Area-based management tools and marine fisheries

EUROPEAN BUREAU FOR CONSERVATION & DEVELOPMENT

IUCN CEM FEG

AREA-BASED MANAGEMENT TOOLS AND MARINE FISHERIES

HISTORY, DEFINITIONS, ROLES, TYPOLOGIES, TENSIONS, SYNERGIES, TRADE-OFFS AND EFFECTIVENESS.

PROLOGUE : Space, humans, nature : a shortcut across centuries
By : François Féral and Serge M. Garcia

PART I : Comprehensive review of ABM and ABMTs
By: Serge M. Garcia ; Jake Rice; Jason Link; Merle Sowman; Anthony Charles; Carel J. Augustyn; Ernesto Penas Lado; Joji Morishita; Darius Campbell; Hugh Govan; and Eskild Kirkegaard

PART II : Case studies
By: Colin Attwood, Carey J. Augustyn; Darius Campbell; Ernesto Penas Lado; and Claire Ward

EUROPEAN BOARD OF CONSERVATION AND DEVELOPMENT

IUCN-CEM FISHERIES EXPERT GROUP

2023

LIST OF AUTHORS

Attwood, Colin, G. Biological Sciences Department. University of Cape Town colin.attwood@uct.ac.za

Augustyn, Carel J. IUCN-CEM Fisheries Expert Group. South African Deep Sea Trawling Industry Association (SADSTIA). Cape Town, South Africa. johann@sadstia.co.za

Campbell, Darius. Secretary, North East Atlantic Fisheries Commission (NEAFC). London. United Kingdom. darius@neafc.org

Charles, Anthony. Vice Chair, IUCN-CEM Fisheries Expert Group. Director, School of the Environment & Professor, Sobey School of Business. Director, Community Conservation Research Network. Saint Mary's University, Halifax, Canada. tony-charles@smu.ca

Féral, François. Professor emeritus, University of Perpignan (France). Honorary Director of the École Pratique des Hautes Études. Centre de recherche Insulaire, Observatoire de l'Environnement UAR 3278 UPVD-CNRS-EPHE-PSL Labex CORAIL. France

Garcia, Serge M. IUCN-CEM Fisheries Expert Group. Fiumicino, Rome, Italy. grcsgm@gmail.com

Govan Hugh. IUCN-CEM Fisheries Expert Group. Private consultant. hgovan@gmail.com

Kirkegaard Eskild. IUCN-CEM Fisheries Expert Group. Independent Consultant. Holte, Denmark. kirkegaardeskild@gmail.com

Link, Jason. IUCN-CEM Fisheries Expert Group. Senior Scientist for Ecosystem-based management (NOAA, NMFS). Woods Hole (MA), USA. Jason.link@noaa.gov

Morishita Joji. IUCN-CEM Fisheries Expert Group. Professor, Tokyo University of Marine Science and Technology. Advisor to the Minister of Agriculture, Forestry and Fisheries on International Affairs. Tokyo, Japan. joji.morishita@gmail.com

Penas Lado Ernesto. Chair, IUCN-CEM Fisheries Expert Group. Chair of the International Commission for the Conservation of Atlantic Tunas (ICCAT). ernestopenas@gmail.com

Rice, Jake. IUCN-CEM Fisheries Expert Group. Chief Scientist – Emeritus with Fisheries and Oceans Canada. Jake.rice1948@gmail.com

Sowman Merle. IUCN-CEM Fisheries Expert Group. Department of Environmental and Geographical Sciences, University of Cape Town (UCT), Cape Town, South Africa. Merle.sowman@uct.ac.sa

Ward, Claire. Founder and Editor: FishMedia, Cape Town, South Africa.
Claire@fishmedia.co.za

PREPARATION OF THIS DOCUMENT

The process leading to the preparation of this document started in 2021 among members of the IUCN-CEM Fisheries Expert Group (https://www.ebcd.org/FEG) on the tensions between MPAs and fisheries and the growing emphasis and visibility of area-based management tools in both fisheries and conservation during the last two decades. Discussions went on informally on the potential of these instruments and the tensions, misunderstanding, misinterpretations, and ideologies, affecting and potentially limiting the widespread use of this approach to fisheries.

It was decided that a comprehensive review of area-based management tools would be prepared as a contribution to a better common understanding. A first annotated outline was prepared by S.M. Garcia in January 2022, circulated, and discussed. Dr. François Féral was specifically asked to contribute a prologue, replacing ABMTs in their broad spatial and historical perspective.

The contributions were progressively assembled by S.M. Garcia. Many contributions touched on many interconnected parts of the report. In the progressive review process, many FEG members reviewed specific sections of the report, commenting and editing them, adding material and reference as needed. The consistency across chapters was ensured by S.M. Garcia so that all chapters of the document, except the Prologue and a few specifically requested case-studies can be considered as jointly elaborated by the authors, under the overall responsibility of S.M Garcia for the assemblage and final editing.

Acknowledgements

The following experts have contributed material, ideas, and references, during virtual discussions, by email, or at the request of the authors of this volume : Gunnstein Bakke, Serge Beslier, Bertrand Cazalet, Daniela Diz, Daniel Dunn, Elizabeth Fulton, Elie Jarmache, Kim Friedman, Maria A. Gasalla, Amber Himes-Cornell, Jérome Jourdain, Michel Kaiser, Bjorn Kunoy, Richard Kenchington, and Dimitra Petza. We wish to express our gratitude for their generosity and patience.

The elaboration of this report was supported by the Nordic Council of Ministers and the European Bureau for Conservation and Development.

Attributions: the cover page has been produced by Genuineromanart in Rome (https://genuineromanart.com/home. Figure 5.1 is kindly provided by Adrienne Williams https://adriennewilliams.com/.

M. Garcia who, as main author and editor, remains entirely and solely responsible for any errors in the whole report.

Suggested citation:
Garcia, S.M.; Rice, J.; Link, J.; Sowman, M.; Charles, A.; Augustyn, C.J.; Penas Lado, E.; Morishita, J.; Campbell, D.; Kirkegaard, E.; Govan, H. 2023. Area-based management tools and fisheries: History, definitions, roles, typologies, tensions, synergies, trade-offs, and effectiveness. Brussels, EBCD. Gland, IUCN-CEM-FEG. Available at https://www.ebcd.org/feg

TABLE OF ACRONYMS[1]

ABMT-related acronyms	
ABM	Area-based Management
ABMT	Area-Based management tool
APEI	Areas of Particular Environmental Interest
ASMA	Antarctic Specially Managed Areas
ASPA	Antarctic Specially Protected Areas
ASRM	Area of Sustainable Resources Management
BAC	Block Areas Closure
BBNJ	Biodiversity Beyond National Jurisdiction
BCCA	Bottom Contact Closed Area
BPA	Benthic Protected Area
BPZ	Biological Protection Zone
BTCA	Bottom Trawl Closed Area
CBAM	Community-Based Area Management
CBFM	Community-Based fisheries Management
CB-MPA	Community-Based MPA
CBSFA	Community-Based Subsistence Fisheries Area
CCA	Community Conservation Area
CEAFM	Community-based Ecosystem Approach to Fisheries Management
CFMA	Community Fisheries Management Area
CMER	Coastal Marine Extractive Reserve
EBSA	Ecologically and Biologically Significant Area
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EFZ	Exclusive Fishing zone
FMA	Fisheries management Area
FMU	Fisheries Management Unit
FMZ	Fisheries Management zone
FRA	Fisheries Restricted Area
GCA	Groundfish conservation area
GFA	Groundfish Fishing Areas
HAPC	Habitat area of Particular Concern
IBA	Important Birds and Biodiversity Area
ICAM	Integrated Coastal Area-Based Management
ICCA	Indigenous and Community Conserved Area
ICZM	Integrated Coastal Zoner Management
IMMA	Important Marine Mammal Area
IMTA	Important Marine Turtles Area
ISRA	Important Sharks and Rays Area
KBA	Key Biodiversity Area
LMMA	Locally Managed Marine Area
LS-MPA	Large-Scale MPA
MARF	Marine Area for Responsible Fishing
MCAIP	Marine Coastal Area of Indigenous People
MCZ	Marine Conservation Zone
MEABR	Management and Exploitation Areas for Benthic Resources
MMA	Marine Managed Area
MPA	Marine protected area
MOR	Move-on Rule
MU-MPA	Multiple-Use MPA
NT-MPA	No-Take MPA (reserve)
NbS	Nature-based Solutions
NCP	Nature Contributions to people
NTZ	No-Take zone
OECM	Other Effective Area-Based Conservation Measure
PSSA	Particularly Sensitive Sea Area
PA	Protected area
RTC	Real-time closure
RTI	Real-time incentive
RTSM	Real-Time Spatial Management
RFZ	Regulated Fishing Zone
RCA	Rockfish conservation area
SBH	Sensitive Benthic Habitat
SMA	Special Management Area
SPAMI	Specially Protected Areas of Mediterranean Importance
TURF	Territorial Use Rights in Fisheries
VME	Vulnerable Marine Ecosystem
WHS	World Heritage Site
WMA	Wildlife management area

Other acronyms	
AIGA	Alternative Income-Generating Activity
BBNJ	Agreement of Biodiversity Beyond National Jurisdiction
BIM	Biodiversity Impact Mitigation
CBD	Convention on Biological Diversity
CCAMLR	Convention on the Conservation of Antarctic Marine Resources
CCRF	Code of Conduct on Responsible Fisheries
EAF	Ecosystem Approach to Fisheries
EIA	Environmental Impact Assessment
GBF	Global Biodiversity Framework (CBD)
GEF	Global Environmental facility
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPLC	Indigenous Peoples and Local Communities

[1] Most acronyms have a definition in Annex 1

IUCN:	International Union for Conservation of Nature
MCDA	Multi-Criteria Decision Analysis
MSP	Marine Spatial Planning
NAFO	Northwest Atlantic Fisheries Organization
NEAFC	Northeast Atlantic Fishery Commission
NG	Net Gain (in BIM)
NNL	No Net Los (in BIM)
PES	Payment for Ecosystem Services
RFMO	Regional Fishery Management Organization
RSC	Regional Seas Convention
SEA	Strategic Environmental Assessment
SGE	Sustainable Development Goal
SOFIA	State of Fisheries and Aquaculture (FAO)
UNCED	United Nations Conference on Environment and Development
UNCHE	Un Conference on the Human Environment
UNCLOS	United Nations Conference / Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNGA	United Nations General Assembly
WHC	World Heritage Convention
WSSD	World Summit on Sustainable Development
WWF	World Wildlife Fund

LIST OF FIGURES

Prologue

Figure 3: Fishery management Zone 10, in Northern Ontario (USA). Https://www.ontario.ca/page/fisheries-management-zone-10-fmz-10

Figure 4: Fisheries management areas in The Philippines. From https://ph.oceana.org/our-campaigns/fisheries-management-areas

Figure 5: World map of the Marine Heritage sites. Red circle: Sites declared in danger. Bicolour cercles: Mixed cultural and natural heritage https://unesdoc.unesco.org/ark:/48223/pf0000235316/PDF/235316eng.pdf.multi

Figure 6: Atata Special Management Area in Tongatapu. The SMA boundary is in red and the no-take zone boundary in blue (from Gillet, 2017).

Annex 1

Figure 1: Benthic Protection Areas in New Zealand EEZ (Dark grey shaded areas) (New-Zealand, 2007)

Figure 2. Example of a zoned designated Essential Fish Habitat (EFH) area containing seamounts (in bold) and various exclusion areas for bottom-contact gear (red); bottom-contact gear and other gear below 700 fathoms (green); Bottom trawl gear (yellow); and bottom trawl other than demersal seine (purple). From Frey and DeVogelaere (2014). Map credit: Chad King. Monterey Bay National Marine Sanctuary (MBNMS). Courtesy NOAA, US Department of Commerce.

Figure 3: Fishery management Zone 10, in Northern Ontario (USA). Https://www.ontario.ca/page/fisheries-management-zone-10-fmz-10

Figure 4: Fisheries management areas in The Philippines. From https://ph.oceana.org/our-campaigns/fisheries-management-areas

Figure 5: World map of the Marine Heritage sites. Red circle: Sites declared in danger. Bicolour cercles: Mixed cultural and natural heritage. https://unesdoc.unesco.org/ark:/48223/pf0000235316/PDF/235316eng.pdf.multi.

Figure 6. Atata Special Management Area in Tongatapu. The SMA boundary is in red and the no-take zone boundary in blue (from Gillet, 2017).

LIST OF TABLES

LIST OF BOXES

TABLE OF CONTENTS

ABSTRACT

This report provides a comprehensive review of Area-Based Management Tools (ABMTs) used in the ocean. It focuses on conventional area-based fisheries management measures (ABFMs) used to protect target resources, non-target species, and essential habitats, as well as on MPAs and community-managed multipurpose areas in which fisheries operate.

The review takes an unusually broad perspective on the concept and successive zoning of ocean space, from antiquity to today providing mystic, historical, philosophical, political economy and ecological points of view. It illustrates in a Prologue, the evolution of the ocean space, from the obscure realm of Gods and monsters in the Antiquity, to a fundamental modern space, involved in, and fragmented by processes of war, colonisation, independence, industrial development, environmentalism and financial forces, in a global competition of States and interest groups.

The background on area-based management looks at the human dimensions of ABMTs, including governance; tensions between conservation and sustainable use; trends in area-based management; the UNCLOS overarching framework; unilateral attempts to territorializations; other legal and informal frameworks: institutional efforts from the United Nations and global policy frameworks.

Area-based management is briefly addressed as the framework within which ABMTs are used, to which they are functionally linked and on which their effectiveness depends. Area-based management tools are defined, with their roles, goals and objectives, and their emerging new roles, in relation to ecosystem services, offsets, nature-based solutions, etc. Existing ABMT typologies are examined, particularly in MPAs, area-based fisheries management measures and community-managed multi-purpose areas. It is clear that no single typology can classify all ABMTs and that many purpose-built typologies are possible. The formal names of ABMT categories and the local names of ABMT sites are examined to illustrate the respective nomenclature “rules”.

Human dimensions are often at the core of tensions, synergies and tradeoffs in the use of ABMTs. The concepts and pathways to tension resolution and mobilisation of synergies (or simple complementarity) are examined together with the trade-offs implied. Finally, the central issue of ABMT’s effectiveness is addressed, looking at general considerations emerging from the literature, methodological challenges, factors of effectiveness, and, in fine, the extent to which various types of ABMTs have been effective.

The report presents also some case-studies on ABMTs, in the Northeast Atlantic area; in South Africa, from an industry perspective; in the European Common Fisheries Policy; with a view of the fishing industry on ABMTs. An extensive inventory of 85 ABMT categories is also given in Annex 1, with their names, definitions and a brief on their characteristics.

PROLOGUE

SPACE, HUMANS AND NATURE - A SHORTCUT THROUGH CENTURIES

By Francois Feral[2] and Serge M. Garcia

It is easier to legalize than to legitimize (Champfort. Maximes et pensées, 1795)

Space is not found. It must always be constructed (Bachelard. Le nouvel esprit scientifique,

SUMMARY

The Prologue considers the marine space from the perspective of fisheries and biodiversity conservation, considering their legal, environmental and socio-political dimensions. Though centuries, the antique, mysterious and mystic conception of the ocean space has been progressively replaced by communities' and States' jurisdictions. The modern fishery and ecological visions of the marine space rests on a political-economy representation of space which, through the strong influence of "the West" over the seas and oceans, has gradually become "universal". The most striking phenomenon since the 17th century has been the growing influence of States on marine and oceanic spaces. The early customary maritime law, and then the recent Law of the Sea, are the political and normative expressions of that historical ocean "appropriation" process. However, the modern evolution of fishery and environmental regulations –particularly through area-based management tools –indicate a new step in the conception of marine space that the prologue describes as a background to Part I and II.

The Prologue is structured around the following themes: (i) Evolution from the antique representation of the ocean space to its modern legal construction; (ii) From gods' space to human's space; (iii) Prominence of the modern State in the constitution of marine space; (iv) States' control of marine spaces by maritime law and the Law of the Sea; and (v) A new page in international management of marine spaces: nature protection, knowledge, and marine protected areas.

1. From the antique marine space to its modern legal construction

This prologue opens a comprehensive report on area-based management (ABM), on its broadest sense, and on area-based management tools (ABMTs) in the ocean. It provides a historical background on the subject, starting from the Antiquity and the 15th century splitting of the Earth in two equal parts between Spain and Portugal. It also describes the historical evolution of this space allocation during more than five centuries, to better understand the forces at play in the past and the implications today, when dividing the

[2] Professor emeritus Via Domitia University Perpignan (France). Honorary Director in École Pratique des Hautes Études. Centre de recherche Insulaire Observatoire de l'Environnement UAR 3278 UPVD-CNRS-EPHE-PSL Labex CORAIL (France)

dynamic, interconnected ocean into delimited areas. The authors review very rapidly the concept of space and its evolution with time, from (i) an antique scaring space full of Gods and mystic creatures to (ii) centuries of navigation, trade, discoveries, competition and colonisation; (iii) a framework of spaces shared and controlled by States through the Law of the Sea; and (iv) a huge economic resource for the expansion of the Blue Economy. In the process, the role of States is essential, ocean zoning is progressing; communities are better recognized and involved, and the concern about biodiversity keeps increasing.

The seas and oceans make up most of our planet's space with deceptive physical unity and plural representations. These representations are in fact available in the form of infinity, cornucopia and freedom, but also in the form of danger, unknown, vacuum, last frontier. "Terrestrial people" have often and for a long time considered the sea as an insurmountable barrier filled with threats even though many have learned to enjoy it as a temporary source of recreation. More "aquatic people", like sailors, fishermen, ship-owners, many merchants, and some specialized industries (like oil and gas companies) look to it and use it as the most effective means of communication and as a source of livelihoods and revenues. In these confused and contradictory representations, the notion of *marine space* raises questions of definition and content to facilitate communication between "terrestrial" and "aquatic" people, exchange hypotheses and link reliable data on the subject.

Defining and conceptualizing are always delicate operations because the vision of those involved is inevitably charged with subjectivity and presumptions linked to their culture, background and interests? In these conditions, as Bruno Latour invites us to do, we can say that there are "*several truths*" of the marine space i.e., *different representations* by different actors (Latour, 2006). During centuries the representations of the sea have been nourished by navigation, exploration, fisheries, battles and piracy, as well as by geography, oceanography, myths and religions, from village economy to global maritime trade and to the outer space vision of a blue planet. More recently, these representations have been by influenced tourism, recreation, sailing competitions, growing industrial development (Last Frontier; Blue Economy) and the continuous geopolitical race of States aiming to strengthen their jurisdictions and technocratic governance. In parallel, a more ecological conception of marine space –that we will examine- has been emerging.

The Prologue deals with the marine space from the perspective of fisheries and biodiversity conservation, considering their legal, environmental and socio-political dimensions. The modern fishery and ecological visions of the marine space rests on a political-economy representation of space which, through the strong influence of "the West" over the seas and oceans, has gradually become "universal". The most striking phenomenon since the 17th century has been the growing influence of States on marine and oceanic spaces. The early customary maritime law, and then the recent Law of the Sea, are the political and normative expressions of that historical ocean appropriation process. However, the modern evolution of fishery and environmental regulations – particularly through protected areas –indicate a new step in the conception of marine space that we will examine.

This Chapter is structured around the following themes: (i) the ocean: from Gods' space to a human space; (ii) In modern times, the preeminent place of the modern State in the constitution of marine space; (iii) The States' control of marine spaces by maritime law and the Law of the Sea; and (iv) Improvement and increase of marine zoning in the 20th century for conflict reduction and protection of nature.

2. From Gods' space to human space

2.1 Space is the container of human productions

During Antiquity and the Middle Ages, space exists including the representation of myths and gods of the forests, of the sea and the oceans, of the mountains and of the Earth. This non-human space is also filled with mysteries, monsters and personified animals. For the Greeks of the archaic period, in the Mediterranean marine space they surveyed, explored and colonized, Ulysses is the object of the fury of Neptune and the seduction of the sirens. If in the 8th and 7th centuries BC, the sea described by Homer and Hesiod is the gods' domain. However, despite its myths and its gods, and nourished by its mysteries, the marine space has existed also for many centuries as a socialized space, for example as a circulation route: by the thousands, antique ships used the sea as a means of transport, discovery and trade; a battlefield; an area of ethnic mixture, and colonization; and of course, as fishing grounds.

Closer to us, in pre-colonisation civilisations of the so-called primitive peoples or Prime Nations, nature "fills" the space and is a mighty power that is deified and worshiped (e.g., mountains, rivers, lakes, rain, thunder, other atmospheric powers, animals)[3]. This nature deserved to be feared and respected, but could also be used –with appropriate rituals– for food and other human needs (Guthrie, 1971)[4]. Johannes (1978) describes traditional management of marine resources in Polynesian traditional societies based on a system of values that determines preferences in the satisfaction of needs. The description illustrates a sophisticated village-based utilitarian conservation system of marine resource. These systems combined technical measures comparable to what was considered as state-of-the-art fisheries management measures in Europe, at that time, including tenure systems, closed areas and season, and protected areas, but few gear or fish size regulations. Measures were also taken based on religious or other ritual grounds with potential ecological consequences. The nutritional needs, albeit fundamental, were superseded by transcendental obligations to meet social relationships, kinship responsibilities and other rituals (including animism and totemism)[5]. Economic value was secondary at best. However, that this did not necessarily mean that these peoples lived "In harmony with nature". They also wasted resources and environmentally destructive practices coexisted, as in most societies, with efforts to conserve natural resources (Guthrie, 1971: 355; Johannes, 1978). Following colonization, marine resources dwindled, due to Several interrelated causes including: (i) the introduction of cash economies, (ii) the breakdown of traditional authority and social bond, and (iii) the imposition of new

[3] See for instance https://www.britannica.com/topic/nature-worship

[4] https://www.britannica.com/topic/nature-worship

[5] Animism: the belief that all natural phenomena, including human beings, animals, and plants, but also rocks, lakes, mountains, weather, and so on, share one vital quality—the soul or spirit that energizes them. It is at the core of most Arctic belief systems (Wikipedia) and was common in West Africa. Totemism: system of belief in which humans are said to have kinship or a mystical relationship with a spirit-being, such as an animal or plant, such as bears, birds, frogs, sharks, cetaceans, turtles, and various supernatural beings

laws and practices by colonial powers that redistributed authority on spaces and resources (Johannes, 1978).

The spatial conception of the Enlightenment era in the 18th century, and of the 19th century society, is built on a preconception established by geographers (inspired by political economy) of a planetary space which exists only when it is filled by the whole system of social relations, including the economy and conflicts, and does not exist otherwise. We refer to this concept below (Section 2.1) as the "presumption of vacuity". Space thus becomes explicitly a product constructed by human societies which can thus interact with its content.

"*Space is not found. It has to be constructed*" (Bachelard, 1934).

"*Economic thought integrates the spatial factor into the study of the formation and circulation of wealth*" (Rallet, 1984).

Therefore, social sciences distinguish, on the one hand, a terrestrial reality of space with its material productions and content of human activities and, on the other hand, a societal representation of space based on the values and dynamics of its main actors. Thus, for centuries, sailors, crews, fishermen, explorers and merchants have jointly "constructed" the marine space, its values and dynamics. However, in modern times, with the progress of capitalism within social sciences, economics and geography have taken over the representation of space. More recently, this space has been invested also by scientists, conservationists, industrial operators and recreational users. In this process, the liberal economic thought, which feeds on abstraction, promotes the vision of a space made up of natural goods for mankind.

"*This is the time of the fusion of space and economy*" (Rallet, 1984).

The fallacious dimension and deleterious scope of this political-economic approach to space, particularly when applied to the marine space, is examined below.

2.2 The primacy of geographical and economic conceptions of terrestrial space

How did we arrive at this immanent political-economic conception of space and what lessons can we draw from it, for the protection of marine space?

We mentioned above how the archaic thought of the Greeks, for example, filled space with gods, monsters and mysteries, even though, at that time, the sea was already a source of wealth and the most important means of circulation for them and many others (Lefebvre, 2007). Therefore, the non-natural, politico-economic conception of the space does not originate in the proto-science of the Greeks, Arabs and Christians of the Middle Ages, deeply dominated by mythology and Sacred Books. It emerged centuries later, establishing a privileged relation between human and space to the detriment of the ancient natural and mythological dimensions. In the last page of his Discourse on Method, René Descartes (1637) refers to Man, with his reason and scientific knowledge, as "*the master and possessor of nature*".

Nature, however, will later be paradoxically evacuated from the modern political-economy paradigm as not constitutive of space. In the 18th century, in a scientist atmosphere illustrated by the "Encyclopaedists"[6], Jean-Jacques Rousseau was the only philosopher who reflected about the relations of Man and Nature in a political movement centred on liberalism, bourgeoisie, science, questioning the nobility privileges, and absolute authority. Within the Enlightenment movement, he appears as an exception, raising awareness of the ongoing transformations of natural space into a human endeavour. However, Rousseau does not specifically address the question of space except in his analysis of "proprietorism"[7] including the question of fences and borders as a factor of conflict and violence (Rousseau, 1755).

It is with the political economy thought of the 19th century that the exclusion of nature from space is the most obvious and becomes definitive. Marx, in his analysis of the accumulation of capital and the colonial phenomenon, discusses the use of space by capitalist society, both in microeconomics[8] and in projecting its overseas conquests (Rallet, 1984). However, he only refers to space as inducing the existence of spatial relationships in capitalistic economy. Thus, for (Lefebvre (1970, 1997), "Real space is that of social practice (...) produced, from social relations". This is why some geographers accuse Marx of having no approach to the concept of space: "Marx's essentialist thought always begins with an elimination of space" (Claval, 1977). Paradoxically, Adam Smith (1776) joins the Marxist analysis for which space is only the container of social relations because the English economist conceives space only in terms of production of values, without any consideration other than the relationships of interest and the mechanisms of wealth circulation (Dubeuf, 1991). Thus, liberal economics and Marxist doctrines come together in considering that space is essentially commoditized because it is where people satisfy their needs, particularly in the form of a market or a State. In that process, the public space or the commons –the "land without a master"– inevitably falls into the commercial and capitalist sphere in a process often referred to as "commodification"[9]. Urban planning or the integration of rural space into the city, measures demographic goods, services and financial flows to qualify and model space transformation. However, these approaches are not interested in anything constituting that space, except these flows. In particular, they exclude the space's ecological content and, sometimes, its historical dimension.

At this stage of our observation of the concept of space in economics and geography, there appears to be an almost universal representation of "space", advocated by the "West", only interested in the social (mainly economic and commercial) relations that occur in that space, as consumer good, following the law of supply and demand (Harvey, 2010). This dominant capitalistic thinking inspires not only corporate strategies, but also

---

[6] The French writers' society, who contributed to the development of the Encyclopaedia (from June 1751 to December 1765), including Voltaire, D'Alembert, Diderot and many others.

[7] Translated from French "propriétarisme": For those theoreticians, property is not a social fact to be defined by society but it derives solely from individual will. It has been defined also as *a political ideology placing at the heart of its project the absolute protection of the right to private property*" (Piketty, 2019)

[8] In the spatial deployment of capitalism on markets and the industrial and urban expansion

[9] « Commodification » is the extension of the market space (and reference to economic value) at the expense of collective or common spaces (and other social and societal values). It implies a dynamic, illustrated by the "enclosures" which "devoured" the villages' common spaces in England, already in the 15th century.

public policies of order and wealth. It is the dominant conception of Western society, in which weak discordant voices are heard[10], or are confronted with traditional conceptions. The ecological approach and thought which --contrary to the political economic thought– integrates the human/nature dimension, is still present in many traditional communities and has been growing in science, most international institutions and policy agreements, and in the media for over three decades, but is not yet fully mainstreamed, in practice, in development policies.

3. The prominent place of the modern State in the marine space

3.1 The singularity of marine space in modern times: a presumption of vacuity

To analyse the concept of "marine space" and to bring out the socio-political issues that emerge in protected areas, it is necessary to examine how the presumption of vacuity, now accepted in modern market society, applies. Compared to this presumption, the situation of the marine space appears singular, is scarcely documented in geographical and economic disciplines, and deserves careful consideration.

Market relations do not exhaust the content of the modern space concept because capitalism and the market exist in their universal form only within the State framework. In modern nations, space is not only a set of social relations, but also the container of the relations within and between States. Through the production of norms, policies, domestic and international public laws, which are consubstantial with it, the State participates in the definition of the content of space and its commodification, particularly with respect to marine space. To illustrate this notional approach, we could say that the terrestrial space (the land) is "filled with social relations" while the modern marine space is "filled with State interventionism". The reason is that the quasi-impossibility of physical human settlements, cadastres, control, protection, and fences in the ocean, if not at short distances from the coast, feeds the presumption of vacuity of the sea and of its free access.

3.2 *The marine space "anthropication"[11] through its State control*

Since the fifteenth century, as navigation capacity evolved rapidly from coastal to transoceanic, a first scheme of the law of the sea is driven by the colonial adventure of the West in search of a marine route towards the "Indies". The treaties of Tordesillas (1494) and Zaragoza (1529) between Portugal and Spain, drew lines on the ocean but were really claiming land-based present and future colonial properties, and trying to ensure safer navigation of these two countries to and from these colonies. More than a century later, the *Mare Liberum* paradigm (Hugo Grotius, 1609) openly questioned the Portuguese *Mare Clausum* policy, and claimed a freedom to navigate and trade across oceans for all nations (a claim favouring particularly those having powerful navies). By

[10] For example, Thomas Malthus (1766-1834) in "An essay on the Principle of Population", looks at its past and present effects of demography on human happiness, and enquires on our prospects regarding the future removal or mitigation of the evils it generates. Malthus stresses the tension between demography and available space and natural resources, arguing the power of population is indefinitely greater than the power in the earth to produce subsistence for man.

[11] Anthropic, or anthropocentric, means concerned primarily with humans. By analogy, "anthropication" refers to a process of increasing focus on human concerns and interests.

interstate customary developments in European nations, it made the ocean a common space contrary to the appropriation process going on terrestrial spaces and resources through wars and colonization. What remained under exclusive control of the coastal States was a 3-miles wide zone, according to the "canon rule". Thus, this early evolution of the law of the sea provided the legal foundations for the development of area-based management in the ocean both at national and international levels, in areas under national jurisdiction and beyond.

Logically, the western States' control is the bridgehead of their anthropocentric spatial expansion and it conditions the development of a modern marine market space, in contrast with traditional marine societies. Since antiquity on land, the legal reality of terrestrial space is that the foundations of space governance are constituted by land ownership, conventions and responsibility and these three institutions are guaranteed and ordered by city or state powers. By contrast, in the Ocean, since the 15th century, the "free" sea space appears singular with the primacy of inter-State order, and by the apparent weakness of the societal laws of property, responsibility and conventions. However, within the different States, the merchant society has developed a private, criminal and disciplinary maritime law developed, regulating in particular the status of crews, harbours and ships.

The inter-State competition for maritime spaces that opened up during the European Renaissance (in the 15th and 16th century) and the modern confiscation of marine spaces had been preceded by other ways of appropriation and zoning. For millennia, traditional maritime societies have very intimately recognized marine spaces, maritime routes, named places, respected taboos, and their access rules have largely spread across these areas (Bambridge & D'Arcy, 2014), close to the coast but also over considerable distances, as in Oceania (Buck, 1952; Lagarde, 2021). However, their legitimacy, their anteriority and therefore their legality have not always been recognized by the law of the contemporary States which have taken possession of these traditional territories during and often after colonization: the spoliation of the ancestral marine rights of the indigenous peoples still constitutes one of the opprobrium of the colonization process (Féral, 2021).

It is easier to legalize than to legitimize (Champfort. Maximes et pensées, 1795)

4. The State control of marine spaces by maritime law and the Law of the Sea

4.1 International State control by maritime law in the 16th century

a. The freedom of the sea principle

Since the 17th century, the rules derived from the *Mare Liberum* principles constitute the essential of the framework of marine spaces. These rules are based on the consensus of the great European maritime powers which set out to conquer the "new world". Hugo Grotius in his 1609 thesis (anonymous, 2013), establishes (i) a general principle of freedom of the seas which excludes the monopolization of marine space beyond a 3 miles zone ; and (ii) the principle of the free disposal of its resources, whatever they may be. In reality his claim was for free access to any territory and free trade with them. "Every nation is free to travel to every other nation, and to trade with it.(…) the sea is common to all, because it is so limitless that it cannot become a possession of anyone, and because it is adapted for the use of all, whether we consider it from the point of view of navigation or of fisheries"[12] (Brown Scott, 1916). As noted above, the first significant step in the appropriation of colonizable land and access overseas markets was the 1494 the Treaty of Tordesillas between Portugal and Spain under the aegis of the Papacy, which divided the ocean and its coasts in two areas. Shortly afterwards, John Selden's theory of the *Mare Clausum* (1635)[13] develops the thesis that the sea can be appropriated, in particular by States, and therefore be the subject of territorialization and heritage. This British claim on the maritime spaces surrounding England could not be imposed to the rest of Europe considering the ongoing development of large national fleets in that region (Theutenberg, 1984).

The victory of the principle of ocean freedom over that of ocean closures, was the foundation of the principle of an international marine space, enshrined in the right for any ship to navigate and trade throughout the world. This idea was organized in maritime law, institutionalizing the *internationalization of the seas* which became the foundation of the concept of marine space. In this approach, the coastal State was left with an exclusive authority on only a three-mile territorial sea to guarantee its security[14].

b. The freedom of the seas for the benefit of the most powerful fleets

In fact, this principle of freedom of the seas has benefited the European nation States with the most powerful military, commercial and fishing fleets, opening them the paths of colonization and the exploitation of natural resources. The freedom Grotius defended was that to navigate and trade freely. This, *de facto* gave fisheries free access to the open sea and to harvest fish as *res nullius* resource.

The purpose of the maritime law was to regulate maritime transport, access and regulation of ports and, incidentally the measures relating to the status of ships and seafarers. Indeed, it was then recognized that the ships of a nation State, flying its flag, are part of its territory. The notion of "piracy" expresses that any attack on the ship is an attack on the territory of its Flag State. Ships are thus the main actors in the occupation and defence of marine spaces. Thus, the navy appears as the basis of maritime sovereignty, and of the defence of and economic, strategic and commercial interests of the State. Considering that, in the sea, access, navigation and exploitation are free, the inter-state cohabitation is more important in the ocean than on land, because each ship represents a moving portion of its flag State and its borders. This is why the State's pressure over marine space and maritime activities appears stronger than on land. This is also why in most developed States, the fishing and navigation professions are so much regulated and subject to authorizations and controls (Fitzpatrick & Anderson, 2022)[15.] For example, in France, in the 17th century, under the absolute Royalty of Louis XIV, a

[12] Extract from Hugo Grotius *The Freedom of the Seas*, New York: Oxford University Press, p. vi

[13] Cf. https://nubis.univ-paris1.fr/web/kenelm-digby/john-selden.html

[14] The formula proposed by Cornelius Bynkershoek in his "De dominio maris" in 1702, limiting the maritime domination of the coastal state to a distance of effective control, was universally adopted and resulted in the adoption of a zone of 3 and then 12 nautical miles as the land-based firepower of the coastal states increased.

[15] Cf. specially the chapters related to the maritime status of seafarers in UK and USA (https://seafarersrights.org/sri-resources/publications/seafarers-rights-book/) and the legal framework of the qualifications and boarding of seafarers (https://www.gov.uk/seafarer-working-and-living-rights).

statute, inspired by the Navy, was applied to marine goods, navigation, fishing, trade, ports, and to the status of the related people (Louis XIV, 1681)[16]. These regulations gave to the administration of the sea and of maritime social relations a unilateral and quasi-hierarchical and tutelary dimension.

c. The State control of marine and oceanic spaces

The dynamics of appropriation and attribution of the Pacific Ocean space by developed States in the 19th century illustrates some aspect of the ocean space State control. "*Cetacean hunting marks the eruption of the world economy in Oceania. It started at the beginning of the 19th century when 193,000 whales were captured between 1804 and 1817. Whale-hunting reached its peak between 1830 and 1840, and declined rapidly after 1860 with the collapse of whale populations and the generalization of petroleum oils. From the 1830s, the exploitation of wealth moved from the ocean to the islands. We are looking for sandalwood, trepang and various mother-of-pearl products, all of which are in great demand*"[17]

In 1919, 63 years before the Montego Bay Convention, the European nations carried out the State-driven zoning of a Pacific Ocean space considered as previously empty (devoid of jurisdiction), filling it with the mandates of the colonizing States from their respective coastal and island possessions (Figure 1). These areas of influence underline the true scope of the "freedom of the seas" which actually organized the primacy of the Western maritime powers by the domination of their gunboats able to navigate freely on all open waters. However, it is through the appropriation of terrestrial spaces (from the coastlines or colonized islands) that domination over related marine spaces is recognized by the other States' community.

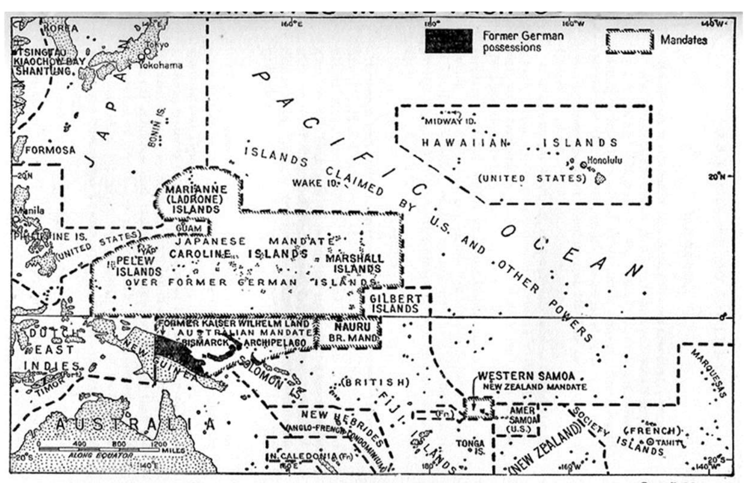


FIGURE 6

Compiled by Col. Lawrence Martin

---

[16] The Marine Ordinance of Colbert, enacted by King Louis XIV in 1681,

[17] Cf. *Le partage colonial dans le Pacifique au XIXè siécle* at https://histoire-geo.ac-noumea.nc/spip.php

(article 125) *Le fait coloniale dans l'Océanie insulaire at* https://histoire-geo.ac-noumea.nc/IMG/pdf/faitcolonialpacifique.pdf

Figure 1: Zones of colonial maritime influence in the Pacific in 1919 (map annexed to the Treaty of Versailles)[18]

It is important to stress that Mare Liberum was intended to give free access to colonies and their spices, gold, slaves, etc. Although expressly quoted by Grotius the priority was not the exploitation of the marine resources. However, the strategic freedom to navigate and to trade opened the way for a global expansion of fisheries, as a co-benefit of colonisation. Moreover, the free access to common marine resources it implied (by default) led to the serial overfishing characterizing the 20th century (Garcia and Newton, 1997).

