.2 A closer look into the variety of measures

Before comparing efforts across countries, this section takes a closer look into the type of measures applied at national level providing specific examples.⁸⁸² Based on the different types identified, as defined in Chapter Two, Section 2.5, four subsections explain: measures that evolved around the collection of data and involvement of the public; those aiming for species' conservation; those that have multiple components and consider both the protection of species and improving fisheries management; and measures only designed for fisheries management and related activities, such as subsequent marketing and trade of marine species, including sharks. Measures are ordered from basic activities to increase knowledge to stringent and enforceable regulations. Furthermore, specific reference is made in relation to the context of international obligations and commitments, as explained in Chapter Three, Section 3.2.

5.2.1 Information gathering initiatives

This section focused on actions taken to increase knowledge on shark nationally, which includes published guides, species inventories, applications collecting data, and established databases. These measures contribute to increasing knowledge at national level and thereby provide means of public engagement and education. Furthermore, centralised databases facilitate easier access to information for decision making.

⁸⁸² All measures, including details and sources are listed in the associated database. Measures are defined in Section 2.5.5. and legal obligations explained in Section 3.2.

5.2.1.1 Guides

A few countries have developed guides for different purposes. In 2018, Israel reported the publication of a national guide on regulations for fishers.⁸⁸³ In the same year, Algeria was in the process of creating a guide for enforcement officers to aid them with the identification of certain shark species (Family of Carcharhinidae).⁸⁸⁴ Similarly, Libya has produced an identification guide for shark species,⁸⁸⁵ so have Greece,⁸⁸⁶ Spain,⁸⁸⁷ and Malta.⁸⁸⁸ Spain has also developed guidelines on good, sustainable fishing practices to aid fisheries management.⁸⁸⁹ More generic guides on fishing resources have been published by Morocco⁸⁹⁰ and Italy.⁸⁹¹ Such guides provide a source of information and align legal obligations for capacity building, and education, as explained in Chapter Three, Sections 3.2.2 and 3.2.3.

5.2.1.2 Inventories

Inventories create a source of information on the presence of shark species and/or their habitats within national waters and can thus aid in the development of specific conservation measures. Legal obligation to generate such inventories stems from, *inter alia*, Article 3(3) of the Barcelona Convention,⁸⁹² which directly refers to the creation of inventories on

⁸⁸³ Ministry of Environmental Protection, 'Israel. 6th National Report for the Convention on Biological Diversity' (2019).

⁸⁸⁴ N Labidi-Neghli, 'Exploitation Des Requins En Algerie' (2018) 75 Collect. Vol. Sci. Pap. ICCAT 493 <https://www.iccat.int/Documents/CVSP/CV075_2018/n_3/CV075030493.pdf>.

⁸⁸⁵ GFCM, 'Report of the Eighteenth Session of the Scientific Advisory Committee on Fisheries, Nicosia, Cyprus, 21–23 March 2016' (n 681).

⁸⁸⁶ European Commission Directorate-General for Maritime Affairs and Fisheries (n 677).

⁸⁸⁷ Survey reply by SUBMON.

⁸⁸⁸ Ministry for the Environment, 'Malta. 6th National Report for the Convention on Biological Diversity' (2020).

⁸⁸⁹ CBD (n 685).

⁸⁹⁰ Gouvernement Marocain, 'Morocco. 6th National Report for the Convention on Biological Diversity' (2019).

⁸⁹¹ European Commission Directorate-General for Maritime Affairs and Fisheries (n 677).

⁸⁹² Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (n 54).

biological diversity for conservation and sustainable management.⁸⁹³ In the course of data collection, a number of such inventories were identified, some of which were still under development at the time of reporting.⁸⁹⁴

During the most recent RAC/SPA Focal Point meeting that reviewed the status of implementation of the regional action plan under the Barcelona Convention, four countries indicated that they were in the process of establishing a national inventory on important habitats for sharks, namely Algeria, Italy, Tunisia, and Turkey.⁸⁹⁵ General marine biodiversity inventories were established in multiple countries (Spain,⁸⁹⁶ Lebanon,⁸⁹⁷ Monaco,⁸⁹⁸ Tunisia,⁸⁹⁹ and Turkey⁹⁰⁰). Algeria reported a preliminary shark inventory in the 2016 ICCAT meeting and updated its marine species inventory in 2018.⁹⁰¹ In the same year, Bosnia and Herzegovina established its first marine species inventory, funded through an environmental protection fund.⁹⁰² Other inventories reporting specifically on sharks were identified in Syria with 49 species (although no species details were provided);⁹⁰³ Spain with 18 confirmed species recorded in its Mediterranean waters;⁹⁰⁴ Slovenia reporting 34 species;⁹⁰⁵ and Lebanon, which has updated its shark records to 25 species based on Lteif's

⁸⁹³ See also Chapter Three, Section 3.2.5

⁸⁹⁴ This refers to national reports analysed under various legal frameworks, as explained in Chapter Three, Section 3.2.6.

⁸⁹⁵ Regional Activity Centre for Specially Protected Areas (SPA/RAC) (n 660).

⁸⁹⁶ CBD (n 685).

⁸⁹⁷ Ministry of Environment, 'Lebanon. 6th National Report for the Convention on Biological Diversity' (2019).

⁸⁹⁸ Departement de l'Equipement de l'Environnement et de l'Urbanisme, '6e Rapport National de La Principauté De Monaco a La Convention de La Biodiversité 2014-2018' (2018).

⁸⁹⁹ Ministère des Affaires Locales et de l'Environnement, 'Sixième Rapport National Sur La Biodiversité En Tunisie' (2019).

⁹⁰⁰ General Directorate of Nature Conservation and National Parks under Ministry of Agriculture and Forestry, 'Republic of TURKEY. UN Convention on Biological Diversity Sixth National Report' (2019).

⁹⁰¹ ICCAT, 'Report for Biennial Period, 2020-21 PART I (2020) - Vol. 1', vol 1 (2021).

⁹⁰² Survey reply from Sharklab Adria.

⁹⁰³ Ministry of Environment, 'Syria. 5th National Report for the Convention on Biological Diversity' (2016).

⁹⁰⁴ CBD (n 685).

⁹⁰⁵ Slovenia, 'Ministry of the Environment and Spatial Planning of the Republic of Slovenia. Marine Environment Management Plan 2017-2021' (2017).

study conducted in 2015.⁹⁰⁶ Albania completed an inventory in 2013, which included 28 species of sharks.⁹⁰⁷ Morocco also reported an inventory for shark species but did not provide an exact species number.⁹⁰⁸ The Greek NGO, iSEA, produced an updated shark inventory in 2020.⁹⁰⁹

5.2.1.3 Applications

Applications, such as mobile phone-based apps or websites, have two main benefits. First, they offer a source of information on species and can directly involve the public or specific stakeholder in the collection of data. Besides that, apps are easily accessible on mobile phones, and thereby facilitate a quick and efficient means of data collection for species records, which subsequently can be validated through pictures. Examples for this approach, identified through the assessment, are ‘Seawatchers.net’⁹¹⁰ in Spain and the Shark Pulse Application developed at Stanford University (USA) and supported by NGOs and scientists in Greece, Cyprus, and Italy to collect data on sharks in the Mediterranean.⁹¹¹ For Italy, another Citizen Science application was recorded called ‘Spot the rare fish’, which collects sighting data from the public.⁹¹²

Such apps can also support enforcement. An example is the public application ‘Sea Watch’ in Israel, through which members of the public can report illegal activities, such as the

⁹⁰⁶ Myriam Lteif, ‘Biology , Distribution and Diversity of Cartilaginous Fish Species along the Lebanese Coast , Eastern Mediterranean’ 310.

⁹⁰⁷ Ministry of Environment, ‘Official Report of the Republic of Albania. Document of Strategic Policies for the Protection of Biodiversity in Albania 2015-2020’ (2016).

⁹⁰⁸ GFCM, ‘Report of the Eighteenth Session of the Scientific Advisory Committee on Fisheries, Nicosia, Cyprus, 21–23 March 2016’ (n 681).

⁹⁰⁹ Ioannis Giovos and others, ‘An Updated Greek National Checklist of Chondrichthyans’ (2022) 7 Fishes 199 <<https://www.mdpi.com/2410-3888/7/4/199>>.

⁹¹⁰ Instituto de Ciencias del Mar, ‘Observadores Del Mar’ <<https://www.seawatchers.net/>> accessed 20 February 2020.

⁹¹¹ ‘SHARKPULSE’ <<http://sharkpulse.cnre.vt.edu/>> accessed 21 February 2020.

⁹¹² Survey reply.

catching or selling of sharks.⁹¹³ These reports are directly referred to regulatory bodies. In Syria, the government has established a website in 2016 to raise awareness on unsustainable fishing practices and support marine conservations.⁹¹⁴

Such applications can aid education and awareness raising and increase stakeholder engagement. Therefore, these support the commitments countries made in terms of raising awareness and involving the public., as defined in Chapter Three, Section 3.2.3.

5.2.1.4 Databases

The oldest existing database on sharks, the Mediterranean Large Elasmobranchs Monitoring (MEDLEM), started by researchers in Italy in 1985 now involves contributions from all Mediterranean countries excluding Monaco, Bosnia and Herzegovina, and Morocco.⁹¹⁵ The MEDLEM collects information not only on the occurrence of species across the region, but also on bycatch. Another large database, 'ELASMOMED', has been collecting genetic information since 2011 and involves researchers from Algeria, Croatia, Cyprus, Israel, Italy, Malta, and Morocco.⁹¹⁶

In Albania, tissue samples from catsharks are building the basis for a database on locally landed species,⁹¹⁷ while Israel has a tissue bank established by the Morris Kahn Marine Research Institute,⁹¹⁸ and reported the development of a biological database supported by a DNA barcoding project.⁹¹⁹ Algeria reported two databases under development, one on

⁹¹³ Ministry of Environmental Protection (n 883).

⁹¹⁴ Ministry of Environment, 'Syria. 5th National Report for the Convention on Biological Diversity' (n 903).

⁹¹⁵ Mancusi and others (n 784).

⁹¹⁶ Cariani and others (n 806).

⁹¹⁷ Survey reply.

⁹¹⁸ Survey reply.

⁹¹⁹ Ministry of Environmental Protection (n 883).

marine resources and one on marine biodiversity called 'BANBIOM', with the latter being operational and accessible from January 2019.⁹²⁰ The genetic database in Malta, set up by the Conservation Biology Research Group, holds a variety of samples including 36 different shark species.⁹²¹ Turkey has two gene banks, which include marine fishes.⁹²²

These databases support the implementation of obligations for national monitoring, as explained in Chapter Three (Section 3.2.5), and preservation of genetic diversity.⁹²³ They also established regional collaborations and contribute to the overall knowledge on shark diversity.

5.2.2 Conservation measures

This section focuses on initiatives related to the conservation and protection of shark species and their habitats. This ranges from the establishment of laws to practical measures.

5.2.2.1 Species protection

Species protection is mainly stipulated by international and regional law (see Annex 1, Table 4). In the Mediterranean, this concerns species listed under Annex II of the SPA/BD Protocol,⁹²⁴ which are also referenced in GFCM Recommendation GFCM/42/2018/2.⁹²⁵ Currently, legal protection, as granted under Annex II of the Protocol, is extended to 24

⁹²⁰ Ministère de l'Environnement et des Energies Renouvelables, 'République Algérienne. Sixième Rapport National Sur La Diversité Biologique' (2019).

⁹²¹ Adriana Vella, Noel Vella and Sarah Schembri, 'A Molecular Approach towards Taxonomic Identification of Elasmobranch Species from Maltese Fisheries Landings' (2017) 36 Marine Genomics 17 <<http://dx.doi.org/10.1016/j.margen.2017.08.008>>.

⁹²² General Directorate of Nature Conservation and National Parks under Ministry of Agriculture and Forestry (n 900).

⁹²³ See Chapter Three, Section 3.2.8.

⁹²⁴ The Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (n 333).

⁹²⁵ Recommendation GFCM/42/2018/2 (n 711).

shark species. However, transposition of the Annex listed species into national species protection legislation was found to be inconsistent across nations concerned in this assessment.

In Morocco, the review suggested that only hammerhead sharks (Sphyrnidae) receive protection through national laws. Slovenia so far only listed two species as nationally protected under its national legislation: the great white shark (*Carcharodon carcharias*), and the basking shark (*Cetorhinus maximus*).⁹²⁶ In Albania, four shark species received protected status as part of the national Red List of wild fauna and flora in December 2013.⁹²⁷ Syria indicated seven species as protected nationally in its 2019 CBD report,⁹²⁸ and Lebanon included ten of the Annex II species in its national legislation.⁹²⁹ Sixteen Annex II species were listed as protected under national legislation in Croatia,⁹³⁰ Montenegro,⁹³¹ and Turkey.⁹³²

5.2.2.2 Additional legal protection

This measure was distinguished from the former by protecting species by law, at national level, which are not listed in international or regional conventions. Evidence of such protection was found in four countries, namely Greece, Israel, Egypt, and Croatia. In Greece, three species are awarded legal protection: the sixgill shark (*Hexanchus griseus*) *sevengill*

⁹²⁶ 2216 Decree on Protected Wild Animal Species, Page 5963. Regulation on protected wild animal species (Slovenia).

⁹²⁷ Order no. 1280 of 20.11.2013 of the Minister of Environment (Albania). Species include: *Charcharodon carcharias*, *Galeorhinus galeus*, *Cetorhinus maximus*, *Mobula mobular*

⁹²⁸ *Carcharodon carcharias*, *Cetorhinus maximus*, *Mobula mobular*, *Pristis pectinata*, *Pristis pristis*, *Rhinobatos rhinobatos*, *Squatina squatina*

⁹²⁹ Resolution No.1/1045 Published in the Official Gazette Issue (Lebanon)

⁹³⁰ Nature Protection Act (OG No. 80/13, 15/18 and 14/19); Ordinance on strictly protected species (OG No. 144/13 and 73/16) (Croatia)

⁹³¹ Order on fishing ban of age classes of fish and other marine organisms (Official Gazette of Montenegro No. 26/15)

⁹³² 5/1 Numaralı Ticari Amaçlı Su Ürünleri Avcılığının Düzenlenmesi Hakkında Tebliğ (TEBLİĞ NO: 2020/20) (Turkey)

shark (*Heptranchias perlo*), and Atlantic torpedo ray (*Tetronarce nobiliana*).⁹³³ Similarly, Croatia protects seven shark species⁹³⁴ outside the scope of species requiring legal protection under international law.⁹³⁵ Both Egypt and Israel protected all sharks through national legislation since 1994 and 2005 respectively. The legislation in Israel is a declaration for the conservation of nature.⁹³⁶ In Egypt, the respective law is an executive regulation for the protection of the environment,⁹³⁷ which contains an annex that refers to all aquatic species of fish (both cartilaginous and bony fish) in the Egyptian waters.

5.2.2.3 Stranding networks

A more contemporary concept for shark conservation is the recording of strandings and potential assistance for such stranded individuals. Such a stranding network for elasmobranchs currently exists in two Mediterranean countries: one in Spain led by an NGO,⁹³⁸ and one in Croatia. The latter was set up in 2019 through the Croatian Institute for Environment and Nature Conservation, which runs an alert network for captured, dead, injured, and sick animals of strictly protected species, including sharks.⁹³⁹

5.2.2.4 Marine Protected Area (MPA)

MPAs are referenced within several legal instruments as a spatial tool for marine biodiversity protection. These include, *inter alia*, provisions under the CBD, CMS, as well as

⁹³³ Presidential Decree 67/1981 'On the protection of native flora and fauna' (Greece)

⁹³⁴ *Carcharhinus plumbeus*, *Prionace glauca*, *Heptranchias perlo*, *Hexanchus griseus*, *Alopias vulpinus*, *Dasyatis pastinaca*, *Dipturus oxyrinchus*

⁹³⁵ 'Ordinance on strictly protected species, OG No. 144/13 and 73/16 (Croatia)

⁹³⁶ Declaration National Parks, Nature Reserves, National Sites and Memorial Sites (Protected Natural Values), 5775-2005 (Israel)

⁹³⁷ Executive Regulation of Law 4/1994 amended by Law 9/009 (Egypt)

⁹³⁸ Survey reply by LAMNA.

⁹³⁹ Ministry of Environment and Energy, 'Croatia. 6th National Report for the Conservation on Biological Diversity' (2019).

the Barcelona Convention and its SPA/BD Protocol, especially for threatened species (Annex 1 Table 4). The latter also enabling cross country establishment of protected areas, as explained in Chapter Three, Section 3.2.8.

Two countries, namely Egypt and Turkey, provided evidence of MPAs relevant to sharks, and a third (Lebanon) listed one of their MPAs as relevant through their reply to the questionnaire. The only MPA which directly concerns sharks, namely sandbar sharks (*Carcharhinus plumbeus*), is named 'Boncuk Cove', located in Turkey. This has been part of the Gulf of Gökova Special Environmental Protection Area since 1988, and effectively became an MPA in 2010.⁹⁴⁰ Within this area, diving has been prohibited since 2001, and all forms of fishing since 2010. This MPA has been the focus of several projects, supporting its significance.⁹⁴¹ The MPA was also the focus of a more recent project (2019-2020) on the 'Conservation of Top Predators through Monitoring and Capacity Building in the Gökçeada Island (North Aegean Sea)', as included under 'projects' below (Section 5.2.3.1).

In its 2019 sixth national report to the CBD, Egypt stipulated an intent to declare an MPA in the Mediterranean, which would include devil rays (*Mobula mobular*).⁹⁴² Lebanon's reply to the survey questionnaire indicated that the Tyre Coast Nature Reserve, which has been declared a no-take zone, supports the conservation of several shark species.⁹⁴³

⁹⁴⁰ Mert ARDAR and others, 'Conservation Leadership Programme Final Report. Conservation of Sandbar Shark (*Carcharhinus Plumbeus*) and Breeding Habitat in Boncuk Cove, Gökova Bay, Turkey', vol 251 (2016).

⁹⁴¹ M Bilecenoğlu, *Conservation and Monitoring Project of Sandbar Sharks (Carcharhinus Plumbeus) in Boncuk Bay, Gökova Special Environmental Protection Area* (Special Environmental Protection Area Environmental Protection Agency for Special Areas, Republic of Turkey Ministry of Environment and Forestr 2008).

⁹⁴² Ministry of the Environment, 'Egypt. 6th National Report for the Convention on Biological Diversity' (2019).

⁹⁴³ *Heptranchias perlo, Hexanchus griseus, Cetorhinus maximus, Glaucostegus cemiculus, Rhinobatos rhinobatos, Squatina oculata, Mobula mobular.*

5.2.3 Measures between conservation and fisheries management

This section considers three measure types that are relevant to conservation and fisheries management: projects, programmes, and assessments. Projects are defined in Chapter Two, Section 2.2.2, and were analysed also in relation to their composition. Programmes entailed long-term initiatives monitoring species distribution, collecting fisheries data, and those encompassing continuous conservation efforts, as well as educational programmes, such as volunteering within NGOs. Assessments included those determining the impact of human activities on sharks, such as fishing, and those focusing on species' population status.

5.2.3.1 Projects

Sixty-three individual projects were identified.⁹⁴⁴ Half of the assessed projects concerned 'conservation management' (32), the other half focused on 'fisheries management' (31). The latter primarily assessed impacts from fishing on sharks (19) and investigated bycatch mitigation (12). Few projects (9) aimed at the development of new policies. Those exploring the monitoring of species occurrence (8) and determining the status of local populations (4) comprised 19.0 %. Educational and capacity building-related projects, which either involved Citizen Science (1), direct outreach through awareness raising (3), or training (1), made up a smaller part of the overall projects. Additionally, some projects aimed to identify important shark areas (5) and contributed to the recovery and release of species (2). A detailed list of projects can be found in Annex 1, Table 9.

⁹⁴⁴ Six projects were indicated as 'planned' (starting in 2021). Those are explained in Section 5.3.1, as they were excluded from the overall analysis.

The majority of projects assessed were conducted at national level only (53), with Spain leading the way with 12 projects, followed by Greece (9), Bosnia and Herzegovina (8), and France (6). Fewer projects at national scale were implemented in Cyprus, Montenegro, and Turkey with 3 projects each, and two projects in Albania, Italy, and Tunisia. Only one project, exclusively implemented at national level, was recorded from Algeria, Israel, and Palestine.

Other projects were implemented through a collaborative effort across countries. Examples include the Mediterranean Elasmobranchs Citizen Observations (MECO) project, initiated by the Israeli NGO 'Sharks in Israel' in 2018.⁹⁴⁵ It involves NGOs and researchers from nine other Mediterranean countries (Albania, Cyprus, France, Greece, Italy, Libya, Malta, Spain, and Turkey) and collects data on shark sightings through social media to establish distribution of shark populations within the Mediterranean Sea. Another project that not only collects data, but aims to establish action plans, the Angelshark Project, as described in Chapter Three, Section 3.1.1, involves NGOs and researchers from Croatia, Cyprus, France, Greece, Libya, and Spain.⁹⁴⁶ This project is implemented across two regions, the Eastern Atlantic (in the Canary Islands, and Wales), and Mediterranean Sea.⁹⁴⁷ It originated out of the need for action, as highlighted in meeting of Conference of the Parties of the CMS within the Concerted Actions for angelsharks (*Squatina* spp.).⁹⁴⁸ A similar project was implemented in the Adriatic (Slovenia, Bosnia and Herzegovina, Croatia, and Montenegro)

⁹⁴⁵ Adi Barash and others, 'The MECO Project (Mediterranean Elasmobranch Citizen Observations): Using Social Media to Create a Regional Database of Elasmobranch Observations', *European Elasmobranch Association 22nd annual conference* (2018).

⁹⁴⁶ See Section 3.1.1 for more information.

⁹⁴⁷ Previously discussed in Chapter Three, Section 3.1.1.

⁹⁴⁸ CMS (n 694).

led by Sharklab Adria.⁹⁴⁹ Another example for collaboration across the region is led by a Spanish NGO SUBMON, which aims to determine the status of bluntnose sixgill sharks (*Hexanchus griseus*) in the region to design better management and conservation measures. This HEXMED project involves NGOs and researchers from Albania, Algeria, Cyprus, France, Greece, Israel, Italy, Libya, and Montenegro.⁹⁵⁰ Between 2019 and 2020, Italy carried out a pilot project on aggregations of sandbar sharks (*Carcharhinus plumbeus*), led by the University of Palermo, around Lampione Island, with the objectives of collecting data on the local population, and determining stakeholder views and perceptions on potential benefits from tourism, and increasing knowledge for improving management of the area to benefit sharks.⁹⁵¹

As defined under Section 5.1.1 conservation projects consist of different components. The analysis revealed that research was the most frequent component, being a part of 56 projects (88.9 %). Education in the form of teaching the public and fishers about sharks was part of 27 projects (42.9 %), followed by outcomes that aim to contribute to improved management decision making and measure proposal (each being part of 36.5 % of projects). While the latter aimed to contribute to the development of national policies, the actual drafting of policy strategies was a direct objective in only four projects (6.4 %). The increase of expertise (capacity) at national levels formed part of nine projects (14.3 %). Lastly, recovery actions formed part of two shark specific projects (3.2 %). The overall composition

⁹⁴⁹ Survey reply. For more information see: <https://www.fondationensemble.org/en/projet/avoiding-extinction-of-angel-sharks-in-the-adriatic-sea/>

⁹⁵⁰ Survey reply. For more information see: <https://www.submon.org/en/hexmed-project/>

⁹⁵¹ MedPAN, 'MPAs and Endangered Sharks in the Mediterranean: A Pilot Project in the Pelagie Islands MPA' (2020) <<https://medpan.org/mpas-and-endangered-sharks-in-the-mediterranean-a-pilot-project-in-the-pelagie-islands-mpa/>> accessed 21 March 2020.

of projects for fisheries and conservation management was similar (Figure 22). Each of those components reflects a commitment under international law and policies, as explained in Chapter Three, Section 3.2.

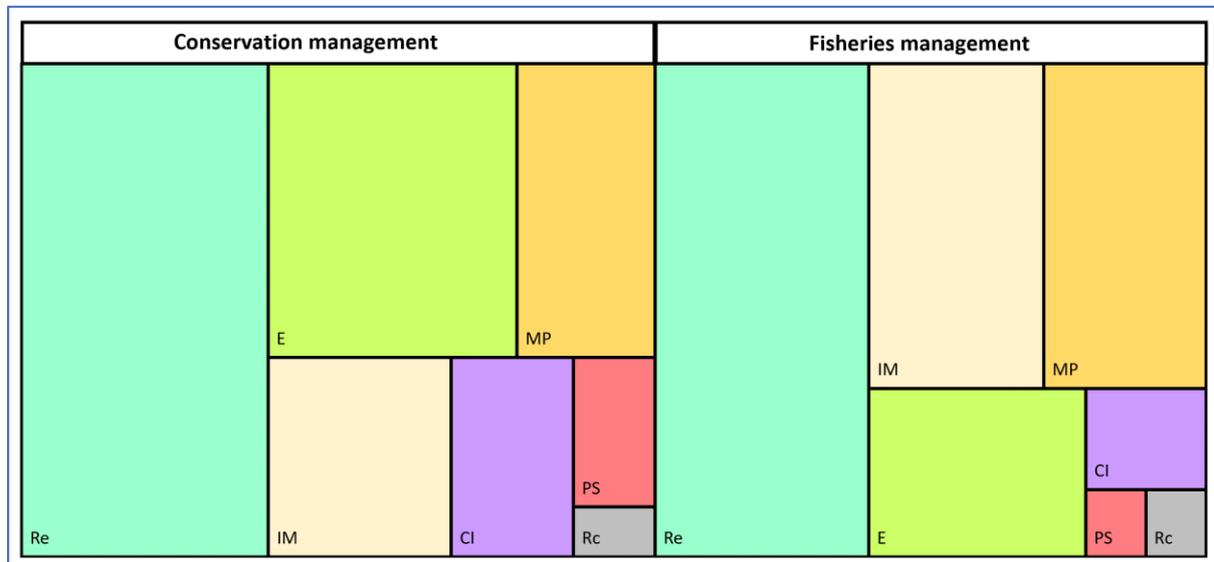


Figure 22. Make up of components of projects for conservation and fisheries management. Individual components, as indicated, include Research (Re), Education (E), Improved management decision making (IM), Measure proposal (MP), Capacity increase (CI), Policy strategy (PS), and Recovery (Rc).⁹⁵²

5.2.3.2 Programmes

Programmes, as opposed to projects, are initiatives carried out long-term or indefinitely.

Several types of programmes were identified in the course of this assessment, including those focusing on monitoring, ex-situ conservation, data collection on fisheries, and capacity building through volunteering.

As elucidated in Chapter Three, Section 3.2.5, several legal instruments incorporated an obligation for long-term data collection. GFCM Recommendation GFCM 42/2018/2, specifies

⁹⁵² Project components are defined in Chapter Two, Section 2.5.5, under the headline 'Measure type classification'.

the need for ongoing and consistent monitoring of fishery landings, discards, and bycaught species, including those of Annex II and Annex III of the SPA/BD Protocol.⁹⁵³ This is in line with the obligations under the data collection frameworks of the GFCM,⁹⁵⁴ and the one for EU MS.⁹⁵⁵ At the EU level, the MSFD lists eleven descriptors for environmental monitoring to be considered by EU MS.⁹⁵⁶ Furthermore, the regional action plan for cartilaginous fishes includes species monitoring as an essential task.⁹⁵⁷ Beside monitoring, there are other legal obligations that encourage the development of long-term programmes, such obligations include, for example, the duty to educate and inform the public, build capacity at national and regional level, and to create initiatives for species recovery, as specified in Chapter Three, Section 3.2, all of which were considered in this analysis.

Programmes were identified as substantial contributors to implementation effort, with 54 confirmed, of which 51 (94.4 %) were being implemented at a national level.⁹⁵⁸ Ten such programmes were recorded from Spain, followed by Malta (7), Israel (6), Italy (5), and Greece (4). Three programmes were found to be implemented in Croatia and Turkey. Algeria, France, and Lebanon each had two programmes, and the remaining countries (Albania, Bosnia and Herzegovina, Cyprus, Egypt, Morocco, Slovenia, and Syria) one.

The focus of these long-term programmes differed from those of short-term projects, with half of the programmes (32) focusing on monitoring, thereby providing long-term data sets on sharks. The categories of Citizen Science, Education & Awareness, and Training, together

⁹⁵³ Recommendation GFCM/42/2018/2 (n 711).

⁹⁵⁴ Recommendation GFCM/40/2016/2 (n 740).

⁹⁵⁵ Regulation (EU) 2017/1004 (n 744).

⁹⁵⁶ Directive 2008/56/EC (n 341).

⁹⁵⁷ UNEP, 'Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea' (n 55).

⁹⁵⁸ These programmes are still ongoing.

made up 24.1 %, thereby supporting capacity building and public knowledge increase. A few programmes (3) concentrated on assessing impacts from human activities, while two attempt to establish the longer-term status of shark populations. Three initiatives, two in Spain⁹⁵⁹ and one in Malta,⁹⁶⁰ established recovery and release programmes, in which egg cases from oviparous shark species⁹⁶¹ are collected from fish markets, hatched in aquaria, and released back into the wild once hatched.

The inclusion of shark species in national PoMs created through obligations under the MSFD by EU MS, was limited.⁹⁶² According to MSFD reports and EU assessments of PoMs,⁹⁶³ only six of the nine Mediterranean EU MS incorporated at least one shark species. These include Croatia, Greece, Italy, Slovenia, Spain, and Malta.

Croatia listed two species for Descriptor 1 (D1, Biodiversity), namely the brown ray (*Raja miraletus*), and the small-spotted catshark (*Scyliorhinus canicula*).⁹⁶⁴ Greece included stock assessments for the thornback ray (*Raja clavata*) for GFCM subareas GSA 22 and 23 under Descriptor 3 (D3, commercially fished species).⁹⁶⁵ Other countries that considered sharks under D3 are Italy and Slovenia, both assessing several commercialised and bycatch species, including protected species protected under the SPA/BD Protocol Annex II.⁹⁶⁶ Italy included the blue shark (*Prionace glauca*), shortfin mako (*Isurus oxyrinchus*), porbeagle (*Lamna*

⁹⁵⁹ Survey reply. For more information see: <https://marillesfoundation.org/en/project/recuperacion-de-huevos-de-tiburones-y-rayas>

⁹⁶⁰ Koehler, Smith and Nowell (n 573).

⁹⁶¹ 'Oviparous' refers to the reproductive mode in which female sharks produce eggcases within their uterus, which are then being laid on the sea floor, usually attached to some form of vegetation.

⁹⁶² The MSFD and its obligations are explained in Chapter One, Section 1.2.2.2.

⁹⁶³ For details see Chapter Two, Section 2.5.4 (Data sources).

⁹⁶⁴ C Dupont and others, 'Article 16 Technical Assessment of the MSFD 2015 Reporting on Programme of Measures. Croatia Report' (2018).

⁹⁶⁵ C Dupont and others, 'Article 16 Technical Assessment of the MSFD 2015 Reporting on Programme of Measures. Greece Report' (2018).

⁹⁶⁶ See Annex 1, Table 4.

nasus), great white shark (*Carcharodon carcharias*), basking shark (*Cetorhinus maximus*), devil fish (*Mobula mobular*) and pelagic stingray (*Pteroplatytrygon violacea*).⁹⁶⁷ Slovenia listed the largest number of 32 species in its PoMs (32),⁹⁶⁸ including protected species that may be bycaught.⁹⁶⁹ Malta incorporated different shark species under three descriptors (D1, D3, and Descriptor 9-for seafood contamination)⁹⁷⁰ within its PoMs.⁹⁷¹ There were no details on species incorporated in the monitoring programmes of Spain, but the technical assessment under Article 12 in 2015 indicated coverage of elasmobranchs in the national programme.⁹⁷²

5.2.3.3 Assessments

Assessment refers to three aspects of management and conservation, namely impacts from human activities (e.g., fishing), the status of shark populations, and the state of commercial fish stocks. The latter was carried out for most relevant fish stocks through regional bodies, namely ICCAT, the GFCM, and STECF. However, current efforts for regular stock assessments at regional level through the GFCM only concern the spiny dogfish (*Squalus acanthias*) in the

⁹⁶⁷ C Dupont and others, 'Article 16 Technical Assessment of the MSFD 2015 Reporting on Programme of Measures. Italy Report' (2018).

⁹⁶⁸ C Dupont and others, 'Article 16 Technical Assessment of the MSFD 2015 Reporting on Programme of Measures. Slovenia Report' (2018).

⁹⁶⁹ *Dalatias licha*, *Dipturus batis*, *Dipturus oxyrinchus*, *Centrophorus granulosus*, *Etmopterus spinax*, *Galeorhinus galeus*, *Galeus melastomus*, *Hexanchus griseus*, *Leucoraja circularis*, *Leucoraja melitensis*, *Heptanchias perlo*, *Myliobatis aquila*, *Oxynotus centrina*, *Raja asterias*, *Raja clavata*, *Raja miraletus*, *Raja polistigma*, *Raja undulata*, *Rostroraja alba*, *Squatina aculeate*, *Squatina oculata*, *Squatina squatina*, *Torpedo marmorata*, *Mustelus asterias*, *Mustelus mustelus*, *Mustelus punctulatus*, *Rhinobatos cemiculus*, *Rhinobatos rhinobatos*, *Scyliorhinus canicula*, *Scyliorhinus stellaris*, *Squalus acanthias*, *Squalus blainvillei*

⁹⁷⁰ For D1 the country assesses *Dasyatis pastinaca*, *Etmopterus spinax*, *Galeus melastomus*, *Heptanchias perlo*, *Hexanchus griseus*, *Leucoraja circularis*, *Leucoraja melitensis*, *Mustelus asterias*, *Mustelus mustelus*, *Myliobatis aquila*, *Raja clavata*, *Squalus acanthias*, and *Squalus blainville*. Under D3 the status of *Centrophorus granulosus*, *Hexanchus griseus*, *Mustelus mustelus*, *Prionace glauca*, *Scyliorhinus canicula*, *Squalus acanthias*, *Squalus blainville*, *Raja clavata*, *Raja montagui* is determined and the common smoothhound (*Mustelus mustelus*) is measured for contamination under D9.

⁹⁷¹ Environment & Resources Authority, ERA Environment and Resources Authority and Environment & Resources Authority, 'Update on Articles 8, 9, and 10 of the Marine Strategy Framework Directive (2008/56/EC) in Malta's Marine Waters, Annexes' (2020).

⁹⁷² C Dupont and others, 'Article 12 Technical Assessment of the MSFD 2014 Reporting on Monitoring Programmes. Spain Country Report' (2015).

Black Sea.⁹⁷³ Scientific advice by STECF was determined through stock assessments of some Mediterranean shark species in 2014⁹⁷⁴ and 2015.⁹⁷⁵ ICCAT has conducted several stock assessments for sharks in the Atlantic, as well as some in the Mediterranean, such as of the blue shark (*Prionace glauca*).⁹⁷⁶ While these efforts help to identify the status of shark populations regionally and support subsequent measures, such as catch limits (e.g., TACs, or MSY), this assessment concentrated on national efforts by individual countries or cooperation among Mediterranean countries.

Italy reported two assessments relevant to shark management, one in 2014 on demersal species in the Adriatic Sea under the auspices of the MSFD as part of its PoMs,⁹⁷⁷ and one to determine the impact of pelagic trawlers on by-caught species, as reported at the fourteenth session of the GFCM SAC in 2012.⁹⁷⁸ At the same meeting, Croatia reported on an assessment of long-term trends in sharks, which showed high fluctuations, but did not provide further details.⁹⁷⁹ Malta also reported on two assessments, both completed in 2012.⁹⁸⁰ One assessment focused on the taxonomic status of the longnose spurdog (*Squalus blainvillei*) and its population dynamic and its overall stock status in the central Mediterranean. The second assessment focused on fish stocks in GFCM subareas 15 and 16

⁹⁷³ Food and Agriculture Organisation of the United Nations (n 56).

⁹⁷⁴ STECF (n 548).

⁹⁷⁵ European Commission Joint Research Centre, 'Scientific, Technical and Economic Committee for Fisheries (STECF) – Consolidated Advice on Fish Stocks of Interest to the European Union (STECF-14-24)' (2015) <https://stecf.jrc.ec.europa.eu/documents/43805/861036/2014-12_STECF+14-24+-+Consolidated+Review+of+advice+for+2015_JRC93360.pdf>.

⁹⁷⁶ ICCAT, 'Report of the 2015 ICCAT Blue Shark Stock Assessment Session' (n 851).

⁹⁷⁷ Claire Dupont and others, 'Article 12 Technical Assessment of the MSFD 2012 Obligations:Italy' (2014).

⁹⁷⁸ GFCM, 'Report of the Fourteenth Session of the Scientific Advisory Committee Sofia, Bulgaria, 20–24 February 2012' (2012).

⁹⁷⁹ GFCM, 'Report of the Fourteenth Session of the Scientific Advisory Committee Sofia, Bulgaria, 20–24 February 2012' (n 978).

⁹⁸⁰ GFCM, 'Report of the Fourteenth Session of the Scientific Advisory Committee Sofia, Bulgaria, 20–24 February 2012' (n 978).

and included the thornback ray (*Raja clavata*).⁹⁸¹ In Spain, the review of sources revealed three assessments carried out since 2018, of which one was in relation to the implementation of the MSFD and offered a risk analysis on bycatch of vulnerable species.⁹⁸² Another assessment at national level, called 'Humans versus sharks', as reported at the 21st meeting of the GFCM SAC, assessed the trophic level change of replacing top predators at stock level.⁹⁸³ The third assessment was carried out by a Spanish NGO, who conducted an assessment on the bycatch of the trammel net fishery in the Gulf of Valencia.⁹⁸⁴ In Palestine, researchers conducted an assessment of the impact of the local fishery in Gaza Strip concentrating on one specific species, the giant devil ray (*Mobula mobular*).⁹⁸⁵ In Lebanon, researchers, with the support of the IUCN, assessed impacts from recreational fishing in the area of Tyre.⁹⁸⁶

These assessments provide crucial information on consequences of human activities on sharks and therefore help to determine further actions, which are explored in Chapter Six.

5.2.4 Fisheries management and related marketing measures

This section concerns regulatory measures aiming to increase sustainability in fisheries. Such measures included the obligation to regular submit landings data to RFMOs, reduce national

⁹⁸¹ These efforts were reflected in the STECF scientific advice as stated above.

⁹⁸² C Dupont and others, 'Article 16 Technical Assessment of the MSFD 2015 Reporting on Programme of Measures. Spain Report' (2018).

⁹⁸³ General Fisheries Commission for the Mediterranean, 'Report of the Twenty-First Session of the Scientific Committee on Fisheries', vol 1290 (2019).

⁹⁸⁴ Survey reply (NGO LAMNA).

⁹⁸⁵ Rufford Foundation, 'Assessment of the Gaza Fishery of the Giant Devil Ray (*Mobula Mobular*) In the Wider Context of Its Protection Status in the Mediterranean' (2021) <<https://www.rufford.org/projects/mohammed-ibrahim-abudaya/assessment-of-the-gaza-fishery-of-the-giant-devil-ray-mobulamobular-in-the-wider-context-of-its-protection-status-in-the-mediterranean/>> accessed 21 March 2021.

⁹⁸⁶ Ministry of Environment, 'Lebanon. 6th National Report for the Convention on Biological Diversity' (n 897).

fishing effort, limit fishing in sensitive areas, and apply technical measures to regulate certain activities. Such regulatory options are explained in Chapter Two, Section 2.5, and their legal foundation is elaborated in Chapter three, Section 3.2.

5.2.4.1 Reporting (as implementing measure)

This type focused on the reporting of data on commercial shark landings. All nations assessed (except Palestine) are obliged under the EU Data Collection Framework⁹⁸⁷ and/or the GFCM Data Collection Reference Framework⁹⁸⁸ to collect and report information on shark landings to the EU and GFCM respectively. Two countries have additionally passed national legislation, establishing specific shark reporting obligations. Albania passed a Regulation in 2009,⁹⁸⁹ to improve bycatch reporting for specific shark species and Croatia reported a new law creating a similar obligation in 2019.⁹⁹⁰

Assessment of national landings reporting to the GFCM and STECF, both relying on the same data collection processes, identified a substantial difference in data quality. First, only four out of the 22 countries assessed, produce reports at species level (Spain, France, Malta, and Italy). Some level of detail on individual species- and species-specific groups were submitted by Albania, Cyprus, Lebanon, Libya, Montenegro, and Tunisia. A lower level of transparency, with the use of aggregated groups, was seen in reports from Algeria, Croatia, Greece, Israel,

⁹⁸⁷ Regulation (EU) 2017/1004 (n 744).

⁹⁸⁸ Recommendation GFCM/40/2016/2 (n 740).

⁹⁸⁹ Regulation No.6, 13.2.2009 for determining the way information is recorded necessary in relation to fish catches (Albania)

⁹⁹⁰ Ministry of Environment and Energy (n 939).

Morocco, Palestine, Slovenia, Syria, and Turkey, with Egypt reporting all species in one group.⁹⁹¹

In relation to Palestine, the FAO database did contain some landings data, but since it was unclear whether the data source was Palestine or Israel, it was not included in this assessment of national implementation effort. Shark landings, as reported, were further analysed in Chapter Six.

5.2.4.2 Reduction of fishing effort

The EU CFP⁹⁹² establishes multiannual fisheries management plans for the entire EU fleet, a process aligned with fisheries management under the GFCM, which assigns fishing opportunities for commercial stocks through fisheries management plans for Mediterranean subregions and shared stocks.⁹⁹³ One aspect of these multi-annual plans, is adaptation of fishing effort, which entails reducing pressure on stocks to ensure a more sustainable approach to fishing. The resulting measures are based on assessments of commercially exploited stocks and are therefore not designed specifically for sharks. However, the reduction of certain fishing types, such as trawling, which are non-selective or have low selectivity, can aid shark conservation.

In 2013, Malta introduced a 20.0 % reduction in trawling by 2015, indicating this would significantly reduce by-catches of several shark species.⁹⁹⁴ Within its MSFD reporting, Slovenia identified a reduction of overall fishing effort, leading to a decrease of 97.0 % in

⁹⁹¹ As retrieved from the FAO database, see Chapter Two, Section 2.6.2.

⁹⁹² Regulation (EU) No 1380/2013 (n 403).

⁹⁹³ Food and Agriculture Organisation of the United Nations (n 56).

⁹⁹⁴ *Scyliorhinus* spp., *Mustelus* spp., and *Raja* spp.; discards of *Scyliorhinus canicula*, *Galeus melastomus*, *Etmopterus spinax*, *Dipturus oxyrinchus*

landings between 1983 and 2014.⁹⁹⁵ Similarly, in 2013, Greece reduced its fleet, including bottom trawlers, by 22.5 %.⁹⁹⁶ Between 2015-2019, Israel reduced its fleet by 22.0 % through a buy-back plan for decommissioned trawlers.⁹⁹⁷ Cyprus reported a reduction of its small-scale fleet by 66 vessels in 2015.⁹⁹⁸ Spain reported a gradual decrease, starting in 2017, of approximately 30.0 % of its global fleet.⁹⁹⁹ Croatia reported a very different approach, in the form of permanent cessation of some fishing boats compensating fishermen for destroyed ships.¹⁰⁰⁰ In Egypt, fuel subsidies supporting trawling were reduced in 2019, which was noted in its 6th national report to the CBD.¹⁰⁰¹

5.2.4.3 Gear restriction

Based on the review of legal obligations, as explained in Chapter Three, Section 3.2.10, two gear restrictions were identified. At the beginning of the 1990s, the international community realised the wide-ranging impact of large driftnets on vulnerable species and the UN adopted a resolution (UN Resolution 46/215) to stop its use.¹⁰⁰² Subsequently, regional legal instruments adopted driftnet bans, such as EC Regulation 345/92,¹⁰⁰³ which was carried forward into the CFP implementing Regulation (EU) 2019/1241,¹⁰⁰⁴ ICCAT Resolution

⁹⁹⁵ Claire Dupont and others, 'Article 12 Technical Assessment of the MSFD 2012 Obligations:Slovenia' (2014).

⁹⁹⁶ STECF Ad-Hoc Expert Working Group, 'Management Plan for Greek Bottom Trawlers. Updated Report. Ref. Ares(2013)548016 - 05/04/2013' (2013).

⁹⁹⁷ Ministry of Environmental Protection (n 883).

⁹⁹⁸ Ministry of Agriculture Natural Resources and Environment, 'Cyprus Annual Report on Efforts During 2018 to Achieve a Sustainable Balance Between Fishing Capacity and Fishing Opportunities' (2019).

⁹⁹⁹ GFCM, 'Report of the Eighteenth Session of the Scientific Advisory Committee on Fisheries, Nicosia, Cyprus, 21–23 March 2016' (n 681).

¹⁰⁰⁰ Dupont and others, 'Article 16 Technical Assessment of the MSFD 2015 Reporting on Programme of Measures. Croatia Report' (n 964).

¹⁰⁰¹ Ministry of the Environment (n 942).

¹⁰⁰² UNGA, 'Resolution on Large-Scale Pelagic Drift-Net Fishing and Its Impact on the Living Marine Resources of the World's Oceans and Seas (1991) A/RES/46/215' (1991) <<http://www.un.org/documents/ga/res/46/a46r215>>.

¹⁰⁰³ Council Regulation (EEC) No 345/92 of 27 January 1992 amending for the eleventh time Regulation (EEC) No 3094/86 laying down certain technical measures for the conservation of fishery resources OJ L 42, 18.2.1992, p. 15–23.

¹⁰⁰⁴ Regulation (EU) 2019/1241 (n 406).

94-2;¹⁰⁰⁵ and GFCM Recommendation GFCM/22/1997/1.¹⁰⁰⁶ The later introduced a limitation on the use of driftnets in the Mediterranean and was followed by Recommendation GFCM/29/2005/3, prohibiting the use of driftnets by fisheries targeting large pelagic species.¹⁰⁰⁷ Therefore, the driftnet ban applies to all GFCM members. Further to the above, Regulation (EU) 2019/1241 incorporates a ban for specific types of entangling gear for certain shark species under Article 9(4).¹⁰⁰⁸

5.2.4.4 Fisheries Restricted Areas (FRAs)

FRAs are a spatial management tool under the GFCM, prohibiting certain fishing gears within specified areas. In 2005, the GFCM adopted a binding recommendation that prohibits trawling beyond 1000 m.¹⁰⁰⁹ Another restriction has been incorporated in GFCM Recommendation GFCM 42/2018/2, which prohibits trawling in coastal waters, either three nautical miles distance from shore or beyond 50 m depth.¹⁰¹⁰

5.2.4.5 Temporal closures

Temporal closures can help to lift fishing pressure on certain areas for a specific period, thereby supporting the reproduction of species or generally aiding the area's recovery. Such closures are in place in several countries, but for the purpose of this assessment, only one area with evidence of its importance for sharks was included. Tunisia introduced a temporal closure in 2009, which, according to the reports, continues to be implemented for three

¹⁰⁰⁵ Resolution by ICCAT on Large-Scale Pelagic Driftnet Fishing (1994) RES 94-2

¹⁰⁰⁶ Recommendation GFCM/22/1997/1 Limitation of the use of driftnets in the Mediterranean.

¹⁰⁰⁷ Recommendation GFCM/29/2005/3 prohibiting the use of driftnets for fisheries of large pelagic species.

¹⁰⁰⁸ Regulation (EU) 2019/1241 (n 406).

¹⁰⁰⁹ Recommendation GFCM/29/2005/1 (n 760).

¹⁰¹⁰ Recommendation GFCM/42/2018/2 (n 711).

months every summer (July-September) in the Gulf of Gabés,¹⁰¹¹ and area that is considered a nursery ground for sharks.¹⁰¹²

5.2.4.6 Minimum Landing Size (MLS)

MLS is a fisheries management tool listed in various legal instruments, including the CFP, and the Bern Convention. However, there is no direct legal obligation applied to shark species in respect of MLS in the Mediterranean. In absence of a uniform, centralised measure, States can determine their own rules, which has led to a piecemeal approach, as indicated in the following paragraph.

As part of the MSFD programmes of measures, Italy reported that it would implement a number of MLS for commercially exploited sharks by 2020.¹⁰¹³ This measure's status was set as 'unknown' at the time of data collection, as there was no evidence it had yet been made effective. Montenegro established such MLS for common smoothhound (*Mustelus mustelus*) of 75 cm, for blackspotted smoothhound (*Mustelus punctulatus*) of 60 cm, and for spiny dogfish (*Squalus acanthias*) of 65 cm.¹⁰¹⁴ Algeria has MLS for several shark species,¹⁰¹⁵ established through an executive degree.¹⁰¹⁶ Similar legislation is in place in Tunisia that also concerns several smaller species,¹⁰¹⁷ through its fisheries legislation.¹⁰¹⁸

¹⁰¹¹ Ministère des Affaires Locales et de l'Environnement (n 899).

¹⁰¹² Enajjar, Saidi and Bradai (n 816).

¹⁰¹³ Genera considered were: *Scyliorhinus*, *Squalus*, *Mustelus*, *Galeus*, *Raja* (and related species).

¹⁰¹⁴ Ilja Četković, 'Composition and Abundance of Shark Bycatch in Montenegrin Fisheries' [2018] Montenegrin Ecologists Society and Environment Programme, Podgorica.

¹⁰¹⁵ *Scyliorhinus canicula*, *Scyliorhinus stellaris*, *Mustelus mustelus*, *Torpedo torpedo*, *Dasyatis pastinaca*, and eight species of skates (*Raja* sp.)

¹⁰¹⁶ Décret exécutif n° 20-266 du 4 Safar 1442 correspondant au 22 septembre 2020 modifiant et complétant le décret exécutif n° 04-86 du 26 Moharram 1425 correspondant au 18 mars 2004 fixant les tailles minimales marchandes des ressources biologiques (Algeria)

¹⁰¹⁷ Skates: *Raja asterias*, *Raja brachyura*, *Raja clavata*, *Raja miraletus*, *Raja montagui*, *Raja polystigma*, *Raja radula*, *Raja undulata*, *Rostroraja alba*; and one ray (*Torpedo torpedo*)

¹⁰¹⁸ Arrêté du ministre de l'agriculture du 28 septembre 1995 réglementant l'exercice de la pêche (Algeria)

5.2.4.7 Finning ban

The legal development of a finning ban was driven by scientists across Europe.¹⁰¹⁹ EU Regulation (EC) No 1185/2003 introduced a prohibition on the removal of fins of sharks on board vessels.¹⁰²⁰ It also prohibits the marketing of fins that have been obtained from the practice of shark finning at sea.¹⁰²¹ This was amended, based on scientific evidence on the difficulty of enforcing a carcass-to-fin ratio,¹⁰²² to a 'fins attached' approach in 2013 through Regulation (EU) No 605/2013.¹⁰²³ This obliges EU MS to land sharks intact. This approach was also included in the GFCM Recommendation GFCM/42/2018/2.¹⁰²⁴ Therefore, this ban applies to all Mediterranean countries. However, some countries, as detailed in section 5.3.2, reported that the finning ban had not been implemented at the time of data collection. It is of note that fin trade is regulated under CITES and the respective EU Regulations, as explained below (Section 5.3.4.10).

5.2.4.8 Fishing ban

Fishing bans are established under fisheries legislation prohibiting the fishing of certain species, with, contrary to legal protection, no obligation to not disturb them or implement further protection measures. Such bans may apply to different types of gear and fishing in general, noting that sharks may or may not be targeted, but are affectively being caught as

¹⁰¹⁹ Hareide and others (n 545).

¹⁰²⁰ Council Regulation (EC) No 1185/2003 of 26 June 2003 on the removal of fins of sharks on board vessels, OJ L 167, 4.7.2003, p. 1–3.

¹⁰²¹ Council Regulation (EC) No 1185/2003 (n 1000) art 3(2): "It shall be prohibited to purchase, offer for sale or sell shark fins which have been removed on board, retained on board, transhipped or landed in contravention of this Regulation."

¹⁰²² Santana-Garcon, Fordham and Fowler (n 828).

¹⁰²³ Regulation (EU) No 605/2013 (n 215).

¹⁰²⁴ Recommendation GFCM/42/2018/2 (n 711).

bycatch. Commercial fishing for bigeye thresher sharks (*Alopias superciliosus*) is generally prohibited through a ban established by ICCAT and further adopted by the GFCM.¹⁰²⁵

Across nations under review, a range of examples of other fishing bans were identified as relevant to the protection of sharks, as follows. According to Syria's fifth national report to the CBD in 2016, the country had implemented a ten-year complete fishing ban.¹⁰²⁶ In relation to implementation of shark related measures established by ICCAT, Libya reported that it prohibits all shark fisheries and catches in 2019.¹⁰²⁷ As there was no evidence of this ban being implemented at the time of this assessment, the measure was considered 'under development'. In 2020, Turkey recently amended a fishing prohibition for multiple shark species¹⁰²⁸ under national law.¹⁰²⁹ Cyprus has a fishing ban for sharks in place for all recreational fishing activities, incorporated in the country's terms for fishing licenses and legislative provisions related to recreational fishing.¹⁰³⁰ Article 8 of the 'Conditions of fishing authorisations and basic provisions of legislation for recreational fisheries', states:

"It shall be prohibited to fish for or hold bluefin tuna (*Thunnus thynnus*), swordfish (*Xiphias gladius*) or any species shark or ray (elasmobranchs). In the event of an accidental catch of one of these species, it should be released immediately with the least possible strain and in a way that maximizes the likelihood of its survival, in the case of elasmobranchs according to the guide to good management practice

¹⁰²⁵ Recommendation by ICCAT on the Conservation of Thresher Sharks caught in Association with Fisheries in the ICCAT Convention Area (2009) REC ICCAT-GFCM/34/2010/4 (C)

¹⁰²⁶ Ministry of Environment, 'Syria. 5th National Report for the Convention on Biological Diversity' (n 903).

¹⁰²⁷ ICCAT, 'Report for Biennial Period, 2018-19 PART II (2019) - Vol. 1', vol 1 (2020).

¹⁰²⁸ *Carcharhinus plumbeus*, *Prionace glauca*, *Alopias superciliosus*, *Carcharhinus longimanus**, *Carcharhinus falciformis*, *Squalus acanthias*, *Alopias vulpinus*, *Raja clavata*, *Squalus blainville*, *Mobula japonica** (*not Mediterr. Species))

¹⁰²⁹ For all season, shark and rays catching are prohibited in all coastal lines of Turkey in accordance with Article 16 of the Notification 3/1 Regulating Commercial Fishing. Regulation 5/1 Numaralı Ticari Amaçlı Su Ürünleri Avcılığının Düzenlenmesi Hakkında Tebliğ (TEBLİĞ NO: 2020/20) (Turkey)

¹⁰³⁰ Basic Fisheries Law Cap. 135 and subsequent amendments of 1961 to 2019, Fisheries Regulations of 1990 to 2019 based on Article 6 of the Basic Law. Available at; <http://www.moa.gov.cy/moa/dfmr/dfmr.nsf> (Cyprus)

accidental captures of sharks and rays (fao.org/publications/card/fr/c/19152e1) (OA)".¹⁰³¹

5.2.4.9 Product labelling

This type was only identified for EU MS. Regulation (EU) No 1379/2013, which aims to organise common markets, includes provisions on labelling obligations for EU MS.¹⁰³² Article 35 stipulates mandatory information, including the species name (common and scientific), the origin, and gear used to catch it, as illustrated in Photo 1 – a product label from a local fish market in Malta. Article 39 provides suggestions for voluntary information that may be included on labels, which, *inter alia*, includes environmental information.

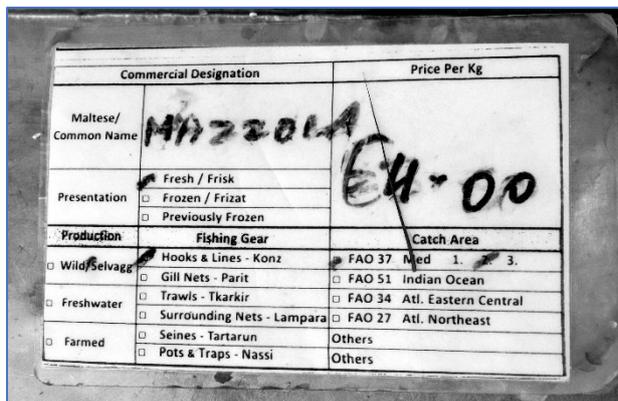


Photo 1. Product label from a Maltese fish market.

5.2.4.10 Regulated trade and trade prohibition

Trade of shark species that are considered threatened is regulated through CITES provisions for those Mediterranean States Party to the Convention. In the case of the EU, CITES provisions are implemented through the EU's Wildlife Trade Regulations.¹⁰³³ In general,

¹⁰³¹ 'Department of Fisheries and Marine Research, Ministry of Agriculture, Rural Development and Environment. Conditions of Fishing Licenses. Terms of Amateur Fishing Licenses' <<http://www.moa.gov.cy/moa/dfmr/dfmr.nsf/All/848F5F5AE4EDEF4042257DD5003374B9?OpenDocument>> accessed 20 January 2021.

¹⁰³² Regulation (EU) No 1379/2013 of the European Parliament and of the Council of 11 December 2013 on the common organisation of the markets in fishery and aquaculture products, amending Council Regulations (EC) No 1184/2006 and (EC) No 1224/2009 and repealing Council Regulation (EC) No 104/2000, OJ L 354, 28.12.2013, p. 1–21.

¹⁰³³ As mentioned in Chapter Three, Section 3.2.10.

there are two approaches to regulation, one is the control of trade through permits for species requiring management (Appendix II), and the other is the total ban of any trade for species facing extinction (Appendix I), as explained in Chapter Three, Section 3.2.10. Both approaches were incorporated in the database and their implementation status was based on the most recent review on progress status on its implementation by CITES.¹⁰³⁴

This concludes the answer to the third research question in relation to the types of measures implemented, including examples demonstrating the variance across actions at national level, applicable to conservation and fisheries management. More insights into the data are provided in the following sections. But first, it is worth recalling those measures identified, but excluded from the overall assessment.

5.3 Measures that were excluded from the analysis

This section introduces measures which at the time of completion of data collection were identified as either being planned or not being implemented. Furthermore, additional considerations are presented, which have not been included in the database for reasons explained below but are relevant to sharks in the Mediterranean Sea.

5.3.1 Planned measures

A few measures recorded through the data collection were indicated as planned to start in 2021. This included projects yet to be initiated, all of which were set up by NGOs. The Spanish NGO 'Save the Med', with the support of local government, planned for an egg case

¹⁰³⁴ CITES, 'Status of Legislative Progress for Implementing Cites (Updated November 2019)' (2019).

recovery project called 'Acció Stellaris', in which, with the cooperation of fishers, egg cases from landed nursehound sharks (*Scyliorhinus stellaris*) are to be retrieved from local fish markets in the Balearic Islands and then bred with the support of the local aquarium until the pups can be released back into the wild.

Based on the questionnaire response of an IUCN Shark Specialist Group member, a new shark project was planned to start in 2021 and run until 2025 called 'LIFE Squalus', involving Albania, Croatia, Italy, and Slovenia. The project aims to increase the education level of the public and train relevant stakeholders, such as fishers, to reduce their impact on species by reducing mortality and the disturbance of elasmobranchs through human activities. A focus of the project is to foster cooperation and co-responsibility while also providing motivation to change behaviours. Another project in the Adriatic (Albania) planned for 2021 was 'Sharks, Skates and Rays of Albania: The Final Step towards the Regional Conservation, Governance and Management' with a clear aim to contribute to the development of better policies for the country. A project that received funding from the Save our Sea Foundation to be carried out by Shark Trust, was planned for 2021, with the aim of investigating commercial fisheries and markets for guitarfishes (*Rhinobatos rhinobatos*, *Glaucostegus cemiculus*) in Tunisia, and potentially other southern Mediterranean countries. Sharklab ADRIA planned a small-scale monitoring project in the Eastern Adriatic to assess shark occurrences in 2021 and increase awareness, and also in 2021, a Spanish NGO planned to engage fishers in the tagging and release of pelagic rays (*Mobula mobular*, *Myliobatis aquila*, *Pteroplatytrygon violacea*, *Aetomylaeus bovinus*) to trace the movements of released sharks.

5.3.2 Legal obligations lacking implementation

The prohibition of shark finning, as explained above (Section 5.2.4.7), is a legal obligation applicable to all EU and GFCM members. However, national reports on the implementation of progress for shark conservation and management to the Regional Activity Centre for the 2019 Focal Point meeting, indicated that transposition and implementation of this obligation are not yet fulfilled by the following countries: Algeria, Bosnia and Herzegovina, Monaco, and Tunisia.¹⁰³⁵ Therefore, these obligations were categorised as ‘not implemented’ and excluded from the assessment. Furthermore, in the case of Algeria, there was no clear evidence that species listed under Annex II of the SPA/BD Protocol are protected under national law, which was confirmed through the country’s national report to the Focal Point meeting.¹⁰³⁶ Another measure not applicable to Bosnia and Herzegovina and Monaco, was the reporting of shark landings to the GFCM. Although this is an obligation under Recommendation GFCM/42/2018/2¹⁰³⁷ and Recommendation GFCM/35/2011/1,¹⁰³⁸ both countries did not report to have an active fishing fleet.¹⁰³⁹

The review on the implementation status of CITES,¹⁰⁴⁰ in relation to the implementation data base on trade regulation (for Appendix II species and a complete trade ban for Appendix I species), identified Lebanon, Libya, and Syria are yet to pass national

¹⁰³⁵ Regional Activity Centre for Specially Protected Areas (SPA/RAC) (n 660).

¹⁰³⁶ Regional Activity Centre for Specially Protected Areas (SPA/RAC) (n 660).

¹⁰³⁷ Recommendation GFCM/42/2018/2 (n 711).

¹⁰³⁸ Recommendation GFCM/35/2011/1 (n 722).

¹⁰³⁹ Food and Agriculture Organisation of the United Nations (n 56).

¹⁰⁴⁰ CITES (n 1034).

implementation measures. It should be noted that Lebanon joined the Convention in 2013, while Syria and Libya have been signatories since 2003.

5.3.3 Other actions taken

One consideration not included in the database compiled for the evaluation of implemented measures, because of only partial evidence on the extent of the issue in the Mediterranean and limited legal basis, was abandoned, lost, or otherwise discarded fishing gear (ALDFG), also referred to as ‘ghost gear’, in which marine animals may get entangled and die.