4.2 The national state control by the Law of the Sea in the 20th century

The State control of marine space grew progressively, especially during colonization, but it increased considerably in the 20th century in a context of competition between European States to appropriate coasts and archipelagos. The colonial phenomenon is therefore the basis for the establishment of zones of maritime influence, connected to appropriation of costal spaces. The United Nations Convention for the Law of the Sea intended to order the phenomenon, based on a dualist conception of marine space: maintaining freedom while establishing clear jurisdictions.

a. *The first maritime claims of the new world states*

The first maritime claims are the result of unilateral declarations of extension of sovereignty by the United States and South American countries. Thus in 1945, President Truman issues a proclamation affirming the right to explore and exploit oil and gas resources on the continental shelf outside the three nautical miles territorial sea. In 1953, the U.S. Congress enacts a Federal and State Control of the Continental Shelf Act. The concept of a fisheries conservation area originates in another Truman Proclamation, but the Congress does not enact legislation regarding a 200 nm fishery conservation area until 1976, six years before the 1982 United Nations Convention on the Law of the Sea (UNCLOS). In 1952, a treaty in the form of a unilateral declaration by Chile, Peru and Ecuador unilaterally extends to 200 miles their oceanic jurisdictions, including from the islands[19]. This pressure, which opened the door to many conflicts, led the United Nations to engage in lengthy negotiations to establish UNCLOS to reconcile conflicting interests.

UNCLOS marked a fundamental step in increasing the influence of coastal States benefiting from economic zones placed under their jurisdiction (Apollis, 1981). It brought to light again, as in the 17th century in Europe, the two opposing conceptions of *Mare Liberum*, for the benefits of powerful maritime nations, and *Mare Clausum* for the benefit of coastal States and attempted to resolve it. On the one hand, UNCLOS confirmed the freedom of the seas, empowering the long-range fleets of military powerful, fishing and trading nations. On the other hand, in the wake of the third world decolonisation

[18] Peace Treaty of Versailles: Mandates in the Pacific 1919 by World war I. Archive Maps & Charts net.lib.byu.edu. This map was annexed to the Treaty of Versailles of 1919 which establishes the colonial rights of Germany and on this occasion strengthens the "Mandates" exercised by the other great maritime powers. It illustrates a political "zoning" of States' influence" more than sixty years before the EEZs of Montego Bay. On this map Kiribati or the Cook or Marshall islands do not exist as legal entities.

[19] Cf. https://jusmundi.com/en/document/pdf/treaty/fr-declaration-sur-la-zone-maritime-1952-declaration-sur-la-zone-maritime-1952-monday-18th-august-1952

movement, it established the economic jurisdiction and sovereign rights of coastal States concerned by the looting of their coastal resources by empowered foreign fleets.

b. *A new zoning of the marine space based on an international convention*

Zoning of the marine space, as developed since the 15th century, and improved and complicated in the 19th and 20th century reflects the State and inter-State nature of marine Space. Maritime zoning has a legal nature. It circumscribes a space over which one State or a group of States has jurisdiction and applies a system of law it determines. However, the established zones do not become proper national "territories" despite the set of policing, use and protection rules that States can decide to implement there, in the domains agreed under the Law of the Sea treaty, and in agreement with the other States. This comment applies to the areas defined in UNCLOS (see below) as well as to the smaller areas like ABMTs defined States within the UNCLOS zones. UNCLOS established the zonal rules for the determination of baselines and new maritime boundaries, as well as the international law regime of these different spaces, mandatory for the signatories of the Convention as a framework for the exercise of their jurisdiction. It established a succession of zones in which the legal power of the coastal States decrease as the distance from the coast increases[20].

After determining the *baseline* (from which distances are measured) the framework distinguishes: (i) *internal waters*, between the coast and the baseline; (ii) a *territorial sea*, with a territorial sovereignty comparable to that exercised over land: 12 miles from the baseline; (iii) a *contiguous zone* in which some of the rights granted in territorial waters may be extended: between 12 and 24 miles from the baseline; (iv) an *Exclusive Economic Zone* (EEZ) extending up to 200 miles from the baseline, in which the state has conditional sovereign rights on the exploitation and conservation of all the resources of the waters, the seabed and its subsoil, either directly or through agreements with third parties; and (v) an *extended continental shelf* between 200 and 350 miles from the baseline, in which the bottom and suprajacent waters is under the coastal state jurisdiction but the rest of the water column is part of the High Sea. Beyond 200 miles (or 350 miles in case of an extended continental shelf) the bottom, referred to as the *Area* and the water column (referred to as the *High Sea*) are beyond the exclusive national jurisdiction and the resources may be managed by international institutions (cf. Figure 3.2).

c. The extension of riparian States' control over the marine space

With this zoning, all the areas under national jurisdiction become administrative districts whose legal system is divided between the UNCLOS principles and the laws and regulations of the coastal State. Within the jurisdictions recognized by the Convention, the resource exploitation regime is determined by the policing rules and public policies of the coastal State, including closed areas. Thus, the legal footprint of the State appears more omnipresent on marine areas and activities than it is on land and reflects its strategic and political stakes.

From this perspective, and as a counterpoint to the freedom of navigation, the sea still constitutes for the State a permeable "border" and a space that is loosely regulated beyond national jurisdiction. It provides climatic regulation, recreation, and economic opportunities, and

---

[20] Cf. The illustration of these successive zonings and the question of their problematic cartographic representation in South Pacific where the author notes many inconsistencies and the existence of holes in the Oceania mesh (Vacher, 2014)

facilitates exchanges, but is also a potential source of pollution, meteorological threats, illicit traffic, smuggling, irregular immigration, and military threat. The “law of the flag” leads to the fact that, in the marine space, including in the space under national jurisdiction, numerous vessels, and hence the different territories they represent through their flag, with the related sovereign rights, must cohabit. The intricate presence of foreign vessels in the ports and areas under the jurisdiction of the coastal State explains the complexity of the legal regimes as the State regulation of trade, navigation, and fisheries, as well as the defence authorities play hide-and-seek with the principle of freedom of the seas and the territoriality of foreign ships. This situation is exceptional because, on land, such situations exist only in limited to narrow consular spaces, whereas it is common in marine and air spaces. The incentive for more State intervention and more area-based management is therefore pressing.

4.3 The importance of the EEZ and the inter-State race for maritime borders

The exclusive economic zone (EEZ) has upset the very conception of the marine space by a riparian nationalization extended to 200 miles for the water column or 350 miles on the continental shelf. However, the increased jurisdiction over these new areas is not an increase in coastal sovereignty *sensu stricto* : the freedom of international commercial and military navigation is maintained, as well as the right to lay communication cables and pipelines for gaseous or liquid fluxes. The EEZ appears as a new space in which additional new human developments thrive under new spatial names: exclusive fishing zones (EFZs), military security zones, navigation lanes, and ecological protection zones such as fishery closures, marine parks, Marine Protected Areas (MPAs), Particularly Sensitive Areas (PSSAs) etc., cf. Annex 1).

Particularly since the Adoption of UNCLOS in 1982, the ensuing zoning process –which could be referred to as *zoning policy* considering its history and dynamics– reflects aa additional progressive “appropriation” of marine spaces initiated by coastal States which contrived to establish their jurisdictions around the smallest habitable island to benefit from territorial waters, EEZs, and continental shelves (Ros, 2014).

a. Spatial claims beyond the EEZs

In Oceans areas, the opening of the right to an EEZ has enabled Small Island or archipelagic states to set up huge jurisdictions whose size often far exceeds their control capacities (Vacher, 2014). On the other hand, developed and emerging countries have been increasingly claiming for greater controls in the areas under their exclusive jurisdiction and sometimes beyond (see below).

Thus, the *Presential Sea* proposal developed in 1994 by Chile and then by Argentina, claimed to significantly extend the jurisdiction of the coastal State beyond the EEZ to protect and conserve marine resources, particularly straddling and migratory fish stocks, and provide a buffer against contaminations originating outside the EEZ (Silva Vilagra, 2012). Just as the Contiguous Zone in the EEZ the extends the territorial powers the coastal State has in the Territorial Sea, the Presential Sea intended to extend State territorial powers to the High Sea[21]. The same approach has been implicitly used off Newfoundland by Canada (in the context of the North Atlantic Fisheries Organization), extending its fisheries enforcement zone beyond the 200-mile EEZ (Sullivan, 1997). This claim follows a tradition of international law of the sea regarding historical rights

[21] The proposal would have increased the area under jurisdiction of Chile from 1.3 to 9.2 million square miles.

recognized to States present in maritime region close to their coasts or in which they have traditionally deployed means and activities. Not recognized by the UNCLOS signatories and by the courts, but largely integrated in the 1995 UN Fish Stock Agreement, the Presential Sea claim illustrates the "hunger" of coastal States for influence in the ocean space.

We observe the same approach to regulation and control of high seas areas by island and coastal States, based on the strengthening of fisheries management standards in bordering fishing zones and including their own EEZs (CMS & SPREP, 2006; Vacher, 2014).For example, the Nauru Agreement[22], establishes among several Polynesian States, a Cooperation in the Management of Fisheries of Common Interest to coordinate and harmonise the management of fisheries with regard to common stocks within the Fisheries Zones (particularly tuna). Regarding the conditions of access to the fisheries zones of the Parties, it was agreed that no fishing will occur in the 4 interstitial High Sea zones between EEZs of the Parties, creating de facto no-Take Zones in the High Sea[23,24] (Figure 2).

Similarly, the mapping, exploration, and identification of the seabed resources revived this desire to control as much of that space as possible, increasing the breadth of coastal jurisdictions on the extended continental shelf. For the same reason, non-riparian States participate in the Regional Fisheries Management Organisations (RFMOs), to exert authority and benefit from resources beyond their national jurisdiction.

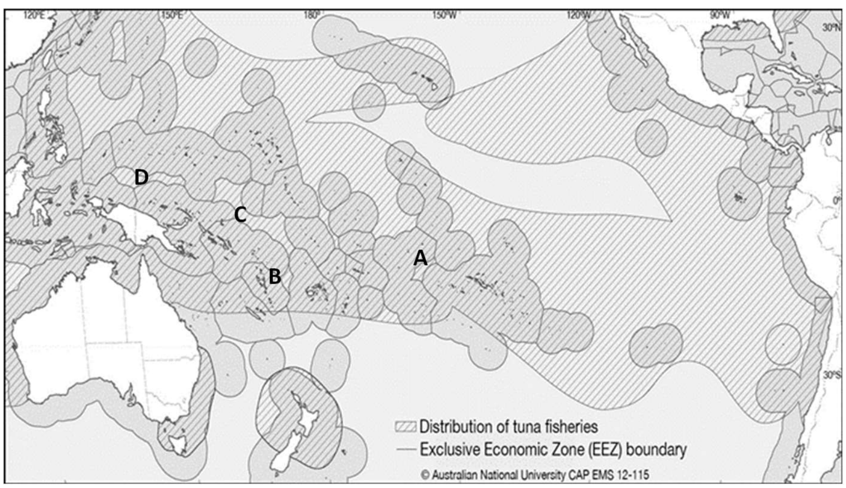


Figure 2: Distribution between EEZs and high seas areas of tuna fisheries in the South Pacific. The map shows the High Sea enclaves in the middle of the EEZs. A to D = Interstitial areas referred to in the 3rd agreement (letters A to D added) (Courtesy Bambridge and D'Arcy, 2014)

Although these initiatives by States bordering the High Sea are carried out through international cooperation and often affect also areas under national jurisdiction, the coastal States strategy is to communicate their capacity for intervention on areas

[22] between Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu plus Tokelau

[23] Source: http://www.intfish.net/treaties/nauru.htm

[24] Cf. NAURU agreement. Third arrangement implementing the Nauru Agreement setting additional terms and conditions of access to the fisheries (4 p.) https://www.ffa.int/nauru_agreement

adjacent to their established claims, based on theses that legitimize rights for their benefit[25]. The result of all these initiatives is that the marine space has been "filled with nationalization" within the framework of an interstate "competitive collaboration" the political nature of which only precedes its economic intent

b. The increase of conflicts on maritime boundaries

Nowadays, marine territories (used for industrial development, navigation, communication and fisheries) constitute a major political stake that builds in the wake of developments in the Law of the Sea. UNCLOS regulated practices and claims that infringe on the freedom of the seas to order marine space. It has set new rules for access to marine resources but in doing so, has opened the Pandora Box of establishing new maritime boundaries, as illustrated by the many open disputes, particularly in semi-enclosed seas, to determine the limits of EEZs, baselines and even territorial seas e.g., in the Mediterranean, Caribbean, Southeast Asia, South America, and the Persian Gulf (Ros & Galetti, 2016).

In this new legal framework, stimulated by progress in the exploration and exploitation of the seabed, the State's footprint has been asserted, grounded on unilateralism and the strategy developed in Chile and Argentina (Calderon, 1998). Thus, the *Presential* principle is also supported by China which has implemented in the South China Sea a "fait accompli" strategy based on the Chinese Historical Presence in the region. The conflict is still open between four States in spite of the decision of the International Court of Justice of The Hague in favour of an opponent State (Cataldi & Féral, 2016).

5. A new page: nature protection, knowledge, and protected areas

5.1 New actors and new marine spaces representations

a. Importance of new actors in marine areas

We underlined that the representation of marine space is in relation to the main social and economic actors who exploit and use it. For centuries this representation, peddled by coastal dwellers, seafarers, explorers, fishermen, commercial navigators, merchants, naval officers was a set of trades and know-how grounded mainly in coastal traditions. These representations have largely inspired the 19TH and 20th centuries' novelists, artists and painters. They have amplified with stories and aesthetic emotions the perception that had for a long time the whole society.

Other, more environmental representations of space, like the nature conservation one, advocated by IUCN since 1948, were not really concerned by the ocean until the 1970s. In 1982, the ocean zoning by UNCLOS which established a new order of the Ocean was based on the idea of a more equitable sharing the sea wealth while maintaining the freedom of navigation and fishing on the high seas. Since the 1972 UN Conference on the Human Environment, in Stockholm, and certainly since the 1992 UN Conference on Environment and Development, in Rio de Janeiro, the political-economic representation of space has been progressively transformed, first on land and then in the ocean. The key

[25] In the same spirit of extension of international competences in 2009 during the World Oceans Day, Greenpeace proposed to classify as marine reserves the interstitial high seas spaces between the EEZs of Oceania countries (Vacher & Argounes, 2011)

actors are environmental experts, conservation and fishery scientists, environmental lobbyists, recreational economy actors, nature conservation NGOs, and international financial institutions like the Global Environment Facility (GEF), and the 1992 Convention on biological Diversity (CBD). The attention has been always focussed first on land, and later on the ocean. International ocean policies started getting more traction in 1992 e.g., with the increased attention given to oceans by the UNGA since 1994[26]; the 1995 FAO Code of Conduct for Responsible Fisheries; the 1995 UNFSA, etc. These new developments, actors, and policy orientations challenged many traditional practices including in coastal development, fishing, tourism, navigation and environmental management of the coastline. The adoption of global conservation targets at the CBD (2010, 2022), the perspective of a booming ocean development under the "Blue Economy" banner[27], and the intrusion of the new actors involved and their expectations, make the zoning system more necessary and more complex than ever, and increases the protective normativity[28].

b. An ambivalent evolution of the representation of marine space

Historically and anthropologically, access to marine resources had been regulated by Indigenous People, communities, clans or village organizations, using area-based multiple-objective frameworks as well as specific fisheries or biodiversity protection measures, and giving priority to local populations and their basic needs. These ancestral rights are illustrated, in Europe, by Lords' patrimonial maritime rights[29] and, in the traditional societies of the Pacific island, by various forms of appropriation at village, clan or tribal levels (Bambridge & al, 2019; Herrenschmidt & Le Meur, 2016).

As mentioned before, in the 19th century colonial conquests, the misguided valueless nature of marine resources, based on the principle of freedom of the seas, was a legal fiction facilitating oceans and coastal areas discovery and colonisation, and enhancing the free access to fish stocks. The process also allowed a "confiscation" of marine space by military, economic and fishing fleets of powerful nations. In the States and in their colonies the freedom principle led to the transformation of the littoral part of coastal zones into a public domain, a process through which States confiscated the ancestral

---

[26] In 1994, UNGA 49 decided to undertake an annual review and evaluation of the implementation of the Convention on the Law of the Sea and other relevant developments and requested the Secretary-General to report annually to the Assembly. Later on, UNGA 54 decided to establish an open-ended informal consultative process in order to facilitate the annual review by UNGA of developments in ocean affairs (resolution 54/33).

[27] "Blue economy" is a term in economics relating to the exploitation, preservation and regeneration of the marine environment. Its scope of interpretation varies among organization (https://en.wikipedia.org/wiki/Blue_economys) Cf. also https://oceans-and-fisheries.ec.europa.eu/ocean/blue-economy/sustainable-blue-economy_en

[28] i.e., the impetus to make decisions about what is good, desirable, or otherwise.

[29] The naval Ordinance promulgated by Colbert, in France (Louis XIV, 1681), is emblematic of this hold of the State delimiting a coastal public domain. It' eradicated the feudal Lords' fishing infrastructures encumbering the coastal areas (e.g., tuna traps; lift-nets) and brackish waters (e.g., fyke-nets). It established a freedom of fishing regulated by the State In this way State liberated the sea from its Lords 'appropriations and especially those relating to resources(cf. Title I, Book IV of the ordinance "De la liberté de la pesche" p. 452 et seq. & Title IV on "Madragues et bordigues" p. 475). However it was in France in a centuries-long legal battle for its effective implementation **(**Torquebiau, 1965).

coastal tenure[30] and use rights of marine communities. The process led to inequitable redistribution of resources and economic opportunities and a State-supported modernization of fisheries, leading to the progressive commodification of the marine resources (Teulières-Preston, 2015; Féral 2021)[31]**.** In many island countries (e.g., in the Pacific Ocean) the tensions between centralized State control and traditional local governance of coastal areas and their resources are still strong (Govan and Jupiter, 2013).

Thus, for half a century, the political discourse on marine areas has been ambivalent. On the one hand, biodiversity is rapidly being degraded, many stocks are depleted, and ecosystem restoration is strongly advocated. On the other hand, the sea is still apparently perceived by many States and institutions, including environmental institutions as an area of freedom, allegedly of inexhaustible precious resources[32], likely to provide invaluable wealth for industrial activities (e.g., in the Blue Economy paradigm)[33]. For example, only a decade ago, the French government perception and message regarding the economic development of the huge French maritime jurisdictions was that *"At the beginning of the twenty-first century, the sea is more than ever a major source of economic growth for States, a reservoir of wealth whose exploitation is just beginning, a formidable source of jobs for our country."* (CESM, 2012).

The progress in fisheries management in well-managed countries is recognised and praised while recognizing the problems persisting elsewhere (e.g., in FAO SOFIA, 2022). At the same time, the media and protectionist activists raise alarm about environmental destruction and resources overexploitation while conservation organisations (like the CBD and IUCN) apparently support commodification concepts like ecosystem services, biodiversity offsets, nature-based solutions and blue economy. This does not happen without controversies within and between institutions. In this context, the policies of marine protected areas and the increasing recognition of social and ecological values of that marine space, place ABMTs on the razor's edge of an equivocal marine space facing protection, sustainable use, or their problematic combination. This new concept of *protected sea* is torn between the anthropocentric conception of efficiency ("space is constructed by human for themselves") and its ecocentric conception aiming to enshrine natural resources for their intrinsic value (space was shape by nature for itself).

5.2 Do these new representations anticipate a new Law of the sea?

Here we have the illustration of the State figure of Janus[34], attached both to exploiting the sea and anxious to protect it. Indeed conversely, the will to protect the marine environment and the international management of fisheries constitute the background of a new (or renewed) way of seeing the marine space and its relationship with humanity.

---

[30] These tenures were often an extension of terrestrial individual or collective properties

[31] Teulière-Preston (2015**)** gives an example of confiscation of traditional maritime rights in New Caledonia through the creation of the coastal public domain. Torquebiau (1965) shows, on the contrary, that in the French southern metropolitan area, real estate rights preceding the creation of the public domain were respected by the State.

[32] Fisheries have illustrated the fallacy of that thought, but the "dream" is being transferred to other living resources.

[33] in https://www.defense.gouv.fr/sites/default/files/cesm/bm-142-colloque-ocean-de-richesses.pdf

[34] In the ancient Rome, Janus, the god of beginnings, gates, transitions, time, duality, doorways, passages, frames, and endings, is depicted as having two faces, back to back.

The policies of Marine Protected Areas (MPAs *sensu lato*) are part of the new tension on the Law of the sea disrupted by the increasing demands of coastal States or maritime powers. But it's also coming from new actors involved in the protection of the sea for improved biodiversity conservation and sustainable uses. Consequently, marine conservationism is not the exclusive playground of the social group of scientists or of NGOs: it is also a new instrument of assertion of coastal States sovereign rights. This protective zoning, where the sovereignty of the coastal State is asserted, is part of a more general movement to claim jurisdiction which has developed since the beginning of the 21st century (cf. Section 3.3) [35]. The Law of the sea and its spatial distribution and nature of powers are therefore in full mutation. The Law of the sea and its spatial distribution and nature of powers are therefore in full mutation. No modification of the 1982 treaty is plausible today, but the new implementation agreements of UNCLOS on biodiversity in areas beyond national jurisdiction (BBNJ), following the 1995 UN Fish Stock Agreement (UNFSA) seem to be one of the solution States can use for a smooth adaptation. In case of failure, States may resort to unilateral affirmation with all the potential and caveats of this approach.

The establishment of area-based management tools (including MPAs and OECMs) which became significant since the 1970s and accelerated since) is a significant step in zoning marine space. The zoning "innovation" has been the incorporation of broad biodiversity data, objectives and criteria, complementing the modern socioeconomic and political contents, and related narrow concern about strict economic resources. Admittedly, in the conquest of the seas, the assessment of the presence and state of natural resources is not new. Their exploration and the related scientific knowledge have been the bridgehead for the exploitation of biological and mineral marine resources and development of related economies. The new protectionist discourse is that the purpose of collecting data is not only resources valorisation through use but also their better knowledge and inventory, for improved protection for their intrinsic value, rebalancing the exclusively anthropocentric conception of space.

6. Discussion and conclusion

In the liberal economies' tradition, the principles of which are inherited from the 19th century political economy, the conception of terrestrial and marine space and its zoning remains today still strongly impregnated with commodification. If the international community of States is bound by numerous international agreements for the sharing of the sea, it participates in this conception because the States are in competition and adhere to this same development and speculation politico-economic model. This competitive inclination of States, which has become almost universal, raises questions regarding the impact of the conception of space on protection of marine spaces and resources. However, this overly economic approach is today being challenged by national and international public opinion, by traditional maritime populations (whether

[35] Cf. the case of the Arctic and the Illulissat Declaration adopted on 28/05/2008 by the five riparian States, affirming their rights, competence, and jurisdiction around an ice-free ocean which previously appeared at first as a space of freedom comparable to the open sea. The exploitability of the area in relation to its partial thawing due to climate change has aroused this claim of sovereignty. (Cinelli, 2014). See also (Beurier, 2016) about the theory of sectors in Arctic Ocean.

indigenous or simply artisanal) and their NGOs, and by environmental NGOs acting for protection of nature and the oceans[36]. The United Nations have largely accompanied this protection movement and its bodies and collaborative initiatives are the place where these representations are confronted (e.g., in UNEP, CBD, IOC, FAO, UNESCO, IPBES, etc.).

The place of the States in this evolution is essential because of the growing geostrategic and economic stakes which are now attached to the marine space and the perspective of its increased development under Blue Economy. In any case, nothing can be done without their policies because the law of the sea regime is essentially grounded on States and inter-State cooperation. Contrary to the old 3- and 12-miles territorial zones, the areas now controlled by States under UNCLOS are not based on their coastal defensive capacity –but on their desire for an extension of the national jurisdiction to an agreed limit, allocating *de facto* former common coastal resources to coastal States. States also manage High Sea resources within the management competence areas of RFMOs. If, as expected, the oceans are the place of creation and development of immense private wealth, State interventionism will never be far from the related activities[37].

This State presence occurs either in a unilateral initiative, or in a cooperative or conventional form, under international law. Examples of unilateralism include China's occupation policy in the South China Sea (Cataldi and Féral, 2016) or the extension of Canadian fishery policy beyond its jurisdiction (Sullivan, 1997). On the contrary, the Galapagos Agreement for the Conservation of the High Sea Marine Resources of the Southeast Pacific was signed in 2000 between the coastal States of the Southeast Pacific, members of the Permanent Commission for the South Pacific (CPPS) and open to other interested States[38]. Similarly, the Nauru Agreement emphasizes the capacity of States to agree and strengthen their control over the High Sea by international cooperation.

UNCLOS established the principles of new maritime boundaries thanks to an unprecedented and probably exceptional inter-State agreement. All strategies, policies and initiatives, as well as the jurisdictions responsible for its application, necessarily refer to it and its rules. Once the core jurisdictions are established, the creation of smaller, more activity-specific ABMTs may be developed as needed to complement non-spatial measures. The difficulties and the freeze on negotiations for the BBNJ Agreement[39] in the summer of 2022 are not encouraging signal for a positive completion of the international process. Pending such agreement, the practices and new initiatives of the States to increase their maritime holdings, pushed by public opinion and economic lobbies will

[36] The same liberal economy approach is also questioned in some parts of the fishery sector and particularly in the small-scale fisheries.

[37] Offshore drilling for fossil fuels, for example, received massive investments from the States, in the order of 100 billion dollars per year. Surfrider (2022) https://surfrider.eu/en/learn/blog/offshore-drilling-worrying-development-121415192167.html

[38] in https://legislacionanp.org.pe/acuerdo-marco-para-la-conservacion-de-los-recursos-vivos-marinos-en-la-alta-mar-del-pacifico-sudeste/

[39] In full, the Intergovernmental Conference on an international legally binding instrument under UNCLOS on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (https://www.un.org/bbnj/)

probably continue reshaping the very conception of the marine space. As part of a dialectical construction integrating these new practices and opinions, new environmental values participate in transforming the societal image and the law of the marine space. In that endeavour, protected and conservation areas have a role to play, together with non-spatial measures.

We have seen in this chapter that the place of the boundaries, the size of the areas, the management and control capacity of the legitimate authority, the relation with neighbouring areas and the cooperation between authorities, the equitable sharing of the space, the overlapping claims of the same area by different interests, etc., are fundamental for the achievements of objectives in the UNCLOS zoning process.

It is intriguing to think that at lower institutional levels, in community area-based managed areas, or in single fisheries, ABMTs will face exactly the same issues and factors of failure or success. The tension between unilateralism and international collaboration is, to some extent, mirrored in the tension between single management or cross sectorial management of ABMTs.

PART I: COMPREHENSIVE REVIEW OF ABM AND ABMTS

by

Garcia, S.M.; Rice, J.; Link, J.; Sowman, M.; Charles, A.; Augustyn, C.J.; Penas Lado, E.; Morishita, J.; Campbell, D.; Govan, H.; and Kirkegaard, E.

CHAPTER 1 – INTRODUCTION

SUMMARY

The concept of *living in harmony with nature* attached to the antique Greek myth of Atlantis, and revived by Bacon in the 17th century, is today still the moto and vision of the CBD programme towards 2050 with the same three pillars of science, governance, and values. The same pillars are a prerequisite to effective area-based management tools today. The expression has progressively but rapidly developed as a globally agreed concept after WWII. The traditionally-used area-based management tools (ABMTs) and people's rights of widespread use before WWII traditional management, attaching rights to space, have been neglected if not abandoned during the 20th century, and replaced by resources-based access and rights, more flexible, but also more easily modified, split or transferred to the most effective operators (through trade). The moder notion of Space was filled with social relations and values and with State authority. During the last 50 years, however, following UNCED, attention given to environmental impacts and conservation also increased exponentially, and have been progressively mainstreamed into economic sectors. In parallel, under the Ecosystem Approach to conservation and management, the notion of space regained traction, with a much stronger environmental and biodiversity content. Accompanying that evolution, ABMTs have increased exponentially their role and coverage of the Earth and the Ocean, conveying still the States' desire of territorialization of the oceans (possibly in harmony with the neighbours) and the societal desire to *live in harmony with nature*. A return to the origins?

1.1 Living in harmony with nature?

The negative impact of humans on the environment has been perceived long ago. Five centuries ago, for example, Leonardo da Vinci noted that due to the nature of humans, "*nothing will remain on the earth or under the Earth and the water that is not pursued, removed, or damaged*" (Nardini, 1999). Closer to us, Homo sapiens have been portrayed both as an endangered species and as the main evolutionary force behind environmental and resources degradation (Vitousek, 1997; Palumbi, 2001; Barbault, 2006).

The global inspirational goal and quest for an equitable society living "*in harmony with Nature*", is centuries old and has progressively grown from the first human communities to the present "global village" with demography and the progressive globalization of knowledge, science, liberal economy, trade, communication, and awareness of human impacts on environment and biodiversity. The ancient Greek myth of Atlantis, for example, aimed at social renovation towards a "*society living in harmony with nature",* through (1) legislation, (2) religious reforms and (3) spreading of knowledge (Berneri, 1950; Bourg, 2003). Francis Bacon (1626) in his posthumous book on the New Atlantis, reinvented the utopia[40] of a perfect society developed on three pillars: (1) the

[40] A utopis is an imaginary community or society that possesses highly desirable or nearly perfect qualities for its members (Wikipedia). A place of ideal perfection especially in laws, government, and social

experimental science needed to improve knowledge and find solutions, (2) wise government to organize and guide people, and (3) religion to establish values needed to bound human wishes and action. The concern and the pillars of the solutions have survived to modern days. Nowadays, the Ecosystem Approach to Fisheries relies on (1) the best scientific advice and local knowledge, (2) Governance, and (3) environmental and human ethics (values).

The same three pillars with small changes in their name are the foundations of the millennia-old dream of humans to live "*in harmony with nature*". The relation between humans and nature is referred to in many ways: conservation; nature for itself; nature despite people; nature for people; people and nature; wise use; sustainable development; sustainable use; or blue economy (cf. Section 1.2 for more details on these terms), constantly rebranding the antique dream to avoid the incumbent nightmare of environmental degradation and its cascading consequences.

The journey towards that ideal world is obviously still on, across difficulties and some progress, with different names in different contexts. The antique expression "*living in harmony with nature*" (>960,000 hits in Google on 20/08/2022)) seems to have started to be used in the mid-19th century, in concomitance with industrial development. Its use has increased significantly and steadily since the late 1960s, and seems to have reached a plateau since the 1990s (Figure 1.1).

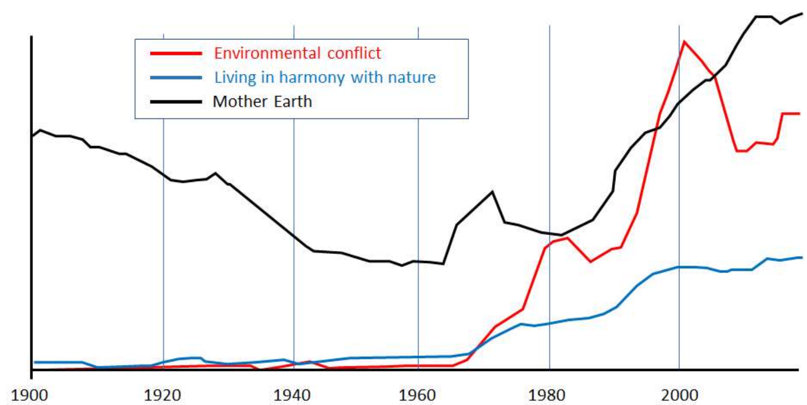


Figure 1.1: Relative frequency of use of the expressions "living in harmony with nature" . Mother Earth" and "environmental conflict" detected by Google NGram viewer™ in English Google books (by 28/03/2023)

The 3000 years-old Japanese concept of <u>Satoyama</u> expresses a similar vision of a positive interaction between humans and nature, in what we refer today as social-ecological systems, and it is still proposed as a concept to improve the sustainable use of buffer zones around no-take MPAs[41]. Finally, the expression "*Living in harmony with nature*! has been enshrined in the 2010 CBD vision for its Strategic Plan for Biodiversity (2011-2020) (CBD, 2010, subtitle and Art. 11). A similar expression "*living in harmony with Mother*

---

conditions (Miriam Webster, online). A societal goal to aim at to mobilize energies in the essential journey toward an unreachable perfection.

[41] https://ias.unu.edu/en/events/archive/side-event/the-satoyama-concept-theory-and-practice.html#overview

Earth" has been used in the Kunming-Montreal Global Biodiversity Framework (hereafter, GBF) (CBD, 2022). This expression is of much older use but also increased rapidly after 1960. The expression "environmental conflict" shows a similar evolution, probably reflecting the same concern.

As a consequence, across all spatial scales, the long-standing societal concern for sustainability and the recognition of the complexity of social-ecological systems have led to refocussing of policies and governance from narrow "resources"[42] –to be sectorally managed– to broader and more complex "ecosystem services" generated by interdependent social and ecological systems, requiring a more ecosystem and area-based governance.

Hopefully the quest is still achievable and the dice still rolls. In that historical context, the conventional resource-based management concepts emerged after WWII are being complemented with area-based management tools (ABMTs) as central to cross-sectoral conservation, allocation and management of natural resources (cf. Box 2) and biodiversity. ABMTs' effectiveness depends on available information, ecological and human values, and effective governance, just as Atlantis.

This document provides a comprehensive review of the subject of ABMTs used in and around fisheries, and referred to as "fishery-ABMTs" for convenience. It reminds us of what fishery-ABMTs are; how diverse they are; what they are intended to chieve; what are the tensions in the process; what synergies may be possible; and how effective could we be; keeping in mind their ecological and human dimensions, but trying to clarity the ABMT "acronym soup". The task may seem globally overwhelming … and so it is, because the enabling and impeding factors are the same as those of "living in harmony with nature" but it might be more amenable at local level than at the global academic and political levels.

1.2 From area-based to resources management and back

In the aftermath of the Second World War, the States' science and technology-based centralized policies advocated, supported and developed the industrial fishing system. This interventionism may have succeeded too well. This system has conquered most of the world coastal and deep ocean, spreading overfishing from the norther hemisphere coastal areas to the deep ocean, the tropics and the poles (Garcia and Newton, 1997). In the process, the industrialized model increased immensely the possible operational range of vessels through: (i) technological development; State subsidies; and deregulation, removing traditional area-based regulations and rights[43] to facilitate the large-scale fleets' expansion. Simultaneously, traditional community and area-based development and management models, with community use rights and tenure systems, have been abandoned or neglected for undelimited resource-based allocation and management systems, eroding the century-old intimate links between the coastal communities and "their resources", transferring the stewardship responsibility to the State centralized

[42] Of importance for human livelihoods and economic development

[43] The process started with Huxley (1883) in England who questioned the resources limitations, rejected the risk of overfishing, and dismantled the existing fishery regulation system (eliminated about 50 regulations) despite opposition of the traditional sector and to open the way to "modernization".

systems, which, in many developing nations have failed to maintain control on the system.

In many areas, the large-scale fishery systems are now in crisis (FAO, 2022a) excessively indebted fishing companies; increase in production costs; conflict between small and large-scale fishing operations in coastal areas (loss of local food security and livelihoods; impoverishment); development of Illegal, Unreported, and Unregulated Fishing (IUU); organized crime[44] (Witbooi et al., 2020) ; and conflict between fisheries and conservation, aggravated by the growing demands of an expanding human population, and the transfer of fishing pressure from rich and well-managed nations to less endowed and weakly governed ones, through the fish market and long-range fleets. Small scale communities and fisheries have been dramatically reduced in rich nations, or are overcrowded in areas of high demography and failing development, playing an increasingly critical role in food security and as buffer for unemployment in countries without any social security system (Bené et al., 2016; Bavink et al., 2015, 2017).

The threat of criminal activity in the fisheries sector has concerned the international community for a number of years. In more recent times, the presence of organized crime in fisheries has come to the fore. In 2008, the United Nations General Assembly asked all states to contribute to increasing our understanding the connection between illegal fishing and transnational organized crime at sea. Policy-makers, researchers and members of civil society are increasing their knowledge of the dynamics and destructiveness of the blue shadow economy and the role of organized crime within this economy. Anecdotal, scientific and example-based evidence of the various manifestations of organized crime in fisheries, its widespread adverse impacts on economies, societies and the environment globally and its potential security consequences is now publicly available. Here we present the current state of knowledge on organized crime in the fisheries sector. We show how the many facets of organized crime in this sector, including fraud, drug trafficking and forced labour, hinder progress towards the development of a sustainable ocean economy. With reference to worldwide promising practices, we highlight practical opportunities for action to address the problem. We emphasize the need for a shared understanding of the challenge and for the implementation of intelligence-led, skills-based cooperative law enforcement action at a global level and a community-based approach for targeting organized crime in the supply chain of organized criminal networks at a local level, facilitated by legislative frameworks and increased transparency.

During the last 3 decades at least, the system has been improving in developed many nations with large investments in research and management capacity, but much less in most of the developing world. In an attempt to "turn the tide", government and inter-governmental institutions aimed at a more sustainable and responsible fishing, in the wake of the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), the Ecosystem Approach to Fisheries (FAO, 2001; 2003), and the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the context of Food Security and Poverty Eradication (FAO, 2015).

[44] www.unodc.org/fisheriescrim

In addition, since the 1990s there has been an Increased recognition of the importance of small-scale fisheries (thereafter SSFs) and the role they play in food security, livelihoods and poverty eradication (De Young et al., 2008; FAO, 2015; Béné, et al 2016). Marine and inland SSFs are responsible for about half of global fish catches and employ more than 90 percent of the world's capture fishers and fish workers (FAO, 2015). Both men and women are engaged in activities along the entire fish value chain. These fisheries play an important role in food security and nutrition, poverty eradication, equitable development and sustainable resource utilization. In 2015 the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication were developed and published as a complement to the 1995 FAO Code of Conduct for Responsible Fisheries. The purpose of the Guidelines is to enhance the visibility, and support the increased recognition of this important sector and to contribute to efforts towards the eradication of hunger and poverty. These Guidelines, underpinned by a human-rights based and ecosystems approach, support responsible fisheries and sustainable socio-economic development of SSFs with a particular focus on poor and marginalised peoples (FAO, 2015; Jentoft, 2014).

Under the liberal economic paradigm that underpinned centralized industrial development, exclusionary systems of resources-based property rights are spreading, hardening the single-resource based management system and potentially further threatening small-scale communities' integrity, if community-based tenure systems and rights are not put in place (cf. in Japan, Box 2).