Although such gear poses less of a risk to shark populations than commercial fishing,¹⁰⁴¹ it can have a wide-ranging impact, and thus be threat for multiple shark species.¹⁰⁴² This caught the attention of researchers in 2019, who assessed the impact on sharks, finding little information on the extent to which ALDFG affects the Mediterranean.¹⁰⁴³

In terms of legal measures, the UNFSA Article 5(f) (General principles) incorporates a duty to minimise the impact from ALDFG on both target and non-target species. However little effort has been made to apply stringent measures to reach such a goal. Thus, although countries should report ALDFG, only ICCAT has put in place a specific requirement to remove such gear through a recommendation in 2019.¹⁰⁴⁴ Given the potential for this to be of some significance, information on pilot projects on ALDFG removal was collected in the course of the review, but not directly included in the database. This included the ‘ADRINET’ project in the Adriatic, involving Montenegro, Italy, and Albania,¹⁰⁴⁵ and the French ‘GHOST

¹⁰⁴¹ Parton, Galloway and Godley (n 641).

¹⁰⁴² Parton, Galloway and Godley (n 641).

¹⁰⁴³ Parton, Galloway and Godley (n 641).

¹⁰⁴⁴ Recommendation by ICCAT on Abandoned, Lost or Otherwise Discarded Fishing Gears (2019) REC 19-11

¹⁰⁴⁵ Università degli Studi di Bari, ‘ADRINET’ <<https://adrinet.italy-albania-montenegro.eu/>> accessed 20 April 2020.

Med’ primarily exploring the effects on sensitive habitats.¹⁰⁴⁶ The latter led to the establishment of an ALDFG database in 2015, which has the potential for extension across Mediterranean countries. The NGOs ‘Healthy Sea’s and ‘Ghost Diving’, collaborate to remove ALDFG in several locations across the Mediterranean, using nets collected to manufacture swimwear etc.¹⁰⁴⁷

Sharks might also benefit from wider activities aiming to clean the sea from marine litter. Such initiatives include the 2013-2016 EU-funded project Derelict Fishing Gear Management ‘DeFishGear’, implemented in Albania, Croatia, Bosnia and Herzegovina, Italy, Slovenia, Greece, and Montenegro.¹⁰⁴⁸ A follow up project on ‘Fishing for Litter’ was initiated in 2019 by the NGO iSEA in Greece, and continues today.¹⁰⁴⁹

Further efforts across the region, organised through the GFCM, included four expert-led capacity building workshops between 2010 and 2014:¹⁰⁵⁰

- 2010: Transversal expert meeting on the status of Elasmobranchs in the Mediterranean and the Black Sea, September 20 - September 22, Sfax, Tunisia.
- 2011: Stock assessment of selected species of elasmobranchs, December 12 - December 16, Brussels, Belgium.

¹⁰⁴⁶ Sandrine RUITTON and others, ‘Ghost Med: Assessment of the Impact of Lost Fishing Gear in the French Mediterranean Sea’ [2019] 3Rd Symposium on the Conservation of Coralligenous and Other Calcareous Bio-Constructions <<https://hal.archives-ouvertes.fr/hal-02112113>>.

¹⁰⁴⁷ ‘Healthy Seas’ <<https://www.healthyseas.org/>> accessed 21 April 2020.

¹⁰⁴⁸ For more details see: <https://defishgear.net/project/background>

¹⁰⁴⁹ For more details see: <https://isea.com.gr/fishing-for-litter-project/?lang=en>

¹⁰⁵⁰ GFCM, ‘GFCM Meetings’ (2020) <<https://www.fao.org/gfcm/meetings/fr/>> accessed 20 December 2020.

- 2012: Training workshop on age reading of elasmobranchs in the GFCM area, (08 October-12 October) Antalya, Turkey.
- 2014: Workshop on elasmobranchs conservation in the Mediterranean and Black Sea, (10 December-12 December) Sète, France.

In 2017, another workshop on demersal elasmobranchs was held under the auspices of a subregional project between Italy, Libya, Malta, and Tunisia, called 'MedSudMed'.¹⁰⁵¹ The project aimed to strengthen national and regional research capacities and to promote scientific cooperation in the southern part of the central Mediterranean for the assessment and monitoring of fishery resources.

5.4 Assessing implementation effort

The following sections present the results of the assessment of the third construct, namely implementation effort at national level. The results identified differences between countries, leading actors, and species concerned, while also showing which socio-economic parameters may have influenced progress nationally.

5.4.1 Differences at national level

This section introduces countries' individual contribution to shark governance in the Mediterranean and assessed differences. Based on the review of all sources, 208 different national level measures were identified. These measures were then categorised into 22 different types (Table 9, as explained in Section 5.2). Most of these measures (30.3 %) were

¹⁰⁵¹ General Fisheries Commission for the Mediterranean (n 983).

comprised of projects, and longer-term programmes (26.0 %). Information repositories, such as inventories and databases, were also popular measures at national level.

Table 9. Measure types and overall frequencies of measures identified

Measure	Frequency	%
Project	63	30.3
Programme	54	26.0
Inventory	20	9.6
Assessment	10	4.8
Guide	9	4.3
Database	8	3.8
Reduction of fishing effort	8	3.8
Application	5	2.4
Fishing ban	5	2.4
Additional legal protection	4	1.9
Minimum Landing Size	4	1.9
Marine Protected Area (MPA)	3	1.4
Reporting	3	1.4
Fisheries restricted area (FRA)	2	1
Gear restriction	2	1
Stranding network	2	1
Finning ban	1	0.5
Product labelling	1	0.5
Regulated trade	1	0.5
Species Protection	1	0.5
Temporal closure	1	0.5
Trade prohibition	1	0.5
Total	208	100

A general view on the difference in the overall number of measures implemented in each of the nations assessed (Table 10), showed that Spain is the leading Mediterranean country when it comes to actions taken in relation to shark governance, with 46 measures in place. As Table 10 demonstrates, the number of measures nationally differed, with most EU MS leading. These total numbers include those measure and actions carried out by NGOs.

However, looking at the standardised numbers within the context of a country's GDP, the leading countries changed with Egypt, Morocco, and Algeria demonstrating the highest effort in implementing measures. These efforts were reduced following standardisation without the contribution of NGOs, with two countries' effort dropping substantially, namely Bosnia and Herzegovina (from 4.37 to 1.46) and Albania (from 5.36 to 3.95).

Table 10. Number of implemented measures per country and their standardised value including and excluding the contribution by NGOs.

Country	Number of implemented measures	Standardised measures	Stand. Measures without NGO contribution
Spain	46	1.71	1.04
Greece	36	1.68	1.03
Italy	33	1.02	0.93
Croatia	27	2.25	1.83
Malta	27	1.30	0.96
Cyprus	26	1.00	0.73
Israel	25	0.84	0.74
France	24	0.65	0.41
Turkey	24	2.71	2.14
Albania	19	5.36	3.95
Algeria	19	4.98	4.98
Slovenia	19	0.92	0.77
Bosnia and Herzegovina	18	4.37	1.46
Montenegro	17	2.98	2.63
Tunisia	15	4.13	3.86
Egypt	14	6.19	6.19
Morocco	14	5.53	5.14
Lebanon	13	2.03	2.03
Libya	13	1.64	1.26
Syria	12	2.47	2.47
Monaco	7	0.05	0.05
Palestine	3	1.24	1.24

To assess any potential difference between EU MS and non-EU countries quantitatively, a Mann-Whitney U test was carried out. The test results indicated that the difference in the mean amount of measures (absolute number) between the two is significant ($p < .000$).¹⁰⁵²

¹⁰⁵² EU MS displayed a mean rank of 17.94 and non-EU countries of 7.82.

This difference remained significant even when comparing the standardised number of measures between the EU and non-EU countries ($p = .024$). This was also the case comparing standardised values without NGO activity ($p = .008$), considering that many NGOs receive funding from outside their own country and therefore GDP would not account for their contribution.¹⁰⁵³

The results imply that EU countries, on average, implement significantly more measures at national level than non-EU countries, with and without the contribution of NGOs. However, comparing the individual number of measures implemented nationally, as shown in Table 11, the implementation effort was not significantly different between Mediterranean States, meaning within the two groups, EU and non-EU countries, implementation effort among countries was similar. These results answer the second and third research question in relation to the individual effort of countries and the differences between them.

¹⁰⁵³ As indicated through the survey questionnaire and mentioned in Chapter Six, Section 6.2.

Table 11. Overview of implemented measures by country. The higher the cell value, the darker is the cell colouration. All cells with values larger than 10 have the same colour.

Country*/ Measures	ALB	ALG	BHG	CRT	CYP	EGY	FRA	GRE	ISR	ITA	LEB	LBY	MLT	MON	MTG	MOR	PAL	SLV	SPN	SYR	TUN	TRK	
Additional legal protection				1		1		1	1														
Application					1			1	1	2									1	1			
Assessment				1						2	1		2				1		3				
Database	2	3		2	2	1	1	1	4	2	1	1	3		1	1	1	1	1	1	1	1	2
Finning ban	1			1	1	1	1	1	1	1	1	1	1		1	1		1	1	1			1
Fishing ban	1	1		1	2	1	1	1		1		2	1			1		1	1	2	1		2
FRA	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			2	2	2	2	2
Gear restriction	1	1	1	2	2	1	2	2	1	2	1	1	2	1	1	1			2	2	1	1	1
Guide		1						1	1	1		1	1			1							2
Inventory	1	3	1					1		1	2			1		1		1	2	1	2		3
Minimum Landing Size		1								1					1							1	
MPA						1					1												1
Product labelling				1	1		1	1		1			1						1	1			
Programme	2	2	2	5	3	1	3	6	6	6	2		8		1	1		3	10				3
Project	4	2	9	4	7		9	13	3	7		3	1		6	1	1	2	14	1	2		5
Reduction of fishing effort				1	1	1		1	1				1						1	1			
Regulated trade	1	1	1	1	1	1	1	1	1	1			1	1	1	1			1	1		1	1
Reporting	2	1		2	1	1	1	1	1	1	1	1	1		1	1			1	1	1	1	1
Species Protection	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1
Stranding network				1																		1	
Temporal closure																						1	
Trade prohibition	1	1	1	1	1	1	1	1	1	1			1	1	1	1			1	1		1	1

*Country abbreviations: Albania (ALB), Algeria (ALG), Bosnia and Herzegovina (BHG), Croatia (CRT), Cyprus (CYP), Egypt (EGY), France (FRA), Greece (GRE), Israel (ISR), Italy (ITA), Lebanon (LEB), Libya (LBY), Malta (MLT), Monaco (MON), Montenegro (MTG), Morocco (MOR), Palestine (PAL), Slovenia (SLV), Spain (SPN), Syria (SYR), Tunisia (TUN), Turkey (TRK)

The assessment whether the class distribution differed among countries, showed that the composition of measure based on their focus (class) was also similar across countries (Figure 23).

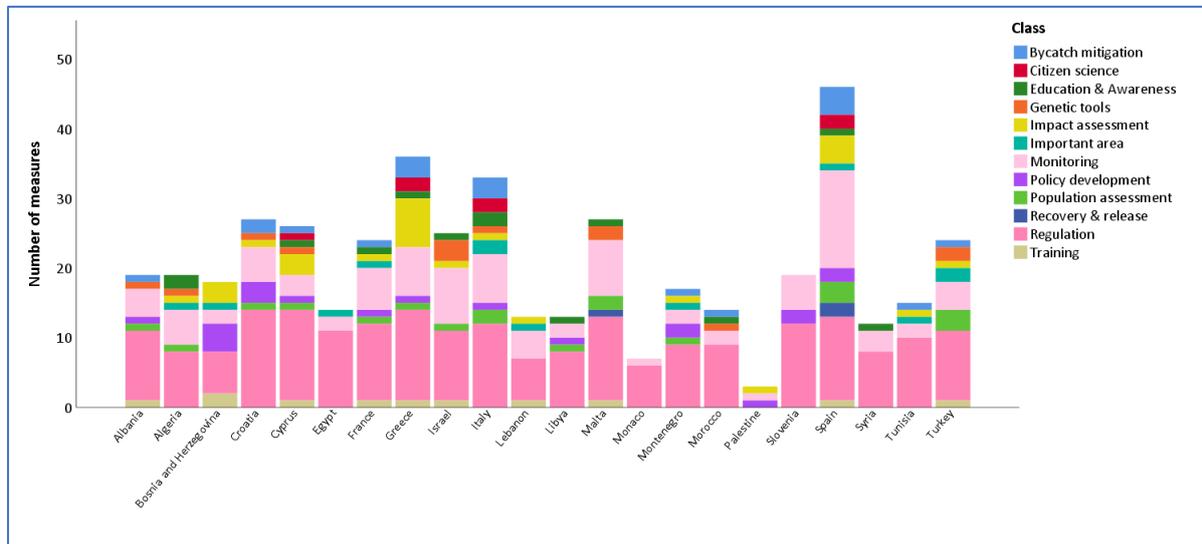


Figure 23. Composition of measure classes by country.

Most measures fell under monitoring, establishing long-term data sets on sharks (28.9 %).

The second biggest class were measures focusing on the regulation of human activities

(16.4 %), which are those stipulated by international and regional law, followed by

assessments that considered impacts on sharks or their population status (17.8 %). Those

measure with a clear indication to aim for the development of new policies contributed to

4.81% overall. Bycatch mitigation measure made up 6.3 %. Efforts involving the public

through Citizen Science and those aiming to increase knowledge through education, as well

as those that offer some form of training combined accounted for 14.4 %. The lowest

contribution was measures with a focus on important areas (5.8 %), developing and applying

genetic tools (3.4 %), and recovery actions (2.4 %), as shown in Table 12.

Table 12. Class contribution of measures.

Class/ Construct	Fisheries management	Conservation effort	Trade management	TOTAL
Monitoring	14	46	0	60
Regulation	27	5	2	34
Impact assessment	23	4	0	27
Education & Awareness	12	2	0	14
Bycatch mitigation	13	0	0	13
Important area	1	11	0	12
Training	1	10	0	11
Policy development	2	8	0	10
Population assessment	4	6	0	10
Genetic tools	0	7	0	7
Citizen science	0	5	0	5
Recovery & release	3	2	0	5
TOTAL	100	106	2	208

There was a difference in the measure type of ‘regulation’ applied for fisheries and conservation management, with 27 and 5 measures respectively. In fact, there was a significant difference in the overall class composition between conservation and fisheries management, as indicated by the results of the Kruskal-Wallis test ($H(44) = 408.691$, $p < .000$). In summary, slightly more measures for sharks identified fell within the construct of conservation than those concerning fisheries management, but it was a close tie with 51.0 % versus and 49.0 % (including 1% applied specifically to recreational fishing) respectively.

Concluding this section, the answer to the fourth research question is there are measurable differences how conservation efforts and fisheries management are implemented in terms of their focus. While fisheries management relies mostly on regulations, conservation actions focus on long-term data collection. This approach did not differ between countries, as measure compositions were similar.

5.4.2 Key actor contributions

For this assessment, each measure was assigned a lead, based on who either initiated it or who was responsible for its realisation. A Kruskal-Wallis test compared the average amount of measures led by government entities (mean rank= 51.32), with those of NGOs (mean rank= 25.39), and researchers (mean rank 23.80), revealing a significant difference between these key actors ($H(2)= 28.744$, $p < .000$), meaning government contribution was generally higher than those of NGOs and researchers. Across the countries forming this evaluation, the overall trend was of governments being the lead for the majority of measures across the region (62.9 %), as shown in Figure 24. Such measures related primarily to the establishment of monitoring programmes and inventories, but also to the implementation of legal obligations such as fishing ban, finning ban, fisheries restrictions, trade regulation and prohibition, as well as a reduction in fishing effort, the reporting of landings, and the legal protection of species. In contrast, researchers took on 19.6 % of initiatives, mostly those concerning impact and population assessments, and creation of databases. NGOs led on 17.6 % of the total measures nationally (on average), chiefly conservation projects and long-term programmes supporting conservation efforts and data compilation. An overview of individual contributions by key actors can be found in Annex 1 Table 10. In addition to taking leading roles, government bodies, researchers, and NGOs collaborated on 25 measures and directly involved fishers in 17 measures, as well as the public through citizen involvement in seven measures. At national scale the picture shifted slightly depending on the country (Figure 24).

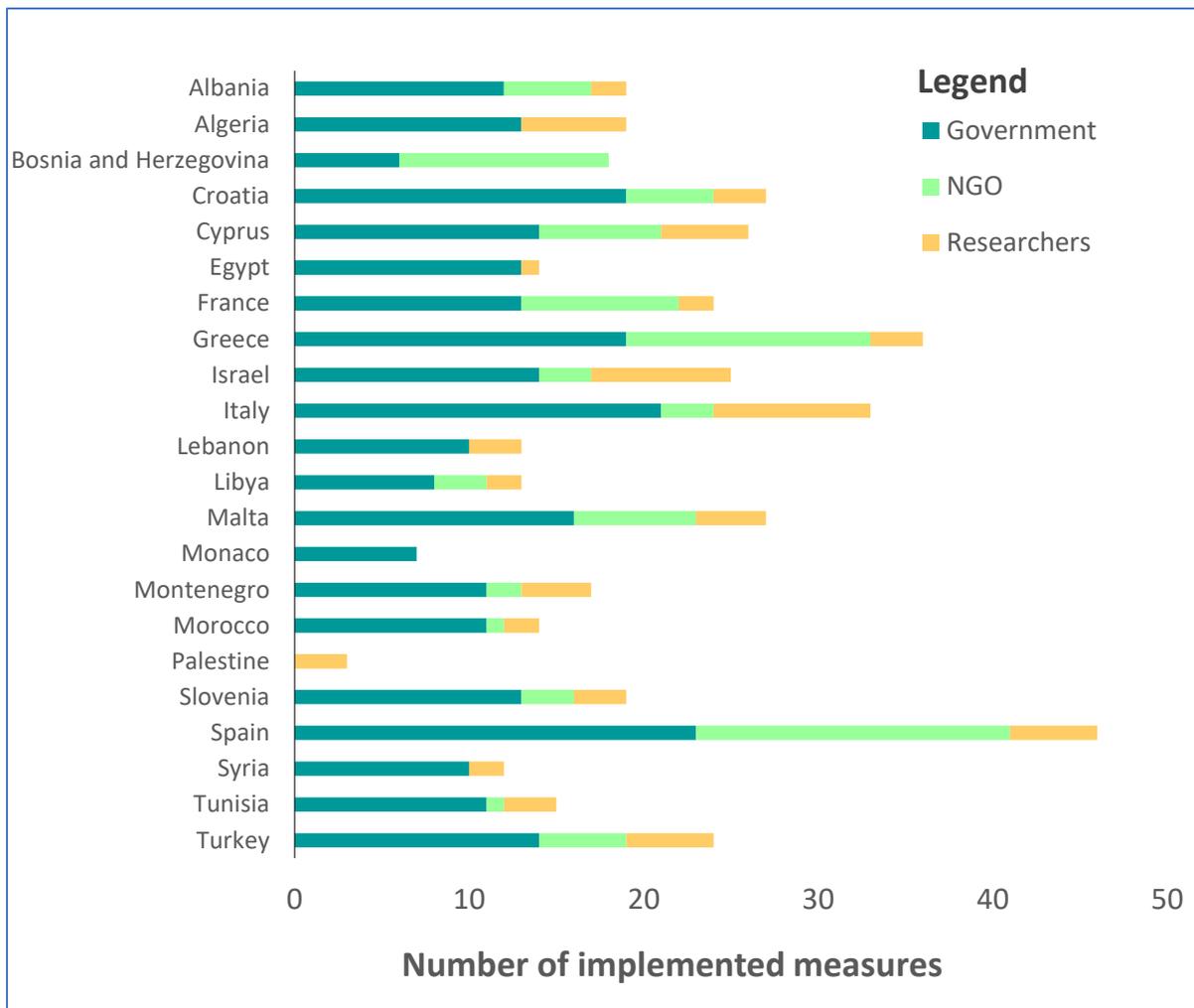


Figure 24. Composition of leading entity in the implementation of measures per country.

In Spain, Greece, and France, NGOs led on almost the same number of conservation and management measures as the government, while in Bosnia and Herzegovina, one NGO exceeded government led efforts by almost double. To determine whether NGO presence at national level increased the overall implementation effort of a nation, a Mann-Whitney U test was conducted. The test result showed that countries with NGOs (mean rank= 15.45) have a significantly higher number of implemented measures than those without NGOs (mean rank= 7.55), with a p-value of .004 (Figure 25). However, comparing the standardised

implementation effort between countries,¹⁰⁵⁴ based on NGOs presence, the results were no longer statistically significant ($p = .200$), indicating that the presence of NGOs as such does not explain difference in the implementation effort between countries when considering their economic status.

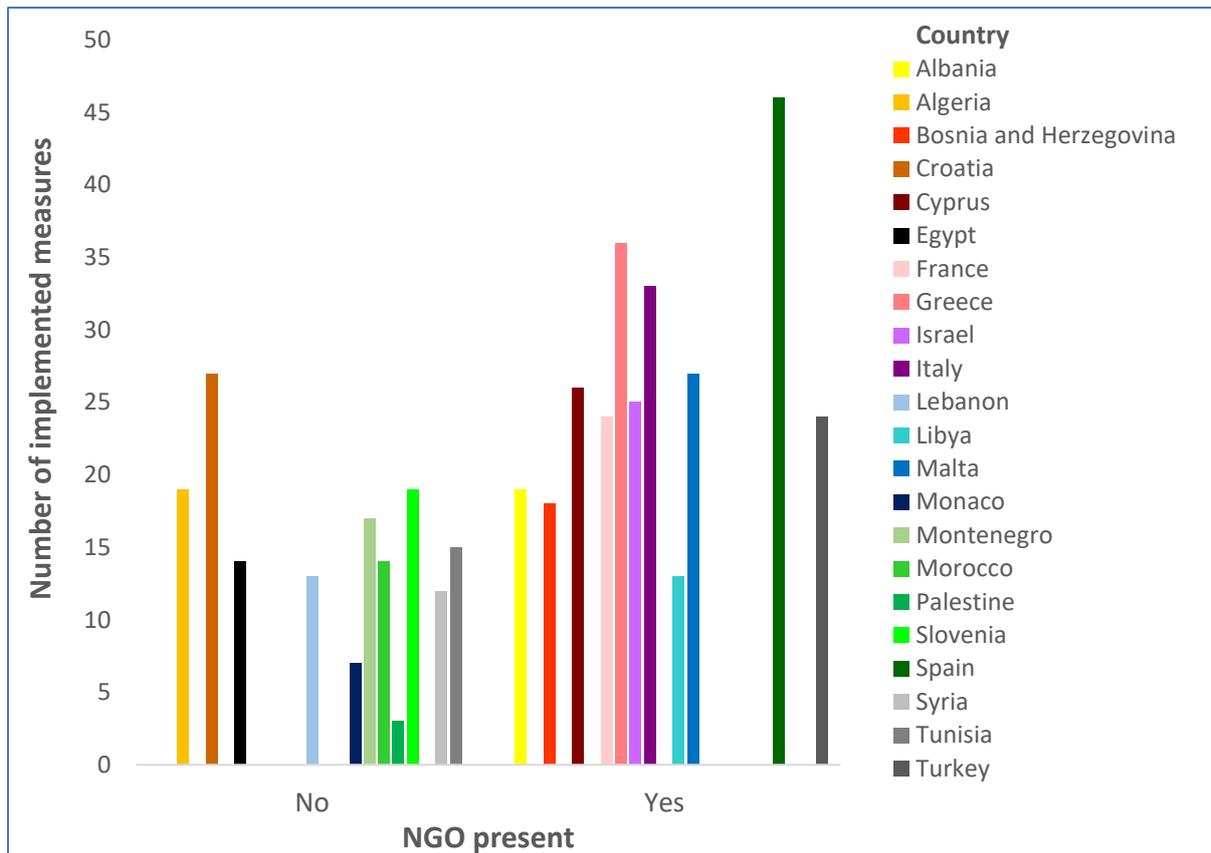


Figure 25. Absolute number of implemented measures per country against NGO presence.

This presents the answer to the question who leads implementation effort at national scale.

While government bodies took the lead, NGOs’ and researchers’ contribution were not negligible and supported obligations in relation to data collection, education, research, and conservation.

¹⁰⁵⁴ Implementation effort was standardised by GDP, as explained in Chapter Two, Section 2.7.1.

5.4.3 Species focus of measures and its relation to existing knowledge

Whether or not the present diversity of shark species within national waters may have influenced the number of national measures implemented was assessed by mapping both variables in a bar chart diagram (Figure 26), since criteria to apply a correlation test were not fulfilled. There was no direct relationship found between the two variables. As the graph shows, the composition of measures and species are not related. While in some countries of relatively high biodiversity relatively low number of measures were recorded, in others, with a similar shark diversity, the number of identified measures was relatively high. For example, in Slovenia 36 species of sharks are present, according to the IUCN database, and the country implements a range of measures (19), while in Palestine, with records of 33 different species, only three measures were identified. This concludes that the sheer presence of diversity does not necessarily stipulate the development of conservation and management actions.

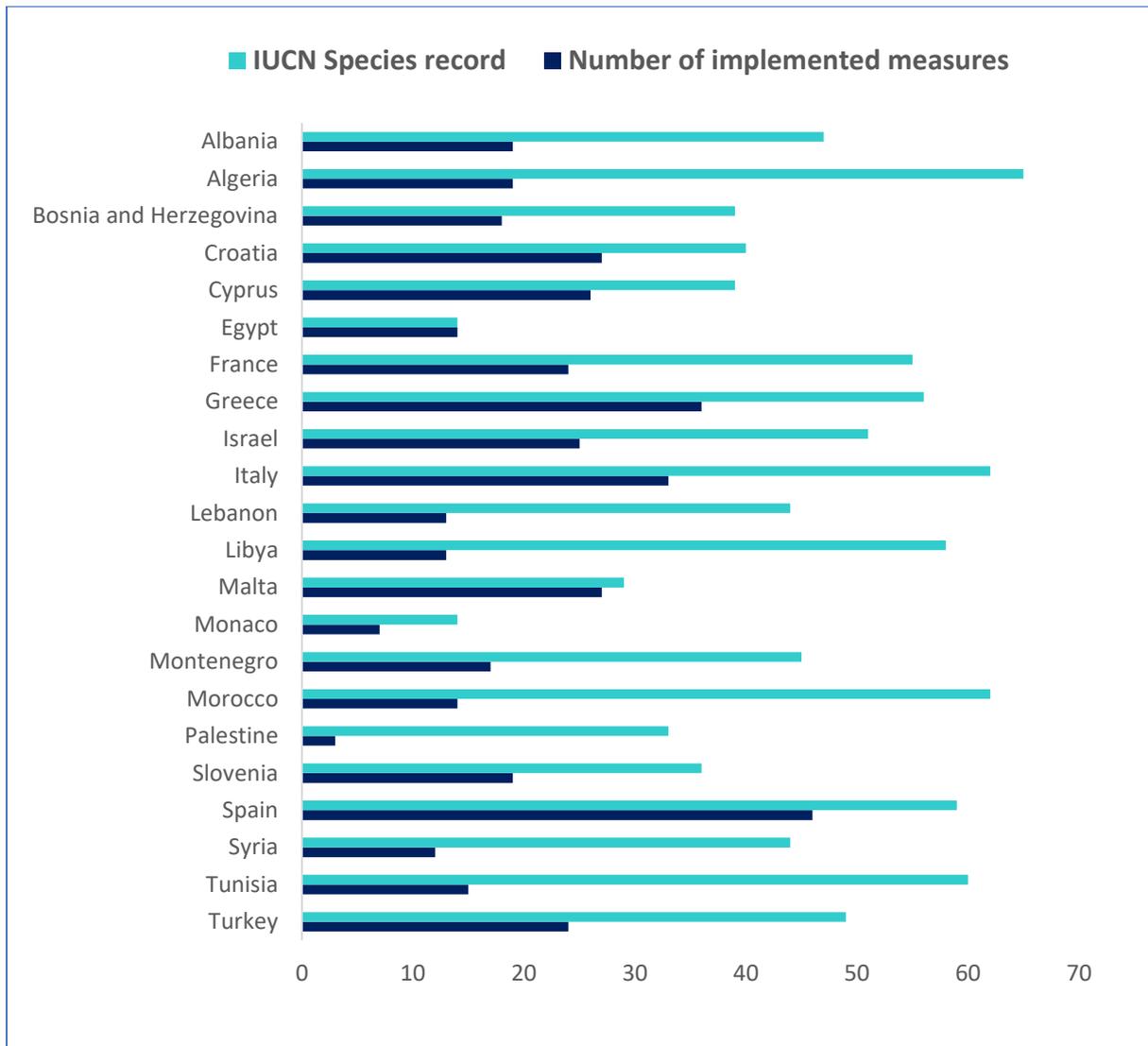


Figure 26. The number of species recorded by the IUCN within national waters and the number of implemented measures per country.

If applied actions concern those species in need, was another aspect investigated. For the purpose of the analysis the IUCN Red List categories were summarised into three overarching categories, in line with the 2016 regional assessment.¹⁰⁵⁵ These categories were defined in Chapter Four, Section 4.1.3.

As regards to the 208 identified measures, only 88 could be assigned to a species group directly (Figure 27). Out of these, the majority (68) were relevant to the group of Regionally

¹⁰⁵⁵ Dulvy and others, 'The Conservation Status of Sharks, Rays, and Chimaeras in the Mediterranean Sea' (n 49).

Threatened species, which applied also in cases where the measures cover multiple species but at least one species was considered threatened. Less measures, namely 14, considered Near Threatened species, while six measures covered only those that are either Data Deficient or of Least Concern. Due to high amount of unspecified actions, no direct conclusion could be drawn whether implementation effort focused on species of high concern. This may be related to the fact that national reports lacked detail and actions are often developed to generally cover sharks, such as reporting of landings.

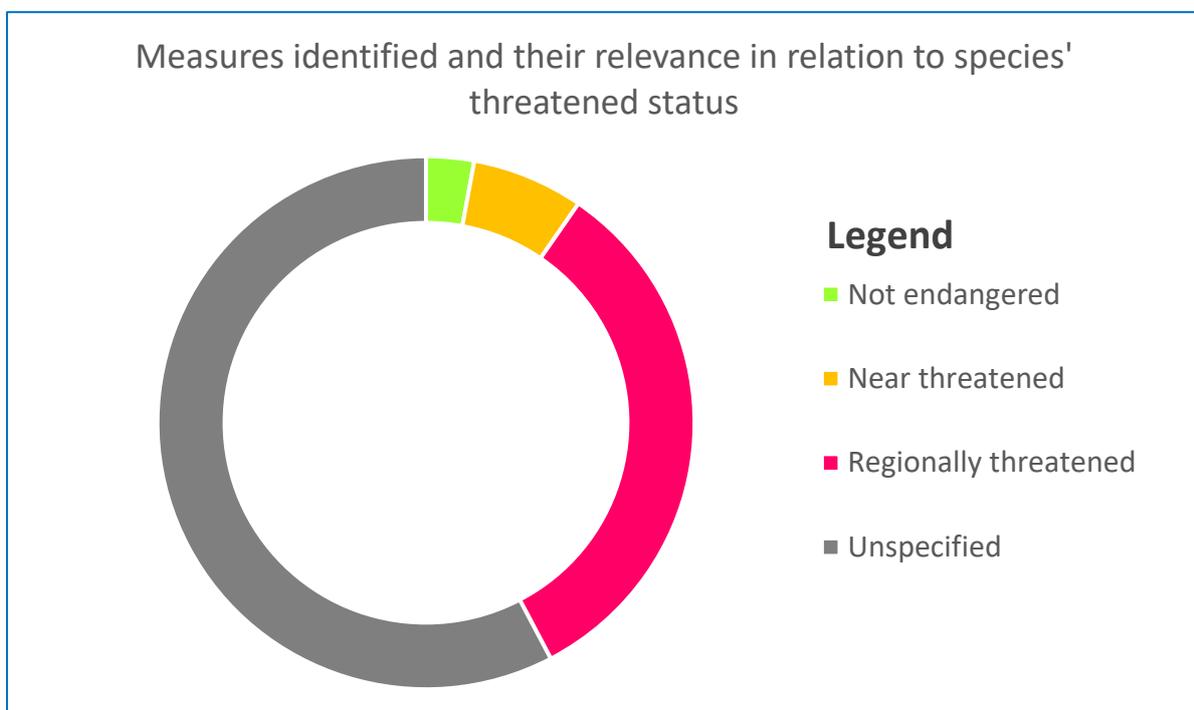


Figure 27. Measure distribution based on species' conservation status.

As described in Chapter One, research should form the basis of policy actions. To determine whether there is a relationship between the number of publications containing information on a certain species and number of measures that apply to that particular species, a Spearman's rank correlation was computed. The results indicated a relatively strong positive correlation between the two variables ($r(80) = .759, p < .000$), meaning that the more knowledge is available on a particular species, more applicable measures seem to exist for

that species. This seemed to be true independent of the species' population status (Figure 28).

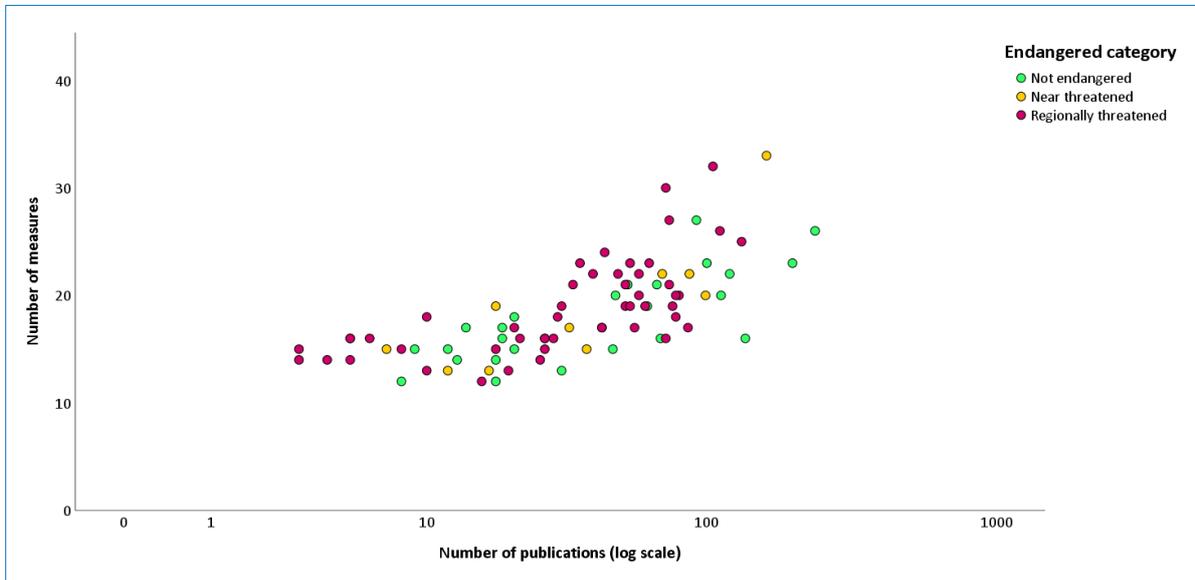


Figure 28. Number of measures implemented at national scale against species recorded by IUCN within national waters, including their threatened status based on the IUCN Red List Assessment.¹⁰⁵⁶

Figure 28 shows that the range of measures applicable to most species is relatively narrow, between ten and thirty, with no discrimination in the amount of measures in relation to the conservation status of species. This suggests that the conservation status *per se* does not initiate action, but the availability of scientific information may have had a direct influence. This answers research question number six: science does seem to guide action, but measures did not appear to have been prioritised by species' conservation status. Even though, considering the intent of each measure (class), some form of prioritisation in terms of policy formulation and implementation appeared to have happened, as shown in Figure 29.

¹⁰⁵⁶ Dulvy and others, 'The Conservation Status of Sharks, Rays, and Chimaeras in the Mediterranean Sea' (n 49).

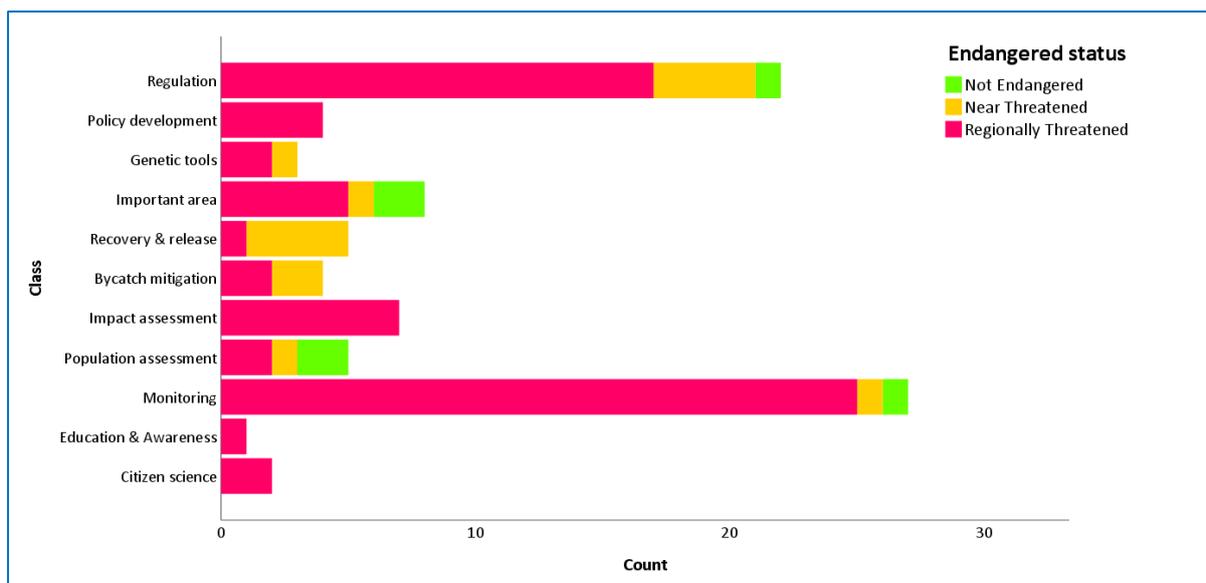


Figure 29. Measure class mapped against applicable species status group.

Regulations, as those legal obligations governing certain activities, seem to prioritise species threatened with extinction. The same applies to monitoring programmes, policy development, the development of genetic tools, and impact assessments. Although, the graph indicates an overall focus on these species, it is noteworthy that educational activities, including Citizen Science cover a wide range of species, including those threatened with extinction. It concludes that overall implementation effort does not prioritise species by status, but more stringent measures, such as regulations, do.

5.4.4 Implementation effort in relation to socio-economic factors

Another aspect of this investigation considered the commercial interest or impact a country has on shark populations, and whether this would influence the effort in implementing measures. ‘Commercial impact’ was defined as the amount of sharks landed and standardised by calculating the ratio between shark landings in relation to overall

landings.¹⁰⁵⁷ As the assumptions for a Spearman correlation test were not fulfilled, standardised implementation effort was mapped against commercial impact giving an indication of the relationship between the two variables (Figure 30). The figure shows no indication of any relationship, but some of the data points seem to be clustering together, implying that some countries with smaller amounts of sharks landed (relative to their overall landings of fish) also invest less in management (in relation to their GDP) concerning these species, such as Slovenia, Palestine, France, Greece, and Spain. The highest amount of sharks landed per country was Libya, with only a very few measures. In relation to the countries' GDP, Egypt implemented more measures than other Mediterranean countries, but also had relatively high shark landings despite the recorded legal ban on fishing sharks. Morocco, on the other hand, which had one of the highest number of measures (in relation to its GDP), fished less sharks compared to the overall fish landings than most other Mediterranean countries.

In conclusion, shark landings did not seem to be a predictor for implemented measures, but some countries demonstrated some similarity between their overall implementation effort and economic impact.

¹⁰⁵⁷ See Chapter Two, Section 2.7.1.

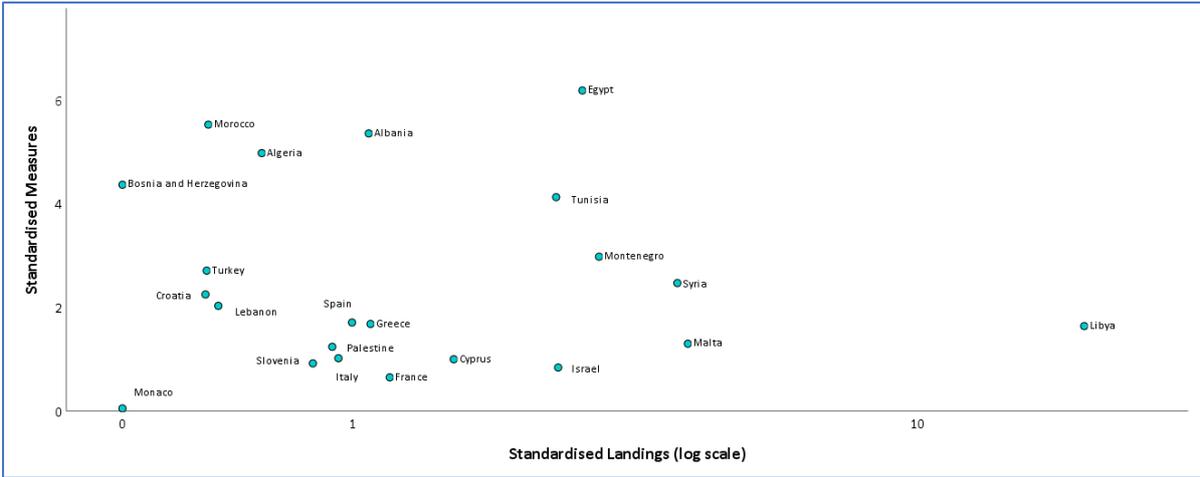


Figure 30. Standardised implementation effort against standardised shark landings per country.

To determine whether other indicators potentially influenced a nation’s implementation effort, Spearman correlation tests were applied. The first executed correlation test between the number of measures implemented at national scale and the Human Development Index (HDI) indicated a strong positive relationship between the two variables ($r(19) = .820$, $p < .000$), as shown in Figure 31, showing that higher HDIs related to more implemented measures.

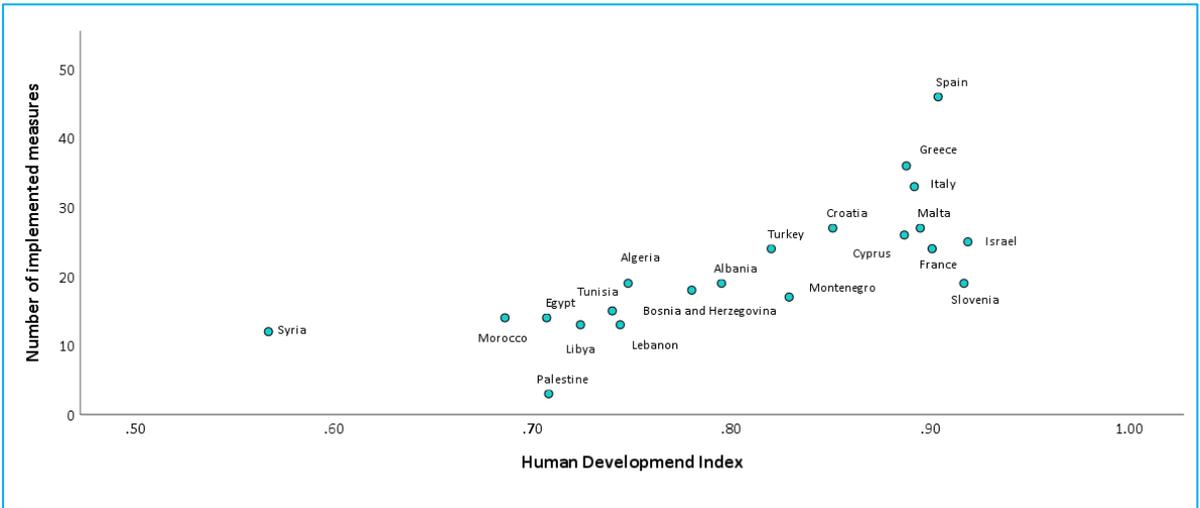


Figure 31. The number of implemented measures at national scale against the Human Development Index (2019) of the country.

An equally strong relationship was observed between three of the government indicators and the number of implemented measures, namely regulatory quality ($r(18) = .770$, $p = .000$), government effectiveness ($r(18) = .762$, $p = .000$), and control of corruption ($r(18) = .735$, $p = .000$). A moderate positive correlation was observed between implementation effort and the Rule of Law ($r(19) = .576$, $p = .006$). This is noting that for Monaco this was the only indicator available, while for Palestine none of the indicators were listed.

Hence, it can be concluded that higher values of socio-economic parameters go hand in hand with an increase in the number of measures implemented, which answers the final research question for this chapter. Although outside the scope of this work, further research into other factors, such as the level of corruption and its impact on implementation efforts at national level, would be required.

5.5 Reflecting on the overall implementation progress nationally

The lack of detail in relation to implemented measures made it often difficult to identify shark specific or relevant actions. Most useful in this regard were RFMO reports, reports of the Focal Point meetings by SPA/RAC on progress on the implementation of the regional action plan, and CMS Shark MoU reports. MSFD reports were also useful if sharks were considered under the national monitoring programme and PoMs. Less useful were responses under CITES, the CMS, and the CBD as these are often generic questions on overall implementation measures, not sharks specifically. No measures relevant to sharks were identified through meeting reports under the PSMA. This might be because it only entered into force in 2016 and has yet to prove its value to combat illegal fishing.

Additionally, many shark-specific measures were identified through surveys, web-based research, and policy documents, revealing that reports are less transparent than online sources.

Across the reports, apart from those commissioned by the EU to assess national PoMs, there seemed to be little in the way of quality control, with various reports making generic statements on efforts implemented, making it harder to track real progress and determining what species are covered by measures. Efforts to improve reporting have been made by RAC/SPA through reporting templates for regional action plans, the GFCM through a new SAC reporting template, and ICCAT. The latter has developed a 'shark sheet', as part of their regular reports to the Secretariat specifically for national shark conservation and management measures.¹⁰⁵⁸ What has become clear through the review of reports, is that marine conservation and fisheries management is a complex web of applicable laws and responsible bodies with only a few clear pathways for shark-specific actions, as required under the CMS and its 2010 Shark MoU, CITES, and specific recommendations under the two relevant RFMOs.

A closer look at that stage of the policy cycle shows that implementation effort differed between the countries studied, despite a common agenda set through international and regional legal frameworks.¹⁰⁵⁹ Not only did the quantity of measures differ, but also the type of measures applied at national level. Spain seemed to lead in the overall implementation of shark governance, being the country with most active national NGOs (n=5), implementing

¹⁰⁵⁸ Recommendation by ICCAT to replace Recommendation 16-03 on Improvement of Compliance Review of Conservation and Management Measures regarding Sharks caught in Association with ICCAT (2018) REC 18-06

¹⁰⁵⁹ As explained in Chapter One.

39.1 % of the measures recorded. The difference in implemented measures among Mediterranean countries may have multiple reasons. Besides the influence and contribution of NGOs, the availability of financial resources may be a considerable obstacle to countries being able to actively fulfil their obligations.¹⁰⁶⁰ Financial restraints as limiting factor of implementation progress has been subject of several studies.¹⁰⁶¹ Timmons et al. noted the following issue of developing nation in regard to implementing commitment made under international treaties:

“Poorer nations are also growing frustrated at unmet promises by rich nations to provide them sufficient environmental loans and foreign assistance to comply with obligations under the new treaties.”¹⁰⁶²

Struggles to comply with obligations and limitations, where assistance would be required at national level, are further explored in Chapter Six. Other factors, including national shark landings, marine area and species diversity in national waters appeared less relevant, as the results of this analysis showed. However, this only relates to the absolute number of measures, not their quality or effectiveness. There is an emerging argument that where shark fishery is less commercially relevant, more stringent measures for protection are put in place.¹⁰⁶³ Internationally, countries with little commercial shark interest and high biodiversity, or where sharks form part of a different economic sector, namely tourism, show significant conservation efforts.¹⁰⁶⁴ An example is Israel, with a small fishing fleet and which has protected all species of sharks from being landed since 2005.¹⁰⁶⁵ Although shark-

¹⁰⁶⁰ Hill and others (n 780).

¹⁰⁶¹ Perkins and Neumayer (n 769).

¹⁰⁶² Roberts and others (n 770).

¹⁰⁶³ Ward-Paige (n 181).

¹⁰⁶⁴ Ward-Paige (n 181).

¹⁰⁶⁵ Proclamation of National Parks, Nature Reserves, National Sites and Memorial Sites (Protected Natural Values), 2005. https://www.nevo.co.il/law_html/law01/999_395.htm

related tourism, as alternative livelihood for fishers, as such is something that has not (yet) developed as an income stream in the Mediterranean,¹⁰⁶⁶ but may become more relevant in the future.¹⁰⁶⁷

Unfortunately, based on this assessment, a large part of the national measures focused on data collection, rather than actual *in-situ* conservation and management. Most stringent measures were applied to the fishing sector, as set out via regulations determined through international and regional bodies. Although the latter require Party support or, in the case of RFMOs, majority votes, the reality is national implementation lags. The SPA/BD Protocol, whose very name demands the creation of Specially Protected Areas, and which should be a focus in the conservation of marine biodiversity, seems to have had little value for sharks, with gaps in research for important areas and a lack of actual protected areas with the objective to preserve sharks within them. The only MPA identified that particularly concerns sharks was in Turkey,¹⁰⁶⁸ (there are possibly more, but there was limited evidence from reports and publications in terms of where such areas are located and what measures have been taken to protect them). Little to no protection was given at the other end of the Mediterranean, where sufficient knowledge would seem to support the designation of a shark MPA, as in the Gulf of Gabés,¹⁰⁶⁹ but being a major fishing ground, including a target fishery for sharks,¹⁰⁷⁰ the only measure applied is a short-term closure. Whether this closure generates actual conservation benefits remains to be assessed.

¹⁰⁶⁶ Zemah Shamir and others (n 829).

¹⁰⁶⁷ Zemah Shamir and others (n 829).

¹⁰⁶⁸ See Section 5.2.2.4 on MPAs above, this concerns Boncuk Cove.

¹⁰⁶⁹ Enajjar, Saidi and Bradai (n 816).

¹⁰⁷⁰ Mohamed Nejmeddine Bradai, Bechir Saidi and Samira Enajjar, 'Overview on Mediterranean Shark's Fisheries: Impact on the Biodiversity', *Marine Ecology - Biotic and Abiotic Interactions* (InTech 2018) <<https://www.intechopen.com/books/advanced-biometric-technologies/liveness-detection-in-biometrics>>.

Habitat conservation is relevant in terms of protecting living space, foraging grounds, breeding, and nursery areas so perhaps the spatial tool of MPAs remains under-utilised.¹⁰⁷¹ A gap that is not unique for the Mediterranean, but exist globally.¹⁰⁷² MPAs have been proven effective, if they are well designed and enforced, although they may be less effective for mobile species,¹⁰⁷³ to which many shark species in the Mediterranean belong.¹⁰⁷⁴ A network of MPAs considering migratory routes of species may be a way to improve this.¹⁰⁷⁵ However, a recent study across the Mediterranean basin showed existing MPAs have little to no conservation benefit for sharks.¹⁰⁷⁶ In summary, spatial measures in general are rare and their conservation success remains to be determined. For example, although the trawling ban below 1000 m might reduce impact on deep sea shark species, there is no evidence of the extent to which this may be the case.¹⁰⁷⁷ Similarly, whether the 3 nm trawling restriction makes a difference for coastal species seems unlikely when small-scale fishing is the main impact in these waters.¹⁰⁷⁸

Another gap in implementation effort was the effective regulation of the recreational fishing sector, which arguably operates without sufficient surveillance, monitoring and control.¹⁰⁷⁹

¹⁰⁷¹ Birkmanis and others (n 537).

¹⁰⁷² Birkmanis and others (n 537).

¹⁰⁷³ Melinda G Conners and others, 'Mismatches in Scale between Marine Protected Areas and Mobile Marine Megafauna' (2019) Manuscript Proceedings of the National Academy of Sciences 1.

¹⁰⁷⁴ Serena and others (n 48).

¹⁰⁷⁵ Davidson and Dulvy (n 41).

¹⁰⁷⁶ Manfredi Di Lorenzo and others, 'Small-Scale Fisheries Catch More Threatened Elasmobranchs inside Partially Protected Areas than in Unprotected Areas' (2022) 13 Nature Communications 4381 <<https://www.nature.com/articles/s41467-022-32035-3>>.

¹⁰⁷⁷ Moranta and others (n 845).

¹⁰⁷⁸ Nadhéra Babali and others, 'Recreational Fisheries Economics between Illusion and Reality: The Case of Algeria' (2018) 13 PLOS ONE e0201602 <<https://doi.org/10.1371/journal.pone.0201602.g001>>.

¹⁰⁷⁹ Ben Lamine and others (n 113).

Recreational fishing remains a problem in multiple countries,¹⁰⁸⁰ and may even supersede pressures exerted from commercial activities.¹⁰⁸¹ The only regulative effort this assessment identified, was the prohibition of recreational shark fishing in Cyprus, and of course, by default, the nation-wide protection of sharks in Israel and Egypt; although in respect of the latter, the reporting of shark landings shows this may not be effectively enforced.¹⁰⁸² The issue was also reflected in the response from national experts, who confirmed that marketing of sharks from recreational fishing does occur, as explained in Chapter Six, Section 6.3.

The working plan for the implementation of the regional shark action plan for 2014-2019,¹⁰⁸³ foresaw the wide-scale application of UNEP RAC/SPA's guidelines for recreational shark fishing, developed in consultancy with international shark experts.¹⁰⁸⁴ However, it seems to be a goal that remains to be realised.¹⁰⁸⁵ Likewise, the reported shark fishing ban in Libya seems currently to be more of a future ambition. With Libya facing political instability and leading on the amount of sharks caught in the region contributing substantially to the decline in biomass of sharks, it seems unlikely that this ban will be turned into reality any time soon. More positive has been the foundation of a local Libyan NGO, which contributes to shark research and conservation.

¹⁰⁸⁰ NIKOLAS PANAYIOTOU and others, 'Offshore Recreational Fisheries of Large Vulnerable Sharks and Teleost Fish in the Mediterranean Sea: First Information on the Species Caught' (2020) 21 Mediterranean Marine Science 222 <<https://ejournals.epublishing.ekt.gr/index.php/hcmr-med-mar-sc/article/view/21938>>.

¹⁰⁸¹ Ben Lamine and others (n 113).

¹⁰⁸² Mohamed Samy-Kamal, 'Outlook on the Fisheries Policy Reform in Egypt and the Draft of the New Fisheries Law' (2020) 120 Marine Policy 104136 <<https://doi.org/10.1016/j.marpol.2020.104136>>.

¹⁰⁸³ UNEP, 'Decision IG.21/4 UNEP(DEPI)/MED IG.21/9' (n 726).

¹⁰⁸⁴ Sarah L Fowler and E Partridge, 'Guidelines for Shark and Ray Recreational Fishing in the Mediterranean' (2012).

¹⁰⁸⁵ Regional Activity Centre for Specially Protected Areas (SPA/RAC) (n 660).

The contribution of NGOs and researchers in relation to the implementation of measures and within the context of international law, was firstly assessed in this region through the present work. It showed that, although these organisations have no regulatory powers, they can substantially progress conservation efforts for sharks at national level. A subject, that has been the focus of limited research. Some studies did look more closely into the available tools of NGOs, such as educational campaigns and advocating for better policies, the latter leading to the most impactful change over long-term;¹⁰⁸⁶ both strategies were confirmed through this assessment. NGOs can also guide fishers' behaviour and thereby lead to more sustainable practices.¹⁰⁸⁷ Another aspect confirmed in the present assessment, through the development of guidelines by these organisations. Moreover, as demonstrated by Guggisberg in 2019, NGOs can serve the role of 'watch dogs' monitoring compliance with existing fisheries regulations.¹⁰⁸⁸ This was only partly observed in the Mediterranean, in relation to NGOs implementing programmes monitoring commercial fishing landings, such as by iSEA in Greece.¹⁰⁸⁹

Fisheries measures, often dominated by regionally set regulations, are the main responsibility of government agencies in terms of implementation and accompanied monitoring and enforcement. The development of such regulations happened gradually. A case in point is the finning ban. This practice has long been recognised as cruel and unsustainable by the research and conservation community, but it took advocacy to

¹⁰⁸⁶ Richards and Heard (n 572).

¹⁰⁸⁷ LK Deighan and LD Jenkins, 'Fishing for Recognition: Understanding the Use of NGO Guidelines in Fishery Improvement Projects' (2015) 51 *Marine Policy* 476 <<http://dx.doi.org/10.1016/j.marpol.2014.10.009>>.

¹⁰⁸⁸ Guggisberg (n 65).

¹⁰⁸⁹ I Giovos and others, 'Approaching the "Real" State of Elasmobranch Fisheries and Trade: A Case Study from the Mediterranean' (2021) 211 *Ocean & Coastal Management* 105743 <<https://doi.org/10.1016/j.ocecoaman.2021.105743>>.

develop the best legal approach.¹⁰⁹⁰ As previously discussed, the first EU regulation on shark finning in 2003 applied a maximum fin-to-carcass ration approach.¹⁰⁹¹ Scientists quickly criticised this approach arguing that the ratio depends on the practice of finning,¹⁰⁹² and on the species being finned, thereby making it hard to implement correctly and thus effectively unenforceable.¹⁰⁹³ This was already predicted by experts in 2007, strongly advocating for a different approach to land sharks with their fins attached.¹⁰⁹⁴ This approach became a reality a few years later when the 2003 EU Regulation was amended to incorporate a ‘fins naturally attached’ policy in 2013;¹⁰⁹⁵ An approach also incorporated under a legally binding GFCM recommendation.¹⁰⁹⁶ An expert review of the effectiveness of the fins attached approach and compliance by EU MS showed that it seems to be working, although more qualitative and comprehensive data on non-compliance would likely assist in making this determination more reliable.¹⁰⁹⁷

Unfortunately, provisions of GFCM and ICCAT Recommendations that have not been transposed into national law, are not enforceable. Legal transposition was an aspect, which was difficult to track due to issues of transparency in national legal systems and sources. It was partly overcome through the review of reports of the GFCM Compliance Committee; however, such reports did not provide the level of detail to assess national transposition in

¹⁰⁹⁰ Hareide and others (n 545).

¹⁰⁹¹ Council Regulation (EC) No 1185/2003 (n 1020).

¹⁰⁹² Santana-Garcon, Fordham and Fowler (n 828).

¹⁰⁹³ L Biery and D Pauly, ‘A Global Review of Species-Specific Shark-Fin-to-Body-Mass Ratios and Relevant Legislation’ (2012) 80 *Journal of Fish Biology* 1643.

¹⁰⁹⁴ Hareide and others (n 545).

¹⁰⁹⁵ Regulation (EU) No 605/2013 (n 215).

¹⁰⁹⁶ Recommendation GFCM/42/2018/2 (n 711).

¹⁰⁹⁷ Patricia Walker and Cecilia Pinto, ‘Scientific, Technical and Economic Committee for Fisheries (STECF) Review of the Implementation of the Shark Finning Regulation and Assessment of the Impact of the 2009 European Community Action Plan for the Conservation and Management of Sharks’ (2019).

depth. This issue may be addressed through the GFCM Lex project, which is currently ongoing.¹⁰⁹⁸

Despite this, there are more EU regulatory measures than there are through the GFCM. The reform of the CFP in 2013 brought attention to three important steps, namely achieving a maximum sustainable yield for commercial stocks; introduce a landing obligation for commercially targeted species for which quotas exist, or, in the case of the Mediterranean, minimum reference sizes; and a regional approach to fisheries management through multiannual plans.¹⁰⁹⁹ Neither of which directly applies to the conservation of the marine environment, and by association, sharks. These latter were partly addressed through technical conservation measures under implementing regulations for the CFP. Such regulations include, for example, EU Regulation 1241/2019 prohibiting different gears to target selected species.¹¹⁰⁰ Furthermore, the MSFD offered an opportunity for the inclusion of sharks in national monitoring programmes. The MSFD itself may be considered a 'bridge policy' between the CFP and the Habitats Directive (HD), updating the latter since it did not include any shark species, and thereby seem to have delayed or hindered efforts to consider this group within their efforts to designate MPAs (most of such being designated under the Natura 2000 scheme).¹¹⁰¹ Indeed, the MSFD opened a 'window of opportunity' for EU MS to integrate sharks under multiple descriptors and in fact a few countries did so.¹¹⁰² However, this integration concerned only limited species numbers and relies often on existing data

¹⁰⁹⁸ For more details, see: <https://www.fao.org/gfcm/activities/monitoring-control-and-surveillance/gfcm-lex/es/>

¹⁰⁹⁹ Pedro Veiga and others, 'The EU Landing Obligation and European Small-Scale Fisheries: What Are the Odds for Success?' (2016) 64 Marine Policy 64 <<https://linkinghub.elsevier.com/retrieve/pii/S0308597X15003279>>.

¹¹⁰⁰ Regulation (EU) 2019/1241 (n 406).

¹¹⁰¹ European Court of Auditors, 'Marine Environment: EU Protection Is Wide but Not Deep' (2020) <https://www.eca.europa.eu/Lists/ECADocuments/SR20_26/SR_Marine_environment_EN.pdf>.

¹¹⁰² As demonstrated in Section 5.2.3.2.

collection mechanisms, such as MEDITS trawl surveys, rather than creating new ones for sharks specifically.

Nonetheless, the MSFD goes beyond fishing data collection and imposes the obligations to assess the stock or population status at relevant ecological level, the distribution, and reduce the impact from bycatch for species under Descriptor 1 and 3.¹¹⁰³ The MSFD's ecosystem approach, stipulating the integration of demersal and pelagic sharks under relevant descriptors, may at least prompted countries to consider sharks that may not otherwise have done so. An example is Italy, which committed to minimum landing sizes (MLS) for several species, yet this assessment could not find further evidence of whether these are now in place, despite the projected implementation timeline of 2020.¹¹⁰⁴

Projects as such could be a good starting point for better measures, improved data collection and reporting, but they come with several restrictions. They often have limited budgets and timescales over which they run, often on a pilot basis, meaning they involve only a fraction of fishers and/or are implemented at smaller scales, e.g., for bycatch mitigation.¹¹⁰⁵ Whether or not they lead to long term, stringent measures, remains to be seen and requires not only government support but general continued political will across election periods, and long-term commitment to change.

¹¹⁰³ Commission Decision (EU) 2017/848 of 17 May 2017 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU (Text with EEA relevance), OJ L 125, 18.5.2017, p. 43–7.

¹¹⁰⁴ Dupont and others, 'Article 16 Technical Assessment of the MSFD 2015 Reporting on Programme of Measures. Italy Report' (n 967).

¹¹⁰⁵ R Snape and others, 'Cyprus Bycatch Project. "Understanding Multi-Taxa 'bycatch' of Vulnerable Species and Testing Mitigation - a Collaborative Approach in Cyprus". Technical Report. Results of Phase 1 (2018-2019) of the Bycatch Monitoring Programme in Cyprus' (2020).

Similarly, newly developed approaches of re-introduction programmes may support the increase in public involvement and education of fishers, but their conservation benefit remains to be assessed.¹¹⁰⁶ Large scale reintroduction programmes, an approach that has gained attention for terrestrial conservation, might be a controversial approach for marine ecosystems given their depleted state and shifted baseline, which could generate potential ecological impacts/issues, rather than conservation success.¹¹⁰⁷

Within the context of international law, implementation effort has been limited, factors that might have influenced the delayed response and consideration of sharks at national level are further explored in the next chapter.

¹¹⁰⁶ Koehler, Smith and Nowell (n 573).

¹¹⁰⁷ Ben a Minterr and James P Collins, *Guidelines for Reintroductions and Other Conservation Translocations IUCN.*, vol 20 (2010).

Chapter Six: Additional Insights and the Overall State of Shark Governance in the Mediterranean

This chapter reviews the three constructs assessed (political commitment, research effort, and implementation effort) across the Mediterranean region and provides further insights into the socio-economic aspects, and expert views of the countries evaluated. While it does not focus on specific research questions, the chapter puts the results of the assessment into the context of shark governance overall and demonstrates how the results align with insights from the survey questionnaires at national level. The section also critically evaluates the overall progress in relation to the stages of the policy cycle and presents information on obstacles and challenges. At the end of this chapter, consideration is given to developments post 2020, which was the cut-off point for data sources evaluated within this work.

Although the assessment necessarily was time limited to a specific period, the dynamic nature of international law, environmental issues, and policy developments is noted and thus further reflected.

6.1 Shark governance and socio-economic parameters

This section provides additional information in respect to socio-economic parameters of the countries assessed. It goes further in summarising the overall outcomes of the assessment and looks at national support for shark conservation, while critically assessing how the information fits into the overall context of shark governance in the Mediterranean Sea.

6.1.1 Shark fisheries and trade

The following sections present information collected from the FAO database, GFCM, and survey replies that formed part of this work. The information concerns the national fishing sectors and related trade activities of Mediterranean countries were assessed.

6.1.1.1 Shark fisheries and national consumption

The fishing sector's characteristics at national level were based on information from the GFCM's biannual report,¹¹⁰⁸ the FAO database,¹¹⁰⁹ and survey replies, as part of this assessment's data collection.¹¹¹⁰ Fishing areas by GFCM geographical subarea (GSA) were based on the most recent report of the GFCM SAC¹¹¹¹ and, where information from the SAC was not available, on publications, assessed under research effort (Chapter Four).

As shown in Table 13, the largest fleet in terms of number of vessels is in Tunisia, followed closely by Italy and Greece.¹¹¹² Looking at the composition of fleets, it becomes clear that commercial Mediterranean fishing is defined by a large small-scale sector and few large-scale commercial vessels such as trawlers, with Italy and Egypt having a relatively high proportion of the latter forming part of their fleet. While most countries fish locally, within their bordering GSAs,¹¹¹³ Cyprus extends its fishing efforts across the basin from the Eastern Mediterranean to the more central fishing grounds.¹¹¹⁴

¹¹⁰⁸ Food and Agriculture Organisation of the United Nations (n 56).

¹¹⁰⁹ As explained in Chapter Two, Section 2.6.2.

¹¹¹⁰ This is noting that Bosnia and Herzegovina and Monaco are not included as both countries reported to the GFCM Secretariat that they had no operating fleet. Both countries did also not report any operating commercial vessel in the previous two reports. (<https://www.fao.org/gfcm/publications/en/>)

¹¹¹¹ General Fisheries Commission for the Mediterranean (n 983).

¹¹¹² Food and Agriculture Organisation of the United Nations (n 56).

¹¹¹³ See Chapter One, Section 1.2.4.1, Figure 2 for the distribution of GSAs.

¹¹¹⁴ Food and Agriculture Organisation of the United Nations (n 56).

Table 13. Fishing fleet vessel composition operating in the Mediterranean Sea by country, based on the latest GFCM report.¹¹¹⁵

Country	Operating vessels (Total No.)	Small-scale vessels	Trawlers & beam trawlers	Purse seiners & pelagic trawler	Other	Not allocated	Ref. year	Fishing grounds (GSA)
Albania*	445	298	120	23	4	0	2019	18
Algeria*	5,608	3,464	553	1,591	0	0	2018	4
Croatia*	6,211	5,666	341	170	34	0	2019	17
Cyprus*	774	731	8	0	35	0	2019	14,15,17,20-22,24-26
Egypt**	3,945	1,759	945	211	1,030	0	2018	26
France*	1,418	1,261	85	16	56	0	2019	7, 8
Greece*	12,807	12,215	226	218	148	0	2019	20, 22, 23
Israel*	336	268	19	10	39	0	2019	27
Italy*	10,909	7,603	2,024	451	831	0	2019	9-11, 16-19
Lebanon*	2,084	1,979	0	91	14	0	2019	27
Libya**	3,974	2,914	80	123	709	148	2017	21
Malta*	682	529	20	4	129	0	2019	15
Montenegro*	224	191	13	20	0	0	2019	17, 18
Morocco*	3,496	3,042	149	244	61	0	2019	3
Palestine*	613	404	12	197	0	0	2019	27
Slovenia*	72	63	9	0	0	0	2019	17
Spain*	2,056	1,053	576	219	208	0	2019	1, 2, 5-7
Syria *	1,300					1,300	2019	27
Tunisia*	13,300	12,328	479	448	45	0	2018	12-14
Turkey*	6,026	5,657	226	58	85	0	2018	22, 24

* GFCM Data Collection Reference Framework (DCRF).
** The reported values for the Egyptian and Libyan fleets (capacity and engine power) are based on the most recent national data as officially transmitted by Egypt and Libya to the GFCM (via the DCRF and SAC national report) and then estimated based on vessels in similar national fleets in the region.¹¹¹⁶

As previously identified,¹¹¹⁷ two countries, Bosnia and Herzegovina and Monaco, did not report any operating fleet.¹¹¹⁸ The responsible regulatory entity for fishing, the Ministry of

¹¹¹⁵ Food and Agriculture Organisation of the United Nations (n 56).

¹¹¹⁶ Food and Agriculture Organisation of the United Nations (n 56).

¹¹¹⁷ In relation to the standardisation of landings, Chapter Two, Section 2.7.1 and Chapter Four and Five under the evaluation of economic impact against the constructs assessed.

¹¹¹⁸ Food and Agriculture Organisation of the United Nations (n 56).

Agriculture, Water Management and Forestry, in Bosnia and Herzegovina explained the situation as follows:

“[...] Bosnia and Herzegovina has only 20 km (12 miles) of coastline located in Neum (Herzegovina-Neretva Canton), which is our only access to the Adriatic Sea. This scant and rather shallow coastline and only one fisheries landing site prevent large-scale development of marine fisheries, which is negligible in terms of its economic contribution and relevance. Thus, the only legislation in the country treating specifically marine fisheries is the Law on Marine Fisheries of the Herzegovina-Neretva Canton adopted in 2014, without specifically treating any marine fish species. The best estimates indicate that only around 20 small-scale fishers work on this small coastline. The main fishing gears used are gill nets. Their reported annual catch is very low, about 5 tons, which is one of the lowest marine fisheries not only in Europe, but also in the world. Due to low quantities, the catch data are not broken down by species. Fish caught by artisanal fishers are sold directly to customers or are transferred to the fish stores of the marine cage farms for marketing [...]”.

This statement indicates that the fishing sector in Bosnia and Herzegovina is negligible and little effort has therefore been made to regulate it. To investigate national fisheries further, each survey questionnaire posed several questions to assist in characterising shark fishing at national level.¹¹¹⁹ Four options to describe shark fisheries at national level were provided:

1. Sharks are not targeted but caught as non-target catch/bycatch and marketed/sold.
2. Only specific shark species are targeted, others are caught as bycatch. Both are marketed.
3. Sharks are targeted in general and sold/marketed nationally.
4. Other.

Experts from eleven countries indicated there is a target fishery for specific shark species nationally. A general fishery for sharks seems to exist in Algeria and Libya, based on expert opinion. Furthermore, for Slovenia, Bosnia and Herzegovina, and Croatia, the response from the NGO Sharklab ADRIA, which operates across the region, indicated that some species are

¹¹¹⁹ See Annex 2 for questionnaire templates.

targeted, including smoothhound sharks (*Mustelus* spp.),¹¹²⁰ spiny dogfish (*Squalus acanthias*), and blue sharks (*Prionace glauca*).¹¹²¹

In Cyprus, target species seem to include smoothhounds (*Mustelus* spp.), bluntnose sixgill sharks (*Hexanchus griseus*), and requiem sharks (Carcharhinidae), based on the reply of national experts and NGOs. The Maltese NGO- Sharklab-Malta- responded that specific shark species, namely the common smoothhound (*Mustelus mustelus*), starry smoothhound (*Mustelus asterias*), longnose spurdog (*Squalus blainvillei*), smallspotted catshark (*Scyliorhinus canicula*), nursehound (*Scyliorhinus stellaris*), blue shark (*Prionace glauca*), bluntnose sixgill sharks (*Hexanchus griseus*), and sevengill sharks (*Hexanchus perlo*) seem to have become targeted. Lebanon also indicated that some species are targeted but did not provide further details. Spanish experts agreed that fishing vessels target smaller species.¹¹²²

In Italy and Tunisia, experts' views differed between whether sharks are only caught as bycatch and sold or if some species are specifically targeted. In respect to the latter, two experts from Italy referred to smoothhound sharks (*Mustelus* spp.) as targeted, noting that many other species, especially rays, are caught regularly as bycatch and sold. The situation in Tunisia, based on responses from two experts, indicated that limited fishery is active during the summer months in the Gulf of Gabés with the targeting of smoothhound sharks (*Mustelus* spp.), and sandbar sharks (*Carcharhinus plumbeus*), while other species are caught as bycatch and marketed.

¹¹²⁰ *Mustelus punctulatus*, *Mustelus mustelus*

¹¹²¹ For Croatia, this was confirmed for common smoothhounds (*Mustelus mustelus*) by another national expert.

¹¹²² Raja spp. (all within range), common smoothhound (*Mustelus mustelus*), smallspotted catshark (*Scyliorhinus canicula*), nursehound (*Scyliorhinus stellaris*), and blackmouth catshark (*Galeus melastomus*). Interesting, but outside the scope of this assessment, was that all Spanish experts mentioned, in the Atlantic the picture is different with blue sharks (*Prionace glauca*) and Mako sharks (*Isurus oxyrinchus*) being targeted.

Further responses from national experts (including NGOs), indicated that sharks are caught only as bycatch, but marketed, in eight countries (Albania, Egypt, France, Greece, Montenegro, Morocco, Syria, and Turkey). Israel represented the other end of the spectrum, as explained in Chapter Five (Section 5.2.2.2.2), where all shark fishing activities have been prohibited since 2005. For Israel, Egypt and Albania, government views concurred with those of national experts, while the regulatory entities in Lebanon and Malta described fisheries at national level as not targeting sharks but selling by-caught species.

A composition of shark landings by species group,¹¹²³ showing the average composition of landings over the past ten years (2010-2019), confirmed some of the observations by experts (Figure 32). As shown in Figure 32, dogfish (Squalidae) are the main species landed by Libya, while smoothhound sharks (*Mustelus* spp.) form part of nearly all countries' landings. Blue sharks (*Prionace glauca*) are also caught regularly by Libya and Spain. Rays and skates also made-up substantial contribution to landed sharks, which was not mentioned by experts, mostly because they are concerned bycatch.¹¹²⁴

¹¹²³ Classification as explained in Chapter Two, Section 2.6.2.

¹¹²⁴ La Mesa and others (n 514).

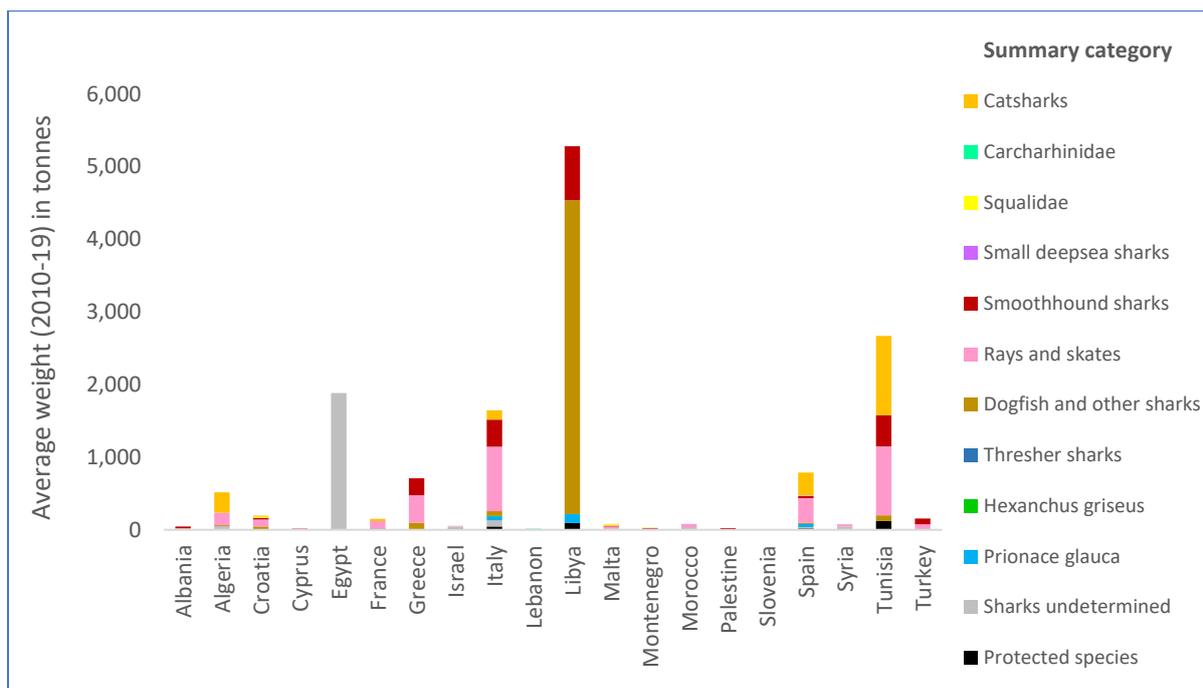


Figure 32. Shark landings composition by species and summary species groups for each country as reported to the FAO.

It is noteworthy that Israel did not report any shark landings post 2013. As mentioned above, Israel protected all shark species in 2005. However, from the enactment of a law to its efficient implementation and enforcement may take years, with resource, long-term political will, and commitment all necessary. This point was highlighted by the regulatory entity, the Israel Nature and Parks Authority (INPA), in open-ended comments to the survey:

“All sharks and rays were declared protected in 2005 but little enforcement was done until around 2015 when the INPA began strict enforcement of the regulation on its own, since the fishery department was not doing its job to protect the sharks. The Department of Fisheries of the Ministry of Agriculture failed for many years to enforce its own fishery regulations in so many areas that the government decided in 2016 on a fishery reform that included turning all enforcement over to a different government agency, the INPA. The INPA formed a new Marine Ranger Unit that spent a year on education and outreach to fishers to teach and prepare for the new reform before they became operation for enforcement in mid-2017. Since then, there has been a great response by legal fishers that are pleased to see new order that will

*help preserve the fish and prevent damage to the stocks and illegal fishing is being strictly enforced. Shark fishing and the sale of sharks have become non-existent.”*¹¹²⁵

The above was also reflected in the response to the question of whether sharks are consumed at national level,¹¹²⁶ which was confirmed by all respondents except Israel, albeit that two Albanian NGOs provided different views on this question.

Within the context of shark governance and international law, shark landings are an important indicator for the impact and transparency of commercial activities, while enabling the tracing of implementation progress of reporting obligations. As demonstrated in Chapter Five, the economic use and value of sharks however did not seem to influence management and conservation efforts. Nevertheless, the information assessed did uncover problems related to it, as further explored in Section 6.3, including, among others, the lack of detailed reporting at species level.¹¹²⁷

6.1.1.2 Trade in shark products

A global challenge, addressed, *inter alia*, through CITES provisions, is the trade of shark products.¹¹²⁸ A recent report on the role of different countries in such trade was published by WWF.¹¹²⁹ The report showed that most Mediterranean countries only play a small part in the international trade of sharks, although Spain is one of the leading nations driving shark meat and fin trade internationally.

The FAO database offers information on national trade statistics for shark products.

However, the data does not differentiate between trade from species caught in the

¹¹²⁵ See Annex 2 for survey template open ended questions.

¹¹²⁶ Answer options: Yes/No.

¹¹²⁷ As explained Chapter Five, Section 5.2.4.1.

¹¹²⁸ As explained in Chapter One, Section 1.2.2, and Chapter Three, Section 3.2.10.

¹¹²⁹ WWF MMI, 'The Shark and Ray Meat Network' (2021).

Mediterranean or elsewhere (e.g., Atlantic), so was used only to provide insight into national trade involvement and for cross-validation for those problems raised by experts. The countries most involved in the shark product trade are France, Italy, Greece, and Spain, with Spain leading in both exports (average of more than 20,000 tonnes) and imports (over 13,000 tonnes) (Figure 33). The export of shark products from France was above 1,500 tonnes on average, with imports over 5,000 tonnes, while Greece exported 344 tonnes on average and imported 993 tonnes on average annually over the past ten years.¹¹³⁰ Italy's export was only 192 tonnes, but import reached almost 9,000 tonnes. In the mid-range of export are Morocco (86 tonnes), Croatia (73 tonnes), and Turkey (52 tonnes), with Morocco importing the highest amount of shark products of the latter with just over 400 tonnes on average annually. Below 5 tonnes are exported from Slovenia, Tunisia, Algeria, Egypt, and Albania, all of which also import some commodities. Bosnia and Herzegovina, Malta, Cyprus Lebanon, Montenegro, Libya do not export, but do import some shark commodities. The only country not involved in any trade is Monaco.

¹¹³⁰ This was the only available, reliable time period for which trade could be compared between countries.

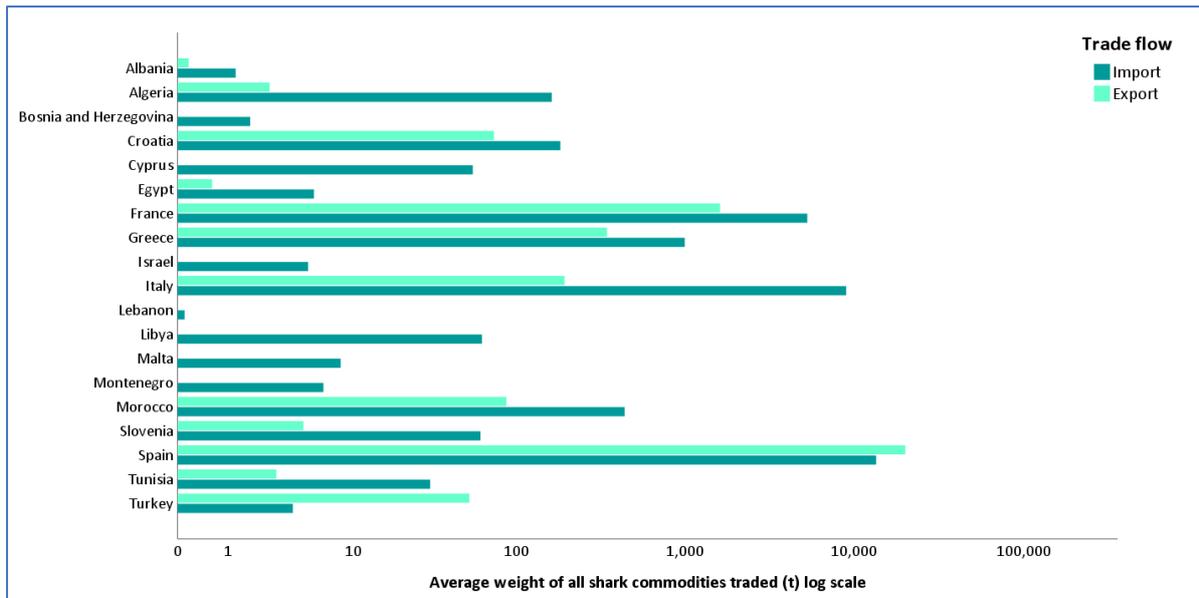


Figure 33. Export and import of shark products by country (average over 2010-2019).

The updated FAO database also provides information on who is trading with whom for 2019, which indicated the following trade relationships. Some countries trade locally in the Mediterranean region such as Albania and Croatia, which supply shark products to their neighbouring countries, while others import and export widely across the globe such as Spain, France, Greece, and Italy. Libya imports blue sharks (*Prionace glauca*) from Spain and Malta imports dogfish (Squalidae) and blue shark products from Spain, Italy, and Portugal. Montenegro mainly imports dogfish from several countries, also outside the region. Morocco exports rays and skates to Italy and other non-Mediterranean countries, shark fins to Spain, while importing dogfish products from multiple countries outside the Mediterranean. Croatia, trades in dogfish, skates and rays (Rajidae) products, with its surrounding countries and Italy. Slovenia trades mostly regionally, and imports from Italy and Spain. Tunisia imports dogfish and other shark products, mainly from Spain, but exports very little. Turkey exports dogfish and undetermined sharks and rays (incl. skates) products to Greece and Cyprus.

While this is a snapshot, it is one able to provide an indication of existing trading relationships. As to the type of products traded, as described in Chapter Two, Section 2.5.5, shark products were classified into nine summary categories. Figures 34 and 35 show trends over the past ten years.¹¹³¹ The highest traded shark products are ‘dogfish and other sharks’, while there is a notable increase in blue shark (*Prionace glauca*) products being both imported and exported in recent years. Generally, there have been similar trends in exports and imports, apart from the trade in catsharks and spiny dogfish (*Squalus acanthias*), for which import is higher. There has also been a notable increase in shark fin export since 2015. The trade in skate products has remained constant.

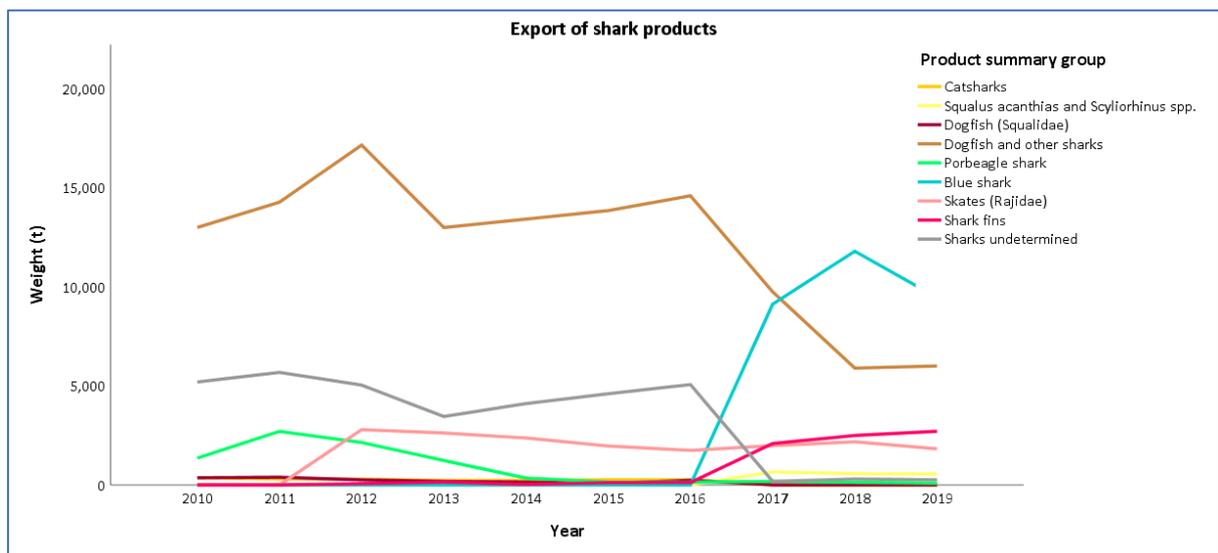


Figure 34. Trend in shark product exports by summarised species category.

¹¹³¹ Period for which there was a consistent available data set.

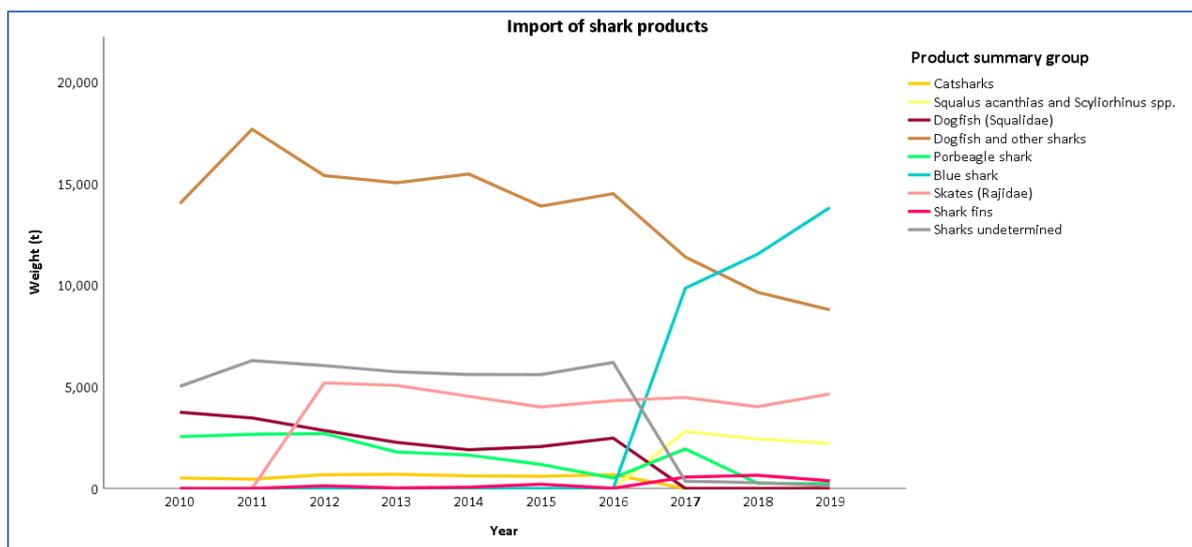


Figure 35. Trend in shark product imports by summarised species category.

There are two main concerns indicated by the data. Although the above Figures show summary categories,¹¹³² the lack of detail in reporting trade by species persists across countries, making it difficult to trace whether CITES regulations, and relevant EU Regulations are fulfilled for species in summary groups. This was confirmed by the review of CITES trade data base for Mediterranean countries, which for the same period does not list any sharks, even though the porbeagle shark (*Lamna nasus*) is listed under Appendix II of the Convention and therefore reporting should take place.¹¹³³ Another aspect of concern is the increasing trade of blue sharks (*Prionace glauca*), as, for the Mediterranean, the population is classified as Critically Endangered under the IUCN Red List assessment.¹¹³⁴ For the Atlantic population, the species is considered as Near Threatened, with a declining trend.¹¹³⁵ The species, as listed under Annex II of the SPA/BD Protocol,¹¹³⁶ should be subject to

¹¹³² As defined in Chapter Two, Section 2.6.2.

¹¹³³ CITES trade data base: <https://trade.cites.org/>

¹¹³⁴ Dulvy and others, 'The Conservation Status of Sharks, Rays, and Chimaeras in the Mediterranean Sea' (n 49).

¹¹³⁵ Sims, D., Fowler, S.L., Ferretti, F. & Stevens, J.D. 2015. *Prionace glauca*. The IUCN Red List of Threatened Species 2015: e.T39381A48924261. Accessed on 19 November 2022.

¹¹³⁶ The Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (n 333).

management measures, yet there was little evidence that is the case, other than those restrictions that generally apply to pelagic sharks, as explained in Chapter Five (Section 5.2.4). The problem of decline in blue sharks (*Prionce glauca*) is one that is currently being discussed at CITES level in the 19th CoP, as presented in Section 6.6.

6.1.2 Shark governance by country

Bringing the constructs together allows, to some extent, for a cross-country comparison of shark governance. Figure 36 shows the combination of absolute values for each construct component, indicating the identified differences between countries. Several conclusions can be drawn from this figure. Firstly, the composition of shark governance components varied between countries. Secondly, in general, research effort dominated other constructs, this is noting that there is a limitation to the number of legal instruments that can be signed, which, in comparison, was similar for Mediterranean countries, apart from those explained below. Research effort, as determined in Chapter Four, differed substantially, and only a few countries had ongoing research projects.¹¹³⁷ Correspondingly, implementation effort was not equal when comparing the countries assessed, which was determined through the analysis in Chapter Five, and did not directly depend on the available knowledge, but more so on the commitments made under international law and applicable policies.

¹¹³⁷ This is noting the limitations explained in Chapter Two, Section 2.4.6.

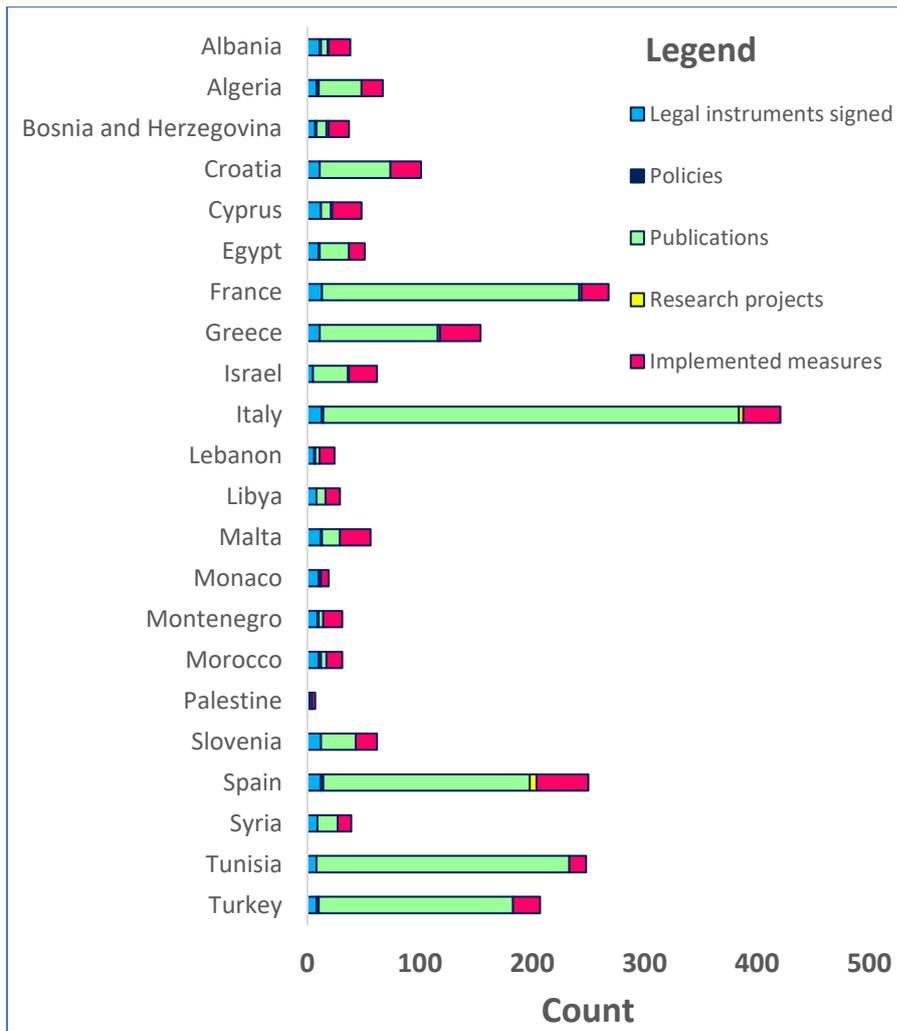


Figure 36. Absolute values for construct contribution by country.

However, the number of measures alone is not an indicator of effective governance or the conservation and management of sharks and each will differ in its relevance, quality, and potential effectiveness. This assessment has identified that there are few relevant, stringent measures. Action lacking at national level includes spatial measures, transposition of species protection, and mitigation of bycatch of vulnerable species. Although there might be gaps in scientific evidence at national level to support the development of such measures, there is certainly a growing amount of literature globally that can be applied.¹¹³⁸ Furthermore, as a

¹¹³⁸ Ward-Paige and others (n 183).

results of an application of the precautionary principle, countries have a duty to act in cases of credible risks, such as biodiversity loss, something that may not have been sufficiently considered for sharks in the region.¹¹³⁹

Reducing the bias against developing countries through the standardisation of construct contributions, Figure 37 shows standardised values, with standardisation for research and implementation effort based on GDP.¹¹⁴⁰ While Figure 37 does not allow for comparisons between constructs, as standardisation was based on different parameters, it demonstrates national differences in the context of development and economic strength. EU countries, in this regard, could increase their efforts in research and implementation, given that it appears developing countries may do more with less (Figure 37).

¹¹³⁹ Koehler, Giovos and Lowther (n 564).

¹¹⁴⁰ As explained in Chapter Two, Section 2.7.1.

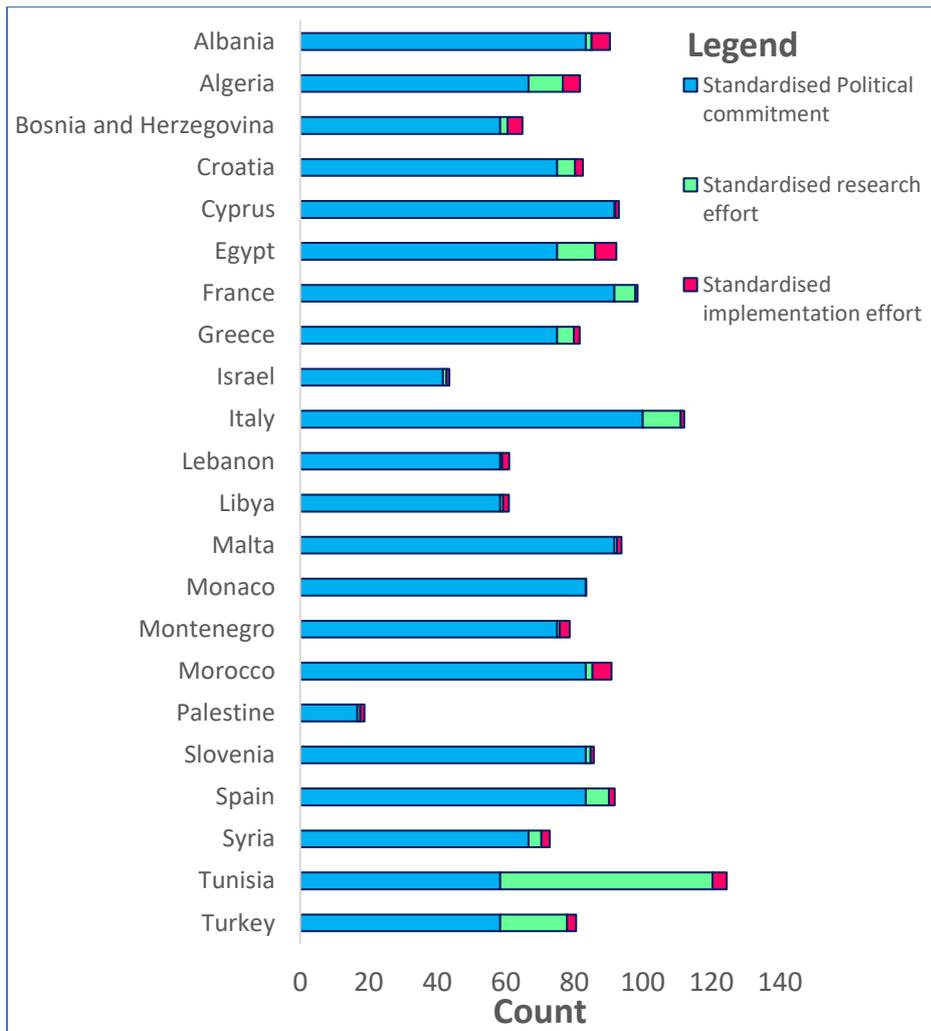


Figure 37. Standardised construct contribution by country.

Nonetheless, the overall effort of a country to manage and conserve sharks depends on multiple factors. While the above constructs evaluated the *status quo* as an absolute value of measures and activities in place, capacities and resources can vary on multiple levels. Although the extent of the availability of knowledge for each species appeared to relate to the number of measures applicable to them, it is hard to determine what research drives the creation of measures, and indeed whether they are sufficiently informed by science. Overall, it appeared that the level of applied effective protection measures at national level

falls short of international efforts and available tools,¹¹⁴¹ which is further explored in Section 6.4.

Based on the research review, there is limited regional research to directly support measures such as bycatch mitigation and the designation of MPAs, but these are gaps ongoing conservation projects may be able to fill in the near future. However, it takes commitment and political will to turn knowledge into action. Government and public support are further explored in the next section.

6.1.3 Public and government support

In terms of public support, two questions were posed in the survey questionnaire, one on whether experts thought there was public support for shark conservation, and the second requesting their judgment on the state of public knowledge. Through the application of a Fisher's exact test, it was assessed whether a relationship exists between the two variables. This was confirmed by a significant association (χ^2 (2, N=31) =18.194, $p < .000$), meaning that public support was confirmed in most countries where public knowledge was considered moderate, while public support was indicated as low in countries where the public was considered 'not well informed'.¹¹⁴² None of the experts stated the public in their country to be 'very well informed', which was defined as a considerable knowledge about sharks and related threats. A public with limited knowledge on sharks (not well informed) was the case

¹¹⁴¹ WWF MMI (n 155).

¹¹⁴² The options were defined as follows: Not well informed: A low percentage (if any) of the local population is aware of shark conservation efforts and issues, including shark products and meat.; Moderately informed: There is a general understanding of marine conservation issues with some knowledge on shark related issues in the public.; Very well informed: The public is well aware of issues related to shark conservation and management. See Annex 2 for survey templates.

according to experts from Cyprus, Greece, Italy, Lebanon, Libya, Morocco, Syria, Tunisia, and Turkey. Opposing views were expressed by the two Albanian experts on whether the public is supportive, which was mirrored by one of four experts in Spain, with one Spanish expert stating they would judge public knowledge as 'not well informed'. In Egypt, the two expert responses also differed between a moderately and not well-informed status of public knowledge. Contrasting views were also present between NGOs in France. While two NGOs agreed that the public is moderately informed, one considered them being less knowledgeable. The same result was present in Italy. Montenegro's, Croatia's, and Israel's experts considered the public in their country to be moderately informed and supportive of shark conservation.

The questionnaire also assessed expert opinion on government support. From the 31 national experts (including NGOs), 21 (67.7 %) have some form of working relationship with their national government (Figure 38). The Marine and Environmental Research (MER) lab in Cyprus works with its government on projects to promote a more sustainable approach to fisheries involving shark catches. The Corsican group for shark research in the Mediterranean¹¹⁴³ works with the national Regional Directorate for the Environment, Planning and Housing. The NGO, iSEA in Greece collaborates on different projects with the Greek Ministry for the Environment, and in Israel, the NGO Sharks in Israel, as well as the Morris Kahn Marine Research Station, collaborate with the Israeli Nature and Parks Authority to train rangers on shark identification and to report illegal shark captures.

¹¹⁴³ Corsica-Groupe de Recherche sur les Requins de Méditerranée

In Italy, national experts work with two ministries, that are responsible for environmental protection and managing fisheries, on monitoring, especially for fishing under the EU Data Collection Framework.¹¹⁴⁴ The national expert on sharks in Montenegro supports the government's monitoring of marine fisheries and works with the Ministry of Agriculture. The same applies in Tunisia, where experts from the 'Institut national des sciences et technologies de la mer' (INSTM) monitor fisheries. Collaboration based on granting permits for research and information exchange exists in Malta and Turkey, between NGOs, researchers, and relevant government departments.

The Institute for Nature Conservation in Albania works closely with the Ministry of Tourism and Environment on the inclusion of shark species in the national Red List and monitors shark fishing within Albania's one MPA. The Albanian Center for Environmental Protection and Sustainable Development (ACEPSD), another NGO in Albania, also works with the same ministry and the Ministry of Agriculture. From the response received, Sharklab Adria appears the only NGO working with government bodies in multiple countries, namely Slovenia, Bosnia and Herzegovina, and Croatia.

¹¹⁴⁴ Regulation (EU) 2017/1004 (n 744).

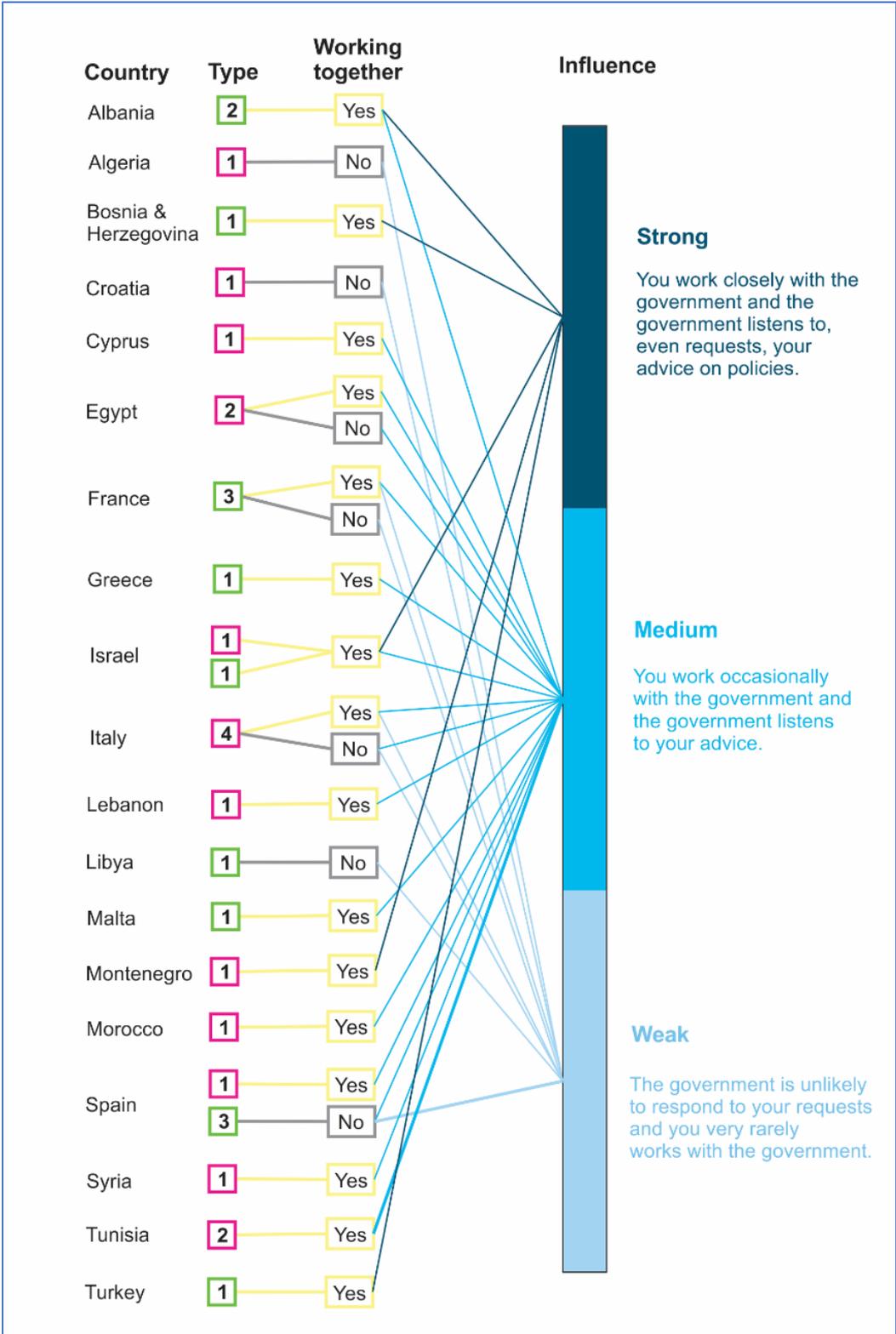


Figure 38. Overview of expert and NGO responses on their relationship with their national government. The 'type' indicates the number of experts (pink box) and NGOs (green box) that replied.

As indicated in Figure 38 above, more than half (54.8 %) of the experts felt that they had a medium influence on their respective governments; 16.1 % felt they had a strong influence; and 29.0 % felt their influence was weak. A Fisher's exact test was applied to assess whether working with government would increase the influence experts felt they had. The results indicated a significant relationship between the two variables, with experts who are working with their national government feeling that their influence was medium to strong ($\chi^2 (2, N=31)= 11.164, p= .004$).

Just under half of the entities represented by experts responding to the survey reported receiving government funding (48.4 %), but if NGOs alone are analysed, only 3 (21.4 %) stated they had received such financial support from the government. Experts and NGOs from Albania, Israel, Croatia, Lebanon, Malta, Montenegro, Morocco, and Tunisia believed their governments to be generally supportive of shark conservation, while experts from Algeria, Bosnia and Herzegovina, Cyprus, Greece, Libya, and Syria did not. The two experts questioned from Egypt had opposing views on this point, which was also the case for France, where two NGOs felt their government was supportive, and one did not. The same divided opinion was seen in Italy. In Spain, three respondents felt their government supported the conservation of sharks (including for the Balearic Islands), although one expert did not concur. Not surprisingly all experts and NGOs questioned stated a need for improved policies at national level, for which details are provided in Section 6.4 reflecting on the priorities for national action, as indicated by those experts.

6.2 Actors in shark governance in the region

This section reflects on the actors involved and how the results of this assessment contributed to existing knowledge. It returns to those actors introduced in Chapter One, Section 1.1.5, of the policy cycle. The section reviews the roles of and provides some critical views on government entities, the fishing sector, researchers, and the public in the case of the Mediterranean, based on the results of this assessment, before exploring in more detail the complexity of contributions by NGOs.

6.2.1 Governments and the fishing sector

National governments are the only actor with the power to commit to international measures, thereby fulfilling the leading role in shark governance nationally. This is linked to and comes with the responsibilities of ensuring that commitments made are transposed and implemented at national level, which was demonstrated in the results of Chapter Three and Five. Government roles have been subject of multiple investigations which demonstrated that the ratification of MEAs depends on multiple factors, including the government's effectiveness, its ability to participate in negotiations and implement the provisions decided,¹¹⁴⁵ and the governance system.¹¹⁴⁶ This was reflected in the actual implementation effort (Chapter Five).

¹¹⁴⁵ Roberts and others (n 770).

¹¹⁴⁶ Neumayer (n 768).

Each country also has a unique set up and the responsibility for fisheries management and marine conservation are often split between different entities under separate ministries.¹¹⁴⁷ In the Mediterranean, there are not only different cultural settings in which national governments operate, but some countries are also affected by ongoing, lasting conflict, limiting effective governance.¹¹⁴⁸ Furthermore, with the establishment of the EU, conventional governance mechanisms within EU MS changed and are now guided by institutions at EU level,¹¹⁴⁹ which may have led to a more structured and equal approach to shark governance by EU countries. However, to achieve the set goals of international and regional legal frameworks, cooperation among Mediterranean States is required. For example, the MSFD's regional approach aiming for GES in all regional seas depends on the cooperation of non-EU countries, which do not benefit from the same resources to support such implementation.¹¹⁵⁰ In addition, some EU-led policies lack consideration of the individual socio-economic and cultural set-up, for instance, when asking for support in implementation of policies trying to establish economic relationships with Arab countries.¹¹⁵¹

In relation to Mediterranean economies, the **fishing sector** is a key component of the policy cycle for sharks. Commercial fishing is subject to regulations established through

¹¹⁴⁷ P Ramírez-Monsalve and others, 'Institutional Challenges for Policy-Making and Fisheries Advice to Move to a Full EAFM Approach within the Current Governance Structures for Marine Policies' (2016) 69 *Marine Policy* 1 <<http://dx.doi.org/10.1016/j.marpol.2016.03.016>>.

¹¹⁴⁸ Daniela Huber and Eckart Woertz, 'Resilience, Conflict and Areas of Limited Statehood in Iraq, Lebanon and Syria' (2021) 28 *Democratization* 1261 <<https://doi.org/10.1080/13510347.2021.1940967>>.

¹¹⁴⁹ Chris Skelcher, 'Fishing in Muddy Waters: Principals, Agents, and Democratic Governance in Europe' (2010) 20 *Journal of Public Administration Research and Theory* 161.

¹¹⁵⁰ Lucio Carlos Freire-Gibb and others, 'Governance Strengths and Weaknesses to Implement the Marine Strategy Framework Directive in European Waters' (2014) 44 *Marine Policy* 172 <<http://dx.doi.org/10.1016/j.marpol.2013.08.025>>.

¹¹⁵¹ Oliver Schlumberger, 'Arab Political Economy and the European Union's Mediterranean Policy: What Prospects for Development?' (2000) 5 *New Political Economy* 247 <<http://www.tandfonline.com/doi/full/10.1080/713687768>>.

international and regional bodies. Projects and training programmes, as demonstrated in Chapter Five, involve the sector directly in the process, and thereby offer a pathway for fishers to express their views and gain knowledge.¹¹⁵² Although the level of direct involvement of fishers was not the focus of this assessment, information on stakeholder involvement has been gathered in the process and showed that NGOs have recognised the importance of involving fishers.

The divide between financial impacts on the sector by fishery management measures and conservation benefits, long- or short-term, can be narrowed by the involvement of fishers in data collection and rewarding their efforts, for example, through monetised incentives, reducing any economic impact on the sector through restrictions.¹¹⁵³ Lifestyle and livelihood may be preserved and even supported if fishers were considered from the starting point for any planned restriction.¹¹⁵⁴ Shark governance issues are unlikely to be solved without the support of the fishing community and as Skelcher expressed:

“Fishermen are born, raised and live in local communities. They are enmeshed in cultural and social systems that give meaning to their lives and directions for their behavior. Their fishing practices are guided by values, norms and knowledge that are shared within their community”.¹¹⁵⁵

Therefore, community dependencies and structures must be considered for successful shark governance and need further investigating in the Mediterranean region. A future approach to further integrate the interests of fishers and build bridges between conservation,

¹¹⁵² Koehler and Lowther (n 80).

¹¹⁵³ Booth, Squires and Milner-Gulland (n 144).

¹¹⁵⁴ Thomas White and others, 'Determining the Financial Costs and Benefits of Conservation Actions: A Framework to Support Decision Making' [2021] OSF Preprints 1.

¹¹⁵⁵ Svein Jentoft, 'The Community: A Missing Link of Fisheries Management' (2000) 24 Marine Policy 53.

management and livelihood dependencies of the sector is social science,¹¹⁵⁶ which can establish the link between fostering compliance and advancing conservation for sharks.¹¹⁵⁷

A more problematic actor in the conservation and management of sharks, are **recreational fishers**. Change in the behaviour of this sector may occur if, for example, long-term relationships between it and conservationists can be built. This could lead to positive behaviour changes, such as correct handling and shark release, reducing the impact of this activity sharks.¹¹⁵⁸ This approach however relies on the sector's willingness to enter such a relationship. Research in the area is only beginning to understand the extent of recreational fishing and its impact on sharks in the Mediterranean. Examples include investigations from Tunisia,¹¹⁵⁹ Algeria,¹¹⁶⁰ and Spain.¹¹⁶¹ Even more importantly, but still lacking, is the understanding of what drives recreational fishers to catch sharks¹¹⁶² and illegally sell them. This is a complex problem, outside the scope of his work, but one that requires more attention.

6.2.1 Scientists, NGOs, and the public

Researchers, are undoubtedly, the key actors in supplying crucial scientific knowledge that can support decision-making. The assessment of research effort clearly demonstrated the

¹¹⁵⁶ Maarten Bavinck, Svein Jentoft and Joeri Scholtens, 'Fisheries as Social Struggle: A Reinvigorated Social Science Research Agenda' (2018) 94 Marine Policy 46 <<https://doi.org/10.1016/j.marpol.2018.04.026>>.

¹¹⁵⁷ Yulianto and others (n 176).

¹¹⁵⁸ Samantha L Mannheim and others, 'Working with, Not against Recreational Anglers: Evaluating a pro-Environmental Behavioural Strategy for Improving Catch-and-Release Behaviour' (2018) 206 Fisheries Research 44 <<https://doi.org/10.1016/j.fishres.2018.04.016>>.

¹¹⁵⁹ Ben Lamine and others (n 113).

¹¹⁶⁰ Babali and others (n 1078).

¹¹⁶¹ Ana Gordo, Arnau L Dedeu and Jordi Boada, 'Recreational Fishing in Spain: First National Estimates of Fisher Population Size, Fishing Activity and Fisher Social Profile' (2019) 211 Fisheries Research 1 <<https://doi.org/10.1016/j.fishres.2018.10.026>>.

¹¹⁶² PANAYIOTOU and others (n 1080).

increasing accumulation of knowledge on sharks through the efforts of national and international scientists. Science certainly has a legally recognised position in environmental conservation,¹¹⁶³ as research not only informs policy needs and the creation of measures,¹¹⁶⁴ but can also provide solutions to problems,¹¹⁶⁵ as well as the information needed to assess the effectiveness and impact of new measures.¹¹⁶⁶ As Gluckman noted:

“There is an ever-growing recognition that science has an important role to play in virtually every dimension of policy making at every level of government, from local to international. [...] At the same time, however, the policy process itself has become more complex as the interaction among civil society, industry, and government has developed”.¹¹⁶⁷

Unfortunately, scientists do not always understand how to make their research useful for policy makers.¹¹⁶⁸ Yet, there are bodies in place that can help governments to interpret available information, such as STECF or the SAC of the GFCM,¹¹⁶⁹ closing gaps and missing linkages between those that generate knowledge, like researchers, and those that need it for decision making.¹¹⁷⁰

It may be beneficial to see such research expand to include improved management options, making it potentially applicable and transferable to implementation efforts. Nonetheless, their role extends from the provision of information, uncovering illegal activities and reporting on ineffective measures in real-world scenarios. Examples of such evidence

¹¹⁶³ As demonstrated in Chapter Three, Section 3.2.4.

¹¹⁶⁴ Sara M Maxwell, Natalie C Ban and Lance E Morgan, ‘Pragmatic Approaches for Effective Management of Pelagic Marine Protected Areas’ (2014) 26 *Endangered Species Research* 59.

¹¹⁶⁵ Me’ira Mizrahi and others, ‘Global Opportunities and Challenges for Shark Large Marine Protected Areas’ (2019) 234 *Biological Conservation* 107 <<https://doi.org/10.1016/j.biocon.2019.03.026>>.

¹¹⁶⁶ O’Toole (n 157).

¹¹⁶⁷ Peter Gluckman, ‘Science Advice to Governments: An Emerging Dimension of Science Diplomacy’ (2016) 5 *Science and Diplomacy* <http://www.sciencediplomacy.org/files/science_advice_to_governments_0.pdf>.

¹¹⁶⁸ von Winterfeldt (n 854).

¹¹⁶⁹ Gluckman (n 1167).

¹¹⁷⁰ Kristen Weiss and others, ‘Knowledge Exchange and Policy Influence in a Marine Resource Governance Network’ (2012) 22 *Global Environmental Change* 178 <<http://dx.doi.org/10.1016/j.gloenvcha.2011.09.007>>.

provided through science includes, for example, investigating the efficacy of the implementation of banning drift netting.¹¹⁷¹ As such scientists in the Mediterranean, although not equally, provided a basis for knowledge, increased cooperation among countries and offer a source for expert advice in most of the States assessed.

The public is another key actor. Citizen Science has increased in recent years, as shown in the results of this research assessment, and can have multiple benefits for ocean governance, such as the collection of large data sets across a wide spatial scale, and empowerment of local communities to contribute to marine management and conservation.¹¹⁷² Citizen Science has become increasingly important in shark conservation, a trend that has made it to the Mediterranean and which has increased since 2017, as the results in Chapter Four indicate. Although increased public knowledge can lead to a supportive attitude towards sharks,¹¹⁷³ and as indicated in Section 6.1.3 remains a task requiring further efforts, knowledge alone does not necessarily lead to active engagement.¹¹⁷⁴

The engagement of the public is a good first step, although the use of Citizen Science to inform policy might be hindered by the public's understanding of the overall context and value of the data collected, therefore requires a reformed policy approach to incorporate

¹¹⁷¹ Tudela and others (n 805).

¹¹⁷² JA Cigliano, 'The Role of Citizen Science in Ocean Governance', *The Future of Ocean Governance and Capacity Development*, vol 60 (Brill | Nijhoff 2019) <http://www.kirj.ee/?id=19246&tpl=1061&c_tpl=1064>.

¹¹⁷³ M Papageorgiou and others, 'Increased Knowledge Affects Public Attitude and Perception towards Elasmobranchs and Support for Conservation' (2022) 23 *Mediterranean Marine Science* 637.

¹¹⁷⁴ Laura A Friedrich, Rebecca Jefferson and Gillian Glegg, 'Public Perceptions of Sharks: Gathering Support for Shark Conservation' (2014) 47 *Marine Policy* 1 <<https://linkinghub.elsevier.com/retrieve/pii/S0308597X14000360>>.

Citizen Science.¹¹⁷⁵ Although governments have started to recognise the value of Citizen Science, its integration into decision-making is less clear and not straight forward, but certainly as an approach that offers a cost-effective way of data collection and policy integration can be improved through the cooperation of organisations, including research entities, NGOs, and regulatory bodies, to overcome challenges such as data quality.¹¹⁷⁶ Because it is crucial that different levels of knowledge and attitude towards shark and conservation are assessed and considered when creating any form of policy or management.¹¹⁷⁷

6.2.1.1 The complex world of NGOs

Globally, two of the main contributing **NGOs** in conservation efforts, are the IUCN and the WWF; both contributed to numerous international developments, including working with UNEP to publish the first World Conservation Strategy in 1980.¹¹⁷⁸ In 1976, IUCN together with WWF created a wildlife monitoring networking- the NGO TRAFFIC- which was established to work in close collaboration with CITES on combating the illegal wildlife trade.¹¹⁷⁹ TRAFFIC is integrated into CITES processes, providing research and acting in an advisory capacity with the CITES Secretariat. It offers advice on the inclusion of species

¹¹⁷⁵ Sarah Vann-Sander, Julian Clifton and Euan Harvey, 'Can Citizen Science Work? Perceptions of the Role and Utility of Citizen Science in a Marine Policy and Management Context' (2016) 72 *Marine Policy* 82 <<http://dx.doi.org/10.1016/j.marpol.2016.06.026>>.

¹¹⁷⁶ Kieran Hyder and others, 'Can Citizen Science Contribute to the Evidence-Base That Underpins Marine Policy?' (2015) 59 *Marine Policy* 112 <<http://dx.doi.org/10.1016/j.marpol.2015.04.022>>.

¹¹⁷⁷ João Neves, Terran McGinnis and Jean-Christophe Giger, 'Changing Trends: Beliefs and Attitudes toward Sharks and Implications for Conservation' (2022) 11 *Ethnobiology and Conservation* <<https://www.ethnobiococonservation.com/index.php/ebc/article/view/630/347>>.

¹¹⁷⁸ IUCN, *World Conservation Strategy*. (Copyright© IUCN-UNEP-WWF 1980 1980).

¹¹⁷⁹ Franckx (n 21).

within the treaty scheme, monitors trade data, and investigates the effectiveness of enforcement.

The WWF extended its working area and conservation efforts to the Mediterranean in 1992, when it founded its Mediterranean Programme.¹¹⁸⁰ These efforts also started to include sharks as a conservation focus, and the organisation has recently produced publications on required shark conservation actions,¹¹⁸¹ as well the global trade of shark products, including in Mediterranean countries.¹¹⁸² Furthermore, WWF was part of the projects evaluated and presented in this assessment being involved in shark conservation, *inter alia*, in Albania and Italy. Additionally, the IUCN, which was founded in 1948, created an office in Malaga (Spain) for its work across the Mediterranean in 2000 and has been leading the MedBycatch project on reducing the bycatch of vulnerable species.¹¹⁸³

Although considered in reporting obligations under the CMS,¹¹⁸⁴ which requires State-Parties to cooperate with NGOs, and the CBD, which collects information on working relationships with NGOs; shark-focused NGOs are a relatively new key actor in the policy development and implementation stage for shark conservation and management in the Mediterranean. The increasing consideration of sharks in legal developments seem to be accompanied by an increase in numbers of NGOs for these species (Figure 39).¹¹⁸⁵ While such instruments put the central responsibility for implementation on national

¹¹⁸⁰ WWF MMI (n 155).

¹¹⁸¹ WWF MMI (n 155).

¹¹⁸² WWF MMI (n 1129).

¹¹⁸³ For more details, see: <https://www.iucn.org/news/mediterranean/201908/med-bycatch-project-a-collaborative-approach-understanding-multi-taxa-bycatch-vulnerable-species-mediterranean-fisheries-and-testing-mitigation>

¹¹⁸⁴ Ninth Meeting and others, 'Convention on Migratory Species' (2008) 1 <<https://www.cms.int/en/document/reporting-template>> accessed 1 November 2021.

¹¹⁸⁵ Koehler and Lowther (n 80).

governments, they do encourage the involvement of NGOs.¹¹⁸⁶ As shown in Figure 39, the number of NGOs that either specifically focus on sharks or have shark-relevant and -specific initiatives has increased substantially in only a few years.¹¹⁸⁷

Italy established the first shark -specific organisation in 1995, a research group for sharks, rays and chimaeras, called Gruppo Ricercatori Italiani sugli Squali, razze e chimere (GRIS). Soon after, in 1997, France saw the foundation of L'Association Pour l'Etude et la Conservation des Sélaciens (APECS).¹¹⁸⁸ To date, NGOs focusing on sharks have been established in eleven of the twenty-two countries forming this work. Some of these operate across borders, as reflected in the projects carried out at subregional and regional level.¹¹⁸⁹

The extent and variety of initiatives that NGOs have created and implemented differs between countries, which may be for multiple reasons, such as the availability of funding, the number of active members of each NGO, or the number of NGOs per country.

Nevertheless, this assessment demonstrated that these organisations fulfil an important role in shark governance in the region, with the majority of activities being projects and programmes focussing on conservation. NGOs also contribute to the development of new policies, supporting the formulation stage of the policy cycle, foster regional cooperation, and support the fulfilment of obligations related to data collection, education and awareness raising, capacity building, bycatch mitigation, species monitoring, and the

¹¹⁸⁶ Regional Activity Centre for Specially Protected Areas (SPA/RAC) (n 660).

¹¹⁸⁷ Koehler and Lowther (n 80).

¹¹⁸⁸ It translates into: Association for the research and conservation of sharks.