In conservation, in an attempt to address the growing degradation of the environment and natural resources, the most advocated instrument advocated has been the Marine Protect Areas (MPAs) and particularly the strictly protected ones, excluding any use, and creating no small problems for the small vulnerable fishing communities living in densely populated coastal areas with little or no alternative livelihood and the vulnerable human community therein. In an attempt to protect both the human communities and biodiversity, the old area-based community management systems have been progressively revived under the generic concept of Community-Based Fisheries Management" (CBFM), mainly but not only in the developing world and for Indigenous People and Local Communities (IPLCs) (e.g., Dugan and Davis, 1993 ; Pernetta et al., 2007 ; Paterson et al., 2013 ; Pacific Community, 2021). The generally shared vision is: Sustainable well-managed inshore fisheries, *underpinned by community-based approaches that provide food security, and long-term economic, social and ecological benefits to our communities* (Pacific Community, 2021). While this may not be obvious from its name, CBFM is often also area-based as it requires specific definitions of the area within which the community has some jurisdiction on fisheries (cf. Pacific Community, 2021: 11).

From a broader, cross-sectoral angle, almost every major legal use of the ocean is now regulated by some sub-national, national, or global authority, using spatial and non-spatial tools (cf. Section 3.1) as deemed appropriate for their task (See Rice et al, 2022). During the last 3 decades, the focus on ABMTs has increased significantly, principally in international organizations and with the intent to boost conservation efforts and promote spatial planning and integration for improved conservation of biological diversity . The CBD Strategic Plan on Biological Diversity 2011-2020 (CBD, 2010) adopted Aichi Target 11 on global biodiversity conservation coverage which, perhaps for the first time brought MPAs and all other effective area-based conservation measures (OECMs) together as complementary measures contributing to a common goal of 10% coverage.

Ten years later, the CBD Post-2020 Global Biodiversity Framework increased the global coverage target to 30%, raising the bar (CBD 2021). The role expected from ABMTs was confirmed by the United Nations Conference on Sustainable Development (UNCSD, in 2015) and its Sustainable Development Goals (SDGs) (United Nations, 2015; UNEP, 2018; Diz et al., 2018; Reymer et al., 2021; Kettunen et al., 2021; Gissi et al., 2022). The ABMT concept has also been brought to the limelight by the process of development of the international agreement on the conservation and sustainable use[45] of marine biological diversity of areas beyond national jurisdiction (referred to as the BBNJ Process) (United nations, 2007, 2022; Druel et al., 2013; Gjerde et al., 2013; Vierros et al, 2016; de Santo, 2018; Wright et al., 2020; FAO, 2022). The trend may have also been accelerating by the perspective of an intense development of economic activities in the ocean under the banner of "Blue Growth" or "Blue Economy"[46] (United Nations, 2012; Smith-Godfrey, 2016 ; Bari, A., 2017) Blue Economy conceptualizes oceans as a new "development space" beyond the "Last Frontier"[47] (Smith, 2019 ; Urbina, 2019) integrating all economic sectors and conservation in a new version of the "sustainable Development"[48] concept (WCED, 1987; United Nations, 2012; UNEP et al., 2012; Voyer et al., 2018; Eikeset et al., 2018). However there have been significant criticisms by various scholars of the Blue Economy agenda and implementation practices in terms of equity, justice and sustainability considerations (Bennet et al., 2019; Bond, 2019; Cohen et al., 2019).

1.3 Purpose and scope of the document

This document intends to bring together, in a condensed manner, all the elements that may help (i) the fishery sector to understand the rationale, importance, and management implications of area-based restrictions for fisheries performance; and (ii) the conservation sector to better understand the implications of area-based conservation for fisheries and the contribution of that sector to conservation. It illustrates the fact that area-based measures have existed for centuries even though the pressure for their use has increased

---

[45] Sustainable use (SU) is defined very simply in the "Caring for the Earth" strategy as a use which is "*within the resources' capacity of renewal* (**IUCN-UNEP-WWF, 1991**). It is defined in the CBD Convention text as "*the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations*" (**United Nations, 1992**). **IPBES (2022**) added that *SU is also an outcome of social-ecological systems that aim to maintain biodiversity and ecosystem functions in the long term, while contributing to human well-being. It is a dynamic process as wild species, the ecosystems that support them, and the social systems within which uses occur, change over time and space.* These definitions are complementary in stressing the need for long-term satisfaction of human basic needs; the need to maintain biodiversity on which those needs depend, and the fact that SU is a complex outcome of a dynamic process.

[46] That emerged in discussions on "green growth" at the UNCSD (Rio + 20) Conference in 2012.

[47] https://theconversation.com/final-frontiers-the-deep-sea-13270

[48] Sustainable development (SD) is broadly defined as "*Development that meets the needs of the present without compromising the ability of future generations to meet their own needs*". It focuses on the long-term satisfaction of human needs and inter-generational equity and conservation of biodiversity is implicit. By comparison, "sustainable use" sets this conservation as a necessity to ensure the satisfaction of human needs in the long term.

with industrial development, growing competition for space and resources, and increasing degradation of the environment and biodiversity. It also stresses that the increasing integration of area-based measures in fisheries operations and management, with due consideration to their ecological, social and economic and equity implications, is not only in line with current international agreements and evolving sustainable development ethics (cf. WCED, 1987 ; IUCN, UNEP and WWF, 1991 ; United Nations, 1992, 2015 ; IPBES, 2022, 2022b ; CBD 2022) but probably also a *sine qua non* condition for the continued existence fisheries and their present "*social license to fish*"[49].

Fishery authorities have a delimited management mandate within the sector, and no direct control on economic activities outside it. These authorities have adopted spatial measures, designed and implemented to address when, where, how, and by whom target species are harvested, to reach sectoral as well as broader biodiversity conservation objectives[50]. However, spatial measures taken by other authorities may also restrict fisheries operations and their outcomes.

In order to provide a strategic vision of the spatial management framework of relevance to fisheries, the document examines (see Figure 1.2):

1. Area-based fisheries management measures (ABFMs). These are spatial tools *formally established, spatially-defined, fishery management and/or conservation measures, implemented to achieve one or more intended fishery outcomes, commonly related to sustainable use of the fishery*. *However, they can also often include protection of, or reduction of impact on, biodiversity, habitats, or ecosystem structure and function* (CBD, 2018). Examples include fishery reserves, refuges, spatio-temporal fishing closures, and VMEs.
2. Large multi-objectives areas, managed by traditional or modern[51] communities (including IPLCs), using spatial and non-spatial, traditional or modern ABMTs and in which fisheries operate under special constraints. Examples include MMAs. LMMAs, MEABRs; MARFs, MCAIP (See Annex 1 for full spelling of acronyms).
3. Areas established specifically for long-term protection of biodiversity and particularly marine protected areas (MPAs). Measures referred to as MPAs, may be also established by fisheries authorities.

In this document, areas in (1) and (2), as a group, are referred to as "fishery-ABMTs" (Himes-Cornell et al., 2022) for convenience and are highlighted in dark blue on Figure 1.2. Many other ABMTs have been established in other economic sectors to optimize their activities, such as the Particularly Sensitive Sea Areas (PSSAs) aimed at protecting biodiversity from navigation threats (IMO, 2005), Areas of Particular Environmental Interest (APEIs) (ISBA, 2011), oil and gas concessions, military firing ranges, submarine

[49] A "social license to fish" refers to the perceptions stakeholders that the way the fishing industry operates in a given area or region is socially acceptable or legitimate. The "license" is context-specific and depends strongly on the social bound between the fishing sector and the society around it. As a consequence, the license is usually stronger at local level, in a coastal/fishing community, than at global level.

[50] e.g., reducing or eliminating pressures on non-target species and habitats.

[51] "Modern communities" refer to groups of people to which the State may have delegated management responsibilities, such as municipalities, fisheries associations, etc.

cable protection lanes, etc. These ABMTs are mentioned but not considered in detail in this document unless that have specific restrictions for fisheries operations.

In this document, we also distinguish individual ABMT sites (the ground reality) from ABMT categories that group ABMT sites with similar properties under a common category name, or label. Category labels have generally been created by international institutions or NGOs, within their mandate (see Rice et al., 2022 for an analysis). The sites are created and named locally (at national or local level) and more or less f0rmally attached to a category (cf. Annex 1).

We also distinguish ABM tools (ABMTs) from ABM frameworks in which fisheries and other sectors operate and in which ABMTs may be used. Examples are ICZM, ICAM, Multiple-use MPAs, some MMAs, most LMMAs, Marine Parks, Biosphere reserves, Large Marine Ecosystems, Seascapes, and MSP, are established to regulate sectors' interactions, allocating space and resources, reducing conflicts, and fostering synergies, to optimize cross-sectoral outcomes. From that angle, EEZs are also national ABM frameworks enshrined in UNCLOS. It is important to stress that some spatial instruments referred to usually as "areas" -like IUCN type VI MPAs)also referred to as multiple-use MPAs (MU-MPAs) operate really as multiple-use management "frameworks" in which fisheries and other sectors may be allowed to operate under certain conditions.

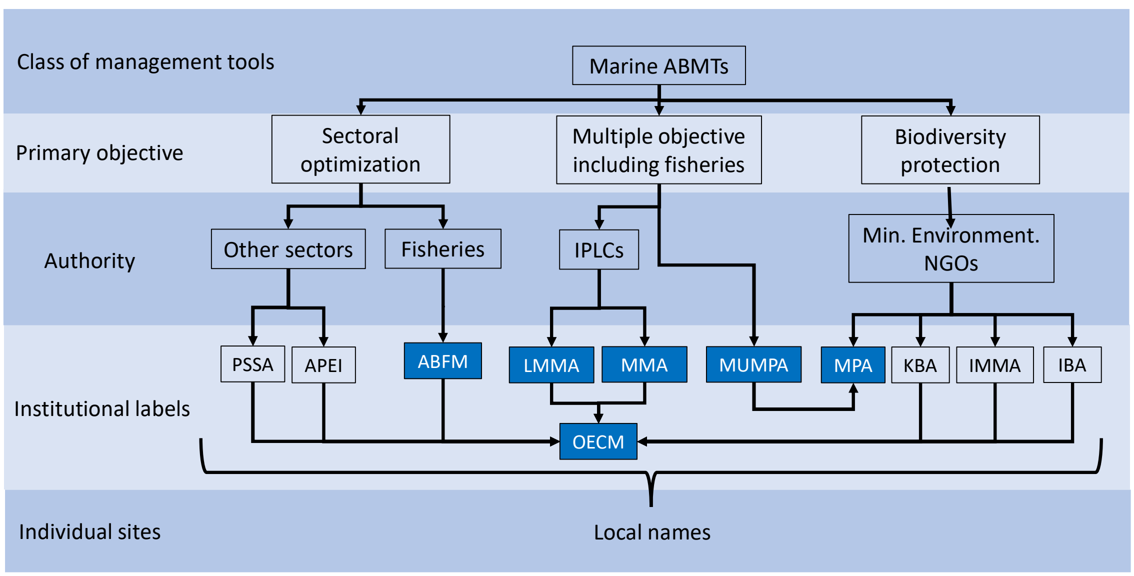


Figure 1.2: Typology of institutional ABMT labels, based on their primary objective and authority. Fishery-ABMTs are in dark blue. OECM is a label that may apply (be added) to all other labels (excluding MPAs) if the OECMs identification criteria are met. Note also that all labels (including OECMs) may also be registered as MPAs if decided by their authority, assuming they meet the MPA definition and have conservation as primary objective.

CHAPTER 2 - BACKGROUND ON AREA-BASED MANAGEMENT

SUMMARY

Human dimensions of ABM and ABMTs

Human Dimensions (HD) of ABM and ABMTs refer to their socio-economic, cultural, political and governance aspects, including Human Rights. They are central to their effectiveness, the tensions emerging in and around them, and the opportunities for synergy. The need to take HDs into account increased since the last 3 decades with the emergence of ecosystemic approaches, the concept of social-ecological systems, and improved recognition of the Human Rights Based Approach (HRBA). In practice, a robust participatory process, offsets, and compensations, as appropriate, are needed for an equitable distribution of benefits and costs, and successful conservation initiatives. The are agreed but progress is still needed at national and local level.

Tensions between conservation and sustainable use

ABMTs have often been central in the most debated issues in fisheries and conservation, particularly since the 2000s. Marine conservation started gaining momentum in the 1960s, with a focus on protected areas in coastal areas, raising tensions and conflicts progressively extended to the open ocean and the High Sea. Issues relate to the recognition of Human rights; the "right" balance in the distribution of costs and benefits among stakeholders; exclusion of vulnerable human communities from traditional "territories of life". These tensions emerge at all scales: between developed and developing nations; fishing and coastal nations; markets holders and resources owners; sovereign rights and freedom of the oceans, and differentiated responsibilities. Numerous solutions are advocated to reduce tensions, using multiple instruments, and tailored to local conditions to improve equity and conservation, and tensions remain between ecocentric and anthropocentric scenarios and strategies, between exclusionary protection and sustainable use, looking for a "middle way".

Trends in area-based management in the ocean

For centuries, perceptions, concerns and actions about the ocean space reflected successively antique myths and fears; curiosity and discovery; navigational skills and geography; colonisation and competition for space, resources and military power; decolonization and independence; post WWII industrialisation and liberal economic development; environmental degradation and biodiversity protection.

The "Order of the ocean" has evolved from the early maritime law to UNCLOS, progressively shaping the political and legal environment, providing the foundations for modern area-based management of the ocean space, locally, in the EEZ and in the High Seas. Attempts to unilateral "territorialisation" of the ocean have been countered but in part formalised into new Implementation Agreements under UNCLOS (including the 1995 UNFSA and 2023 BBNJ).

The law of the sea is the overarching legal framework for ABMTs with their ambivalent role in sectoral management, biodiversity conservation and creeping territorialization. ABMTs are being promoted by numerous international conventions, regional or global organizations and NGOs, producing guidance that States adapt to their local capacity and

conditions. In the process, traditional communities and IPLCs have been struggling – sometimes successfully, to maintain jurisdiction on their "territories of life" in some form of legal pluralism, within the overarching State-driven system.

ABMTs have also been promoted since the 1970s by United Nations summits like the UNCHE, UNCED, WSSD, UNSCD, UNSSD, and the UNGA itself, as well as international NGOs The process led to adoption of global policy frameworks such as: Caring for the Earth (1991); UNCED Agenda 21 (1992); The Sustainable Development Goals (2015) and the CBD Kunming-Montreal Global Biodiversity Framework (2022), reflecting the concern for conservation but also the rising awareness of the human dimensions of ABMTs (including governance, user rights, and cultural values. The 2010 CBD Aichi Target 11, set a quantitative commitment of global conservation areas of 10% in 2020, reflected in the SDGs for the 2030. The 2022 GBF increased the commitment to 30% by 2030. These commitments may not been fulfilled everywhere but they increased focus on ABMTs and to their effective establishment.

2.1 Human dimensions of ABM and ABMTs

Human dimensions of ABM and ABMTs are central to their effectiveness, recurrent and emerging tensions, and possible synergies. In this Report, the human dimensions of ABM and ABMT refer to Human Rights, and to the socio-economic, cultural, political and governance aspects (including institutional aspects) that need to be taken into account and inform any planning, design and management processes.

Since Soulé (1985) underlined the role of social sciences in conservation, there has been increasing recognition of the need to take account of human dimensions in conservation and fisheries management, including in frameworks such as ABM and in the application of ABMTs tools to achieve sustainable use and biodiversity protection (Cochrane, 2001 ; FAO, 2003 ; De Young et al., 2008 ; Pomeroy et al., 2004 ; Christie 2003 ; Charles and Wilson, 2009 ; Agardy, 2011 ; Mann-Lang, 2021). While the term "human dimensions" has been gaining ground in the conservation and fisheries management literature, other terms such as human or social context, social aspects (Pomeroy et al., 2006 ; ICSF 2010), socio-economic and cultural aspects, and concerns about human well-being, or socio-economic and institutional dimensions (FAO, 2003), have been increasingly integrated into international instruments, national policies, plans and management documents. There have been various debates in the literature regarding the use of the term "human dimensions" in natural resource management, largely due to concerns that referring to "human" dimensions as distinct from "ecological" ones may separate rather than integrate these two domains (Latour, 1991 ; Sexton et al., 2013).

Scholars such as Geertz (1960), influenced by systems thinking, introduced the concept of ecosystems and an ecosystems perspective and argued that the human dimension and the bio-physical dimension were unified entities within the wider system. Scholars such as Berkes, Colding and Folke (2003) were also grappling with the artificial and arbitrary separation of ecological and social systems, and introduced the concept of socio-ecological systems (Berkes et al., 2003). In his work on fisheries, Charles (2001) was influential in conceptualising the fishery system as an integrated and interlinked human-ecological system that spanned the full value chain process. These ideas have taken hold and been further developed and incorporated in conservation and fisheries management (e-g- in Garcia and Charles, 2007) although their interpretation and application in planning and management differ widely. Given the strong focus historically on the ecological and biological aspects of both fisheries and conservation management, there has been an effort to place people at the centre of these endeavours and to ensure that human dimensions are considered and integrated into all aspects of planning, assessment, decision making and management (e.g., in Jonas et al., 2021).

At the same time, increasing attention has been given to the need to respect and protect human rights in conservation and fisheries management policies, plans and actions (Campese et al., 2007 ; IUCN, 2009; FAO, 2011 and 2015; Sunde, 2014 ; Bennett, 2017 ; One Ocean Hub, 2022) and in particular recognising the rights of women (FAO, 2015). This has given rise to the concept of a "human rights-based approach" which has been embraced in various international instruments and guideline documents such as the Voluntary Guidelines for SSFs (FAO 2015) (hereafter VGSSF) and other conservation guidelines that have application to ABMTs (Campese et al., 2007 ; Sowman et al., 2014). The human-rights based approach has been informed by various international instruments that place obligations on States to recognise and protect the human rights of its citizens such as the International Covenant on Civil and Political Rights, the Convention on the Elimination of all Forms of Discrimination against Women (CEDAW), the Convention on the Rights of the Child; the UN Declaration of the Rights of Indigenous Peoples (UNDRIP); the UN Declaration on the Rights of Peasants and Other People Working in Rural Areas, as well as various Voluntary Guidelines such as the VGSSF, the voluntary guidelines on the Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security, and others. These instruments provide the foundational principles for the need to ensure protection and promotion of human rights in all actions and decisions, at all levels, especially where poor and vulnerable people are concerned. Particular attention should be paid to the rights of women, children and disabled peoples.

A Human Rights Based Approach (HRBA) requires recognition, protection and promotion of both procedural and substantive human rights. Procedural human rights include recognition and respect for the following principles and processes including access to information which is available in an accessible format; meaningful participation in planning and decision-making; prior and informed consent; access to justice; equitable access to and sharing of benefits derived from resources; gender equality; recognition of customary systems of governance; respect and integration of local and indigenous knowledge. Substantive human rights include the right to life, dignity, food, water, health, education, culture, security of tenure (cf. Box 2), an adequate standard of living, decent work and labour rights, freedom from all forms of discrimination; and self-determination (FAO, 2015**;** 2022). These rights are inter-related and inter-dependent and need to be considered holistically. States have an obligation to put in place processes and mechanisms (legal, administrative and other) to ensure that these rights are respected and not violated. The HRBA approach also recognises that environmental health and resource integrity are requirements for ensuring the achievement of a range of guaranteed legal rights, and that respect for human rights will lead to more support for conservation measures (Sowman et al., 2014). These ideas, calling for a more holistic, integrated, participatory and human rights-based approach to conservation and fisheries management, have been taken up at various levels from international agreements to national policies and local plans. However, the operationalisation of these approaches and ideas into the planning, design and implementation of various ABM tools is more challenging.

Table 2.1 Elements of Human Dimensions requiring consideration in area-based management and ABMTs(Source; Sowman et al., 2014 with minor changes)

	Dimensions	Elements
Human system	**Social** (including individual level)	Gender, class, ethnicity Attitudes, perceptions, beliefs, values, and experiences Goals and aspirations Social networks Social vulnerabilities Conflict and power dynamics
	Economic	Sustainable and diversified livelihoods Income, debt, and assets Markets and trade Food security Ecosystem goods and services Fishing infrastructure and technology
	Cultural	Customary fishing practices and rights Traditional and local knowledge Sense of place; Way of life; Culture and cultural heritage Spiritual practices and sacred sites
	Political	Tenure, Access, use and management rights Representation and legitimacy Benefits and losses (social, economic, and cultural) Patronage
	Governance (including institutional)	Community organisation Stakeholder participation Information flow and communication Policies, laws, and legal systems (state and customary) Institutional arrangements Enforcement and compliance Equity

Table 2.1 provides a list of human dimensions derived from a review of the academic literature and technical guidelines produced by various conservation and development agencies as well as experience from various cases studies. The human dimensions have been clustered into five main themes – social, economic, cultural, political and governance (including institutional) comprising several human dimensions within each cluster. While consideration of human rights is fundamental to all contexts and decisions, It is important to emphasise that not all the human dimensions listed in **Table 2.1** will be relevant in all contexts.

A key task is identifying those dimensions that require consideration, and which require further investigation and/or assessment before a decision can be taken. The table thus

provides a checklist or *aide-memoire* for those engaged in ABM as well as stakeholders[52] exploring spatial tools to achieve particular fisheries management and conservation objectives.
It needs to be noted that the costs and benefits associated with various ABMTs will differ across stakeholders: some may gain and others may lose. While the intention is that a robust participatory process will minimize any group or individual being unfairly impacted by the decision or management action, in some cases it may be necessary to explore offsets and compensation for certain groups. However, protection of human rights remains a guiding principle.

While ABMTs are concerned with management, there are critical processes prior to management (or implementing the ABMT) where the problem or proposed intervention needs to be articulated, through a robust participatory planning and design process, where options can be explored, deliberated on, and decided upon. These principles, which support the adoption of a HRBA, are referred to as good governance principles in some literature, and need to be respected and promoted. These include:

- Inclusive and meaningful participation;
- Safe, accessible and fair engagement spaces and processes;
- Prior and informed consent in relation to local and indigenous peoples;
- Legitimate representation;
- Transparent and accountable processes;
- Capacity development, where necessary;
- Respect for all knowledge systems and sources including local and indigenous knowledge; and
- Robust and, where appropriate, participatory monitoring and evaluation processes allowing for learning and adaptation.

Evaluating the effectiveness of management tools (including ABMTs) implemented to achieve fishery or conservation objectives is key to any robust management process. However, research on management effectiveness across these various ABMT tools has been limited and the focus has mainly been on MPA effectiveness with a strong focus on ecological and conservation outcomes. It is progressively realized that effectiveness in relation to social and economic outcomes is essential.

From this perspective, how effectiveness is determined will also depend on the type of ABMT being evaluated - whether a national or local ABMT whether a fisheries or conservation tool. Evaluating management effectiveness of any ABMT would clearly require consideration of human dimensions but which dimensions need to be considered and the processes employed to ascertain effectiveness would depend on the tool being evaluated and the goals and objectives agreed upon. For example, an ABMT such as a LLMA would have a strong focus on determining whether the livelihood objectives have been met since this is key to local priorities and critical to gaining community support for the intervention. However, since habitat restoration and rebuilding of particular marine species is vital to enhancing livelihood benefits, these ecological outcomes would be equally important to evaluate. On the other hand, evaluating the effectiveness of an

[52] In this document, we use the term “stakeholders” in a broad sense including right-holders. Right-holders are certainly very important stakeholders, and stakeholders are not right-holders.

ABMT such as a national or marine park, which would affect a far larger stakeholder group, and have implications for a wide set of human dimensions (across various domains – social, economic, cultural, ecological, institutional and governance) would need to be informed by indicators across these domains that reflect that objectives set and agreed to have been realised

2.2 Governance

a. The idea of governance

This section focuses on governance of those Area-Based Management Tools (ABMTs) that are used in fisheries and conservation. Governance, in general, concerns the processes, structures and underlying values affecting decision-making. It focuses on who makes decisions and how those decisions are made. Management operates within the strategic governance framework and is shaped by it. With any management or conservation process, the implementation steps would broadly involve (1) analysing the problem faced keeping in mind the objectives; (2) considering the types of tools available to address the problems and their pros and cons; (3) choosing the tool or mix of tools considered most appropriate; (4) fine-tuning the tool to fit into the specified context (e.g., determining the spatial extent, the degree of restrictions to be put in place, the timing of the restrictions, etc.); (5) implementing the specific measures applying within the area, including any required enforcement mechanisms, and integrating it into the overall more or less formal management plan; and ideally; and (6) assessing the performance of the tool, correcting its properties as appropriate (adaptive management). While these steps tend to be common within any management activity, the type of governance – from top-down (centralised) to totally devolved (at a local level) – has a very significant effect on this process and as a result, on the effectiveness of the ABMT.

b. Spatial issues

Given the spatial nature of ABMTs, governance decision-making must be placed in the modern context of ecosystem-based management, or in the fishery context, the Ecosystem Approach to Fisheries (EAF). This implies that whatever the 'area' involved in an ABMT, there should be consideration of the relevant ecosystems involved – and these may be at multiple spatial scales, ranging from a local (community) level through national and sub-national levels, to regional (multi-national) levels. This adds complexity to the governance challenge, since the governance area should match as much as possible that of the "ecosystem" involved – yet without doubt, human-oriented boundaries must also be considered. This arises with any aquatic management, but certainly with ABMTs, given the inherent need to specify the area involved and within which special measures apply.

Related to the above, a key feature of ABMTs that differentiates them from other, non-spatial, aquatic management measures (such as technology restrictions, e.g., related to fishing gear, or to the type of vessel used for tourism, etc.) is the focus on restrictions within a specified area. Those restrictions imposed through an ABMT, on access to the space or use of the space, mean that there is an impact on at least some users of the aquatic space.

For example, a fishery closed area (or ABFM) restricts the fishing activity of those who operate within a certain spatially-defined aquatic space, such that those fishers are impacted more than those in the open space around. (Restrictions imposed through an ABMT will need to be coordinated with separate fisheries regulations that may either apply outside the ABMT, or apply in a spatial area larger than, and containing, the ABMT.)

Similarly, a zoned Marine Protected Area also restricts activity within a certain space, but activities being restricted may vary widely, from fishing to mining and energy production, to tourism or shipping – and again, the extent of the restrictions can vary greatly. This has implications for governance of such areas, or area-based management measures, since decision-making regarding these has strong and differential implications on a range of aquatic users.

c. Distributional issues

ABMTs, like any spatial restrictions, have differential impacts on those operating inside versus outside a designated area. This particularly affects those who are constrained to operate inside the area, notably those who are less mobile, in terms of the range of their fishing activity (based on their vessels), or the level of technology involved. While the distributional impacts of an ABMT might diminish over time, at the point of introducing a new ABMT, within an area already being utilized, some aquatic users will be more affected than others, and indeed, some may be 'winners' and others 'losers'. The new ABMT changes the opportunities for aquatic users (reallocating space, resources and opportunities for use) such that "winners" will get more opportunities, and "losers" will get less. This may be, in the latter case, due to a lack of means, skill, or technology to find new sources of livelihood, or simply a matter of higher distances to travel, or additional risks being faced. In any case, a key aspect in implementing an ABMT is how to deal with equity and justice concerns, and in particular, opposition to the measures among those 'losing' as a result of their imposition.

d. Types of governance

In considering governance of ABMTs, it is helpful to consider a spectrum of possibilities, from State governance, carried out by governments, to local-level or community governance. The latter may be based on traditional longstanding local governance, or may be based on various levels of devolution of decision-making authority by a central government. The differences among these scenarios, and their implications, are illustrated in Table 2.2.

Local-level or community governance has been present since before the Nation State, but since the mid-19th century, State governance expanded greatly, and overtaking by States progressed after World War II. Community-based governance has faced progressively eroded powers, yet community-based institutions still survived, in some cases, for hundreds of years, and the community role is reviving nowadays, more so, but not only, in the developing world. As a result, the current reality is one of a multi-stream evolution of governance.

e. Participatory governance

In this evolution, decision-making – regarding many ABMTs, and other management tools in the aquatic realm – took place in a top-down manner, with a government agency typically creating, implementing, and enforcing them on its own, with varying and often minimal communication with local stakeholders. The evidence (the state of stocks and the environment) indicates that this approach was often largely ineffective or otherwise unsuccessful, as a result of the lack of acceptance ('buy-in') by those using the aquatic space involved (in the case of ABMTs), a consequent inability to achieve suitable compliance with the restrictions, and a resulting failure of the ABMT to achieve desired results. As a result, it is now clear that the effectiveness of ABMTs, together with their equity and justice aspects, requires that those affected by the ABMT (together with other stakeholders) should be involved in governing the ABMTs. This, indeed, is a basic principle of participatory governance: an imperative of suitable participation in management decisions concerning access and conditions of use of the area involved in the ABMT.

Table 2.2: Properties of governance models for ABMTs (based on Garcia et al., 2011; UN Environment, 2019)

	Top-down		**Types of governance**		**Bottom-up**
Decision power	Statal Centralized	Delegated (under State control)	Decentralized (Shared)	Private/Sectorial [1] (State supervision)	Indigenous (State oversight)
Institutions	Government, Legal framework, Research centers,	Peripheral administration, Specialized agencies,	Communities' structures, Municipalities,	Prof, associations Sector concessions Private structures [2] NGOs	IPLCs. Local authorities & knowledge
Implementa-tion	Centralized with Consultation	On behalf of State Higher participation	Co-management (Shared decision)	Partly devolved (State oversight)	Locally managed (State oversight & support. NGOs
Funding	Budgetary	Mixed	Voluntary. Municipal	Associations. Sectors. NGO projects	Voluntary. State support. Project funds
Advantages	Easier networking Means available No local pressures	Bette perception of local issues and solutions	Top-down & bottom up. Better compliance Negotiated solutions	Self interest Responsive Low State costs	Local empowerment Responsive to local knowledge & culture
Challenges	Expensive Central-local tensions		Meeting local & global needs Management means	Self-interest. Long-term funding.	Weak institutions States support Conflict with non-locals

Consider two scenarios:

- When the ABMT is operated by a national or regional government, good governance would call for that government to determine the participating set of stakeholders, and to facilitate their involvement in the governance process. Typically, those affected by a fishery-focused ABMT (and accordingly, those to be involved in decision-making processes) will tend to be largely those within the fishery sector, while for conservation-oriented ABMTs, those affected by and to be involved will be a broader set, possibly including all of the aquatic users in that space.

- ABMTs may have existed for centuries and are managed locally, e.g., within a traditional coastal community, a municipality, or by a fisher association. In such cases, governance over the ABMT may follow local rules, norms and values, with some degree of oversight by the State. Examples could include decision-making by an Indigenous Chief and tribal council members, or by local fisher organizations. The latter may be involved in making decisions about fishing areas (as well as when and how its members can go fishing) – even if larger-scale non-spatial decisions such as the overall total catch level or spatial zoning are determined by the government with a variable amount of consultation with local stakeholders.

Overall, governance relating to an ABMT – as with the governance of other aspects of fisheries and aquatic usage generally – may involve some 'mix' of decision-making (a) by the State, (b) within local or informal settings (governing beyond the state per se) or (c) in collaborative or 'co-management' modes.

2.3 The tensions between conservation and sustainable use

In this document, we focus the discussion on ABMTs and fisheries. ABMTs have long been important in fisheries, often central to some of the most debated relations between conservation and this economic sector (Garcia et al. 2014b ; Thompson et al., 2016 ; Grip, K. & Blomqvist, S. 2020 ; Hilborn et al., 2021 ; Himes-Cornell et al., 2022**)**. The tension between conservation and development is not new and was indeed thoroughly addressed by the United Nations World Commission on Environment and Development and numerous UN summits in the following decades. The WCED report (1987; §56) summarises perfectly the issue: *The network of protected areas that the world will need in the future must include much larger areas brought under some degree of protection. Therefore, the cost of conservation will rise - directly and in terms of opportunities for development foregone. But over the long term the opportunities for development will be enhanced.* The tensions result from various emerging questions: who is responsible for most of the degradation? Who will pay the short-term costs? Who will benefit from the promised future benefits? Who decides on all of this? The definitions of "Sustainable Development" (SD, **WCED, 1987**) and "Sustainable Use" (SU, United Nations, 1992) (cf. Section 1.2) both recognize the need to satisfy human generations in the long-term (inter-generational equity) but SU stresses that this long-term objective can only be reached if biodiversity resources are maintained, and that SU is an outcome of a complex and dynamic process.

2.3.1 Tensions and solutions

In the decades following UNCLOS fisheries policy and management tended to focus on technical and structural management measures intended to function as input/output controls). However, in the 2000s global commitments to EAF/EBFM and the increased attention paid to the collateral impact of fisheries on non-target species and habitats placed "space" and its uses back in center stage. These developments meant the use of ABMTs had regained traction.

This renewed prominence of ABMTs in fisheries is occurring a very different climate of public policy than was the case in the earlier years of fisheries management. Marine biodiversity conservation had started as early as the 1920s and 1930s in USA and Australia but in UK and the rest of the world biodiversity conservation only began to gain momentum in the 1960s and 1970s (Cole-King, 1993). The IUCN, which evolved from the IUPN (International Union for Protection of Nature) in 1956, rode this wave, with Protected Areas heralded as a central conservation tool. As the marine aspects of protected areas emerged from these initiatives, the initial focus was MPAs in coastal waters. However, the use of ABMTs beyond national jurisdiction became a hot subject of debate at the United Nations level by the late 1990s, with MPAs and ABMTs both active topics of debate about gaps and ways to fill them (Garcia et al., 2014b). By the 2010s, ABMTs were highlighted by the CBD Strategic Plan on Biodiversity 2011-2020 and its associated Aichi Targets, and are even more prominent in the CBD Global Biodiversity Framework (CBD, 2022).

The growing acceptance of ABMTs has not been without challenges. First, there has been a long-standing separation of considerations of the biodiversity consequences of ABMTs from consideration of their social and economic consequences. These tensions are amplified by the tendency for biodiversity outcomes to be valued on global and regional scales, whereas the social and economic consequences are experienced locally. This creates potential serious tensions between centralized versus local governance processes, each striving to progress on its most urgent (but different) goals (cf. Section 2.1).

In the fisheries community, the importance of taking account of the human dimensions of ABMTs (e.g., their social, cultural, economic, and institutional considerations), together with the biodiversity consequences of the same measures, has been recognized in an increasing number of reports and papers since the early 2000s (FAO, 2008 and 2009, Christie, 2004; Christie et al 2003; Charles and Wilson, 2008; Sowman et al 2014; Garcia et al., 2014; CBD, 2022). Recognition of the inextricable links between humans and their environment have been documented by fisheries scholars since the 1970s (McKay 1978; Clay and Goodwin, 1995) but it was the work of scholars such as McKay, (1997), Berkes et al. (2003), and Dengbol (2007) that brought these social considerations to attention in fisheries and conservation management decisions and in the tools employed to manage these systems. This more integrated work, drawing on complex systems theory, introduced the notion that the relation of humans with nature needed to be conceptualised as socio-ecological systems. Although peoples' relationship with nature is central to the concept of EAF and the implementation of ABMTs, explicit recognition of its central place in policy dialogue only emerged slowly as ABMTs have been increasingly adopted by nations across the world and their governance emerged as a central issue. However, as illustrated below, this recognition of the inextricability of the well-being of people and Nature has not reduced the tensions on many scales but moved them from recognition of HDs to the "right" balance in the distribution of costs and benefits.

At international level, tensions have grown between conservation and sectoral economic development. The issue is not new and was thoroughly addressed by the United Nations Commission on Environment and Development (WCED) in its well-known "Bruntland Report" (WCED, 1987), immediately raising concern from Third World elites about what they considered "*green imperialism*" (Bergesen, 1988). The "global biodiversity crisis" (Westley 1997; CBD, 2022) is now well-established in public policy discussions. However, addressing it has to confront a widespread perception that global undifferentiated biodiversity protection targets alter country's sovereignty over their natural resources, clashing with national political, social, and economic interests. On the other hand, the establishment of ABMTs –for environmental or other reasons– may be considered by States to be a way to increase their "control" over the ocean space (cf. Prologue**)**. Tensions continue to be fostered by these two perspectives. On the one hand, environmental protection ABMTs may be used for (or result in) a progressive "territorialization" of the ocean space by States, in the EEZs and the high sea, which may be seen as interfering with the freedom of navigation and right to innocent passage without which UNCLOS would have probably never been adopted (cf. Section 2.3). On the other hand, the need for coordinated action by States, which is considered essential to deal with many aspects of the global biodiversity crisis (CBD, 2022), has increased calls for States to show leadership by implementing ABMTs within their jurisdictions that can be extended more widely as States buy into the measures as effective supports to their objectives.

At national and local levels, the tensions are closely inter-connected. They relate to governance (role of the State versus coastal communities; sectoral “fractures”; problems of recognition, rights, and participation); allocation of space between uses, sectors, and sub-sectors; political support and capacity-building. Implementing conservation-targeted ABMTs often requires imposing political, social, and economic costs on States, which are experienced immediately. However, the desired benefits from conservation measures often accrue slowly, giving security to future generations of beneficiaries but with often no obvious returns in the short-term to the immediate “payors” (Harrop, 2011). Moreover, often both the costs and benefits of ABMTs are not imposed or experienced equally within a State. Many conservation-oriented AMBTs result in a displacement of users outside the area. This can disrupt established traditions and rights, threatening very vulnerable livelihoods in areas with few or no alternative incomes opportunities. This also results in concentrating the displaced activities outside the ABMT, possibly amplifying harvesting there to unsustainable levels (IPBES 2022 Chapter 4), and generating conflict with fishers long established in areas outside the ABMT (cf. Section 6.2).

At local level, tensions emerge also when the regulation of modern fishing (often monospecific or paucispecific and spatially unconstrained) clashes with traditional community management, multispecific and spatially constrained in traditional fishing territories. Tensions emerge also when the establishment of ABMTs by the State is perceived as an overriding intrusion of top-down external governance into local community governance. These causes of local tensions may weaken effectiveness of local authorities, erode customary systems of marine resource use and governance, disrupt social cohesion, community resilience and sense of stewardship, and increase inequities in access to and distribution of resources.

As a consequence, as the historical process described above unfolded, it became obvious both that the objectives of ecology and economy had to be necessarily compatible in the long-term to be viable, and that they were often in strong conflict in the short term. Biodiversity degradation has not been reversed and in some areas is still increasing (IPBES, 2019). This often results in increasing pressure for more aggressive conservation and for more prescriptive ABMTs (Arthington et al., 2016 ; Jones et al 2018). Tensions seem, therefore, to continue to increase, with each cause of the increase linked to others, each by promoting actions that end up contributing to other sources of tensions.

Pressure on States is growing to go beyond aspirational goals with weak implementation, to take effective action and verifiable outcomes (e.g., in United Nations, 2015; CBD, 2022), This forces states to consider measures worth faster biodiversity payoffs, which often makes the short-term costs at least more visible, if not larger, and makes the debate on trade-offs more intense (as illustrated in the protracted debates on the Kunming-Montreal Global Biodiversity Framework (CBD, 2022; Obura, 2023).

Global governance developments are giving greater recognition to Indigenous Peoples, long-established resource users and other stakeholders (e.g., in CBD, 2022). This can make decisions which result in loss of access to resources and effects on livelihoods in order to increase the effectiveness of conservation interventions more partisan and legally complex (cf. Section 2.1).

Ways to resolve these tensions can be identified in the abstract, but that does not make them easy to implement on the ground, in individual cases:

- Evidence is growing that local stakeholders' empowerment may produce better outcomes at lower costs than top-down imposition of conservation measures through ABMTs. (cf. Section 2.1) , with lower risk of weakening local leadership, social bonds, and stewardship. However, that leaves the ABMTs a patchwork of local measures that may or may not collectively be adequate to deliver the desired biodiversity outcomes, particularly in cases when the species are migratory or locally highly mobile
- ABMTs which may result in a temporary or permanent loss of access to vital resources, loss of jobs, livelihoods, transfer of effort and people, and unexpected social, economic, and ecological consequences, can include plans for the social and economic transitions. However, just transition planning is very difficult when different interest groups affected by an ABMT value the costs and benefits in fundamentally different ways (IPBES 2022b)
- If more restrictive ABMTs are deemed necessary for sustainability, short-term local costs could be more transparently and equitably shared by the broader society, making the transition into a long-term societal investment instead of a pure local cost that local communities have to absorb. However, such strategies also require governance processes on all scales to acknowledge existing inequities in fisheries management, with consequences far beyond simply implementing an ABMT. Compensations and creation of alternative sources of livelihoods may need to be seriously considered.

The challenge, for ABMTs is to contribute to the long-term an equitable balance between conservation and sustainable use, guided by a Human Rights approach (Section 2.1). But as the 2022 IPBES Sustainable Use Assessment stresses (IPBES, 2022), there are no "silver bullets" for conservation or sustainable use, no single solution that will fit cases. Each socio-ecological challenge of sustainable combines enough unique properties in biodiversity, communities, and economies., that case specific combinations of measures must be found for outcomes to be widely positive. Complex case-specific combinations of ABNTs and non-spatial measures, with support from local communities and any other resource users, and within supportive enabling policy, legal and economic frameworks, must be developed and implemented. Moreover, future conditions are never stable in the long term, requiring implementation frameworks that have monitoring, assessment capacity, foresight, and adaptive ability to respond to change.

All United Nations summits organized in the last 50 years have stressed the need for integration of the two central concerns: balancing biodiversity protection and human wellbeing. The principles emerging from these gatherings and outputs stress the principles of effective participation, equity, and social justice, meeting basic socio-economic needs, conservation of biodiversity, futurity, and adopting holistic, integrated, and adaptive approaches. As the IPBES Plenary confirmed in 2022, "sustainable use" is a multi-dimensional concept considering: (i) the status of the species being used directly;

(ii) the habitat impacts of the harvesting techniques; (iii) the ecosystem consequences of the targeted harvests, and habitat impacts on economic revenues, employment, dependent livelihoods, cultures, and equity. Sustainable use requires, therefore, multiple, complementary solutions and instruments. Few single fishery or conservation systems can excel on all dimensions, but for a use to be sustainable, it cannot perform *poorly* on any of them.

The 2015 Sustainable Development Goals (SDG) and the 2022 CBD Global Biodiversity Framework, both looking at the 2030 horizon, and the BBNJ process, are the latest manifestation of global efforts to have humanity and nature *live in harmony*. They increase the pressure for a better integration and synergy of conservation and sectoral management and of their spatial and non-spatial measures. This integration needs to be guided by the broad principles listed above. The task may seem overwhelming considering the past decades of mixed results, but the reality is that all experiences were not unsuccessful everywhere, and there the solution does not involve two opposing "blocks" sustaining two opposed paradigms, each holding firm to their sets of "silver bullets". A wide range of intermediate strategies and hybrid measures can indicate possible pathways, tailored to different sets of ecological and socio-economic conditions.

These strategies rest on the conception that the Earth ecosystem is made of two closely intertwined and interdependent natural and human subsystems. For this reason, most ecosystems may be referred to as social-ecological systems. The natural sub-system needs to be conserved for its own sake and to continue supporting humans' livelihoods. The human sub-system needs management to ensure sustainable use of the ecosystem services. This dual obligation requires an effective area-based management to maintain an ecologically and socially viable balance in which ABMTs play a central role. Some of the proposed strategies are briefly looked at below with their ABM implications.

2.3.2 "Half Earth" or "Sharing the Planet"?[53]

a. The "Half Earth" scenario

The tensions between totally and partially protected ABMTs relate to an old tension between two broad conservation scenarios: "Half Earth" (HE) and "Sharing the Planet" (SP). These scenarios have never been formally considered by States and are more aspirational goals than strategies because the plans and means of implementation and their multidimensional consequences have not yet been clearly examined (Immovil and Kok, 2020; De Bruin, 2022). However, some elements of each scenario may be found in the States' action of the last 5 decades.

The overall HE narrative proposes an ecocentric scenario focused primarily on securing the long-term viability of ecosystems, by turning half of the Earth into a network of interconnected protected areas encompassing "about 85 percent" of the remaining biodiversity (Wilson, 2016). These areas were originally thought as strictly protected but

---

[53] See https://www.pbl.nl/en/publications/narratives-for-the-%E2%80%9Chalf-earth%E2%80%9D-and-%E2%80%9Csharing-the-planet%E2%80%9D-scenarios

https://www.pbl.nl/en/publications/understanding-equity-perceptions-of-the-half-earth-and-sharing-the-planet%E2%80%99s-scenario-narratives have also been interpreted las including community-managed areas[54]. Target 3 on the Kunming-Montreal Global Biodiversity Framework is indeed framed in these terms, including in the 30% coverage target MPAs *sensu stricto,* Other Effective Area-based Conservation measures, including IPLCs' areas where applicable (CBD, 2022). The concept is also referred to as "Nature for Nature" (Mace, 2014; Pereira et al., 2020). Uses outside protected areas are intensified to meet human requirements in the remaining footprint, allegedly with minimal or no externalities on the protected areas. The benefits to humans are de facto considered as co-benefits, obtained while pursuing the primary objective of protection, but not necessarily prioritised (Immovil & Kok, 2020).

The HE scenario is supported by some academics (Locke, 2015; Locke et al., 2019; Dinerstein et al., 2019) and contested by others (e.g. Ellis and Mehrabi, 2019; Napoletano and Clark, 2020; Ellis, 2021). It is relayed to the policy sphere by the focus on strictly protected areas promoted by IUCN World Commission on Protected Areas (WCPA) and radical environmental NGOs. To a less radical extent it is also behind the international targets for conservation areas coverage adopted in CBD strategic plans (CBD, 2010; 2022).

The HE scenario is criticized inside the conservation arena and outside it for many reasons: (i) it would necessarily entail an active programme of restoration and 'rewilding' of coastal ocean space to return larger areas presently used to a more pristine 'pre-human' baseline (Wilson, 2016) with huge social and economic consequences, including displacement of populations (a "no-take zone syndrome" of global scale!) (Schleicher et al., 2019 ; Ellis, 2021); (ii) because of the way biodiversity is distributed, a large part of the protected network would be in Asia and Southeast Asia where a majority of poor people and vulnerable communities live and are the least guilty of the global environmental crisis (Buscher et al., 2017). Consequently, global and local equity would be a major and very divisive issue, and is perceived by experts as more threatened in HE and SP (see below) (De Bruin, 2022); (iii) the HE scenario does not refer at all to the non-protected half, as if the different parts of this worldview were totally independent and indifferent behind some conceptual "iron curtain"; and (iv) because the HE scenario does not address any of the real cause of the biodiversity crisis including human demography and the global liberal economic and overconsumption paradigms of modern development (Buscher et al., 2017 ; Obura et al., 2021). There is also a perception among experts that equity is more threatened under HE than under SP (De Bruin, 2022).

b. The Sparing the Planet scenario

In contrast, the "Sparing the Planet" (SP) is an anthropocentric scenario regrouping several approaches that focus on the valuation of nature for its economic, social and cultural utility to people (Gavin et al., 2015; Buscher et al., 2017 ; Busher and Fletcher, 2020; Obura et **al.,** 2021 ; De Bruin, 2022). Nature is mostly valued by humans through the benefits they draw from it (instrumental values) and the relations they developed with it (social and ritual values) (Charles, 2021). Natural and human systems are not

[54] Suggested in http://natureneedshalf.org/nature-needs-half/what-do-we-mean-byprotected/),

separated but integrated to form multifunctional shared spaces. Relevant concepts include "Nature for Society"[55] and "Nature for Culture"[56] (Pereira et al., 2020)[57], "Nature despite People"[58] (Mace, 2014) "Nature for People" (Mace, 2014) , "Nature's contribution to People," (NcP) (Immovil and Kok, 2020); and the still fuzzy concept of "100% sustainable use. All these concepts are to some extent nuances of the concept of sustainable development [59](WCED, 1987). The SP scenario narratives include mainstream approaches based on ecosystem services (ES); mixed landscapes; the concept of relational values focusing on cultural human-nature relations (IPBES, 2022); and more radical proposals to conservation, such as "Convivial Conservation" (Buscher and Fletcher, 2020) and "biocultural conservation" (Gavin et al., 2015). These approaches imply sustaining inter-dependent dynamic social-ecological systems in which natural and human functions are integrated to form shared landscapes and seascapes[60] where nature is conserved for its instrumental as well as cultural and natural values (De Bruin, 2022). Aiming at sustainable use of natural resources and the optimisation of nature's contribution to people (De Bruin, 2022), landscapes are therefore shaped by humans, and the term may be implicitly opposed to the "pristine ecosystems" aimed at by HE. A landscape is also the visual perception of a wide ecosystem, with in the SP scenario, is a nature transformed by humans[61]. A landscape may be aesthetic or dystopic depending on whether it is shaped by environment-friendly activities (e.g., small and medium-scale agriculture and tourism) or by destructive ones. The SP scenario, however, aiming at sustainable use of natural resources and optimisation of nature's contribution to people (De Bruin, 2022), should not generate dystopic landscapes.

It should be noted that the "landscape" is a terrestrial and originally aesthetic concept. The aesthetic definitions of seascapes in dictionaries refer to picturesque coastal areas, in which depth is missing. The idea of deep seascapes, with mountains valleys, plains, areas protected and areas sustainably used is less easy to perceive but may be imagined.

---

[55] In "Nature for Society", nature has an instrumental value to humans. It contributes to satisfying human needs (**Pereira et al., 2020**)

[56] In "Nature as Culture" the human-nature relationship is valued in itself (Pereira et al., 2020).

[57] In the concept of "Nature for Society", nature has an instrumental value to humans, providing services, supporting livelihoods, maximizing the contribution to humans (Pereira et al., 2020).

[58] Emerging in the 1970s and 1980s, the concept of "Nature despite people" (Mace, 2014) coincides with the growing awareness of biodiversity degradation and desire to reduce and reverse impacts defining minimum viable populations and sustainable harvest levels, promoting community-based management and sustainable use. Still a dominant conservation current today (IPBES, 2022, 2022b).

[59] Defined in the Bruntland Report (WCSD, 1987) as "*Development that meets the needs of the present without compromising the ability of future generations to meet their own needs*".

[60] Landscape *means the natural and physical attributes of land together with air and water which change over time and which is made known by people's evolving perceptions and associations such as beliefs, uses, values and relationships* (Cited in **De Bruin, 2022**). A seascape is *a network of marine protected areas, typically large, multiple-use marine areas, where governments, private organizations and other key stakeholders work together to conserve the diversity and abundance of marine life and promote human well-being.* https://www.conservation.org.projects.seascapes..

[61] However, in "ordinary" language, natural ecosystems provide also enjoyable "landscapes" to be photographed and painted, but produced largely by Nature for its own sake.

The SP scenario has been criticized for: (i) an excessive focus on protection of some emblematic, vulnerable and useful species, as opposed to broad diversity (lack of equity among natural components); (ii) and excessive focus on the human development dimension, at the expense of the natural dimensions; (iii) a deficit of consideration of future generations' interests (inter-generational inequity); and (iv) the fact that the future role of small-scale, low impact, activities in the future is politically controversial (from De Bruin, 2022).

The difference between a mosaic of used and unused areas in (HE) and of a landscape with areas containing differentiated uses (in SP) is not that clear-cut if ideological lenses are removed. Implicit differences may be that in HE the space partitioning may be authoritatively conducted and enforced by the State, while in SP it might be seen as an emergent property of the social-ecological system under local participative governance.

In both scenarios, intensification of production is needed to compensate the loss of productive areas, while reducing externalities towards protected areas. In HE, intensification is supposed to be supported by global food markets and trade liberalisations, with high ecological standards worldwide (Wilson, 2016 ; Immovilli and Kok, 2020).

c. *The middle road?*

The strict dichotomy between Sparing or sharing the Earth strategies, and the overly "protectionist" character of the first and overly utilitarian aspect of the second, may be combined or compatibilized by the concepts of "people and nature" (Mace, 2014) and of "reciprocity"[62] recognizing the two-way, dynamic relationships between people and nature, and of cultural structures and institutions for developing sustainable and resilient interactions between human societies and the natural environment.

The outcomes of these approaches depend on the rules in use and some may be more restrictive than others, with associated social impacts. Sharing strategies may be preferred by those whose livelihood is directly dependent on biodiversity systems and threatened by the exclusionary proposals of HE.

The need for an ecologically and socially viable balance between preservation and sustainable use is the subject of the World Conservation Strategy (IUCN, UNEP and WWF, 1980) and its update, "Caring for the Earth" (IUCN, UNEP and WWF, 1991). It is also the sine qua non condition for sustainable development (United Nations, 1992). Dividing the Earth in two parts and pitting all humans in one and nature in the other is obviously not a viable solution, neither for humans nor for nature, particularly in the deeply interconnected aquatic ecosystems. On the other hand, leaving all areas of the world equally accessible to economic development, does not sound realistic either if historical records are of any use.

[62] The concept of "Reciprocity" between nature and humans, encompasses actions, interactions, and experiences between people and other components of nature that result in positive contributions and feedback loops for both nature and humans. It relocates people as active part of nature. It may support transformation pathways in which ethical principles and practices from Indigenous and local communities (IPLCs) redirects policy approaches and interventions worldwide (Ojeda et al., 2022).

An important question, therefore, is that of the optimal allocation of space to both functions (protection and sustainable use), in particular the optimal balance between cities, farmlands, forests, fishing territories, aquaculture, recreation, ritual and wilderness areas, etc. (Locke et al., 2019). ABMTs are central instruments for this purpose. While strictly protected areas play are central to preservation, multiple objective areas and OECMs are central to sustainable use. It might seem that balancing the mix of protected and sustainably used areas is the solution for achieving sustainable development. In reality, however, ABMTs are only one type of instrument in the sustainable development toolbox, interacting with non-spatial instruments, and their effective contribution depends on the enabling or impeding legal, policy, political, and economic frameworks within which they are used.

A central factor of the tension and of the ABMTs' effectiveness is equity in its three complementary forms: (1) equitable recognition of the actors; (2) equitable access to decision-making procedures; and (3) equitable distribution of costs and benefits (CBD, 2018; De Bruin, 2022) (See also Chapter 7 on effectiveness of ABMTs and Section 2.1 on their human dimensions).

2.4 Trends in area-based management in the ocean

The Prologue to this report provides a historical perspective of area-based management (in its broadest sense) in the ocean, starting from the 15th century splitting of the Earth in two equal parts between Spain and Portugal for colonization purposes. It also describes the evolution of this space allocation during more than five centuries.

We have not found any documents attesting or speculating on the "origin" of the idea or need of managing land-space (or *a fortiori* ocean space) and the related human activities on it. We know that terrestrial and coastal areas have been claimed and shared or contested by competing plants, animals and humans, for millennia, striking alliances, or wedging competition at local to regional and even global levels (cf. Prologue), for as long as life as existed, driving a "Darwinian" evolution. We may speculate that need emerged within the very first human communities, probably first as a community asset, as hunting territory, agricultural land, and sacred area, for peoples' livelihood, defence, rituals, leisure, common identity, and wellbeing. Later, private property developed as a measure of wealth and power (Chape et al., 2008: 4).

With rapid urban development and industrialization, protected areas were also established in the 19th century to protect nature from emerging risks of environmental degradation, and to ensure areas of rest and leisure for urban populations (initially eliminating "noxious species"). Colonial nations replicated the approach in their colonies, often cancelling traditional rights and displacing ancestral resident communities, turning a part of coastal areas into common space (cf. Prologue). The sensitivity of the issues of spatial "boundaries" and of "rights" within these boundaries is attested by a long history of social disputes and fierce wars across the globe.

In modern times, however, area-based management is intended as the activities and processes, led by the legitimate authority, to optimize the use of a given space and of the resources therein, for specific objectives, avoiding or reducing the probability of conflict. During the last three decades the need for area-based management of economic activities and conservation has become viral (Lopoukhine and Ferreira de Souza Dias, 2012; Ovando et al. 2021). Two decades ago, the review of the MPA literature indicated that the initial narrow focus on bioecological concerns was slowly broadened to include governance and management concerns (human dimensions) even though consideration of economic and social concerns appeared to lag behind (Thorpe et al., 2011). Despite continuous progress, the lag persists today (cf. Section 6.2.2).

The attention given to area-based management in the past has been checked rapidly using Google Ngram application (https://books.google.com/ngrams) to detect the relative frequency of use in the anglophone literature –between 1860 and 2019– of terms such as: "environmental conflict", "protected areas", "marine protected areas", "in harmony with nature", "spatial management", "area-based management, "closed fishing area + fishery closure", and "area-based management tool". The results (**Figure 2.1**) indicate that the use of most terms starts increasing during the period 1960-1980 except for the term "area-based management tool" (see below).

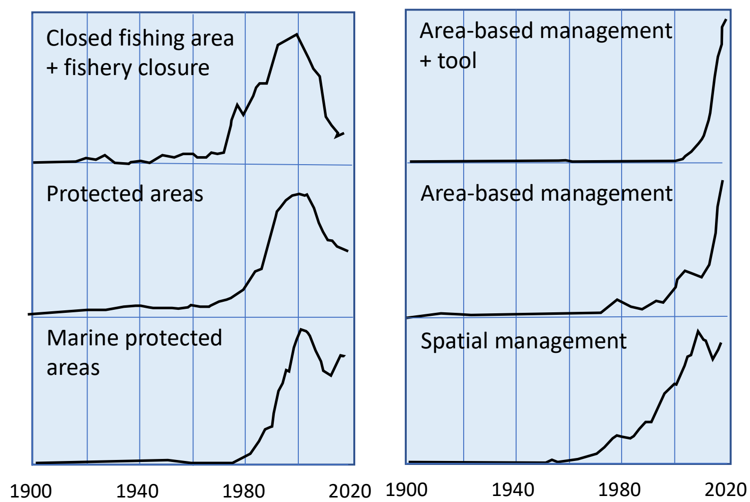


Figure 2.1. Trends in the relative frequency of expressions related to area-based management in anglophone literature (1860-2019) using Google Ngram Viewer[tm]. Search done on 06/10/2022 . Vertical scales are different.

The use of the term "area-based management tool" increases exponentially after 2000 while the use of "fisheries closed areas", "protected areas" and "MPAs", decreases, as if part of the attention shifted after 2000 from sectoral spatial instruments (like MPAs and ABFMs) to a more cross-sectoral perspective. The trends should not be over-interpreted, however, because the search is limited to the Google Books collection in English[63] and most search terms are not ocean- or fishery-specific. Although this cannot be checked formally with the methodology used, it is likely that the fisheries-related trends represent mainly what happened in modern large-scale fisheries. In traditional communities and small-scale fisheries, area-based governance of multiple use areas and existed and persisted for centuries without appearing in the literature. Because of the significant increase in the interest of social sciences for small-scale communities since the 1960s, the increased literature on their conservation and management systems are likely to have contributed to the post WWII increase in interest for ABM.

[63] The collection contains 40 million titles though.

Other factors may have contributed to the rising attention to spatial tools in the second half of the 20th century including the United Nations summits and conferences on the environment and sustainable development; the IUCN World Park Congress; the creation of the CBD; and the emergence of the issues related to biodiversity beyond national jurisdiction (BBNJ) (cf. Section 6.2.2 for more details).

At national level, the same factors (competition for space and resources) has progressively increased the need for management, to allocate resources to user groups; to allocate fishing pressure in space, protecting vulnerable sectoral attributes; and to protect essential habitats.

A few milestones of this long evolution may be mentioned such as (Garcia et al, 2014a):

- The first national parks in the USA in the mid-nineteenth century;
- The creation of a seal reserve and closure of the Pribilof Island fur seal exploitation (1870);
- The first national parks agency (The Dominion Parks) in Canada (1911);
- The first whale sanctuary in Western Australia (1913);
- The first transnational national park between USA and Canada and the first bilaterally managed protected area between Poland and Slovakia (1932);
- The London Convention Relative to the Preservation of Fauna and Flora in their Natural State, which created hunting reserves and protected areas;
- The Truman Declaration on the sovereignty of the USA on its outer continental shelf and the resources therein (1945);
- The similar unilateral extension of national jurisdiction to 200 miles by Chile and Peru (1947);
- The creation of the International Union for the Protection of Nature (IUPN, in 1948) renamed as International Union for the Conservation of Nature (IUCN) in 1956.

2.4.1 Evolution of the Law of the Sea

The history of the Law of the Sea, from the early maritime law to UNCLOS has progressively shaped the political and legal environment that provided the foundations for the development of area-based management in the ocean both at national and international levels, in areas under national jurisdiction and beyond (cf. Prologue).

The modern situation started to emerge in the 1940s. First, in 1945 the US extended their control on all the resources of their continental shelf. Between 1946 and 1950, Chile, Peru, and Ecuador unilaterally extended their coastal Sates' rights to 200 nautical miles to protect their resources from long range foreign fishing. The infamous "cod wars" between the United Kingdom and Iceland (and won by Iceland) in 1958–1961, 1972–73 and 1975–76, reflected a similar confrontation on rights over the ocean natural resources in the North Atlantic, following centuries long dispute over the access to fish resources. Iceland was granted a 12 miles "exclusive zone" where only its vessels could fish and 200 miles "fishing zone" where other nations might fish only with Icelandic permission, prefiguring the 1982 Law of the Sea.

Following suit, in the 1960s and 1970s a large number of nations unilaterally extended their jurisdiction establishing de facto an international customary law of the sea. This was also the time when a large number of colonies became independent and concerned for their sovereignty on marine resources. In parallel, between 1956 and 1983, three long United Nations Conferences on the Law of the Sea (UNCLOS I, II and III) led to the adoption of various conventions regarding the Territorial sea, the contiguous zone and the high sea. Finally, in 1982, the UN Convention on the Sea (UNCLOS) was adopted[64] establishing a post-colonial new order of the ocean, allocating resources and responsibilities within a set of spatially defined jurisdictional areas[65].

From that angle UNCLOS may be considered as the overarching legal Area-Based Management Framework of the ocean, within which all marine area-based management frameworks and tools need to be nested and managed, consistent with international law. This is illustrated by the ongoing international negotiations on conservation and sustainable use of biodiversity in areas beyond national Jurisdiction (ABNJ) and the use of ABMTs for the purpose (United Nations, 2022).

2.4.2 Territorialisation of the ocean

The concept of "territorialization" of the ocean space and of the *Presential Sea* were addressed in the Prologue section 4.3.a). The territorialization is the attempt by States, within their EEZ or beyond, to acquire the same rights they have been granted in their territorial sea (CEMM 2014, 2016). Such rights have been granted by UNCLOS in the 12 miles "contiguous zone" adjacent to the Territorial Sea. Concern has been expressed that coastal States might attempt to gain further regalian powers in the EEZ and beyond through environmental constraints mediated by the MPAs and other ABMTs creating "environmental" barriers" to the freedom of navigation[66]. Additional barriers to navigation may be conceived in certain areas to reduce noise, use of sonars, etc., for the sake of conservation[67]. The fear –particularly in the Navies– is that a proliferation of such ABMTs becomes a violation of the UNCLOS sacrosanct rights of innocent passage and free navigation (CEMM, 2014; 2016).

The concern is also fuelled by the rapid expansion of durable occupation of significant areas of the ocean by new forms of use of the marine environment (oil and gas fields, aeolians, underwater turbines, telecommunication and computer cables, etc.) and MPAs which already reduce the freedom to navigate theoretically still guaranteed by UNCLOS. The issue is sensitive in the EEZ and may become so in the High Sea following the adoption of the BBNJ Agreement. The progressive "territorialisation" of the North Atlantic waters is illustrated also by the statement of the EU in 1997, following a debate in the European Parliament (E-3529/96, OJ C138, 5.5.97), that the EU Birds and Habitats Directives also applied in non-territorial waters. The same decision was made by the English Supreme Court (McLeod et al. 2002).

---

[64] UNCLOS is also often referred to as UNCLOS, confusing the Convention with the United Nations Conference on the Law of the sea process and its three phases: UNCLOS I, II and III.

[65] referred to as Internal waters, Territorial Sea (12 miles), Contiguous zone (up to 24 miles), Exclusive Economic zones (EEZ), up to 200miles; continental shelf (not extending beyond 350 miles); High Sea, and Area.

[66] like PSSAs and some MPAs and sanctuaries do for biodiversity protection.

[67] For example, the French Navy takes into account, in its operations in the Mediterranean, the existence of the marine mammals' sanctuary created in 2002 by France Monaco and Italy, which covers a sector of the High Sea between France, Corsica, Monaco despite the lack of legal obligation to do so.

The *Presential Sea* concept proposed three decades ago by Chile is an attempt of territorialization. The claim, proposed as a solution to the problem of overfishing of straddling stocks, to provide security to the EEZ and territorial Sea, and to secure national development opportunities raised international legal issues (De Cola and Joyner, 1993; De Yturriaga, 1997). The UN Fish Stocks agreement adopted 3 years later was a more successful attempt to address the fishery issues in a more institutionally "correct" approach within the UNCLOS framework, limiting *de jure* the freedom to fish in the High Sea. However, many of the other issues raised by Chile remain, reminding that area-based management has to do with geopolitics and this is true at international level but also within EEZs.

2.4.3 Other legal and informal frameworks

There is no single global legal framework, as far as we know, underpinning the use of ABMTs in natural resources management. UNCLOS might, however, be considered as the overarching area-based framework for the ocean management with its binding legal definition of space-based jurisdictions (territorial seas, EEZs, the High Sea and the Area). UNCLOS does not provide specifically for use of ABMTs in its implementation but within their relevant jurisdictions, States, alone or jointly, can establish whatever management measures they deem necessary, including using ABMTs.

A number of States-based conventions and organizations have space-based management in their foundations (expanded from Barnes, 2010):

- The World Heritage Convention (WHC), which requires its signatories to identify, protect, conserve and transmit natural heritage to future generations, essentially protecting sites. The Natural Heritage protects sites containing habitats of threatened species or plants. The Cultural Heritage protects areas containing remains of historical or cultural importance.
- The 1992 Convention on Biological Diversity (CBD) attaches special importance to protected areas. The Convention contains an obligation to monitor the components of biological diversity and identify activities that may threaten biodiversity (Article 10) and requires States, where appropriate, to take measures to conserve biodiversity in situ (Article 8) including through the designation of protected areas to protect or facilitate recovery of vulnerable species and essential habitats. It Strategic Programme on Biodiversity 2011-2020 (and its Aichi Target 11 on conservation coverage) and its Post 2020 Global Biodiversity Framework (for the period 2021-2030) and successor Target 3, have played a significant role in the expansion of MPAs and OECMs coverage.
- The OSPAR Commission adopted in 2003, its Strategies for the Protection of the Marine Environment of the North-East Atlantic, which includes, in addition to measures against pollution, a Biological Diversity and Ecosystem Strategy, and focuses on developing a network of protected marine areas.
- The 1971 Ramsar Convention concerns the protection of important wetland sites including in marine waters to a depth not exceeding six metres at low tide. This gives it a role in the conservation of marine biodiversity in coastal brackish waters, lagoons, coral reefs, mangroves and intertidal zones (Article 2) through

the establishment of marine reserves or forestry parks that extend in coastal waters up to 6 meters depth.

- The Intergovernmental Maritime Organization (IMO) uses ABMTs to regulate navigation and reduce the occurrence of accidents (such are navigation corridors; anchoring areas). It also adopts Particularly Sensitive Sea Areas (PSSAs) to protect vulnerable coastal areas and habitats from the risk of accidental oil spills.
- The Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS) provides a framework for the research into and protection of certain endangered migratory species.143 Endangered species are subject to strict control, including, the duty to conserve or restore habitats and the duty to reduce or control factors that endanger the species (Article III; Caddell, 2005).
- The International Union for the Conservation of Nature (IUCN) was created in 1948 and evolved into the world's largest and most diverse environmental network on conservation. Although it has no binding power, the IUCN is a recognized global authority on the status of the natural world and the measures needed to safeguard it. Its World Commission on Protected Areas (WCPA) has been central to the development of terrestrial and marine Protected Areas and other effective area-based conservation measures (OECMs).
- The Agreement on Biodiversity Beyond National Jurisdiction is still under negotiation as an implement agreement of UNCLOS. It is hard to predict when and how it will eventually emerge. However, there are expectations that it will provide an adequate enabling framework for the establishment and effective coordination and use of ABMTs also in areas beyond national jurisdiction.
- The Regional Fisheries Management Organizations (RFMOs) have usually clearly delineated areas of competence (they are management areas). They manage fisheries in these institutional spaces and often use ABMTs for fisheries optimization or biodiversity and habitat conservation (cf. Chapter 8; Boxes 1 and 3).
- The Regional Seas Conventions (RCS) Also referred to as Regional Seas Organizations (RSOs) provide inter-governmental frameworks to address the degradation of the oceans and seas at a regional level, initially focusing on pollution at sea, such as oil spills and movement of hazardous waste, as well as land-based sources of pollution, they have expanded their mandate on biodiversity and actively promote the use of marine protected areas.

However, the "obligations" contained in such mandates are far from absolute, and typically qualified according to capacity of the State to act or its subjective view of what measures are actually appropriate in their specific contexts. This allows States broad discretion in implementing the agreements. Many of these frameworks have been in place for several decades and have a strong conservation focus without including robust provisions that protect rights and require consideration and integration of socio-economic, cultural and institutional dimensions. However, states have the opportunity to expand on and strengthen human dimensions in national laws and regulations in response to these legal frameworks

The frameworks referred to above are all State-driven, centralized. However, at national and mainly at local level, traditional/customary governance systems still exist in manty parts of the world, In the Pacific ocean, Indian ocean Canada, New Zealand, South-east Asia, Canada and Europe, sometimes referred to as informal, sometimes neglected or depressed by centralized governments and sometimes enhanced and empowered. Centuries-old community-based governance systems like the French "Prud'homies" or the Spanish "Cofradias" are still operational in the Mediterranean despite repeated attempt by central authorities to curtail them and having sometimes been considered for decades as "*legal curiosities; anachronic legal relict;* and *debris of old institutions,* but also as *an* institution both old and new, so odd, but so useful (Rauch, 2014).

Similar traditional/customary systems exist in many parts of the world and play an important role as custodians of the environment employing ABMTs to sustainably manage resources[68]. Other customary systems have been eroded due to political agendas while others try to survive or develop in response to their evolving social, political and economic environments[69]. The co-existence between centralized legal systems and local rules has been termed as legal pluralism (Benda-Beckmann, 2002), or *the application of different sets of values, norms, principles and rules to similar situations*. The institutions that they give rise to, may either be formal or informal and the latter are frequently overlooked in formalized policy processes (Bavinck et al., 2015). Yet increasingly, the role that these traditional and customary systems play in resource conservation and resource management is being recognised and integrated in international and national policy instruments.

Examples of indigenous and other community-based frameworks include: Community multiple use MPAs; Community-Based Fisheries Management (CBFM) frameworks; Locally Managed Marine Areas (LMMAs; cf**.** Box 4); Marine Areas for Responsible fisheries (MARFs); Management and Exploitation Areas for Benthic Resources (MEABRs); and Territorial Use Right in Fisheries (TURFs) (cf. Annex 1 for details).

2.4.4 Institutional efforts and United Nations Summits

The increase in interests for area-based management illustrated in Figure 2.1 followed the intense global institutional developments that started in the early 1970s, and coincides with the UNCLOS III process.

The UN Conference on the Human Environment (UNCHE, Stockholm 1972) stressed the global concern about the growing impact of economic development on biodiversity and the need to better protect ecosystems, biodiversity benefits, and the related ecosystem services[70]. Since then, the unsatisfactory diagnosis on the environment and biodiversity have been discussed at several successive United Nations and other fora, recognizing each time the continuous negative global trends, the recurrent failure to meet previous

[68] Examples of reasonably intact customary marine tenure systems may be found in Indo-Pacific region and Places like Vanuatu which all use spatial tools as one of the mechanisms to manage resources (e.g., Ruddle and Johannes, 1985,1990, 1995, Hickey 2006) and in Madagascar (Andriamalala and Gardner, 2010).

[69] An example of eroding customary system is the Nocobar Archipelago in India (Patankar et al 2015)

[70] The expression "nature contributions to people" has also been proposed for the same concept, raising some controversy **(**Diaz et al., 2018)

global commitments despite notable national or local successes, and underlying the urgency to meet new and usually higher global commitments in the future.

- In 1992, the United Nations Conference on Environment and Development (UNCED, Rio de Janeiro) and its Agenda 21 Chapter 17 on oceans and coastal areas, called *inter alia* for integrated management of coastal and marine areas and on sustainable use and conservation of marine living resources (on the high seas and under national jurisdiction), referring to non-spatial approaches to target resources management and spatial measures to preserve fragile ecosystems, habitats and other ecologically-sensitive areas.
- Also in 1992, the CBD was created with a central focus on conservation and sustainable use of biodiversity and ecosystems, and the use of protected areas to protect or recover degraded biodiversity and habitats (e.g., in CBD Art. 8).
- In 2002, the World Summit on Sustainable Development (WSSD, Johannesburg) committed to develop representative networks of MPAs.
- In 2007, the Report of the UN Secretary General to the UNGA on oceans, stressed the importance of ABMTs in the different economic sectors. (United Nations, 2007:§117-186).
- In 2010, the CBD Strategic Plan for Biological Diversity, in its Aichi Target 11, committed to have 10% of the ocean covered by MPAs and Other Effective Area-based Conservation Measures (OECMs) by 2020.
- In 2012, the same commitment was reaffirmed by the UN Conference on Sustainable Development (UNCSD, Rio+20).
- In 2015, the United Nations Summit on Sustainable Development (UNSSD, New York) adopted a Declaration "Transforming Our World: The 2030 Agenda for Sustainable Development by 2030". Sustainable Development Goal 14 (SDG 14) aims to *conserve and sustainably use the oceans, seas and marine resources for sustainable development.* For this purpose, SDG 14.5 repeats the CBD 2010 commitment to, *by 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information.*
- In 2016, The IUCN World Conservation Congress (Hawaii) adopted a Resolution WCC-2016-Res-050 encouraging *members to designate and implement at least 30% of each marine habitat in a network of highly protected MPAs and other effective area-based conservation measures…subject to the rights of indigenous peoples and local communities.*
- In 2022, following on the IUCN WCC resolution, the CBD Post-2020 Global Diversity Framework adopted a commitment to have 30% of the Earth ecosystems covered by MPAs and OECMs (CBD, 2022).

While many of the earlier environmental conferences and international agreements relevant to conservation and fisheries management focused on biodiversity protection and sustainable use of resources, increasingly issues regarding rights and wellbeing of people were raised and a more people-centred approach was adopted. Many of the documents emanating from these gatherings (Agendas, Conventions, Action plans, Strategies and Goals, Declarations) increasingly referred to the need to pursue conservation goals within a human-rights framework, taking account of sociocultural and economic dimensions, respecting the rights, practices and governance systems of indigenous and local peoples, and requiring that inclusive and transparent planning and decision-making processes are adopted. These principles and approaches were relevant across all sectors, decisions and management interventions.

For example, the Convention on Biological Diversity highlights that the participation of women is a key element in the preamble to the CBD (1992) and recognises "*the vital role that women play in the conservation and sustainable use of biological diversity*". The CBD Programme of Work on Protected Areas (CBD, 2004) calls on Parties to achieve full and effective participation of indigenous and local communities, in full respect of their rights and recognition of their responsibilities, consistent with national law and applicable international obligations, and the participation of relevant stakeholders in the management of existing, and the establishment and management of new protected areas (Target 2.2). The recent Global Biodiversity Framework (CBD, 2022) includes text that recognises and respects the rights, knowledge systems, collective action, and other contributions of indigenous peoples, local communities and women in the context of biodiversity conservation. More generally, it also suggests increasing recognition of the need to take account of rights and social dimensions in biodiversity conservation planning, management and decision-making.

Greater attention to the human dimensions of environmental and conservation management efforts including the processes followed to develop and implement such policies, plans and interventions, were also being informed by various other more socially orientated international instruments such as CEDAW (Convention on the Elimination of All Forms of Discrimination against Women, 1979), the International Labour Organization Convention C169 and the United Nations Declaration on the Rights of Indigenous Peoples (2007). While these instruments do not deal specifically with ABMT for fisheries and conservation, they deal with the rights and socio-economic realities of local and indigenous communities that may be affected by such agreements and related interventions. Thus, states that have committed to these instruments are required to adopt the principles and provisions within these instruments in any planning, management and decision-making processes that affect the lives of local and indigenous peoples.

2.4.5 Global policy frameworks

The use of ABMTs has been strongly advocated for decades in major global policy frameworks such as Caring for the Earth (1991); UNCED Agenda 21 (1992); The FAO Ecosystem Approach to Fisheries (2001); the Millennium Assessment (2005); the CBD Strategic Plan for Biodiversity 2011-2020 (2010); the UNSCD Sustainable Development Goals (2015); and the CBD Global Biodiversity Framework (2022).

In its 2030 Agenda for Sustainable Development, the UNSCD established a broad Sustainable Development Goal for oceans (SDG 14) to *Conserve and sustainably use the oceans, seas and marine resources for sustainable development*. Contrary to a frequent practice in policy documents, the 2030 Agenda does not refer to the specific "objectives" implied by the goals but specifies directly the "Targets" (United Nations, 2015). However, these "targets", as the goals, are purposely drafted as *universal and transformative* (page

3) and *defined as aspirational and global* (page 13), leaving to States the right and responsibility to fix their national targets more precisely. Most of these targets are time-bound (to 2020, 2025 and 2030) but only one, Target 5 sets a quantitative commitment for a global conservation areas coverage of 10% of coastal and marine areas by 2030. This target has been overtaken by Target 3 of the Post 2020 Global Biodiversity Framework (CBD, 2022) which aims to fulfil its vision of *living in harmony with nature* (and *Mother Earth)* through four long-term goals for 2050, three of which are particularly relevant for Fishery ABMTs: (i) On the integrity, connectivity and resilience of all ecosystems is enhancing, halting extinctions of threatened species, and maintaining genetic diversity of wild populations (Goal A); (ii) On sustainable use and management of biodiversity and valuation of nature's contributions to people (NbS), and ecosystem functions and services; (and (iii) on the provision of adequate means of implementation.