¹¹⁸⁹ See Annex 1, Table 9.

identification of important areas.¹¹⁹⁰ Thus, these organisations play a key role in progressing shark conservation and management.

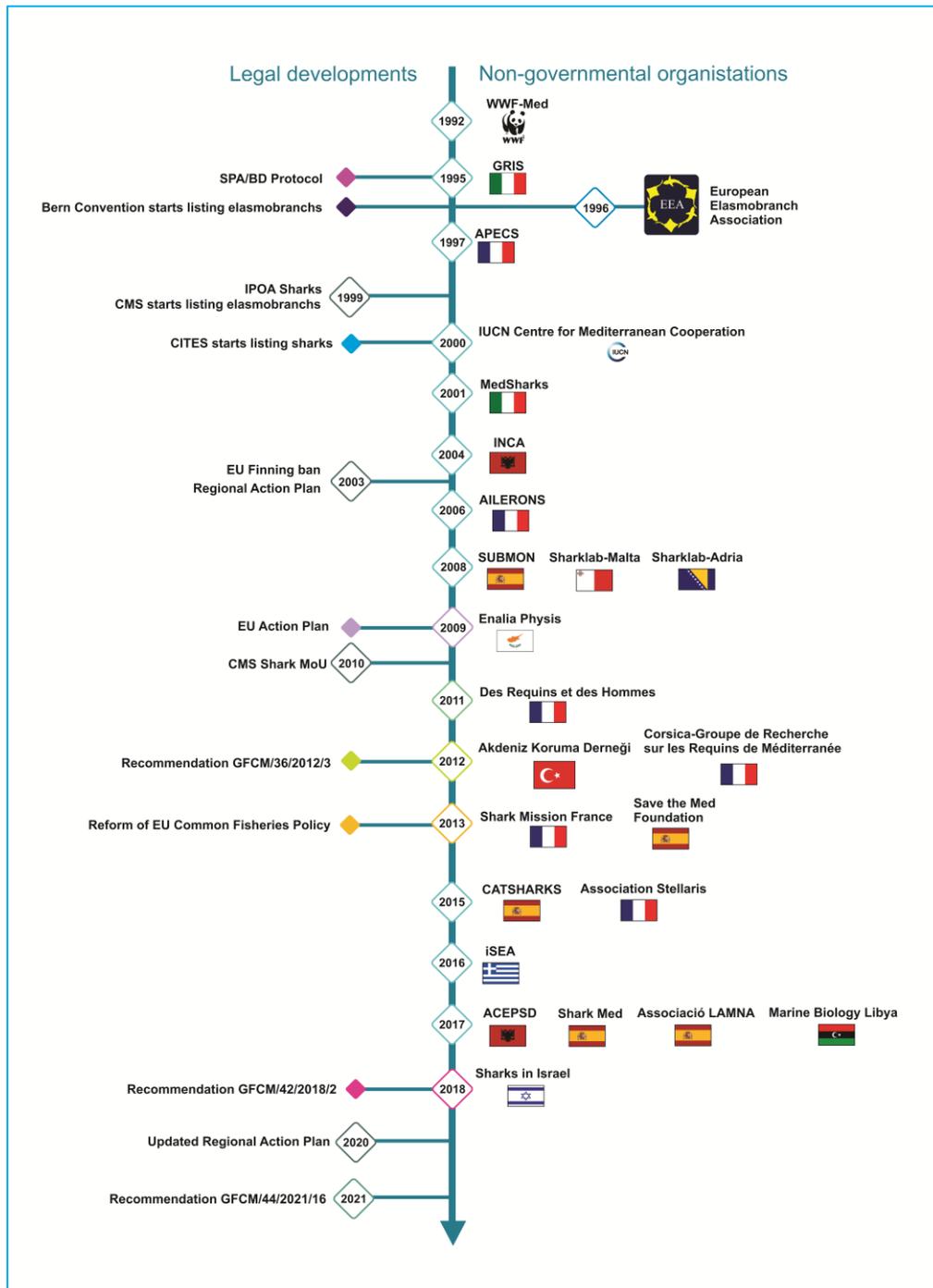


Figure 39. Timeline of NGOs foundation in the Mediterranean, as adapted from Koehler and Lowther.¹¹⁹¹

¹¹⁹⁰ Koehler and Lowther (n 80).

¹¹⁹¹ Koehler and Lowther (n 80).

One example of the significance of NGOs was seen in Bosnia and Herzegovina, where the responsible regulatory entity for fishing, the Ministry of Agriculture, Water Management and Forestry, made it clear in its response to the survey that shark conservation is not high on its agenda. But Sharklab ADRIA has plugged this gap, implementing shark-specific initiatives that equated to over 60 % of the country's effort. However, there are legal limitations to the power and involvement of NGOs, especially in relation to exerting regulatory powers, if not granted by the national government.¹¹⁹²

From a global perspective, NGOs also have the option to use litigation to ensure countries' legal obligations are complied with. Examples in which litigation, or the threat if it, offers a pathway to raise concerns are provided by organisations such as Client Earth,¹¹⁹³ The Blue Marine Foundation, the WWF, and the Marine Conservation Society.¹¹⁹⁴ The contemporary trend of NGOs using litigation as a way to hold governments responsible, offers an alternative to hold countries accountable and expose gaps of non-compliance. An option that NGOs could use as a gateway for ensuring effective shark conservation in the Mediterranean Sea. NGOs may also bring illegalities to light through investigative, published research, something they have in common with researchers.¹¹⁹⁵

While scholars note the role and increasing importance of non-state actors, Challenger and MacMillan also identified a drawback in cases where NGOs claimed unwarranted victories and with that reduced their credibility, especially when their claims were not supported by

¹¹⁹² Guggisberg (n 65).

¹¹⁹³ Client Earth, 'Client Earth' <<https://www.clientearth.org/what-we-do/priorities/fisheries-and-sustainable-seafood/>> accessed 30 March 2022.

¹¹⁹⁴ JL Appleby, T., Condon, J., Rammelt T., Reuchlin-Hugenholtz, E., Solandt, 'Report to Inform Appropriate Assessment of Fishing Operations on the Dogger Bank SACs' (2020) <<https://www.researchgate.net/publication/348186859>>.

¹¹⁹⁵ Giovos and others, 'Approaching the "Real" State of Elasmobranch Fisheries and Trade: A Case Study from the Mediterranean' (n 1089).

available science.¹¹⁹⁶ An example would be the call for fisheries ban in regions where sustainable shark fisheries could be a viable, and preferred option.¹¹⁹⁷ Within well-informed NGOs that base their efforts for shark conservation and policy development on solid science, there is a noticeable support for sustainable fisheries approaches, rather than total bans, and conservation measures that create a balance between human needs and protection of species.¹¹⁹⁸

NGOs, even if not essential for improving the management of fisheries at any level, can also be a bridge between stakeholders.¹¹⁹⁹ NGO efforts in involving different stakeholders are therefore essential in generating support for improved management.¹²⁰⁰ Both education and awareness are important to foster support for shark conservation.¹²⁰¹ As recognised by Richards and Heard, NGOs have a repository of ‘armoury’ at their disposal to create and initiate change, including training, education, public engagement through different media, and their active participation in policy making; the latter providing the course of action to create long-term change.¹²⁰² The use of a wide range of activities and measures by these organisations was observed in this assessment. Mediterranean NGOs collaborate with national governments and other organisations at national, regional, and international level, as demonstrated through the evaluation in Chapters Three to Five, which may lead to better designed and more effective policies and implemented measures at a national scale.

¹¹⁹⁶ Challender and MacMillan (n 66).

¹¹⁹⁷ Shiffman and others (n 33).

¹¹⁹⁸ Shiffman and others (n 33).

¹¹⁹⁹ Deighan and Jenkins (n 1087).

¹²⁰⁰ Börzel and Risse (n 160).

¹²⁰¹ O’Byrhim and Parsons (n 257).

¹²⁰² Richards and Heard (n 572).

However, whilst increasing, there is little research concerning the reach and influence of NGOs in the development and progress of existing policies and legal instruments,¹²⁰³ which was partly filled through this work. Nevertheless, there is evidence of increasing participation of these organisations in relevant fora. One of the first RFMOs in which NGOs participated, originally informally, was the GFCM Commission meeting in 1995.¹²⁰⁴ The participation of NGOs in these fora focused on promoting transparency and facilitating independent performance reviews of RFMOs.¹²⁰⁵

In summary, the findings of this assessment support the importance on non-state actors across the policy cycle and highlighted the multifaceted contributions they make at national level. Yet, effective shark governance nationally remains to face multiple challenges, which are further discussed in the following section.

6.3 Problem framing at regional level – remaining and emerging challenges

Three separate data sources were used to further assess existing shark-specific problems and other limitations at national level. These sources include survey responses, publications, and national reports. However, only the first two sources provided an insight into specific problems faced by sharks.

¹²⁰³ Challender and MacMillan (n 66); Elisabeth Corell and Michele M Betsill, 'A Comparative Look at NGO Influence in International Environmental Negotiations: Desertification and Climate Change' [2017] *International Environmental Governance* 475.

¹²⁰⁴ Petersson (n 774).

¹²⁰⁵ Petersson (n 774).

6.3.1 General limitations

The CMS' national reporting template provides a selection of generic options for countries to indicate limiting factors that reduce the ability to effectively implement obligations. This includes, *inter alia*, the need for financial and technical support, as well as capacity building, all of which were selected by Algeria,¹²⁰⁶ Bosnia and Herzegovina,¹²⁰⁷ Morocco,¹²⁰⁸ Syria,¹²⁰⁹ Montenegro,¹²¹⁰ Libya,¹²¹¹ and Malta.¹²¹² Croatia indicated a need for the exchange of information and further research.¹²¹³ Egypt also indicated the need for financial and technical assistance to be able to fully implement the obligations under the CMS within their latest report.¹²¹⁴

Like the CMS template, the CBD report provides an opportunity to indicate national limitations, to which Lebanon replied that there was a gap in data obtained through monitoring and enforcement as both require extensive financial resources, which are limited.¹²¹⁵ Palestine indicated a gap in available data, but also the need for improved

¹²⁰⁶ Ministère de l'Agriculture du Développement Rural et de la Pêche, 'Algeria. National Report of Parties on the Implementation of the Convention on the Conservation of Migratory Species of Wild Animals' (2017).

¹²⁰⁷ Ministry of the Foreign Trade and Economic Relations, 'Bosnia and Herzegovina. National Report of Parties on the Implementation of the Convention on the Conservation of Migratory Species of Wild Animals' (2019).

¹²⁰⁸ La Division des Parcs et Réserves Naturelles, 'Morocco. National Report of Parties on the Implementation of the Convention on the Conservation of Migratory Species of Wild Animals' (2019).

¹²⁰⁹ Ministry of Local Administration and Environment, 'Syrian Arab Republic. National Report of Parties on the Implementation of the Convention on the Conservation of Migratory Species of Wild Animals' (2019).

¹²¹⁰ Ministry of Sustainable Development and Tourism, 'Montenegro. National Report of Parties on the Implementation of the Convention on the Conservation of Migratory Species of Wild Animals' (2019).

¹²¹¹ Environment General Authority, 'Libya. National Report of Parties on the Implementation of the Convention on the Conservation of Migratory Species of Wild Animals' (2019).

¹²¹² Environment and Resources Authority, 'Malta. National Report of Parties on the Implementation of the Convention on the Conservation of Migratory Species of Wild Animals' (2019).

¹²¹³ Ministry of Environment and Energy, 'Croatia. National Report of Parties on the Implementation of the Convention on the Conservation of Migratory Species of Wild Animals' (2019).

¹²¹⁴ Egyptian Environmental Affairs Agency (EEAA), 'Egypt. National Report of Parties on the Implementation of the Convention on the Conservation of Migratory Species of Wild Animals' (2017) <https://www.cms.int/sites/default/files/document/cms_cop12_nr_egy_e.pdf>.

¹²¹⁵ Ministry of Environment, 'Lebanon. 6th National Report for the Convention on Biological Diversity' (n 897).

national legislation for biodiversity protection.¹²¹⁶ Slovenia reported lack of personnel and financial resources,¹²¹⁷ and Tunisia a lack of knowledge for the management of endangered species.¹²¹⁸

Some efforts have been made to reduce existing capacity limitations within countries. These efforts include various workshops by the GFCM,¹²¹⁹ as well as multiple guidelines produced by regional bodies.¹²²⁰ RAC/SPA has created a guideline for reducing impact from recreational fishing on sharks,¹²²¹ and the GFCM has published identification guides and reporting guidelines.¹²²² NGOs, on the other hand, involve not only the public, but create cooperation and capacity building options through collaborative projects, volunteer opportunities, and training workshops, as demonstrated in the evaluation of implemented measures. Internships and volunteer programmes, which were indicated by all surveyed NGOs to be part of their work, have long been an established tool to foster participation and increase capacity.¹²²³

Another wide-ranging limitation recorded was ineffective and insufficient enforcement and control, which is reflected, for example, by the wide-ranging problem of mislabelling, as reported by national experts below (Section 6.3.2). It is a problem that affects multiple countries worldwide, where missing controls allow illegal fishing and mislabelling to

¹²¹⁶ Environment Quality Authority, 'State of Palestine. Fifth National Report to the Convention on Biological Diversity.' (2015).

¹²¹⁷ Ministry of the Environment and Spatial Planning, 'Convention on Biological Diversity – Sixth National Report of the Republic of Slovenia' (2019).

¹²¹⁸ Ministère des Affaires Locales et de l'Environnement (n 899).

¹²¹⁹ See Chapter Five, Section 5.3.3.

¹²²⁰ As listed in Chapter Five, Section 5.3.3.

¹²²¹ Fowler and Partridge (n 1084).

¹²²² FAO, *Monitoring the Incidental Catch of Vulnerable Species in Mediterranean and Black Sea Fisheries: Methodology for Data Collection*. (n 731).

¹²²³ RC Ballinger and CS Lalwani, 'The Role of Internships in Marine Policy and Integrated Coastal Management Higher Education' (2000) 43 *Ocean and Coastal Management* 409.

contribute to the decimation of protected species.¹²²⁴ Unfortunately, due to limited responses by government entities for this assessment, there was no information on official enforcement capacities or the prosecution of illegal activities nationally.¹²²⁵

6.3.2 Challenges identified through surveys

A more direct insight on existing problems related to shark governance, was obtained through the survey replies. Survey responses were received from either NGOs and/or other experts from 19 countries, excluding Slovenia, Palestine, and Monaco. Experts were questioned on existing problems given multiple choice options, which were based on evidence of existing problems. There was also an option to list any additional problems.¹²²⁶ An overview of the responses, as supported by existing literature, is shown in Figure 40. Beside the problems of overfishing and illegal fishing, which were mentioned in some reports and are considered a global issue, there are issues that occur more on a national level.

¹²²⁴ Narkie Akua Agyeman and others, 'Illegal, Unreported, and Unregulated Fisheries Threatening Shark Conservation in African Waters Revealed from High Levels of Shark Mislabeling in Ghana' (2021) 12 Genes 1002 <<https://www.mdpi.com/2073-4425/12/7/1002>>.

¹²²⁵ Although both were considered in the survey questionnaire, as shown in Annex 2.

¹²²⁶ Questionnaire templates can be found in Annex 2.

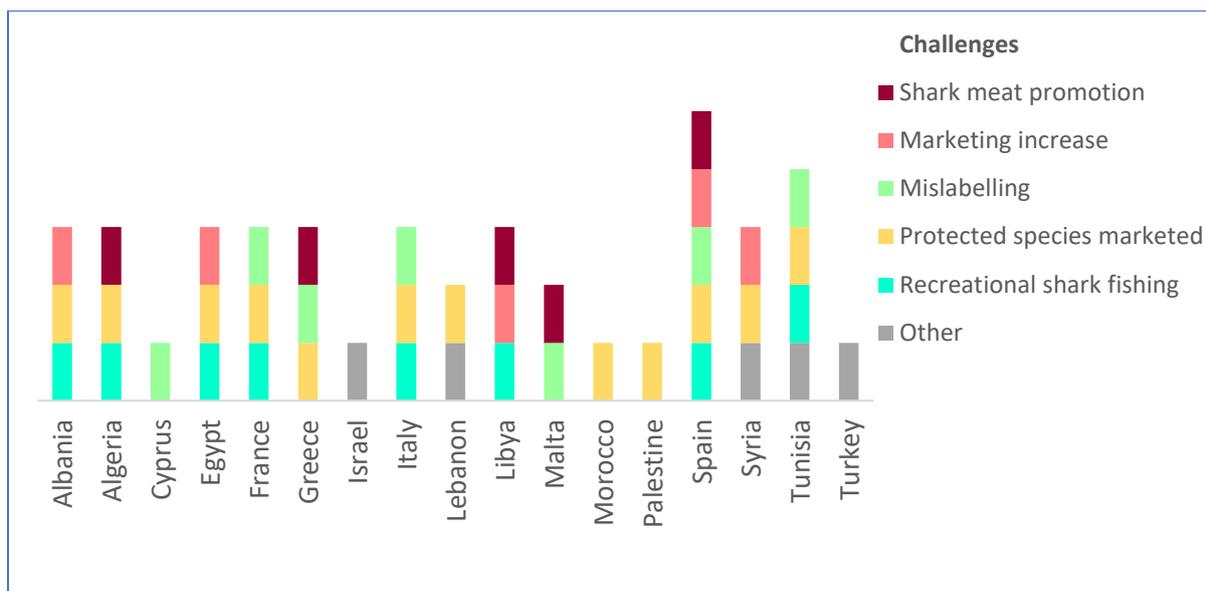


Figure 40. Problems based on survey replies related to shark conservation and management at national level.

Seven countries around the Mediterranean, identified a problem with the **mislabelling of species** at market level (Figure 40). This entails the intentional selling of shark meat as more valuable fish. Mislabelling is a wide-ranging problem and has been subject of multiple studies, with scientific proof from Greek,¹²²⁷ Spain,¹²²⁸ and Egypt¹²²⁹, enabled through genetic barcoding. The Greek NGO iSEA conducted its own investigation on illegal marketing and trade in 2020, which found that about 60 % of shark species caught were mislabelled, most commonly blue sharks (*Prionace glauca*) and smoothhounds (*Mustelus spp.*).¹²³⁰

Other market related problems included an increase in shark meat consumption and the promotion of such consumption. As reported from Albania, Egypt, Libya, Spain, and Syria,

¹²²⁷ T Pazartzi and others, 'High Levels of Mislabeling in Shark Meat – Investigating Patterns of Species Utilization with DNA Barcoding in Greek Retailers' (2019) 98 Food Control 179 <<https://doi.org/10.1016/j.foodcont.2018.11.019>>.

¹²²⁸ Eva Garcia-Vazquez and others, 'High Level of Mislabeling in Spanish and Greek Hake Markets Suggests the Fraudulent Introduction of African Species' (2011) 59 Journal of Agricultural and Food Chemistry 475 <<https://pubs.acs.org/doi/10.1021/jf103754r>>.

¹²²⁹ Asmaa Galal-Khallaf and others, 'DNA Barcoding Reveals a High Level of Mislabeling in Egyptian Fish Fillets' (2014) 46 Food Control 441 <<http://dx.doi.org/10.1016/j.foodcont.2014.06.016>>.

¹²³⁰ Ioannis Giovos and others, 'Assessing Multiple Sources of Data to Detect Illegal Fishing, Trade and Mislabelling of Elasmobranchs in Greek Markets' (2020) 112 Marine Policy 103730 <<https://linkinghub.elsevier.com/retrieve/pii/S0308597X19302027>>.

there was a noticeable increase in the sale of shark meat over past decades. This phenomenon is a global problem, and a result of bycaught species being marketed for profit due to overfished commercial stocks.¹²³¹ In some countries, this was also reflected in the targeting of sharks, as explained in Section 6.1.1.1. Furthermore, this problem relates to targeted promotion of shark meat, such as in Malta, where through a European Maritime and Fisheries Fund (EMFF)-financed project, small-spotted catsharks (*Scyliorhinus canicula*) and thornback rays (*Raja clavata*) have been promoted as a sustainable food source.¹²³² Such claim is highly debatable, since these species are bycaught in trawl fisheries, which cannot be considered sustainable, and the campaign did not provide evidence of population assessments to support its argument. A similar campaign on smoothhound sharks (*Mustelus* spp.) was carried out in Greece.¹²³³

Other problems reported included the **lack of assessments of bycatch** in Israel, and high amounts of **discards** (Israel and Turkey). In Lebanon, two distinct problems were reported, which were **finning occurs** and the regular **catching of guitarfishes**,¹²³⁴ which are listed under SPA/BD Protocol Annex II as protected.¹²³⁵ In summary, the **catching and marketing of protected species** seems common and confirmed as a problem by all countries except Cyprus, Israel, and Turkey (Figure 40).

¹²³¹ Ila France Porcher and Brian W Darvell, 'Shark Fishing vs. Conservation: Analysis and Synthesis' (2022) 14 Sustainability 9548 <<https://www.mdpi.com/2071-1050/14/15/9548>>.

¹²³² Funds and Programmes Division, 'Annual Implementation Report for the EMFF. European Maritime and Fisheries Fund - Operational Programme for Malta' (2019) <https://eufunds.gov.mt/en/EU_Funds_Programmes/Agricultural_Fisheries_Fund/Documents/EMFF_links_and_downloads/5th_MC_-_15th_May_2019/EMFF_AIR_2018_Adopted_by_MC.pdf>.

¹²³³ For details see: https://pericles.inale.gr/en/home_en/

¹²³⁴ This concerns the blackchin guitarfish (*Glaucostegus cemiculus*) and the common guitarfish (*Rhinobatos rhinobatos*)

¹²³⁵ The Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (n 333).

Furthermore, a problem at national level that has been widely recognised is **recreational fishing** (also associated with the subsequent illegal sale), and its impacts on local shark populations.¹²³⁶ Studies from Algeria and Tunisia have confirmed that recreational fishing has become a considerable threat to sharks: in Algeria, it has become an illegal revenue for locals,¹²³⁷ and in Tunisia, this revenue now exceeds the level of commercial fishing.¹²³⁸ As discussed in the previous sections, recreational fishing awaits effective management, which was part of the work programme of RAC/SPA in 2013 and included again in the 2020 update under the regional action plan, as progress had been too slow.¹²³⁹ This is noting that within the context of this work, ‘unregulated’ refers to the lack of regulation of recreational fishing in relation to sharks, not the overall state of regulation of this activity at national level, which is, in fact, regulated through, for example, licensing systems.¹²⁴⁰ The lack of consideration of shark-specific regulations for recreational fishing, is not a problem restricted to the Mediterranean but occurs globally.¹²⁴¹

Reporting efforts and data seems to be a differentiated problem in general, as demonstrated in the results of implementation effort (Chapter Five, Section 5.2.4.1). While some countries manage to report at species level, others fail to provide detailed data,¹²⁴² thereby not complying with the legal obligations under the GFCM and EU CFP.¹²⁴³ Besides

¹²³⁶ Reference to this being ‘illegal’ is made, as national laws, in general, state that recreational fisheries are not allowed to sell their catches.

¹²³⁷ Babali and others (n 1078).

¹²³⁸ Ben Lamine and others (n 113).

¹²³⁹ Regional Activity Centre for Specially Protected Areas (SPA/RAC) (n 660).

¹²⁴⁰ Ramon Franquesa and others, ‘The Recreational Fishing in the Central and Western European Mediterranean Frame’ (2004).

¹²⁴¹ Freire and others (n 243).

¹²⁴² Madeline S Cashion, Nicolas Bailly and Daniel Pauly, ‘Official Catch Data Underrepresent Shark and Ray Taxa Caught in Mediterranean and Black Sea Fisheries’ (2019) 105 Marine Policy 1 <<https://doi.org/10.1016/j.marpol.2019.02.041>>.

¹²⁴³ These obligations are explained in Chapter Three, Section 3.2.6, and Chapter Five, Section 5.2.4.1.

the quality issues in landing reporting, there seem to be limited efforts to effectively record discards of sharks, a problem confirmed by national experts, and which has been subject to critic by researchers, highlighting the need for better data to assess the actual extent of the impact of high discard rates on regional populations.¹²⁴⁴ It is an obstacle to achieving sustainability in fisheries as catches are mis- or underreported.¹²⁴⁵ This problem continues to undermine conservation efforts and transparency in tracking the impact of fishing.¹²⁴⁶

6.3.3 Further evidence on issues and challenges related to fishing

In its 2019 report to the CBD, Tunisia highlighted the problem of overfishing, especially in the Gulf of Gabés.¹²⁴⁷ A problem that was also recognised by the expert from Albania,¹²⁴⁸ and incorporated in the most recent report under the CBD by Syria.¹²⁴⁹ This refers not only to the threat of sharks being fished as bycatch or target, but also related issues due to overfishing of ecosystems such as reduced prey availability and overall health of marine systems.¹²⁵⁰ The loss of shark biodiversity can lead to shifts in trophic roles,¹²⁵¹ signs of which have been recorded in the Mediterranean.¹²⁵² While in the 1950s large, pelagic shark

¹²⁴⁴ Persefoni Megalofonou and others, 'Incidental Catch and Estimated Discards of Pelagic Sharks from the Swordfish and Tuna Fisheries in the Mediterranean Sea' (2005) 103 *Fishery Bulletin* 620.

¹²⁴⁵ Shelley C Clarke and others, 'Global Estimates of Shark Catches Using Trade Records from Commercial Markets' (2006) 9 *Ecology Letters* 1115.

¹²⁴⁶ Cashion, Bailly and Pauly (n 1242).

¹²⁴⁷ Ministère des Affaires Locales et de l'Environnement (n 899).

¹²⁴⁸ Survey reply.

¹²⁴⁹ Ministry of Environment, 'Syria. 5th National Report for the Convention on Biological Diversity' (n 903).

¹²⁵⁰ Charles F Boudouresque, 'Marine Biodiversity - Warming vs. Biological Invasions and Overfishing in the Mediterranean Sea: Take Care, "One Train Can Hide Another"' (2017) 2 *MOJ Ecology & Environmental Sciences* <<https://medcraveonline.com/MOJES/marine-biodiversity-warming-vs-biological-invasions-and-overfishing-in-the-mediterranean-sea-take-care-Isquoone-train-can-hide-another.html>>.

¹²⁵¹ JD Stevens and others, 'The Effects of Fishing on Sharks, Rays, and Chimaeras (Chondrichthyans), and the Implications for Marine Ecosystems' (2000) 57 *ICES Journal of Marine Science* 476.

¹²⁵² Chiara Piroddi and others, 'Modelling the Mediterranean Marine Ecosystem as a Whole: Addressing the Challenge of Complexity' (2015) 533 *Marine Ecology Progress Series* 47 <<http://www.int-res.com/abstracts/meps/v533/p47-65/>>.

species were abundant and fulfilled key roles in Mediterranean marine environment, these roles have widely been replaced by smaller species living close or on the seafloor.¹²⁵³

Overfishing remains the main driver for population declines worldwide and in the Mediterranean.¹²⁵⁴ Despite increasing efforts through research, bycatch mitigation still seems to be in its infancy and lacks wide-scale application, despite a number of short-term projects trying to establish ways to reduce or mitigate the catch of vulnerable species, including sharks.¹²⁵⁵ The added value of these projects remains to be assessed and, if successful, could be applied at a larger scale to make a difference for shark populations in the Mediterranean Sea.

One globally recognised problem in relation to fisheries management, also substantially affecting sharks, is illegal, unregulated, and unreported fishing (**IUU fishing**).¹²⁵⁶ A study investigating the extent of global IUU fishing found that there was a significant relationship between governance and the level of illegal fishing.¹²⁵⁷ In the Mediterranean, there is little evidence to the extent of IUU. However, Albania recognised this problem in its response to the CMS in 2017, as one hindering progress on the effective conservation of fish species listed in Appendix I.¹²⁵⁸ A recent investigation into the issue concluded the problem affects, to some degree, most Mediterranean countries.¹²⁵⁹ However, while Italy, Greece, and Egypt

¹²⁵³ Piroddi and others (n 1252).

¹²⁵⁴ Dulvy and others, 'Overfishing Drives over One-Third of All Sharks and Rays toward a Global Extinction Crisis' (n 5).

¹²⁵⁵ For project details see Annex 1, Table 9.

¹²⁵⁶ Don Liddick, 'The Dimensions of a Transnational Crime Problem: The Case of Iuu Fishing' (2014) 17 Trends in Organized Crime 290 <<https://doi.org/10.1007/s12117-014-9228-6>>.

¹²⁵⁷ Agnew and others (n 191).

¹²⁵⁸ Biodiversity and Protected Areas Directorate at the Ministry of Environment, 'Albania. National Report of the Parties on the Implementation of the Convention on the Conservation of Migratory Species of Wild Animals' (2017).

¹²⁵⁹ Bayram Öztürk, 'Nature and Extent of the Illegal, Unreported and Unregulated (IUU) Fishing in the Mediterranean Sea' (2015) 21 Journal of Black Sea / Mediterranean Environment 67 <<http://dergipark.ulakbim.gov.tr/jbme/article/view/5000144270>>.

are battling with this problem on a regular basis, no records of IUU were reported from France in this study.¹²⁶⁰

Increasing attention globally has been given to the threat of **lost fishing gear**.¹²⁶¹ The impact from ALDFG reaches beyond the entanglement of species, as it can propagate the spread of invasive species, release microplastics and other toxins into the marine ecosystem, and contribute to habitat degradation.¹²⁶² However, it is a problem that has not yet gained the focus of much research in the Mediterranean.¹²⁶³ Limited evidence of the extent of this problem has certainly caught the eye of NGOs, which have advocated for more action on the matter, as shown in a recent report by WWF.¹²⁶⁴ While some efforts have made, as demonstrated in Chapter Five (Section 5.3.3), and RFMOs have started to create actions to combat this problem, including the driftnet ban, there is clear need for wider measures to tackle it.¹²⁶⁵ Entangling gears such as drift nets, gillnets, beside purse seines and trawling, pose the highest risk to vulnerable marine species, including sharks, and require mitigation actions to reduce any impacts related to derelict fishing gear.¹²⁶⁶ Evidence on the extent of this problem in just one nation comes from Turkey published in 2016, which noted that the amount of lost gear does not only depend on the amount of fishing gear used, but is also

¹²⁶⁰ Öztürk (n 1259).

¹²⁶¹ Parton, Galloway and Godley (n 641).

¹²⁶² Eric Gilman and others, 'Highest Risk Abandoned, Lost and Discarded Fishing Gear' (2021) 11 *Scientific Reports* 7195 <<https://doi.org/10.1038/s41598-021-86123-3>>.

¹²⁶³ Parton, Galloway and Godley (n 641).

¹²⁶⁴ WWF, 'Stop Ghost Gear - the Most Deadly Form of Marine Plastic Debris' (2020)

<<https://www.worldwildlife.org/publications/stop-ghost-gear-the-most-deadly-form-of-marine-plastic-debris>>.

¹²⁶⁵ Eric Gilman, 'Status of International Monitoring and Management of Abandoned, Lost and Discarded Fishing Gear and Ghost Fishing' (2015) 60 *Marine Policy* 225 <<http://dx.doi.org/10.1016/j.marpol.2015.06.016>>.

¹²⁶⁶ Gilman and others (n 1262).

determined by interactions between different gear types, gear obstruction by the seafloor, interference between fishing and cargo ships, and bad weather.¹²⁶⁷

6.3.4 Emerging challenges

An emerging problem, which has not yet made it onto the policy agenda, is the phenomenon of **depredation**, whereby sharks steal catches from fishers.¹²⁶⁸ This has become a recent topic of interest to research, as a problem affecting both commercial and recreational fishing.¹²⁶⁹ It has, for example, been observed in swordfish fisheries in Italy with the notation that it is likely to increase in extent and occurrence frequency over time.¹²⁷⁰ If not mitigated or regulated, the problem of depredation can lead to a conflict between fishers and sharks, which has proven to generate loss of support for their conservation by the sector:¹²⁷¹ a paradox when the potential cause of depredation is the overfished state of the marine environment, depriving larger species of prey.

Shark stranding is a topic that has long been neglected as an issue, but as shown in the implementation evaluation (Chapter Five), is something that has caught the attention of a few Mediterranean countries. A recent global review has revealed that strandings have been occurring for over a century in varying locations and affecting multiple species, with

¹²⁶⁷ T Yıldız and FS Karakulak, 'Types and Extent of Fishing Gear Losses and Their Causes in the Artisanal Fisheries of Istanbul, Turkey' (2016) 32 *Journal of Applied Ichthyology* 432 <<https://onlinelibrary.wiley.com/doi/10.1111/jai.13046>>.

¹²⁶⁸ JD Mitchell and others, 'Shark Depredation in Commercial and Recreational Fisheries' (2018) 28 *Reviews in Fish Biology and Fisheries* 715 <<https://doi.org/10.1007/s11160-018-9528-z>>.

¹²⁶⁹ Mitchell and others (n 1268).

¹²⁷⁰ D Malara and others, 'When Opportunistic Predators Interact with Swordfish Harpoon Fishing Activities: Shark Depredation over Catches in the Strait of Messina (Central Mediterranean Sea)' (2021) 88 *European Zoological Journal* 226 <<https://doi.org/10.1080/24750263.2021.1879284>>.

¹²⁷¹ Danielle Robinson and others, 'Fisher–Shark Interactions: A Loss of Support for the Maldives Shark Sanctuary from Reef Fishers Whose Livelihoods Are Affected by Shark Depredation' [2022] *Conservation Letters* 1 <<https://onlinelibrary.wiley.com/doi/10.1111/conl.12912>>.

less than ten percent alive when found.¹²⁷² Strandings can be caused by multiple factors, such as environmental changes and impacts from human activities, including fishing and pollution.¹²⁷³ Whether the existing stranding networks provide a conservation benefit for sharks, remains to be assessed. They do, however, allow for more insight into the issue at regional level.¹²⁷⁴

An emerging challenge for governments, decision makers, researchers, and the conservation community, one that has gained much attention, is **climate change**. As for all marine and terrestrial species, sharks will face the consequences of human-induced climate change, which not only entail the shifting of species' distribution,¹²⁷⁵ but will deteriorate ocean health at a wider scale through deoxygenation and acidification. Research has begun to predict potential impacts, ranging from reduced breathing rates, to weakened skin, and impacts on embryonal development.¹²⁷⁶ These, and other, impacts pose a considerable risk and require the adaptation of fisheries management to reduce their impact, thereby contributing to the reduction of risk: a 'business as usual' approach will simply not suffice and cannot continue without devastating consequences.¹²⁷⁷ Climate change projections indicate that the Mediterranean will be affected substantially,¹²⁷⁸ requiring conservation

¹²⁷² Natascha Wosnick and others, 'Global Assessment of Shark Strandings' [2022] *Fish and Fisheries* 1.

¹²⁷³ Wosnick and others (n 1272).

¹²⁷⁴ Jaime Penadés-Suay and others, 'Aggressive Interactions between Juvenile Swordfish and Blue Sharks in the Western Mediterranean: A Widespread Phenomenon?' (2019) 20 *Mediterranean Marine Science* 314.

¹²⁷⁵ Pedro Luis Diaz-Carballido and others, 'Evaluation of Shifts in the Potential Future Distributions of Carcharhinid Sharks Under Different Climate Change Scenarios' (2022) 8 *Frontiers in Marine Science* 1 <<https://www.frontiersin.org/articles/10.3389/fmars.2021.745501/full>>.

¹²⁷⁶ Rosa and others (n 120).

¹²⁷⁷ William WL Cheung and others, 'Opportunities for Climate-Risk Reduction through Effective Fisheries Management' (2018) 24 *Global Change Biology* 5149.

¹²⁷⁸ Filippo Giorgi and Piero Lionello, 'Climate Change Projections for the Mediterranean Region' (2008) 63 *Global and Planetary Change* 90 <<https://linkinghub.elsevier.com/retrieve/pii/S0921818107001750>>.

and fisheries management to be more adaptive, accounting for species specific traits and needs.

These emerging challenges not only pose risks to sharks, but also put pressure on decision-makers to address these and existing issues and determine approaches to reduce or prevent impacts on vulnerable marine species. The next section provides some guidance in how to improve shark governance regionally.

6.4 Improving agenda setting and policy formulation- advice for future action

This part gives advice for the future of shark governance in the Mediterranean. This advice is based on the outcomes of this assessment, including expert opinion (as obtained from the surveys), the review of scientific literature, and reports by relevant organisations.

6.4.1 Next steps

The following sections reflect on expert opinion and international guidance for shark conservation and management. Starting with insights at national level, the section progresses to regional and international knowledge, based on scientific information.

6.4.1.1 National priorities based on expert opinion

In the process of obtaining data through the survey questionnaires, national experts were asked to provide insight on what they think should be priority actions at national level. This section provides a summary of proposed actions, which is further discussed in Section 6.4.2.

In relation to fisheries, the Institute for Nature Conservation in Albania had a very detailed view in its preferences for conservation policies, making enforcement actions on illegal

fisheries, monitoring of fishing, including improved data collection on landings and discards, as well as market controls, national priorities. Concerns about incomplete landing and discard data collection were mentioned by multiple experts across countries. This includes Israeli experts from a local NGO, who expressed concerns relating to the amount of unmonitored discards, as shark fishing is prohibited. Increased efforts to control and monitor markets was also raised by experts from Greece, Spain, and Tunisia.

The reduction of mortality, the application of more selective gear, and temporary closures were proposed by Spanish and Turkish experts. In Syria, the national expert called for focus on landing controls, compensations to fishers to reduce shark catches, as well as identification training and increased education with better communication channels with the sector. Albanian experts and those from Egypt and Tunisia mentioned concerns about IUU fishing and the need for action to combat this at national level. Tackling unregulated recreational fishing was a priority mentioned by experts from Malta and Cyprus.

Increasing the knowledge of fishers, but also their interest in these species, was recognised as an important next step by experts from Libya, Montenegro, and Lebanon. One example was identified by the Institute for Nature Conservation in Albania and relates to training for the safe release of sharks. ACEPDS, the other Albanian organisation included in the survey, argued for increasing efforts to raise public awareness, as they also stated the public to be not well informed (Section 6.1.3).

Enforcement issues raised included making effective protection of Annex II species under the Barcelona Convention a priority in Tunisia, and a prohibition of catches of these species in Spain and Lebanon. A total ban on fishing for sharks and targeting them for the fin trade

was raised as a necessary intervention at national level by the Spanish NGO ‘Save the Med Foundation’, and the French NGO ‘Shark Mission France’. The former also advocates for no-take zones in existing MPAs and MLS for species landed.

Increasing research for sharks was determined a priority by multiple experts, although perhaps this should not be surprising given their direct involvement in such activities. This included experts from France, Israel, Cyprus, Egypt, Tunisia, Italy, and Spain. The identification of critical habitats was mentioned by experts from Libya, Tunisia, and Turkey.

In summary, experts mainly focused on two things- regulatory measures and controls of fishing activities and increasing involvement and awareness of fishers. Both priorities are also addressed in priority setting at regional and international level, as explained in the next section.

6.4.1.2 Priorities in the context of global and regional needs

In terms of global priorities for shark conservation, a consortium of world-leading shark scientists and NGOs, developed a ‘Global Conservation Strategy for Shark and Rays’, proposing actions for different countries for the period 2015 to 2020.¹²⁷⁹ They distinguished between four global targets: saving species through effective conservation measures; reducing the impact on shark populations from fishing and promote a sustainable use sustainable use of marine resource; creating informed and responsible markets, including consumer education; and ensuring that trade does not have adverse effects on protected species and is well managed. Their vision for the future of sharks was stated as follows:

¹²⁷⁹ Bräutigam and others (n 153).

“Sharks and rays throughout the world are fulfilling their ecological roles, sustaining well-managed fisheries, and are valued by all for their critical contribution to ecosystem health and human well-being”.¹²⁸⁰

This strategy’s advice regarding Mediterranean countries, was that Spain should prioritise all four targets, while Libya should take urgent action to improve their fisheries management. Improved trade regulation as well as increased efforts to make national consumption more informed and responsible, were tasks that should be taken on by regulatory authorities in Italy and France.¹²⁸¹ These two points were only partly observed in the responses to this assessment’s surveys. However, advice for Spain and Libya by the above strategy agrees with the findings of this work. Noteworthy is that some progress has been made by Spain in terms of implemented measures, as presented by the current evaluation of nationally implemented measures.

Scientists also have looked to the conservation of genetic information on shark populations as a priority for shark conservation at a global level.¹²⁸² In 2018, Stein et al. mapped genomes of sharks to identify areas in which genetic diversity should be protected, highlighting the distinct and unique evolutionary history of sharks over, at least, 26 million years.¹²⁸³ Such research could be utilised to prompt spatial conservation through the identification of diversity hotspots and areas in need of urgent conservation measures, something that is now on the global agenda.¹²⁸⁴ The available genetic databases, as

¹²⁸⁰ Bräutigam and others (n 153).

¹²⁸¹ Bräutigam and others (n 153).

¹²⁸² Stein and others (n 2).

¹²⁸³ Stein and others (n 2).

¹²⁸⁴ Luis O Lucifora, Verónica B García and Boris Worm, ‘Global Diversity Hotspots and Conservation Priorities for Sharks’ (2011) 6 PLoS ONE e19356 <<https://dx.plos.org/10.1371/journal.pone.0019356>>.

identified through the assessment of implementation effort, could help to apply this approach in the Mediterranean.

Priorities set at regional level, were included in the updated regional plan for sharks with an ambitious implementation timeline between 2020 and 2024.¹²⁸⁵ This implementation schedule assigns lead responsibilities not only to Contracting Parties and the RAC/SPA itself, but also to RFMOs and NGOs. Urgent actions that need to be taken 'as soon as possible' are the protection of Annex II species through transposition into national law, and the designation of protected areas where critical habitats have been identified, with, training activities on shark biology and species identification to be organised immediately.¹²⁸⁶

Recently published research from Turkey indicated that fisheries are incidentally catching young sharks in Mersin and Iskenderun Bay, a major fishing ground, calling for the cooperation of all stakeholders and the government to reduce impact from bycatch and protect a potential nursery area.¹²⁸⁷ This research would support furthering efforts to protect critical areas for sharks, a priority of the Mediterranean, as has been indicated in the outcomes of implementation effort in Chapter Five.

National expert views, as presented above (Section 6.4.1.1), mirror priorities also identified at global and regional level, as supported by science. Based on the results of the assessment of national implementation effort, other urgent actions might be considered at national level. For example, Tunisia could establish a MPA in the Gulf of Gabés, a known shark

¹²⁸⁵ Regional Activity Centre for Specially Protected Areas (SPA/RAC) (n 660).

¹²⁸⁶ RAC/SPA (n 448).

¹²⁸⁷ Deniz Erguden, Hakan Kabasakal and Deniz Ayas, 'Fisheries Bycatch and Conservation Priorities of Young Sharks (Chondrichthyes: Elasmobranchii) in the Eastern Mediterranean' [2022] *Zoology in the Middle East*.

nursery.¹²⁸⁸ This would not come without a cost to the fishing sector, so fisheries compensation schemes, co-management and new revenue options through shark tourism could be considered to reduce the economic impact on the sector and gain conservation support from fishers. Spatial protection measures, as highlighted in numerous sources, need wider consideration by all countries, as do restrictive fishing measure such as MLS, temporal closures, and bycatch mitigation measures.

In Egypt, Algeria, and Morocco, increased enforcement capacities for existing fisheries regulations and additional conservation measures should be considered. Although this would require increased financial resources, external support options could be explored and may become more easily accessible if countries collaborate on larger initiatives, such as the MedByCatch project.¹²⁸⁹ The lack of NGOs in these countries that could support shark conservation on the ground, might be overcome through such collaborations as well. Countries where legislation has not yet been effectively transposed or implemented such as Algeria, Lebanon, and Syria also need to continue efforts to do so, as stated in the updated regional action plan.¹²⁹⁰

One problem that has caught only a little attention, led by one individual trying to make a difference at national scale, is the fishery of threatened giant devil rays (*Mobula mobular*) in the Gaza Strip, which would require regulatory intervention, as well as education and potentially compensation of fishermen. All these options, and more, are further explored in

¹²⁸⁸ Enajjar, Saidi and Bradai (n 816).

¹²⁸⁹ See details in Annex 1, Table 9.

¹²⁹⁰ RAC/SPA (n 448).

the context of available tools and approaches, based on international research and developments, in the following sections.

6.4.2 Opportunities to improve shark governance

One organisation that has recently shifted its focus towards fisheries and conservation issues related to sharks, is the WWF. Its 2019 report, 'Sharks in crisis: A call to action for the Mediterranean', provides insight into the situation of sharks in the region, presenting a holistic overview and proposing actions that are considered in urgent need.¹²⁹¹ This includes several steps to reduce shark mortality through gear modifications, and other fisheries measures, including recommendations for improved reporting, enforcing existing regulations and increasing cooperation among countries, while making efforts to protect important habitats.¹²⁹²

While it is salient to protect species that are threatened by extinction, there is a clear need, compatible with the precautionary principle, to apply conservation and management measures to species before they become threatened, thereby preventing further population decline.¹²⁹³ Likewise, species classified as Data Deficient, which may fall within in any of the IUCN threatened categories but the lack of evidence does not allow for determination, may otherwise slip under the radar of international and regional agendas, and possibly need to be considered for conservation management before data will confirm this is their status.¹²⁹⁴

¹²⁹¹ WWF MMI (n 155).

¹²⁹² WWF MMI (n 155).

¹²⁹³ Rachel HL Walls and Nicholas K Dulvy, 'Eliminating the Dark Matter of Data Deficiency by Predicting the Conservation Status of Northeast Atlantic and Mediterranean Sea Sharks and Rays' (2020) 246 *Biological Conservation* 108459 <<https://doi.org/10.1016/j.biocon.2020.108459>>.

¹²⁹⁴ Walls and Dulvy (n 1293).

A promising observation of this assessment was that in the Mediterranean, these species are subject to several such measures, including recovery programmes in Spain and Malta.¹²⁹⁵

Within the context of national priorities and identified challenges hindering shark governance, the following sections discuss available solutions from research regionally, and globally.

6.4.2.1. Measures for fisheries management

The conflict between the need to protect nature to ensure its functionality and secure future ecosystem services, with the need to feed the existing and increasing human population, is likely to contribute to the continued overexploitation of marine resources. Solving this complex problem relies on science to determine alternative food sources, to make fishing, such as trawling, more sustainable through, for example, gear modifications, and political will to enforce existing regulations and create conservation measures that benefit species, whilst minimising impacts on the economic sector. While such ambitions can be reflected in law, it requires political will and resources to transfer them into reality. Countries have access to many existing guidelines on how to progress management and conservation efforts, such as the global strategy for sharks produced by Bräutigam et al.,¹²⁹⁶ regional action plans, including the one for angel sharks,¹²⁹⁷ and guidelines by the GFCM and RAC/SPA, e.g., for recreational fishing.¹²⁹⁸ Furthermore, research is increasingly becoming

¹²⁹⁵ As explained in Chapter Five, Section 5.2.3.2.

¹²⁹⁶ Bräutigam and others (n 153).

¹²⁹⁷ Gordon and others (n 686).

¹²⁹⁸ Fowler and Partridge (n 1084).

aware of the need to offer solutions rather than merely presenting knowledge. Research contributes to shark conservation by investigating new mitigation methods, measure cost efficiency, and trade-offs between fisheries and conservation objectives. Such trade-offs have recently been explored by Booth et al., who, based on data from shark landings and associated profit margins, determined that the most cost-effective solutions to reduce fishing impact on sharks are temporal closures and depth limit restrictions, as well as limitations on the number of hooks.¹²⁹⁹ These measures should be further explored for Mediterranean application, especially bycatch mitigation, as mentioned above. Although existing tools for bycatch mitigation are limited, especially for longlines that impact pelagic species,¹³⁰⁰ increasing research on this, and the projects included in this assessment, offer hope for reducing the mortality of vulnerable species including sharks.

However, trade-offs between methods are considerably. For example, circular hooks for longline fisheries have been proposed to reduce bycatch for sharks; but a study from the Gulf of Gabés showed that there are limited conservation benefits, since whilst this may reduce the mortality of some shark species, such as shortfin mako (*Isurus oxyrinchus*) and common smoothhound (*Mustelus mustelus*), it did not provide benefits for sandbar sharks (*Carcharhinus plumbeus*).¹³⁰¹ Therefore, the study proposed measures that regulate fishing effort, fishing closures for this critical habitat, and size limitations for targeted shark species,

¹²⁹⁹ Hollie Booth and others, 'Exploring Cost-Effective Management Measures for Reducing Risks to Threatened Sharks in a Problematic Longline Fishery' (2022) 225 Ocean and Coastal Management 106197 <<https://doi.org/10.1016/j.ocecoaman.2022.106197>>.

¹³⁰⁰ Tamlyn Engelbrecht and others, 'Shark Spotters: Successfully Reducing Spatial Overlap between White Sharks (*Carcharodon Carcharias*) and Recreational Water Users in False Bay, South Africa' (2017) 12 PLOS ONE e0185335 <<https://dx.plos.org/10.1371/journal.pone.0185335>>.

¹³⁰¹ Bechir Saidi and others, 'Are Circle Hooks Effective Management Measures in the Pelagic Longline Fishery for Sharks in the Gulf of Gabès?' (2020) 30 Aquatic Conservation: Marine and Freshwater Ecosystems 1172 <<https://onlinelibrary.wiley.com/doi/abs/10.1002/aqc.3315>>.

all of which could be more beneficial than hook changes.¹³⁰² One mitigation measure that could widely benefit smaller, demersal species such as skates, could be ground gear modification for trawlers. As recent research has shown, this provides a low-cost option to reduce ray bycatch while not impacting the catch of targeted species.¹³⁰³

In conclusion, shark mortality across gear types, if continued, will lead to further population declines.¹³⁰⁴ As Moore et al. succinctly stated it, in order to improve the management of mixed fisheries and support natural system resistance and recovery we need “[.] to extract less or regulate better “.¹³⁰⁵

6.4.2.2 Spatial protection measures

Even low exploitation rates can hinder conservation outcomes for certain shark species due to their life history, therefore spatial protection measures can offer a ‘sanctuary’ for sharks, not only for their protection, but also of their habitats.¹³⁰⁶ Globally, the leading champions of spatial conservation for sharks through large scale protected areas are those countries that have an established shark tourism industry as an income stream, which often ban fishing altogether.¹³⁰⁷ Advocating, as the WWF is, for 30% protection of marine areas by

¹³⁰² Saidi and others (n 1301).

¹³⁰³ YE Fakioğlu and others, ‘Effect of Ground Gear Modification on Bycatch of Rays in Mediterranean Bottom Trawl Fishery’ (2022) 223 *Ocean & Coastal Management* 106134 <<https://linkinghub.elsevier.com/retrieve/pii/S09645669122001090>>.

¹³⁰⁴ Ward-Paige and others (n 183).

¹³⁰⁵ Jonathan W Moore, Brendan M Connors and Emma E Hodgson, ‘Conservation Risks and Portfolio Effects in Mixed-stock Fisheries’ (2021) 22 *Fish and Fisheries* 1024 <<https://onlinelibrary.wiley.com/doi/10.1111/faf.12567>>.

¹³⁰⁶ Ward-Paige and others (n 183).

¹³⁰⁷ Ward-Paige and Worm (n 180).

2030, through MPAs or other area-based conservation measures, could contribute to habitat restoration and the rebuilding of stocks.¹³⁰⁸

One suggestion made by NGOs, as discussed in Section 6.4.1.1, is the use of already designated MPAs for shark conservation, by establishing no-take zones. This approach, however, will only work if sharks use these areas regularly and sufficiently to provide a protection value, which may not always be the case, as new research from Spain shows.¹³⁰⁹

Overall, there is a need for wider application of such spatial conservation measure for sharks in the Mediterranean. Ladle and Malhado argue that for protected areas to be established, culture, history, politics, and economic interests must converge with scientific information and the prioritisation of species and be driven by national and international legal obligations.¹³¹⁰ While the latter are in place, as demonstrated in Chapter Three, and research on these area is increasing, prioritisation of shark on the political agenda at national level lags and needs further efforts, though, for example, national action plans.

Spatial measures are particularly necessary for the protection of blue sharks (*Prionace glauca*), one of the main species of the international fin trade,¹³¹¹ with a declining population trend globally and a Critically Endangered status in the Mediterranean.¹³¹² A recent global study based on tagging data provides insight in the spatial use of oceans by this species, showing changing patterns in distribution between different life stages in terms

¹³⁰⁸ Marina Gomei, '30 by 30: Scenarios to Recover Biodiversity and Rebuild Fish Stocks in the Mediterranean' [2021] WWF Summary Report.

¹³⁰⁹ Joan Giménez and others, 'Marine Protected Areas for Demersal Elasmobranchs in Highly Exploited Mediterranean Ecosystems' (2020) 160 *Marine Environmental Research* 105033 <<https://linkinghub.elsevier.com/retrieve/pii/S0141113620302609>>.

¹³¹⁰ Richard J Ladle and Ana CM Malhado, 'Responding to Biodiversity Loss', *Companion Encyclopedia of Geography* (2007).

¹³¹¹ Andrew T Fields and others, 'Species Composition of the International Shark Fin Trade Assessed through a Retail-Market Survey in Hong Kong' (2018) 32 *Conservation Biology* 376 <<http://doi.wiley.com/10.1111/cobi.13043>>.

¹³¹² Dulvy and others, 'The Conservation Status of Sharks, Rays, and Chimaeras in the Mediterranean Sea' (n 49).

of preferred environmental parameters.¹³¹³ Between January and March in the western Mediterranean, there was increased abundance of male juveniles recorded, which extended further to the East to the Central Mediterranean Sea between July and September. Female adults seem to use the entire basin as foraging ground, with increased abundance from July to September. This information could be used to create seasonal closures in these areas to reduce pressure, although one obstacle to this seems to be that it overlaps with the longline fishing for swordfish, which could in turn have a negative impact on the economy.¹³¹⁴

Additionally, there is an aligned need to consider habitat restoration and species recovery. Strong spatial protection measures can support the recovery of species if well identified, managed, and enforced.¹³¹⁵ Recovery is assessed against a baseline, but the baseline for sharks in the Mediterranean is difficult to determine, as historic and contemporary overfishing has shifted this substantially.¹³¹⁶ A potential approach to solidify this baseline may be assessments which determine the contrast between an existing population and a reference state. This reference state may involve data on species distribution and abundance prior to any human influence but can also determine contrast on a temporal scale. The latter would use information as it became available over time and consider areas

¹³¹³ Jean-Noël Druon and others, 'Global-Scale Environmental Niche and Habitat of Blue Shark (*Prionace Glauca*) by Size and Sex: A Pivotal Step to Improving Stock Management' (2022) 9 *Frontiers in Marine Science* 1 <<https://www.frontiersin.org/articles/10.3389/fmars.2022.828412/full>>.

¹³¹⁴ Megalofonou and others (n 1244).

¹³¹⁵ Speed, Cappo and Meekan (n 602).

¹³¹⁶ Aarti Gupta, 'There's Something Fishy in the Mediterranean: The Harmful Impact of Overfishing on Biodiversity' (2017) 27 *Duke Environmental Law and Policy Forum* 317 <<https://scholarship.law.duke.edu/delpf/vol27/iss2/3>>.

of lower impact against those with a higher level of human activities to model potential population sizes in areas that are more impacted.¹³¹⁷

Another source of information gaining attention in recent years is the use of fishers' knowledge, an approach that could be further explored and applied in the Mediterranean region. Fishers can offer information and valuable insight on long-term changes of behaviours, diversity, and abundance of sharks, which was tested in a recent study.¹³¹⁸ This approach provides an opportunity to use them and potentially compensate them for their insights and contribution to knowledge.¹³¹⁹ The same study also revealed that fisheries seem to maintain fishing in the same areas and thereby offer insight in local changes on species composition and abundance, including seasonal changes. For 40 species observed declines in abundance were reported. However, some fishers noted locally occurring aggregations, which might offer useful information for determining important habitats. Interestingly 77 % of the fishers' interviewed agreed that elasmobranchs are important for the marine ecosystem, but at the same time 75 % acknowledged the economic value of them too. Seventy-four percent of fishers questioned supported the need for conservation action. Interestingly, proposed shark and ray management plans by fishers went beyond the requirement of existing action plans.¹³²⁰ The cooperation and willingness of fishers to

¹³¹⁷ Ana SL Rodrigues and others, 'Unshifting the Baseline: A Framework for Documenting Historical Population Changes and Assessing Long-Term Anthropogenic Impacts' (2019) 374 *Philosophical Transactions of the Royal Society B: Biological Sciences*.

¹³¹⁸ MATTEO BARBATO and others, 'The Use of Fishers' Local Ecological Knowledge to Reconstruct Fish Behavioural Traits and Fishers' Perception of Conservation Relevance of Elasmobranchs in the Mediterranean Sea' (2021) 22 *Mediterranean Marine Science* 603 <<https://ejournals.epublishing.ekt.gr/index.php/hcmr-med-mar-sc/article/view/25306>>.

¹³¹⁹ BARBATO and others (n 1318).

¹³²⁰ BARBATO and others (n 1318).

increase conservation and management of sharks, offers potential new avenues to instigate change and gain government and public support for actions.

6.4.2.3 Monitoring and control

Improving legal compliance requires instruments to adopt an effective control and enforcement mechanism.¹³²¹ Although such control mechanism may be in place, their effectiveness often remains to be elected. For example, an assessment of trawling across EU countries in 2022, showed that although EU MS are obliged to report discards, current reporting lacks sophistication, with underreporting hindering accurate stock assessments.¹³²² Stock assessments, *per se*, are few for Mediterranean shark species and there is limited consideration of these species under wider stock assessment efforts under RFMOs and STECF, nor through national efforts. Available scientific advice based on previous stock assessments, such as those conducted by STECF in 2014 and 2015,¹³²³ are outdated and need updating.

Improved reporting is necessary at the level of data collection, and in terms of adapting existing reporting templates to better reflect national effort, especially under the CBD and the CMS. Although the GFCM SAC reporting template does ask for implementation status and progress on GFCM recommendations concerning sharks, there was little consistency in reporting and few countries extended beyond the statement of compliance with it.

¹³²¹ Hoffman and others (n 469).

¹³²² S Nemecky, 'The Untrawled Truth: Why EU Fisheries (Control) Policy Should Strengthen Discard Monitoring, Control and Reporting within an Implemented Landing Obligation.' (2022).

¹³²³ European Commission Joint Research Centre (n 975).

Additionally, ongoing NGO projects could be integrated in the template for reporting to RAC/SPA for national efforts on the implementation of the regional action plan.

As raised by national experts, enforcement controls need to be increased at national level. On-board observers could, if properly trained in species identification and data collection, be a valuable addition to ensure correct and efficient data collection on sharks.¹³²⁴ Available tools such as DNA barcoding for market checks should be used to investigate and prosecute the marketing of protected species to combat mislabelling. The practical application of this was tested through one of the projects determining species composition of sold ray and skate wings in Greek markets.¹³²⁵

Any proposed actions in this and the previous sections, need to be integrated into policies determining specific objectives, timelines, and concrete targets. Advice for such integration is provided in the next section.

6.4.2.4 Improved policies

Policies, at global, regional, and national level require clearer objectives against which measures can be evaluated. For example, Goti-Aralucea et al. suggested improved incorporation of 'SMART' objectives¹³²⁶ in line with international goals for sustainability within the CFP, to overcome obstacles of reaching its goals.¹³²⁷

¹³²⁴ Philip D Doherty and others, 'Big Catch, Little Sharks: Insight into Peruvian Small-Scale Longline Fisheries' (2014) 4 Ecology and Evolution 2375 <<http://doi.wiley.com/10.1002/ece3.1104>>.

¹³²⁵ Zoe Giagkazoglou and others, 'Flying under the Radar: DNA Barcoding Ray Wings in Greece Detects Protected Species and Umbrella Labelling Terms' (2022) 132 Food Control 108517 <<https://doi.org/10.1016/j.foodcont.2021.108517>>.

¹³²⁶ SMART: Specific, Measurable, Achievable, Relevant and Time-bound.

¹³²⁷ Leyre Goti-Aralucea and others, "'Overarching Sustainability Objectives Overcome Incompatible Directions in the Common Fisheries Policy'" (2018) 91 Marine Policy 49 <<https://doi.org/10.1016/j.marpol.2018.02.006>>.

Decision makers nowadays have a substantial amount of knowledge to develop actions, as well as multiple sources providing specific guidance, such as the SPA/RAC, the FAO, scientific publications, guides produced by NGOs, and action plans, such as that for angel sharks.¹³²⁸ There is also increasing practical support from NGOs that have developed expertise in the field of shark research, which decision makers could rely on. But it takes political will and capacity to ensure the transfer of knowledge into actions and to achieve long-term benefits for marine ecosystems and fishers.¹³²⁹ NGOs are working hard to contribute to the improvement of policies, and governments should listen and continue to collaborate with them, beyond the limits of short-term projects. It may also be helpful to create 'local champions' within the small-scale fishing sector.¹³³⁰ Gaining the support of fishers, can support policies that benefit both sharks and the fishing community.¹³³¹

In general, conservation planning should consider the cost to fishers and provided benefit in the identification of areas considered for protection. Increased scientific advice is available on how to integrate the costs of conservation in relation to the potential impact on the fishing sector.¹³³² Based on a study in the world leading nation for shark fisheries, in Indonesia, innovative policy approaches are needed to create new incentives for fishers and create conservation approaches that carry the costs resulting from restrictions to local fishing communities.¹³³³ Such approaches should be guided by methods from econometrics

¹³²⁸ Gordon and others (n 686).

¹³²⁹ Eric L Gilman, 'Bycatch Governance and Best Practice Mitigation Technology in Global Tuna Fisheries' (2011) 35 Marine Policy 590 <<http://dx.doi.org/10.1016/j.marpol.2011.01.021>>.

¹³³⁰ Benjamin Carbonetti, Robert Pomeroy and David L Richards, 'Overcoming the Lack of Political Will in Small Scale Fisheries' (2014) 44 Marine Policy 295 <<http://dx.doi.org/10.1016/j.marpol.2013.09.020>>.

¹³³¹ Baker-Médard and Faber (n 25).

¹³³² Merrill Baker-Médard and others, 'Rethinking Spatial Costs and Benefits of Fisheries in Marine Conservation' (2019) 178 Ocean & Coastal Management 104824 <<https://linkinghub.elsevier.com/retrieve/pii/S0964569118309840>>.