CHAPTER 3 - AREA-BASED MANAGEMENT

SUMMARY

Spatial and non-spatial management tools

Area-based management (ABM) uses both spatial and non-spatial measures (ABMTs) to reach its objectives. The first are specifically attached to a geographically-defined area while the second are not delimited and apply across the entire distribution of the activity concerned. Special access rules, gear definitions, or prohibitions, regarding species or habitats that apply only within the ABMT are "spatial" measures. While the "area" exists in nature and the "tools" exist in the tool-box, it is the association of the two that creates the ABMT.

ABM Definition and role

Area-based management (ABM) may be defined as *a spatially integrated approach to management of the full suite of human activities, organized and regulated in formally delimited spaces or zones, of different sizes, based on geomorphological, bioecological, sociocultural, technoeconomic, legal, jurisdictional, or political considerations, in which different regulations may apply to reach agreed objectives*. ABM should not be confused with Area-based planning as management starts when planning ends. States currently manage the Ocean, in their EEZs and in ABNJ within UNCLOS-defined spatial and resources-based jurisdictions. The role of area-based management is to maintain some sort of order within this multiple-scales assemblage of management areas and jurisdictions, with various degrees of partnership between the State and local communities.

ABM approaches and frameworks

UNCLOS has established the overarching ocean ABM framework and zoning under which all other spatial management frameworks may operate at different scales. The UNCLOS framework is tri-dimensional, and establishes a zoning system based on distances from the coastal baseline and depth (in the case of the extended continental shelf and the Area). Within UNCLOS, ABM may be conducted –and ABMTs applied– in frameworks like MSP, ICAM, MPAs, EBSAs, EAF, LMEs, seascapes; as well as across the management areas covered by RFMOs and RSCs.

3.1 Spatial and non-spatial measures

ABM generally use spatial and non-spatial measures and these two terms are very frequently used in this document, justifying a short introduction of the subject.

The adjective "spatial" (or area-based) refers to the fact that the tool (or measure) is applied inside well define spatial boundaries to achieve specific objectives, resulting in different regimes of use being implemented respectively inside and outside the defined area. ABFMs, MPAs and many other examples of area-based measures and frameworks are given in Annex 1.

By contrast, the adjective "non-spatial" (or non-area-based) refers to the fact that the tool (or measure) is applied everywhere in the general area of operations (e.g., the fishing ground) or the ecosystem for which it is designed, and of which it conditions the regime of use. Examples are catch and effort quotas, fleet capacity limitations, controls on landing sizes, landing obligations, as well as gear and mesh size regulations. They are referred to as "non-spatial tools" by convention although, in reality, they certainly apply in a space, be it a fishing ground or an ecosystem, the boundaries of which, however, are: (i) not directly relevant for management; (ii) not formally stated, although the geographical localisation of the fishery may be well-known and the fishery footprint may be determined if needed); and not controlled.

As a consequence, spatial and non-spatial tools may often only differ in nature by the fact that their space of application is explicitly geographically defined or not. For example, mesh size and gear regulations (including design, size, and sped) might be "area-based" when defined for use within a closed area in a fishery or conservation area, or "non-area-based" when applying to the general management space (the undelimited fishing ground), as part of the common regime of use. Moreover, while the "area" exists in nature and the "tools" exist in the tool-box, it is the association of the two that creates the ABMT.

In this document we will refer to ABMTs only for areas used for fisheries and biodiversity conservation (impacting fisheries), within which specific measures apply (see definitions below). Large ABMTs may be "zoned" and therefore contain smaller ABMTs with even more specific roles like no-take zones, refuges, or gear restricted areas.

3.2 ABM definition and role

Combining a number of existing definitions, Area-based management (ABM) may be defined as an application of ecosystem-based management (EBM), *the integrated approach to management of the full suite of human activities, organized and regulated in formally delimited spaces or zones, of different sizes, based on geomorphological, bioecological, sociocultural, technoeconomic, legal and jurisdictional, or purely political considerations, in which different regulations may apply to reach agreed objectives* (based on Molenaar, 2013; Vierros, 2016; UNEP, 2018; Reimer et al, 2021; TNC 2022[71]). ABM is also referred to as spatial management or place-based management[72] (Norse et al., 2005; Olsen et al., 2010), and sometimes assimilated to spatial planning, unfortunately blurring the boundary between area-based management and area-based planning (like in Marine Spatial Planning).

Area-based planning is a forward looking, cross-sectoral *public process of analysing and allocating the spatial and temporal distribution of human activities in areas to achieve ecological, economic, and social objectives that are usually specified through a political process* (Ehler and Douvere, 2009). The planning process intends to facilitate the

---

[71] https://www.conservationgateway.org/ConservationPractices/Marine/Area-basedManagement/Pages/area-based-management.asp

[72] It should be noted that for social scientists the "place" means more than the mere location in an ecosystem. It is the area which people live and work in, take care of. This "sense of place" is what leads to customary stewardship.

reduction of sectoral or cross-sectoral conflict for space. It provides an integrated framework for sectoral or cross-sectoral management, but cannot replace it. The planning process ends when the spatial allocation plan is completed and agreed. It does not include the continuous management of the specific activities in the areas allocated to them.

By contrast, ABM is the continuous regulation and enforcement of human activities taking place in the various regulated areas, and around them, to achieve their objectives. It has to be undertaken at a scale large enough to protect biodiversity and ecosystem processes. The term "ABM" covers the institutions, processes, objectives and operational plans activated in the management process to reach the policy objectives. ABM activities include the monitoring and assessments of the resources and of the fisheries, and the control of undesirable collateral impacts. ABM is adaptive through continuous adjustment of the different regulatory regimes of the different zones, to changes in the requirements, status of resources, or context of the areas and activities within them. Consequently, area-based management starts where area-based planning stops.

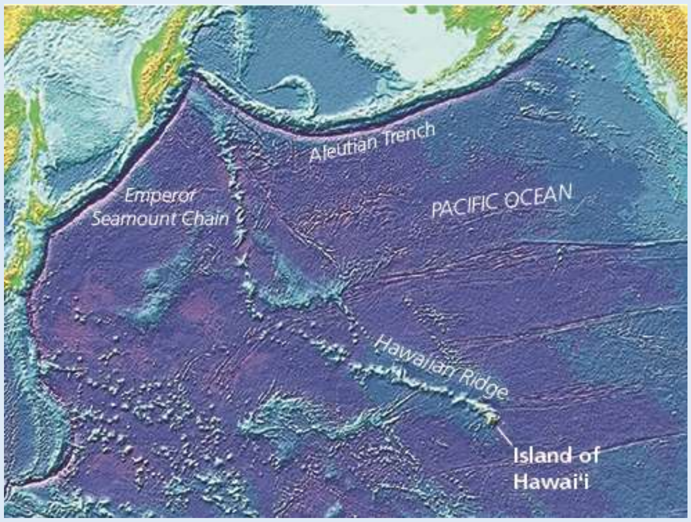
As international competition of economic sectors and conservation for space and resources increases around the world, the "roles" (or functions) of area-based management (ABM) have become a leading topic for sectoral management and biodiversity conservation. Both streams of activity have roles and combine area-based and non-spatial tools to fulfil them. The role of ABM is explicit in its definition. Like any other approach to management, ABM is expected to organize human activities towards the realization of agreed objectives and expected outcomes. Its specificity is to achieve this by considering areas in which different uses and protection regimes are enforced.

States manage the Ocean. In the High Sea, they collaborate to draw management areas placed under the jurisdiction of designated regional or international authorities with different powers. In the Exclusive Economic Zone (EEZ) access is free but regulated for security or other reasons. The use of resources and conservation of biodiversity are regulated, using spatial and non-spatial measures. Similarly, within EEZs, States and traditional or modern communities cooperate in various ways to manage multiple-objectives areas, usually delimited, in which, like in mini-EEZs, circulation is usually free but the use of resources and space is regulated. Regulations may differ between the Territorial Sea and the rest of the EEZ. Fisheries operate in both EEZs and community-managed areas. Their fishing grounds inside these areas may not be formally delimited but some smaller areas, of particular importance may be delimited and protected (e.g., closed areas, taboos, ABFMs). EEZs and community-based areas overlap, many resources are shared, and their fleets come in contact, generating tensions and conflicts. Conservation also defines areas of importance for biodiversity, environmental or historic features, or cultural reasons, in which access and use rules are more or less strictly regulated. Fisheries and conservation areas may overlap, fisheries may operate inside protected areas and protected areas may be created inside fisheries Area-based management tries to maintain some sort of order within this baroque "Russian doll" assemblage of management areas and jurisdictions

ABM may be traditional or modern; top-down, participative or devolved; sectoral or cross-sectoral; and applied at local, national or regional scales. Hence, ABM may be undertaken by a local coastal community, a State in its EEZ, or an RFMO or RSO, in their area of competence. Within the broad area of competence of the managing authority, a sectoral ABM –for example, in fisheries, using ABFMs– defines and regulates the sector's activities with spatial and non-spatial measures to reach the specific sector's objectives – including conservation objectives. A cross sectoral ABM –for example, Integrated Coastal Area Management (ICAM)– aims to simultaneously optimize the outcomes of many sectors operating in one or several overlapping areas, using nested sets of spatial and non-spatial measures to reduce conflict and improve synergy and overall expected outcomes.

Box 1: The use of ABMTs in the North Pacific Fisheries Commission

by Joji Morishita



Map source : https ://www.usgs.gov/media/images/hawaiian-emperor-seamount-chain

The North Pacific Fisheries Commission (NPFC) is a relatively young regional fisheries management organization established by the Convention on the Conservation and Management of High Seas Fisheries Resources in the North Pacific Ocean, which entered into force in July 2015.

There are several seamounts in the high seas of the North Pacific Ocean, and in the waters of the Emperor Seamounts, Japan, Korea, and Russia have been engaged in bottom trawling, bottom gillnet, and bottom longline fisheries for North Pacific armorhead (Pentaceros wheeler)I and splendid alfonsino (Beryx splendens) since the 1960s. In addition, Canada has been engaged in bottom trawl, bottom gillnet, and bottom longline fisheries in the northeast Pacific Ocean. Canada also has longline fisheries for sablefish (Anoplopoma fimbria) in four northeast Pacific seamounts. Because these fisheries target fish that live on the seafloor, fishing gear such as bottom trawl nets come in contact with the seafloor, which can disturb and destroy the seafloor where cold-water corals and goats are distributed.

Regarding area-based management tools (ABMT), the NPFC has established no-operation zones for fishing in the waters surrounding the Emperor Seamounts to protect the vulnerable marine ecosystems (VMEs), in the Northern part of the Koko Seamount and the Northern Ridge of the Colahan Seamount. In addition, a vast closed area is established in previously unfished waters, where no new fishing operations are allowed.

Area-based management may be considered from two different perspectives.

First in modern commercial or industrial fisheries, management tends to focus on distinct stocks of resources, which happen to be located in a certain ocean area, within EEZs and/or outside them. The resources may move and hence the foundation of the management is the resource and not the area that the resources occupy ad its exact boundary. The "rights" are attached to the resource and the boundary within which the resources move and are fished (i.e., the fishing ground) is not or rarely specifically delimited. The dynamic boundary exist but is secondary to the use-right itself, and it automatically matches the natural resource boundaries, as long as the resources stay in the EEZ. The same applies in RFMOs which are responsible for types of resources within areas that are ecological proxies of the resources' distribution, but within which fishing grounds are not specifically delimited. The management units that might be defined are within the general competence area and based on the resources structure and distribution.

Second, and by contrast, traditional coastal communities –and fishing communities in particular– have a strong sense of attachment to place (e.g., ritual or recreational sites or traditional fishing grounds) which may be a formally or informally delineated limited space and within which they have had long-standing traditional rights and stewardship responsibilities. Within that space, they wish to manage fisheries and other activities in as much governing autonomy as possible, and support from the central State, as needed, for capacity-building or control of intrusion of non-local fisher or industrial vessels. The boundary of the community areas cannot match the boundary of all the resources it contains. The community area is the "management unit" and the community may define smaller units within it for various purposes, based on locally important geographical, cultural, religious, or ecological features.

In traditional small-scale communities under local or shared governance, the management process have been given many names in the literature such as: Community-Based Adaptive Management (CBAM); Community-based Fisheries Management (CBFM, in Kiribati and Vanuatu); Community-Based Fisheries Management Program (CBFMP, in American Samoa and Samoa); Community-Based Marine Resource Management (CBMRM); Community-Based Natural Resource Management (CBNRM); Community-Based Ecosystem Approach to Fisheries Management (CEAFM); Community-Based Resource Management CBRM (in Solomon Islands) (Hugh Govan, pers. Comm.) These names stress the strong community role in management, the scope of management (fisheries or broader natural and marine resources, or the management approach (ecosystem approach). The areas within which these forms of ABM is implemented have been given different names in different places (cf. Section 5.4.3).

In a social-ecological system, the process of adaptation of the ecosystem and the fishery to ABM measures modifies the situation that would have developed without it, inside and around it e.g.: access rules; distribution of activities; authorized technology; protected species and habitats; resources biomass, market value, and accessibility, particularly in case of exclusion from a traditional fishing area; and hence the resulting allocation of space, resources and wealth; the nature and quality of livelihoods; and possibly the social relations within the community (e.g., between winners and losers).

For these reasons (cf. Section 2.1), the re-allocation of spaces and resources through the use of ABMTs has been -and still is- at the origin of tensions at local to global levels, between stakeholders, and with the State and/or the conservation authorities. Consequently, modification of spatial allocations should be (and usually is) a careful, law-based and increasingly participative process, in which local restrictions may be introduced -and better accepted- when supported by users and affected persons, intended to enhance general wellbeing, and resulting in an equitable distribution of long- and short-term costs and benefits at all levels (CBD, 2018). The ecological, social and economic consequences will depend on the relative impact the new closed area will have on the pre-closure situation.

To a great extent, similar changes are provoked with the introduction of non-spatial management instruments like Individual Transferable Quotas (ITQs) which also result in the exclusion of part of the users from a fishery with potential transfer of effort to other fisheries and areas. The Brexit process (2016-2020) and its continuing wakes in the North Atlantic fisheries is a good large-scale example of a change in spatial allocations and its impact on the perceptions and the reality by the sector and a broad range of stakeholders (Gallic et al., 2018; Philipson & Symes, 2018; cf. Chapter 11).

3.3 ABM approaches and frameworks

ABM may be conducted using various approaches or frameworks. The United Nations Convention on the Law of the Sea (UNCLOS) has established the overarching ocean ABM framework under which all other spatial management frameworks can be established, subject to follow UNCLOS zoning and provisions. ABM may also be conducted at all scales, from local to global, at sectoral or cross-sectoral level.

Other examples of ABM frameworks include: Integrated Coastal Zone/Area Management (ICZM/ICAM) promoted by UNCED in Chapter 17 of Agenda 21, had a similar intent but a broader scope, covering both marine and adjacent terrestrial areas. Ecologically and Biologically Significant Areas (EBSAs), established under the CBD, have no prescribed management objectives and it is up to States are to decide what to do with and in them. They can therefore be considered as an ABM framework. RFMOs and RSCs also represent area-based frameworks withing which resources and biodiversity are managed. The ecosystem approach to fisheries (EAF) (FAO, 2003; Bianchi and Skjoldal, 2008) combines ABM and conventional non-spatially explicit management, to improve the ecological performance of fisheries. The Large Marine Ecosystem (LME) concept may also be an approach to promote large-scale ABM (Sherman et al, 1993) . The Reef-to-Ridge framework considered in the Cook Islands (Twyford, 2021) is a good example of an ecosystem approach in which tourism and agriculture activities in production landscapes adjacent to marine and terrestrial protected areas are managed together to reduce threats to biodiversity. Marine Spatial Planning is sometimes mentioned as an ABM framework bit it is only a planning framework, used as a basis for area-based management (cf. Section 3.2).

ABM may also be conducted at all scales, from local to global under the governance systems that are appropriate for the scale: a fishery; a local community; an EEZ, an ocean or globally. At cross-sectoral level; a region or an ocean e.g., under RFMOs (Figure 3.1) or RSOs; and a large marine ecosystem (LME). Ideally ABM would (i) successfully harmonize or integrate management of activities at a given scale (e.g., in all fisheries across communities in a region and (ii) then upscale the approach to the higher hierarchical level (the whole national fishery sector, the EEZ, the sub-region, and so on. The experience is that : management complexity increases and uncertainty increase with scale, increasing the requirement for a precautionary approach; early definition of valuable and vulnerable areas (from an ecological and socio-economic perspective) is essential; and that cross-

<u>sectoral integration</u>, institutional <u>collaboration,</u> and <u>stakeholders' participation</u> are necessary (Olsen et al., 2011). Clearly, horizontal and vertical integration of ABM should be functional <u>means</u> to improve situations, and not just an objective to reach at any cost (cf. Section 6.2 on synergies). It should stop when interactions costs become larger than management benefits. The useful scale depends on the distribution resources and activities affecting them.

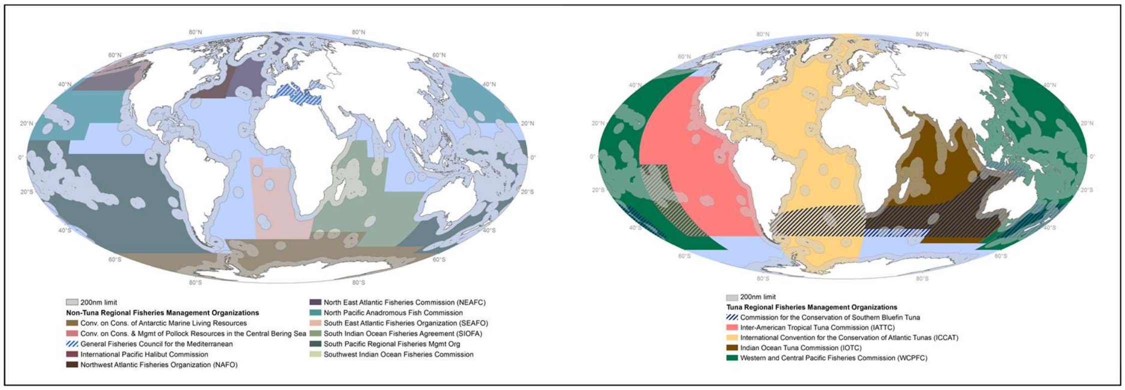


Figure 3.1: **Zoning of the world oceans for the management of highly migratory tunas and tuna-like species (right) of other local or regional resources (left). Reproduced with permission from Ban et al. (2014)**.

The UNCLOS spatial framework is tridimensional (as appropriate for the Ocean) and distinguishes a number of "zones" referred to as: <u>internal waters</u> (behind the baseline); <u>territorial waters</u> (0-12 miles from shore); a <u>contiguous zone</u> (12-24 miles); <u>exclusive economic zones</u> (0-200 miles maximum); the <u>extended continental shelf</u> zone (200 to 300 miles) the bottom and superjacent waters of which are placed under national jurisdiction while the rest of the water column is part of the High Sea, under international jurisdiction; <u>The Area</u> covers the entire bottom area beyond the continental shelf edge and its superjacent waters; the <u>High Sea</u> covers the whole water column beyond 200 miles (except the superjacent waters where relevant, including over the extended continental shelf zone and the Area. In addition, the 200 miles zone is divided in national EEZs by agreed national boundaries, established following rules established by UNCLOS (Figures 3.2 and 3.3; cf. also Prologue).

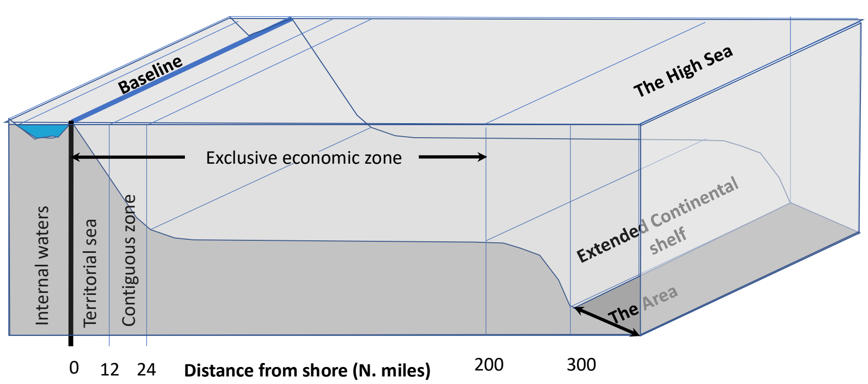


Figure 3.2: Block diagram illustrating the tridimensional area-based framework established by UNCLOS.

The UNCLOS spatial framework is therefore the overarching spatial framework below which all other marine area-based management frameworks and tools are nested (usually implicitly) and consistent with international law. This reality is illustrated by the ongoing international negotiations on conservation and sustainable use of biodiversity in areas beyond national Jurisdiction and the use of ABMTs for the purpose (ABNJ) (United Nations, 2022) in which a further potential subdivision of the Area Beyond National Jurisdiction is being considered though the introduction of international or regional MPAs and other ABMTs.

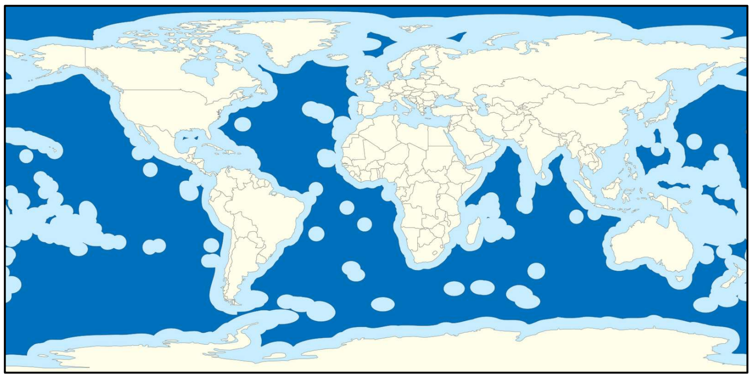


Figure 3.3: Global map of national waters (the EEZs, in light blue) and international waters (the High Sea, in dark blue). The map is purely indicative. Source: Wikipedia. Accessed 08/10/2022

CHAPTER 4 – AREA-BASED MANAGEMENT TOOLS

SUMMARY

ABMT definition

ABMTs categories or individual sites are defined as *geographically defined areas in which human activities are regulated for one or more purposes, delivering one or more social, economic, and ecological outcomes to achieve objectives for biodiversity conservation, sustainable resource use or both*. The geographical area is conflated with the specific measures applying into it and in this report the term "ABMT" refers both to the area and the measures applied in it, unless specified otherwise.

ABMT roles and objectives

ABMTs are a social construct. They are expected to contribute to achieve the SDGs and the commitments contained in the GBF, while also ensuring the sustainability of the activity they support. The roles, goals, and objectives of ABMTs are strongly inter-connected and often cofounded. They may be of bioecological or socioeconomic nature and unless the two roles are played in balance none of the long-term objectives will be met. ABMTs have primary and secondary objectives for which positive outcomes (benefits) are expected, for the actors operating in and around the area, as well as for society as a whole. They may also produce conservation co-benefits. There can be as many objectives as features to be protected and threats to be addressed. The goals and objectives of ABFMs and MPAs greatly overlap, the main difference being that the primary objectives of most ABFMs are secondary objectives for MPAs and vice versa. In both arenas, and despite decades of promotion, the social and economic dimensions of many ABMTs are still too scarcely considered (cf. Chapter 7).

Potential new roles for ABMTs are emerging in relation to ecosystem services; payments for ecosystem services (PES); nature-based solutions (NbS); and nature contribution to people (NCP), even though these "new roles" may mainly be "new hats" that ABMTs may wear while contributing to sectoral sustainable use and biodiversity conservation.

4.1 ABMT definition

ABMTs are a "class" of management tools used for centuries, locally and progressively in central State institutions, to organize and regulate the activities within communities and single economic sectors. The sharp increase in the use of the term ABM in the literature since the year 2000 corresponds to a decrease in the use of the terms "MPA" and of "fisheries closed area" (cf. Figure 2.1). This cannot be safely interpreted without more detailed information, but might indicate a shift in literature focus from sectoral tools to cross-sectoral ones prompted, for example, by the intensive activity at the United Nations level on area-based instruments, including the adoption of global area-based coverage targets (cf. Section 2.3.4). It may also reflect the national and international efforts to regulate the growing competition for space through integrated management (e.g., within ICAM, LMEs, seascapes and MSP frameworks). The EU Marine Strategy framework

Directive and the Birds and Habitats Directives[73] (http://data.europa.eu/eli/dir/1992/43/oj) are good examples of policy frameworks in which protected and other conservation areas, including ecological corridors, are considered important to achieve sustainable maritime development, Good Environmental Status (GES) and Favourable Conservation Status (FCS).

As their name clearly indicates, area-based management tools (ABMTs), also referred to as spatial measures, closed areas, or spatially-explicit management tools, are a class of spatial instruments used in area-based management. They have been defined as *geographically defined areas in which human activities are regulated for one or more purposes, delivering one or more social, economic, and ecological outcomes to achieve objectives for biodiversity conservation, sustainable resource use or both* (based on Molenaar, 2013; Reimer et al., 2021)[74]. In March 2023, the United Nations defined an ABMT BBNJ definition (Match 2023) is: "*a tool, including a marine protected area, for a geographically defined area through which one or several sectors or activities are managed with the aim of achieving particular conservation and sustainable use objectives in accordance with this Agreement* (United Nations, 2023*)*. Thes definitions are "umbrella" definitions applying to individual ABMT sites as well as categories but the latter may have also category-specific definitions (e.g., for ABFMs, MPAs, EBSAs).

The BBNJ Agreement listed the elements to be met by ABMTs in the ABNJ, in brief: (a) Geographic or spatial description of the area; (b) Information on any of the ABMT criteria (listed below); (c) Human activities in the area, including by IPLCs and their possible impact; (d) Description of the state of the marine environment and biodiversity in the area; (e) Description of the conservation and, where appropriate, sustainable use objectives that are to be applied to the area; (f) Draft management, measures, monitoring, research, review, etc.; (g) Duration of the proposed area and measures; (h) Information on any consultations with States, including adjacent coastal States and/or relevant bodies; (i) Information on ABMTs implemented under relevant legal instruments and frameworks; and (j) Scientific input and traditional and IPLCs' knowledge.

The indicative criteria of such ABMTs include: uniqueness; rarity; special importance for the life history stages of species; special importance of the species found therein; importance for threatened, endangered or declining species or habitats; vulnerability, including to climate change and ocean acidification; fragility; sensitivity; biological diversity and productivity; representativeness; dependency; naturalness; ecological connectivity; important ecological processes occurring therein; economic and social factors; cultural factors; cumulative and transboundary impacts; slow recovery and resilience; adequacy and viability; replication; sustainability of reproduction; existence of conservation and management measures.

In the Pacific Island States, the Western Indian Ocean region, and elsewhere, the primary objective of ABMTs is to enhance livelihoods (Govan and Jupiter, 2013; Charlie et al., 2020), which implies also conserving the biodiversity on which these livelihoods depend.

---

[73] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

[74] A similar definition is being considered in the unedited draft of the BBNJ Agreement (United Nations, 2022).

The definition of "sustainable use" of the CBD (United Nations, 1992) complemented by that of IPBES (Fromentin et al., 2022) (cf. Section 1.1) indicate that sustainable use implies maintaining biodiversity while contributing to human wellbeing for present and future generations –which implies maintaining livelihoods, particularly in traditional/customary communities.

ABMTs delimitate a "special place" within which special regulations apply, usually affording higher levels of restriction of activities than the open space around them. Their effective implementation entail the existence, in a particular management area, of a system of rights and duties under the responsibility of a designated (legitimate) authority, often referred to as the ABM framework (UNGA, 2007; Cazalet at al. 2011).

The key elements usually considered as constituting an ABMT are: its boundary, its biophysical characteristics, its objectives, and the spatial and non-spatial measures[75] applied in it and the human populations living in and around it, interacting with it, and ultimately conditioning its performance though compliance or poaching.

Box 2: Area-based fishing rights in Japan

By Joji Morishita PhD

In Japan, small-scale fisheries, aquaculture, and set-net fisheries are basically operated in coastal areas and large-scale fishing operations take place outside it. This is the basic structure of the Japanese fishing sector as defined by the Fisheries Law. Coastal fisheries are managed through the establishment of three types of exclusive fishing rights: communal fishing rights, demarcated fishing rights (aquaculture), and set-net fishing rights. From the perspective of area-based management tools, we will focus on communal fishing rights.

The Fisheries Law defines the fishing rights as follows "*the exclusive right to engage in a particular type of fishing <u>on a certain body of water</u> for a certain period of time*." Fishery rights are intended to strengthen the protection of fishers' legal rights by granting a property right claim, which generates the same legal effects as those arising from property rights under the Civil Code. For example, a communal fishing right grants a fishery that harvests abalone, sea urchins, lobsters, seaweeds, etc. the exclusive right to use a certain area of the sea that serves as a fishing ground for such species. The authority to grant the rights rests with the prefectural governor, and the rights are granted to the fishery cooperative.

Fishing rights are granted to specific fisheries, which does not preclude other fisheries targeting other organisms from being operated in the same waters. However, any act that infringes on the right to fish based on fishing rights constitutes an infringement of fishing rights under Article 195 of the Fisheries Law, even if it is an activity other than fishing.

It is difficult to establish uniform criteria for infringement of fishing rights. However, the following abstract categorization can be made.

1. Any act by any person that actually interferes with the harvesting of fish by damaging the fishing gear laid down or in use.

[75] The "non-spatial measures" are the other measures applying to the whole fishing ground such as Input/output measures, economic incentives, gear regulations, minimum market sizes or open/closed seasons, etc

2. In cases where the value of fishing in the fishing grounds is reduced or quantitatively or qualitatively damaged, for example, acts of taking aquatic animals and plants that are the object of harvesting or aquaculture in the fishing grounds, or acts of preventing aquatic animals and plants that are the object of harvesting from living and migrating in the fishing grounds by polluting water quality or installing artificial (?) structures, etc.

Specifically, the removal of aquatic animals and plants subject to fishing rights by persons who are not members of a fishery cooperative (including the general public), or the construction of structures or land reclamation in the waters where fishing rights are established, are considered infringements of fishing rights.

As a result, the areas where communal fishing rights are established are protected from many human activities, and high biodiversity is maintained.

Although the size of a typical communal fishery right area is as small as a few square kilometres, there are a large number of communal fishing rights established in Japan's coastal waters. These are basically operated and managed by fishery cooperatives, and the establishment of areas and decisions on activities to be restricted are made in consultation with fishermen's representatives, experts, and local governments.

In the definition and usual understanding of the ABMT concept, the geographical area, with its biophysical and socio-economic characteristics, is conflated with the specific measures applying into it. When referring to the role, or effectiveness of an ABMT one refers both to the delimited area in which specific technical measures are applied, to the technical measures applied in the delimited area. In this paper, we decided that, unless specified otherwise, the term "area-based management tool" or "area-based management measure" measure refers both to the area and to the technical measures taken inside it (following Garcia et al, 2021).

In the following sections, we consider the general roles (or functions) generally expected from ABMTs, followed by their more specific Goals, objectives or expected outcomes realizing that these terms are often used as if they were interchangeable.

4.2 ABMTs roles, goals and objectives

The terms roles, goals and objectives are very frequently used in the literature and the differences given by the authors to their meanings is not that clear. and it is not clear.

Adapting the definition of a human role given in Meriam-Webster online dictionary, the ABMT "role" is the function it plays in the social-ecological system. It is what it does. That role may be natural, or defined (expected) by management. It is the socially expected behaviour (and function) of the ABMT for the sector or in the ecosystem, determined by its properties or its belonging to an ABMT category. A goal Is a broad statement of what the ABMT is ultimately expected to achieve (i.e., the goal, is the expected outcome of the function . It is usually expressed as a brief and broad mission statement, clearly defining the vision or the expected state of the system under effective management. It ought to be simple to understand and communicate. While some of the "roles" of an ABMT may be natural (e.g., the production of biomass and other ecosystem support services), all goals are defined by policy or management. Objectives of the same nature as goals but usually are more specific and measurable statements of what needs to be accomplished to attain the broad goal. They tend to be associated to targets and indicators (cf. Pomeroy et al., 1995; Evans, 2021).

We examine below what the literature says about roles, goals and objectives, for ABMTs in general and for some specific ABMTs like MPAs or ABFMs.

4.2.1 ABMT' s roles

The literature does not seem to always distinguish the general roles of ABM from the more specific role of each category of ABMTs. These roles are obviously inextricably connected and interdependent. On the one hand, ABMTs are used in ABM to produce local outcomes that will contribute to reaching the broader ABM objectives for the whole system. On the other hand, the ABMT outcomes tightly depend on the enabling environment provided by the ABM system such as the adequation of the measures, the type of governance, and the enforcement capacity. Moreover, when referring to "ABMTs" the literature may refer to a category of ABMTs (e.g., MPAs or ABFMs) or to individual sites. The properties of the ABMT sites are site-specific realities that may not match all, or well, the expected properties of the category to which they are supposed to belong.

ABMTs are human artefacts, a social construct (See the Prologue section 2.1) even though their geomorphological or bioecological features are natural. It is their designation as ABMT and the measures put in place in them that define their nature (as a management instrument) and their properties (role, goal, objective, targets) in relation to the problem requiring their use. For example, all seamounts are ecologically fundamental, with features, functions/roles in the ecosystem. But only those designated as ABMTs have a regulatory function in relation to human activities. And their "role" as ABMT depends both on their intrinsic (natural) features, the objectives of the establishment, and on the measures introduced in them. Moreover, every ecological site will have many natural functions (e.g., or produce many ecosystem services, including support services) but only some of these functions may be deemed needed and explicitly recognized in the ABMT utility[76]. The ignored or disregarded functions may be a source of problems (e.g., in case of "perverse" feed-back loops) that may involuntarily reduce the overall ABMT utility.

For different types of ABMTs, the following roles and functions have been mentioned in the literature we screened. Considering the similarities we encountered, we grouped them into two broad human-centric and eco-centric categories:

1. Social and economic roles. ABMTs are expected to: (i) Contribute to achieve sustainable use and conservation; (ii) Safeguard ecological processes for provisioning services including food security and nutritional requirements of especially poor communities; (iii) Support livelihoods and human reliance on the ocean's resources; (iv) Contribute to integrated management; (v) Complement other (including non-spatial) management tools; (vi) Address and minimize multiple local human impacts; (vii) Attract funding for research and capacity-building; and (viii) Insulate or help mitigating errors in assessments or

[76] Utility: the state of being useful, practical, profitable, or beneficial; especially through being able to perform several functions. (Oxford Dictionary) https://dictionary.cambridge.org/dictionary/english/utility.

management measures within a precautionary approach (compiled from Rodwell & Roberts, 2004; Vieros et al. 2016; Diz et al., 2018; CBD, 2018; Hilborn et al., 2021; Willer et al., 2023). In the specific context of Indigenous Peoples and local fishing communities, ABMTs may be linked to long-standing customary systems of marine use and management that fulfil many of the roles above (Ruddle, 1998; Ruddle and Johannes 1992; Hickey, 2006; Govan et al 2009a).

2. Ecological roles. ABMTs are expected to: (i) Maintain landscape and seascape connectivity; (ii) Protect wilderness, biodiversity and ecosystem processes; (iii) Lead to higher species densities, biomass, mean size and diversity; (iv) Preserve critical habitats or sensitive life stages; (v) Reduce collateral impact on dependent and associated species; (vi) Increase resilience of biodiversity to climate change[77]; (vii) Slow down the impact of other stressors than climate, buying time to help marine ecosystems adapt (UN, 2007; Dudley, 2008; Kenchington, 2010; Pipitone et al., 2014; Vierros et al., 2016; CBD, 2018 ; Hilborn et al., 2021).

It can be seen form the lists that ABMT "roles" refer to problems, issues, gaps, in existing policies and programs of management or conservation that the ABMTs are intended to fill in or correct to help authorities and stakeholders move in some particular desirable direction. It is therefore not surprizing that ABMT roles are reflected in their goals and objectives (see below).

Roles are usually mentioned in relation to positive expected outcomes. In this respect, the Biodiversity Impact Mitigation (BIM) hierarchy is a central approach to manage impacts on biodiversity supported by both CBD and IUCN. The hierarchy requires to sequentially aim to *avoid, reduce/minimize*; and *mitigate* biodiversity impacts. Each step addresses the residual impacts remaining after having applied the preceding step to the extent possible. In the end, final residual impacts may be compensated by *offsets*[78]. ABMTs are usually expected to generate long-term, positive biodiversity outcomes. In the BIM hierarchy approach, these outcomes may reflect No Net Loss (NNL), maintaining biodiversity, or Net gain (NG), rebuilding it. Maintaining and rebuilding biodiversity is a central role for many ABMTs acting in synergy with non-spatial technical measures (cf. Section 7.2.4; Garcia and Ye, 2018). However, closed areas might also be used as "green banks" to maintain genetic reservoirs, or to limit the expansion of impacts (like ring-fencing, Annex 1). ABMTs protecting and rebuilding mangroves, have already been considered as "carbon sinks" to absorb CO^2 and help slowing down global warming.

However, the pursuit of a positive role may lead to negative and usually unexpected outcomes. For example, no-take-areas established to rebuild predators, if successful, will reduce the abundance of preys. Moreover, the ABMT outcome may be positive for conservation inside the area, and negative for people. For example, closures located in places that overlap with traditional fishing grounds or are used to sustain livelihoods, have led to displacement and exclusion or restricted access of Ips and resource

[77] This hard-to-prove belief is questioned by Darling et al., (2010).

[78] Compensatory offsets, used to "compensate" a biodiversity loss somewhere by a biodiversity benefit obtained somewhere else, preferably in the vicinity of the impacted area, have been controversial. **Garcia and Squires (2018)** proposed instead the use of conservatory offsets applied within the life cycle of impacted species.

dependent communities with negative socio-economic and cultural impacts. Consequently, several scholars and practitioners are increasingly asserting that unless socio-economic objectives are met, ecological and conservation objectives are unlikely to be met in the long-term (Christie et al., 2003; Christie, 2004; ICSF, 2008, 2010; Mascia et al., 2010; Sowman and Sunde 2018). (Agardy et al., 2003; Christie, 2003; FAO, 2011). In the absence or insufficient participation, adequate communication and deliberation e.g., in the analysis of trade-offs and potential compensations, different stakeholders may have different views about the utility of a given ABMTs. Positive roles of the ABMT tend to be heralded by supporters and "winners" in their communication and advocacy, while negative roles tend to be underemphasized if not denied by them and painful and emphasized instead by "losers".

Fishery-ABMTs have the potential role of generating many of the multiple benefits necessary for achieving SDG Targets and in particular SDG 14 and other ocean-related SDGs (Haas et al., 2021; Gissi et al., 2022). The MSP ABM framework has the potential support this role by fostering complementarity among ABMTs, and enhancing opportunities for synergy among different ABMTs (and sectors) for most SDG targets. Fishery-OECMs are ABMTs contributing directly SDG target 14.5 on relative spatial coverage of conservation in addition to their more conventional contribution to address overfishing and IUU fishing, and to conserve living marine resources, foreseen under SDG target 14.4 on fisheries regulation.

In other cases, Fisheries ABMTs contribute to SDGs achievements, as enabling or enhancing factors. For example, effectively integrating women in the establishment of ABMTs can foster women empowerment and provide social and economic benefits to their families and the broader community, contributing to SDG 5 on gender equality, and SDG 1 on poverty. ABMTs are also often expected (or claimed) to have the potential to contribute to minimizing or mitigating climate change impact, and adapting to it (SDG 14.3). However, evidence of the effectiveness of ABMTs across the range of tools being explored in this paper, is very limited as their monitoring and evaluation over a reasonable time period is not routinely integrated into the management process.

While the expectations above are conceptually logical, the demonstration that this potential is realized is complex, and the available evidence is scarce (Rilov et al, 2020) and often controversial (cf. Chapter 7; Cabral et al., 2020 vs Ovando et al., 2020; Sala et al, 2021 vs Hilborn and Kaiser, 2022). The role of ABMTs on ocean acidification and pollution is not well established yet (Reimer et al., 2021) and the conservation functions of ABMTs, themselves, are seriously threatened by climate change (see Johnson et al., 2018; Bruno, 2018 for MPAs). However, it has been suggested that reducing local stressors on coral reefs (through ABMTs) improves their recovery from climate-driven bleaching (Carilli et al., 2009).

Finally, although the issue would deserve a complete analysis, the different roles of AMBTs may be enhanced, improved, by their effective synergy within functional networks (cf. Section 6.2). ABMT networks will produce the benefits of their ABMT components, and enhance these benefits through: representation of broader range of biodiversity attributes; provision of steppingstones of genetic, demographic, and ecological connectivity on a larger scale than single ABMTs; combining the roles of sectoral and conservation ABMTs (as proposed by CBD (2018), and improved overall resilience to climate change impacts (Olsen et al. 2013; IUCN-WCPA, 2018) (cf. also Section 7.6.c).

Role of ABMT networks

ABMTs are usually planned and established individually but their effectiveness relates in part to the quality of the network they constitute together. Grorud-Colvert et al. (2014) distinguish various types of MPAs networks: (i) a regional network is an unplanned collection of MPAs in a region, not planned for any cohesive goal; (ii) a conservation network is a collection of MPAs in a given area aimed at protecting conservation priority sites in a given area, not established with a cohesive goal; (iii) a management network is a collection of MPAs in a given area established to manage a marine resource and multiple human uses; (iv) a social network would be a collection of MPAs whose managers, practitioners, stakeholders, decisionmakers, scientists, and others interact and transfer knowledge; and (v) a connectivity network is a set of MPAs connected by the movement and dispersal of larvae, juveniles, or adults.

The "connectivity network" is likely to be also what is usually considered a "functional network", i.e., an MPA network of individual MPAs intentionally arranged into an organized group within which MPAs operate in a cooperative and synergistic manner (IUCN-WCPA 2008, emphasis added). The result of synergy between MPAs is that together, they achieve more than the simple sum of their individual outcomes and at a larger scale (Olsen et al., 2013). Grorud et al. (2014) offer a framework to assess the synergistic effect for biomass increases in a network of reserves (cf. Chapter 7).

4.2.2 ABMT's objectives

Most ABMTs have primary objectives (also referred sometimes as core objectives) and secondary ones, even though they may not be that explicitly prioritized. An important distinction among protected areas and other ABMT categories is indeed whether their primary (and hence overriding) objective is biodiversity protection or sustainable use. The primary objective of sectoral ABMTs like ABFMs is most often the long-term sustainability and economic viability of the activity. Biodiversity conservation is implicit –and increasingly explicit– when the sector depends on it for its survival, like in fisheries. In community-based ABMTs such as LLMAs and CCAs the primary objective is enhancing livelihoods (Govan 2009; Govan and Jupiter 2013; Charlie et al., 2020) which also implies biodiversity conservation objectives as secondary but essential to attain the primary objective. In protected areas, biodiversity conservation is the primary objective and socio-economic objectives are secondary or constraints. Consequently, and schematically, the primary objective of protected areas is, therefore, a secondary objective for sectoral ABMTs and vice-versa[79], illustrating both their necessary complementarity in sustainable development, the origin of existing tensions, and the need to consider trade-offs for an overall balance.

Last but not least, objectives are aimed to produce benefits (positive expected outcomes) but their pursuit may also generate co-benefits (positive unexpected outcomes). At no

[79] Notable exceptions are the VMEs established in fisheries with the primary objective to conserve the vulnerable habitats and the species they host.

additional cost[80], and which may be known or not. If known, they should be explicated in order to be formally accounted for and integrated in the set of values delivered by the ABMTs and their long-term performance assessment (CBD, 2018).

We have compiled a broad range of overlapping and interconnected objectives of ABMTs based on the numerous examples we looked at (see Annex 1) and based on United Nations (2007: § 117-118, 126), Rice et al., 2012; Molenaar (2013), O'leary et al. (2016), Gilman et al. (2020), and PFMC (2020). These objectives have been conveniently divided into three sets related respectively to social and economic concerns (focused on resources conservation and fisheries viability), broader ecological concerns (focused on biodiversity conservation) and governance. However, some objectives are really common and contribute to the realization of both socioeconomic and ecological objectives and have been marked with an asterisk*.

Social and economic objectives of ABMTs include:

a. Maintain / Recover fishery resources, food security and livelihoods*;
b. Protect tangible and intangible cultural heritage, and cultural, archaeological, or historical values;
c. Provide space for recreation and public enjoyment (tourism, parks);
d. Allocate or recognize area-based use rights and related governance;
e. Reduce conflict between fishing activities and accidents (e.g., though zoning);
f. Maximize or optimize sectoral outputs and cost-effectiveness
g. Reduce cross-sectoral conflict (through Marine Spatial Planning)
h. Support to scientific research, monitoring and assessment (reference sites);*
i. Provide insurance against uncertainty*
j. Contribute to education and awareness raising
k. Complement non-spatial measures (in integrated management)
l. Increase resilience of social-ecological systems*

Ecological objectives of ABMTs include:

a. Foster conservation and strengthen related frameworks
b. Maintain geomorphological structures of importance for biodiversity;
c. Safeguard aesthetic or naturalness/wilderness values (e.g., in pristine areas);
d. Maintain, enhance, recover biodiversity attributes of concern (e.g., rare, threatened or vulnerable species, vulnerable and essential habitats)*;
e. Protect or safeguard key ecosystem processes (e.g., nutrient cycling, energy flow, and trophic chains)
f. Provide a spatial 'buffer" area against threats (with specific regulations)*
g. Reduce collateral impact of fishing (e.g., bycatch mortality, habitat degradation)*
h. Maintain/recover fishery resources (utilitarian conservation)*
i. Contribute to conservation networks

Governance objectives

a. Foster sustainable use and strengthen related frameworks*
b. Support human communities and culture, satisfying multiple stakeholders*

[80] Beyond the cost of their detection and evaluation

c. Respect for and collaboration with Local and customary governance systems;
d. Ensure ongoing and effectives participation in management and monitoring & Evaluation (M&E) processes;
e. Improve community awareness, participation and stewardship*
f. Recognise and Improve the dissemination and use of local knowledge*
g. Contribute to management capacity development*
h. Ensure equitable distribution of costs and benefits*
i. Ensure Mechanisms for Conflict management are in place

This long list may not be exhaustive. But conversely, the objectives listed above are not expected to apply to all ABMTs. In fact, each category of ABMT will usually have a selection of these objectives, possibly in some order of priority, reflecting the context, and the values, needs and priorities of resource users and relevant stakeholders.

In addition, in individual sites, the core objectives above may be subdivided in more specific ones. For example, in the case of pelagic fisheries, the human-centric general objective "to maintain / Recover fishery resources, food security and livelihoods" (Section 4.2.1b) could be subdivided into more specific objectives such as to: (i) Reduce or eliminate bycatch fishing mortality of the target species of concern; (ii) Reduce or eliminate fishing mortality on critical life history stages; (iii) Reduce the fishing mortality of target stocks to sustainable levels; (iv) Reduce fishing mortality of prey species of target stocks; and (v) Reduce trait-based selective fishing mortality and fisheries-induced evolution (Gilman et al., 2020). Similarly, the general objective to " foster conservation and strengthen related frameworks" may be further specified to indicate the particular species, habitat or ecological species to protect. There are therefore, potentially, as many objectives for an ABMT, as there are features to be protected and threats to be addressed.

4.2.3 Goals and objectives of ABFMs

Although in use for many centuries if not millennia, ABFMs seem to appear in the wester scientific literature in the 19ty century (Cardin et al., 1995).

In the context of fisheries, ABFMs may contribute to three main goals, each of which implicitly requiring more specific objectives, that can be further subdivided on the basis of the elements to be protected (Table 4.1).

Many of the ABFMs' objectives listed in Table 4.1 are also detailed objectives for the whole fishery (if not of the whole sector) and may indeed be also reached combining spatial and non-spatial measures. For example, protection of juveniles of the target species , or of non-target species, may be obtained through gear selectivity regulation. The table does not show that the goals and objectives are functionally interconnected. For example, "broader conservation" may be considered nowadays as part of a modern definition of "fishery performance". Similarly, improving "governance " improve both "fishery performance" and "broader conservation". The list of objectives for fisheries optimization and food security (and livelihoods) would be longer and more detailed if we would specifically consider small-scale and recreational fisheries. Finally, empowering governance, and improving the integration of science and local and indigenous knowledge may serve all goals.

Table 4.1: Goals and objectives of Area-Based Fisheries Management Measures (ABFMs). Based and expanded from Hall (1999) and Rice et al. (2018)

Fishery goals	Fishery objectives	ABFMs' objectives
Optimize the fishery performance	Protect/recover resources	Protect nursery, recruitment & spawning areas
		Protect Juveniles and spawning aggregations
		Protect essential habitats
	Control fishing pressure	Reduce fishing mortality in some key areas
		Reduce pressure on selected ages/species
		Deter/eliminate IUU
	Reduce operational conflict	Allocate different activities/gears to specific zones
		Protect traditional tenure and user rights
	Maintain economic viability	Contribute to maintain yields
Maintain/enhance food security	Maintain livelihoods	Protect livelihoods & access to resources & markets
		Ensure equitable distribution of costs & benefits
Provide broader conservation	Reduce collateral impact	Protect rare, emblematic, threatened species
		Protect ecosystem structure (trophic chain)
		Protect unique, critical of vulnerable habitats
		Change or ban destructive fishing gear
	Improve governance	Protect traditional rights, tenure, values, knowledge
		Empower local governance/co-management
Cross-cutting goal	Improve monitoring, scientific assessments and use of local knowledge	

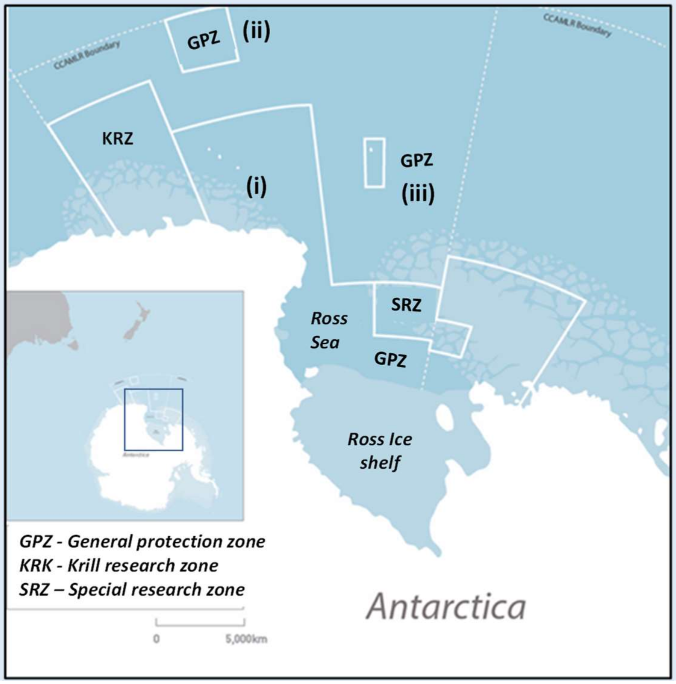
Box 3: Area-Based Management Tools in CCAMLR

By Joji Morishita PhD

In October 2016, CCAMLR agreed to establish an MPA in the Ross Sea, and the global press reported that the world's largest marine protected area, covering 1.57 million square kilometers, would be designated, fishing would be prohibited, and the precious, pristine Antarctic nature would be protected.

As shown in the figure below, the Ross Sea MPA consists of a complex combination of areas with different purposes and functions. Each boundary defining an MPA is based on scientific information and addresses, for example, the conservation of seafloor ecosystems in need of protection. In the Special Research Zone (SRZ), fishing is allowed for ***Antarctic toothfish*** (*Dissostichus mawsoni*) and krill, and scientific data is collected through these fisheries. In the krill research zone (KRZ), data will also be collected through fishing. Fishing is prohibited in the general prohibition zones (i), (ii) and (iii) shown in the figure below, but the marine ecosystem that needs to be protected from fishing is clearly defined, and new fishing grounds outside the MPAs are released as a compensation for the fishing ban. It sets forth clear management objectives for MPAs and the scientifically necessary measures to achieve those objectives.

The Ross Sea MPA provides for a management plan and a research and monitoring plan under the established MPA, and further provides for a review of various activities in the MPA and the effectiveness of the MPA by the CCAMLR Scientific Committee every five years, a review of the MPA by the CCAMLR Annual Meeting every ten years and revisions as necessary, and termination of the MPA after 35 years.



Overall, while economic viability is, logically, the main concern of most commercial fishery operators, the main concern of managers since WWII has been the maintenance of the resource base (utilitarian conservation) (Gulland, 1977: 384; Cochrane and Garcia, 2009). Since the 1990s, the concerns regarding the collateral impact of fishing on the broader biodiversity have increased, joined in the 2000s by the concerns related to climate change.

4.2.4 Goals and objectives of MPAs

Similarly, in biodiversity conservation, the main goals may be subdivided into more specific _objectives (Table 4.2) (cf. also Rice et al.; 2012). This list is very detailed and include objectives related to biophysical, socioeconomic and governance dimensions of MPAs. However, it represents an ideal set, unlikely to be met in many MPAs today[81]. For example, Fox et al (2014) in their analysis of indicators of performance collected in MPAs, noted (i) the paucity of high-quality data needed to clarify the contribution of MPAs to both biodiversity conservation and poverty alleviation; (2) the absence of rigorous and consistent monitoring protocols and instruments; and the fact that "*managers assessed biophysical indicators more often than socioeconomic and governance constructs*. These conclusions strongly suggest that the limited resources available for MPA management are focussed on the biophysical objectives.

Table 4.2: Goals and objectives of Marine Protected Areas (from Pomeroy et al., 1995)

Goals	Biophysical objectives
Sustain/protect marine resources	Maintain/Restore populations of target species at the desired reference points
	Prevent loss of biodiversity and ecosystem structure
	Protect life-stages of vulnerable species from threatening activities
	Minimize, prevent or prohibit overexploitation
	Improve yields in areas adjacent to the MPA

[81] The same comment can be made for fisheries objectives.

	Sustain and increase stock replenishment rate in the MPA
Protect biological diversity	Protect representative ecosystems, communities, habitats, & gene pools
	Maintain ecosystem functions
	Protect rare, localized, or endemic species
	Protect areas essential for species life history
	Minimize unnatural threats and human impacts in and out of the MPA
	Spread risk from unmanageable disturbances across the MPA
	Remove or prevent establishment of invasive species & genotypes
Protect individual species	Maintain/increase focal species abundance
	Maintain/restore habitats & ecosystem required for survival of focal species
	Minimize unnatural threats and human impacts in and out of the MPA
	Remove or prevent establishment of invasive species & genotypes
Protect habitat	Maintain/restore habitat quality and/or quantity
	Protect ecological processes essential for the habitat
	Minimize unnatural threats and human impacts in and out of the MPA
	Remove or prevent establishment of invasive species & genotypes
Restore degraded areas	Restore native species to desired reference points
	Restore ecosystem functions
	Restore/rehabilitate the quality & Quantity of habitat
	Minimize unnatural threats and human impacts in and out of the MPA
	Remove or prevent establishment of invasive species & genotypes
Goals	**Socioeconomic objectives**
Maintain/enhance food security	Meet/improve nutritional needs of residents*
	Improve accessibility of local caught seafood for public consumption*
Maintain/enhance livelihoods	Improve relative economic status and wealth of local residents
	Stabilize or diversity household occupational and income structure reducing marine resources dependency
	Improve local access to markets and capital*
	Improve health of local residents/users
Maintain/enhance non-monetary benefits to society	Maintain/enhance aesthetic values
	Maintain/enhance existence values
	Maintain/enhance wilderness value
	Maintain/enhance recreational opportunities
	Maintain/enhance cultural value
	Maintain/enhance ecological services values
Equitably distribute MPA benefits	Equitably distribute economic benefits to and through coastal communities*
	Equitably distribute non-monetary benefits to and through coastal communities
	Equity within social structures and between social groups is improved and fair*
Compatible management & local culture	Minimize/avoid adverse effects on traditional practices and relationships
	Protect resources-related cultural features & historical sites & monuments
Enhance environmental knowledge and awareness	Enhance respect for and/or understanding of local knowledge*
	Improve understanding of environmental and social "sustainability"*
	Increase scientific knowledge held by the public
	Expand scientific understanding through research and monitoring*.
Goals	**Governance objectives**
Maintain effective management structures and strategies	Ensure effective management planning and implementation
	Clearly define socially acceptable rules for resources use and access
	Establish effective and accountable governance
	Ensure sufficient & efficiently used human and financial resources
	Recognize & integrate local/informal governance in management planning
	Periodically evaluate & adapt monitoring and plans
Maintain effective legal structures & management	Ensure adequate legislation
	Ensure compatibility between legal and local arrangements
	Incorporate international rights & obligations in national/local "law"

strategies	Ensure compatibility between local, State and national rights & obligations	
	Ensure that arrangements are enforceable.	
Ensure participation and representation	Ensure representation, equity and efficacy of collaborative management	
	Effectively build resource users capacity for co-management	
	Enhance/strengthen community organizing and participation	
Increase user participation in surveillance & monitoring	Improve monitoring and surveillance of coastal areas	
	Increase people's willingness to abide to sustainable management	
	Build local capacity and ability to sustainable use resources	
	Increase users' participation in monitoring and surveillance	
	Maintain/improve application of law & regulations	
	Ensure access, transparency & simplicity of management & compliance	
Reduce/manage use conflicts	Reduce/manage conflicts, within & between user groups; between them and the community, and with the outside community	

The apparent difference between the number of ABFMs and MPAs goals and objectives is an artefact due to the higher level of aggregation used for the fisheries list. In reality the set of goals and objectives are very similar, The main difference is that the primary objectives of most ABFMs are secondary objectives for MPAs and vice versa.

In MPAs, the emphasis on social and economic objectives given by Pomeroy is commendable, but the literature indicates that little attention has been paid to such aspects in the last three decades (cf. Section 6.2.2 and Chapter 7).

4.3 Potential new roles?

Advocacy is growing in relation to concepts such as ecosystem services and payments for ecosystem services (PES); Biodiversity Impact Mitigation Hierarchy (BIM) with its concepts of no-net loss (NNL), net gain (NG) and compensatory offsets; nature-based solutions (NbS); and nature contribution to people (NCP). These are new or rebranded scenarios, with a liberal economy backdrop, in which the ABMT "actors" may play a role. These concepts are briefly addressed below. It has been suggested that ABMTs might be considered as instruments to be used in the above approaches. The review and discussion of these potential roles and the controversies around some of them, related to "commodification of Nature" is beyond the scope of this report and we only briefly explain the concepts below.

Ecosystem Services (ES) are "*the benefits people derive from ecosystems*" (MEA, 2005). More specifically, they are *outputs, conditions, or processes of natural systems that directly or indirectly benefit humans or enhance social welfare* (Encyclopaedia Britannica, online). It is obvious that ABMTs can and do produce ecosystem services in the form of biodiversity and social and economic outcomes and hence may have role in that framework. Roncin et al. (2008) for example, studied the ecosystem services shared by recreational fishers an scuba divers on the one hand and professional fishers on the other hand in Southern Europe MPAs.

A Payments for Ecosystem Services (PES) is *a voluntary transaction whereby a well-defined ecosystem service (ES) is 'bought' by a minimum of one ES buyer from a minimum of one ES provider if and only if the ES provider continually secures the ES provision* (Wunder, 2005). In other words, a PES is a positive incentive provided within a voluntary agreement between a provider and a buyer, aiming to maintain or re-establish the flow of ecosystem services needed to mitigate or resolve conflicts of interests between different stakeholders, in relation to that service. For a simplistic example, fishers with an impact hard to eliminate through conventional enforcement and prosecution could be individually incentivised, by a payment, to reduce their impact on the flow of services. The payment may be used by the "provider" (e.g., a fishers' cooperative) to change operations, gear, or refrain from fishing. Gelcich and Donlan (2015) suggested that the owners of Territorial Use Rights in Fisheries (TURFs) might be paid for the biodiversity generated in the TURF by no-take zones, generating finance to support effective community-based monitoring and compliance.

Nature-based Solutions (NbS) are defined in many ways. For example, NbS are defined as *"actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"* **(**IUCN 2016). They are also defined as *actions to protect, sustainably manage, or restore natural ecosystems, that address societal challenges such as climate change, human health, food and water security, and disaster risk reduction effectively and adaptively, simultaneously providing human well-being and biodiversity* benefits[82].

Specifically, they are actions aiming at protection, restoration or management of natural, semi-natural, or artificial ecosystems (e.g., artificial reefs) to restore or enhance the services they provide. These actions are underpinned by biodiversity, designed and implemented with the full engagement and consent of local communities and Indigenous Peoples[83]. They are expected to be inspired and supported by nature and cost-effective; to provide environmental, biodiversity, social and economic benefits; to help build resilience; and to support the delivery of a range of ecosystem services (Cardinali et al, 2021). They have a strong spatial planning dimension and in principle, many if not all ABMTs mentioned in this Report comply with the international standards for NbS. Indeed, in coastal areas, NbS solutions have been considered in coastal wetlands, mangroves, seagrass beds, and algal beds including kelp forests for the purpose of carbon trapping in vegetation and sediments (UNEP and IUCN, 2021; Griscom et al. 2017; Girardin et al. 2021.

Nature Contributions to People (NCP) emerged recently as an important element of the IPBES conceptual framework (in IPBES 5, in 2017, according to Diaz et al., 2018). They are defined as *all the contributions, both positive and negative, of living nature (i.e., diversity of organisms, ecosystems, and their associated ecological and evolutionary processes) to the quality of life for people*. Beneficial contributions from nature include such services as food provision, water purification, flood control, and artistic inspiration, whereas detrimental contributions include disease transmission and predation that damages people or their assets. Many NCP may be perceived as benefits or detriments depending on the cultural, temporal or spatial context. NCP builds on the concept of ecosystem services but (i) recognizes the negative contributions of nature (from a human point of view); (ii) recognizes better the central and pervasive role that culture plays in defining

[82] https://www.worldbank.org/en/news/feature/2022/05/19/what-you-need-to-know-about-nature-based-solutions-to-climate-change

[83] https://www.naturebasedsolutionsinitiative.org/news/new-paper-getting-the-message-right-on-nature-based-solutions/

links between people and nature, and (iii) emphasizes and operationalizes the role of IPLCs and local knowledge in understanding NCP[84]. As such it appears as an attempt to rebalance the narrow utilitarian aspects of ecosystem services (often seen and criticized as part of the "commodification of nature") with socio-cultural aspects (Diaz et al., 2018).

[84] https://ipbes.net/glossary/natures-contributions-people.

CHAPTER 5 - TYPOLOGIES OF AREA-BASED MANAGEMENT TOOLS

SUMMARY

Introduction

Several institutional categories of ABMTs are used by different economic sectors to regulate and optimize their activity, and by conservation institutions to maintain, enhance or recover biodiversity and related ecosystem services. These ABMTs have numerous properties in their natural and human dimensions, some common, and some specific to the categories. Their numerous names and acronyms constitute a confusing "acronym soup", and ABMT typologies are often used for classifications and comparisons of categories or individual sites.

ABMTs' properties

The general "properties" of ABMT categories are imposed *a priori* by the institution of origin for general application. By contrast, the local ABMT sites have specific properties reflecting their physical, bioecological and socioeconomic particularities. The matching between a site and the category properties may not always be perfect. The institutional categories have overlapping set of properties which open opportunities for cross-sectoral coordination, but may also create confusion. Fortunately, the guidance available for implementation is usually flexible, allowing local tailoring of the instrument, as better practices emerge. All the ABMTs considered have in common their intent to protect biodiversity among various other objectives and hence overlapping sets of criteria. Most of the differences found related to governance and threat management within and around the ABMTs.

The properties of ABMTs may be infinite depending on the perspective and scale at which they are observed. The most important ones are: (i) properties related to bioecological and socioeconomic features and values to be protected, and (ii) properties affecting their performance. Physical properties are usually not given much importance. This chapter reviews the bioecological and socioeconomic properties of ABMTs and the particularities tar may affect their performance (cf. Chapter 7). Limited information is a key challenge. Properties, related to ecosystem functions or to multiple-risk aversions of different stakeholder groups, for example, may be hard to document. The comparison of the sets of criteria formally adopted for ABMTs in different jurisdictions indicate similarities, ambiguities, clear differences and gaps.

ABMTs' typologies

Several ABMT typologies have been elaborated based on properties like their size; intended degree of protection; legitimate authority; primary objective; time; or activities constrained. A multi-parameter typology is presented for ABFMs. For MPAs, the globally recognized typology is the IUCN classification in 6 types. A matrix has also been elaborated regarding community-based area management frameworks. The diversity of properties and their multiple possible combinations are such that no single universal typology is possible because of the large overlap between the properties of ABMT sites and categories. But different typologies can be elaborated based on the property of interest.

ABMTs nomenclature[85]

There is no single agreed nomenclature for ABMT categories or sites. Some ABMTs may not have any name and be gazetted only with their geographical location and the measures in place. The "acronym soup" is particularly rich in community-managed areas (CMAs) which include ARSM; CABM; CBFM; CBSFA; CCAs; CFMAs; CMER; ICCAs; LMMAs; MARF; MCAIP; MEABR; MPAs; RFZs; SMAs; and TURFs MPAs are subdivided in 6 types but sub-categories are also mentioned such as Multiple-Use MPAs (MU-MPAs), No-take MPAs, (NT-MPAs) or large-scale MPAs (LS-MPAs). Many conservation ABMTs (like KBAs, IBAs, IMMAs, etc.) may have, in addition, an MPA label. Similarly, the ABFM category includes BPA; EFH; EFZ; FMZ or FMA; FRAs; GCAs; GFAs; HAPC; MOR; NTZ; OECM; RCAs; RTCs, RTIs; SBHs. Other conservation measures include: ISRA; MCZ; OECMs. PSSAs; SPAMI; WHS, and WMA (see Annex 1 or the list of acronyms for full spelling). The elements most represented in ABMT categories' names are spatial nature of the measure, the specific biodiversity attributes, and governance and their priority)order of the element in the name) differ between ABMT categories. The social and economic properties are generally not reflected in the names.

The analysis of 74 local ABFM sites names indicated six components: (i) ABFM type; (ii) geographic location ; (iii) biodiversity attribute(s) of concern; (iv) duration: seasonal or permanent; (iv) restricted gear(s); (v) biological function being protected e.g., spawning; and (vi) originating institution, in that decreasing order of importance. The national names of MPAS taken in the global database is a lot more homogeneous and refers quasi systematically to (1) the geographical local name; (2) the original type of the ABMT e.g., natural reserve, national park; and (3) the type of habitat or biome being protected.

5.1 Introduction

Several categories of ABMTs are used by different economic sectors to regulate and optimize their activity, and by conservation institutions to maintain, enhance or recover biodiversity and related ecosystem services. These ABMTs share some properties but have also distinctive ones. The large number of ABMTs categories, sites, and names met in literature (cf. Annex 1) may be very confusing for the non-initiated and the problem has sometimes been referred to as a slew of acronyms (Rocliffe, 2015) or more colloquially as an "acronym soup" confusing practitioners and the public (**Figure 5.1**). In addition, different nations sometimes give different meanings and implement different and conflicting regulations under the same acronym (Rocliffe, 2015). Consequently, an effective classification system of ABMTs, into categories and sub-categories may be essential to prevent mislabelling and a correct and heuristic evaluation of the existing types of ABMTs (Horta e Costa, et al., 2016).

This suggests that the development of some classification of ABMTs might be useful.

[85] The full spelling of the acronyms is available in Annex 1 and in the List of Acronyms

Figure 5.1: The acronym "soup". By courtesy of Adrienne William
https://adriennewilliams.com/

Rational classifications are generally referred to as typologies or taxonomies. A"typology" is *a classification; a study of types, or a system of dividing things into types, facilitating the analysis of a complex reality and of classification.* A "taxonomy" is *a system for naming and organizing things, especially plants and animals, into groups that share similar qualities; the Science of the law of classifications of living organisms*[86]. It has been argued also that typologies are *ex-ante* conceptual configurations, predefining categories and sub-categories in which elements that happen to have the required characteristics are grouped. By contrast taxonomies are *ex-post* empirical configurations, in which categories and sub-categories are defined through an analyses of the characteristics of the elements to classify[87] (Meyer et al., 1993; Borgès da Sylva, 2013, 2014). The most famous taxonomy is the Linnean classification of living forms[88].

Consequently, the term "typology" seems most appropriate to classify the global categories pre-defined by international institutions with a specific name, a definition containing the objectives or function of the ABMT category and, sometimes, a set of identification criteria. This is the case of ABMT categories or labels (ABFM, MPAs, PSSAs, APEIs, etc.) established a priori by various institutions. These categories represent ideals of characteristics to have and outcomes to be achieved by an ABMT to become a "member" of the category. Subsequently, States establish new ABMT sites or identify existing ones corresponding to these categorial requirements, giving them a local name related to the locally relevant characteristics. As a result, ABMT sites have both local names and a category or sub-category label. Because the category characteristics overlap, an ABMT site may get more than one label. For example, a fishery reserve (ABFM) or a

---

[86] Combined from Cambridge (https://dictionary.cambridge.org/dictionary/english/typology) and le Petit Robert (https://www.lerobert.com)

[87] e.g., using factorial analysis, principal components analysis, clustering methods, etc.

[88] The Linnean taxonomy classifies living organisms into kingdoms, phyla, classes, orders, families, genuses and species, in descending order of complexity and diversity of their characteristics.

Marine Managed Area (MMA), may also be labelled as MPAs. Moreover, an ocean space might be identified in two different categories of ABMTs that will overlap on a map. For example, many ABFMs established by NEAFC, and MPAs established by OSPAR overlap significantly.

In this process, States must shoehorn their existing ABMT sites into the institutional categories based on a mix of objective data and political arguments (e.g., identifying which existing ABMT sites, presently in any institutional category, may also be labelled as OECM). They may also create new ABMT sites for a given category (e.g., MPA) or sub-category (e.g., Type I or VI MPA), based on *a priori* characteristics such as management objectives and hence intended outcomes (for MPAs, see Day et al., 2012, 2019**).** Because of implementation vagaries, the real characteristics of the ABMT, its regulations, enforcement, and outcomes, may in the end be quite different from the original intent (Horta e Costa et al., 2026; cf. also Chapter 7).

The terms "typology" and "taxonomy" refer to the process of organizing the elements in homogenous groups and the outcome of such a process. In both cases, the classification aims to minimize variance within categories and maximize it between categories, meaning that, Ideally, the groupings identified should be homogenous (i.e., with very similar properties within the group) and clearly distinct from each other (i.e., with little or no overlap between groups). The clustering of individual elements is based on their inferred or measured similarity and proximity (Borges da Sylva; 2014). By capturing similarities, redundancies, and differences the typology can inform ABMT users of potential cross-sectoral synergies and conflicts, and facilitate comparative evaluations of performance of ABMTs in ways that enhance understanding of enabling (and impeding) conditions for successful performance

The elements considered for the clustering are selected based on the nature and purpose of analyses (e.g., economic, socio-economic, legal). The variables considered might be discrete (e.g., species, sub-sectors, primary objective, type of governance, type of outcome) or continuous (e.g., area covered; distance from the coast, duration, degree of protection). Elementary variables may be grouped in dimensions that may be physical (area, depth); ecological (biotope, key biodiversity value); social (traditional, modern, culture, rituals): economic (services, revenues, costs); or related to governance (centralised, shared, developed, private, right-based).

Based on the above, one might argue that an *ex-post* taxonomy of all existing ABMTs in categories and subcategories, based on an analysis of a global database containing all their essential characteristics and outcomes would be a useful instrument for performance evaluation and decision-making. Such taxonomy could be based on the regulations effectively in place and enforced, still reflecting inputs, as proposed by Horta e Costa et al. (2016; 2017) for MPAs. Considering the different purposes of ABMTs, across many sectors, within different institutional or legal frameworks, such taxonomy would be a herculean task and, for a large majority of ABMTs, the necessary data are not available. These ABMTs are usually already functionally grouped by categories (e-g-, ABFM, MPA, PSSA, APEI, IBA, LMMAs) which are also labels (cf. Annex 1) which can be used for creating various typologies (see below and in Figures 5.3-5.6 and Tables 5.1 and 5.2).

The following sections focus therefore on typologies of ABMT categories/labels.

5.2 ABMTs' properties

5.2.1. General considerations on properties

The following draws heavily on Rice et al. (2022) who analysed and compared the criteria specified for a number of ABMT categories.

The "properties" of ABMT categories are in fact criteria imposed *a priori* by the institution of origin. Comparing categories is comparing seta of formally agreed expectations. These properties are usually reflected in the category definition, or more precisely in its set of identification criteria which need to be matched by individual ABMT sites to obtain the category label (e.g., in the case of for Green-listed MPA, VMEs or OECM). Consequently, a group of ABMT sites having the same category label (e.g., all OECMs) should have a good number of essential properties in common, but may still differ on other properties not referred to in the definition or criteria.

By contrast, the "properties" of ABMT sites are specific to these sites and reflect the physical and bioecological properties of the ecosystem in which they are established, the measures applied into it (and around it) and the behaviour of stakeholders. ABMT sites may be seen to provide "ground-truthing" of the theoretical categories in which they have been classified. However, these properties are usually patchy in space, and many of them vary with time. Therefore, depending on location, size, "permeability" to external factors, history, and socioeconomic context, the properties of an individual ABMT site may differ somewhat from the general properties of the surrounding area, influencing its performance. In addition, some variability in performance is to be expected between ABMTs located in different places in an ecosystem, even if they have been placed in the same category.

ABMT categories originating in regional or international processes and institutions reflect consensus and common understanding among Parties on the scope, general purpose, definition, criteria, and design of the tool, and therefore should lead to harmonized application. However, despite open communication, interaction and collaboration among the institutions and processes concerned, the result of this international process is a set of ABMT categories, clearly attached to originating institutions for which they are proudly waved "flags", but with overlapping sets of criteria and governance. This overlap may be positive if it opens opportunities for institutional coordination. It may also be negative if its generates confusion, about the distinct properties and roles of certain ABMT categories, duplication of work, and implementation inefficiencies, contributing to the "acronym soup" conundrum.

As noted in the opening part of Section 5.1, ABMTs used for conservation and sustainable use of natural resources have strongly overlapping objectives plus some specific characteristics. These are reflected in their descriptions or definitions (cf. Annex 1) and sometimes in the identification criteria adopted by different institutions within their specific mandates. The national ABMT sites are generally intended to fall within an internationally agreed category, but they may also fall into more than one category. For example, an Important Bird and Biodiversity Area (IBA) may be also designated as Marine Protected Area and could fall in, or overlap, with an Ecologically and Biologically Significant Area (EBSA).

The general guidance available for these areas is hopefully followed but it may be adapted possibly to local ecological and socioeconomic specificities. Consequently, some variation is to be expected in the properties of nationally "tailored" ABMTs belonging to a given institutional category and, sometimes, some deviation from the original standards. Part of that variability is often implicitly or explicitly foreseen in the original international definition processes, as a necessity to both obtain a high-level consensus on the concepts, and then facilitate local applications. A good example is the CBD Decision 14/8 on OECMs with its formally adopted definition and broad voluntary guidance.

Not all existing ABMTs have specific criteria, formally adopted by the institution creating them. However, a general list may be established (as in Rice et al., 2022) based on the criteria adopted for green-listed MPAs (IUCN-WCPA (2017), Area-Based Conservation Measures (OECMs, CBD, 2018), Ecologically and Biologically Significant Areas (EBSAs), Vulnerable Marine Ecosystems (VMEs), Key Biodiversity Areas (KBAs), Areas of Particular Environmental Interest (APEIs), Particularly Sensitive Sea Areas (PSSAs), and Locally Managed Marine Areas (LMMAs; cf. Box 4). The comparison of the sets of criteria can be summarized as follows.

While an important overlap among conservation-relevant ABMTs criteria is logical, differences can be observed (Rice et al., 2022). The tendency for each type of jurisdiction to adopt its own strategies for management and conservation of biodiversity, and hence its "pet" ABMT, label, definition and set of criteria, is at least partially justified by the need to reflect their specific mandates and competencies, to demonstrate transparency and accountability in their decisions and actions, and to make best use of the diverse expertise and experience they have.

5.2.2. Types of ABMTs' properties

The properties of ABMT sites may be infinite depending of the perspective and scale at which they are observed. From a sustainable use and conservation angle, ABMT properties, relate to their bioecological, socioeconomic, and governance and management dimensions, Such properties may be considered for their descriptions, identification, management, performance assessment and to create typologies (cf. Section 5.3). It is convenient to group these properties in properties related to: (i) their bioecological and socioeconomic values to be protected, and (ii) their performance in doing so. Physical and geomorphological properties that may be important for fuller descriptions of ABMT (e.g., sea-mounts; hot vents; Cold seeps; canyons, ocean fronts, upwellings, etc.) are usually not significantly impacted by fishing and are not, therefore, dealt with in any detail in the properties listed below, although they may be addressed under "vulnerable habitats".