¹³³³ Christopher Costello and others, 'Economic Incentives and Global Fisheries Sustainability' (2010) 2 Annual Review of Resource Economics 299 <<https://www.annualreviews.org/doi/10.1146/annurev.resource.012809.103923>>.

research which can also help determine how decisions can produce better outcomes for both wildlife and people.¹³³⁴ This has not yet been studied or explored in the Mediterranean and could be a way forward to reduce conflict between fisheries and conservation efforts. Incentive based approaches, such as catch shares, for fisheries management can reverse or prevent the collapse of fisheries and counter the effects of a common pool policies for fishing, but they require further empirical research as their effects on conservation outcomes and resource sustainability are less well studied.¹³³⁵

Streamlining and standardising existing databases and information on species could provide a more robust and valuable tool for conservation policies and management. Through a recent project under the auspices of ‘Species360 Conservation Science Alliance’, a group of scientists has started on the creation of such a tool. They combined information on individual shark species based on the review of available research, existing databases, information sourced from treaty websites, and web-based sources and collated this information into a database which also provide guidance on available management options to help policy makers.¹³³⁶

A new revenue stream that could benefit sharks and people, is tourism. One species offering this in the Mediterranean are sandbar sharks (*Carcharhinus plumbeus*). This is seen in Israel, where the species aggregates around the warm waters of a coastal power station offering a predictable experience for tourists to see. A new study showed regular aggregation of the

¹³³⁴ Hollie Booth and others, ‘Estimating Economic Losses to Small-Scale Fishers from Shark Conservation: A Hedonic Price Analysis’ (2021) 3 Conservation Science and Practice 1.

¹³³⁵ Booth and others, ‘Estimating Economic Losses to Small-Scale Fishers from Shark Conservation: A Hedonic Price Analysis’ (n 1334).

¹³³⁶ Rikke Oegelund Nielsen and others, ‘Standardized Data to Support Conservation Prioritization for Sharks and Batoids (Elasmobranchii)’ (2020) 33 Data in Brief 106337 <<https://doi.org/10.1016/j.dib.2020.106337>>.

species in Italy, also offering a potential path for tourism to be established, if conservation management is done right.¹³³⁷

A problem that needs addressing, is the increase in shark meat marketing and mislabelling.¹³³⁸ Fisheries management plans specifically for shark species or, at least, considering sharks in non-target fisheries, could support increased sustainability. Another option to improve markets, is the establishment of eco-labels as a market incentive. A recently published study investigated the willingness of consumers to pay for products that are labelled 'shark-free' and found that although there was general support for such an incentive, the willingness to pay more for such products was influenced by age, income, and the frequency of consumption.¹³³⁹ While the use of eco-labels for shark conservation in the Mediterranean needs further investigating and testing, it is one to be considered.¹³⁴⁰

Although such programmes do not come without challenges, if established through rigorous science and transparent, they could substantially change the market and contribute to sustainable fisheries management, as shown by the example of the Marine Stewardship Council, an NGO co-initiated by the WWF in 1997.¹³⁴¹

With priorities identified for fisheries management and conservation actions, there is a need for additional efforts into the identification of long-term financial support for these measures, both regionally and nationally, through improved financial strategies and new

¹³³⁷ C Cattano and others, 'Sandbar Shark Aggregation in the Central Mediterranean Sea and Potential Effects of Tourism' (2021) 31 *Aquatic Conservation: Marine and Freshwater Ecosystems* 1420 <<https://onlinelibrary.wiley.com/doi/10.1002/aqc.3517>>.

¹³³⁸ Ruth Beatriz Mezzalira Pincinato and others, 'Market Incentives for Shark Fisheries' (2022) 139 *Marine Policy* 105031 <<https://doi.org/10.1016/j.marpol.2022.105031>>.

¹³³⁹ Luca Mulazzani and others, 'Consumer Appreciation of a Shark-Free Eco-Label for Small Pelagics' (2021) 123 *British Food Journal* 88.

¹³⁴⁰ Mulazzani and others (n 1339).

¹³⁴¹ Ponte (n 565).

research on potential benefit sharing from different revenue streams and conservation outcomes.

6.5 Limitations of this assessment

This work presents an essentially simplified version of a complex problem trying to establish as clear a picture as possible of national efforts. The limitations to the methodological approach in terms of the data obtained and deployed are listed Chapter Two, and there are numerous aspects that offer scope for future study.

The results widely relied on the reports from national governments, which may or may not provide an accurate reflection of the national situation and fisheries management efforts. On the other hand, the evaluation of research was mostly based on peer-reviewed articles presenting validated facts. The use of questionnaires, although validated as a standard method to gather information, limits responses to pre-determined options and does not allow for an in depth understanding of the complexity of national efforts but helped to confirm the results of the assessments of constructs.

Although monitoring and enforcement efforts are at the base of effective implementation, and some insights on this have been gathered, a closer look at national structures and the frequencies and extent of controls, such as on the use of onboard observers, market controls etc., would assist in the aim of understanding the real situation of shark governance in the Mediterranean region. This assessment included efforts to collect such data from government institutions through questions integrated in the survey, but the low response rate from regulatory entities did not allow for these to be assessed in more detail and reports unfortunately did not provide sufficient information on these aspects.

Beyond the scope of this work included regional conflicts related to EEZ claims, and measures/obligations applicable to regions bordering some Mediterranean countries; including bordering seas and the responsibilities of certain countries outside of the Mediterranean region.¹³⁴² Also outside the scope of this assessment but requiring further research, is assessment of the effectiveness and application of quality indicators for each measure and publication. This was beyond scope because it would require large-scale data collection and many years to complete.

An insight into the perspective of fishers would also add to the validation of effort and understanding of the national real-world situation. While the fishing sector rarely creates or imposes self-regulatory measures to protect or manage sharks, their knowledge and views are undoubtedly necessary to improve future policies and increase compliance with existing regulations.

One key actor, as introduced in Chapter One, is the media. This includes different media channels such as national newspapers, social media platforms, etc. The positive framing of sharks in social media such as YouTube, has the potential to change attitudes and promote tolerance towards sharks.¹³⁴³ However, the assessment of media influence at national level for all Mediterranean coastal States would be a large-scale investigation, entailing challenges such as language barriers and access limitations and thus was outside the scope of this work.

¹³⁴² France/Spain Morocco: Atlantic; Egypt, Israel: Red Sea, Turkey: Black Sea

¹³⁴³ JM Beall and others, 'The Influence of YouTube Videos on Human Tolerance of Sharks' [2022] *Animal Conservation* <<https://onlinelibrary.wiley.com/doi/10.1111/acv.12808>>.

The evaluation of which management approach is the best option for each country will depend on whether measures will be practical, feasible and functional. This was to some extent considered in the work but would benefit from in-depth testing for on-the-ground applicability. Additional research is also necessary to explore ongoing and future project outcomes, as well as future national developments. Costs associated with the measures identified would benefit from further analysis, integrating the determination of national resources, the allocation of funding, and potential funding streams.

6.6 Post 2020 developments

Although the data collection process for this assessment stopped at the end of 2020, since then there have been some developments worthy of mention. A summary of relevant legal updates and progress at the implementation stage are provided in this section. The significance for this insight is to prove how law and policy evolve and what recent research has to offer for improving shark governance at regional level.

6.6.1 New available information

The IUCN updated its Red List assessment in 2021,¹³⁴⁴ determining the continued decline of shark species globally and regionally.¹³⁴⁵ Experts also took a closer look into the state of Data Deficient species in the Mediterranean, concluding that species classified under this category are likely to be threatened,¹³⁴⁶ an argument supported by a proposed re-

¹³⁴⁴ Dulvy and others, 'Overfishing Drives over One-Third of All Sharks and Rays toward a Global Extinction Crisis' (n 5).

¹³⁴⁵ Rachel HL Walls and Nicholas K Dulvy, 'Tracking the Rising Extinction Risk of Sharks and Rays in the Northeast Atlantic Ocean and Mediterranean Sea' (2021) 11 Scientific Reports 15397 <<https://doi.org/10.1038/s41598-021-94632-4>>.

¹³⁴⁶ Walls and Dulvy (n 1293).

classification from Data Deficient to 'Assumed Threatened',¹³⁴⁷ which would increase political salience for the duty to act.

NGOs continue to exercise their role as 'watch dogs' gathering information on and revealing illegal activities,¹³⁴⁸ but also working together to combat them. An example is the exposure of illegal fishing of protected great white sharks (*Carcharodon carcharias*) in Tunisia, identified through social media, and combatted by NGO efforts to address the issue with national regulatory entities, which has led to Tunisia committing to increased protection for these species by ensuring the effective implementation of their legal obligations through increased controls.¹³⁴⁹

What also continues is research on sharks, by NGOs and researchers alike. More research, gathering knowledge through non-invasive and non-lethal methods has been undertaken, including the knowledge of the fishing community and its value for shark conservation.¹³⁵⁰

Non-lethal methods have also been applied to further efforts in the identification of important areas.¹³⁵¹ This includes assessing the use of social media to support research on the habitat use of Critically Endangered species, such as the blue shark (*Prionace glauca*).¹³⁵²

Research from Spain, has identified important areas for demersal species that are regularly

¹³⁴⁷ ECM Parsons, 'Why IUCN Should Replace "Data Deficient" Conservation Status with a Precautionary "Assume Threatened" Status—A Cetacean Case Study' (2016) 3 *Frontiers in Marine Science* 2015 <<http://journal.frontiersin.org/article/10.3389/fmars.2016.00193/full>>.

¹³⁴⁸ Giovos and others, 'Approaching the "Real" State of Elasmobranch Fisheries and Trade: A Case Study from the Mediterranean' (n 1089).

¹³⁴⁹ Marco Milazzo and others, 'Mediterranean Sharks and Rays Need Action' (2021) 371 *Science* 355 <<https://www.science.org/doi/10.1126/science.abg2355>>.

¹³⁵⁰ BARBATO and others (n 1318).

¹³⁵¹ Cattano and others (n 1337).

¹³⁵² Ginevra Boldrocchi and Tiziano Storai, 'Data-mining Social Media Platforms Highlights Conservation Action for the Mediterranean Critically Endangered Blue Shark <sc> *Prionace Glauca* </Scp>' (2021) 31 *Aquatic Conservation: Marine and Freshwater Ecosystems* 3087 <<https://onlinelibrary.wiley.com/doi/10.1002/aqc.3690>>.

fished by trawling.¹³⁵³ Also, a potential second nursery area in Turkey for sandbar sharks (*Carcharhinus plumbeus*) has been discovered.¹³⁵⁴ Further efforts have also been made to reduce the research impact on sharks through trawl surveys and to use alternative methods to determine abundance and distribution.¹³⁵⁵

Some countries have published updated versions of national inventories specifically focusing on shark species in national waters. This includes a review of new species records in Turkey with annotations to related conservation issues,¹³⁵⁶ an update on shark species in respect to historic records in Lebanon,¹³⁵⁷ and recent records of fish species recorded in Israeli waters making reference to species considered Lessepsian migrants from the Red Sea.¹³⁵⁸

Furthermore, researchers from Syria have created the first national atlas for sharks and rays in Syrian waters.¹³⁵⁹ Additionally, a project under the auspices of the IUCN Shark Specialist Group in Greece has produced an updated inventory for Greek waters.¹³⁶⁰

Another project that has been delivered, is international collaborative work on assessing the attitude of people towards sharks.¹³⁶¹ The publication found that most people learn about

¹³⁵³ Angela Carluccio and others, 'Deep-Water Cartilaginous Fishes in the Central Mediterranean Sea: Comparison between Geographic Areas with Two Low Impact Tools for Sampling' (2021) 9 Journal of Marine Science and Engineering 686 <<https://www.mdpi.com/2077-1312/9/7/686>>.

¹³⁵⁴ NURI BASUSTA, ASIYE BAŞUSTA and CANER E OZYURT, 'Evidence of a Second Nursery Area of the Sandbar Shark, *Carcharhinus Plumbeus* (Nardo, 1827) in the Eastern Mediterranean Sea' (2020) 20 Mediterranean Marine Science 549 <<https://ejournals.epublishing.ekt.gr/index.php/hcmr-med-mar-sc/article/view/24490>>.

¹³⁵⁵ Carluccio and others (n 1353).

¹³⁵⁶ Hakan Kabasakal, 'A Review of Shark Biodiversity in Turkish Waters: Updated Inventory, New Arrivals, Questionable Species, and Conservation Issues' (2021) 31 Annales, Series Historia Naturalis 181.

¹³⁵⁷ GHAZI BITAR and ALI BADREDDINE, 'An Updated Checklist of the Marine Fishes in Lebanon. An Answer to Bariche and Fricke (2020): "The Marine Ichthyofauna of Lebanon: An Annotated Checklist, History, Biogeography, and Conservation Status"' (2021) 5010 Zootaxa 1 <<https://mapress.com/zt/article/view/zootaxa.5010.1.1>>.

¹³⁵⁸ DANIEL GOLANI, 'An Updated Checklist of the Mediterranean Fishes of Israel, with Illustrations of Recently Recorded Species and Delineation of Lessepsian Migrants (2021) 4956 Zootaxa 1 <<https://www.biotaxa.org/Zootaxa/article/view/zootaxa.4956.1.1>>.

¹³⁵⁹ Adib Ali Saad and Hasan Alkusaairy, *Atlas (Illustrated Guide) of Cartilaginous Fishes (Sharks, Rays, and Chimeras) in Syrian Marine Waters; How to Identify and Classify Them, Their Biological Properties, Their Range of Distribution* (2022).

¹³⁶⁰ Giovos and others, 'An Updated Greek National Checklist of Chondrichthyans' (n 909).

¹³⁶¹ Giovos and others, 'Understanding the Public Attitude towards Sharks for Improving Their Conservation' (n 853).

sharks from documents, followed by chosen sources in the web and books, as well as information provide by NGOs, strengthening their value in the role of education. Overall, the people surveyed showed a positive attitude towards sharks, on which the foundation for conservation support can be built.¹³⁶² In addition, to support the training of fishers and increase education, the FAO has published a new guide for species identification.¹³⁶³

Checking on projects that were considered 'planned' in 2020, indicated that these are well underway. For example, the project by Shark Trust on fisheries markets in Tunisia that targets guitarfishes,¹³⁶⁴ is indicated as 'active' on the funding source's website.¹³⁶⁵ Other projects, now in the planning, provide some hope and potential for sharks. The IUCN, for example, has launched an initiative to expand marine protected areas in Libya.¹³⁶⁶ Similarly, Morocco's Prime Minister announced the country's' commitment to expand MPAs within its waters at the 2022 One Ocean Summit and to tackle IUU Fishing through stronger measures,¹³⁶⁷ something that he highlights is needed across the Mediterranean Sea. An investigation into the commitment made at such conferences, shows promising compliance afterwards.¹³⁶⁸ Furthermore, through the work presented in this thesis, contributions to policy research have been published, assessing the applicability of precautionary measures

¹³⁶² Giovos and others, 'Understanding the Public Attitude towards Sharks for Improving Their Conservation' (n 853).

¹³⁶³ M Barone, C Mazzoldi and F Serena, *Sharks, Rays and Chimaeras in Mediterranean and Black Seas* (FAO 2022) <<http://www.fao.org/documents/card/en/c/cc0830en>>.

¹³⁶⁴ Blackchin guitarfish (*Glaucostegus cemiculus*) and common guitarfish (*Rhinobatos rhinobatos*)

¹³⁶⁵ For details see: <https://saveourseas.com/project/mediterranean-guitarfishes-addressing-fisheries-pressure-and-market-demand/>

¹³⁶⁶ Themes Regions, Resources Support and IUCN, 'News: New Initiative to Expand and Strengthen the Network of Marine Protected Areas in Libya Launched Last Week' (2022) <<https://www.iucn.org/news/mediterranean/202202/new-initiative-expand-and-strengthen-network-marine-protected-areas-libya-launched-last-week>> accessed 22 February 2022.

¹³⁶⁷ <https://www.moroccoworldnews.com/2022/02/347044/morocco-highlights-efforts-toward-fishery-resources-preservation>

¹³⁶⁸ Kirsten Grorud-Colvert and others, 'High-Profile International Commitments for Ocean Protection: Empty Promises or Meaningful Progress?' (2019) 105 *Marine Policy* 52 <<https://doi.org/10.1016/j.marpol.2019.04.003>>.

for sharks,¹³⁶⁹ and the significance of the contribution of NGOs in support of legal obligations.¹³⁷⁰

These actions provide evidence of continued efforts to improve shark governance in the Mediterranean, confirming that sharks have made it onto the regional policy agenda, and demonstrating that the assessment of the status of shark governance at regional level should be continued. Further developments in relation to law and policy, in support of shark governance, are considered in the next section.

6.6.2 Legal and policy developments

There are multiple developments in relation to CITES. Checking progress in the effective transposition of CITES into national law and efforts,¹³⁷¹ showed that Lebanon, Syria, and Libya continue to remain insufficient.¹³⁷² However, both, Libya and Syria have submitted draft legislation to the CITES Secretariat, which is currently being reviewed.¹³⁷³

Moreover, four new proposals for sharks have been reviewed by the Advisory Panel for consideration at the 19th meeting of the Conference of the Parties to CITES (CoP19), held between the 14th to 25th of November 2022 in Panama City.¹³⁷⁴ One of the proposals was to include all members of the family Carcharhinidae in Appendix II. The expert panel found that only three would fulfil the criteria for an Annex II listing and suggested the submission of

¹³⁶⁹ Koehler, Giovos and Lowther (n 564).

¹³⁷⁰ Koehler and Lowther (n 80).

¹³⁷¹ CITES, 'Status of Legislative Progress for Implementing CITES (Updated February 2022)' (2022) <<https://cites.org/eng/legislation/parties>>.

¹³⁷² Category 3: "legislation that is believed generally not to meet any of the four requirements for effective implementation of CITES"

¹³⁷³ CITES (n 1371).

¹³⁷⁴ FAO, 'Report of the Seventh FAO Expert Advisory Panel for the Assessment of the Proposals to Amend Appendices I and II of CITES Concerning Commercially-Exploited Aquatic Species. Rome, 18–22 July 2022'.

individual species proposal rather than a combined proposal. However, during the CoP, CITES Parties voted in favour of all four shark proposals, which were formally adopted in the plenary.¹³⁷⁵ This means that many more shark species, including blue sharks (*Prionace glauca*), will be subject to trade regulations.

Another development connected to the 2019 listing of mako sharks on CITES, saw the implementation of a retention for the shortfin mako (*Isurus oxyrinchus*) under ICCAT in 2021,¹³⁷⁶ which supports a wider conservation effort of stocks in the Atlantic. At GFCM level, further progress has also been made: an updated shark recommendation was adopted in 2021, which obliges GFCM members to effectively reduce mortality of protected species and submit more detailed reports on incidental catches of these species, but also considers that the SAC needs to increase studies on socio-economic aspects of depredation and countries should further effort to identify critical habitats.¹³⁷⁷ This is a major step up for shark effort in the Mediterranean and hopefully will lead to improved efforts.

Additionally, the GFCM has considered the problem of ALDFG through the adoption of a non-binding resolution, which entails that GFCM Parties are prohibited from the intentional discard of fishing gear at sea unless in situations of *force majeure*.¹³⁷⁸ Within the GFCM's 2030 strategy, ambitious goals for the region are set in terms of fisheries. Focus is given to expanding technical measures for all types of fishing, including recreational fishing, the reduction and mitigation of bycatch of vulnerable species and their discard, enhancing

¹³⁷⁵ For more information see: <https://cites.org/eng/news/record-number-of-species-to-be-regulated-by-cites-after-cop19>

¹³⁷⁶ Recommendation by ICCAT on the Conservation of the North Atlantic Stock of Shortfin Mako caught in Association with ICCAT Fisheries (2021) REC 21-09.

¹³⁷⁷ Recommendation GFCM/44/2021/16 on additional mitigation measures for the conservation of elasmobranchs in the Mediterranean Sea (2021).

¹³⁷⁸ Resolution GFCM/44/2021/14 on abandoned, lost or otherwise discarded fishing gear (2021).

monitoring and control across the region, and urgently addressing the impact of climate change, pollution, and invasive species. Five targets are set, of which target one, the achievement of a healthy, prosperous marine ecosystem, is relevant to future shark conservation.¹³⁷⁹

Equally ambitious is the 2030 Biodiversity Strategy set out by the EU, which aims for the restoration of (at least) 20 % of marine ecosystems under EU jurisdiction by 2050. It also expresses zero tolerance for illegal practices that hinder the achievement of sustainability and commits to a revised approach to establish sustainable fisheries and protect marine ecosystems by 2021.¹³⁸⁰ The motto under which the strategy was published is ‘Bringing nature back into our lives’, which makes one wonder when or whether it ever left. That being said, on the 22nd of June 2022, the EU announced a new law for the restoration of ecosystems, especially considering that:

“Restoring marine habitats such as seagrasses or sediment bottoms and restoring the habitats of iconic marine species such as dolphins and porpoises, sharks and seabirds” is of major concern”.¹³⁸¹

A project that continues to expand efforts for better policies for vulnerable species is the angel shark project, which in 2021 produced two more subregional action plans, one for GSA 24 in the Eastern Mediterranean around Turkey¹³⁸², and one for Cyprus (GSA 25).¹³⁸³

¹³⁷⁹ FAO, ‘GFCM 2030 Strategy for Sustainable Fisheries and Aquaculture in the Mediterranean and the Black Sea’ (FAO 2021) <<http://www.fao.org/documents/card/en/c/cb7562en>>.

¹³⁸⁰ European Commission, ‘Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, EU Biodiversity Strategy for 2030, European Commission’ (2020).

¹³⁸¹ European Commission, ‘Press Release:Green Deal: Pioneering Proposals to Restore Europe’s Nature by 2050 and Halve Pesticide Use by 2030’ (2022).

¹³⁸² E Fakioglu and others, ‘Mediterranean Angel Sharks: SubRegional Action Plan (SubRAP) GSA 24 (Northern Levant Sea)’, vol 24 (2021).

¹³⁸³ Elizabeth GT Bengil and others, ‘Mediterranean Angel Sharks: SubRegional Action Plan (SubRAP) GSA 25* (Cyprus – Northern Cyprus)’ (2021).

Sharklab ADRIA has also made progress having identified important angel shark areas in the Adriatic.¹³⁸⁴

Two international relevant processes, that have not yet been concluded, but will impact and shape the future of all oceans, are the development of the new global framework for biodiversity protected under the CBD and discussion on the supplementary agreement under the LOSC for the protection of biodiversity beyond areas of national jurisdiction (ABNJ).¹³⁸⁵ Soon, the world will see the adoption of new biodiversity framework under the CBD, which will define future actions until 2050.¹³⁸⁶ While scientists and NGOs advocate for strong provisions obligating country to act urgently and with stringent measures, some provide guidance on how to do so. Milner-Gulland et al. suggest using a methodological framework called the 'Mitigation and Conservation Hierarchy' to support the drafting of actions for nature restoration and their future evaluation across sectors and on different levels. This conceptual framework considers the consequences of biodiversity loss through human impacts in an iterative approach.¹³⁸⁷ They suggest four steps and provide guidance on how to refrain from harmful activities, reduce the impact from activities, including day-to-day choices, restore ecosystems, and renew where unavoidable damage has been done through investing in areas that have not yet been impacted (offsetting impacts).¹³⁸⁸

¹³⁸⁴ Andrej A Gajić, 'New Hope for the Critically Endangered Common Angel Shark *Squatina Squatina* in the Adriatic Sea' (2022) 80 *Ribarstvo, Croatian Journal of Fisheries* 1.

¹³⁸⁵ 15-26 August 2022 during the Fifth Session of the Intergovernmental Conference (IGC)

¹³⁸⁶ CBD, 'Report of the Open-Ended Working Group on the Post-2020 Global Biodiversity Framework on Its Third Meeting (Part II)' [2022] *Cbd/Wg2020/3/7* 1.

¹³⁸⁷ EJ Milner-Gulland and others, 'Four Steps for the Earth: Mainstreaming the Post-2020 Global Biodiversity Framework' (2021) 4 *One Earth* 75 <<https://linkinghub.elsevier.com/retrieve/pii/S2590332220306576>>.

¹³⁸⁸ Milner-Gulland and others (n 1387).

The negotiations aiming to create an international legally binding instrument under the LOSC for the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (BBNJ) could drive action in the region noting that a substantial part of the Mediterranean is considered high seas. The future, hopefully the more imminent future, will also show whether countries can agree on the new agreement for the protection of biodiversity beyond national jurisdiction. The latest negotiations in New York have not led to a successful conclusion and adoption of the new treaty, which was, among others, related to opposing views related to monetary benefits from the exploitation of marine genetic resources.¹³⁸⁹ Nevertheless, hope remains that the Intergovernmental Conference will conclude negotiations in 2023.

Another important step, towards a more sustainable approach to fishing, was made in June 2022, when the World Trade Organisation (WTO) released the first draft of a new agreement on fishery subsidies.¹³⁹⁰ Under Article 3 of said draft agreement it would be prohibited to subsidise any illegal fishing. Even more importantly, and a milestone in terms of making progress, is encompassed under Article 4, which relates to the prohibition of subsidising fishing of stocks that are considered to be overfished.¹³⁹¹

These are promising steps that could potentially improve shark governance through the creating of additional legal obligations and guidance for the development of measures in the Mediterranean. However, what the future for shark holds in this region remains to be

¹³⁸⁹ SDG Knowledge Hub, 'Despite Progress, High Seas Treaty Talks Not Yet "Over the Finish Line"' (2022) <<https://sdg.iisd.org/news/despite-progress-high-seas-treaty-talks-not-yet-over-the-finish-line/>> accessed 31 August 2022.

¹³⁹⁰ WTO, 'Agreement on Fisheries Subsidies Draft Text. Ministerial Conference Twelfth Session Geneva, 12-15 June 2022 WT/MIN(22)/W/20', vol 2022 (2022) WT/MIN(22)/W/20.

¹³⁹¹ WTO (n 1390).

determined. The final section (conclusion) reflects on outcomes of the overall assessment of shark governance in the Mediterranean Sea, considering the points raised in this and all previous chapters.

Conclusion

Assessing shark governance against the complex and fragmented legal landscape for the conservation and management of sharks, was approached through the application of a shark policy cycle, focusing on the implementation progress of Mediterranean coastal States at national level, while also considering aspects of agenda setting and policy formulation-internationally, regionally, and nationally. Reflecting on the work presented, these final remarks focus on the outcomes and information collated in the context of the policy cycle and international law.

Agenda setting and policy formulation nationally seemed to be mainly guided by commitments made under international laws and policies, which include those considering species protection, monitoring, and sustainable fisheries management. There was a substantial similarity in legal obligations and policy commitments between the 22 countries assessed. Nevertheless, government priorities are set nationally depending on a variety of factors including for example the economic set up and environmental concerns. While political commitment was not equal across the region, legal obligations under those conventions signed by countries overlap between those related to cooperation, capacity building, education and awareness raising, research, monitoring, reporting, policy integration, conservation of species and habitats, sustainable management, reporting and regulation (Chapter Three, Section 3.2). A measurable difference in commitment was uncovered between EU and non-EU countries, indicating that supranational arrangements can drive such commitments, but also confirming the observations of legal scholars that democratic States sign up to more environment agreements than other government

systems.¹³⁹² This may also be related to the fact that those countries have more access to resources, a more supportive administrative set up, and a higher development status, providing an advantage in the implementation of measures;¹³⁹³ while States facing, *inter alia*, political instability, conflicts, substantial resources and capacity limitations, and economic challenges, experience unique struggles hindering the ability to implement legal obligations.¹³⁹⁴ However, in this assessment it was of note that all States indicated some limitations.

Whether the existing legal obligations under international and regional frameworks are sufficient to achieve good shark governance is a complex question. Human activities have and continue to shape the state of health of marine ecosystems in the Mediterranean Sea.¹³⁹⁵ The review of problems identified at national level exhibits proof that global issues have become local problems, and gaps in policy and implementation remain (Figure 41). Some of the threats to sharks, globally and locally, have long been discussed in international fora to be addressed through legal measures, yet there are also new and emerging threats, which have not yet received the necessary attention of national policy agendas. Figure 41 demonstrates these remaining and emerging issues in need of addressing and provides some solutions.

Shark-specific legal and policy commitments have mainly been addressed in soft law instruments. Soft law has its advantages in being, for example, more flexible and less

¹³⁹² Neumayer (n 768).

¹³⁹³ Freire-Gibb and others (n 1150).

¹³⁹⁴ Roberts and others (n 770).

¹³⁹⁵ Stelios Katsanevakis and others, 'Invading the Mediterranean Sea: Biodiversity Patterns Shaped by Human Activities' (2014) 1 *Frontiers in Marine Science* 1 <<http://journal.frontiersin.org/article/10.3389/fmars.2014.00032/abstract>>.

costly.¹³⁹⁶ As demonstrated in the case of the regional action plan, such instruments can drive action, if compliance mechanisms are in place, such as the biennial meeting organised by RAC/SPA. Furthermore, the assessment of legal obligations demonstrated that RFMOs have picked up on fisheries related issues, which pose the main threat to sharks, and started to create legally binding measures at regional level. As the global governance landscape continues to evolve, non-State actors are acting beyond traditional roles, including a role in the development of soft law, for example, for some of the most threatened species-angelsharks.¹³⁹⁷ Persisting challenges, such as overfishing, IUU fishing, and biodiversity loss will require continued political commitment and action, by all key players, as shown in Figure 41, which exposes research needs and proposes actions for key actors.

¹³⁹⁶ Abbott and Snidal (n 437).

¹³⁹⁷ See Chapter Three, Section 3.1.1.

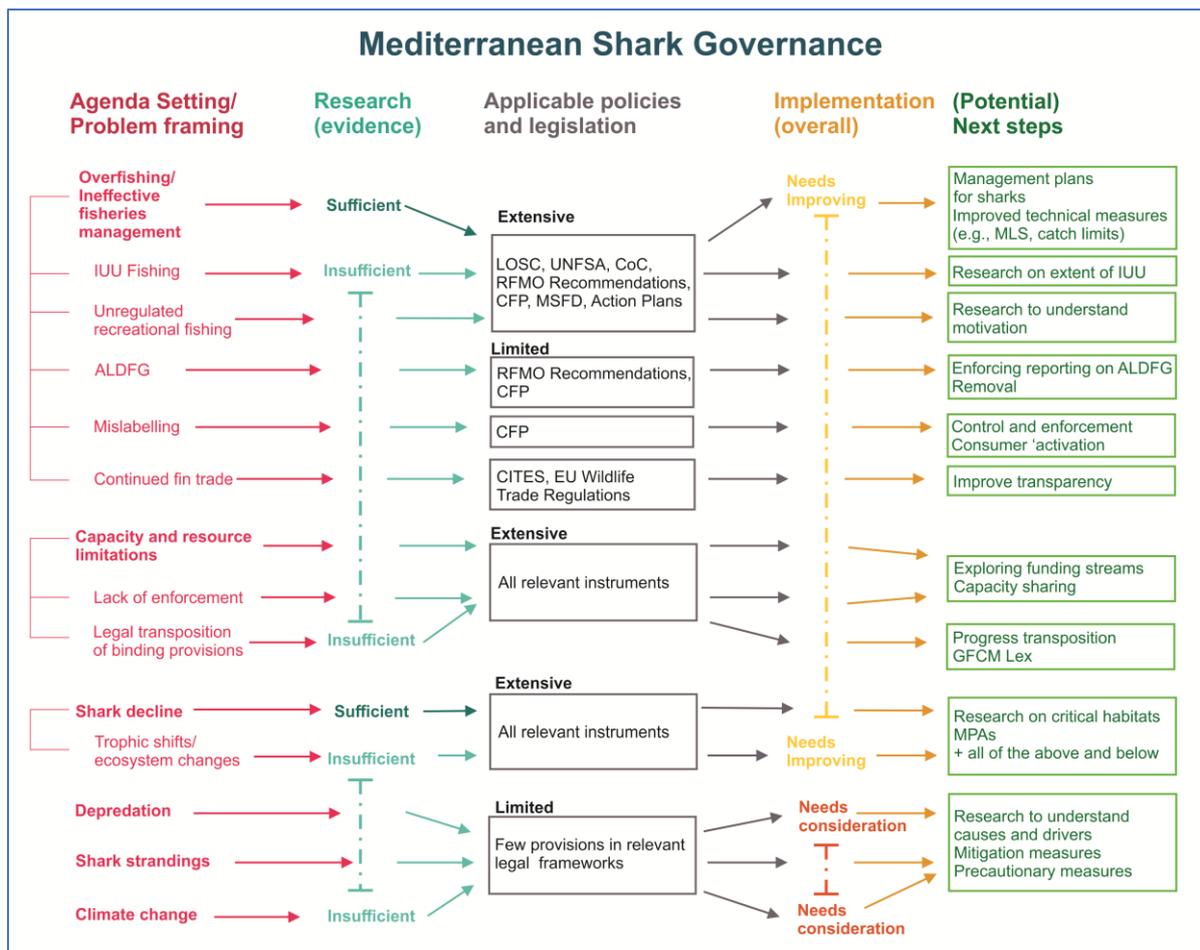


Figure 41. Overview of identified gaps in Mediterranean shark governance aligned with the steps of the policy cycle and recommendations for future action.

Priorities can change with changes in government leadership, this is especially important in democracies where governments are voted in place by the public, who could demand prioritisation of key issues, for example, the conservation of the marine environment.¹³⁹⁸

However, this relies on the level of education and awareness of such problems, which across countries was determined as low in nine out of 22 countries in relation to knowledge on sharks and the threats they face; thereby, public support was also perceived as low. There

¹³⁹⁸ Adrian Bua and Oliver Escobar, 'Participatory-Deliberative Processes and Public Policy Agendas: Lessons for Policy and Practice' (2018) 1 Policy Design and Practice 126 <<https://doi.org/10.1080/25741292.2018.1469242>>.

are certainly further efforts required to gain public support that would foster shark prioritisation on the national agenda.

The evidence required to guide such agenda setting and policy formulation is, or should be, provided by science. Although the evaluation of research effort across the Mediterranean region demonstrated substantial gaps in terms of applied conservation advice and policy evaluation (Figure 41), there is a substantial basis of knowledge and increasing consideration of scientist aiming to provide such advice.¹³⁹⁹ This is not without accrediting scientists' effort in trying to gather knowledge as sharks continue to disappear, noting that the baseline for sharks in the Mediterranean is a shifted one, as fishing has decimated populations, whilst researchers are working across the region to catch up.

The reliance on scientific evidence, a requirement integrated in multiple legal instruments, not only generates a duty to actually employ it but can also be used by States as an excuse to delay action until such evidence is available. This is further discussed below in relation to the use of the precautionary approach as a basis for creating further actions. There is also evidence, that despite robust scientific guidance being available, States fail to apply it. A case in point is the failure of the EU's CFP in achieving sustainable yields by 2020,¹⁴⁰⁰ as quotas were influenced by the lobbying of some of the largest fishing nations in the EU, such as Spain, leading to economic interest overruling environmental needs.¹⁴⁰¹ Although the assessment of implementation effort has shown that the EU CFP partly increased efforts for

¹³⁹⁹ See Chapter Six, Section 6.4.

¹⁴⁰⁰ Jenni Grossmann and Elisabeth Druel, 'Taking Stock 2020 - Are TACs Set to Achieve MSY? A Report on Key Areas Where Progress Is Still Needed Now That the 2020 MSY Deadline Has Passed' (2020) <<https://www.documents.clientearth.org/wp-content/uploads/library/2020-10-12-taking-stock-2020-are-tacs-set-to-achieve-msy-ce-en.pdf>>.

¹⁴⁰¹ Grossmann and Druel (n 1400).

the conservation of sharks, with reported high compliance among EU MS, the effectiveness and control mechanisms at national level need further investigating. This is also noting that EU policies and legislation, especially Directives, leave some flexibility in relation to the implementation at national level, which could lead to lesser efforts being made than intended by such Directive.¹⁴⁰² This was reflected in the choice of indicators for different descriptors by EU MS within the national PoMs under the MSFD, which only had limited consideration of sharks.

Returning to consideration of the CBDR principle,¹⁴⁰³ there is a shared responsibility between countries to safeguard the marine environment of the Mediterranean Sea, including sharks. As noted by Trouwborst, shared responsibility in international law may relate to State's contribution to the decline of a species for which, under international or regional treaties, protective measures should be established.¹⁴⁰⁴ The CBDR principle is based on historical differences, impacting on strength of government, available capacity, economic power, and related financial resources.¹⁴⁰⁵ Common responsibility and universal goals may be argued to undermine CBDR or make it irrelevant, but as argued by Williams and Montes this is a misunderstanding.¹⁴⁰⁶ The principle aims to reduce unfairness in expectations to implement obligations, a result of historically disputed resource distribution and political problems, especially in developing countries, as seen through the integration of CBDR in

¹⁴⁰² Perkins and Neumayer (n 769).

¹⁴⁰³ As explained in Chapter Two, Section 2.6.

¹⁴⁰⁴ Arie Trouwborst, 'SHARES Research Paper. The Practice of Shared Responsibility in Relation to Nature Conservation', *André Nollkaemper and Ilias Plakokefalos (eds.), The Practice of Shared Responsibility in International Law*, vol 68 (Cambridge University Press 2016) <sharesproject.nl>.

¹⁴⁰⁵ As introduced in Chapter Two, Section 2.6

¹⁴⁰⁶ Mariama Williams and Manuel F Montes, 'Common but Differentiated Responsibilities: Which Way Forward?' (2016) 59 *Development* (Basingstoke) 114.

different MEAs, including the CBD. This supports the argument that the principle remains a valid consideration, despite the drive for universal equality. However, the question remains how to operationalise it and measure progress.¹⁴⁰⁷

In the current assessment the CBDR principle was operationalised through the standardisation of national effort, thereby considering difference in economy strength. In the context of the application of the CBDR principle to shark conservation, this assessment has shown that whilst responsibilities for regional shark conservation are common between countries, the extent of such responsibility differs. This is a result of national differences in, *inter alia*, shark biodiversity, marine areas, and shark landings. Furthermore, limitations at national level were taken into consideration in the proposition of next steps and needs of countries in the region. However, the problem of regional overfished stocks and the general decline of shark in the Mediterranean remains a shared responsibility, which countries should tackle together. Particularly, the contribution to resolving such problems should come from the countries with more access to resources, namely EU countries, especially noting the EU action plan for sharks frankly states that the Union is on the forefront of shark conservation.¹⁴⁰⁸

Despite the EU's commitment to take a leading role in shark management in its 2009 action plan,¹⁴⁰⁹ there seems to be little evidence of that being true: many EU countries continue to land sharks in high numbers, and two projects financed through EU funding mechanisms even supported shark meat promotion, with no evidence of being sourced from sustainable

¹⁴⁰⁷ Williams and Montes (n 1406).

¹⁴⁰⁸ European Commission, 'European Community Action Plan for the Conservation and Management of Sharks' (n 407).

¹⁴⁰⁹ European Commission, 'European Community Action Plan for the Conservation and Management of Sharks' (n 407).

fishing.¹⁴¹⁰ Furthermore, it is noteworthy that the EU has never updated its action plan. Whether this is because the EU expected MS to create national plans, or because the existing regional plan is updated every 4 to 5 years, is debatable. A recent review by an expert group, suggested an update as some objectives have now become obsolete.¹⁴¹¹

Conversely, the analysis of the overall implementation effort did indicate a statically significant difference between EU and non-EU countries, but less though in relation to stringent regulations. While the assessment of implemented actions and measures at national level revealed a variety of approaches, namely 208 distinguished ones, the majority of these focused on non-stringent measures, such as short-term projects and monitoring programmes (together 56 %). Very little effort has been made to establish spatial protection, apart from two MPAs in which shark receive some level of protection, and fisheries restricted areas for which the conservation benefit for sharks remains to be assessed. Gaps in the implementation of regulatory measures created for fisheries management remain (Figure 41 above), including qualitatively poor reporting in many countries, missing application of wide-ranging bycatch mitigation, which seems to remain an intention in law rather than an applied tool, the regulation of recreational fisheries, and mislabelling of shark products - a challenge faced by many countries. These require further efforts to investigate causes and drivers, but also the application of existing tools as science continues to deliver them (Figure 41, Next Steps).

¹⁴¹⁰ As explained in Chapter Six, Section 6.3.2.

¹⁴¹¹ Walker and Pinto (n 1097).

Implementation *in fact* refers to the state when measures in law or policy are made effective through administrative structure and processes at national level.¹⁴¹² Establishing effective implementation through enforcement on the ground requires resources, public support, political will, and potentially the threat of sanctions.¹⁴¹³ Implementation, unquestionably, is a costly undertaking and requires controls and enforcement, therefore may be hindered by the limitations in national capacity and resources,¹⁴¹⁴ as indicated above. Nevertheless, there are pathways and existing approaches that could benefit implementation efforts, controls, and enforcement. For example, increasing effort, as shown through the present assessment, has been made on the use of genetic information. Incorporated under the CBD, the preservation of genetic diversity goes hand in hand with success in the conservation of overall biodiversity. Although the CBD's consideration was based on the intention to safeguard genetic information for agricultural purposes, scholars argue that the obligation to ensure genetic information is collected and preserved should be expanded to serve wider conservation efforts.¹⁴¹⁵ In the context of sharks, it is not only needed to ensure the diversity of populations, thereby their resistance to environmental stress, but could also provide a strong basis for improved measures and should guide

¹⁴¹² A Jordan, 'The Implementation of EU Environmental Policy: A Policy Problem without a Political Solution?' (1999) 17 *Environment and Planning C: Government and Policy* 69.

¹⁴¹³ Elizabeth Hattan, 'The Implementation of EU Environmental Law' (2003) 15 *Journal of Environmental Law* 273 <<https://www.jstor.org/stable/44248430>>.

¹⁴¹⁴ Oliver Houck, 'Tales from a Troubled Marriage: Science and Law in Environmental Policy' (2003) 302 *Science* 1926 <<https://www.science.org/doi/10.1126/science.1093758>>.

¹⁴¹⁵ Sean Hoban and others, 'Genetic Diversity Targets and Indicators in the CBD Post-2020 Global Biodiversity Framework Must Be Improved' (2020) 248 *Biological Conservation* 108654 <<https://doi.org/10.1016/j.biocon.2020.108654>>.

policies.¹⁴¹⁶ The establishment of efforts on genetic databases for sharks in the Mediterranean offers a good starting point for future conservation and policy efforts.¹⁴¹⁷ But the application of genetic information goes beyond determining genetic variability and composition, as it has also been used to monitor compliance in, for example, the correct labelling of species;¹⁴¹⁸ and thus has driven researchers to make further progress on easy-to-use and quick tools, thereby creating new options and possibilities to combat illegal trade, aiding the effective implementation of CITES.¹⁴¹⁹ Determining shark species that are traded has also seen increased research at national level.¹⁴²⁰ Nevertheless, there is a need to streamline efforts and to manage genetic information for it to reach its full potential as a tool for conservation.¹⁴²¹

Moreover, the problem of mislabelling could be addressed, or at least reduced, by ‘activating consumers’ ensuring that the general public demands legally required information, to make better informed choices. NGOs, in this regard, can play a key role in such consumer activation through educational programmes and awareness campaigns.¹⁴²² This was another aspect highlighted by this work - the contributions of key actors in shark governance in the Mediterranean region, especially those made by NGOs, as indicated below.

¹⁴¹⁶ Rodrigo Rodrigues Domingues, Alexandre Wagner Silva Hilsdorf and Otto Bismarck Fazzano Gadig, ‘The Importance of Considering Genetic Diversity in Shark and Ray Conservation Policies’ (2018) 19 *Conservation Genetics* 501.

¹⁴¹⁷ Cariani and others (n 806).

¹⁴¹⁸ Pazartzi and others (n 1227).

¹⁴¹⁹ Shaili Johri and others, ‘“Genome Skimming” with the MinION Hand-Held Sequencer Identifies CITES-Listed Shark Species in India’s Exports Market’ (2019) 9 *Scientific Reports* 1 <<http://dx.doi.org/10.1038/s41598-019-40940-9>>.

¹⁴²⁰ Ingrid Vasconcellos Bunholi and others, ‘The Fishing and Illegal Trade of the Angelshark: DNA Barcoding against Misleading Identifications’ (2018) 206 *Fisheries Research* 193 <<https://doi.org/10.1016/j.fishres.2018.05.018>>.

¹⁴²¹ Jessica Pearce and others, ‘State of Shark and Ray Genomics in an Era of Extinction’ (2021) 8 *Frontiers in Marine Science* <<https://www.frontiersin.org/articles/10.3389/fmars.2021.744986/full>>.

¹⁴²² Abbott (n 202).

Both NGOs and researchers contribute significantly to information availability and sharing, as well as awareness raising. Whilst governments have also made efforts, as part of the commitment they made internationally, to increase public knowledge and involve relevant sectors, such as fishers, NGOs use a wide array of tools and approaches to involve and integrate the public and the fishing sector in conservation. There is scientific consensus that working with fishers, rather than against the industry, is more effective; and that a sustainable shark fishery is a path which can secure livelihoods,¹⁴²³ while supporting species conservation, as opposed to banning activities.¹⁴²⁴

However, information and involvement are not enough to safeguard sharks – targeted, direct action is also needed to regulate activities, mitigate impacts, and actively develop recovery and restoration measures for shark populations and their environment. Continued overfishing of sharks and commercial fish stocks not only directly impacts sharks but also leads to the depletion of marine ecosystems overall and decreasing ecosystem resilience.¹⁴²⁵

This in turn leads to the exacerbation of problems and development of new ones such as depredation, something that has gained attention globally and in the Mediterranean region. Advanced consideration of emerging challenges and their impacts on sharks was therefore proposed as part of this work (Chapter Six) and summarised in Figure 41 above.

Furthermore, the protection of migratory species will demand international cooperation in the creation of measures and substantial joint fisheries measures, which might be established through RFMOs. Although pelagic sharks make up a substantial amount of the

¹⁴²³ Dharmadi, Fahmi and F Satria, 'Fisheries Management and Conservation of Sharks in Indonesia' (2015) 37 African Journal of Marine Science 249.

¹⁴²⁴ Mannheim and others (n 1158).

¹⁴²⁵ Ferretti and others, 'Loss of Large Predatory Sharks from the Mediterranean Sea' (n 730).

species occurring in the Mediterranean, measures to protect local populations of non-migratory species should be a focus for conservation actions.

The implementation database is only a starting point to assist in the monitoring of future efforts to protect sharks and will need to be regularly updated to offer a well-informed, continuous source of information. Compulsory measures required by parties to a MEA or members of a regional body, will and should further be monitored through the mechanisms set up under the respective legal instrument. Such compliance mechanisms established through MEAs, include, for example, the meetings of the Parties of the Barcelona Convention, to which signatory States report updates on implementation and discuss future priorities. Within this compliance process, reported non-compliance is not considered a wilful act, but the result of existing limitations and capacity level,¹⁴²⁶ which, as shown in Chapter Six, still exist. Reporting, as shown in this assessment, forms a relational approach to compliance for all the respective MEAs, as well as regional bodies and, to some degree, action plans.¹⁴²⁷

The EU creates obligations by virtue of specific law such as regulations implementing the CFP or directives such as the MSFD for protection and has the power to enforce them, which the EU will exert in cases of non-compliance.¹⁴²⁸ The pathway of litigation and the role of researchers and NGOs to uncover illegal activities may be something that needs further

¹⁴²⁶ Evangelos Raftopoulos, 'Compliance Procedure : Barcelona Convention for the Protection of the Mediterranean Sea' [2019] Max Planck Encyclopedias of International Law [MPIL] 1.

¹⁴²⁷ Referring to the Focal Point meeting under the Barcelona Convention on implementation progress under the SPA/BD Protocol

¹⁴²⁸ Court of Justice of the European Union, Case C-304/02 *Commission v France* [2005] ECR I-6263

exploring. What has, however, become clear through the assessment of overall shark governance is in line with what Houck remarked:

“That which is not nailed down by law is not likely to happen.”¹⁴²⁹

Although sharks have made it on to the international, regional, and partly the national agenda, it seems that they are not considered a priority group for conservation efforts in the Mediterranean region. The exception appears to be for NGOs, which have been increasing in numbers in recent years and widely try to create positive change, supplying information to the public, involving them and other relevant stakeholders, contributing to research, and supporting the development of new policies.

The RAC/SPA established working programmes to support implementation of the regional action plan, but despite of some recent evidence of implementation effort, many of the goals and targets set at the eight meeting,¹⁴³⁰ have not yet been achieved, such as the application of recreational fishing guidelines and the establishment of inventories for important areas, the latter being needed to support the creation of MPAs.¹⁴³¹ In short, there is no effective tracing mechanism to monitor that commitments are kept and realised and the assessment strategy introduced in this work may be a tool to combat this.

Considering the time to achieve the intended results against the threats posed, the suggestion is to rely on science and precautionary measures, not only through the generation of new measures but also through effective implementation and enforcement of

¹⁴²⁹ Houck (n 1414).

¹⁴³⁰ ‘Decision IG.21/6 Amendments to Annex II to the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean, UNEP (2013) UNEP(DEPI)/MED IG.21/9’ (n 443).

¹⁴³¹ UNEP Decision IG.21/4 UNEP(DEPI)/MED Action Plans under the Specially Protected Areas and Biological Diversity Protocol including Monk Seal, Marine Turtles, Birds, Cartilaginous Fishes, and Dark Habitats (2013) IG.21/9

existing ones. This includes, *inter alia*, improving national reporting, investing in research, building capacity, and collaborating widely, as proposed in Figure 41 above. Further actions could include the development of recovery actions, habitat restoration programmes, and reducing impact from bycatch and illegal and unregulated fishing, with the latter incorporating regulation of recreational fishing. The problems of resources limitations and lack of expertise can be tackled: existing funding schemes and supporting programmes, as well as increased cooperation between governments, NGOs, and researchers, could assist in the development of such precautionary measures and widely improve the outlook for sharks. The legally, well-integrated but little applied precautionary principle may be a way to counter inaction due to gaps in scientific knowledge.¹⁴³²

Further insight into the evaluation phase of the policy cycle to assess the effectiveness of implemented measures will need more time, particularly since such measures are relatively 'new' and sharks have life history traits that not only make them more vulnerable to impact but also mean it will take longer to show conservation benefits, with some species taking decades to recover and reproduce. Success will also depend on the resources invested in fostering compliance with existing regulations and to enforce stringent measures, and thus fulfil promises made, such as the fishing ban for sharks in Libya. The evaluation stage of the policy cycle was therefore outside the scope of this work, but it would be an interesting future research exercise.

The first step over the next decade is for governments to give greater priority to shark conservation, investing in long-term programmes to proactively protect sharks. This could

¹⁴³² Koehler, Giovos and Lowther (n 564).

include supporting research on important areas, the wide application of bycatch mitigation measures, capacity building at national level, and potentially, if scientific information is supportive, the creation of protected areas that are monitored and enforced with protective measures such as fishing bans. There is also a fundamental need to establish funding sources for such actions, especially to support action in developing countries.

A key question was whether to adequately protect sharks, the Mediterranean needs more stringent regulations, more protective actions, or a completely different approach. The answer is as complex as the question. Countries need to measure up to the commitments made, share knowledge and working approaches, as well as conservation benefits across the sectors involved to reduce harmful practices. Science in the Mediterranean might not be able to plug the knowledge gaps quick enough to create better and more stringent measures, therefore information from other regions may become useful, and should be continuously assessed for its applicability- such an approach remains to be considered in the Focal Point meetings conducted by SPA/RAC. Also of assistance would be further collaboration between governments and NGOs at national and international level, noting that initiatives as those led by the WWF offer valuable guidance on actions needed and how to design shark measures.¹⁴³³ While NGOs certainly contribute to shark conservation, their ambitions to do so depend on government support at national level, political will, and resources.

¹⁴³³ Cassandra L Rigby and others, 'A Practical Guide to the Effective Design and Management of MPAs for Sharks and Rays.' [2019] WWF, Gland, Switzerland.

With climate change, the problems sharks are facing will become more substantial and harder to manage. Climate change will not only have an effect on the distribution of species, and thereby potentially changes in jurisdictional responsibility,¹⁴³⁴ but also on physiology impacting shark' health and resilience to cope in certain regions. Furthermore, human population growth, will generate pressure on all marine resources, and with significantly reduced fish stocks, may lead to a turning of tables from shark bycatch to targeted shark fishers, a trend observed by experts across the Mediterranean.

Looking at the situation for sharks in the Mediterranean a 'business as usual' approach is unlikely to prevent further population declines and achieve sustainable fisheries. Although NGOs proved a hopeful approach to drive shark conservation and management at different levels, more political will to turn technical knowledge into management is needed to achieve the norms and vision of international law and global targets. While law continues to evolve, as demonstrated in Chapter Six (Section 6.6), and new global targets are being set, existing frameworks and new conservation tools offer multiple pathways to improve shark governance at regional and national level.

Reflecting on the introduction to this work on whether can shark governance in the Mediterranean deemed to be 'good' -there is no direct answer as it differs for each country. While EU MS seem to be leading across the constructs assessed, there were gaps in reporting on the status of implementation and a lack of applied stringent conservation measures. Overall, Mediterranean shark governance cannot be declared to be good

¹⁴³⁴ Diaz-Carballido and others (n 1275).

governance, as scientific knowledge has yet to guide better actions, implementation of protective measures is lacking, and transparency issues remain.

Legal scholars may argue there has been a noticeable increase in the recognition of sharks and that shark conservation has *de facto* become a norm,¹⁴³⁵ this study would argue against it, at least in the case of the Mediterranean Sea. With an increase in shark product marketing, continued shark landings and overfishing, shark conservation can certainly not be considered a norm, but more of an aspiration. At this point in time, it seems the reality is more that of Neff and Wynter - that the 'saving sharks movement'¹⁴³⁶ has started in the Mediterranean, spearheaded by the work of NGOs, but to develop and thereby offer more effective shark governance, more effectively/robustly implemented, and enforced measures at national level are required.

Finding methods to trace national progress in shark governance is crucial to ensure obligations are implemented. The conceptual framework and assessment strategy developed through this work can offer a tracing mechanism for future progress and could help to address identified gaps and needs at national level. This work could also support national reporting and guide further research needs. Furthermore, it helped to highlight and quantify the contributions of different key actors in shark governance, which increases transparency and offers a baseline for regional and national efforts.

¹⁴³⁵ van Osch (n 27).

¹⁴³⁶ Pepin-Neff and Wynter (n 62).

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Annex table 1. Selected ICCAT Recommendations relevant to sharks in the Mediterranean.¹⁴³⁷

Rec. #	Title
04_10	RECOMMENDATION BY ICCAT CONCERNING THE CONSERVATION OF SHARKS CAUGHT IN ASSOCIATION WITH FISHERIES MANAGED BY ICCAT
07_06	SUPPLEMENTAL RECOMMENDATION BY ICCAT CONCERNING SHARKS
09_07	RECOMMENDATION BY ICCAT ON THE CONSERVATION OF THRESHER SHARKS CAUGHT IN ASSOCIATION WITH FISHERIES IN THE ICCAT CONVENTION AREA
10_06	RECOMMENDATION BY ICCAT ON ATLANTIC SHORTFIN MAKO SHARKS CAUGHT IN ASSOCIATION WITH ICCAT FISHERIES
10_07	RECOMMENDATION BY ICCAT ON THE CONSERVATION OF OCEANIC WHITETIP SHARK CAUGHT IN ASSOCIATION WITH FISHERIES IN THE ICCAT CONVENTION AREA
10_08	RECOMMENDATION BY ICCAT ON HAMMERHEAD SHARKS (FAMILY SPHYRNIDAE) CAUGHT IN ASSOCIATION WITH FISHERIES MANAGED BY ICCAT
11_08	RECOMMENDATION BY ICCAT ON THE CONSERVATION OF SILKY SHARKS CAUGHT IN ASSOCIATION WITH ICCAT FISHERIES
14_06	RECOMMENDATION BY ICCAT ON SHORTFIN MAKO CAUGHT IN ASSOCIATION WITH ICCAT FISHERIES
15_06	RECOMMENDATION BY ICCAT ON PORBEAGLE CAUGHT IN ASSOCIATION WITH ICCAT FISHERIES
18_06	RECOMMENDATION BY ICCAT TO REPLACE RECOMMENDATION 16-13 ON IMPROVEMENT OF COMPLIANCE REVIEW OF CONSERVATION AND MANAGEMENT MEASURES REGARDING SHARKS CAUGHT IN ASSOCIATION WITH ICCAT FISHERIES
16_13	RECOMMENDATION BY ICCAT ON IMPROVEMENT OF COMPLIANCE REVIEW OF CONSERVATION AND MANAGEMENT MEASURES REGARDING SHARKS CAUGHT IN ASSOCIATION WITH ICCAT FISHERIES

¹⁴³⁷ ICCAT, 'Compendium Management Recommendations and Resolutions Adopted by ICCAT for the Conservation of Atlantic Tunas and Tuna-like Species' 1.

Annex table 2. Indicators for international, regional, and national commitments relevant to shark governance

Legal instrument/ management body	Relevance	Party/ member list
Regulatory framework for general ocean uses and fisheries management		
Law of the Sea Convention (LOSC) ¹⁴³⁸	The Law of the Sea Convention is often referred to as 'the constitution of the oceans' and the fundamental legal instrument regulating ocean use. It introduced the right of states to claim a 200 nautical mile exclusive economic zone (EEZ) over which countries have, as the name stipulates, exclusive economic power. ¹⁴³⁹ Such claims and established zones will be the basis area of assessment for this study. Beside economic claims, the convention incorporates the duty for states to cooperate in resource use, share knowledge, and harvest marine resources in a sustainable way within their waters ¹⁴⁴⁰ and in the high seas. ¹⁴⁴¹ The LOSC also embodies an overall duty to protect the marine environment, ¹⁴⁴² and acknowledges the importance of the protection and management of migratory species, ¹⁴⁴³ which includes a list of three species and four families of sharks. ¹⁴⁴⁴	https://treaties.un.org g
United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA) ¹⁴⁴⁵	The UNFSA supplemented the LOSC by formulating principles to safeguard and sustainably manage migratory and straddling fish stocks and foster the cooperation of nations for these stocks. ¹⁴⁴⁶ It also obliges parties to share data, ¹⁴⁴⁷ avoid bycatch of threatened species including sharks, ¹⁴⁴⁸ and ensure that stocks are not fished below their ecological boundaries. ¹⁴⁴⁹ The 2012 review conference on the implementation of the UNFSA recommended that States (and RFMOs) should increase their efforts to conserve and manage shark catches, as these species are threatened by tuna fisheries. ¹⁴⁵⁰	https://treaties.un.org g
Agreement to Promote Compliance	The Compliance Agreement was developed in response to unsustainable and irresponsible fishing the high sea, e.g.,	https://treaties.un.org g

¹⁴³⁸United Nations Convention on the Law of the Sea [hereinafter LOSC] (adopted 10 December 1982, entered into force 1 November 1994) 1833 UNTS 397

¹⁴³⁹ LOSC, Part V

¹⁴⁴⁰ LOSC, Art. 61

¹⁴⁴¹ LOSC, Art. 119

¹⁴⁴² LOSC, Art. 192

¹⁴⁴³ LOSC, Art. 64

¹⁴⁴⁴ LOSC, Annex I (16.) Oceanic sharks: *Hexanchus griseus*; *Cetorhinus maximus*; Family *Alopiidae*; *Rhincodon typus*; Family *Carcharhinidae*; Family *Sphyrnidae*; Family *Isurida*.

¹⁴⁴⁵ Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks. [hereinafter UNFSA] (adopted 8 September 1995, entered into force 11 December 2001) 34 ILM 1542

¹⁴⁴⁶ UNFSA, Preamble

¹⁴⁴⁷ UNFSA, Article 5 (j)

¹⁴⁴⁸ UNFSA, Article 5 (f)

¹⁴⁴⁹ UNFSA, Article 5 (b)

¹⁴⁵⁰ Para. 6(g), United Nations, 2010 Review Conference Report.

with International Conservation and Management Measures by Fishing Vessels on the High Seas (Compliance Agreement) ¹⁴⁵¹	through the reflagging of ships ('flags of convenience'). The Agreement places a higher responsibility on Flag States to ensure vessels are controlled and authorised to fish in these areas ¹⁴⁵² and comply with international management and conservation measures. ¹⁴⁵³ High seas areas, also referred to as 'areas beyond national jurisdiction', are important for migratory, oceanic sharks where they need protection from unsustainable fishing practices. ¹⁴⁵⁴	
Regional Fisheries Management Bodies (RFMOs)	RFMOs not only regulate and provide access to economically important fish stocks, such as tuna, in the high seas, they are bodies that incorporate principles for responsible fishing and aim to regulate these fisheries towards sustainable exploitation. ¹⁴⁵⁵ Tuna and tuna-related RFMOs play a major role for shark conservation and management in the high seas and have started to acknowledge this role by developing management conservation measures for shark populations that are impacted by such fisheries. ¹⁴⁵⁶	http://www.fao.org
Agreement on Port State Measures (PSMA) ¹⁴⁵⁷	The PSMA agreement was developed to combat illegal, unreported, unregulated fishing (IUU fishing), and demands Parties to establish measures at ports to control fisheries landings. ¹⁴⁵⁸ Such measures should ensure that illegally caught fish cannot be landed thereby reducing the opportunities for illegal catches to enter the market. Inspections, as required under this legal instrument, also support the identification of species caught illegally, including protected shark species. ¹⁴⁵⁹	http://www.fao.org
Conservation conventions and regional programmes		
Convention on Biological Diversity (CBD) ¹⁴⁶⁰	The CBD was the first legal instrument to acknowledge the intrinsic value and importance of biodiversity. It requires State Parties to set up national biodiversity action plans, ¹⁴⁶¹ in line with global targets as agreed by the Conference of the Parties, such as the Aichi targets (2011-2020). ¹⁴⁶² In relation to shark governance, targets	https://www.cbd.int/

¹⁴⁵¹ Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas [hereinafter Compliance Agreement] (approved by the FAO Conference at its 27th session in November 1993, entered into force on 24 April 2003)

¹⁴⁵² Compliance Agreement, Art. III 2.

¹⁴⁵³ Compliance Agreement, Art. III 1. (a)

¹⁴⁵⁴ Nuno Queiroz and others, 'Global Spatial Risk Assessment of Sharks under the Footprint of Fisheries' (2019) 572 Nature 461.

¹⁴⁵⁵ Martin Aranda, Hilario Murua and Paul de Bruyn, 'Managing Fishing Capacity in Tuna Regional Fisheries Management Organisations (RFMOs): Development and State of the Art' (2012) 36 Marine Policy 985 <<http://dx.doi.org/10.1016/j.marpol.2012.01.006>>.

¹⁴⁵⁶ Pavone (n 23).

¹⁴⁵⁷ Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, opened for signature Nov. 22, 2009, 129 Stat. 664 (entered into force June 5, 2016) [hereinafter PSMA], available at http://www.fao.org/fileadmin/user_upload/legal/docs/037se.pdf.

¹⁴⁵⁸ FAO, <<http://www.fao.org/port-state-measures/en/>> accessed 17 August 2020.