The ABMT Properties to be considered for protection are:

- Bioecological attributes. They are very important in fishery-ABMTs and overriding in protected areas. They are mentioned or implicit in the definitions and criteria of ABMTs and include: high biodiversity and productivity; exceptional naturalness; species and habitats that are unique, rare, emblematic, vulnerable representative biodiversity features; species and/or habitats (including bottom types) dangerously impacted, declining or declared as protected, endangered, or threatened; importance for some of life history stages of the species mentioned above; species and habitats sensitive to threats (including unsustainable fisheries, land-based threats, and climate change); and their role as stepping stones in ecological networks; ecosystem functions and services; and regional biogeographic importance (Rice et al, 2022).

- Social and economic properties for which ABMTs may be established include properties related to: the existing uses of the area (sectoral ABMTs); dependent livelihoods; exiting use-rights; provision of food and leisure (including tourism); cultural values, particularly but not only of traditional communities.

The ABMT Properties affecting the extent and effectiveness of the protection include:

- Originating institution: e.g., MPAs are sponsored by IUCN and CBD. EBSAs are promoted by CBD; ABFMs are advocated by FAO and used by RFMOs; PSSAs have been created by IMO; the World Heritage Sites are under UNESCO; VMEs are promoted by the UNGA and FAO, etc. (Figure 5.3). The institutional origin affects the mandate and core objectives.

- Core purposes of the ABMT expressed in the roles, functions, goals, and objectives assigned by the originating institution to the ABMT e.g., regulation of fisheries (ABFMs); navigation (PSSAs), mining (concessions, APEIs, oil and gas fields; firing range (military); or biodiversity protection (MPAs, EBSAs, KBAs, etc.). The resulting categories logically tend to match the institutional mandate of the originating institution.

- Geographic position and boundary are sometimes the only information provided in databases. They are important for the users (e.g., fishers and navigators) that need to comply with it, and are sometimes a formal identification requirement e.g., in the case of MPAs or OECMs. The boundary is generally bi-dimensional, related to latitude and longitude, or distance from the coast, particularly for ABMTs regulating activities on the bottom or in shallow waters. The boundary may become tri-dimensional when the vertical distribution of the properties to be protected, or the activities impacting them, becomes relevant: the air column above the ABMT, the depth of the water column above or below the ABMT (depending on whether it is pelagic or benthic), and the sediment, for benthic species and carbon storage (Figure 5.2). The ABMT may have a single continuous boundary, or it may consist of several areas considered together as a "mosaic" ABMT. Both types may be fixed or dynamic, changing with time (Pons et al., 2022). A classical critique of ABMTs in fisheries is the fact that they are static while the ocean, contrary to land, is fluid and dynamic, and its resources are essentially mobile.

- Ocean domain: e.g., coastal, inshore, in the EEZ, on the extended shelf, in the high sea; in the tropical, temperate or polar areas; in the pelagic or benthic domains. These properties affect both the bioecological properties of the ABFM, the governance, management operations, and effectiveness.

- The jurisdiction: The ABMT may be located in internal waters, territorial waters, the EEZ, or beyond national jurisdiction (ABNJ). It may also be transboundary. transboundary

- Type of governance. The ABMT establishment and management may be centralised in the capital and Ministries concerned, delegated to mandated State agencies, decentralised in peripheral regions, shared between the State and local communities (under co-management), or totally devolved to the local communities (IPLCs, other traditional communities, municipalities, NGOs, associations), generally with some State oversight. A general requirement is that of equitable governance, as defined in CBD (2018) .

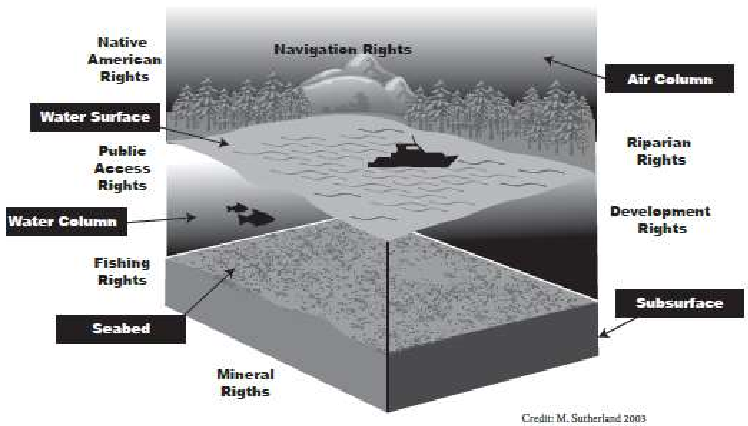


Figure 5.2: Some relevant features of ABMTs, regarding specifically the tri-dimensional boundaries. Reproduced from Esch (2006), Courtesy of NOAA, USA. FGDC. Federal Geographic Data Committee's (FGDC) Marine Boundary Working Group

- Specific threats to biodiversity and to dependent communities that may result from economic activities, environmental drivers, or changes in the destination of the area. Threats may be local, such as competition for space, or overuse, local demography (if associated to lack of livelihood alternatives). That may relate to external drivers such as climate oscillations and change, land-based pollution, regional or global economy; transboundary impacts. Threats may be cumulative. They may also be generated by poor governance and management.
- Level of protection or degree of risk aversion intended to be provided, with respect to biodiversity or socio-economic values: strictly protected areas vs multiple use areas multiple use areas. In practice, ABMTs may be well-managed (as in green-listed MPAs or effective ABFMs) or "paper parks". Protection may vary, as between IUCN MPA categories I to V. or as between ABFMs and open areas. Risk aversion regarding the technological[89], economic and social functions of the ABMT may be very important in sectoral ABMT categories.
- Duration and age of the ABMT, intended or historical, is an important factor for conservation and the closure may be temporary (with dates fixed or determined in real time), seasonal (with parameters fixed or adjusted every year), or rotational but long term, implicitly or explicitly permanent. The time elapsed since its establishment affects the ABMT degree of performance.

[89] Technological dimensions and risk may be important in areas of production of renewable energy (aeolian or turbines fields; oil and gas concessions)

- Management arrangements remembering that an ABMT is above all, a human construct: ABMT design; availability of baseline and monitoring data; clarity and ranking of objectives; participation; management capacity; ability to adapt to future changes/new threats; deterrence of enforcement; integration of the ABMT in the management plan and in conservation networks; cost-effectiveness of the regime compared to other alternatives, including non-spatial, approaches; cross-sectoral issues; information management and communication; ; documentation of the basis for status decisions is available and accessible; and availability of baseline data and benchmarks for monitoring effectiveness.

These properties are all potentially relevant for the establishment of ABMTs and their effectiveness. The importance attached to these properties by the relevant stakeholders will vary according to the ABMT core and secondary objectives. Some key properties are linked to the criteria distinguishing ABMT categories.

Properties like geographic position, boundary, size, depth range, bottom and habitat type, and main biodiversity attributes of concern, may be relatively easy to determine. Some very important functional properties, however, may be more problematic to determine. For example, assessing the degree of risk-aversion (or degree of protection) achieved by any ABMTs is challenging because of the number of factors involved[90], the incomplete information available, and the difficulty of establishing unequivocal cause-effect relationships between factors and outcomes (cf.Section7.2.2). Therefore, the position of an ABMT site in the risk-aversion vector may be easily stated as an *ex-ante* expectation but not easy to empirically determine in an unambiguous manner. Moreover, in case of multiple-objective ABMTs, compromises are likely to be needed between the risk-aversion intended for a range of bio-ecological and socio-economic considerations, even though some balanced optimal position is intended (Hilborn et al., 2021). Moreover, different groups of stakeholders will usually have different perspectives about magnitude of risk, its probability to materialize, the damage and costs if it materializes, and the appropriate allocation of residual risk among stakeholder groups, complicating the balancing process. The complexity of risk aversion analysis increases therefore with the size of the area, the diversity of threats, and of the stakeholders' groups involved.

As seen above, the list of potential properties that may be considered for ABMT typologies is impressive even though many of them are presently rarely documented and explicitly mentioned when describing an ABMT. Moreover, the properties put in evidence for each ABMT site or category will be those directly related to its core role (and primary objective), and ABMTs may in reality be much more similar in what is included within their boundaries and management than appears in their summary descriptions, if the "sponsoring" jurisdictions or institutions themselves have very different mandates or stakeholders.

Generally speaking, the main common property for the ABMTs considered in this document is the existence of high biodiversity values (species, populations, habitats, ecosystems, etc.) even though there is a concern that they might not always be located

[90] E.g., the nature of the biodiversity features of concern, the types of threats to address, the design of the ABMT, the measures applied in the area, the implementation process (particularly compliance) and last but not least, the external drivers of ecological economic and social nature.

where they would have maximum impact in that respect. The main differences among them is the importance given to human dimensions including forms of governance (centralized vs local) and on the weight, if any, given to social and economic properties. OECMs stand out as having the most comprehensive set of characteristics, in line with their position as a label straddling the domains of protection and sustainable use, followed in that respect by APEIs and PSSAs (Rice et al., 2022).

5.2.3. Result of comparisons

All these ABMTs considered in this document have in common their intent to protect biodiversity among various other objectives. Consequently, they have in common many criteria addressing this concern. However, having been developed in parallel asynchronous and uncoordinated processes, and despite unavoidable "cross-fertilization" among processes, there are also remarkable differences among the sets of criteria.

The comparison of the sets of criteria formally adopted for ABMTs in different jurisdictions may show: (i) similarities when properties are referenced in explicit and similar ways by most labels; (ii) ambiguities when properties leave broad scope for interpretation in different institutional contexts potentially leading to different decisions when considering the same evidence; (iii) differences among jurisdictions in how similar criteria, functions and measures may be framed, even when their intents may seem to be similar, (iv) and gaps when properties that appear to be mentioned for some ABMTs are not present in others, or when properties are common, but referenced across ABMT labels in ways so substantively different that differences in outcomes of their applications are likely.

The evaluation in Rice et al. (2022) found few substantive differences among seven sets of ABMT criteria, in the types of features considered as characteristic of the ABMT but somewhat more differences in how the criteria reflected the functions the different ABMTs as intended support for the benefit of nature or people. It was in the governance processes relevant to their identification and management and the management of threats within and around the ABMT that the criteria used by the respective agencies differed most. The degree to which these differences in governance and management of threats have affected performance of the various ABMTS relative to their objectives, and overall relative to conservation biodiversity, has not been explored systematically.

Criteria are rarely quantitatively rigid, and room is typically left in the guidance for interpretation by States according to local conditions which may be highly variable. These conditions may relate to differences in ecological context: the same set of ecological properties can be rare and distinct in some jurisdictions, yet very common in others. They may also relate to the quantity and quality of information available when the criteria are applied, and to the socio-economic factors that alter the threats to which various ecological features are exposed. There are therefore likely to be differences among individual ABMT sites grouped in the same category (label), resulting from local interpretation of the formal criteria, or from experience acquired during implementation (operational practices). This evolution is specifically considered by CDB in the case of EBSA criteria (https://www.cbd.int/ebsa/about).

The process of ABMT identification has been going on for decades, in sequential or parallel but uncoordinated manner in different sectors, particularly since the 1980s (cf. Figure 2.1). In addition, their conceptual evolution with time has sometimes led to confusion, overlap, inconsistent claims over their intended properties, and sometimes convergence of their respective criteria, as well as to different interpretations of these criteria. This evolution of thinking and accumulation of experience with the criteria has sometimes triggered later adjustments either to sharpen the application of previously adopted criteria, or to actually change the scope of criteria to include a wider or narrower range of cases, depending on the experiences. However, at this point, systematic reviews of the evolution of ABMT criteria over time has not been undertaken for any of the criteria (Rice at al., 2022).

5.3 ABMTs' typologies

One or more of these properties may be used to construct a typology and the choice of properties is guided by the specific purpose of the typology, the phenomenon one intends to describe across the population of ABMT sites, and a number of examples are presented below.

5.3.1 Types of typologies

a. Typology based on size and degree of protection

The World Bank (2006) –before the formal definition of MPAs by IUCN in 2008 (Dudley et al, 2008)– produced a typology of ABMTs referred to as Marine Management Areas (MMA), based on the intended degree –and not necessarily achieved– degree of protection.

(i) Marine Protected Areas: primarily designed for biodiversity conservation and habitat protection such as: community-based MPAs; no-take marine reserves; natural WHS; Ramsar wetlands; national marine parks; and marine sanctuaries,

(ii) Multiple-use management areas: balancing conservation and sustainable such as: multiple-use MPAs; community-based management areas (CBMAs) ; World Heritage Sites (WHS); and biosphere reserves;

(iii) Sustainable extractive use and marine resources management areas: designed primarily for sustainable extractive purposes such as: fishery reserves; ecosystem-based fishery reserves; locally managed marine areas (LMMAs); marine extractive reserves; management and exploitation area for benthic resources (MEABR); Community-based Fisheries Management areas (CBFM); other collaborative management area;

(iv) Cultural-ecological and social protection areas primarily set for Indigenous and traditional non-indigenous communities, to protect their cultural heritage, landscapes and seascapes, and use rights, such as: non-indigenous marine extractive reserves; marine sacred sites; cultural-ecological reserve; cultural-ecological Indigenous People territory; customary tenure multiple-use MPA, indigenous MPA; and indigenous landscape management area.

In this typology, the degree of protection decreases from categories (i) to (iv) while the degree of protection of socio-economic and cultural protection increases. A graphic representation based on ABMT size and intended protection is given in Figure 5.3.

The report implicitly draws attention on the difficulty to identify really self-contained homogenous categories of ABMTs. The Term MPA, for example, in used in three of the 4 categories, stressing the large range of protection that the term covers. The reports also notes that the category “Locally Managed Marine Area “ used across the Pacific contains two different types of areas, one established centrally by States in collaboration with non-local US-funded NGOs as a learning network focused on community-based conservation, and one based on customary tenure, primarily established by traditional communities to protect their cultural, ritual and social values, with conservation at best as a collateral benefit.

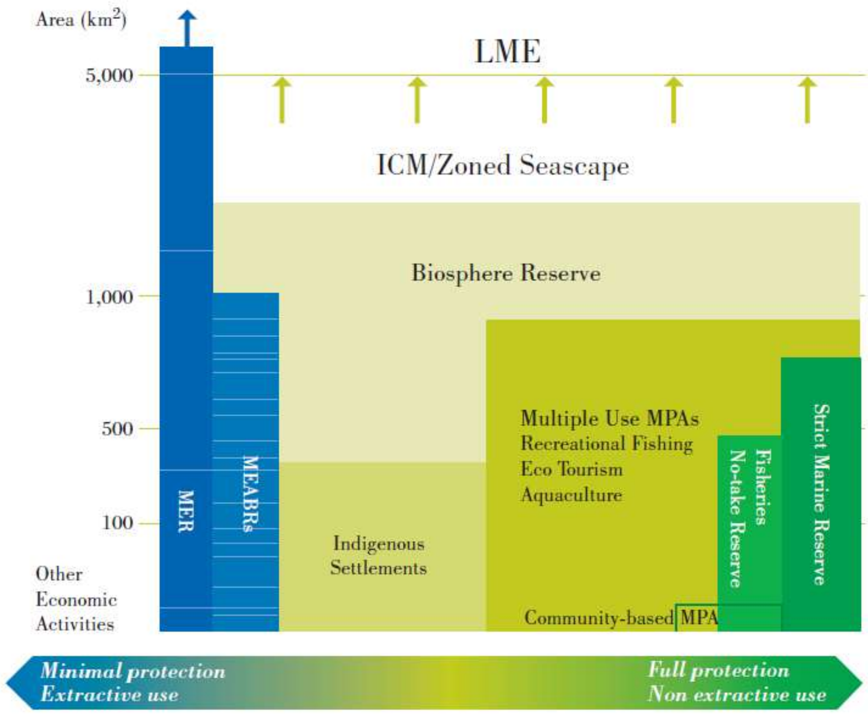


Figure 5.3: **Graphic typology of ABMTs based on their size and intended degree of protection (from World Bank, 2006)**

b. Typology based on institutional origin

An institutional typology could instead be developed distinguishing the Marine Protected Areas (MPAs), promoted by IUCN and the CBD from Ecologically and Biologically Significant Areas (EBSAs), established and promoted by CBD; Area-Based Fisheries Management Measures (ABFMs) promoted by FAO and RFMOs; Vulnerable Marine Ecosystems, promoted by FAO and the UNGA); Particularly Sensitive Sea Areas (PSSAs) established by IMO; or Biosphere reserves and Natural World Heritage sites, established by UNESCO (Figure 5.4).

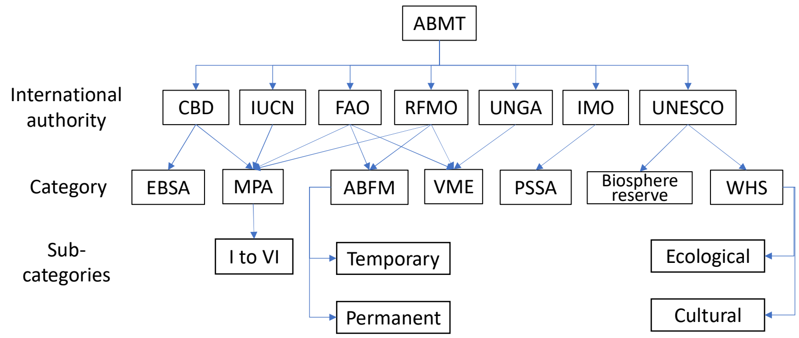


Figure 5.4 : Institutional typology

c. *Typology based on primary objective and legitimate authority*

A multiparameter typology could be established, based, for example, on their (i) primary objective; and (ii) usual authority (Refer to Figure 1.2).

Other typologies might be possible, however, based on functional and other properties of ABMTs. For example, a group of "areas of ecological importance" would group areas of importance for broad range of biodiversity attributes (EBSAs) and for a specific range of species (e.g., KBAs, IBAs, IMMAs and ISRAs), with no prescriptive management requirements, but which may require special management considerations of their habitat needs and vulnerability to a range of activities (expanded from Dunn et al., 2014). In the sections below, we look at typologies of two specific categories of ABMTs: ABFMs and MPAs.

Altogether the review confirms that many important properties are common among ABMTs, the diversity of properties and their multiple possible combinations are such that no single universal typology is possible because of the large overlap between the properties of ABMT sites and categories. The institutional typologies (classifying ABMTs according to their origination institution) is straight forward even though one ABMT may belong to more than one category. In addition, there is so much variability in the way in which States apply or comply with the categories ' criteria that the real properties of single ABMTs may be quite different from the theoretical categories' requirements.

5.3.2 ABFMs' typologies

Fisheries management measures are usually classified in three groups: (i) Input controls to regulate fishing capacity, effort, and mortality. (ii) Output controls to regulate total allowable catch and its allocation through quotas. (iii) Technical measures, including incentives, to control the distribution of mortality and catch among age or size groups, species, space, and time. ABFMs are spatio-temporal technical measures, referred also as "fishery closures" or simply "closed areas", that operate usually jointly with input and output controls, fine-tuning the distribution of fishing effort and catch in space and time, allocating resources between communities or fishery sub-sectors to limit conflict, and protecting selected species, life stages, or essential habitats. Like all ABMTs, ABFMs are areas within which regulations are different and more restrictive than outside (Sutinen and Soboil, 2003 ; Cochrane and Garcia, 2009).

ABFMs have been defined as "*formally established, spatially defined fishery management and/or conservation measures, implemented to achieve one or more intended fishery outcomes. The outcomes of these measures are commonly related to sustainable use of* *the fishery. However, they can also often include protection of, or reduction of impact on, biodiversity, habitats, or ecosystem structure and function"* (CBD, 2018: 15). The overarching goals and objectives that characterize the ABFM category have been examined in Section 4.3.1.

The distinguishing properties that might be considered as a basis for a typology of ABFMs sites include:

- The biodiversity and ecological features protected or intended to be protected: e.g., life stages, species, essential habitat, spawning process; migration process, etc.
- The ecological domain in which the ABFM is established e.g., Lake, river, estuary, littoral, inter-tidal zone, continental shelf, or slope, canyon, abyssal plain, seamount.
- The purpose/objectives of the closure e.g., resources allocation, conflict reduction, fisheries optimization; biodiversity impact mitigation.
- Its "vertical" position in that domain e.g., epipelagic, mesopelagic (if feasible), benthic
- Its static or dynamic nature, in both time and space: fixed, mobile, real-time.
- Its duration: temporary, seasonal, rotational, permanent.
- Its biophysical properties: size, boundaries, geomorphological characteristics (boulder reef, hot vent, lagoon).
- The types of fishing activities (artisanal, recreational, commercial, industrial) and gears allowed, regulated, or prohibited in and around the area:
- The number of other sectors operating in the area: sectoral or multiple use area.
- The type of governance of the area e.g., centralized, decentralized, deconcentrated, shared, devolved, private (only on land)
- The jurisdiction in which the area falls: IPLC (local, traditional), statal, federal, regional (RFMO)

Rice et al (2018) considered a typology of individual ABFMs (only) constructed along three of their key properties: space, time and gear regulations (Figure 5.5):

- <u>Space</u>, i.e., the areal closed which ranges from: (i) a small spart of the fishing ground (e.g., to protect a feature like a nursery area), to (ii) the whole fishing ground (in the case of some seasonal closures, or of a specific fishery gear ban), or (iii) to the EEZ, region or the world ocean, in case of a national, regional or global gear ban (like the UNGA ban of large-scale pelagic drift nets).
- <u>Time</u>, i.e., the duration of the closure which may be <u>temporary</u>, with different durations depending on whether they are (i) established in real time, as a result of application of a move-on rule; (ii) are seasonal (with static or dynamic parameters); (iii) have sunset clause e.g., related to the outcome of a population or habitat recovery programme); rotational (with different time schedules depending on context). The closures may also be implicitly or explicitly <u>permanent</u>

(reserves) and apply to one or more gear (see below). Seasonal closures that are repeated every year on a fixed or dynamic schedule, become *de facto* permanent. Rotational closures may have annual of multiannual cycles and may also be repeated indefinitely. The duration of the closure and the duration of the technical measures applied into it may be different.

- Fishing activities: limitations imposed inside the closures may apply to all or only some gears (e.g., to protect the bottom ecological features from bottom contacting gear), or to some socio-economic categories (e.g. to protect vulnerable fishing communities from industrial or foreign fishing).

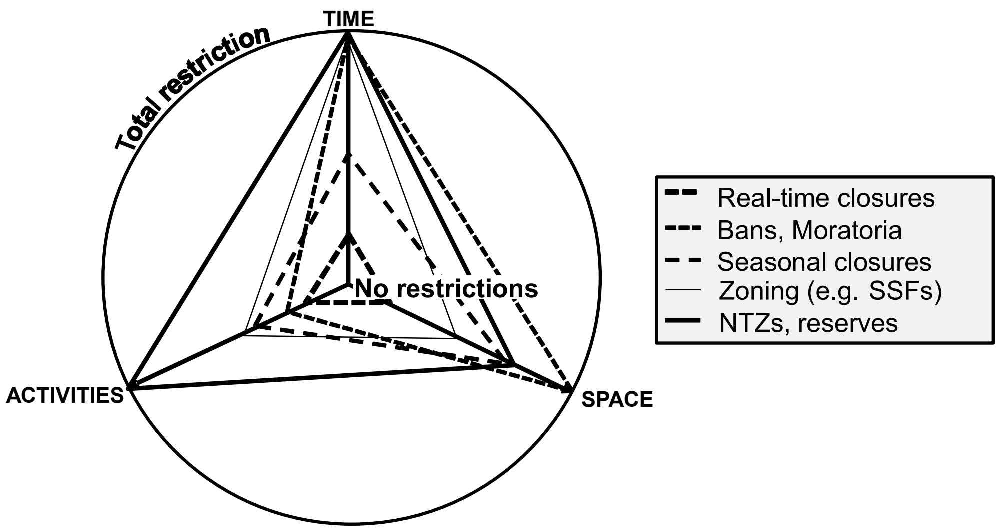


Figure 5.5: Different types of area-based fishery management measures (ABFM) according to the degree of restriction of time, space and types of activities (Redrawn from Garcia et al., 2013). The three axes range from zero restriction (at the center) to total restriction (on the circle). The relative positions of the triangles on each dimension is subjective and may vary between individual sites in each category indicated in the legend.

This simple set of properties were used by Rice et al (2018) and Himes-Cornell et al, 2022 to compare ABFMs' performance to the criteria to be met by ABFMs to obtain the CBD Label of "Other Effective Area-Based Conservation Measures" (OECM). Rice et al. (2018) used the degree of protection (total or partial) to compare the properties of the ABFMs falling in these two categories to OECMs requirements (Figure 5.6).

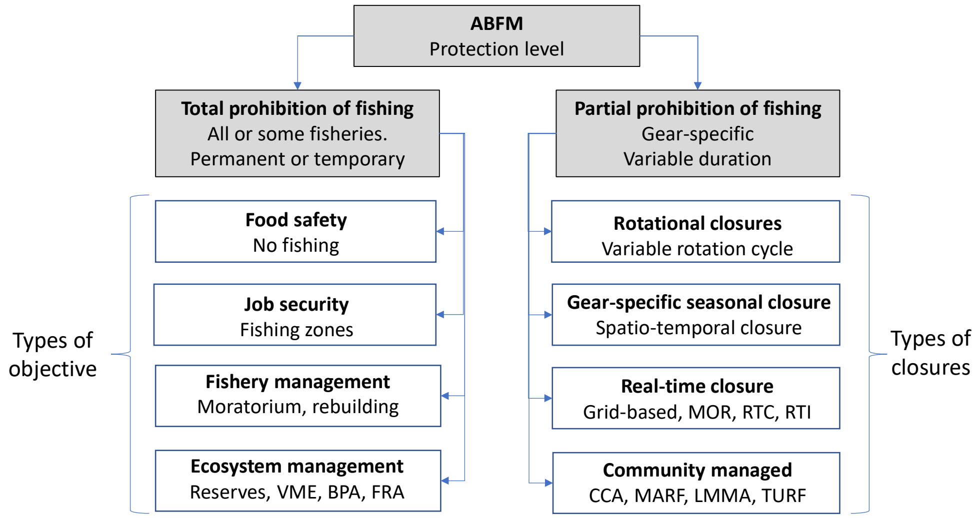


Figure 5.6: ABFM based on the degree of protection used in Rice et al. (2022) to try to match the properties of ABFM categories to OECM properties.

As the ABFMs sites to classify have many common properties and several possible options for each of them, it becomes difficult if not impossible to classify them on all their characteristics simultaneously and the typology may look like a matrix (Table 5.1) or a complex "tree" (Figure 5.7).

Table 5.1: Selected set of fishery-ABFM types (Col. 1) with their main properties (col.2-16).

	PROPERTIES														
	Jurisdiction		Governance			Objectives		biovalues		Measures					
										Restriction		Duration			
	ABNJ	EEZ	Central	Shared	Local	Fishery optimization	Biodiversity conservation	Species	Habitats	Some gears	All gears	Permanent	Temporary	Seasonal	Real Time
Gear ban	■	■	■	■	■	■	■	■	■	■	■	■	■		
Zoning		■	■			■	■		■	■		■			
Reserve	■	■	■	■	■	■	■	■		■	■	■	■		
TURF		■	■	■	■	■	■	■		■		■	■		
VME, BPA	■	■	■	■	■				■	■	■	■			
FRA	■	■	■			■	■	■	■	■	■	■		■	
Ring-fencing	■	■	■				■	■	■	■		■			
Moratorium	■	■	■	■	■			■		■	■	■			
MMA		■	■	■	■	■	■	■	■	■	■	■			
LMMA		■			■	■	■	■	■	■	■	■			
Rotational		■	■		■	■		■		■				■	
Closed season		■	■	■	■	■		■							
Real-Time incentive		■	■			■	■	■		■		■	■		■
Move-on rule	■	■	■		■	■	■	■	■	■					■

Table 5.1 lists a series of ABMT types (column 1) with their properties of importance for attribution of the OECM label (row 2): jurisdiction, governance, management objectives, biodiversity values, and technical measures applied. A few other properties could have been considered such as the aquatic domain (inland vs marine; coastal vs offshore); the marine ecological domains (e.g., littoral, intertidal, coastal, infralittoral, abyssal, bathyal, pelagic vs benthic); the climatic context (tropical vs temperate or polar). Each key property) offers more than one option (row 3), and a lot more options exist that could ne

be represented on this table. The shaded cells indicate those properties that are relevant for every ABFM type. Such a representation illustrates well the bunch of properties characterizing each individual type of ABFM and the difficulty of organizing these types in homogeneous sub-categories. In practice any of the properties may be chosen to create groups of ABFMs (as in Figure 6-8). This figure illustrates in a different way the various options available for each ABFM properties, from the jurisdiction to specific measures and their relations. Every row in the figure might be used to construct a typology based on one property or a combination of properties, depending on the rationale behind the analysis.

For the ABMTs considered in this document, a fundamental property is their effectiveness (intended or observed) in supporting conservation and sustainable use e.g., in producing long-term positive ecological, social, and economic outcomes. However, the number of relevant properties for each individual ABFM in this regard, and the diversity of external conditions affecting their effectiveness is such that ABFMs that cannot be easily grouped into distinct effectiveness groups. This reality justifies the CBD Decision 14/8 suggestion to assess the ABMTs capacity to obtain the OECM label, case by case, and not by categories (see also Rice et al., 2018).

More recently, a systematic analysis of single "fishery-ABMTs[91]"sites, updating the work of Rice et al. (2018), confirmed the above conclusion but indicated that some types of fishery-ABMTs are more likely than others to contain promising OECM candidates, particularly and not surprisingly those established specifically with conservation as the primary objective (Himes-Cornell et al., 2022).

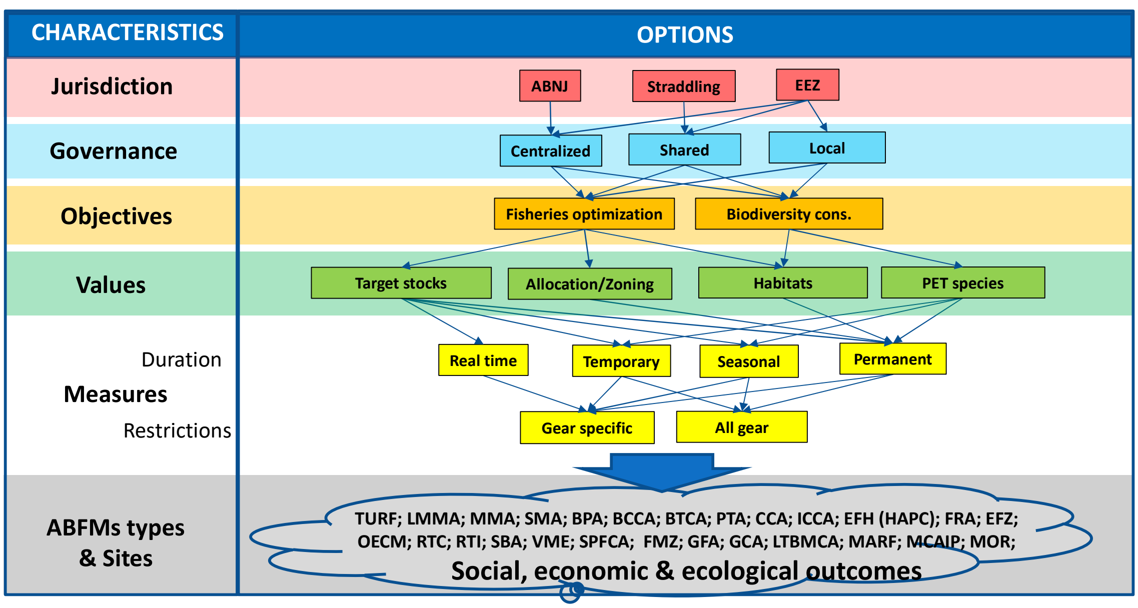


Figure 5.7: Simplified representation of the relationships between a few key characteristics of ABFMs. The arrows indicate how the options are connected to each other. The resulting complex combination leads to the numerous types of fisheries

[91] Fishery-ABMTs include ABMTs established in fisheries (referred to as ABFMs) and areas established for other than fisheries purposes but that affect/constrain fishing operations).

related ABMTs listed as acronyms in the bottom row. The specific characteristics of the individual sites falling in these categories may also vary with the local context prohibiting any reliable generalization on the performance of broad ABMT categories.

5.3.3 MPAs' typologies

IUCN MPAs give an example of typology based essentially on management objectives with regard to an intended degree of protection of biodiversity, which unfortunately are often out-of-sync with the regulations in place and enforced, limiting effectiveness **(**Horta e Costa et al. 2016).

The six types of MPAs identified by a simple list of narratives (Table 5.2, col. 2) range from strict protection and wilderness areas (Types I and II) to partial protection areas, in seascapes and sustainable use areas (Type V and VI). The narratives refer to many other characteristics (Table 5.2, col. 3-8) that tend to indicate simultaneously an increase of the concern for human values and effective management action from Type I to type VI, as the degree of protection decreases. The total score shows that the ecological and physical values, logically, are the most important characteristic, followed by protection level, human values, size and management. The strong deficit in consideration of social and economic issues has been stressed in Hoagland et al. (1995), Empafish (2002) ; Jentoft et al., 2007; Thorpe et al., 2011) but the situation is changing (cf. Section 2.1).

Table 5.2. Categories of MPAs (Col. 1, 2 from Day et al., 2102) and characteristic elements contained in their narrative (col. 3-8). Scores 0 to 3 reflect the relative importance given to the characteristic in the narrative. A star indicates that the characteristic is only implicit. A hyphen indicates that the characteristic is absent. All scores are subjective.

MPA type	Narrative	Protection level	Size	Physical traits	Ecological values	Human values	Management
Ia	**Strict nature reserve**: Strictly protected for biodiversity and also possibly geological/ geomorphological features, where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values.	3	-	3	3	1	1
Ib	**Wilderness area**: Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition.	3	3	3*	3*	0	-
II	**National park**: Large natural or near-natural areas protecting large-scale ecological processes with characteristic species and ecosystems, which also have environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.	2	3		3	3	-*

III	**Natural monument or feature**: Areas set aside to protect a specific natural monument, which can be a landform, sea mount, marine cavern, geological feature such as a cave, or a living feature such as an ancient grove.	**2?**	**-**	**3**	**3**	**-**	**-**
IV	**Habitat/species management area**: to protect particular species or habitats, where management reflects this priority. Many will need regular, active interventions to meet the needs of particular species or habitats, but this is not a requirement of the category**.**	**2**	**-**	**3***	**3**	**0**	**2**
V	**Protected landscape or seascape**: Where the interaction of people and nature over time has produced a distinct character with significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.	**1**	**-**	**3**	**3**	**3**	**3***
VI	**Protected areas with sustainable use of natural resources**: Areas which conserve ecosystems, together with associated cultural values and traditional natural resource management systems. Generally large, mainly in a natural condition, with a proportion under sustainable natural resource management and where low-level non-industrial natural resource use compatible with nature conservation is seen as one of the main aims.	**1**	**3**	**-**	**3**	**3**	**3**
	TOTAL SCORE	**14**	**9**	**15**	**21**	**10**	**9**

Looking at the potential contribution of MPAs to SDGs, Gissi et al. (2022) grouped MPAs by sectors in which they were established: fisheries, deep seabed mining, underwater cultural and natural heritage (UCNH), conservation, and marine spatial planning

A complementary classification based on regulations of uses has been elaborated by Horta e Costa et al. (2016) raising a controversy (Horta e Costa et al., 2017). We do not address the controversy here, but simply stress again that very often more than one typology can be elaborated for a number of ABMTs, depending on one's perspective.

5.3.4 Typology of community-based area management (CBAM) frameworks

Community-based management occurs in a specified area over which some degree of local jurisdiction can be exerted by a community, usually with a greater or lesser degree of collaboration with state authorities. An EEZ may contain many such neighbouring areas like in Fiji. Each area may in turn contain smaller permanent or temporary ABMTs (or closures) aiming at regulating human activities (e.g., fisheries, recreation, rituals), protecting habitats or species (e.g., taboos). From that angle, the large multiple use areas (lime LMMAs; cf. Box 4) may be seen also as ABM frameworks and not as ABMTs.

Box 4: LMMAs in East Africa and Indo-Pacific Island States

By Merle Sowman

Increasingly coastal communities in East Africa and the Indo-Pacific region are adopting Locally Managed Marine Areas (LMMAs) as a means to conserve fisheries, marine resources and habitats, secure sustainable use, and sometimes provide alternative livelihoods (locally referred also as: Collaborative Fisheries Management

Area, Community Conservation Area (CCA), and other local names (Rocliffe et al., 2014; Kawaka, et al., 2017; Newell et al., 2019; Gardner et al., 2020). LMMAs are managed using a range of tools including periodic closures, gear restrictions, species-specific reserves, and strictly protected areas. Conservation benefits of LMMAs are increasingly being acknowledged at local, regional and global levels.

LMMAs and similar community supported ABMTs have been adopted with support from communities in Kenya, Tanzania, and Mozambique as well as a number of Indo-Pacific Island States including Madagascar and Seychelles. These LMMA's range in size from areas of a few hectares (e.g., Mkwiro in Kenya covering an area of approximately 0.16 km^2) (Kawaka et al., 2015) to much larger areas such as the Velondriake Community-Managed Protected Area (CMPA) in Madagascar (650 km^2) and includes coral reefs, mangroves, lagoons, beaches, and sea grass beds (Rocliffe and Peabody, 2012).

The Velondriake CMPA began as the need to improve the sustainability of the local octopus fishery which is important for the region's economic survival. Local communities govern access rights and resource use through a legally recognised "Dina" (a community law) that bans destructive fishing practices (e.g., beach seining and poison fishing) with a clear conservation outcome. Furthermore, the Dina regulates temporary and permanent closures of octopus and crab fisheries, and grants conflict resolution and enforcement powers to local communities, allowing them to impose fines and utilize the regional court system in cases where conflict resolution is unsuccessful.

Factors affecting LMMAs' effectiveness include: (i) a sense of community ownership, fostered by a focus on community needs and priorities; (ii) presence of local "champions"; (iii)) decision-making by resources users, integrating scientific, local and indigenous knowledge; (iv) awareness and education in community-based marine resource management; (v) supportive legal framework and relevant government actors, and community buy-in; (vi) a capacity on monitoring and adaptive management; and (vii) an external source of start-up funding and a diversified entrepreneurial funding model; (viii) a co-management rather than a purely community-managed approach; (ix) NGO support; (x) focus on locally important natural resources; (xi) poverty alleviation initiatives alongside management intervention (Govan, 2009; Rocliffe and Peabody, 2012; Odote et al., 2015; Kawaka et al., 2015; Gardner et al., 2020)

The research suggests that effectively managed LMMAs as an alternative to government managed MPAs, can achieve both conservation and fisheries objectives as well as socio-economic benefits to local communities (Evans et al, 2011; Benbow et al., 2014; Oliver et al, 2015). Ecological benefits include increasing fish biomass (Gardner et al., 2020), increased fish landings and CPUE (Newell et al., 2019), inspiring communities to seek alternative livelihoods, conserve fishing areas that were degraded by overfishing, and control destructive fishing gear (Kawaka et al., 2015). Furthermore, even if not without challenges LMMAs have also shown to be cost effective, scalable, resilient and more socially accepted than conventional State-centric models of management (Rocliffe and Peabody, 2012).

The term "community" may refer to Indigenous Peoples and local Communities (IPLCs); other traditional communities; non-traditional communities like municipalities, or associative institutions, cooperatives, unions. In these areas, the communities have substantial flexibility if not exclusive authority to manage activities often within the overarching regulatory framework of the central government. While the community-based framework is usually permanent or for a specified or conditional period (for political stability) the smaller ABMTs it contains may be permanent like reserves or sacred areas, or temporary like fishery closures. The framework and ABMTs effectiveness depends on combinations of local managerial capacity –which may sometimes be quite limited– and external support, from the State and/or NGOs. These ABMTs have in common:

- Some form of decentralized governance in which traditional or modern communities play a central role, under some degree of State oversight;
- Their support of local priorities, multiple uses and objectives, related to livelihoods, food security, or sacred rituals, among which biodiversity conservation
- The fact that biodiversity conservation may not be the primary purpose and objective and may not be easily discerned as an objective at all (World Bank 2006).

In IPLCs and other traditional communities, the last point is mitigated by the fact that activities and life within the area-based framework are usually considered to be grounded in traditional environmental ethics that ensured long term conservation co-benefits.

We are not aware of a general typology of area-based community frameworks and Table 5.3 summarizes our understanding based on the partial information we compiled in Annex I for CCAs, Marine Extractive Reserves, Fishery community-based MPAs, ICCAs, LMMAs, MARFs, MCAIPs, MEABRs, MMAs, and TURFs.

Table 5.3: Properties of Community-Based Area Management. Light blue cells indicate a lower priority in conservation or fisheries optimization objectives. NA = Not available

	PROPERTIES														
	Jurisdiction		Governance			Objectives		biovalues		Measures					
										Restriction		Duration			
	ABNJ	EEZ	Central	Shared	Local	Fishery optimization	Biodiversity conservation	Species	Habitats	Some gears	All gears	Permanent	Temporary	Seasonal	Real Time
MMA		■	■	■		■	■	■	■	■		■			
LMMA		■			■	■	▨	■	■	■		■			
TURF		■		■	■	■	▨	■	■	■		■	■		
CCA		■			■	▨	■	■	■	■	■	■	NA		
Marine Ext. Reserves		■	■	■		▨	■	■	■	■	■	NA			
Fishery community MPAs		■			■	■	■	■	■	■		■			
ICCA		■			■	■	■	■	■	■		NA			
MEABR		■		■		■	■	■	■	■			■		
MARF		■		■	■	■	■	■	■	■		NA			
MCAIP		■	■		■	■	■	■	■	■		NA			

The table shows that these frameworks have in common the fact that: (i) they are located inside EEZs; (ii) they protect biodiversity; (iii) they may restrain some but not all fishing gears. Differences among them appear in : (a) Governance and the amount of intervention of the central State; and (ii) the relative priority of conservation versus use. The implication is that area-based community frameworks are established both for conservation and sustainable use , with a strong concern for maintaining livelihoods, but with a balance often not totally clear with the information available.

The effectiveness of area-based community frameworks in protecting resources, livelihoods and biodiversity depends on many factors including the strength of the social bond between stakeholders, the degree of penetration of the market economy, the positive or negative contribution made by States and the demography, ecological and socioeconomic drivers in the surrounding area. It can only be determined case by case, even though their use sometimes for centuries implies a recognition of their utility by the communities concerned.

5.4 The ABMTs nomenclature

There does not seem to be an agreed nomenclature for ABMTs categories or individual sites. The first have been usually crafted in high level meetings of technocrats and politicians. The second, in participative governance, may reflect better the local elements of importance. Historically, each authority establishing ABMTs categories has tended to pay more attention to "its" own ABMT category, giving it a particular name and acronym and a more or less distinguishing definition, names, as institutional "flags", reflecting its main concern, mandate, and responsibility. As far as we know, there is no agreed formal nomenclature for ABMT categories but we look below at how ABMT categories' names have been constructed, to see if any rules emerge.

5.4.1 The names of ABMTs categories

Looking at the names of ABMT categories collected in Annex I, it is likely that different originating agencies have selected different names and acronyms to be distinguished from each other. So doing, it appears that States and management institutions have often given different names to ABMTs having very similar functions (World Bank, 2006) but also similar names to areas having different functions. The fuzziness in the names of some ABMT categories is a source of confusion among managers and stakeholders, in general but more seriously in a process of Marine Spatial Planning (Twyford, 2021).

By contrast, the individual ABMT sites in each category are more likely to focus on locally important characteristics such as geographic location, gear restriction, and species concerned (see below). The ways in which such characteristics may be selected and expressed depends on the ecological, social (including cultural) and economic contexts of each ABMT and the local need to differentiate the areas to facilitate fishing operations and enforcement.

Fisheries closures may not always have a specific name, however, even though their properties are usually registered in a government gazette. This is often the case when closing an extensive area to all or some fishing activities, e.g., in the coastal area, within a distance from the shore or a depth range (the category is usually referred to as a Zone"). For example, in South Africa since 1978, no fishing is permitted east of Cape Agulhas in water depths of less than 110 m or within 20 nautical miles from the coast, whichever is the greater distance from the coast to protect the Agulhas bank from heavily industrialised offshore demersal trawl fleets. Similarly, in the area west of Cape Agulhas, no fishing is allowed within 5 nautical miles of the coast. None of these extensive closures have a specific name (Johan Augustyn, Pers. Comm. 09/2022). Other examples in Rogers (1997).

Community-managed areas (here CMAs) are operated by traditional or modern communities, with a variable degree of support and oversight by the State and, often, in collaboration with NGOs for specific time-bound conservation projects. They have been given a diversity of names. In the Pacific Ocean, the categories include (in English): Community Fisheries Management Area (CFMA, in Nauru); Community-Based Subsistence Fisheries (CBSF) Area (in Hawaii); Locally-Managed Marine Area (LMMA, in Fiji, Papua New Guinea, Pohnpei, and Tuvalu); Marine Protected Areas (MPA, in New Caledonia and French Polynesia); Special Management Area (SMA, in Tonga); Wildlife Management Area (WMA, in Papua New Guinea) or Regulated Fishing Zone[92] (RFZ, in French Polynesia) (Hugh Govan, Pers. Comm.). In other regions, the categories include: Coastal Marine Extractive Reserves (CMER, in Brazil); Extractive Reserves; Community Conservation Areas (CCA); Conservation Area; Fisheries Community-Based MPAs (in Japan), Indigenous and Community Conserved Areas (ICCAs) sometimes referred to as Territories of Life; Management and Exploitation of Benthic Resources (MEABR, Chile?); Marine Areas for Responsible Fishing (MARF, Costa Rica?); Marine Coastal Areas of Indigenous peoples (MCAIP, Chile?); Marine Managed Areas (MMAs); Territorial Use Right in Fisheries (TURFs, Chile).

A short information on each of these categories is given in ANNEX 1. We have analysed the composition of the names of ABMT categories listed in this Chapter, distinguishing conventional ABFMs from multi-objective CMAs. The terms used, their occurrences and relative frequencies (in percentage), grouped by key ABMT properties, and ranked according to the number of occurrences in ABFMs, are given in Table 5.4. The results, summarized in the last column of the table and in Figure 5.8.

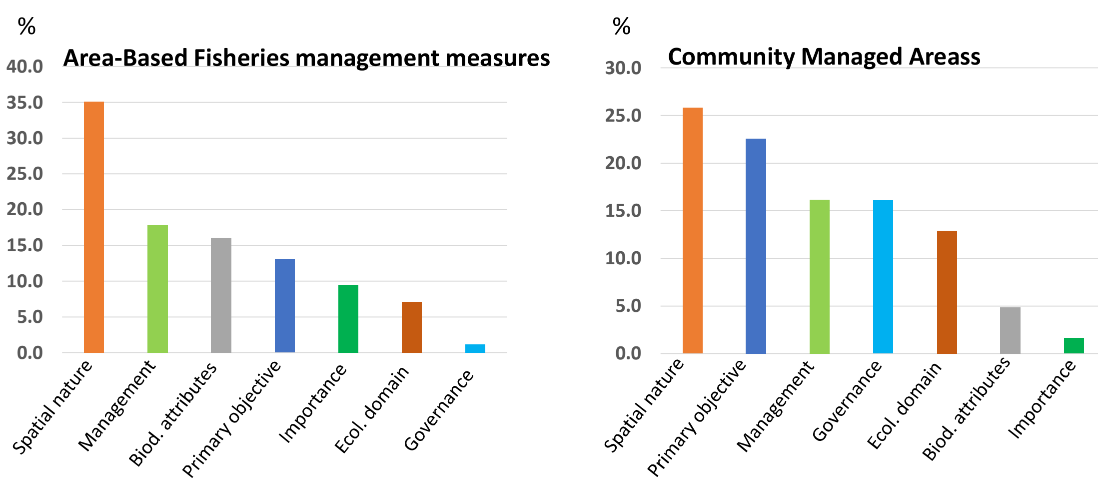


Figure 5.8: Frequency of terms used in the names of area-based fisheries management measures (ABFM) and Community-managed Areas

---

[92] In French: Zone de pêche règlementée

Table 5.4: Occurrences of terms used in the names of fishery ABMTs categories; Area-based fisheries management measures (ABMFs) and community-managed areas (CMAs)

ABMT		Terms used in ABMT names	N°	%
Property	Type			
Spatial nature of the tool	ABFM	area/area-based (30); block (1); closed/closure (12); corridor (1); habitat (4); Park (1); sanctuary (1); site (1); zone (8).	59	36.2
	CMA	Area/area-based (13); MPA (1); territorial/territory (2)	16	25.8
Management & measures	ABFM	Ban (1); buffer (1); contact (bottom) (1); effective (1); grid-based (1); incentives (1); Long-term (1); management (3); mosaic (closure) (1); measure(s) (2); Mitigation (1); moratorium (1); Move on (rule) (1); real-time (2); regulated (1); refuge (1); restricted (1); Ring fencing (1); rotational (1); rule (1); seasonal (1); temporary (1); tool (1); total (1); trawl (1); unit (1)	30	18.4
	CMA	framework (1); Managed/management (7); sustainable (1); use-rights (1)	10	16.1
Biodiversity attributes of concern	ABFM	artificial (reef) (1); biodiversity (2); Biological/biologically (2); bird (1); bycatch (1); concern (1); ecological/ ecologically (2); ecosystem (1); environmental (1); fish (1); groundfish (2); habitat (4); heritage (1); mammal (1); oceanographic (1); rays (1); reef (1); rockfish (1); sharks (1); turtles (1)	27	13.5
	CMA	life(1); resources (2) ; wildlife (1).Total =3	3	4.8
Primary objective	ABFM	conservation (5); conserved (1); fishery/Fisheries/fishing (8); Harvest (1); no-Take (1); protected/protection (5); reserve (1)	22	13.5
	CMA	Conservation 1; conserved 1; exploitation 1; extractive 2; fisheries /fishing (5); reserve(s) 2; responsible 1; subsistence	14	22.6
Importance of concern	ABFM	critical (1); essential (1); important (4); of interest (1); key (1); particular(ly) (3); sensitive (2); significant (1); special (1); vulnerable (1)	16	9.8
	CMA	Special (1)	1	1.6
Ecological domain	ABFM	benthic (2); bottom (2); marine (6);sea (1); world (1).	12	7.4
	CMA	benthic (1); coastal (2); marine (5)	8	12.9
Governance	ABFM	exclusive (1); national (1)	2	1.2
	CMA	community (6); indigenous (2); locally (1); people (1)	10	16.1

They indicate that, in both ABFMs and CMAs, the spatial nature of the measure is the most frequently mentioned property. Differences are observed in the other properties identified. In CMAs, the specific biodiversity attributes seem to be given a much lower priority then in ABFMs, possibly because many ABFMs are species-specific while CMAs aim at broader biodiversity conservation. By contrast, governance has a higher priority in CMAs than in ABFMs, possibly because the tensions between local and central governance is a more sensitive issue in traditional communities. The social and economic properties figure neither in ABFMs nor in CMAs.

These preferences and differences should, however, not be over-interpreted because, (i) the statistical significance of the conclusions are untested and the ranking of components may change with a larger sample; and (ii) the names of these categories have often been crafted by State' technocrats, often with little or no participation by the sector of the communities. They may, therefore, reflect more the objectives and preferences of the State than those of local stakeholders.

5.4.2 The names of individual ABFM sites

As already stressed for ABMT categories (Section 5.4.1) fisheries closures may not always be given a specific name and might be registered in official government gazettes describing their location, coordinates, species concerned, the regulated gears, etc., without constructing a name.

It could be expected that the local name of individual ABMT sites would be more specific and give more importance to local characteristics of the ABMTs, related to local values and worldviews. However, the concerns of the State and the community ought to be on (1) the localisation so that people know where it stands in their territory; (2) the measures in place so that the people know what the constraints are regarding access and operations in the area; and (3) the biodiversity of concern, the distribution of which might often be better known by fishers than by the State.

The structure of 74 names of individual ABFMs collected and kindly contributed by D. Petza[93] were examined. These names originating in the literature, were constructed around the following components: (i) the ABFM type (e); (ii) the geographic location name (e.g., Firth of Clyde; Gulf of Maine); (iii) The biodiversity attribute of concern (mainly the local fishing name); (iv) the duration (e.g., seasonal, permanent); (iv) the gear being regulated (e.g.., trawl, gillnet); (v) the biological function being protected (only spawning in our sample); and (vi) the originating institution (the State, NAFO, NEAFC) (Figure 15). The results of the analysis indicates that ABFM sites have between 1 and 4 components, mainly 2-3 components (Figure 5.9, last chart).

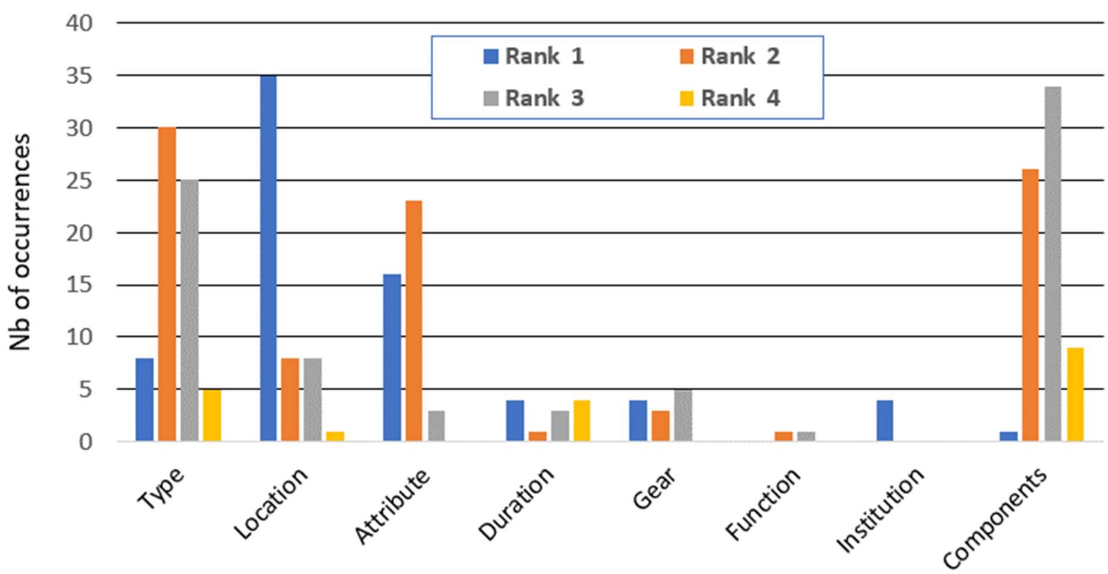


Figure 5.9: Number of components in ABMT names (last chart) and rank of these components in individual ABMT names. Raw data by courtesy of Dimitra Petza.

The first component of the name indicates mainly the geographical location. The second component indicates the type of ABFM followed by the attribute of concern. The third component position reflects most often the type of ABFM. The other components, i.e.,

[93] Data assembled for a systematic review of ABFMs properties (Petza et al., submitted)

duration of the measure, regulated gear, and originating institution, are rarely used. The most rarely used component is the biological function.

The results are certainly sensitive to the size of the sample of local names we could get access to, and the picture might change somewhat using a larger sample. However, the relative "importance" given to the best represented elements may not be significantly affected. The geographic name of the location[94], the attribute of concern[95], and the type of ABFM[96] come clearly first with the location being very often the first element of the name, matching the importance of these three properties for ABMTs ; (ii) the duration of the measure[97], the gear being regulated[98], and the institution of origin[99] are far behind, and the bioecological function[100] to be protected is very rarely mentioned.

It should be noted that the list of names used contains very few community-managed areas and no MPAs. Therefore, the above results might not be directly applicable to these categories of ABMTs.

A final necessary caveat is that the analysis is conducted on English names and we do not know if the order of the components may have been changed in the translation from a local language to English.

5.4.3 The national names of MPAs.

A quick review of individual MPA sites listed in the world database of protected areas (WDPA, MPAs (WD-MPA)[101] indicates that the national names of MPAs, as registered in the database include the following elements:

- A local geographic name, systematically present, is often the first and single element, as in: Grand Connétable Island (France), Cape Byron (Australia), Cape Mohamed (Egypt), or Con Dao (Vietnam). In the database, this local name is accompanied (in a different field) by its English designation (category) such as: national nature reserve; national marine protected area; National natural park; fauna and flora sanctuary, etc.
- The original area category is sometimes included in the MPA label, such as: Natural Marine Protected Area Punta Cappanella (Italy, our English translation),

---

[94] like in the Hawke Box closed area (Canada), Nantucket Lightship closed area (USA), Western Gulf of Maine closed area (USA), or Zamboanga peninsula seasonal fishing ban (The Philippines).

[95] like in the Lophelia coral conservation area (Canada), or the Sandeel fishery closure (Scotland).

[96] Like moratorium, closed season, conservation area, or fishery closure

[97] like the Torres Straight seasonal closure (Australia), Seasonal fishing ban on juvenile Hammerhead fishing (Peru), seasonal fishing closure in great oyster bay (Tasmania, Australia); the Sea Scallop Rotational area (USA).

[98] like the Marmara Sea Spatial Trawling Ban (Turkey), The Trawl seasonal fishing moratorium (East China Sea), or Gulf of Castellamare trawl ban (Italy);

[99] like the NAFO Flemish Cap and Slope of the Grand Bank Sponge VMEs or the NAFO closed areas on the Flemish Cap and the Tail of the Grand Bank.

[100] like the Gulf of Maine Spawning protection area (USA), or Red Hind Spawning Aggregation closure (UN Virgin islands);

[101] https://www.protectedplanet.net/en/thematic-areas/wdpa?tab=WDPA

Papahānaumokuākea Marine National Monument (In Hawaii, USA); Natural park of the Coral Sea (New Caledonia); National Park of the Tuscan archipelago (Italy);

- The type of habitat/biome protected is sometimes mentioned, such as: Lagoon complex of Salses-Leucate (France), Chumbe Island Coral Park (Tanzania); Mangrove national marine Park (UAE).

The geographical location and the protected attribute are essential. But the MPA "category" being essentially a conservation "label" for a large range of ABMTs, the original ABMT category such as "marine Park", related to the local function, may also be given.

CHAPTER 6 - TENSIONS, SYNERGIES AND TRADE-OFFS

SUMMARY

Tensions, synergies, and trad-offs are three key inter-connected concepts in management and conservation that may emerge at any time in the ABMT establishment and use process. Their nature, intensity and related difficulties may change with time. Tensions impede synergies and their resolution is needed to progress and improve performance. In the process, trade-offs are often met and need to be addressed

Tensions

Tension is a state of latent hostility, distrust, or opposition between individuals or groups that may lead to conflict. Tensions between biodiversity conservation have evolved through time with mixed results. In the process, tensions have emerged among States and communities, and between them because of competition for jurisdiction, socioeconomic consequences of reallocations of space and resources, security, costs and benefits, and their distribution among stakeholders. Tensions increased with commitment of protected areas coverage and are aggravated by demography, loss of "territories of life", livelihoods, and lack of alternatives in vulnerable communities. More specifically, tensions between fisheries and MPAs increased since the 1970s, particularly in densely populated areas, in parallel with the decolonisation and independence process; development of industrial large-scale and long-distance fleets; progressive depletion of many fishery resources and collateral impact on non-target species and habitats. Controversies developed on the reality and size of MPAs spillover; the lack of mobility of MPAs in the ocean; fishers' exclusion from traditionally used areas; central versus local governance; and lack of protection from global impacts (pollution, climate change). A key factor of tension is the differing perceptions of risk, and of its appropriate allocation between humans and nature. The reduction of tensions requires, *inter alia*, improved governance processes; improved awareness on conservation and socio-economic issues; demonstration of benefits relative to costs; and equitable allocation of both costs and benefits.

Synergy and complementarity

Synergy between two or more factors occurs when their cumulative effect is larger than the sum of the single effects they would have had, operating independently. Synergies can be positive or negative. Complementarity occurs when the cumulative effect is equal to the sum of the independent effects. Both synergy and complementarity are important, among States, institutions, policies, plans, and measures.

Synergy is a systemic property and outcome of complex social-ecological systems. It may improve effectiveness and efficiency. It may be sought in all bioecological and socioeconomic dimensions of the system. Its value will therefore be differently perceived by different stakeholders. The overall value of a bunch of synergies is multi-dimensional and harder to assess for want of a common "currency". Enhancing synergies may involve additional costs in interaction, capacity-building, financing, etc., and enhancing synergies in one dimension may reduce effects and synergies in others, affecting equity and trade-offs. Partial assessments should therefore be considered with caution. Complementarity is a necessary but not sufficient condition for synergy but it is a key step towards it.

Complementarity between fisheries management and conservation is widespread and well-documented, albeit not everywhere and not sufficiently.

For the reasons invoked above, pathways to synergy require enhancing harmony, complementarity, at institutional to operational levels, and from the global to local (single site) scale. General principles are known but approaches need to be locally tailored. Mainstreaming biodiversity concerns in economic sectors and of socio-economic concerns in conservation are the “highway” to synergies. This implies sharing know-how as well as tangible resources; pooling negotiating and bargaining powers; applying good governance and adaptive management principles, paying particular attention to social and economic dimensions. These actions ought to be undertaken at the onset of initiatives rather than as afterthought. Marine spatial planning (MSP) and other cross-sectoral integrated frameworks (like ICZM) would effectively support the efforts at cross-sectoral level (including conservation).

The Chapter reviews briefly the contributions to improved synergy already made at international, regional, and national levels, which are considerable but need to be dynamically maintained and enhanced. Synergy is facilitated by good governance, interconnexion of fisheries and conservation concerns; coordination of policy targets; setting of common norms; empowerment of traditional communities; complementarity of measures taken within and outside ABMTs and between ABMTs and non-spatial tools; good scientific and local knowledge; Multidisciplinary assessment including of costs and benefits. Synergy may be improved (i) between spatial and non-spatial measures, enhancing complementarity but reducing duplication; (ii) between MPAs and fisheries, ensuring a better balance between bioecological and socioeconomic. Specific examples of positive synergy exist. Convergence on governance principles and management objectives is significant even though priorities may differ.

Trade-offs

Trade-offs involve an explicit exchange between the different stakeholders’ ideal requirements to reach a compromise that is considered by the majority of stakeholders as better than no compromise at all and conflict. They are needed to reduce conflict and develop synergies. The assumption is that the expected outcomes of each party are “fungible” and can be equitably exchanged. Increasingly, however, decision-making is occurring in multi-cultural and multi-sectoral contexts, among groups of stakeholders with different legal and institutional roles, which challenge the identification of equitable trade-offs. In ABMTs, if both sectoral and conservation objectives need to be met, balance is needed between expected outcomes, although for specific ABMTs, the balance will be necessarily tilted towards the primary objective. Simulations conducted in known fisheries demonstrated that trade-offs are affected by: (i) interaction between fisheries and conservation values; (ii) evolution of the risk for vulnerable species; (iii) the relation between various gear restrictions; (iv) the critical importance of the aggregations of biodiversity attributes in time and/or space and their different vulnerability to different gears; (v) the growing complexity of acceptable solution as the complexity of biodiversity attributes increase; and (vi) the better performance of dynamic ABMTs when natural variability is high and as global change proceeds.

Tensions, synergies, and trade-offs are three key inter-connected concepts in management and conservation. Tensions between institutions and stakeholders do not facilitate synergies. Active search for synergy, may also be a way to relax tensions and avoid conflicts. In the process, trade-offs need to be addressed.

Tensions and opportunities for synergies may emerge in three sequential stage of ABMTs establishment and use:

1. Before the establishment of the ABMT, in the initial stages of the negotiation, when the ABMT is still a proposal, and right holders and stakeholders can discuss and argue about the usefulness, location, dimension, and potential benefits and costs of the ABMT;
2. At the beginning of implementation, when the immediate reality and the costs of the partial or total exclusion or restrictions are experienced by stakeholders and right-holders who are directly impacted;
3. As implementation proceeds and tensions evolve, increasing or decreasing in intensity as the bio-ecological and socio-economic impacts and implications of the intervention are realized and slowly stabilize, confirming or not the early perceptions and assessments. The implementation may also call for new unforeseen actions and/or trade-offs if transitional outcomes are not as expected or if groups of stakeholders, sub-sectors, etc. are not as equally affected by the measure as foreseen.

The range of perspectives from which tensions and synergies can be considered indicate that they are significantly dependent on the enabling framework within which they operate. We have already noted above that, obviously, ABM and ABMT's effectiveness are intimately connected. Indeed, in general, tensions may result from inadequacies in management (in stakeholder identification, level of participation, lack of incentives, lack of communication), as well as real economic and operational conflict. Similarly, efforts to increase synergies may be supported or hampered by incomplete or weak ABM framework.

Finally, both fisheries management and biodiversity conservation have changed with time and will continue to do so in the future, particularly with climate change (see **Section 7.2**), and the same can be said of tensions and opportunities for synergies, and trade-offs.

In the sections below we will be considering successively the tensions and synergies between and within ABMTs and groups of stakeholders, and the trade-offs that emerge.

6.1 Tensions

6.1.1 The concept of "tension"

The general tensions between conservation and sustainable use have been touched on in Section 2.1 as background to the whole document. In the following sections we concentrate on the issues related to fisheries and conservation of biodiversity and to the specific context of fishery-ABMTs.

Tension is *a state of latent hostility or opposition between individuals or groups*[102]. It may be the result of disbelief, distrust, and diverging objectives, historical inequities, antagonistic expected outcomes, or different worldviews among individuals or between groups. They may also result from more objective reasons like increasing resources scarcity, worsening economic situation, or inequity or changes in resources and power allocation. Tensions may simmer "under the surface" for some time before they are manifest, triggered by evolving circumstances. These tensions often materialise in academic controversies or political disagreements and broken negotiations, sub-optimal policy outcomes such as non-compliance and poor management performance, and may materialise in open conflict among individuals, between communities, between them and the State, or between States (cf. Section 2.2).

Tensions and conflicts signal trade-offs that need to be addressed and resolved, preferably in a participative framework, to re-establish good operational conditions and avoid legal or administrative actions (like appeals) against the decisions. They also signal potential areas of work towards better complementarity if not synergy of policies and management instruments. International policy instruments (like the UN summits), as well as scientific progress, may also contribute to conflict resolution.

6.1.2 Tensions between fisheries management and biodiversity conservation

The tensions between sustainable use and conservation were briefly addressed in Section 2.2. In this section, we (i) provide some historical background on fisheries management and biodiversity conservation; (ii) describe the specific tensions about area-based conservation in the ocean; and (iii) review the more specific tensions about fisheries and MPAs.

a. Historical background in marine fisheries and conservation

Tensions between marine fisheries and biodiversity conservation have evolved through time in a continuous quest for improved performance, with mixed results, affecting the nature and intensity of tensions and opportunities for synergies (Garcia et al., 2014).

The governance of fisheries and conservation have evolved considerably with time, from common roots in traditional pre-capitalistic and pre-colonial communities. Fisheries management and rules for proper conduct of fisheries have existed for centuries, first in inland and coastal waters in small-scale fisheries, and later in the deeper ocean and larger-scale fisheries, increasing in complexity in parallel with human populations and technological innovation, particularly since the 19th century. (cf. Prologue; Smith, 1994; Roberts, 2007; Bolster, 2012: 29, 61 ; Rauch, 2014). Marine conservation took off in the 1960s and 1970s (Roberts, 2007) with a strong focus on Marine Protected Areas, in the wake of the emergence to the New Law of the Sea and a number of cross-sectoral United Nations summits (e.g., UNCHE, UNCED, WSSD, UNSCD) which established conceptual and institutional bridges between the two streams of governance, accelerating conceptual convergence of State-driven initiatives around the liberal economy market-based approaches, in tension, however, with community-based governance.

For centuries, and in some areas perhaps millennia, fisheries management by coastal communities was part of their customary governance and stewardship of marine tenure

[102] Myriam Webster Dictionary online. https://www.merriam-webster.com/dictionary/tension

in areas adjacent to their settlements[103]. Management by fishery leaders or elders, based on local knowledge and values as well as religious beliefs, included: (i) control of the right to fish in the community area and eventual exclusion of outsiders as an ancient "limited entry" system; and (ii) rules regarding where and when to harvest resources; the gears allowed or prohibited; and the catching and eating of certain species (Johannes, 1978; 2002; Aswani, 2005; Govan et al., 2009a, 2009b; Sunde, 2014).The jurisdictional area was strongly enforced, sometimes violently, but sharing agreements existed between villages against payments in kind, or simply for social support in case of need. There was no explicit differentiation of fisheries management from nature conservation and, while, some measures undoubtedly had positive ecological consequences, whether or not this was intended is not clear. Needing little or no extraneous infrastructure, the fishing settlements were mainly rural and disconnected from central State's processes.

Nowadays There is increasing understanding of the evolution of distinctive patterns of coastal and marine resource use and governance by coastal peoples found all over the world: in India (Bavinck, 2005), the South Pacific (Johannes 2002, Govan et al. 2009b) and Africa (Sunde, 2014b ; Mbatha, 2018). These customary systems of marine resources governance incorporate various spatial, temporal, technical, social and legal norms and rules (Sunde, 2014) and rights to access, use and manage resources are usually part of a system of customary law (Ruddle, 1998; Hviding, 1998; Johannes, 2002).

In Europe, for centuries, these pre-modern traditional systems also maintained productive fishery systems, providing food, livelihood, social security, coastal defence, ensuring effective enforcement, resolving conflicts, and maintaining equity in well-delimited areas, often far away from central governments' systems. Those also are believed to have produced ecological co-benefits, often likely unintended, and generally not objectively assessed (Féral, 2001; Rauch, 2014; Rauch; Bavinck et al., 2015).

During the 19th century, the two streams of governance emerged more clearly, respectively as utilitarian and aesthetic branches of conservation with tumultuous relationships (Garcia et al., 2014). Since WWII, the governance of fisheries and conservation have evolved in very similar directions through convergence[104] and co-evolution[105] of fisheries and biodiversity conservation governance and management (Garcia, 20014; Garcia et al., 2014a; Charles et al., 2014). Centralized forms of governance already existed in the 13th century (Bolster, 2012), progressively complementing and often replacing traditional community-based governance systems with the emergence of

---

[103] Up to 3 to 12 nautical miles from the coast in Europe (Rauch, 2014) and up to 40 miles in the Pacific (Johannes, 1978)

[104] The term "convergence" was use to reflect an increase in similarity in governance processes due to external pressures exerted on the two governance streams by international undertakings like The UN conference on the human environment (UNCHE ,1972), the UN Conference on Environment and Development (UNCED, 1992), the World Summit on Sustainable Development (WSSD, 2012), The United Nations Sustainable Development Summit (UNSDS, 2015); The International Panel on Biodiversity and Ecosystem Services (IPBES); the Strategic Plan for Biodiversity 20112020 (by the CBD in 2010) and the Kunming-Montreal Global Biodiversity Framework (CBD, 2022).

[105] The term "co-evolution" was used to reflect the progressive increase in similarity resulting from direct interactions between the institutions concerned, resulting conflicts, and their resolution (Garcia et al., 2014).

Nation States, and during the modern colonization process (cf. Prologue). Since the second world war, following the decolonization process, tensions developed between developing central States' initiatives (often mimicking or maintain colonial powers' approaches) and resisting traditional governance institutions.

The modern tensions between fisheries and conservation emerged and grew after WWII with the emergence and development of semi-industrial and industrial fishing, raising conflicts with the conservation constituency, small-scale fishery systems, and coastal nations (threatened by long-range fleets). These fisheries have developed in a global context of freedom of the oceans for both navigation and resource use (cf. Prologue), free individual access to resources, allowed to operate everywhere they technically could reach, with some constraint on target species and gears, but no constraint on the operational space beyond the species distribution area. Conflicts grew with the area-based community managed resources systems using multiple species with multiple gears, within a constrained space, limited by a short fishing range, close to community settlements. Conflicts increased with the development of long-range, large-scale fishing operations, based in well-equipped urban centres, benefiting from State's infrastructures and financial and political support, and often competing with traditional fisheries for space, resources and markets. The lack or too late control of these developments generated tensions within fisheries, between stocks conservation needs and socio-economic objectives, leading to overfishing and stocks collapses (Grainger and Garcia, 1996; Garcia and Newton, 1997; Fogarty and Murawski, 1998; Bailey et al., 2016 ; Pedersen et al., 2017), as well as between fisheries and conservation of the broader biodiversity (see below).

Since WWII, In part as a result of these tensions and because of globalisation, the governance paradigm of fisheries and conservation has evolved with time with different approaches emerging at different times in different sectors and regions, in a globally similar but asynchronous process (see a description in Garcia et al., 2014). In marine fisheries, the traditional empirical ABM of multispecies and multigear small-scale fisheries, using ABMTs and non-spatial (technical) measures has been progressively complemented by a modern, scientific, resources-based ABM of increasingly specialized large-scale single-species fisheries, before a strong renewal of interest for ABMTs and fishery closures starting in the 1980s (Figure 2.1). This evolution followed the broadening of the fisheries management scope to address broader biodiversity concerns (cf. Section 4.3). In conservation, the focus remained on ABM and ABMTs, transferring terrestrial concepts to the ocean with unavoidable biases or misconceptions but undisputable success in expansion. In both sectors, the evolution included an increasing recognition of the fundamental importance of human dimensions of ABM and ABMTs and of stakeholders' empowerment.

A reason often invoked when questioning the appropriateness of ABMTs in fisheries is that fisheries resources are mobile, changing distribution seasonally, during their life-cycle, from year, and now because of climate change (Hilborn et al., 2004; Buxton et al., 2006; FAO, 2007; Game at al., 2009; Fulton et al.; 2015).

As the evolution described above unfolded, it became obvious that while the objectives of ecology and economy were very compatible in the long-term, they were often at odds in the short term for the following concatenated reasons (see also Sections 7.1.2 and 7.1.3d):

- The perception of the future value of present costs or the Net Present Value of future benefits, compared to costs (economic and social discount rates). The fact is that benefits of an action, now and in a given place, that both ecology and economy recognize in the long term, have a significant cost in the short term that local communities can often not absorb alone (refs on loss of jobs, livelihood opportunities, landing sites, danger of alternatives, effort transfer, unexpected social, economic and ecological consequences). This implies that the short-term local costs often have to be shared by the broader society and perceived as a long-term societal investment.
- The distribution of costs and benefits of conservation is often not fully perceived by managers and NGOs, and neither fair nor equitable. Various costs are borne locally and immediately by communities as conservation measures are introduced (e.g., loss of access to traditional fishing grounds), while a large part of the benefits may materialize much later (generating a transient stress) and often partly or totally elsewhere (e.g., in areas farther away, for the broader national and global society) reducing justice as well as the willingness to comply.
- The re-allocation of space brought about by ABMTs, threatens established traditional or long-term use rights (e.g., from fisheries to tourism) and management systems, reallocating explicitly or implicitly the opportunities for the present beneficiaries and their descendants. There is a long bibliography of violations of human and traditional rights, dispossession of traditional territories, ocean grabbing (Benjaminsen and Bryceson, 2012 ; Fairhead at al., 2012 ; Feydel and Bonneuil, 2015 ; Bavink et al., 2017; Sowman and Sunde, 2018 ; Aburto et al., 2020 ; Queffelec et al., 2021).

Today, tensions remain in both fisheries and conservation, between the liberal economy paradigm adopted by most governments, with property rights and market-based management (in commercial and industrial fisheries management) and Ecosystem Services, Payments for ecosystem services, offsets, etc. in conservation. Similarities across these arenas in terms of their overall goals and underlying principles and approaches are increasingly being recognised. For example, around the concepts of "good governance" (UNDP, 1997 ; Graham et al., 2003) and the principles underpinning this notion are embraced by both conservation and fisheries management. Regarding governance approaches, the advantages of co-management and community-based management are advocated in both fisheries and conservation, which in traditional communities are often not distinguished (Govan, pers. Comm.; cf**.** Section 2.1).

While there is a growing albeit nuanced agreement at global and regional levels about the present situation, there are still tangible tension about the "sharing of the bill" implied by corrective actions as demonstrated in the United Nations Framework Convention on Climate Change (UNFCCC)[106] (United Nations, 2021) and in the protracted negotiations at the CBD on the Post-2020 Global Biodiversity Framework (CBD, 2022; Obura, 2023).

---

[106] https://www.weforum.org/agenda/2015/10/how-do-we-share-the-costs-of-climate-change/; https://www.cbc.ca/news/science/cop26-climate-finance-1.6223922

Interestingly enough, the same class of management tools have emerged as most effective in fisheries and conservation: those restricting access, either to the fisheries resources (moving from open access to limited entry and exclusive use rights, maintaining many traditional reserves and refuges, or to marine territories, from a free and open ocean to different jurisdictional spaces, and traditional and modern use of ABMTs.

To some extent, the tensions in fisheries between spatial and non-spatial approaches to resources allocation and management derive from the above dichotomy. Spatial constraints are more easily integrated in a traditional area-based community governance system than in a modern set of fisheries tracking complex resources movements in a non-delimited space. From that angle, there are tensions today between EEZs, and between community-managed areas, as well as between the latter and modern centralized resource-based systems, about resources freely moving across boundaries.

Notwithstanding, exclusionary measures, whether area-based (like NT-MPAs and fishery reserves) or non-spatial (like limited entry schemes and Individual Transferable quotas, ITQs), may generate tensions in the short term when immediate costs are confronted by affected stakeholders. These tensions may progressively weaken with time if the advocated longer-term benefits materialize. The implication is that the interplay between tensions and synergies is likely to be very case-specific, is also likely to be dynamic and to evolve with time.

Ocean and fishery-ABMTs have attracted widespread attention