¹⁴⁵⁹ Davidson, Krawchuk and Dulvy (n 163).

¹⁴⁶⁰ Convention on Biological Diversity [hereinafter CBD] (adopted 5 June 1992, entered into force 29 December 1993) 1760 UNTS 79

¹⁴⁶¹ CBD Art. 6(a)

¹⁴⁶² Convention on Biological Diversity <<https://www.cbd.int/sp/targets/>> accessed 20 October 2020

	include, <i>inter alia</i> , the sustainable management of fish stocks (Target 6), a global coverage of 10% marine space as designated marine protected areas (Target 11), as well as saving threatened species from extinction (Target 12).	
Regional Seas Conventions and Action Plans. For the Mediterranean, this refers to the Barcelona Convention. ¹⁴⁶³	The Regional Seas Programme was initiated to support, guide, and monitor the implementation of relevant international commitments to protect, conserve, and use the marine environment in a sustainable way. ¹⁴⁶⁴ States also have reporting obligations and an administrative support structure for implementation. Regional seas conventions can support the national listings of protected shark species and develop regional plans of actions for sharks in line with the International Plan of Action for Conservation and Management of Sharks (IPOA Sharks). ¹⁴⁶⁵ Regional and supranational (e.g., EU level) plans of actions for managing and conserving shark populations have been developed and underly a regional reporting duty, thereby support efforts on a regional and national scale. There are currently five regional plans of actions, ¹⁴⁶⁶ including a European plan of action, ¹⁴⁶⁷ Action Plan for the conservation of cartilaginous (Chondrichthyans) in the Mediterranean Sea, ¹⁴⁶⁸ the West African Commission Sous-Regionale des Peches (CSRP), ¹⁴⁶⁹ and the Pacific Island plan of action. ¹⁴⁷⁰	https://www.unenvironment.org and http://www.fao.org
Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) ¹⁴⁷¹ – relevant for continental Europe.	A Council of Europe treaty to support the conservation of European habitats and species. The Bern Convention has two relevant Appendixes for shark conservation. Appendix II lists strictly protected species, while Appendix III lists those that require protective measures.	https://www.coe.int/t
Convention on the Conservation of Migratory	Although the CMS has a narrow range in terms of species coverage, ¹⁴⁷³ the Convention has initiated important steps in shark conservation and management. ¹⁴⁷⁴	https://www.cms.int

¹⁴⁶³ Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (n 54).

¹⁴⁶⁴ United Nations Environmental Programme, < <https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/working-regional-seas/why-does-working-regional-seas-matter>> accessed 17 August 2020

¹⁴⁶⁵ FAO, International Plan of Action for Conservation and Management of Sharks (1999), <<http://www.fao.org/docrep/006/x3170e/x3170e03.htm>>

¹⁴⁶⁶ FAO, <www.fao.org/ipoa-sharks/national-and-regional-plans-of-action/en/> accessed 16 August 2020

¹⁴⁶⁷ European Commission, EU Action Plan on Sharks (2009), <https://ec.europa.eu/fisheries/marine_species/wild_species/sharks/sharks_action_plan_en>

¹⁴⁶⁸ United Nations Environment Programme, Mediterranean Action Plan, Regional Activity Centre for Specially Protected Areas, Action Plan for the Conservation of Cartilaginous (Chondrichthyans) in the Mediterranean Sea (2003, currently being updated), http://www.rac-spa.org/sites/default/files/action_plans/elasma.pdf.

¹⁴⁶⁹ Mika Diop & Justine Dossa, 30 Years of Shark Finning in West Africa: Development of Fisheries, Catch Trends, and Their Conservation Status in Sub-Regional Fishing Commission Member Countries (2011), <http://www.iucnssg.org/uploads/5/4/1/2/54120303/30years_eng.pdf>

¹⁴⁷⁰ Mary Lack & Frank Meere, Pacific Islands Regional Plan of Action for Sharks: Guidance for Pacific Island Countries And Territories on the Conservation and Management of Sharks (Honiara, Solomon Islands, Forum Fisheries Agency, 2009).

¹⁴⁷¹ Convention on the Conservation of European Wildlife and Natural Habitats [hereinafter Bern Convention] (adopted 19 September 1979, entered into force 01 June 1982) ETS 104

¹⁴⁷³ CMS, < <https://www.cms.int/sharks/en/species>> accessed 27 August 2020

¹⁴⁷⁴ Lawson and Fordham (n 26).

Species of Wild Animals (CMS) ¹⁴⁷²		
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) ¹⁴⁷⁵	CITES' approach is to protect threatened species through trade regulations, whether through prohibition of such trade or control measures. Although CITES was not intended to consider or list commercially interesting or exploitable species, ¹⁴⁷⁶ it has, over time, opened for shark listings, ¹⁴⁷⁷ enhancing their protection. ¹⁴⁷⁸	https://www.cites.org
National commitments (evaluation of obligatory and voluntary legal commitments)		
Party to CMS Shark Memorandum of Understanding (Shark MoU) ¹⁴⁷⁹	The CMS Shark MoU was created to support and enable cooperation for the conservation of migratory shark species through science-based actions. ¹⁴⁸⁰ The value of this non-binding instrument is that it adds to the IPOA Sharks, creating a more detailed conservation plan. The Sharks MoU intends to help implement actions through regular meetings of the MoU Advisory Committee, which involves beside government participants, other relevant stakeholders, such as scientific institutions and NGOs. ¹⁴⁸¹	https://www.cms.int
National Plan of Action for sharks (NPOA)	The NPAO is a voluntary commitment and intends to define a national course of action for shark management based on species occurring in national waters or subject to fishing pressure by the respective country. The advantage of a NPAO to a regional plan is that it can be tailored to nationally occurring species, national priorities, resources, and capacities. NPOAs focus more on the regulation of fishing activities from a commercial perspective, as opposed to conservation <i>per se</i> . ¹⁴⁸² The development and implementation of measures is tracked through the FAO. ¹⁴⁸³	www.fao.org
National Fisheries Management Plan	A national fisheries management plan that supports the reduction/elimination vulnerable species bycatch and incorporates the precautionary approach, as well as stock recovery options for sharks supportive of shark conservation and management.	Government questionnaire/ reporting under www.fao.org

¹⁴⁷² Convention on the Conservation of Migratory Species of Wild Animals [hereinafter CMS] (adopted 23 June 1979, entered into force 1 November 1983) 1651 U.N.T.S. 333 19 I.L.M. 15

¹⁴⁷⁵ Convention on International Trade in Endangered Species of Wild Fauna and Flora [hereinafter CITES] (adopted 3 March 1973, entered into force 1 July 1975) 993 U.N.T.S. 243

¹⁴⁷⁶ Franckx (n 21).

¹⁴⁷⁷ Wijnstekers, W. (2011): The Evolution of CITES - 9th edition. International Council for Game and Wildlife Conservation

¹⁴⁷⁸ Friedman and others (n 36).

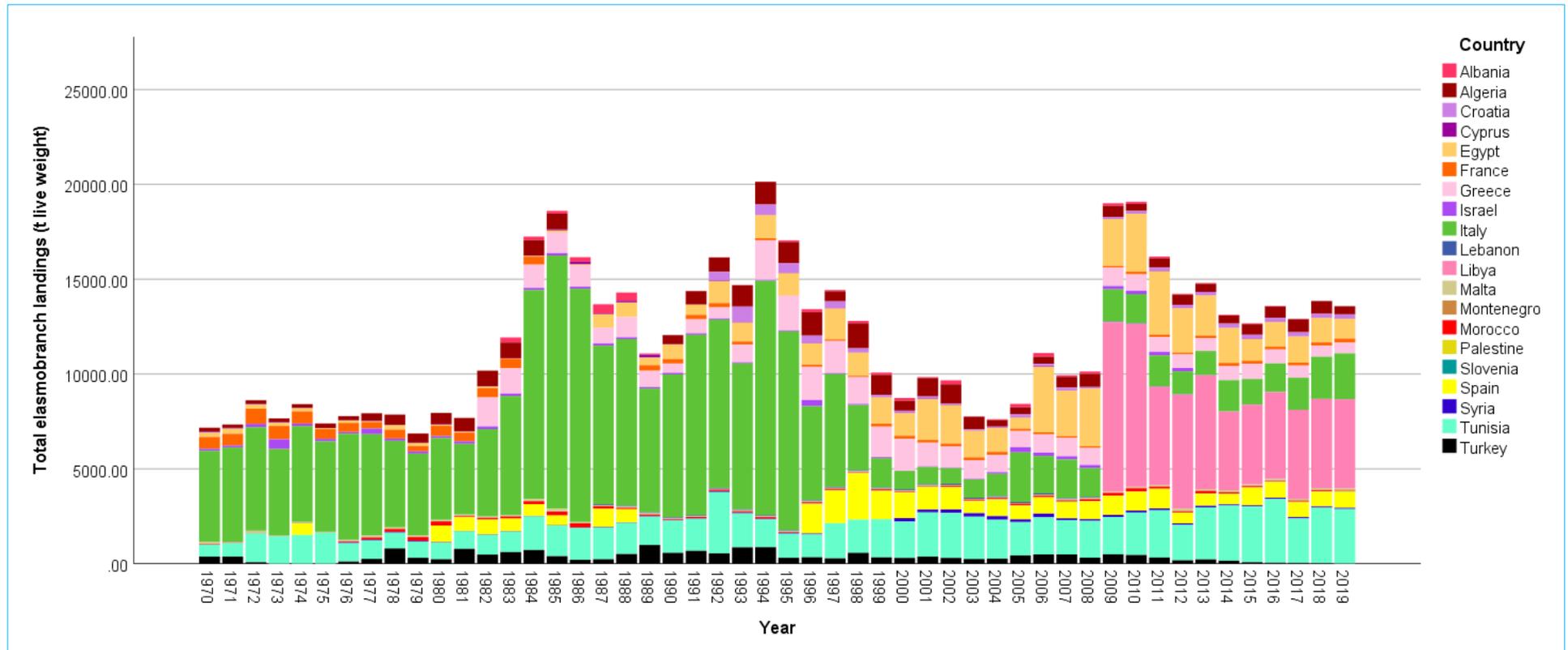
¹⁴⁷⁹ Memorandum of Understanding on the Conservation of Migratory Sharks. CMS. 2010

¹⁴⁸⁰ CMS, < <https://www.cms.int/sharks/en/legalinstrument/sharks-mou>> accessed 17 August 2020

¹⁴⁸¹ Muir and Klein (n 452).

¹⁴⁸² Muir and Klein (n 452).

¹⁴⁸³ FAO, <<http://www.fao.org/ipoa-sharks/database-of-measures/en/>> accessed 17 August 2020



Annex figure 1. Shark landings by country from the Mediterranean Sea, as reported under the GFCM and retrieved from the FAO database (FishStatJ). (Bosnia & Herzegovina and Monaco do currently not report shark landings.)

Annex table 3. Political commitments of Mediterranean countries by year of signature and ratification, accession, or succession.

Country/ Commitment	CBD signed	CBD year*	LOSC signed	LOSC year*	UNFSA signed	UNFSA year*	CA year*	GFCM year*	ICCAT year*	PSMA signed	PSMA year*	CMS year*	CMS MoU signed	CMS MoU year*	CMS Range State, Not signed	CITES year*	Bern signed	Bern year*	BC signed	BC year*	SPA/BD P. signed	SPA/BD P. year*	RAP implemented	NPOA	NPOA year*
Albania		1994		2003			2005	1991	2008		2017	2001	No		Yes	2003	1995	1999		1990	1995	2001	Yes		
Algeria	1992	1995	1982	1996				1967	2001			2005	No		Yes	1983				1981	1995	2007	Yes	Under development	
Bosnia and Herzegovina		2002		1994				2016 (coop. party)				2017	No		Yes	2009	2008	2008		1994			Yes		
Croatia	1992	1996		1995		2013		1995	1997	2009	2011	2000	No		Yes	2000	1999	2000		1992	1995	2002			
Cyprus	1992	1996	1982	1988		2002	2000	1965	1997	2009	2011	2001	No		Yes	1974	1981	1988	1976	1979	1995	2003			
Egypt	1992	1994	1982	1983	1995		2001	1951	2007			1983	Yes	2014	No	1978			1976	1978	1995	2000		Under development	
France	1992	1994	1982	1996	1996	2003	1996	1952	1968	2010	2016	1990	Yes	2019	No	1978	1979	1985	1976	1978	1995	2001			
Greece	1992	1994	1982	1995	1996	2003	1996	1952	1997	2009	2011	1999	No		Yes	1992	1979	1983	1976	1979	1995				
Israel	1992	1995			1995			1952				1983	No		Yes	1979			1976	1978	1995				
Italy	1992	1994	1984	1995	1996	2003	1996	1951	1997	2009	2011	1983	Yes	2011	No	1979	1979	1982	1976	1979	1995	1999	Yes	Under development	
Lebanon	1992	1994	1984	1995				1960				2019	No		Yes	2013				1977			Yes		
Libya	1992	2001	1984					1963	1995		2018	2002	Yes	2014	No	2003			1977	1979					
Malta	1992	2000	1982	1993		2001	1996	1965	1997	2009	2011	2001	No		Yes	1989	1993	1993	1976	1977	1995	1999	Yes		
Monaco	1992	1992	1982	1996		1999		1954				1993	Yes	2011	No	1978		1994	1976	1977	1995	1997	Yes		
Montenegro		2006		2006				2008			2017	2009	No		Yes	2006	2009	2009		2007		2007	Yes		
Morocco	1992	1995	1982	2007	1995	2012	2001	1956	1969			1993	No		Yes	1975			1976	1980	1995	2009		Alternative	2012
Palestine		2015		2015									No		No										
Slovenia	1992	1996		1995		2006	1996	2000	1997	2009	2011	1999	No		Yes	2000	1998	1999		1993		2003			
Spain	1992	1993	1984	1997	1996	2003	1996	1953	1997	2009	2011	1985	No		Yes	1986	1979	1986	1976	1976	1995	1998			
Syria	1993	1996					2002	1975	2005			2003	Yes	2014	No	2003				1978		2003			
Tunisia	1992	1993	1982	1985				1954	1997			1987	No		Yes	1974			1976	1977	1995	1998			
Turkey	1992	1997						1954	2003	2010	2018		No		Yes	1996	1979	1984	1976	1981		2002	Yes	Under development	
EU	1992	1993	1984	2003	1996	2003	1996	1998	1997	2009	2011	1983	Yes	2011	No	2015			1976	1978	1995	1999			

* Year of ratification, accession, or succession

Abbreviations: Convention on Biological Diversity (CBD), Law of the Sea Convention (LOSC) signed, UN Fish Stock Agreement (UNFSA), General Fisheries Commission for the Mediterranean (GFCM), International Convention for the Conservation of Atlantic Tuna (ICCAT), Agreement on Port State Measures (PSMA), Convention on Migratory Species (CMS), CMS Shark Memorandum of Understanding (CMS MoU), Convention on the Trade of Endangered Species (CITES), Bern Convention (Bern), Barcelona Convention (BC), SPA/ BD Protocol (SPA/BD P.), Regional Action Plan for Cartilaginous Fishes under the SPA/BD P. (RAP), National Plan of Action for Sharks (NPOA)

Annex table 4. Overview of sample provisions of relevant, selected legal obligations and commitments under different legal instruments applicable to Mediterranean countries concerning shark conservation and management. The table summarises duties subcategorised to specific tasks and indicates whether these are binding to the relevant Parties/Member States. Furthermore, the direct relevance to sharks is evaluated and stated. As adapted from Koehler & Lowther (2022).¹⁴⁸⁴

Category	Subcategories	Instrument	Paragraph/ Article	Text	Binding?	Shark relevance
Cooperation	Cooperation at international level for the conservation and sustainable use of biological diversity	Convention on Biological Diversity (CBD)	Art. 5	Each Contracting Party shall, as far as possible and as appropriate, cooperate with other Contracting Parties, directly or, where appropriate, through competent international organizations, in respect of areas beyond national jurisdiction and on other matters of mutual interest, for the conservation and sustainable use of biological diversity	as far as possible and appropriate	All
		Barcelona Convention, SPA/BD Protocol	Art. 3(2)	The Parties shall cooperate, directly or through competent international organisations, in the conservation and sustainable use of biological diversity in the area to which the Protocol applies.	Yes	All
	Regional cooperation through RFMOs for shark conservation	Communication from the Commission to the European Parliament and the Council on a European Community Action Plan for the Conservation and Management of Sharks	3	3.2.2. An emphasis on regional cooperation Several species of sharks are wide-ranging and highly migratory inhabiting international waters. Therefore, the responsibility for managing fisheries exploiting such stocks will be primarily in the hands of the relevant Regional Fisheries Management Organisations. It is for these bodies to determine the appropriate measures for the waters under their responsibility. It is therefore important to support the work of RFMOs in this regard, strengthen the RFMOs already in place and work together for the prompt establishment of new RFMOs in areas not yet covered.	No	Migratory species
	National cooperation for sustainable use	Convention on Biological Diversity (CBD)	Art. 10	(e) Encourage cooperation between its governmental authorities and its private sector in developing methods for sustainable use of biological resources.	as far as possible and appropriate	All

¹⁴⁸⁴ Koehler and Lowther (n 80).

Cooperation at international level on education and awareness raising		Art. 13	(b) Cooperate, as appropriate, with other States and international organizations in developing educational and public awareness programmes, with respect to conservation and sustainable use of biological diversity	as appropriate	All
Cooperation at international level on technical and scientific matters		Art. 18	1. The Contracting Parties shall promote international technical and scientific cooperation in the field of conservation and sustainable use of biological diversity, where necessary, through the appropriate international and national institutions.	Yes	All
Cooperation in research on migratory species	Convention on the Conservation of Migratory Species of Wild Animals (CMS)	Art. II	3. In particular, the Parties: a) should promote, co-operate in and support research relating to migratory species;	optional (should)	Migratory species
Establish agreements to protect endangered migratory species		Article IV	3. Parties that are Range States of migratory species listed in Appendix II shall endeavour to conclude AGREEMENTS where these should benefit the species and should give priority to those species in an unfavourable conservation status.	Yes	Migratory species Appendix II
Regional and international cooperation for the conservation of migratory species	UNEP/CMS/Resolution 11.2 (Rev.COP12). Strategic Plan for Migratory Species 2015-2023	Goal 3	Target 9: International and regional action and cooperation between States for the conservation and effective management of migratory species fully reflects a migratory systems approach, in which all States sharing responsibility for the species concerned engage in such actions in a concerted way.	No	Migratory species
Cooperation with relevant organisations to facilitate implementation of shark conservation	CMS Memorandum of Understanding on the Conservation of Migratory Sharks (as amended by the Signatories at their 2nd Meeting, Costa Rica, February 2016)	Section 4	13. The Signatories recognize that in order to be successful in these endeavours they should make every effort, as appropriate and subject to the availability of necessary resources, to: a) Cooperate with relevant organizations so as to facilitate the work conducted in relation to the Conservation Plan;	optional (should)	Migratory species
Cooperation between Parties for conservation and management of Annex II and III species	Barcelona Convention, SPA/BD Protocol	Art. 12	(1) Cooperative Measures for the Protection and Conservation of Species. (1) The Parties shall adopt cooperative measures to ensure the protection and conservation of the flora and fauna listed in the Annexes to the Protocol relating to the List of Endangered or Threatened Species and the List of Species whose Exploitation is Regulated.	Yes	Annex II and III species

	EU Commission and Member State cooperation in exchange of information with GFCM	Regulation (EU) No 1343/2011	Art. 23	Cooperation and information 1. The Commission and Member States shall cooperate and exchange information with the Executive Secretary of the GFCM, in particular by:(a) requesting information from, and providing information to, relevant databases; (b) requesting cooperation and cooperating in order to promote the effective implementation of this Regulation	Yes	All
	Cooperation at international level in capacity building and implementation	10_08 Recommendation by ICCAT on Hammerhead sharks (Sphyrnidae) caught in association with Fisheries managed by ICCAT	6	As appropriate, the Commission and its CPCs should, individually and collectively, engage in capacity building efforts and other cooperative activities to support the effective implementation of this Recommendation, including entering into cooperative arrangements with other appropriate international bodies.	as appropriate	Sphyrnidae
Capacity building	Technology transfer	Convention on Biological Diversity (CBD)	Art. 16	4. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim that the private sector facilitates access to, joint development and transfer of technology referred to in paragraph 1 above for the benefit of both governmental institutions and the private sector of developing countries and in this regard shall abide by the obligations included in paragraphs 1. 2 and 3 above	Yes	All
		UNEP/CMS/Resolution 11.2 (Rev.COP12). Strategic Plan for Migratory Species 2015-2023	Goal 5	Target 15: The science base, information, training, awareness, understanding and technologies relating to migratory species, their habitats and migration systems, their value, functioning, status and trends, and the consequences of their loss, are improved, widely shared and transferred, and effectively applied.	Not directly	Migratory species
	Information exchange		Art. 12	(a) Establish and maintain programmes for scientific and technical education and training in measures for the identification, conservation and sustainable use of biological diversity and its components and provide support for such education and training for the specific needs of developing countries:	Yes	All
	Programme development	Convention on Biological Diversity (CBD)	Art. 17	1. The Contracting Parties shall facilitate the exchange of information, from all publicly available sources, relevant to the conservation and sustainable use of biological diversity, taking into account the special needs of developing countries. 2. Such exchange of information shall include exchange of results of technical, scientific and socio-economic research, as well as information on training and surveying programmes, specialized knowledge, indigenous and traditional knowledge as such and in combination with the technologies referred to in Article 16, paragraph 1. It shall also, where feasible, include repatriation of information.	Yes	All

	Training	Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea 2003 (as updated 2020)	B.	13.8. Develop training to ensure capacity-building at national and regional level, mainly in the following fields: taxonomy, biology, ecology, monitoring methods and stock assessment.	No	All
			C.5.	29. The Contracting Parties should promote the training of specialists, fisheries officers and managers in the study and conservation of chondrichthyan fishes. To this end, it is important to identify already existing initiatives and to give priority to taxonomy, conservation biology and techniques for monitoring research programmes (cf. above paragraph on scientific research). 30. Training programmes should also focus on methods of fisheries data collection and stock assessment, especially data analysis.	No	All
	General Capacity building	Recommendation GFCM/36/2012/3 (amended by GFCM/42/2018/2)	Part III	10. As appropriate, the GFCM and its CPCs should, individually and collectively, engage in capacity building efforts and other research cooperative activities to improve knowledge on sharks and shark fisheries and to support the effective implementation of this recommendation, including entering into cooperative arrangements with other appropriate international bodies.	as appropriate	All
		Recommendation GFCM/42/2018/2	Part IV	10. As appropriate, the GFCM and its CPCs shall, individually and collectively, engage in capacity-building efforts and other research cooperative activities to improve knowledge on sharks and shark fisheries and to support the effective implementation of this recommendation, including entering into cooperative arrangements with other relevant international bodies.	as appropriate	All
		10_08 Recommendation by ICCAT On Hammerhead Sharks (Family Sphyrnidae) caught in Association with Fisheries Managed by ICCAT	6	As appropriate, the Commission and its CPCs should, individually and collectively, engage in capacity building efforts and other cooperative activities to support the effective implementation of this Recommendation, including entering into cooperative arrangements with other appropriate international bodies.	as appropriate	Sphyrnidae
Education and Awareness	Promote understanding of the importance of biological diversity and necessary conservation efforts	Convention on Biological Diversity (CBD)	Art. 13	(a) Promote and encourage understanding of the importance of. And the measures required for, the conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programmes;	Yes	All
	Promote knowledge on conservation and regulations and foster public participation	Barcelona Convention, SPA/ B Protocol	Art. 19	1. The Parties shall give appropriate publicity to the establishment of specially protected areas, their boundaries, applicable regulations, and to the designation of protected species, their habitats and applicable regulations. 2. The Parties shall endeavour to inform the public of the interest and value of specially protected areas and species,	Yes	All

				and of the scientific knowledge which may be gained from the point of view of nature conservation and other points of view. Such information should have an appropriate place in education programmes. The Parties shall also endeavour to promote the participation of their public and their conservation organizations in measures that are necessary for the protection of the areas and species concerned, including environmental impact assessments.		
Promote understanding of the importance of migratory species and necessary conservation efforts	UNEP/CMS/Resolution 11.2 (Rev.COP12). Strategic Plan for Migratory Species 2015-2023	Goal 1		Target 1: People are aware of the multiple values of migratory species and their habitats and migration systems, and the steps they can take to conserve them and ensure the sustainability of any use.	No	Migratory species
Increased awareness of public on threats to sharks and foster participation in their conservation	CMS Memorandum of Understanding on the Conservation of Migratory Sharks (as amended by the Signatories at their 2nd Meeting, Costa Rica, February 2016)	Section 4		12. The Signatories should cooperatively strive to adopt, implement and enforce such legal, regulatory and administrative measures as appropriate to conserve and manage migratory sharks and their habitat. [...] d) Increasing public awareness of threats to sharks and their habitats, and enhance public participation in conservation activities; and	optional (should)	Migratory species
Development of programmes	Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea 2003 (as updated 2020)	B. Priorities		13.9. Develop information and education programmes for professionals and public awareness.	No	All
Foster public support and involve all stakeholders; design material and establish programmes	Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea 2003 (as updated 2020)	C.6. Education and public awareness		31. For protection and conservation measures to be effective, public support should be obtained. In this respect, (1) information campaigns should be directed at national authorities, residents, teachers, visitors, professional fishermen, sport anglers, divers and any other stakeholder (2) Publication materials should be produced to present the life history, and vulnerability, of chondrichthyans and (3) education programme on the issue should be taught for school children	No	All
Work with relevant bodies in development of guidelines for shark activities and programmes				32. Also, guidelines for chondrichthyan watching should be published and widely distributed to potential observers such as anglers, yachtsmen, divers, shark-fans, etc, in order to make them actively involved in the conservation of chondrichthyan fishes. 33. In this process of education and public awareness, the help of associations and other bodies involved in nature conservation should be solicited.	No	All

	Promotion of education on conservation of species	Bern Convention	Chapter 1, Art. 3	(3) Each Contracting Party shall promote education and disseminate general information on the need to conserve species of wild flora and fauna and their habitats.	Yes	All
Research	General informaiton (biology, genetic studits, ecology, taxonomy, etc.)	Action Plan for the Conservation of Cartilaginous Fishes (Chondrichtyans) in the Mediterranean Sea (2020)	B. Priorities	13.6. Develop research programmes on general biology (feeding, reproduction and growth parameters), taxonomy, ecology and population dynamics, with particular regard to genetic and migration studies.	No	All
	Biology	14-06 Recommendation by ICCAT on Shortfin Mako caught in Association with ICCAT Fisheries	3	CPCs are encouraged to undertake research that would provide information on key biological/ecological parameters, life-history and behavioural traits, as well as on the identification of potential mating, pupping and nursery grounds of shortfin mako sharks. Such information shall be made available to the SCRS.	Not directly	<i>Isurus oxyrinchus</i>
	Migratory populations	Convention on the Conservation of Migratory Species of Wild Animals (CMS)	Art. II (Fundamental Principles), 3(a)	3. In particular, the Parties: a) should promote, co-operate in and support research relating to migratory species;	Optional (should)	Migratory species
		CMS Memorandum of Understanding on the Conservation of Migratory Sharks (as amended by the Signatories at their 2nd Meeting, Costa Rica, February 2016)	Section 4	12. a) Improving understanding of migratory shark populations through research, monitoring and information exchange;	Optional (should)	Migratory species
	Development of programmes	Action Plan for the Conservation of Cartilaginous Fishes (Chondrichtyans) in the Mediterranean Sea (2020)	C.4. Scientific research and monitoring	26. Parallel to protection and conservation measures, properly funded and staffed scientific research programmes should be undertaken or developed, mainly on species biology and ecology, emphasising growth, reproduction, diet, geographical and bathymetric distribution, migration, population genetics and dynamics and risk assessment. Regional tagging (conventional, pop-up and satellite tag) programmes should be developed for migratory species.[...]	No	Migratory species
	Genetic resources research	Convention on Biological Diversity (CBD)	Article 15. Access to Genetic Resources	6. Each Contracting Party shall endeavour to develop and carry out scientific research based on genetic resources provided by other Contracting Parties with the full participation of, and where possible in. such Contracting Parties	Yes	All
	Fisheries	UNEP/CMS/Resolution 12.22. Bycatch	Participation in Regional Fisheries Management Organizations (8 d)	d) encourage research proposals in geographical areas in which there is a particular lack of information and that, at the same time, are not covered by currently existing CMS Agreements. In particular, information is needed on: i) artisanal fisheries, generally; ii) gillnet fisheries, generally; iii) pelagic and bottom trawling, and purse seine fisheries; vii) for sharks, all fisheries;	as appropriate	Migratory species

	UNEP/CMS/Concerted Action 12.6 (Rev.COP13). Concerted Action for the Mobulid Rays (Mobulidae)	1. Reduce target and incidental catch of mobulid rays, (1.3.)	1.3. Support research that improve knowledge on target and incidental mobulid catch. Latest scientific knowledge informs Parties on appropriate protective measures and management. 2020 - 2023 Party Range States, NGOs. Parties may invite the following to support with implementation: Sharks MOU Signatories, CMS Sharks MOU Cooperating Partners, NGOs, research bodies.	Not directly	Migratory species
	Communication from the Commission to the European Parliament and the Council on a European Community Action Plan for the Conservation and Management of Sharks	3. THE ACTION PLAN 3.1. The Community Action Plan: general purpose, scope and operational objectives	The Action Plan pursues the following three specific objectives,: (a) To broaden the knowledge both on shark fisheries and on shark species and their role in the ecosystem; (b) To ensure that directed fisheries for shark are sustainable and that by-catches of shark resulting from other fisheries are properly regulated; (c) To encourage a coherent approach between the internal and external Community policy for sharks	No	All
Increased gear selectivity	04-10 Recommendation by ICCAT Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT	8	CPCs shall, where possible, undertake research to identify ways to make fishing gears more selective.	where possible	All
Important areas (e.g., critical habitats, nursery areas)	Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea 2003 (as updated 2020)	B. Priorities	13.5. Identify critical habitats for their protection and restoration, especially mating areas, and spawning and nursery grounds.	No	All
	Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea (2020)	C.3. Critical habitats and environment	23. Field studies are needed to inventory and map critical habitats around the Mediterranean	No	All
	04-10 Recommendation by ICCAT concerning the Conservation of Sharks caught in Association with Fisheries Managed by ICCAT	9	CPCs shall, where possible, conduct research to identify shark nursery areas.	where possible	Sharks caught in association with Fisheries managed by ICCAT
	07-06 Supplemental Recommendation by ICCAT concerning Sharks	4	CPCs shall, where possible, implement research on pelagic shark species caught in the Convention area in order to identify potential nursery areas. Based on this research, CPCs shall consider time and area closures and other measures, as appropriate	where possible	Pelagic species

		09-07 Recommendation by ICCAT on the Conservation of Thresher Sharks caught In Association with Fisheries in the ICCAT Convention Area	5	CPCs shall, where possible, implement research on thresher sharks of the species <i>Alopias</i> spp in the Convention area in order to identify potential nursery areas. Based on this research, CPCs shall consider time and area closures and other measures, as appropriate	where possible	<i>Alopias</i> spp.
		10-08 Recommendation by ICCAT on Hammerhead Sharks (Family Sphyrnidae) Caught in Association with Fisheries Managed by ICCAT	5	CPCs shall, where possible, implement research on hammerhead sharks in the Convention area in order to identify potential nursery areas. Based on this research, CPCs shall consider time and area closures and other measures, as appropriate.	where possible	Sphyrnidae
	Stock assessment	07-06 Supplemental Recommendation by ICCAT concerning Sharks	5	The SCRS shall, as soon as possible but no later than 2009, conduct a stock assessment or a thorough review of available stock assessment information of, and recommend management advice for, porbeagle shark (<i>Lamna nasus</i>).	Yes	<i>Lamna nasus</i>
	Population assessment	15-06 Recommendation by ICCAT on Porbeagle caught in Association with ICCAT Fisheries	4	CPCs are encouraged to implement the research recommendations of the joint 2009 ICCAT-ICES intersessional meeting. In particular, CPCs are encouraged to implement research and monitoring projects at regional (stock) level, in the Convention area, in order to close gaps on key biological data for porbeagle and identify areas of high abundance of important life-history stages (e.g. mating, pupping and nursery grounds). SCRS should continue joint work with ICES Working Group on Elasmobranch Fishes.	Not directly	<i>Lamna nasus</i>
Monitoring	Create inventory nationally	Convention on Biological Diversity (CBD)	Art. 7	(a) Identify components of biological diversity important for its conservation and sustainable use having regard to the indicative list of categories set down in Annex I:	as far as possible and appropriate	All
			Art. 3	(3) The Parties shall identify and compile inventories of the components of biological diversity important for its conservation and sustainable use.	Yes	All
		Barcelona Convention, SPA/BD Protocol	Art. 11	(2) The Parties shall, in the zones subject to their sovereignty or national jurisdiction, identify and compile lists of endangered species of flora and fauna and accord protected status to such species. The Parties shall regulate and where appropriate, prohibit activities having adverse effects on such species or their habitats, and carry out management, planning and other measures to ensure a favourable state of conservation of such species.	Yes	Threatened/endangered species
	Monitor potentially harmful activities	Convention on Biological Diversity (CBD)	Art. 7	(c) Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques;	as far as possible and appropriate	All

Trade monitoring	Convention of International Trade in Endangered Species (CITES)	Art. IV	3. A Scientific Authority in each Party shall monitor both the export permits granted by that State for specimens of species included in Appendix II and the actual exports of such specimens. Whenever a Scientific Authority determines that the export of specimens of any such species should be limited in order to maintain that species throughout its range at a level consistent with its role in the ecosystems in which it occurs and well above the level at which that species might become eligible for inclusion in Appendix I, the Scientific Authority shall advise the appropriate Management Authority of suitable measures to be taken to limit the grant of export permits for specimens of that species.	Yes	Appendix II
	Convention on Biological Diversity (CBD)	Art. 7	(b) Monitor, through sampling and other techniques, the components of biological diversity identified pursuant to subparagraph (a) above, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use;	as far as possible and appropriate	All
Species monitoring	CMS Memorandum of Understanding on the Conservation of Migratory Sharks (as amended by the Signatories at their 2nd Meeting, Costa Rica, February 2016)	Section 4 Conservation Plan (12,a)	12. The Signatories should cooperatively strive to adopt, implement and enforce such legal, regulatory and administrative measures as appropriate to conserve and manage migratory sharks and their habitat. [...] a) Improving understanding of migratory shark populations through research, monitoring and information exchange;	optional (should)	Migratory species
	Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea (2020)	C.4	26. Parallel to protection and conservation measures, properly funded and staffed scientific research programmes should be undertaken or developed, mainly on species biology and ecology, emphasising growth, reproduction, diet, geographical and bathymetric distribution, migration, population genetics and dynamics and risk assessment. Regional tagging (conventional, pop-up and satellite tag) programmes should be developed for migratory species.	No	All
Species monitoring	Recommendation GFCM/42/2018/2 on fisheries management measures for the conservation of sharks and rays in the GFCM area of application, amending Recommendation GFCM/36/2012/3	Part IV	9. CPCs shall ensure that: c) any other additional measure is taken to improve data collection in view of the scientific monitoring of species.	Yes	All

Monitor species and activities with potential impacts as well as their effects	Barcelona Convention, SPA/BD Protocol	Art. 3	(5) The Parties shall monitor the components of biological diversity referred to in paragraph 3 of this Article and shall identify processes and categories of activities which have or are likely to have a significant adverse impact on the conservation and sustainable use of biological diversity, and monitor their effects.	Yes	All
		Art. 7 (2)	(b) the continuous monitoring of ecological processes, habitats, population dynamics, landscapes, as well as the impact of human activities	Yes	All
Development of programmes	Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea (2020)	B. Priorities	13.7. Develop both systems for the monitoring of fisheries and fishery-independent monitoring programmes.	No	All
Fisheries and discard/bycatch monitoring		C.4	27. For the monitoring of fisheries, the standardised collection of data at landing places and fish markets should be supplemented and completed by on-board observation programmes to gather precise data on fisheries and on species biology.	No	All
	Recommendation GFCM/42/2018/2	Part IV	9. CPCs shall ensure that: a) information on fishing activities, catch data, incidental catches, release and/or discarding of sharks species listed either in Annex II or Annex III of the SPA/BD Protocol, is recorded by the ship owner in the logbook or in an equivalent document, in line with the requirements of Recommendation GFCM/35/2011/1;	Yes	All
	UNEP/CMS/Resolution 12.22. Bycatch	Participation in Regional Fisheries Management Organizations	c) implement appropriate schemes (including, where appropriate, on-board observers or electronic monitoring systems) for fisheries within waters under their jurisdiction, or carried out by flagged fishing vessels under their jurisdiction or control, in order to determine the impact of fisheries bycatch on migratory species. Where relevant, this should be carried out in the context of the Food and Agriculture Organization of the United Nations' (FAO's) International Plans of Action on Seabirds and Sharks;	Yes	Migratory species
	Discard and release monitoring	10-07 Recommendation by ICCAT on the Conservation of oceanic whitetip shark caught in association with Fisheries in the ICCAT convention area	2	CPCs shall record through their observer programs the number of discards and releases of oceanic whitetip sharks with indication of status (dead or alive) and report it to ICCAT.	Yes
11-08 Recommendation by ICCAT on the Conservation of silky sharks caught in association with ICCAT Fisheries		3	CPCs shall record through their observer programs the number of discards and releases of silky sharks with indication of status (dead or alive) and report it to ICCAT.	Yes	<i>Carcharhinus falciformis</i> *

		15-06 Recommendation by ICCAT on porbeagle caught in association with ICCAT Fisheries	2	PCs shall ensure the collection of Task I and Task II data for porbeagle sharks and their submission in accordance with ICCAT data reporting requirements. Discards and releases of porbeagle sharks shall be recorded with indication of status (dead or alive) and reported to ICCAT in accordance with ICCAT data reporting requirements.	Yes	<i>Lamna nasus</i>
	Impact assesement	Convention on Biological Diversity (CBD)	Art. 14	1. (b) Introduce appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have significant adverse impacts on biological diversity are duly taken into account:	as far as possible and appropriate	All
Reporting	Implementation report	Convention of International Trade in Endangered Species (CITES)	Art. VIII	7. Each Party shall prepare periodic reports on its implementation of the present Convention and shall transmit to the Secretariat: (a) an annual report containing a summary of the information specified in sub-paragraph (b) of paragraph 6 of this Article; and (b) a biennial report on legislative, regulatory and administrative measures taken to enforce the provisions of the present Convention.	Yes	Relevant to Appendixes
		Regulation (EU) No 605/2013	Art. 6	Reports 1. Where vessels flying the flag of a Member State catch, retain on-board, tranship or land sharks, the flag Member State, in accordance with [...] shall send to the Commission, annually, [...] comprehensive report on its implementation of this Regulation during the previous year. The report shall describe the monitoring by the flag Member State of compliance with this Regulation by its vessels in Union and non-Union waters, and the enforcement measures it has taken in cases of non-compliance. In particular, the flag Member State shall provide all of the following information: — the number of landings of sharks, — the number, date and place of the inspections that have been carried out, — the number and nature of cases of non-compliance detected, including a full identification of the vessel(s) involved and the penalty applied for each case of noncompliance, and — the total landings by species (weight/number) and by port.	Yes	All
		14-06 Recommendation by ICCAT on Shortfin Mako caught in Association with ICCAT Fisheries	2	CPCs shall include in their annual reports to ICCAT information on the actions they have taken domestically to monitor catches and to conserve and manage shortfin mako sharks.	Yes	<i>Isurus oxyrinchus</i>

	18-06 Recommendation by ICCAT to replace 16-13 on Improvement of Compliance Review of Conservation and Management Measures regarding sharks caught in Association with ICCAT Fisheries	1	All CPCs shall submit to the ICCAT Secretariat, with their Annual Reports, details of their implementation of and compliance with shark conservation and management measures using the check sheet in Annex 1, as may be revised by the ICCAT Secretariat in consultation with the COC and PA4 Chairs to reflect new shark measures adopted by the Commission.	Yes	Sharks caught in association with Fisheries managed by ICCAT
	11-08 Recommendation by ICCAT on the Conservation of Silky Sharks caught in Association with ICCAT Fisheries	7	In their annual reports, CPCs shall inform the Commission of steps taken to implement this Recommendation through domestic law or regulations, including monitoring, control and surveillance measures that support implementation of this recommendation.	Yes	<i>Carcharhinus falciformis*</i>
	11-15 Recommendation by ICCAT on Penalties applicable in case of non-fulfilments of reporting obligations	1	CPCs shall include information in their Annual Reports on actions taken to implement their reporting obligations for all ICCAT fisheries, including shark species caught in association with ICCAT fisheries, in particular the steps taken to improve their Task I and Task II data collection for direct and incidental catches;	Yes	Sharks caught in association with Fisheries managed by ICCAT
	10-06 Recommendation by ICCAT on Atlantic Shortfin Mako Sharks caught in Association with ICCAT Fisheries	1	CPCs shall include information in their 2012 Annual Reports on actions taken to implement Recommendations 04-10, 05-05, and 07-06, in particular the steps taken to improve their Task I and Task II data collection for direct and incidental catches	Yes	<i>Isurus oxyrinchus</i>
	18_06 Recommendation by ICCAT to Replace Recommendation 16-13 on Improvement of Compliance Review of Conservation and Management Measures Regarding Sharks Caught in Association with ICCAT Fisheries	1	All CPCs shall submit to the ICCAT Secretariat, with their Annual Reports, details of their implementation of and compliance with shark conservation and management measures using the check sheet in Annex 1, as may be revised by the ICCAT Secretariat in consultation with the COC and PA4 Chairs to reflect new shark measures adopted by the Commission	Yes	As relevant under previous Recommendations
	Report on measures and their effectiveness	Convention on Biological Diversity (CBD)	Art. 26	Each Contracting Party shall, at intervals to be determined by the Conference of the Parties, present to the Conference of the Parties, reports on measures which it has taken for the implementation of the provisions of this Convention and their effectiveness in meeting the objectives of this Convention.	Yes

	Barcelona Convention	Art. 26	The Contracting Parties shall transmit to the Organization reports on: (a) the legal, administrative or other measures taken by them for the implementation of this Convention, the Protocols and of the recommendations adopted by their meetings;(b) the effectiveness of the measures referred to in sub-paragraph (a) and problems encountered in the implementation of the instruments as mentioned above. 2. The reports shall be submitted in such form and at such intervals as the Meetings of Contracting Parties may determine	Yes	All
Improved catch reporting	14-06 Recommendation by ICCAT on Shortfin Mako caught in Association with ICCAT Fisheries	1	CPCs shall improve their catch reporting systems to ensure the reporting of shortfin mako catch and effort data to ICCAT in full accordance with the ICCAT requirements for provision of Task I and Task II catch, effort and size data.	Yes	<i>Isurus oxyrinchus</i>
			11. Requests Parties to improve reporting of bycatch information and data in their CMS National Reports, or via their reports to CMS daughter agreements, particularly on bycatch mitigation methods that have proved to be effective;	Yes	Migratory species
Provision of information on bycatch mitigation methods	UNEP/CMS/Resolution 12.22. Bycatch	Bycatch Mitigation Measures and Data Collection	13. Requests Parties to provide available information, including the results of bycatch risk assessments or mitigation research, to the Scientific Council to allow the Scientific Council, upon request from one or several Parties, to identify and provide advice to them on best practice mitigation techniques for each particular circumstance;	Yes	Migratory species
Adjust reports for sharks	Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea 2003 (as updated 2020)	C.2. Fisheries management	16. Existing assessment reports and fisheries management programmes should be adjusted to chondrichthyan fishes or specific plans should be developed within the framework of the IPOA Sharks and the GFCM recommendation GFCM/42/2018/2.	No	All

	Reporting on exceptions made	Bern Convention	Chpt 3, Art. 9 (2)	<p>The Contracting Parties shall report every two years to the Standing Committee on the exceptions made under the preceding paragraph. These reports must specify:</p> <p>1) the populations which are or have been subject to the exceptions and, when practical, the number of specimens involved;</p> <p>2) the means authorised for the killing or capture;</p> <p>3) the conditions of risk and the circumstances of time and place under which such exceptions were granted;</p> <p>4) the authority empowered to declare that these conditions have been fulfilled, and to take decisions in respect of the means that may be used, their limits and the persons instructed to carry them out;</p> <p>5) the controls involved.</p>	Yes	Annex II (<i>Carcharodon carcharias</i> , <i>Cetorhinus maximus</i> , <i>Mobula mobular</i> , <i>Isurus oxyrinchus</i> , <i>Lamna nasus</i> , <i>Prionace glauca</i> , <i>Squatina squatina</i> , <i>Rostroraja alba</i>)
	Catch and discard reporting	Recommendation GFCM/42/2018/2	PART IV, Art.9	<p>CPCs shall ensure that:</p> <p>a) information on fishing activities, catch data, incidental catches, release and/or discarding of sharks species listed either in Annex II or Annex III of the SPA/BD Protocol, is recorded by the ship owner in the logbook or in an equivalent document, [...];</p> <p>b) such information is reported to the national authorities for notification to the GFCM Secretariat within their annual national reporting to the SAC and in accordance with the data reporting requirements of relevant GFCM recommendations, in line with the GFCM Data Collection Reference Framework (DCRF);</p>	Yes	Annex II and III SPA/BD Protocol
		Regulation (EU) 2017/1004 (and the respective Implementing Decision (EU) 2019/909)	Art. 5 (2b)	(b) data to assess the impact of Union fisheries on the marine ecosystem in and outside Union waters, including data on by-catch of non-target species, in particular species protected under Union or international law, data on impacts of fisheries on marine habitats, including vulnerable marine areas, and data on impacts of fisheries on food webs;	Yes	All
		07-06 Supplemental Recommendation by ICCAT concerning Sharks	1	Contracting Parties, Cooperating non-Contracting Parties, Entities and Fishing Entities (hereinafter referred to as CPCs), especially those directing fishing activities for sharks, shall submit Task I and II data for sharks, as required by ICCAT data reporting procedures (including estimates of dead discards and size frequencies) in advance of the next SCRS assessment;	Yes	Sharks caught in association with Fisheries managed by ICCAT

		09-07 Recommendation by ICCAT on the Conservation of Thresher Sharks caught in Association with Fisheries in the ICCAT Convention Area	4	CPCs shall require the collection and submission of Task I and Task II data for <i>Alopias</i> spp other than <i>A. superciliosus</i> in accordance with ICCAT data reporting requirements. The number of discards and releases of <i>A. superciliosus</i> must be recorded with indication of status (dead or alive) and reported to ICCAT in accordance with ICCAT data reporting requirements	Yes	<i>Alopias</i> spp.
		10-08 Recommendation by ICCAT on Hammerhead Sharks (Family Sphyrnidae) caught in Association with Fisheries managed by ICCAT	4	CPCs shall require that the number of discards and releases of hammerhead sharks are recorded with indication of status (dead or alive) and reported to ICCAT in accordance with ICCAT data reporting requirements.	Yes	Sphyrnidae
		11-08 Recommendation by ICCAT on the Conservation of Silky Sharks caught in Association with ICCAT Fisheries	3	CPCs shall record through their observer programs the number of discards and releases of silky sharks with indication of status (dead or alive) and report it to ICCAT.	Yes	<i>Carcharhinus falciformis</i> *
Policy development and integration	Cross-sectoral policy plans for conservation and use of biological diversity	Convention on Biological Diversity (CBD)	Art. 6	(b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.	as far as possible and appropriate	All
		Barcelona Convention, SPA/BD Protocol	Art. 3	(4) The Parties shall adopt strategies, plans and programmes for the conservation of biological diversity and the sustainable use of marine and coastal biological resources and shall integrate them into their relevant sectoral and intersectoral policies.	Yes	All
	Establish national policies	Bern Convention	Chapter 1, Art.3	(1) Each Contracting Party shall take steps to promote national policies for the conservation of wild flora, wild fauna and natural habitats, with particular attention to endangered and vulnerable species, especially endemic ones, and endangered habitats, in accordance with the provisions of this Convention.	Yes	Threatened/endangered species
	Strategies for species recovery	Convention on Biological Diversity (CBD)	Art. 8	(f) Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, inter alia, through the development and implementation of plans or other management strategies:	as far as possible and appropriate	Threatened/endangered species
	Establish agreements to protect endangered migratory species	Convention on the Conservation of Migratory Species of Wild Animals (CMS)	Art. II	3. In particular, the Parties: c) shall endeavour to conclude Agreements covering the conservation and management of migratory species included in Appendix II	Yes	Migratory species Appendix II
	Regional Action Plan development	UNEP/CMS/Concerted Action 12.5 (Rev.COP13). Concerted Action for the Angelshark (<i>Squatina squatina</i>)	(vi)	2.3 Develop in collaboration with CMS Range States an annex for the Regional Action Plan that includes actions to be implemented by CMS Parties CMS annex developed and agreed by Range States; by 2021; to be	Not directly	<i>Squatina squatina</i>

				done by: Range States, CMS Secretariat, Shark Trust and the ASCN		
	Development of national action plans for sharks	IPOA Sharks	Implementation, 18.	States should adopt a national plan of action for conservation and management of shark stocks (Shark-plan) if their vessels conduct directed fisheries for sharks or if their vessels regularly catch sharks in non-directed fisheries. Suggested contents of the Shark-plan are found in Appendix A. When developing a Shark-plan, experience of subregional and regional fisheries management organizations should be taken into account, as appropriate.	No	All
	Bycatch reduction policies	UNEP/CMS/Concerted Action 12.6 (Rev.COP13). Concerted action for the mobulid rays (Mobulidae)	1. Reduce target and incidental catch of mobulid rays	1.1. Develop and implement legislation that supports mobulid conservation. Protective policies exist on local, national or regional scale that decrease or eliminate mobulid mortality.	Not directly	Mobulidae
	Management plan	Barcelona Convention, SPA/BD Protocol	Art. 7 (2)	(a) the development and adoption of a management plan that specifies the legal and institutional framework and the management and protection measures applicable	Yes	All
Conservation measures		Convention on Biological Diversity (CBD)	Article 8 (a)	(a) Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity	as far as possible and appropriate	All
	Spatial conservation	CBD-Strategic Plan for Biodiversity 2011-2020	Target 11	By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	Not directly	All
		Barcelona Convention	Art. 10	The Contracting Parties shall, individually or jointly, take all appropriate measures to protect and preserve biological diversity, rare or fragile ecosystems, as well as species of wild fauna and flora which are rare, depleted, threatened or	Yes	Threatened/endangered species

			endangered and their habitats, in the area to which this Convention applies.		
	Barcelona Convention, SPA/BD Protocol	Art. 3(1,a)	(a) protect, preserve and manage in a sustainable and environmentally sound way areas of particular natural and cultural value, notably by the establishment of specially protected areas; (b) protect, preserve and manage threatened or endangered species of flora and fauna.	Yes	Threatened/endangered species
	Convention on the Conservation of Migratory Species of Wild Animals (CMS)	Art. III	4. Parties that are Range States of a migratory species listed in Appendix I shall endeavour: a) to conserve and, where feasible and appropriate, restore those habitats of the species which are of importance in removing the species from danger of extinction;	Yes	Migratory species
	Memorandum of Understanding on the Conservation of Migratory Sharks	Section 4	12. The Signatories should cooperatively strive to adopt, implement and enforce such legal, regulatory and administrative measures as appropriate to conserve and manage migratory sharks and their habitat [...] c) Ensuring to the extent practicable the protection of critical habitats and migratory corridors and critical life stages of sharks;	No	All
	Bern Convention	Chapter 2, Art. 4	(3) The Contracting Parties undertake to give special attention to the protection of areas that are of importance for the migratory species specified in Appendices II and III and which are appropriately situated in relation to migration routes, as wintering, staging, feeding, breeding or moulting areas.	Yes	Migratory species in Appendices II and III
	Barcelona Convention, SPA/BD Protocol	Art. 5	Each Party may establish specially protected areas in the marine and coastal zones subject to its sovereignty or jurisdiction.	No	Threatened/endangered species
	Regulation (EU) No 1380/2013	Art. 8	Establishment of fish stock recovery areas 1. The Union shall, while taking due account of existing conservation areas, endeavour to establish protected areas due to their biological sensitivity, including areas where there is clear evidence of heavy concentrations of fish below minimum conservation reference size and of spawning grounds. In such areas fishing activities may be restricted or prohibited in order to contribute to the conservation of living aquatic resources and marine ecosystems. The Union shall continue to give additional protection to existing biologically sensitive areas.	Yes	All
Species protection and recovery	Convention on Biological Diversity	Art. 9	(c) Adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions;	as far as possible and appropriate	Threatened/endangered species

			Art. 3(1)	(b) protect, preserve and manage threatened or endangered species of flora and fauna.	Yes	Threatened/endangered species	
		Barcelona Convention, SPA/BD Protocol	Art. 11	(1) The Parties shall manage species of flora and fauna with the aim of maintaining them in a favourable state of conservation.	Yes	All	
			Art. 12	(2) The Parties shall ensure the maximum possible protection and recovery of the species of fauna and flora listed in the Annexes relating to the List of Endangered or Threatened Species by adopting at the national level the measures provided for in paragraphs 3 and 5 of Article 11 of this Protocol.	Yes	Threatened/endangered species	
	Genetic diversity preservation	CBD-Strategic Plan for Biodiversity 2011-2020, including Aichi Biodiversity Targets (In decision X/2, the tenth meeting of the Conference of the Parties)	Target 13	By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	Not directly	'Culturally valuable'	
	Improve conservation status	UNEP/CMS/Resolution 11.2 (Rev.COP12). Strategic Plan for Migratory Species 2015-2023	Goal 4	Target 12: The genetic diversity of wild populations of migratory species is safeguarded, and strategies have been developed and implemented for minimizing genetic erosion.	Not directly	Migratory species	
			Goal 3	Target 8: The conservation status of all migratory species, especially threatened species, has considerably improved throughout their range	Not directly	Migratory species	
	Extinction prevention	CBD-Strategic Plan for Biodiversity 2011-2020, including Aichi Biodiversity Targets (In decision X/2, the tenth meeting of the Conference of the Parties)	Target 12	By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	Not directly	Threatened/endangered species	
	Reduce human interactions with species	UNEP/CMS/Concerted Action 12.5 (Rev.COP13). Concerted Action for the Angelshark (<i>Squatina squatina</i>)	(iv). Summary of Activities and expected outcome	Delivered through objectives grouped under three key goals: Goal 1: Fisheries based Angel Shark mortality is minimized; Goal 2: Critical Angel Shark areas are identified, investigated and protected where appropriate.; Goal 3: Human interactions are identified and any negative impacts on Angel Sharks are minimized.	Not directly	<i>Squatina</i> spp.	
	Sustainable management	Sustainable management (general)	CBD-Strategic Plan for Biodiversity 2011-2020, including Aichi Biodiversity Targets (In decision X/2, the tenth meeting of the Conference of the Parties)	Target 7	By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	Not directly	All

	Fisheries sustainability	CMS Memorandum of Understanding on the Conservation of Migratory Sharks (as amended by the Signatories at their 2nd Meeting, Costa Rica, February 2016)	Section 4, Art. 12	12. The Signatories should cooperatively strive to adopt, implement and enforce such legal, regulatory and administrative measures as appropriate to conserve and manage migratory sharks and their habitat. [...] b) Ensuring that directed and non-directed fisheries for shark are sustainable;	Optional (should)	All
	Fisheries management	Communication from the Commission to the European Parliament and the Council on a European Community Action Plan for the Conservation and Management of Sharks	3.	(b) To ensure that directed fisheries for shark are sustainable and that by-catches of shark resulting from other fisheries are properly regulated;	No	All
	Bycatch mitigation/reduction	UNEP/CMS/Resolution 12.22. Bycatch	Participation in Regional Fisheries Management Organizations	7. Requests those Parties that are also Parties to regional fisheries management organizations (RFMOs) to highlight there the serious problems of incidental mortality of migratory species listed in Appendices I and II, with a view to the adoption of mitigating measures;	Yes	Migratory species in Appendices I and II
		Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea (2020)	B. Priorities (13.3)	13.3. Identify further management and technical measures to minimize bycatch and mortality of sharks and develop management programmes for species currently marketed.	No	All
		Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea (2020)	B. Priorities	13.4. Ensure good practice for handling rays and sharks caught accidentally and encourage fishing practices that reduce chondrichthyan by-catch and/or facilitate live release.	No	All
		Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea (2020)	C.2. Fisheries management	18. Management programmes for chondrichthyan fishes should be based on studies of the assessment of stocks and populations. Management should be also based on by-catch and measures to reduce incidental catches studies	No	All
		UNEP/CMS/Resolution 12.22. Bycatch	Participation in Regional Fisheries Management Organizations	8. Calls on Parties, working through RFMOs and regional fisheries management agreements, as appropriate, to: a) raise the serious and ongoing problem of bycatch of migratory species, especially as it refers to seabirds, fishes, marine turtles and marine mammals, with a view to improving mitigation measures for the reduction of bycatch;	as appropriate	Migratory species
		Regulation (EU) No 1380/2013	Art. 14	1. In order to facilitate the introduction of the obligation to land all catches in the respective fishery in accordance with Article 15 ("the landing obligation"), Member States may conduct pilot projects, based on the best available scientific advice and taking into account the opinions of the relevant Advisory Councils, with the aim of fully exploring all	Yes	All

Catch limit (sensitive species)			practicable methods for the avoidance, minimisation and elimination of unwanted catches in a fishery.		
	Regulation (EU) 2019/1241	Preamble (9)	To evaluate the effectiveness of technical measures, targets relating to the levels of unwanted catches, in particular catches of marine species below the minimum conservation reference size, to the level of incidental catches of sensitive species and to the extent of seabed habitats adversely affected by fishing should be established.	Yes	All
		Preamble (13)	(13) For some years, certain TACs for stocks of elasmobranchs (skates, sharks, rays) have been set at zero, with a linked provision establishing an obligation to immediately release accidental catches. [...]	Yes	All
		Preamble (33)	(33) During the 2020 ICCAT decision-making process, the Union proposed a comprehensive plan that included a TAC with the aim of stopping immediately the overfishing of shortfin mako in the Northern Atlantic, together with a series of flanking measures to reduce its mortality further. In the absence of consensus within ICCAT, and in light of the dire situation of that stock and considering that the Union is responsible for two thirds of the catch level, the Union should establish a unilateral catch limit for that species. That catch limit would correspond to the Union share of the limit as required by the scientific committee at ICCAT level.	Yes	<i>Isurus oxyrinchus</i>
	Council Regulation (EU) 2021/92	Art. 8	Conditions for landing catches and by-catches 1. Catches that are not subject to the landing obligation under Article 15 of Regulation (EU) No 1380/2013 shall be retained on board or landed only if they: (a) have been taken by vessels flying the flag of a Member State having a quota and that quota has not been exhausted; or (b) consist of a share in a Union quota which has not been allocated by quota among Member States, and that Union quota has not been exhausted. 2. The stocks of non-target species within safe biological limits referred to in Article 15(8) of Regulation (EU) No 1380/2013 are identified in Annex I to this Regulation for the purposes of the derogation from the obligation to count catches against the relevant quotas provided for in that Article.	Yes	All

	Regulation (EU) No 1380/2013	Art. 7	Art. 7 lists a number of available conservation measures to regulate fisheries; including, inter alia, the establishment of multiannual plans: 1. Measures for the conservation and sustainable exploitation of marine biological resources may include, inter alia, the following: (e) measures on the fixing and allocation of fishing opportunities;	Not directly	All
Safe limits	UNEP/CMS/Resolution 11.2 (Rev.COP12). Strategic Plan for Migratory Species 2015-2023	Goal 2	Target 6: Fisheries and hunting have no significant direct or indirect adverse impacts on migratory species, their habitats or their migration routes, and impacts of fisheries and hunting are within safe ecological limits	Not directly	Migratory species
Discard elimination	Regulation (EU) No 1380/2013	Art. 2	Art. 2 (Objectives): 1. long-term, sustainable use; 2. Application of the PA for harvested species; 5. (a) eliminate discard based on best avail. Science; 5. (b) make use of unwanted catch without creating a market and not below conservation reference size	Yes	All
Reduce mortality	07-06 Supplemental Recommendation by ICCAT concerning Sharks	2	Until such time as sustainable levels of harvest can be determined through peer reviewed stock assessments by SCRS or other organizations, CPCs shall take appropriate measures to reduce fishing mortality in fisheries targeting porbeagle (<i>Lamna nasus</i>) and North Atlantic shortfin mako sharks (<i>Isurus oxyrinchus</i>)	Yes	<i>Lamna nasus, Isurus oxyrinchus</i>
	UNEP/CMS/Concerted Action 12.5 (Rev.COP13). Concerted Action for the Angelshark (<i>Squatina squatina</i>)	(iv). Summary of Activities and expected outcome	Delivered through objectives grouped under three key goals: Goal 1: Fisheries based Angel Shark mortality is minimized; Goal 2: Critical Angel Shark areas are identified, investigated and protected where appropriate.; Goal 3: Human interactions are identified and any negative impacts on Angel Sharks are minimized.	Not directly	<i>Squatina squatina</i>
Prevent adverse impacts	Convention on Biological Diversity (CBD)	Art. 10	(b) Adopt measures relating to the use of biological resources to avoid or minimize adverse impacts on biological diversity;	as far as possible and appropriate	All
Reduce human impact	UNEP/CMS/Concerted Action 12.5 (Rev.COP13). Concerted Action for the Angelshark (<i>Squatina squatina</i>)	(iv). Summary of Activities and expected outcome	Delivered through objectives grouped under three key goals: Goal 1: Fisheries based Angel Shark mortality is minimized; Goal 2: Critical Angel Shark areas are identified, investigated and protected where appropriate.; Goal 3: Human interactions are identified and any negative impacts on Angel Sharks are minimized.	Not directly	<i>Squatina squatina</i>
Live release	04-10 Recommendation by ICCAT concerning the Conservation of Sharks caught in Association with Fisheries managed by ICCAT	6	In fisheries that are not directed at sharks, CPCs shall encourage the release of live sharks, especially juveniles, to the extent possible, that are caught incidentally and are not used for food and/or subsistence	Yes	Sharks caught in association with Fisheries managed by ICCAT

		10-08 Recommendation by ICCAT on Hammerhead Sharks (Family Sphyrnidae) caught in Association with Fisheries managed by ICCAT	2	CPCs shall require vessels flying their flag, to promptly release unharmed, to the extent practicable, hammerhead sharks when brought alongside the vessel.	Yes	Sphyrnidae
		11-08 Recommendation by ICCAT on the Conservation of Silky Sharks caught in Association with Fisheries managed by ICCAT	2	CPCs shall require vessels flying their flag to promptly release silky sharks unharmed, at the latest before putting the catch into the fish holds, giving due consideration to the safety of crew members. Purse seine vessels engaged in ICCAT fisheries shall endeavor to take additional measures to increase the survival rate of silky sharks incidentally caught.	Yes	<i>Carcharhinus falciformis*</i>
		15-06 Recommendation by ICCAT on Porbeagle caught in Association with Fisheries managed by ICCAT	1	Contracting Parties, and Cooperating non-Contracting Parties, Entities or Fishing Entities (hereafter referred to as CPCs) shall require their vessels to promptly release unharmed, to the extent practicable, porbeagle sharks caught in association with ICCAT fisheries when brought alive alongside for taking on board the vessel.	Yes	<i>Lamna nasus</i>
		Recommendation GFCM/36/2012/3	Part II (6)	CPCs shall ensure a high protection from fishing activities to elasmobranch species listed in Annex II of the SPA/BD protocol of the Barcelona Convention that must be released unharmed and alive to the extent possible.	Yes	Annex II of the SPA/BD Protocol
		Recommendation GFCM/42/2018/2	Part III, Fisheries management measures	6. CPCs shall ensure a high protection from fishing activities for elasmobranch species listed in Annex II of the SPA/BD Protocol of the Barcelona Convention, which must be released unharmed and alive, to the extent possible. 7. Specimens of shark species listed in Annex II of the SPA/BD Protocol shall not be retained on board, transhipped, landed, transferred, stored, sold or displayed or offered for sale. 8. CPCs shall ensure that tope shark (<i>Galeorhinus galeus</i>) specimens caught with bottom-set gillnets, longlines and tuna traps be promptly released unharmed and alive, to the extent possible.	Yes	Annex II of the SPA/BD Protocol
	Management programmes for sustainable fishing	Regional Action Plan for the conservation of cartilaginous fishes (2003)	B (Priorities)	11.3 Develop management programmes for sustainable fisheries catching, as target or by-catch, the following species:	No	Primarily for the main bycatch and target species: <i>Squalus acanthias</i> , <i>Alopias spp.</i> , <i>Isurus spp.</i> , <i>Lamna nasus</i> , <i>Prionace glauca</i>
Regulation	Legal protection	Convention on Biological Diversity (CBD)	Art. 8	(k) Develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations	as far as possible and appropriate	Threatened/endangered species
		Bern Convention	Chapter 3, Art. 6	Each Contracting Party shall take appropriate and necessary legislative and administrative measures to ensure the special protection of the wild fauna species specified in Appendix II	Yes	Appendix II

	Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea 2003 (as updated 2020)	C. Implementation Measures	C.1. Protection 14. Strict legal protection of elasmobranchs species under Annex II (list of endangered or threatened species) of the SPA/BD Protocol to the Barcelona Convention [...]	No	Annex II species
Adapted national legislation and administration	Bern Convention	Chapter 1, Art. 4	(1) Each Contracting Party shall take appropriate and necessary legislative and administrative measures to ensure the conservation of the habitats of the wild flora and fauna species, especially those specified in Appendices I and II, and the conservation of endangered natural habitats.	Yes	Appendices I and II
	Barcelona Convention	Art. 14	The Contracting Parties shall adopt legislation implementing the Convention and the Protocols.	Yes	All
Prevent/minimize/control impact	Convention on the Conservation of Migratory Species of Wild Animals (CMS)	Art. III	4. Parties that are Range States of a migratory species listed in Appendix I shall endeavour: b) to prevent, remove, compensate for or minimize, as appropriate, the adverse effects of activities or obstacles that seriously impede or prevent the migration of the species; and c) to the extent feasible and appropriate, to prevent, reduce or control factors that are endangering or are likely to further endanger the species, including strictly controlling the introduction of, or controlling or eliminating, already introduced exotic species.	Yes	Threatened/endangered species
	UNEP/CMS/Concerted Action 12.5 (Rev.COP13). Concerted Action for the Angelshark (<i>Squatina squatina</i>)	(iv). Summary of Activities and expected outcome	Delivered through objectives grouped under three key goals: Goal 1: Fisheries based Angel Shark mortality is minimized; Goal 2: Critical Angel Shark areas are identified, investigated and protected where appropriate.; Goal 3: Human interactions are identified and any negative impacts on Angel Sharks are minimized.	Not directly	<i>Squatina squatina</i>
	CBD-Strategic Plan for Biodiversity 2011-2020, including Aichi Biodiversity Targets (In decision X/2, the tenth meeting of the Conference of the Parties)	Target 6	By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	Not directly	All
Prohibition of killing animals within SPAMIs	Barcelona Convention, SPA/BD Protocol	Art.6	(g) Protection measures within SPAs: (g) the regulation and prohibition of fishing, hunting, taking of animals and harvesting of plants or their destruction, as well as trade in animals, parts of animals, plants, parts of plants, which originate in specially protected areas	Yes	Those occurring in SPAMIs

Regulate activities impacting status of endangered species			(2) The Parties shall, in the zones subject to their sovereignty or national jurisdiction, identify and compile lists of endangered species of flora and fauna and accord protected status to such species. The Parties shall regulate and where appropriate, prohibit activities having adverse effects on such species or their habitats, and carry out management, planning and other measures to ensure a favourable state of conservation of such species.	Yes	Threatened/endangered species
Control taking, trade and disturbance of protected species		Art. 11	(3) With respect to protected species of fauna, the Parties shall control, and where appropriate, prohibit: (a) the taking, possession or killing (including, to the extent possible, the incidental taking, possession or killing), the commercial trade, the transport and the exhibition for commercial purposes of these species, their eggs, parts, or products; (b) to the extent possible, the disturbance of wild fauna, particularly during the period of breeding, incubation, hibernation or migration, as well as other periods of biological stress.	Yes, where appropriate	Protected species
Prohibition of habitat destruction of endangered species		Art. 12 (3)	(3) The Parties shall prohibit the destruction of and damage to the habitat of species listed in the Annex relating to the List of Endangered of Threatened Species and shall formulate and implement action plans for their conservation or recovery. They shall continue to cooperate in implementing the relevant action plans already adopted.	Yes	Annex II species
Habitat protection and restoration incl. activity regulation	Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea (2020)	C.3. Critical habitats and environment	24. Legal protection should be given to these habitats, in conformity with the national and international laws and conventions on the subject, to prevent their deterioration due to the negative effects of human activity. When these habitats have deteriorated, restoration programmes should be undertaken. One example of legal protection is the creation, where possible, of marine protected areas in which human activity is regulated.	No	All
Regulated exploitation	Bern Convention	Chapter 3, Art. 7	Any exploitation of wild fauna specified in Appendix III shall be regulated[...]. Measures to be taken shall include: 1) closed seasons and/or other procedures regulating the exploitation; 2) the temporary or local prohibition of exploitation, as appropriate, in order to restore satisfactory population levels; 3) the regulation as appropriate of sale, keeping for sale, transport for sale or offering for sale of live and dead wild animals.	Yes	Appendix III

Management of recreational fishing	Regulation (EU) 2019/1241	Preamble (6)	Where relevant, technical measures should apply to recreational fishing, which can have a significant impact on the stocks of fish and shellfish species.	where relevant	All
Closed season, exploitation regulated	Bern Convention	Chapter 4, Art. 10	1 The Contracting Parties undertake, in addition to the measures specified in Articles 4, 6, 7 and 8, to co-ordinate their efforts for the protection of the migratory species specified in Appendices II and III whose range extends into their territories. 2 The Contracting Parties shall take measures to seek to ensure that the closed seasons and/or other procedures regulating the exploitation established under paragraph 3.a of Article 7 are adequate and appropriately disposed to meet the requirements of the migratory species specified in Appendix III.	Yes	Appendix III.
Retention ban	Recommendation GFCM/36/2012/3 on fisheries management measures for conservation of sharks and rays in the GFCM area	Part II (7)	Specimens of sharks' species listed in Annex II of the SPA/BD Protocol cannot be retained on board, transhipped, landed, transferred, stored, sold or displayed or offered for sale.	Yes	Annex II SPA/BD protocol
Drift net limitation	Recommendation GFCM/22/1997/1 on the limitation of the use of driftnets in the Mediterranean		1. No vessel flying the flag of a contracting party or cooperating non-contracting party (CPC) may keep on board, or use for fishing, one or more driftnets whose individual or total length is more than 2.5 kilometres; 2. Throughout the fishing referred to in paragraph 1, the net, if longer than one kilometre, shall remain attached to the vessel. However, within the 12 mile coastal band, a vessel may detach itself from the net, provided that the net is kept under constant observation	Yes	All
Drift net ban	Regulation (EU) 2019/1241	Art. 9	2. It shall be prohibited to use driftnets to fish for the species listed in Annex III	Yes	Annex III (Sharks: <i>Hexanchus griseus</i> ; <i>Cetorhinus maximus</i> ; Alopiidae; Carcharhinidae; Sphyrnidae; Isuridae; Lamnidae
	Recommendation GFCM/29/2005/3 (A)	Art. 3.	3. Contracting Parties, Cooperating, non-Contracting Parties, Entities or Fishing Entities shall prohibit the use of driftnets for fisheries of large pelagics in the Mediterranean.	Yes	Pelagic species
	ICCAT Res 94-2 Resolution by ICCAT on Large-scale Pelagic Driftnet		CALLS UPON all of its member nations to fully implement these Resolutions and to report to the Commission and to the U.N. Secretary General the regulatory measures taken in order to assure such implementation, per U.N. Decisions 47/443 and 48/445.	No	Pelagic species

3nm no trawling	Recommendation GFCM/36/2012/3 on fisheries management measures for conservation of sharks and rays in the GFCM area	Part II (5), Fisheries management measures	Reduction of trawl fishing in coastal areas to enhance protection of coastal sharks A) CPCs shall ensure that fishing activities carried out with trawl nets are prohibited within 3 nautical miles off the coast, provided that the 50 meters isobath is not reached, or within the 50 meters isobath where that depth is reached at a shorter distance from the coast.	Yes	Coastal species
Trawling prohibition below 1000m	Recommendation GFCM/29/2005/1	Art. 2	Deep-water fisheries 2. CPCs shall prohibit the use of towed dredges and trawl nets at depths beyond 1 000 m.	Yes	Deepwater species
	Regulation (EU) No 1343/2011 as amended by Regulation (EU) 2019/982	Chapter III, Art. 16	Use of towed dredges and trawl nets fisheries The use of towed dredges and trawl nets fisheries at depths beyond 1 000 m shall be prohibited.	Yes	Deepwater species
Gear restriction (entangling gear)	Regulation (EU) 2019/1241	Art. 9	(4) It shall be prohibited to use bottom-set gillnets, entangling nets and trammel nets to catch the following species:	Yes	(e) Sharks belonging to the following species or families <i>Hexanchus griseus</i> ; <i>Cetorhinus maximus</i> ; all species of Alopiidae; Carcharhinidae; Sphyrnidae; Isuridae; Lamnidae.
Prohibition of impactful actions, Prohibition of unselective gear	Bern Convention	Chapter 3, Art. 8	In respect of the capture or killing of wild fauna species specified in Appendix III and in cases where, in accordance with Article 9, exceptions are applied to species specified in Appendix II, Contracting Parties shall prohibit the use of all indiscriminate means of capture and killing and the use of all means capable of causing local disappearance of, or serious disturbance to, populations of a species, and in particular, the means specified in Appendix IV.	Yes	Appendix III (<i>Isurus oxyrinchus</i> , <i>Lamna nasus</i> , <i>Prionace glauca</i> , <i>Squatina squatina</i> , <i>Rostroraja alba</i>)
Catch utilization	04-10 Recommendation by ICCAT by ICCAT concerning the conservation of sharks caught in association with Fisheries managed by ICCAT	2	CPCs shall take the necessary measures to require that their fishermen fully utilize their entire catches of sharks. Full utilization is defined as retention by the fishing vessel of all parts of the shark excepting head, guts and skins, to the point of first landing	Yes	Sharks caught in association with Fisheries managed by ICCAT
Finning prohibition		3	CPCs shall require their vessels to not have onboard fins that total more than 5% of the weight of sharks onboard, up to the first point of landing. CPCs that currently do not require fins and carcasses to be offloaded together at the point of first landing shall take the necessary measures to ensure compliance with the 5% ratio through certification, monitoring by an observer, or other appropriate measures.	Yes	All (excl. rays/skates)

Fishing/retention ban	Recommendation GFCM/36/2012/3 on fisheries management measures for conservation of sharks and rays in the GFCM area	Part II (4)	CPCs shall ensure that: - 'finning' shall be prohibited; - beheading and skinning of specimens on board and before landing shall be prohibited. Beheaded and skinned sharks cannot be marketed at the first sale markets after landing; - It shall be prohibited to purchase, offer for sale or sell shark fins which have been removed, retained on board, transhipped or landed in contravention of this Recommendation.	Yes	All (excl. rays/skates)
	Recommendation GFCM/42/2018/2 on fisheries management measures for the conservation of sharks and rays in the GFCM area of application, amending Recommendation GFCM/36/2012/3	Part III	4. CPCs shall ensure that: a) it is prohibited to remove shark fins onboard vessels and to retain, transship or land shark fins;	Yes	All (excl. rays/skates)
	Regulation (EU) No 605/2013	Preamble	(1) Council Regulation (EC) No 1185/2003 (3) establishes a general prohibition of the practice of 'shark finning', whereby a shark's fins are removed and the remainder of the shark is discarded at sea	Yes	All (excl. rays/skates)
	04-10 Recommendation by ICCAT by ICCAT concerning the conservation of sharks caught in association with Fisheries managed by ICCAT	5	Fishing vessels are prohibited from retaining on board, transshipping or landing any fins harvested in contravention of this Recommendation.	Yes	Sharks caught in association with Fisheries managed by ICCAT
	09-07 Recommendation by ICCAT by ICCAT concerning the conservation of Thresher Sharks caught in Association with Fisheries in the ICCAT Convention Area	1	1. Contracting Parties, and Cooperating non-Contracting Parties, Entities or Fishing Entities (hereafter referred to as CPCs) shall prohibit, retaining onboard, transshipping, landing, storing, selling, or offering for sale any part or whole carcass of bigeye thresher sharks (<i>Alopias superciliosus</i>) in any fishery with exception of a Mexican small-scale coastal fishery with a catch of less than 110 fish.	Yes	<i>Alopias superciliosus</i>
		3	CPCs should strongly endeavor to ensure that vessels flying their flag do not undertake a directed fishery for species of thresher sharks of the genus <i>Alopias</i> spp	Optional (should)	<i>Alopias</i> spp.
	10-07 Recommendation by ICCAT on the Conservation of Oceanic Whitetip Shark caught in Association with Fisheries in the ICCAT Convention Area	1	Contracting Parties, and Cooperating non-Contracting Parties, Entities or Fishing Entities (hereafter referred to as CPCs) shall prohibit retaining onboard, transshipping, landing, storing, selling, or offering for sale any part or whole carcass of oceanic whitetip sharks in any fishery	Yes	<i>Carcharhinus longimanus</i> *
	10-08 Recommendation by ICCAT on Hammerhead Sharks (Family Sphyrnidae) caught in	1	Contracting Parties, and Cooperating non-Contracting Parties, Entities or Fishing Entities (hereafter referred to as CPCs) shall prohibit retaining onboard, transshipping, landing, storing, selling, or offering for sale any part or whole	Yes	Sphyrnidae

	Association with Fisheries managed by ICCAT		carcass of hammerhead sharks of the family Sphyrnidae (except for the <i>Sphyrna tiburo</i>), taken in the Convention area in association with ICCAT fisheries.		
	11-08 Recommendation by ICCAT on the Conservation of Silky Sharks caught in Association with ICCAT Fisheries	1	Contracting Parties, and Cooperating non-Contracting Parties, Entities or Fishing Entities (hereafter referred to as CPCs) shall require fishing vessels flying their flag and operating in ICCAT managed fisheries to release all silky sharks whether dead or alive, and prohibit retaining on board, transshipping, or landing any part or whole carcass of silky shark.	Yes	<i>Carcharhinus falciformis</i> *
	Council Regulation (EU) 2021/92	Preamble	25) For certain species, such as certain species of sharks, even a limited fishing activity could result in a serious conservation risk. Fishing opportunities for such species should therefore be fully restricted through a general prohibition on fishing those species	No	All
	Regulation (EU) 2019/1241	Preamble (16)	For certain rare fish species, such as some species of sharks and rays, even limited fishing activity could result in a serious risk for their conservation. To protect such species a general prohibition on fishing for them should be introduced	Optional (should)	'rare' species
		Annex I: Prohibited species	Species for which there is a prohibition to fish for, retain on board, tranship, land, store, sell, display or offer for sale, as referred to in Article 10(2)	Yes	Sawfishes, monulid rays, <i>Cetorhinus maximus</i> , <i>Carcharodon carcharias</i> [and other not relevant to the Med]
	Council Regulation (EU) 2021/92	Section 3, Art. 27	1. Retaining on board, transshipping or landing any part or whole carcass of bigeye thresher sharks (<i>Alopias superciliosus</i>) caught in any fishery shall be prohibited. 2. It shall be prohibited to undertake a directed fishery for species of thresher sharks of the <i>Alopias</i> genus. 3. Retaining on board, transshipping or landing any part or whole carcass of hammerhead sharks of the Sphyrnidae family (except for the <i>Sphyrna tiburo</i>) caught in fisheries in the ICCAT Convention Area shall be prohibited 4. Retaining on board, transshipping or landing any part or whole carcass of oceanic whitetip sharks (<i>Carcharhinus longimanus</i>) taken in any fishery shall be prohibited. 5. Retaining on board silky sharks (<i>Carcharhinus falciformis</i>) caught in any fishery shall be prohibited.	Yes	<i>Alopias superciliosus</i> , <i>Sphyrnidae</i> , <i>Carcharhinus longimanus</i> ,* <i>Carcharhinus falciformis</i> *
Product labelling	Regulation (EU) No. 1379/2013	Art. 35	Mandatory information 1. Without prejudice to Regulation (EU) No 1169/2011, fishery and aquaculture products referred to in points (a), (b), (c) and (e) of Annex I to this Regulation which are marketed within the Union, irrespective of their origin or of	Yes	All marketed species

				<p>their marketing method, may be offered for sale to the final consumer or to a mass caterer only if appropriate marking or labelling indicates:</p> <p>(a) the commercial designation of the species and its scientific name;</p> <p>(b) the production method, in particular by the following words "... caught ..." or "... caught in freshwater ..." or "... farmed ...";</p> <p>(c) the area where the product was caught or farmed, and the category of fishing gear used in capture of fisheries</p>		
Trade prohibition/regulation	Convention of International Trade in Endangered Species (CITES)	Art. VIII	<p>Article VIII Measures to be taken by the Parties</p> <p>1. The Parties shall take appropriate measures to enforce the provisions of the present Convention and to prohibit trade in specimens in violation thereof. These shall include measures:</p> <p>(a) to penalize trade in, or possession of, such specimens, or both; and</p> <p>(b) to provide for the confiscation or return to the State of export of such specimens</p>	Yes	Relevant to Appendixes	
Trade prohibition	Convention of International Trade in Endangered Species (CITES)	Art. III	Trade prohibition for Annex I species (unless under terms specified)	Yes	Appendix I species	
Trade regulation	Convention of International Trade in Endangered Species (CITES)	Art. IV	<p>2. The export of any specimen of a species included in Appendix II shall require the prior grant and presentation of an export permit. An export permit shall only be granted when the following conditions have been met:</p> <p>(a) a Scientific Authority of the State of export has advised that such export will not be detrimental to the survival of that species;</p> <p>(b) a Management Authority of the State of export is satisfied that the specimen was not obtained in contravention of the laws of that State for the protection of fauna and flora; and</p> <p>(c) a Management Authority of the State of export is satisfied that any living specimen will be so prepared and shipped as to minimize the risk of injury, damage to health or cruel treatment.</p>	Yes	Appendix II species	
<p>*Relevant to Mediterranean countries for ICCAT fisheries in the Atlantic, but not directly applicable to the Mediterranean Sea as this species is not an established species in the region.</p>						

Annex table 5. Overview of Mediterranean shark species and their listings under different applicable conventions. (Order alphabetically by scientific names)

Common name	Scientific name	Bern Convention Annex II	Bern Convention Annex III	CMS Appendix I	CMS Appendix II	CITES Appendix I	CITES Appendix II	Barcelona Annex II	Barcelona Annex III
Bullray	<i>Aetomylaeus bovinus</i>								
Bigeye thresher shark	<i>Alopias superciliosus</i>				YES		YES		
Common thresher shark	<i>Alopias vulpinus</i>				YES		YES		YES
Brown ray	<i>Bathytoshia lata</i>								
Bignose shark	<i>Carcharhinus altimus</i>								
Copper shark	<i>Carcharhinus brachyurus</i>								
Spinner shark	<i>Carcharhinus brevipinna</i>								
Silky shark	<i>Carcharhinus falciformis</i>				YES		YES		
Blacktip shark	<i>Carcharhinus limbatus</i>								
Blacktip reef shark	<i>Carcharhinus melanopterus</i>								
Dusky shark	<i>Carcharhinus obscurus</i>				YES				
Sandbar shark	<i>Carcharhinus plumbeus</i>								YES
Sandtiger shark	<i>Carcharias taurus</i>							YES	
Great white shark	<i>Carcharodon carcharias</i>	YES		YES	YES		YES	YES	
Gulper shark	<i>Centrophorus granulosus</i>								YES
Little gulper shark	<i>Centrophorus cf. uyato</i>								
Portuguese dogfish	<i>Centroscymnus coelolepis</i>								
Basking shark	<i>Cetorhinus maximus</i>	YES		YES	YES		YES	YES	
Kitefin shark	<i>Dalatias licha</i>								
Roughtail stingray	<i>Bathytoshia centroura</i>								
Marbled stingray	<i>Dasyatis marmorata</i>								
Common stingray	<i>Dasyatis pastinaca</i>								
Tortonese's stingray	<i>Dasyatis tortonesei</i>								
Common skate	<i>Dipturus batis</i>							YES	
Norwegian skate	<i>Dipturus nidarosiensis</i>								
Longnose skate	<i>Dipturus oxyrinchus</i>								
Bramble shark	<i>Echinorhinus brucus</i>								
Vlevet belly lanternshark	<i>Etmopterus spinax</i>								
Tiger shark	<i>Galeocerdo cuvier</i>								
Tope shark	<i>Galeorhinus galeus</i>				YES			YES	
Atlantic sawtail catshark	<i>Galeus atlanticus</i>								
Blackmouth catshark	<i>Galeus melastomus</i>								
Blackchin guitarfish	<i>Glaucostegus cemiculus</i>						YES	YES	
Halavi guitarfish	<i>Glaucostegus halavi</i>						YES		
Butterfly ray	<i>Gymnura altavela</i>							YES	
Sevengill shark	<i>Heptranchias perlo</i>								YES
Sixgill shark	<i>Hexanchus griseus</i>								
Bigeyed sixgill shark	<i>Hexanchus nakamurai</i>								
Leopard whipray	<i>Himantura leoparda</i>								
Honeycomb stingray	<i>Himantura uarnak</i>								
Shortfin mako	<i>Isurus oxyrinchus</i>		YES		YES		YES	YES	
Longfin mako	<i>Isurus paucus</i>				YES		YES		
Porbeagle shark	<i>Lamna nasus</i>		YES		YES		YES	YES	
Sandy skate	<i>Leucoraja circularis</i>							YES	
Shagreen skate	<i>Leucoraja fullonica</i>								
Maltese skate	<i>Leucoraja melitensis</i>							YES	
Cuckoo Skate	<i>Leucoraja naevus</i>								
Giant Deveil Ray	<i>Mobula mobular</i>	YES		YES	YES		YES	YES	
Starry smoothhound	<i>Mustelus asterias</i>								YES

Common smoothhound	<i>Mustelus mustelus</i>							YES
Balckspotted smoothhound	<i>Mustelus punctulatus</i>							YES
Common egale ray	<i>Myliobatis aquila</i>							
Smalltooth Sandtiger shark	<i>Odontaspis ferox</i>						YES	
Angualr rough shark	<i>Oxynotus centrina</i>						YES	
Blue shark	<i>Prionace glauca</i>	YES		YES				YES
Smalltooth sawfish	<i>Pristis pectinata</i>		YES	YES	YES		YES	
Largetooth sawfish	<i>Pristis pristis</i>		YES	YES	YES		YES	
Pelagic stingray	<i>Pteroplatytrygon violacea</i>							
Starry skate	<i>Raja asterias</i>							
Blonde skate	<i>Raja brachyura</i>							
Thornback ray	<i>Raja clavata</i>							
Brown skate	<i>Raja miraletus</i>							
Spotted skate	<i>Raja montagui</i>							
Speckeld skate	<i>Raja polystigma</i>							
Rough skate	<i>Raja radula</i>							
Undulate skate	<i>Raja undulata</i>							
Common guitarfish	<i>Rhinobatos rhinobatos</i>		YES	YES			YES	
Lusitanian Cownose ray	<i>Rhinoptera marginata</i>							
Milk shark	<i>Rhizoprionodon acutus</i>							
White skate	<i>Rostroraja alba</i>	YES					YES	
Small-spotted catshark	<i>Scyliorhinus canicula</i>							
Nursehound	<i>Scyliorhinus stellaris</i>							
Little sleeper shark	<i>Somniosus rostratus</i>							
Scalloped hammerhead	<i>Sphyrna lewini</i>			YES		YES	YES	
Great hammerhead	<i>Sphyrna mokarran</i>			YES		YES	YES	
Smalleye hammerhead	<i>Sphyrna tudes</i>							
Smooth hammerhead	<i>Sphyrna zygaena</i>			YES		YES	YES	
Spiny dogfish	<i>Squalus acanthias</i>							YES
Longnose spurdog	<i>Squalus blainville</i>							
Shortnose spurdog	<i>Squalus megalops</i>							
Sawback angelshark	<i>Squatina aculeata</i>						YES	
Smoothback angelshark	<i>Squatina oculata</i>						YES	
Common angelshark	<i>Squatina squatina</i>	YES	YES	YES			YES	
round fantail ray	<i>Taeniurops grabatus</i>							
Great torpedo ray	<i>Tetronarce nobiliana</i>							
Spotted torpedo	<i>Torpedo marmorata</i>							
Variable torpedo ray	<i>Torpedo sinuspersici</i>							
Common torpedo ray	<i>Torpedo torpedo</i>							

Annex table 6. Mediterranean institutes involved in shark research and their individual contributions, classified by institute type.

Country	Institute	Institute type	No. of Publications as leading institute	No. of publications as collaborating institute	Sum (roles)	Ratio (No. of publications by institute/ Total No. Publications country was involved in)
Albania	Agricultural University of Tirana	University	2	1	3	50.00
Albania	Regional Administrative of Protected Areas in Vlora	Regulatory entity	1	0	1	16.67
Albania	University of Tirana	University	1	2	3	50.00
Algeria	Ecole Nationale Supérieure des Sciences de la Mer et Aménagement du Littoral (ENSSMAL)	University	0	5	5	13.16
Algeria	Ministère de l'Agriculture, du Développement Rural et de la Pêche	Regulatory entity	1	1	2	5.26
Algeria	Mohamed Boudiaf University of Science and Technology of Oran	University	1	0	1	2.63
Algeria	Université Ahmed Ben Bella d'Oran	University	3	1	4	10.53
Algeria	Université Mustapha Stambouli de Mascara	University	1	0	1	2.63
Algeria	Université Saad Dahlab Blida	University	1	0	1	2.63
Algeria	University of Sciences and Technology Houari Boumediene	University	14	13	27	71.05
Bosnia Herzegovina	Sharklab ADRIA	NGO	7	1	8	88.89
Bosnia Herzegovina	University of Sarajevo	University	1	2	3	33.33
Croatia	Blue World Institute of Marine Research and Conservation (BWI)	NGO	1	1	2	3.17
Croatia	Croatian History Museum	Museum	0	1	1	1.59
Croatia	Institute for Medical Research and Occupational Health	Research institute	1	0	1	1.59
Croatia	Institute of Oceanography & Fisheries (IZOR)	Research institute	22	16	38	60.32
Croatia	National Museum Zadar	Museum	0	1	1	1.59
Croatia	Oikon Ltd.	Company	1	0	1	1.59
Croatia	Public Institution for Managing Protected Areas	Regulatory entity	0	1	1	1.59
Croatia	Ruder Boskovic Institute	Research institute	0	6	6	9.52
Croatia	University of Dubrovnik	University	0	1	1	1.59
Croatia	University of Juraj Dobrila Pula	University	0	3	3	4.76
Croatia	University of Split	University	9	11	20	31.75
Croatia	University of Zagreb	University	6	1	7	11.11
Croatia	UPA Rostrum Split	NGO	0	1	1	1.59
Cyprus	Eastern Mediterranean University	University	0	2	2	22.22
Cyprus	MER Lab	Research institute	1	3	4	44.44
Cyprus	Ministry of Agriculture, Natural Resources and Environment/Department of Fisheries and Marine Research	Regulatory entity	0	4	4	44.44
Egypt	Al Azhar University	University	5	0	5	19.23
Egypt	Alexandria University	University	10	0	10	38.46
Egypt	Mansoura University	University	3	0	3	11.54
Egypt	Matrouh University	University	0	1	1	3.85
Egypt	Minia University	University	0	1	1	3.85
Egypt	National Institute of Oceanography & Fisheries (NIOF)	Research institute	5	2	7	26.92
Egypt	Suez Canal University	University	0	1	1	3.85

France	Agence Nationale de Securite Sanitaire de l'Alimentation, de l'Environnement du Travail (ANSES)	Regulatory entity	0	1	1	0.44
France	AILERONS	NGO	1	0	1	0.44
France	Aix-Marseille Universite	University	2	0	2	0.87
France	Centre National de la Recherche Scientifique (CNRS)	Research institute	2	19	21	9.17
France	Corsica Mediterranean Shark Research Group	NGO	1	0	1	0.44
France	Des Requins & Des Hommes	NGO	0	2	2	0.87
France	Ichtyo Consult	Company	0	3	3	1.31
France	Ifremer	Research institute	11	8	19	8.30
France	INRA - French National Research Institute for Agriculture, Food and the Environment	Regulatory entity	0	1	1	0.44
France	Institut des Sciences Analytiques (ISA)	Research institute	0	1	1	0.44
France	Institute de Recherche pour le Developpment (IRD)	Research institute	0	9	9	3.93
France	Laboratoire d'Excellence 'CORAIL'	Research institute	0	2	2	0.87
France	L'Observatoire Oceanologique de Banyuls-sur-Mer (OOB)	Research institute	3	0	3	1.31
France	Museum National d'Histoire Naturelle (MNHN)	Museum	3	16	19	8.30
France	Parc Naturel Regional de Camargue	Regulatory entity	0	1	1	0.44
France	Station Meditteraneenne de l'Environnement Littoral	Research institute	1	1	2	0.87
France	Univeriste Paris	University	0	1	1	0.44
France	Universite Cote d'Azur	University	0	1	1	0.44
France	Universite de Bretagne Occidentale	University	0	1	1	0.44
France	Universite de la Mediterranee	University	1	0	1	0.44
France	Universite de Montpellier	University	73	88	161	70.31
France	Universite de Reims Champagne-Ardenne	University	1	2	3	1.31
France	Universite Grenoble Alpes (UGA)	University	0	1	1	0.44
France	Universite Paul-Valery	University	0	1	1	0.44
France	WWF France	NGO	0	1	1	0.44
Greece	Amvrakikos Gulf- Lefkada Management Agency	Regulatory entity	0	1	1	0.95
Greece	Aristotle University of Thessaloniki	University	6	4	10	9.52
Greece	BiodiversityGR	NGO	1	0	1	0.95
Greece	Department of Fisheries	Regulatory entity	1	1	2	1.90
Greece	Fisheries Research Institute (FRI), Hellenic Agricultural Organization – DEMETER	Research institute	1	3	4	3.81
Greece	Foundation for Research & Technology - Hellas (FORTH)	Research institute	0	1	1	0.95
Greece	Goulandris Natural History Museum	Museum	0	1	1	0.95
Greece	Hellenic Centre for Marine Research	Research institute	32	26	58	55.24
Greece	Hellenic Society for the Study and Protection of the Monk seal	NGO	0	1	1	0.95
Greece	Institute of Marine Biology of Crete	Research institute	1	1	2	1.90
Greece	iSea	NGO	6	7	13	12.38
Greece	MEDASSET-Mediterranean Association to Save the Sea Turtles	NGO	1	0	1	0.95
Greece	National and Kapodistrian University of Athens	University	23	8	31	29.52

Greece	Pelagos Cetacean Research Institute	Research institute	0	1	1	0.95
Greece	International Hellenic University	University	2	0	2	1.90
Greece	Toulipa Goulimi	NGO	0	1	1	0.95
Greece	University of the Aegean	University	4	3	7	6.67
Greece	University of Crete	University	1	1	2	1.90
Greece	University of Patras	University	2	4	6	5.71
Greece	University of Thessaly	University	0	2	2	1.90
Greece	Western Greece University of Applied Sciences	University	1	1	2	1.90
Israel	Hebrew University of Jerusalem	University	6	3	9	29.03
Israel	Interdisciplinary Center (IDC) Herzliya	Research institute	0	2	2	6.45
Israel	Israel Nature and Parks Protection Authority	Regulatory entity	0	1	1	3.23
Israel	Kimron Veterinary Institute	Research institute	0	1	1	3.23
Israel	Ministry of Agriculture and Rural Development	Regulatory entity	1	1	2	6.45
Israel	Ministry of Health	Regulatory entity	0	1	1	3.23
Israel	Morris Kahn Marine Research Station	Research institute	0	1	1	3.23
Israel	National Institute of Oceanography (Israel)	Research institute	9	4	13	41.94
Israel	Oranim Academic College	University	0	1	1	3.23
Israel	Sharks in Israel	NGO	1	0	1	3.23
Israel	Tel Aviv University	University	4	5	9	29.03
Israel	Tel Hai Academy College	University	0	2	2	6.45
Israel	University of Haifa	University	6	3	9	29.03
Italy	Abdus Salam International Centre for Theoretical Physics (ICTP)	Research institute	0	1	1	0.27
Italy	Aplysia Societa Cooperativa	Research institute	0	1	1	0.27
Italy	Aquario Comunale di Messina	Aquarium	0	1	1	0.27
Italy	Aquarium Genoa	Aquarium	0	2	2	0.54
Italy	Aquarium Massa Marittima	Aquarium	0	1	1	0.27
Italy	Aquarium Mondo Marino	Aquarium	0	1	1	0.27
Italy	Aquastudio Research Institute	Research institute	11	2	13	3.51
Italy	Azienda Sanitaria Provinciale	Regulatory entity	0	1	1	0.27
Italy	Cattolica Aquarium	Aquarium	3	2	5	1.35
Italy	CEAS - Centro di Educazione all'Ambiente e alla Sostenibilità	University	1	1	2	0.54
Italy	Centro di biologia marina ed ecologia applicata	Research institute	2	6	8	2.16
Italy	Centro Radiologia Diagnostica Tagliavia	Research institute	0	1	1	0.27
Italy	Centro Studi Squali (University of Calabria and Siena)	Research institute	3	5	8	2.16
Italy	Centro Turistico Studentesco e giovanile (CTS)	Regulatory entity	0	1	1	0.27
Italy	Civic Museum of Natural History "Giacomo Doria"	Museum	0	1	1	0.27
Italy	COISPA Tecnologia & Ricerca – Stazione Sperimentale per lo Studio delle Risorse del Mare	Research institute	2	10	12	3.24
Italy	National Research Council (CNR)/Institute for Agro-environmental Biology and Forestry (IBAF)	Research institute	0	1	1	0.27
Italy	Consiglio Nazionale delle Ricerche (CNR)/Institute for Marine Biological Resources and Biotechnologies (IRBIM)	Research institute	5	8	13	3.51

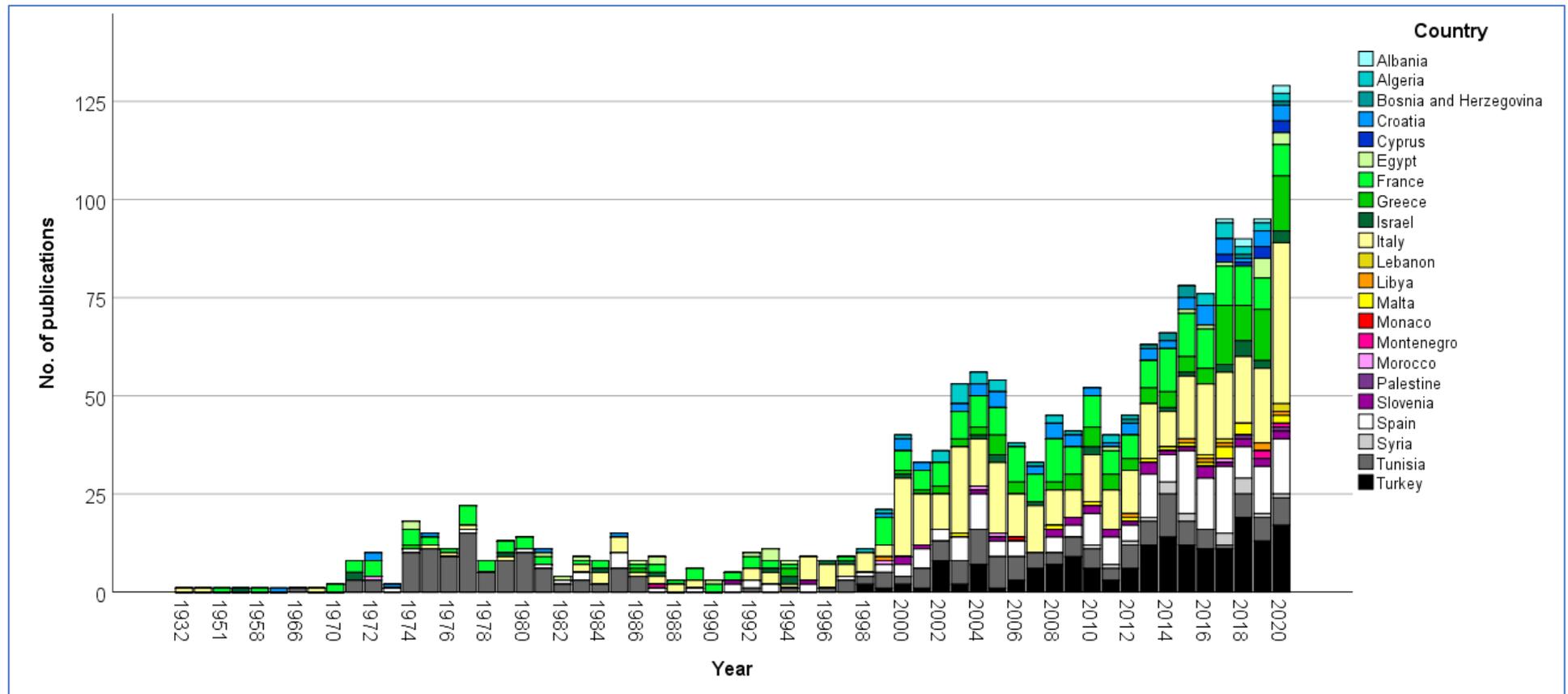
Italy	Consiglio Nazionale delle Ricerche (CNR)/Istituto di Geoscienze e Georisorse (IGG-CNR)	Research institute	0	1	1	0.27
Italy	Consiglio Nazionale delle Ricerche (CNR)/Institute of Anthropic Impacts and Sustainability in Marine Environment, National Research Council (IAS-CNR)	Research institute	17	19	36	9.73
Italy	Consiglio Nazionale delle Ricerche (CNR)/Institute of Atmospheric Sciences and Climate (CNR-ISAC)	Research institute	0	1	1	0.27
Italy	Consiglio Nazionale delle Ricerche (CNR)/Institute of Marine Science (ISMAR)	Research institute	9	9	18	4.86
Italy	Consiglio Nazionale delle Ricerche (CNR)/Istituto di Studi sui Sistemi Intelligenti per l'Automazione (ISSIA)	Research institute	0	1	1	0.27
Italy	Consorzio Nazionale Interuniversitario per le Scienze Mare (CoNISMa)	Research institute	7	7	14	3.78
Italy	Cooperativa Mare Ricerca Societa' Cooperativa	Research institute	1	0	1	0.27
Italy	DNAQuA - Laboratorio di Ricerche e Studi sulla vita marina	Research institute	2	0	2	0.54
Italy	ECHO Group	Company	1	0	1	0.27
Italy	ENEA Centro Ricerche Ambiente Marino	Research institute	1	2	3	0.81
Italy	Ente Fauna Marina Mediterranea	NGO	3	3	6	1.62
Italy	Fondazione Cetacea	NGO	0	1	1	0.27
Italy	Gruppo Ricercatori Italiani sugli Squali (GRIS)	NGO	1	1	2	0.54
Italy	Grp Avis Mineral & Paleontol Scandicci	Research institute	0	4	4	1.08
Italy	Istituto di Ricerche Economiche per la Pesca e l'Acquacoltura (IREPA)	Research institute	0	1	1	0.27
Italy	Italian Shark Research Project	Research institute	0	1	1	0.27
Italy	Istituto di Scienze Naturali e Biologia Marina de Olbia	Research institute	1	2	3	0.81
Italy	Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA)	Research institute	43	29	72	19.46
Italy	Consiglio Nazionale delle Ricerche (CNR)/Istituto Nazionale di Fisica Nucleare (INFN)	Research institute	0	1	1	0.27
Italy	Istituto Nazionale di Oceanografia e di Geofisica Sperimentale	Research institute	2	3	5	1.35
Italy	Istituto Zooprofilattico Sperimentale della Puglia e della Basilicata	Research institute	0	1	1	0.27
Italy	Istituto Zooprofilattico Sperimentale dell'Umbria e delle Marche	Research institute	1	0	1	0.27
Italy	Istituto Zooprofilattico Sperimentale delle Venezie	Research institute	1	1	2	0.54
Italy	Laboratorio Provinciale di Biologia Marina (Bari)	Research institute	9	4	13	3.51
Italy	Marche Polytechnic University	University	9	4	13	3.51
Italy	Medsharks	NGO	2	4	6	1.62
Italy	Museum of Natural History of Firenze "La Specola"	Museum	0	3	3	0.81
Italy	Museo Civico di Storia Naturale - Comune di Comiso	Museum	2	0	2	0.54
Italy	Museo Civico di Scienze Naturali della Valdinievole	Museum	4	1	5	1.35
Italy	Museo "Luigi Donini"	Museum	1	7	8	2.16
Italy	Museo Civico di Storia Naturale (Milan)	Museum	3	0	3	0.81

Italy	Necton Marine Research Society	Research institute	0	1	1	0.27
Italy	Research and Education Activities for Chelonian Conservation	Research institute	0	1	1	0.27
Italy	Roma Tre University	University	0	1	1	0.27
Italy	Sapienza University Rome	University	7	4	11	2.97
Italy	Shoreline Soc. Coop	Company	1	0	1	0.27
Italy	Stazione Zoologica Anton Dohrn	Research institute	5	18	23	6.22
Italy	Studio Tecn Geol & Paleontol	Research institute	0	4	4	1.08
Italy	Universita Ca Foscari Venezia	University	0	1	1	0.27
Italy	Tethys Research Institute	Research institute	2	2	4	1.08
Italy	University of Turin	University	2	0	2	0.54
Italy	Tuscia University	University	0	1	1	0.27
Italy	University of Calabria	University	7	5	12	3.24
Italy	University of Salento	University	0	1	1	0.27
Italy	University of Parma	University	4	1	5	1.35
Italy	University of Bari Aldo Moro	University	47	14	61	16.49
Italy	University of Bologna	University	10	17	27	7.30
Italy	University of Cagliari	University	25	8	33	8.92
Italy	University of Camerino	University	1	1	2	0.54
Italy	University of Catania	University	4	6	10	2.70
Italy	University of Ferrara	University	3	0	3	0.81
Italy	University of Florence	University	1	0	1	0.27
Italy	University of Genoa	University	18	11	29	7.84
Italy	University of Messina	University	5	2	7	1.89
Italy	University of Milano-Bicocca	University	1	2	3	0.81
Italy	University of Milan	University	2	4	6	1.62
Italy	University of Modena and Reggio Emilia	University	0	1	1	0.27
Italy	University of Naples Federico II	University	9	2	11	2.97
Italy	University of Padua	University	7	5	12	3.24
Italy	University of Palermo	University	0	10	10	2.70
Italy	University of Pisa	University	11	3	14	3.78
Italy	University of Sassari	University	1	8	9	2.43
Italy	University of Siena	University	4	2	6	1.62
Italy	University of Teramo	University	1	7	8	2.16
Italy	University of Trieste	University	0	2	2	0.54
Italy	Wilderness Studi Ambientali	Research institute	3	3	6	1.62
Italy	WWF Calabria	NGO	0	1	1	0.27
Italy	WWF Italy	NGO	2	1	3	0.81
Lebanon	American University of Beirut	University	1	1	2	50.00
Lebanon	Centre National de la Recherche Scientifique (CNRS) - Lebanon	Research institute	2	0	2	50.00
Lebanon	Lebanese University	University	0	2	2	50.00
Libya	Marine biology research center (Tajura)	Research institute	1	0	1	12.50
Libya	Omar Al Mukhtar University	University	2	1	3	37.50
Libya	University of Benghazi	University	0	1	1	12.50
Libya	University of Tripoli	University	1	3	4	50.00
Malta	Department of Fisheries and Aquaculture (Malta)	Regulatory entity	0	1	1	6.25
Malta	BirdLife Malta	NGO	0	1	1	6.25
Malta	Malta Centre for Fisheries Sciences (MCFS)	Research institute	1	2	3	18.75
Malta	Nature Trust Malta	NGO	0	1	1	6.25
Malta	Sharklab-Malta	NGO	3	0	3	18.75
Malta	University of Malta	University	6	5	11	68.75
Monaco	Musee Oceanographique de Monaco	Museum	1	0	1	100.00

Montenegro	Montenegrin Ecologists Society	NGO	1	0	1	25.00
Montenegro	University of Montenegro	University	1	2	3	75.00
Morocco	Association AZIR pour la Protection de l'Environnement a Al Hoceima	NGO	0	1	1	20.00
Morocco	Institut National De Recherche Halieutique	Research institute	2	0	2	40.00
Morocco	Le Centre Regional de l'INRH à Nador	Regulatory entity	0	1	1	20.00
Morocco	Universite Ibn Tofail	University	1	0	1	20.00
Palestine	Ministry of Agriculture (MOA)	Regulatory entity	0	1	1	50.00
Palestine	National Research Center	Research institute	1	1	2	100.00
Slovenia	Fisheries Research Institute (Slovenia)	Research institute	0	3	3	9.68
Slovenia	Jozef Stefan Institute	Research institute	1	1	2	6.45
Slovenia	National Institute of Biology - Slovenia	Research institute	17	5	22	70.97
Slovenia	Piran Aquarium	Aquarium	0	4	4	12.90
Slovenia	University of Ljubljana	University	1	1	2	6.45
Slovenia	University of Primorska	University	0	5	5	16.13
Spain	ALNITAK-ALNILAM Research & Conservation	Research institute	0	2	2	1.09
Spain	Asociación Ondine	NGO	0	2	2	1.09
Spain	Association Lamna	NGO	0	1	1	0.54
Spain	Autonomous University of Barcelona	University	13	7	20	10.87
Spain	University of Barcelona	University	4	4	8	4.35
Spain	Autonomous University of Madrid	University	0	1	1	0.54
Spain	Balearic Islands Government	Regulatory entity	2	4	6	3.26
Spain	Campus de Excelencia Internacional del Mar (CEIMAR)	Research institute	0	1	1	0.54
Spain	Centro de Investigacion Ecologica y Aplicaciones Forestales (CREAF)	Research institute	0	1	1	0.54
Spain	CIBER - Centro de Investigacion Biomedica en Red	Research institute	0	1	1	0.54
Spain	Complutense University of Madrid	University	4	0	4	2.17
Spain	Concejalía de Medio Ambiente	Regulatory entity	1	0	1	0.54
Spain	Consejo Superior de Investigaciones Científicas (CSIC)/Institute of Marine Science (ICM-CSIC)	Research institute	34	20	54	29.35
Spain	Consejo Superior de Investigaciones Científicas (CSIC)/Estacion Biologica de Donana (EBD-CSIC)	Research institute	1	4	5	2.72
Spain	Consejo Superior de Investigaciones Científicas (CSIC)/Instituto Mediterráneo de Estudios Avanzados (IMEDEA - CSIC)	Research institute	1	1	2	1.09
Spain	Consejo Superior de Investigaciones Científicas (CSIC)/Instituto de Agroquímica y Tecnología de Alimentos (IATA-CSIC)	Research institute	1	0	1	0.54
Spain	Consejo Superior de Investigaciones Científicas (CSIC)/Departamento de Informatica Cientifica (SGAI-CSIC)	Research institute	0	1	1	0.54
Spain	Consejo Superior de Investigaciones Científicas (CSIC)/Centre d'Estudis Avançats de Blanes (CEAB)	Research institute	0	2	2	1.09
Spain	Consejo Superior de Investigaciones Científicas (CSIC)/National Museum of Natural Sciences (MNCN-CSIC)	Research institute	0	1	1	0.54

Spain	Consejo Superior de Investigaciones Cientificas (CSIC)/Institut Mediterrani d'Estudis Avancats (CSIC-UIB)	Research institute	5	5	10	5.43
Spain	Consejo Superior de Investigaciones Cientificas (CSIC)/Institute of Earth Sciences Jaume Almera (ICTJA-CSIC)	Research institute	1	0	1	0.54
Spain	CRAM - Foundation for the rehabilitation and conservation of marine animals	NGO	1	0	1	0.54
Spain	Ecopath International Research Association	Research institute	1	2	3	1.63
Spain	Hospital Universitario San Cecilio	Research institute	0	1	1	0.54
Spain	Museo Paleontologico de Elche	Museum	0	1	1	0.54
Spain	Museo Zoologia	Museum	8	2	10	5.43
Spain	Oceana Europe	NGO	0	1	1	0.54
Spain	Oceanografic Foundation	NGO	0	1	1	0.54
Spain	Save the Med Foundation	NGO	0	1	1	0.54
Spain	Shark-Med Association	NGO	2	0	2	1.09
Spain	SOCIB (Balearic Islands Coastal Observing and Forecasting System)	Research institute	0	1	1	0.54
Spain	Spanish Institute of Oceanography	Research institute	35	27	62	33.70
Spain	SUBMON	NGO	0	3	3	1.63
Spain	Tuna Farms of Mediterraneo	Regulatory entity	1	0	1	0.54
Spain	Universidad de Alicante	University	0	1	1	0.54
Spain	Universidad de Extremadura	University	1	0	1	0.54
Spain	Universidad de Las Palmas de Gran Canaria	University	0	1	1	0.54
Spain	Universidad de Malaga	University	12	2	14	7.61
Spain	Universidade de Vigo	University	0	2	2	1.09
Spain	Universitat de Girona	University	4	1	5	2.72
Spain	Universitat de les Illes Balears	University	6	6	12	6.52
Spain	University of the Basque Country	University	0	1	1	0.54
Spain	University of Granada	University	6	0	6	3.26
Spain	Universidad de Sevilla	University	0	1	1	0.54
Spain	University of Valencia	University	7	8	15	8.15
Spain	WWF Mediterranean Programme	NGO	1	1	2	1.09
Syria	Tishreen University	University	13	5	18	100.00
Tunisia	Institut National des Sciences et Technologies de la Mer	Research institute	59	26	85	37.78
Tunisia	Institut national agronomique de Tunisie	Research institute	2	10	12	5.33
Tunisia	Universite de Carthage	University	19	7	26	11.56
Tunisia	Universite de Gabes	University	0	2	2	0.89
Tunisia	Universite de Gafsa	University	3	0	3	1.33
Tunisia	Universite de Sfax	University	9	39	48	21.33
Tunisia	Universite de Tunis El Manar	University	97	24	121	53.78
Turkey	Adiyaman University	University	2	0	2	1.16
Turkey	Adnan Menderes University	University	2	2	4	2.31
Turkey	Afyon Kocatepe University	University	1	0	1	0.58
Turkey	Akdeniz University	University	5	2	7	4.05
Turkey	Ankara University	University	1	1	2	1.16
Turkey	Balikesir University	University	5	1	6	3.47
Turkey	Bandirma Onyedi Eylul University	University	0	1	1	0.58
Turkey	Bogazici University	University	0	1	1	0.58
Turkey	Canakkale Onsekiz Mart University	University	10	1	11	6.36
Turkey	Cukurova University	University	7	8	15	8.67
Turkey	Dokuz Eylul University	University	1	2	3	1.73
Turkey	Duzce University	University	2	0	2	1.16

Turkey	Ege University	University	19	7	26	15.03
Turkey	Firat University	University	14	9	23	13.29
Turkey	Gaziantep University	University	0	1	1	0.58
Turkey	Giresun University	University	2	1	3	1.73
Turkey	Girne American University	University	4	0	4	2.31
Turkey	Halic University	University	0	1	1	0.58
Turkey	Ichthyological Research Society	Research institute	45	7	52	30.06
Turkey	Iskenderun Technical University	University	12	5	17	9.83
Turkey	Istanbul University	University	9	5	14	8.09
Turkey	Izmir Katip Celebi University	University	1	0	1	0.58
Turkey	Karadeniz Technical University	University	0	1	1	0.58
Turkey	Kastamonu University	University	1	0	1	0.58
Turkey	Mediterranean Conservation Society (MCS)/Akdeniz Koruma Dernegi	NGO	5	0	5	2.89
Turkey	Mersin University	University	4	4	8	4.62
Turkey	Middle East Technical University	University	1	2	3	1.73
Turkey	Ministry of Food, Agriculture & Livestock - Turkey	Regulatory entity	1	3	4	2.31
Turkey	Mugla Sitki Kocman University	University	6	3	9	5.20
Turkey	Munzur University	University	3	0	3	1.73
Turkey	Mustafa Kemal University	University	9	5	14	8.09
Turkey	Necmettin Erbakan University	University	0	1	1	0.58
Turkey	Nevsehir Haci Bektas Veli University	University	0	3	3	1.73
Turkey	Rize University	University	0	1	1	0.58
International bodies						
International	European Commission Joint Research Centre	International body	3	5	8	NA
International	Food & Agriculture Organization of the United Nations (FAO)	International body	0	6	6	NA
International	ICCAT Secretariat	International body	0	1	1	NA
International	RAC/SPA	International body	0	1	1	NA
International	IUCN	International body	0	1	1	NA



Annex figure 2. Publication contributions by country over time (between 1932 to 2020).

Annex table 7. Mediterranean elasmobranch species the number of publications containing information on the species (Pub.) and applicable implemented measures (Meas.). Furthermore, the IUCN Red List status and the listing in SPA/BD Protocol Annexes are indicated.

Species	Family	Pub.	Meas.	IUCN Red List status	Annex II	Annex III
<i>Scyliorhinus canicula</i>	Scyliorhinidae	237	26	Least Concern		
<i>Galeus melastomus</i>	Pentanchidae	198	23	Least Concern		
<i>Raja clavata</i>	Rajidae	161	33	Near Threatened		
<i>Etmopterus spinax</i>	Etmopteridae	136	16	Least Concern		
<i>Mustelus mustelus</i>	Triakidae	132	25	Vulnerable		Yes
<i>Raja miraletus</i>	Rajidae	120	22	Least Concern		
<i>Torpedo marmorata</i>	Torpedinidae	112	20	Least Concern		
<i>Dasyatis pastinaca</i>	Dasyatidae	111	26	Vulnerable		
<i>Prionace glauca</i>	Carcharhinidae	105	32	Critically Endangered		Yes
<i>Squalus blainville</i>	Squalidae	100	23	Data Deficient		
<i>Raja asterias</i>	Rajidae	99	20	Near Threatened		
<i>Hexanchus griseus</i>	Hexanchidae	92	27	Least Concern		
<i>Dipturus oxyrinchus</i>	Rajidae	87	22	Near Threatened		
<i>Dalatias licha</i>	Dalatiidae	86	17	Vulnerable		
<i>Carcharodon carcharias</i>	Lamnidae	80	20	Critically Endangered	Yes	
<i>Myliobatis aquila</i>	Myliobatidae	78	18	Vulnerable		
<i>Squalus acanthias</i>	Squalidae	78	20	Endangered		Yes
<i>Oxynotus centrina</i>	Oxynotidae	76	19	Critically Endangered	Yes	
<i>Isurus oxyrinchus</i>	Lamnidae	74	27	Critically Endangered	Yes	
<i>Raja radula</i>	Rajidae	74	21	Endangered		
<i>Carcharhinus plumbeus</i>	Carcharhinidae	72	30	Endangered		Yes
<i>Centrophorus granulosus</i>	Centrophoridae	72	16	Critically Endangered		Yes
<i>Scyliorhinus stellaris</i>	Scyliorhinidae	70	22	Near Threatened		
<i>Torpedo torpedo</i>	Torpedinidae	69	16	Least Concern		
<i>Heptranchias perlo</i>	Hexanchidae	67	21	Data Deficient		Yes
<i>Alopias vulpinus</i>	Alopiidae	63	23	Endangered		Yes
<i>Raja polystigma</i>	Rajidae	62	19	Least Concern		
<i>Aetomylaeus bovinus</i>	Aetobatidae	61	19	Critically Endangered		
<i>Cetorhinus maximus</i>	Cetorhinidae	58	22	Endangered	Yes	
<i>Gymnura altavela</i>	Gymnuridae	58	20	Critically Endangered	Yes	
<i>Galeorhinus galeus</i>	Triakidae	56	17	Vulnerable	Yes	
<i>Mobula mobular</i>	Mobulidae	54	23	Endangered	Yes	
<i>Mustelus punctulatus</i>	Triakidae	54	19	Vulnerable		Yes
<i>Pteroplatytrygon violacea</i>	Dasyatidae	53	21	Least Concern		
<i>Mustelus asterias</i>	Triakidae	52	19	Vulnerable		Yes
<i>Rhinobatos rhinobatos</i>	Rhinobatidae	52	21	Endangered	Yes	
<i>Squatina squatina</i>	Squatinae	49	22	Critically Endangered	Yes	
<i>Raja montagui</i>	Rajidae	48	20	Least Concern		
<i>Tetronarce nobiliana</i>	Torpedinidae	47	15	Least Concern		
<i>Glaucostegus cemiculus</i>	Glaucostegidae	44	24	Endangered	Yes	
<i>Leucoraja circularis</i>	Rajidae	43	17	Critically Endangered	Yes	

<i>Rostroraja alba</i>	Rajidae	43	17	Endangered	Yes	
<i>Alopias superciliosus</i>	Alopiidae	40	22	Endangered		
<i>Leucoraja naevus</i>	Rajidae	38	15	Near Threatened		
<i>Squatina oculata</i>	Squatinae	36	23	Critically Endangered	Yes	
<i>Lamna nasus</i>	Lamnidae	34	21	Critically Endangered	Yes	
<i>Raja brachyura</i>	Rajidae	33	17	Near Threatened		
<i>Centroscymnus coelolepis</i>	Somniosidae	31	13	Least Concern		
<i>Squatina aculeata</i>	Squatinae	31	19	Critically Endangered	Yes	
<i>Sphyrna zygaena</i>	Sphyrnidae	30	18	Critically Endangered	Yes	
<i>Leucoraja melitensis</i>	Rajidae	29	16	Critically Endangered	Yes	
<i>Bathytoshia centroura</i>	Dasyatidae	27	15	Vulnerable		
<i>Dasyatis tortonesei</i>	Dasyatidae	27	16	Data Deficient		
<i>Odontaspis ferox</i>	Odontaspidae	27	16	Critically Endangered	Yes	
<i>Centrophorus cf. uyato</i>	Centrophoridae	26	14	Endangered		
<i>Carcharhinus brevipinna</i>	Carcharhinidae	22	16	Vulnerable		
<i>Carcharhinus brachyurus</i>	Carcharhinidae	21	15	Data Deficient		
<i>Carcharhinus obscurus</i>	Carcharhinidae	21	18	Data Deficient		
<i>Dipturus batis</i>	Rajidae	21	17	Critically Endangered	Yes	
<i>Leucoraja fullonica</i>	Rajidae	20	13	Critically Endangered		
<i>Dasyatis marmorata</i>	Dasyatidae	19	17	Data Deficient		
<i>Taeniurops grabatus</i>	Dasyatidae	19	16	Data Deficient		
<i>Carcharias taurus</i>	Odontaspidae	18	15	Critically Endangered	Yes	
<i>Raja undulata</i>	Rajidae	18	19	Near Threatened		
<i>Rhinoptera marginata</i>	Rhinopteridae	18	12	Data Deficient		
<i>Somniosus rostratus</i>	Somniosidae	18	14	Data Deficient		
<i>Dipturus nidarosiensis</i>	Rajidae	17	13	Near Threatened		
<i>Echinorhinus brucus</i>	Echinorhinidae	16	12	Endangered		
<i>Carcharhinus altimus</i>	Carcharhinidae	14	17	Data Deficient		
<i>Squalus megalops</i>	Squalidae	13	14	Data Deficient		
<i>Carcharhinus limbatus</i>	Carcharhinidae	12	15	Data Deficient		
<i>Galeus atlanticus</i>	Pentanchidae	12	13	Near Threatened		
<i>Carcharhinus falciformis</i>	Carcharhinidae	10	18	Vulnerable		
<i>Himantura uarnak</i>	Dasyatidae	10	13	Endangered		
<i>Isurus paucus</i>	Lamnidae	9	15	Data Deficient		
<i>Hexanchus nakamurai</i>	Hexanchidae	8	12	Data Deficient		
<i>Rhizoprionodon acutus</i>	Carcharhinidae	8	15	Vulnerable		
<i>Galeocerdo cuvier</i>	Carcharhinidae	7	15	Near Threatened		
<i>Sphyrna mokarran</i>	Sphyrnidae	6	16	Critically Endangered	Yes	
<i>Pristis pectinata</i>	Pristidae	5	16	Critically Endangered	Yes	
<i>Sphyrna lewini</i>	Sphyrnidae	5	16	Critically Endangered	Yes	
<i>Sphyrna tudes</i>	Sphyrnidae	5	14	Critically Endangered		
<i>Himantura leoparda</i>	Dasyatidae	4	14	Vulnerable		
<i>Carcharhinus melanopterus</i>	Carcharhinidae	3	15	Vulnerable		
<i>Glaucostegus halavi</i>	Glaucostegidae	3	0	Critically Endangered		

<i>Pristis pristis</i>	Pristidae	3	14	Critically Endangered	Yes	
<i>Torpedo sinuspersici</i>	Torpedinidae	3	0	Data Deficient		
<i>Bathytoshia lata</i>	Dasyatidae	1	0	Vulnerable		

Annex table 8. Overview of reviewed reports (343 reports in total). (ordered by instrument)

Country	Year	Instrument	Number of reports	Details
Albania	Multiple	CBD	6	1-6th national report
Algeria	Multiple	CBD	5	1, 3-6th national report
Bosnia & Herzegovina	Multiple	CBD	6	1-6th national report
Croatia	Multiple	CBD	5	1, 3-6
Cyprus	Multiple	CBD	4	3-6th national report
Egypt	Multiple	CBD	6	1-6th national report
France	Multiple	CBD	6	1-6th national report
Greece	Multiple	CBD	5	1-3, 5-6 national report
Israel	Multiple	CBD	6	1-6th national report
Italy	Multiple	CBD	5	1-2, 4-6 national report
Lebanon	Multiple	CBD	6	1-6th national report
Libya	Multiple	CBD	1	4th national report
Malta	Multiple	CBD	3	4-6th national report
Monaco	Multiple	CBD	5	1-2, 4-6th national report
Montenegro	Multiple	CBD	3	4-6th national report
Morocco	Multiple	CBD	6	1-6th national report
Palestine	Multiple	CBD	2	5-6th national report
Slovenia	Multiple	CBD	6	1-6th national report
Spain	Multiple	CBD	6	1-6th national report
Syria	Multiple	CBD	5	1-5th national report
Tunisia	Multiple	CBD	6	1-6th national report
Turkey	Multiple	CBD	6	1-6th national report
Albania	Multiple	CITES	4	2003-4, 2005-6, 2007-8, 2009-10
Bosnia & Herzegovina	Multiple	CITES	2	2013-14, 2015-20
Croatia	Multiple	CITES	6	2003-4, 2007-8, 2009-10, 2011-12, 2013-14, 2015-17
Cyprus	Multiple	CITES	6	2003-4, 2007-8, 2009-10, 2011-12, 2013-14, 2015-17
France	Multiple	CITES	8	2003-4, 2005-6, 2007-8, 2009-10, 2011-12, 2013-14, 2015-17, 2018-20
Greece	Multiple	CITES	7	2003-4, 2005-6, 2007-8, 2009-10, 2011-12, 2013-14, 2015-17
Israel	Multiple	CITES	1	2018-2020
Italy	Multiple	CITES	6	2003-4, 2005-6, 2007-8, 2009-10, 2013-14, 2015-17
Malta	Multiple	CITES	8	2003-4, 2005-6, 2007-8, 2009-10, 2011-12, 2013-14, 2015-17, 2018-20
Montenegro	Multiple	CITES	2	2003-4, 2007-8
Morocco	Multiple	CITES	6	2003-4, 2005-6, 2007-8, 2009-10, 2011-12, 2015-17
Slovenia	Multiple	CITES	8	2003-4, 2005-6, 2007-8, 2009-10, 2011-12, 2013-14, 2015-17, 2018-20

Spain	Multiple	CITES	8	2003-4, 2005-6, 2007-8, 2009-10, 2011-12, 2013-14, 2015-17, 2018-20
Tunisia	Multiple	CITES	1	2019-2020
Turkey	Multiple	CITES	7	2003-4, 2005-6, 2007-8, 2009-10, 2011-12, 2013-14, 2015-16, 2017-18
Albania	Multiple	CMS	4	COP 8, 10, 12, 13
Algeria	Multiple	CMS	3	COP 10, 12, 13
Bosnia & Herzegovina	Multiple	CMS	1	COP 13
Croatia	Multiple	CMS	7	COP 7, 8, 9, 10, 11, 12, 13
Cyprus	Multiple	CMS	5	COP 9, 10, 11, 12, 13
Egypt	Multiple	CMS	4	COP 7, 9, 11, 12
France	Multiple	CMS	4	COP 9, 10, 12, 13
Israel	Multiple	CMS	6	COP 7, 8, 10, 11, 12, 13
Italy	Multiple	CMS	6	COP 7, 8, 9, 10, 11, 12
Libya	Multiple	CMS	1	COP 13
Malta	Multiple	CMS	2	COP 12,13
Monaco	Multiple	CMS	6	COP 7, 8, 9, 10, 12, 13
Montenegro	Multiple	CMS	3	COP 10, 12, 13
Morocco	Multiple	CMS	6	COP 7, 8, 9, 10, 12, 13
Slovenia	Multiple	CMS	4	COP 9, 10, 12, 13
Spain	Multiple	CMS	7	COP 7, 8, 9, 10, 11, 12, 13
Syria	Multiple	CMS	3	COP 11, 12, 13
Tunisia	Multiple	CMS	3	COP 7, 8, 12
As applicable	2012	GFCM	1	GFCM SAC Report
As applicable	2013	GFCM	1	GFCM SAC Report
As applicable	2014	GFCM	1	GFCM SAC Report
As applicable	2015	GFCM	1	GFCM SAC Report
As applicable	2016	GFCM	1	GFCM SAC Report
As applicable	2017	GFCM	1	GFCM SAC Report
As applicable	2018	GFCM	1	GFCM SAC Report
As applicable	2019	GFCM	1	GFCM SAC Report
As applicable	2019	GFCM	2	GFCM Compliance Committee report
As applicable	2010-11	ICCAT	2	ICCAT Report
As applicable	2012-13	ICCAT	2	ICCAT Report
As applicable	2014-15	ICCAT	2	ICCAT Report
As applicable	201-17	ICCAT	2	ICCAT Report
As applicable	2018-19	ICCAT	2	ICCAT Report
As applicable	2020	ICCAT	2	ICCAT Report
As applicable	2007	SPA/BD Protocol	1	SPA/RAC biennial Focal Point meeting reports
As applicable	2009	SPA/BD Protocol	1	SPA/RAC biennial Focal Point meeting reports
As applicable	2011	SPA/BD Protocol	1	SPA/RAC biennial Focal Point meeting reports

As applicable	2013	SPA/BD Protocol	1	SPA/RAC biennial Focal Point meeting reports
As applicable	2015	SPA/BD Protocol	1	SPA/RAC biennial Focal Point meeting reports
As applicable	2017	SPA/BD Protocol	1	SPA/RAC biennial Focal Point meeting reports
As applicable	2019	SPA/BD Protocol	1	SPA/RAC biennial Focal Point meeting reports
As applicable	Multiple	PSMA	3	2017, 2019, 2021 meeting of the Parties
Greece	2016	MSFD	1	MSFD National monitoring programmes
France	2015	MSFD	1	MSFD National monitoring programmes
Croatia	2017	MSFD	1	MSFD National monitoring programmes
Cyprus	2016	MSFD	1	MSFD National monitoring programmes
Italy	2016	MSFD	1	MSFD National monitoring programmes summary report
Malta	2020	MSFD	1	MSFD National monitoring programmes summary report
Slovenia	2014	MSFD	1	MSFD National monitoring programmes
Spain	2016	MSFD	1	MSFD National monitoring programmes
Italy	2014	MSFD	1	Article 12 Technical Assessment of the MSFD 2012 obligations
Greece	2015	MSFD	1	Article 12 Technical Assessment of the MSFD 2012 obligations
Cyprus	2016	MSFD	1	Article 12 Technical Assessment of the MSFD 2012 obligations
Slovenia	2017	MSFD	1	Article 12 Technical Assessment of the MSFD 2012 obligations
Cyprus	2015	MSFD	1	Article 12 Technical Assessment of the MSFD 2014 reporting on monitoring programmes - Country Report
Greece	2018	MSFD	1	Article 12 Technical Assessment of the MSFD 2014 reporting on monitoring programmes - Country Report
Spain	2015	MSFD	1	Article 12 Technical Assessment of the MSFD 2014 reporting on monitoring programmes - Country Report
France	2015	MSFD	1	Article 12 Technical Assessment of the MSFD 2014 reporting on monitoring programmes - Country Report
Croatia	2015	MSFD	1	Article 12 Technical Assessment of the MSFD 2014 reporting on monitoring programmes - Country Report
Italy	2015	MSFD	1	Article 12 Technical Assessment of the MSFD 2014 reporting on monitoring programmes - Country Report
Malta	2018	MSFD	1	Article 12 Technical Assessment of the MSFD 2014 reporting on monitoring programmes - Country Report
Slovenia	2015	MSFD	1	Article 12 Technical Assessment of the MSFD 2014 reporting on monitoring programmes - Country Report

Cyprus	2017	MSFD	1	Article 16 Technical Assessment of the MSFD 2015 reporting on Programme of Measures
Greece	2018	MSFD	1	Article 16 Technical Assessment of the MSFD 2015 reporting on Programme of Measures
Spain	2018	MSFD	1	Article 16 Technical Assessment of the MSFD 2015 reporting on Programme of Measures
France	2018	MSFD	1	Article 16 Technical Assessment of the MSFD 2015 reporting on Programme of Measures
Croatia	2018	MSFD	1	Article 16 Technical Assessment of the MSFD 2015 reporting on Programme of Measures
Italy	2018	MSFD	1	Article 16 Technical Assessment of the MSFD 2015 reporting on Programme of Measures
Malta	2018	MSFD	1	Article 16 Technical Assessment of the MSFD 2015 reporting on Programme of Measures
Slovenia	2018	MSFD	1	Article 16 Technical Assessment of the MSFD 2015 reporting on Programme of Measures
Croatia	2019	MSFD	1	National report on MSFD
Cyprus	2021	MSFD	1	National report on MSFD
France	2019	MSFD	1	National report on MSFD
Greece	2017	MSFD	1	National report on MSFD
Malta	2020	MSFD	1	National report on MSFD
Spain	2018	MSFD	1	National report on MSFD
EU MS	2012	EU	1	Evaluations of Slovenian and Spanish Management Plans (STECF-OWP-12-02)
EU MS	2015	EU	1	STECF Technical Measures part III (STECF-15-05)
EU MS	2016	EU	1	Multiannual plan for demersal fisheries in the Western Mediterranean (STECF-16-21)
EU MS	2017	EU	1	STECF -Technical measures (STECF-17-02)
EU MS	2018	EU	1	Fishing effort regime for demersal fisheries in the western Mediterranean Sea (STECF-18-09)
EU MS	2019	EU	1	Evaluation of fishing effort regime in the Western Mediterranean –part IV (STECF-19-14)
EU MS	2020	EU	1	STECF Evaluation of fishing effort regime in the Western Mediterranean – part V (STECF-20-13)
EU MS	2020	EU	1	STECF- Review of technical measures (STECF-20-02)
EU MS	2020	EU	1	STECF-Fisheries Dependent Information– FDI (STECF-20-10)
EU MS	2020	EU	1	Evaluation of Joint Recommendations on the Landing Obligation and on the Technical Measures Regulation (STECF-20-04)
EU MS	2020	EU	1	Monitoring the performance of the Common Fisheries Policy (STECF-Adhoc-20-01)
EU MS	2020	EU	1	Evaluation of fishing effort regime in the Western Mediterranean – part V (STECF-20-13)
EU MS	2021	EU	1	STECF West Med assessments: conversion factors, closures, effort data and recreational fisheries (STECF-21-01)

Annex table 9. Overview of implemented projects across the Mediterranean with details on their objectives and component determined, as well as timeframe and implementation status.

No.	Countries	Name/ Description	Objective	Components	Subconstruct (Focus)	Start	End	Implementation status	Year reported	Source	Reference/Source
1	Italy	A pilot project in the Pelagie Islands MPA on the seasonal aggregation of the sandbar shark <i>Carcharhinus plumbeus</i> around the Island of Lampione	Project objective: The objectives of this project include collecting and analysing data on shark population, assessing stakeholders' perspectives on the socio-economic benefits of sandbar sharks, developing focused management measures (i.e. a code of conduct) involving local stakeholders and tourists, and transferring knowledge gained to MPA staff, visitors and other stakeholders to increase awareness	Research, Education, Measure proposal	Conservation effort	2019	2020	Ongoing	2020	Web-based research	https://medpan.org/mpas-and-endangered-sharks-in-the-mediterranean-a-pilot-project-in-the-pelagie-islands-mpa/
2	Spain	Acció Stellaris	1) An environmental education programme for public and fishers; 2) The breeding of nursehound sharks in a controlled, artificial environment and the subsequent release of the offspring in different areas of the Balearic Sea.	Education, Recovery	Conservation effort	2021		Planned	2020	Survey	https://www.savethemed.org/en/our-projects/research-projects/
3	Bosnia and Herzegovina	“Basic biology of cartilaginous fish: the First Bosnian-Maltese School of Pathology and Molecular Genetics – PATHOGEN 2017” Medicine, etc.)	Teaching methods to researchers for the purpose of improving their knowledge and practice in marine science in the area of pathology,	Capacity increase	Conservation effort	2017	2017	Completed	2019	CBD report 2019	http://sharklab-adria.org/
4	Greece	Alliance for Survival I	Assess level of bycatch of vulnerable species in Greece and work together with the fishing sector to mitigate it.	Research, Capacity increase,	Commercial Fisheries management	2017	2018	Completed	2020	Survey	https://isea.com.gr/activities/projects/fisheries/fishermen-sea-turtles-sharks-

				Measure proposal							alliance-survival/?lang=en
5	Greece	Alliance for Survival II	Assess level of bycatch of vulnerable species in Greece and work together with the fishing sector to mitigate it.	Research, Capacity increase, Measure proposal	Commercial Fisheries management	2019	2022	Ongoing	2020	Survey	https://isea.com.gr/fishers-sea-turtles-sharks-and-rays-alliance-for-survival-ii/?lang=en
6	Bosnia and Herzegovina	Assessment of Degree of Exploration and Conservation Strategy of the Protection of Sharks, Skates and Rays in the Neum Bay	Create inventory of elasmobranch species in Neum Bay and create conservation strategy.	Research, Policy strategy	Conservation effort	2017	2017	Completed	2020	NGO survey	https://www.rufford.org/projects/andrej-gajic/assessment-of-degree-of-exploration-and-conservation-strategy-of-the-protection-of-sharks-skates-and-rays-in-the-neum-bay/
7	Greece	Catches of pelagic (drifting) longline fisheries in the Mediterranean (MEDPEL).	Assessing fisheries discards to inform management measures	Research, Informed management decision making	Commercial Fisheries management			Completed	2016	Report of the eighteenth session of the SCIENTIFIC ADVISORY COMMITTEE ON FISHERIES, Nicosia, Cyprus, 21–23 March 2016	Report review
8	Greece	Collection of biological data regarding DNA barcoding and levels of mislabelling/species substitution in commercialised shark meat that is sold under the term “Galeos”.	Fisheries data collection and DNA barcoding to uncover label fraud	Research, Informed management decision making	Fisheries management			Unknown	2018	CMS/Sharks/MOS3/National Report EU/Rev.3	Report review

9	Palestine	Conserving Giant devil rays under fire	Assessing scale and impact of target Mobula ray fisheries to create conservation measures	Research, Informed management decision making	Commercial Fisheries management	2014		Unknown	2020	Survey	https://saveourseas.com/project/conserving-mobulas-under-fire/
10	Cyprus	Cyprus Bycatch Project Phase I	Assessing bycatch of the Cypriot fleet to determine suitable mitigation measures.	Capacity increase, Research, Measure proposal	Commercial Fisheries management	2018		Completed	2020	Survey	https://enaliaphysis.org.cy/2021/01/17/568/
11	Cyprus	Cyprus Bycatch Project Phase II	Assessing bycatch of the Cypriot fleet to determine suitable mitigation measures.	Capacity increase, Research, Measure proposal	Commercial Fisheries management	2020	2022	Ongoing	2020	Survey	https://enaliaphysis.org.cy/2021/01/17/786/
12	Cyprus	Cyprus Elasmobranch Research and Conservation Network (CERECON)	Assess bycatch impact to propose mitigation measures.	Research, Education, Measure proposal	Commercial Fisheries management	2019	2020	Ongoing	2020	Survey	https://enaliaphysis.org.cy/2021/01/15/598/
13	Montenegro	Determination of Fishing Effort on Sharks by Montenegrin Marine Fisheries	Assessing fishing impact on sharks in Montenegro and educating fishermen	Research, Education	Commercial Fisheries management	2018	2018	Completed	2020	Survey	https://www.rufford.org/projects/ilija-%C4%87etkovi%C4%87/determination-of-fishing-effort-on-sharks-by-montenegrin-marine-fisheries-and-multi-stakeholder-informing-about-conservation-of-these-endangered-species/
14	France	Diable de mer	Collect information on Mobula sightings and educate and involve the public.	Research, Education	Conservation effort	2019		Ongoing	2020	Survey	https://www.asso-ailerons.fr/nos-projets/diable_de_mer_mediterraneen/
15	France	DIRAIPO project	As part of the management plan of the Cerberère-Banyuls Nature Reserve, collect information on the occurrence of elasmobranchs.	Research, Education, Improved management-	Conservation effort	2019		Ongoing	2020	Survey	https://www.asso-ailerons.fr/nos-projets/diraipo/

				decision making							
16	Spain	DiscardLess	Reducing fisheries discards	Research, Improved management-decision making	Commercial Fisheries management	2015	2019	Completed	2018	Report of the twentieth session of the SCIENTIFIC ADVISORY COMMITTEE ON FISHERIES, Tangiers, Morocco, 26–29 June 2018	Report review
17	Spain	DISCARDLIFE II	To evaluate the physical and physiological recovery capacity of the rays most caught in the Gulf of Cádiz	Research, Improved management-decision making	Commercial Fisheries management	2020	2021	Ongoing	2020	Web-based research	https://www.programalearmar.es/proyectos/discardlife-ii-supervivencia-y-recuperacion-de-las-rayas-descartadas-en-la-pesca-de
18	Spain	DISCARDLIFE.	Assessing survival of discard species and thereby impact of fisheries to inform management measures.	Research, Improved management-decision making	Commercial Fisheries management	2019	2020	Ongoing	2019	Report of the twenty-first session of the SCIENTIFIC ADVISORY COMMITTEE ON FISHERIES, Cairo, Egypt, 24–27 June 2019	Cariani, A., Messinetti, S., Ferrari, A., Arculeo, M., Bonello, J. J., Bonnici, L., ... & Tinti, F. (2017). Improving the conservation of Mediterranean chondrichthyans: the ELASMOMED DNA barcode reference library. PloS one, 12(1), e0170244.
19	Greece	Elasmobranch bycatch	Assessing bycatch of sharks in small scale fisheries in Greece to inform management measures.	Research, Improved management-decision making	Commercial Fisheries management	2018		Ongoing	2020	Survey	https://isea.com.gr/by-elasmocatch/?lang=en
20	Greece	Elasmobranch Fisheries and Trade in North Aegean	To determine extend of trade of elasmobranch species in the region to inform management measures.	Research, Improved management-decision making	Commercial Fisheries management	2019	2019	Completed	2020	Survey	https://isea.com.gr/activities/projects/fisheries

21	France	Grand Large	Reduce bycatch of blue sharks, collect catch data and genetic samples	Research, Improved management-decision making	Fisheries management	2009		Ongoing	2020	Survey	https://www.asso-ailerons.fr/nos-projets/grand-large/
22	Albania, Algeria, Cyprus, France, Greece, Israel, Italy, Libya, Montenegro, Spain	<i>Hexanchus griseus</i> in the Mediterranean (HexMed)	To assess the status of <i>Hexanchus griseus</i> across the Mediterranean and educate fishermen on identification of species and create conservation management	Research, Education, Measure proposal	Conservation effort	2019		Ongoing	2020	Survey	https://www.submon.org/en/hexmed-project/
23	Italy	Mermaid's purse/ Progetto Stellaris	Collect information on eggcase distribution locally to protect nursery areas.	Research, Measure proposal	Conservation effort	2012		Ongoing	2020	Web-based research	http://www.progettostellaris.it/
24	France	IPEP (Impact of Fishing on Protected Species)	<ol style="list-style-type: none"> 1. Study the horizontal and vertical movements of pelagic sharks commonly encountered in the Gulf of Lions blue shark (<i>Prionace glauca</i>) and common thresher shark (<i>Alopias vulpinus</i>) 2. Collect information on catches and observations of pelagic sharks from recreational fishermen 3. Disseminate information on good practices to be observed in order to guarantee the survival of the individuals caught 4. Sample sharks at points of sale to obtain information on sex ratios and size structures of individuals caught. 	Research, Education	Conservation effort	2013	2017	Completed	2013	Report of the fifteenth session of the SCIENTIFIC ADVISORY COMMITTEE Rome, 8–11 April 2013. Report of the eighteenth session of the SCIENTIFIC ADVISORY COMMITTEE ON FISHERIES, Nicosia, Cyprus, 21–23 March 2016	Report review
25	Greece	Is it Alien to you? Share it. Citizen science	Monitor species occurrence through Citizen science.	Research, Education	Conservation effort	2016		Ongoing	2020	Survey	https://isea.com.gr/activities/projects/alien-species/is-it-alien-to-you-share-it/?lang=en

26	Bosnia and Herzegovina, Croatia, Montenegro, Slovenia	Let's Create a Better Future for Sharks, Skates and Rays in the Eastern Adriatic: Towards the Unique Regional Protection	Regional protection measures for Bosnia and Herzegovina, Croatia, Slovenia and Montenegro	Research, Measure proposal, Education, Capacity increase	Conservation effort	2019	2020	Ongoing	2020	Survey	https://www.rufford.org/projects/andrej-gajic/lets-create-a-better-future-for-sharks-skates-and-rays-in-the-eastern-adriatic-towards-the-unique-regional-protection/
27	Cyprus, Greece, Italy	LIFE eLIFE (Elasmobranchs Low-Impact Fishing Experience)	<p>Specific objectives of the project are:</p> <ul style="list-style-type: none"> - reduction of the by-catch of many threatened elasmobranchs, critically endangered, endangered and vulnerable species, during the professional fishing activities. - reduction of the mortality of threatened elasmobranchs during the professional fishing activities. - elimination of catches for the endangered sandbar shark, <i>Carcharhinus plumbeus</i>, caused by bottom trawling in the waters of the Lampione island. - reduction of the incidental catches and collisions and the anthropic disturbance on the endangered basking shark, <i>Cetorhinus maximus</i>, in Northern Sardinian Sea. - implementation of suitable conservation measures with an eco-systemic approach to fisheries through the preparation and adoption of specific local management plans - support to the management authorities for conservation and management policies of sharks, providing newest and deepest data 	Research, Education, Measure proposal, Policy strategy	Commercial Fisheries management	2019	2024	Ongoing	2020	Survey	https://www.elifeproject.eu/en/

			<p>for assessment of the environmental status and implementing activities consistent with a management plan of this species.</p> <ul style="list-style-type: none"> - to obtain a substantial shift toward low impacting fishing devices lowering the shark by-catch by professional fishermen, supporting them in fund raising. - to involve Mediterranean fishermen and enhance their role in marine biodiversity conservation issues . - to transfer conservation actions and good practices for shark by-catch mitigation and lowering mortality in others EU-Mediterranean countries - to promote the evidence of the value of the elasmobranch fishes to maintain the marine good environmental status. - to make people and stakeholders aware about the vulnerability of the elasmobranchs, in order to promote awareness towards a more sustainable fishing and a responsible fish consumption. 								
28	Albania, Croatia, Italy, Slovenia	LIFE Squalus	Aim is to raise awareness on the status of elasmobranchs in the Mediterranean and reducing elasmobranch mortality from fishing by providing training.	Capacity increase, Education	Fisheries management	2021	2025	Planned	2020	Survey	Survey questionnaire
29	Morocco, Tunisia, Turkey	MedBycatch (Phase I)	Collect bycatch data, identify and test bycatch mitigation methods.	Capacity increase, Research, Measure	Commercial Fisheries management	2017	2020	Ongoing	2020	Survey	https://www.iucn.org/news/mediterranean/201908/med-bycatch-project-a-collaborative-approach-

				proposal, Education							understanding-multi-taxa-bycatch-vulnerable-species-mediterranean-fisheries-and-testing-mitigation
30	Croatia, Italy	MedBycatch (Phase II)	Collect bycatch data, identify and test bycatch mitigation methods.	Capacity increase, Research, Measure proposal, Education	Commercial Fisheries management	2020	2022	Ongoing	2020	Survey	https://www.iucn.org/news/mediterranean/201908/med-bycatch-project-a-collaborative-approach-understanding-multi-taxa-bycatch-vulnerable-species-mediterranean-fisheries-and-testing-mitigation
31	Albania, Cyprus, France, Greece, Israel, Italy, Libya, Malta, Spain, Turkey	Mediterranean Elasmobranchs Citizen Observations (MECO)	Improved knowledge of distribution of elasmobranchs in the Mediterranean	Research, Education	Conservation effort	2018		Ongoing	2020	Survey	https://www.researchgate.net/project/The-MECO-Mediterranean-Elasmobranchs-Citizen-Observations-project
32	Tunisia	Mediterranean guitarfishes: addressing fisheries pressure and market demand	To determine level of commercialisation of guitarfishes in the Eastern and Southern Mediterranean.	Research, Measure proposal, Capacity increase	Commercial Fisheries management	2021		Planned	2020	Web-based research	https://saveourseas.com/project/mediterranean-guitarfishes-addressing-fisheries-pressure-and-market-demand/
33	Spain	Monitoring of devil rays occurrences around the Balearic Islands	The main objectives of the project are: 1) to examine the migration patterns and vertical movements of the species, and 2) to collect DNA samples to characterise the Mediterranean population.	Research, Education	Conservation effort	2018		Ongoing	2020	Survey	https://www.savethemed.org/en/our-projects/research-projects/
34	Bosnia and Herzegovina	National Geographic BioBlitz: the intense period of biological surveying in the Eastern Adriatic Sea	Research of elasmobranchs in the Adriatic to create conservation measures.	Research, Measure proposal	Conservation effort	2021	2021	Planned	2020	NGO survey	sharklab-adria.org

35	Spain	Sample projects for the mitigation and reduction of the incidental catches of protected turtles, birds, mammals and elasmobranchs and other non-targeted species by different fishing gear.	Reducing bycatch	Measure proposal	Commercial Fisheries management	2018		Ongoing	2018	Article 16 Technical Assessment of the MSFD 2015 reporting on Programme of Measures Spain Report Version 5 – April 2018	Report review
36	Spain	Occurrence of pelagic sharks around the Balearics. Shark Conservation using BRUV observations	Determining occurrence of sharks in the Balearic Islands through non-invasive field observations to create conservation measures.	Research, Measure proposal	Conservation effort	2017	2021	Ongoing	2020	Survey	https://www.sharkmed.org/proyecto/Trabajo-de-campo%3A-salidas-con-BRUV
37	Bosnia and Herzegovina	Quantification of the microplastic debris in the by-catch samples from marine and freshwater small-scale fisheries in Bosnia and Herzegovina	Assessing microplastic pollution impact on sharks to inform public.	Research, Education	Conservation effort	2020		Ongoing	2020	NGO survey	sharklab-adria.org
38	Montenegro	Reducing the Negative Impact of Tuna Fisheries on Pelagic Sharks and Their Conservation in Montenegrin Part of the Adriatic Sea	Impact reduction	Measure proposal	Commercial Fisheries management	2017	2017	Completed	2020	Survey	https://www.rufford.org/projects/ilija-%C4%87etkovi%C4%87/reducing-the-negative-impact-of-tuna-fisheries-on-pelagic-sharks-and-their-conservation-in-montenegrin-part-of-the-adriatic-sea/

39	France	RéPAST project (Raie pastenague)	It aims to (1) evaluate, during the ascent of the gear, the mortality rate of the pelagic ray (<i>Pteroplatytrygon violacea</i>), a species very frequently caught by the longline fishery targeting bluefin tuna (2) to clarify residence times and their critical habitats, (3) to know their movements on small and large scales, (4) to test the existence of genetically differentiated subpopulations. In 2015, 14 individuals were equipped with satellite marks and 8 with pressure temperature sensors. 50 muscle samples were collected for genetic analysis. This project has been extended by one year and will be completed in December 2016	Research, Informed management decision making	Commercial Fisheries management	2015	2016	Completed	2016	Report of the eighteenth session of the SCIENTIFIC ADVISORY COMMITTEE ON FISHERIES, Nicosia, Cyprus, 21–23 March 2016	Report review
40	Albania, Italy	SafeSharks	Reduce bycatch of longline fleet in Adriatic and improve post-release survival of elasmobranchs caught.	Capacity increase, Education, Measure proposal	Commercial Fisheries management	2018	2020	Ongoing	2020	Survey	https://mava-foundation.org/grants/safesharks/
41	Bosnia and Herzegovina	Shark Tales: the effects of habitat loss and pollution on elasmobranch health and specific disease development	Investigation impacts of pollution and habitat loss on elasmobranch health to inform conservation measures.	Research, Informed management decision making	Conservation effort	2018	2018	Completed	2020	NGO survey	sharklab-adria.org
42	Albania	Sharks, Skates and Rays of Albania: The Final Step towards the Regional Conservation,	Improved legal protection for elasmobranchs in Albania	Measure proposal, Research	Conservation effort	2021		Planned	2020	Survey	https://www.rufford.org/projects/andrej-gajic/sharks-skates-and-rays-albania-final-step-towards-regional-conservation-governance-and-management/

Governance and Management											
43	Tunisia	Status of elasmobranchs and sea turtles in the purse seine and surface longline fisheries in the Gulf of Hammamet	Impact assessment of fisheries	Research, Informed management decision making	Commercial Fisheries management	2019	2020	Ongoing	2019	Report of the twenty-first session of the SCIENTIFIC ADVISORY COMMITTEE ON FISHERIES, Cairo, Egypt, 24–27 June 2019	Report review
44	Spain	Tagging of elasmobranch bycatch	Release and trace movement of bycaught elasmobranch species	Research, Recovery	Fisheries management	2021		Planned	2020	Survey	https://www.savethemed.org/en/our-projects/research-projects/
45	Algeria	Preliminary study on the extent of incidental catches and depredation along the Algerian coast	The project aims to: - identification of interactions between fishing activity and endangered marine species such as cetaceans, sharks, turtles and seabirds; - the assessment of the socio-economic impacts generated by the phenomenon of depredation; - proposal of measures to be adopted in order to mitigate negative interactions, protect and conserve endangered species in coordination with the profession; - the establishment of a monitoring system.	Research, Measure proposal	Commercial Fisheries management	2015	2017	Completed	2016	Report of the eighteenth session of the SCIENTIFIC ADVISORY COMMITTEE ON FISHERIES, Nicosia, Cyprus, 21–23 March 2016	https://mava-foundation.org/wp-content/uploads/2021/08/cb5405en-1.pdf
46	Bosnia and Herzegovina	The Next Step for the Establishment of the Long-Term In-Situ Conservation of Sharks, Skates and	Design and propose conservation measures for elasmobranchs at national level while raising awareness.	Research, Measure proposal, Education, Capacity increase	Conservation effort	2018	2019	Completed	2020	NGO survey	https://www.rufford.org/projects/andregajic/the-next-step-for-the-establishment-of-the-long-term-in-situ-conservation-of-sharks-skates-and-

		Rays in Bosnia and Herzegovina										rays-in-bosnia-and-herzegovina/
47	Bosnia and Herzegovina	The SharkLab is working on implementation of project "Establishing the first MPAs in Bosnia: Protecting the highly endangered habitats and spawning sites of skates and rays in the Neum bay".	Establishment of Marine Protected Areas	Research, Measure proposal	Conservation effort	2018	2020	Ongoing	2019	CBD report 2019		https://www.waittoundation.org/projects-2/association-for-animal-protection-and-inventory%3A-1st-mpas-in-bosnia
48	Albania	The starting point for saving Albania's sharks.	There are currently no efforts of Albanian government to conserve sharks, the project tries to create a scientific basis for action.	Research, Capacity increase, Education, Measure proposal	Conservation effort	2017		Ongoing	2020	Survey		https://www.rufford.org/projects/andrej-gajic/sharks-skates-and-rays-albania-final-step-towards-regional-conservation-governance-and-management/
49	Spain	SUBMON: Update on current state of elasmobranchs in Spain	Update on current state of elasmobranchs in Spain	Research, Informed management decision making	Conservation effort	2016		Ongoing	2020	Survey		Survey questionnaire
50	Bosnia and Herzegovina	Plastic Sharks: habitat research, microplastic quantification, disease development and conservation	Assessing microplastic pollution impact on sharks	Research, Informed management decision making	Conservation effort	2020		Ongoing	2020	NGO survey		https://corporate.discovery.com/discovery-newsroom/the-explorers-club-discovery-announce-first-wave-of-grants-to-fund-an-array-of-scientific-expeditions/

51	Greece	The project “Addressing the interaction between SSF and marine megafauna in Greece” (INCA)	This provides for the first-time robust data from throughout the country on the impact of fishing activities on key marine megafauna. - incl. elasmobranchs	Education, Research, Informed management decision making	Fisheries management	2020	2021	Ongoing		Together for the Med	https://www.togetherforthemed.org/our-actions/inca-greece-11.html
52	Turkey	Can Opportunistic Sampling Provide Information for Conservation of Sharks and Rays?	Gather ecological information for improved conservation	Research, Informed management decision making	Conservation effort	2015	2015	Completed	2020	Rufford Foundation	https://www.rufford.org/projects/elizabeth-grace-tunka-bengil/can-opportunistic-sampling-provide-information-for-conservation-of-sharks-and-rays-chondrichthyans-population-genetics-and-breeding-ecology-in-turkish-seas/
53	Turkey	Is Opportunistic Sampling Enough? Shark and Ray Population Genetics and Bioecology in Eastern Mediterranean, Turkey	Gather ecological information for improved conservation	Research, Informed management decision making	Conservation effort	2016	2017	Completed	2020	Rufford Foundation	https://www.rufford.org/projects/elizabeth-grace-tunka-bengil/is-opportunistic-sampling-enough-shark-and-ray-population-genetics-and-bioecology-in-eastern-mediterranean-turkey/
54	Turkey	Conservation of Top Predators through Monitoring and Capacity Building in the Gökçeada Island (North Aegean Sea)	Determine fishign impact and improve fisheries management for conservation	Research, Capacity increase, Informed management decision making	Conservation effort	2019	2020	Ongoing		Rufford Foundation	https://www.rufford.org/projects/nurbikem-kesici/conservation-of-top-predators-through-monitoring-and-capacity-building-in-the-g%C3%B6k%C3%A7eada-island-north-aegean-sea/
55	Spain	Baselines for butterfly babies. Determine population status of <i>G. altavela</i>	Determine population status of <i>Gymnura altavela</i> locally and raise awareness.	Research, Education	Conservation effort	2019		Ongoing	2020	Survey	https://saveourseas.com/project/baselines-for-butterfly-babies/

		locally and raise awareness.									
56	Spain	Batoids consumption and commerce in Valencia	Study main pollutants in batoids samples from local markets and analyse through DNA their correct labelling.	Research, Informed management decision making	Fisheries management	2020	2021	Ongoing	2020	NGO survey	https://www.facebook.com/associaciolamna
57	Greece	Batoids on your plate	Batoids on your plate: Using genetic analysis assessing species composition of the European ray trade	Research, Informed management decision making	Fisheries management	2019	2020	Ongoing	2020	Web-based research	https://saveourseas.com/project/mediterranean-diet-are-rays-on-the-menu/
58	Montenegro	Distribution and Conservation of Vulnerable Blue Shark (<i>Prionace glauca</i> L.) in Coastal Waters of Montenegro	Blue shark abundance while educating fishermen	Research, Education	Conservation effort	2016	2016	Completed	2020	Rufford foundation	https://www.rufford.org/projects/ilija-%C4%87etkovi%C4%87/distribution-and-conservation-of-vulnerable-blue-shark-prionace-glauca-l-in-coastal-waters-of-montenegro/
59	Israel	MKMRS: Shark tourism and economics	Determine feasibility and impacts of shark tourism around Haifa	Research, Informed management decision making	Conservation effort	2017	2021	Ongoing	2020	Survey	Survey questionnaire
60	Spain	Pelagic stingray project (<i>Pteroplatytrygon violacea</i>)	Improve species knowledge and identify important areas	Research, Education, Improved management-decision making	Conservation effort	2018		Ongoing	2020	Web-based research	https://www.catsharks.org/proyectos/
61	Croatia, Cyprus, France, Greece, Libya, Spain	Angel shark project	Developing and implementing regional action plan for Angel sharks	Research, Capacity increase, Education, Policy strategy	Conservation effort	2014		Ongoing	2020	Survey	https://angels sharknetwork.com/#network

62	Bosnia and Herzegovina, Croatia, Montenegro, Slovenia	Avoiding extinction of angel sharks in the eastern Adriatic Sea	To determine status of angel sharks and impacts of fishing and microplastic in the region and determine conservation actions	Research, Capacity increase, Education, Policy strategy	Conservation effort	2020	2021	Ongoing	2020	Survey	https://www.fondationensemble.org/en/projet/avoiding-extinction-of-angel-sharks-in-the-adriatic-sea/
63	France	Agir à son échelle. Enable consumers to make informed decisions	Enable consumers to make informed decisions	Education	Fisheries management	2017		Ongoing	2020	Web-based research	https://www.asso-ailerons.fr/agir-a-son-echelle/

Annex table 10. Leading entity contribution to measures implemented national level.

Country	Total No. measures implemented	Government (%)	NGO (%)	Researchers (%)
Spain	46	50.00	39.13	10.87
Greece	36	52.78	38.89	8.33
Italy	33	63.64	9.09	27.27
Croatia	27	70.37	18.52	11.11
Malta	27	59.26	25.93	14.81
Cyprus	26	53.85	26.92	19.23
Israel	25	56.00	12.00	32.00
France	24	54.17	37.50	8.33
Turkey	24	58.33	20.83	20.83
Albania	19	63.16	26.32	10.53
Algeria	19	68.42	0.00	31.58
Slovenia	19	68.42	15.79	15.79
Bosnia and Herzegovina	18	33.33	66.67	0.00
Montenegro	17	64.71	11.76	23.53
Tunisia	15	73.33	6.67	20.00
Egypt	14	92.86	0.00	7.14
Morocco	14	78.57	7.14	14.29
Lebanon	13	76.92	0.00	23.08
Libya	13	61.54	23.08	15.38
Syria	12	83.33	0.00	16.67
Monaco	7	100.00	0.00	0.00
Palestine	3	0.00	0.00	100.00
Average		62.86	17.56	19.58

Annex 2: Survey questionnaires

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Participant Consent

Research Project Title:

Assessing countries' background, set-up, role, and approach to shark conservation

Lead researcher: Lydia Koehler (lydia.koehler@plymouth.ac.uk)

This agreement is made regarding the information provided through the survey which took place on [DATE].

In consideration of my participation in the research and other valuable consideration provided by the University of Plymouth (“**University**”), I declare the following:

Declaration:

- I confirm that I have read and understood the participant information sheet for this study, and I have had the opportunity to ask questions about the study.
- I [NAME] voluntarily agree to participate in this research study.
- I understand that I answer in my capacity as [POSITION] on behalf of [ORGANISATION/ENTITY/INSTITUTE/EXPERT DIVISION].
- I understand that even if I agree to participate now, I can refuse to answer any question.
- I understand that I can withdraw permission to use data from my interview within one month after the interview, in which case the material will be deleted.
- I understand that I will not benefit directly from participating in this research.
- I agree to my interview being audio-recorded (in case of an interview).
- I understand that my personal data (name, contact details, position) will not be disclosed and kept confidential.
- I understand that in any report on the results of this research my identity will remain anonymous. This will be done by disguising any details of my interview which may reveal my identity or the identity of people I speak about and only report the results of my interview within specific groups or referring to my organisation/entity/institute/expert division.
- I understand that the information provided in this survey/interview will be used and analysed within the course of this project and may be subject to publication.
- I understand that the research will be written up as part of a PhD thesis by Lydia Koehler.
- I grant to the researcher and the University the right to use this survey (in whole or in part, transcribed or otherwise) for educational, research, and promotional purposes, such uses include but not limited to the respective PhD thesis, print and online publication, and conference presentation.

- I understand that disguised extracts from my interview may be quoted in the respective PhD thesis, conference presentations, published papers.
- I understand that signed consent form, survey responses and original audio recordings (interview) will be retained in a secured laptop with back-ups being saved on a password protected external hard drive and the University's One Drive student account to which only the PhD student and her supervisors will have access. The forms and interviews will be stored there for two years after the end of the project/award of the PhD, maximum until end of 2025.
- I agree that my data may be managed, stored and archived at the University in accordance with the UK Data Protection Act 1998 and that the University may store electronically the information and recordings outside the European Economic Area (EEA).
- I understand that I am entitled to request a copy of my interview and respective forms at any time while it is in storage as specified above.
- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.
- I understand that the Ethics Committee of the University has reviewed and approved this study.
- I agree to taking part in the above study and recording, and hereby assign to the University all copyright in my contribution for use in all work resulting from this project.
- I understand how to raise any concerns or complaints about this study.
- I am aware that there are no compensation arrangements.
- This consent form shall be governed in all respects by English law and the English courts.

Name/ signature and date:

Date

Signature (please type your name)

Survey: Government/Public entities

The project investigates different aspects of shark conservation and management.

The term “sharks” in this project and the surveys refers to all elasmobranchs (sharks, skates, and rays). Please consider this when filling in the survey.

This survey is designed for governmental and regulatory entities involved in marine biodiversity conservation and management. This also includes bodies/entities that regulate, control, and manage fisheries.

Please keep in mind that the questions relate to measures and regulations implemented nationally.

* Asterisk indicates required fields.

Section 1: General information

As stated above, personal information will not be made public.

* First name

* Last name

* e-mail

* Entity you work for/represent

* Your position

* Country

Website link of your entity

Section 2: Shark conservation and management

This section focuses on conservation measures implemented nationally that support shark conservation. "Shark" includes sharks, skates, and rays.

Is “shark conservation” considered a priority in your country’s political agenda for marine conservation?

Yes.

No.

I do not know.

If “No”, please indicate what your current priority in terms of marine conservation is:

Is sustainability considered a priority in your country’s political agenda for fisheries?

Yes.

No.

I do not know.

If “No”, please indicate what your current priority in terms of fisheries management is:

Is there a National Plan of Action for Sharks (NPOA)?

Yes.

No.

There is a regional plan of action for elasmobranchs which is implemented nationally.

If “yes”, please indicate the current state of the NPOA (multiple may apply):

Under development (drafting stage)

Currently implemented

Updated (at least) every 4 years

Updated less than every 4 years

Not updated since first draft

Please submit a copy of the NPOA with this survey or provide a link to it:

Please list all shark species that are protected under national law. Or provide a link to the respective legislation.

How much of the national waters are designated as marine protected area (in km²)?

km²

Are there marine protected areas that do support shark conservation?

- Yes. There are MPA(s) specifically designated for sharks.
- Yes. There are MPA(s) in which sharks occur and that can benefit shark conservation.
- No. There are no MPAs that host sharks or are relevant for shark conservation.

If “Yes”, please list the area (name, location, size) of the respective MPA for sharks and whether there is a management plan in place, and if so whether fishing is allowed or not (No-take area).

MPA name	Location (Coordinates, link, map)	Size (km ²)	Shark species present in MPA	Management plan (Yes/No/ under development)	No take area? (partial/full)

Are there species recovery plans for sharks in place?

Yes.

No.

If "Yes", please indicate for which shark species you have such recovery plans.

Please indicate any other conservation programmes or measures for shark species that is implemented nationally:

Section 3: Fisheries, market, and trade regulations

This section focuses on measures and regulations implemented nationally that are relevant to fisheries, marketing, and trade of sharks.

3.1 Commercial fisheries

This section focuses on regulatory measures implemented for species subject to commercial fishing pressure.

Is there a National Fisheries Management Plan in place?

Yes.

No.

If "Yes", please provide a link (or attach a copy with the survey).

Are sharks consumed/marketed nationally?

Yes.

No.

Please describe the shark fisheries taking place in your country:

Sharks may be caught, but they are not marketed.

Sharks are not targeted but caught as non-target catch/bycatch and marketed/sold.

Only specific shark species are targeted, other caught as bycatch. Both are marketed.

Sharks are targeted in general and sold/marketed nationally.

Other. ***Please specify:**

***If only certain species are targeted, please list these species.**

Are sharks considered "commercially important"?

Yes.

No.

I cannot say.

Are there subsidies for commercial fishing?

Yes.

No.

I cannot say.

If "yes" please specify:

Regulations and measures implemented nationally for commercial fisheries

Please select as applicable to your country.

Finning ban. Please specify:

Fin to carcass ratio

Fins naturally attached

Other. Please specify:

Retention ban. *If yes, please list species for which the ban applies:

Fishing ban. Please specify:

Partially. *If yes, please list species for which the ban applies:

Fully (all sharks, skates, and rays in national waters).

Stock assessment (for shark species subject to fishing pressure).

*If yes, please list species for which there are stock assessments in place:

(Landing) Port controls.

*If yes, please list how often/regular you exercise port controls on fishery landings:

Reporting of shark landings. Please indicate how shark landings are reported and whether there is a Logbook for Bycatch.

- By individual species.
- By species groups.
- As aggregated category/ as "other"
- Not recorded/reported.
- Bycatch Logbook in place.

Bycatch mitigation/elimination. Please specify:

Pilot studies on new bycatch mitigation devices/options.

*If yes, please list the pilot study(ies) that are currently executed:

Applied bycatch mitigation for certain fishing methods (e.g. circular hooks, magnets). *If yes, please list what bycatch mitigation for sharks are in place:

Gear restrictions (prohibition of certain fishing gear).

**If yes, please list what gear restrictions are in place:*

Lost fishing gear removal. Please specify:

Obligation to report lost/discarded fishing gear for fishermen

Obligation to report and remove lost/discarded fishing gear for fishermen

Minimum landing size (MLS) (for shark species).

**If yes, please list species for which there are MLS nationally and applicable MLS:*

Catch limits/quota for shark species.

**If yes, please list species for which quotas are in place:*

Closures. Please specify:

Temporal closures. **If yes, please list closure period and area location:*

Permanent closure (e.g. for nursery, aggregation areas).

**If yes, please list location of the area and why it is closed:*

Other closures. **Please specify:*

Fisheries observers in place. Please specify:

Regular deployment of fisheries observers.

**If yes, please list how many observers per boat and how often they are observing:*

Occasional deployment of fisheries observers.

***If yes, please list how many observers per boat and how often they are observing:**

Cameras installed on board of fishing vessels.

Other regulatory measures for commercial fisheries relevant to shark conservation and management. ***Please specify:**

3.2 Market regulations

This section focuses on information and regulatory measures implemented for selling and marketing shark products (meat, fins, etc.).

Please select as applicable to your country.

Labelling of shark products. **If products are labelled, please select what information is shown on the label (multiple options may apply):**

Shark species - common (local) name

Shark species - scientific name

Fisheries area

Saltwater/Freshwater origin

Conservation status (e.g. national list or ICUN Redlist classification)

Population trend (e.g. “declining”, “stable”, etc.)

Other. **Please specify:**

Market inspections . Please specify:

Visual inspections. ***Please specify how regular these inspections are carried out:**

Genetic sampling of shark products.

***Please specify how regular these inspections are carried out:**

Promotional campaigns for shark meat/products. *Specify campaign, please:

Product certification/Eco-label. Please specify:

Nationally developed fishing certification

Other (e.g. Marine Stewardship Council), **please specify:**

Other. Any other measures implemented nationally.

***Please specify:**

3.3 Recreational fisheries

This section focuses on regulatory measures implemented for recreational fishing (of sharks). Please select as applicable to your country.

Are there regulations applicable to recreational fisheries?

Yes.

No.

***If “Yes”, please fill in the following section on applicable regulations:**

Regulations:

Please select as applicable to your country.

Retention ban. *If yes, please list species for which the ban applies:

Fishing ban. **Please specify:**

Partially. *If yes, please list species for which the ban applies:

Fully (all sharks, skates, and rays in national waters).

Limits/permits. **Please specify:**

Bag/catch limits for sharks. ***If yes, please specify limit and respective species:**

Permits for recreational fishing

Other regulatory measures for recreational fisheries relevant to shark conservation and management. ***Please specify:**

3.4 Trade of shark products

This section focuses on measures regulating shark product trade nationally.

Please select as applicable to your country.

Does your country export shark products (meat, fins, oil, etc)?

Yes.

No.

If “yes”, please list the products your country exports:

If shark products are exported, is this export considered “important” for the economy?

Yes.

No.

Cannot say/Do not know.

Does your country import shark products (meat, fins, oil, etc)?

Yes.

No.

If “yes”, please list the products your country imports:

If shark products are imported, is this import considered “important” for the economy?

Yes.

No.

Cannot say/Do not know.

If shark products are traded, please indicate whether one of the following measures/regulations applies/is implemented nationally:

Non-detriment findings (in line with the Convention on Trade of Endangered Species-CITES: <https://www.cites.org/eng/prog/ndf/index.php>)

****If NDFs are conducted, please list the species for which there is a NDF:***

Permits for CITES-listed species. **Please specify:**

Export permits

Import permits

Total prohibition of trade of protected species.

Taxation for shark products. **Please specify:**

Export taxes

Import taxes

If taxation exists, please specify for which products these apply and how the taxes are used:

Other regulatory measures for trade of shark products.

***Please specify:**

Section 4: (Shark) Tourism

This section focuses on measures regulating (shark) tourism nationally.

Please select as applicable to your country.

Is shark tourism conducted/executed in the country?

(Shark tourism refers to activities actively promoting shark encounters through e.g. diving, guided snorkeler tours, etc.)

Yes.

No.

Of no, please continue to section 5.

If yes, please indicate whether one of the following measures/regulations apply/are implemented nationally:

Code of Conduct

Eco- certification for operations

Permits. **Please specify:**

Operational permits

Entry permits (to certain marine areas)

Feeding ban. **Please specify:**

Prohibition of baiting

Prohibition of feeding animals

Visitor control (*Permitted max. number of tourists at one time*)

Educational programme

(Voluntary briefing of tourists presenting aspects of species behaviour and ecology.)

Other regulatory measures for shark tourism.

***Please specify:**

Section 5: Additional information

Does your entity cooperate with national or international non-governmental organisations?

Yes.

No.

If yes, please specify which organisations you are working with:

Are there currently any projects on shark conservation, fisheries (e.g. stock assessment), or regulations (e.g. pilot projects on shark catch mitigation) that are carried out by the government?

Yes.

No.

**If yes, please list the projects currently being implemented or planned.*

Project	Duration (YEAR to YEAR)	Objective	Shark species affected	Approximate costs/budget	Please list relevant partners

What is the annual budget for the following sectors?

Please indicate applicable currency.

Fisheries management:

Marine conservation:	
Marine research:	
Enforcement (marine):	

Are there any capacity restraints to effectively conserve shark populations and manage shark fisheries? (please *select all that apply*)

- Enforcement capacity restraints
- Budget restrains
- Gap in expert knowledge
- Other, **please specify:**

Are there any legal cases (e.g. seizures, fines, court cases) in which sharks have been fished or killed illegally that you can share?

- Yes.
- No.

If yes, please submit a list with this survey, if possible.

By ticking this box, I agree that I can be contacted after submission of this survey for follow-up questions regarding this study.

By ticking this box, I would like to ask the researcher to keep me updated on the outcomes of this study.

Additional comments and remarks you would like us to consider:

Survey: Non-governmental organisations

* Asterisk indicates required fields.

Section 1: Basic information

* First name

* Last name

* e-mail

* Name of your organisation

* Your position within the organisation

* Country

* Year your organisation was founded

Website link

* Current number of members

Section 2: Contribution, empowerment, national environment

Are sharks consumed/marked nationally?

Yes.

No.

Please describe the shark fisheries taking place in your country:

- Sharks may be caught, but they are not marketed.
- Sharks are not targeted but caught as non-target catch/bycatch and marketed/sold.
- Only specific shark species are targeted, other caught as bycatch. Both are marketed.
- Sharks are targeted in general and sold/marketed nationally.
- Other. **Please specify:**

If only certain species are targeted, please list these species.

What problems/changes do you observe in your country?

(Choose all that apply.)

- Protected shark species are regularly caught and marketed.
- Shark meat is mislabelled/wrongly labelled.
- Shark meat is actively promoted.
- There is an increase in shark meat being sold over the past 10 years.
- Finning occurs.
- Recreational fishers illegally sell sharks.
- Other. **Please specify:**

Do you work with the national government?

- Yes.
- No.

If yes, please specify:

o you receive any financial support from the government?

- Yes.

No.

If yes, please specify:

Would you say there is governmental support for shark conservation and sustainable fisheries management in your country?

Yes.

No.

I do not know.

Would you say there is need for improved policies and government actions for shark conservation and sustainable fisheries management?

Yes.

No.

I do not know.

If yes, would you say there is sufficient scientific knowledge for your government to improve shark conservation and sustainable fisheries management?

Yes.

No.

I do not know.

What would you describe your position/influence on national policy making as?

Low. The government is unlikely to respond to our requests and we do no or very rarely work with the government.

Medium. Your organisation works occasionally with the government and the government listens to their advice.

Strong. Your organisation has a close relationship with your national government. You work closely together, and the government listens to, even requests, your advice on policies.

Other. *Please specify:*

How informed is the public on shark related issues, in your opinion?

Not well informed. A low percentage (if any) of the local population is aware of shark conservation efforts and issues, including shark products and meat.

- Moderately informed. There is a general understanding of marine conservation issues with some knowledge on shark related issues in the public.
- Very well informed. The public is well aware of issues related to shark conservation and management.
- Other. **Please specify:**

Would you say there is public support for shark conservation in your country?

- Yes.
- No.
- I do not know.

What would be priority action(s) for shark conservation and management in your country?

This can refer to actions such as increase enforcement, establish protected areas for sharks, improve labelling of shark products, etc. (you may list multiple)

Section 3: Projects and activities

This section focuses on projects and activities carried out by your organisation.

3.1) Education and awareness activities

This section focuses on activities that are meant to increase public awareness and education in relation to shark conservation and management. Such activities can, for example, include school events, information stands, snorkel trips, projects focused on awareness raising. This section also includes training activities, such as species identification training, volunteer programmes, and internships. This does not include research projects with an awareness component. Such projects will be listed separately.

Does your organisation offer volunteer programmes?

Yes

No

If yes, please indicate how many volunteers you have (on average per year)?

If yes, please specify where your volunteers are from:

Our volunteers are mainly from abroad.

Our volunteers are mainly local/nationals.

Our volunteers are both local and foreign.

Other

Please specify:

Does your organisation hold regular awareness events nationally?

Yes

No

If yes, please indicate the type of events you participate in/organise and the regularity (e.g. once a week):

(choose all that apply)

Public awareness events. Regularity:

Snorkel trips. Regularity:

School presentations. Regularity:

University presentations. Regularity:

Annual, national events: please specify events:

Other. Please specify activity and regularity:

Does your organisation hold training events (e.g. species identification for fishermen)?

Yes

No

If yes, please specify the kind of training your organisations provides and how often:

Does your organisation design/print their own awareness material?

Yes

No

What is (approximately) your annual costs/budget for awareness raising events and material? (please indicate currency)

Is your organisation part of any larger awareness raising projects (nationally or internationally)?

Yes

No

If yes, please provide details:

Project name/link	Start/End (Year to Year)	Approximate costs/budget	Country(ies) in which the project is carried out	Partners involved (if applicable)

3.2) Research activities

This section focuses on activities with the objective to increase knowledge on elasmobranchs. Such activities can, for example, include market surveys, occurrence monitoring (e.g. underwater surveys), or genetic studies. This does not include projects or activities that aim for conservation of species, e.g. marine protected area co-management, recovery programmes, etc.

Please indicate which of the following applies in relation to research projects for your organisation:

(This applies to national and international research.) *(multiple may apply)*.

- Our organisation has been conducting /has conducted research projects in the past 5 years.
- Our organisation has ongoing research projects.
- Our organisation is currently planning to carry out new research projects.
- Our organisation is not involved in any research projects.

If research projects are carried out, please specify all activities and projects that have been carried out in the past 5 years, those that are ongoing, and those planned. If you have website links to any of the activities, please include.

Research project/link	Start/End (Year to Year)	Objective	Species investigated	Approximate costs/budget	Country(ies) in which the research is carried out	Is this project carried out in cooperation with other entities/ organisations?	If applicable, please list entities and organisations involved (e.g. government entities, other NGOs, etc.). This also includes if "Citizens" are involved /Citizen science. <i>Enter multiple, if applicable.</i>

For additional projects (that do not fit in here), please submit information on separate sheet.

3.3) Conservation projects

This section focuses on activities with the objective to conserve elasmobranchs. Such activities can, for example, include stock recovery projects, projects aiming to declare marine protected areas for elasmobranchs, projects on bycatch mitigations, etc.

Please indicate which of the following applies in relation to conservation projects for your organisation:

(This applies to national and international projects.) *(multiple may apply)*

- Our organisation has been conducting /has conducted conservation projects in the past 5 years.
- Our organisation has ongoing conservation projects.
- Our organisation is currently planning to carry out new conservation projects.
- Our organisation is not involved in any conservation projects.

If conservation projects are carried out, please specify all activities and projects that have been carried out in the past 5 years, those that are ongoing, and those planned. If you have website links to any of the activities, please include.

Project/link	Start/End (Year to Year)	Objective	Species investigated	Approximate costs/budget	Country(ies) in which the project is carried out	Is this project carried out in cooperation with other entities/ organisations?	If yes, please list entities and organisations involved (this included government entities, other NGOs, etc.). This also includes if “Citizens” are involved /Citizen science. <i>Enter multiple, if applicable.</i>

For additional activities (that do not fit in here), please submit information on separate sheet.

3.4) Policy campaigns

This section focuses on activities with the objective to request change in regulation. Such activities include for example petitions, campaigns for legal change, campaigns requesting government actions or legal changes, public campaigns, demonstrations, etc.

Is your organisation involved in any political campaigns?

Yes.

No.

If political campaigns are carried out, please specify all activities and projects that have been carried out in the past 5 years, those that are ongoing, and those planned. If you have website links to any of the activities, please include.

Campaign & aim	Target groups	Approximate costs/budget	Country(ies) in which the campaign is carried out.	Is this campaign carried out in cooperation with other entities/ organisations?	If yes, please list entities and organisations involved (this included government entities, other NGOs, etc.). <i>Enter multiple, if applicable.</i>

For additional campaigns (that do not fit in here), please submit information on separate sheet.

Section 4: Additional remarks

By ticking this box, I/our organisation agree(s) that I can be contacted after submission of this survey for follow-up questions regarding this study.

By ticking this box, I/our organisation would like to ask the researcher to keep me updated on the outcomes of this study.

Additional comments and remarks you would like us to consider:

Survey: National researchers/experts

* Asterisk indicates required fields.

Section 1: Basic information

* First name

* Last name

* e-mail

Name of your research
institute/affiliation *(if applicable)*

Your position

* Country

Section 2: Contribution, empowerment, national environment

Are sharks consumed/marketed nationally?

Yes.

No.

Please describe the (shark) fisheries taking place in your country:

Sharks may be caught, but they are not marketed.

Sharks are not targeted but caught as non-target catch/bycatch and marketed/sold.

Only specific shark species are targeted, other caught as bycatch. Both are marketed.

Sharks are targeted in general and sold/marked nationally.

Other. **Please specify:**

--

If only certain species are targeted, please list these species.

What problems/changes do you observe in your country?

(Choose all that apply.)

- I am not aware of any problems.
- Protected shark species are regularly caught and marketed.
- Shark meat is mislabelled/wrongly labelled.
- Shark meat is actively promoted.
- There is an increase in shark meat being sold over the past 10 years.
- Finning occurs.
- Recreational fishers illegally sell sharks.
- Other. **Please specify:**

Are you a member of any professional association that focuses on elasmobranchs?

- Yes.
- No.

If yes, please specify:

Would you say there is governmental support for shark conservation and sustainable fisheries management in your country?

- Yes.
- No.
- I do not know.

Do you/your research institute work with the national government?

- Yes.
- No.

If yes, please specify:

Do you/your research institute receive funding from the government?

- Yes.
- No.

If yes, please specify:

Would you say the government invests sufficiently in shark research?

- Yes.
- No.
- I do not know.

Would you say there is need for improved policies and government actions for shark conservation and sustainable fisheries management?

- Yes.
- No.
- I do not know.

If yes, would you say there is sufficient scientific knowledge for your government to improve shark conservation and sustainable fisheries management?

- Yes.
- No.
- I do not know.

What would you/your research institute describe your position/influence as researcher on national policy making as?

- Low. The government is unlikely to respond to requests from researchers and I/ our institute do(es) not or very rarely work with the government.
- Medium. I/our institute work(s) occasionally with the government and the government listens to my/researchers' advice.
- Strong. I/our institute have/has a close relationship with the national government. Researchers and the government work closely together, and the government listens, even requests, researchers' advice on policies.
- Other. ***Please specify:***

Do you/your research institute work with non-governmental organisations (NGOs)?

- Yes.
- No.

If yes, please specify:

How informed is the public on shark related issues, in your opinion?

- I do not know.
- Not well informed. A low percentage (if any) of the local population is aware of shark conservation efforts and issues, including shark products and meat.
- Moderately informed. There is a general understanding of marine conservation issues with some knowledge on shark related issues in the public.
- Very well informed. The public is well aware of issues related to shark conservation and management.
- Other. **Please specify:**

Would you say there is public support for shark conservation in your country?

- Yes.
- No.
- I do not know.

In your opinion, what would be priority action(s) for shark conservation and management in your country?

This can refer to actions such as increase enforcement, establish protected areas for sharks, improve labelling of shark products, etc. (you may list multiple)

Section 3: Projects and activities

This section focuses on activities with the objective to increase knowledge on elasmobranchs (e.g. market surveys, occurrence monitoring, genetic studies) carried out by you/ your institute.

You can also list research activities in that you are not directly involved in but aware of.

Research activities (This applies to national and international research.)

Please include all activities and projects that have been carried out in the past 5 years, those that are ongoing, and those planned.

If you have website links to any of the activities, please include.

Research project/link	Duration (YEAR to YEAR)	Objective	Species investigated	Approx. costs/ budget	Country(ies) in which the research is carried out	Is this project carried out in cooperation with other entities/ organisations?	If yes, please list entities and organisations involved (this includes research and government entities, NGOs, etc.). This also includes if "Citizens" are involved /Citizen science. <i>Enter multiple if applicable.</i>

For additional projects (that do not fit in here), please submit information on separate sheet.

Section 4: Additional remarks

Are there any other activities your/your research institute is carrying out in relation to shark conservation and management (e.g. public campaigns, educational or training courses, awareness events, etc.)?

Yes.

No.

If yes, please provide details:

By ticking this box, I agree that I can be contacted after submission of this survey for follow-up questions regarding this study.

By ticking this box, I would like to ask the researcher to keep me updated on the outcomes of this study.

Additional comments and remarks you would like us to consider: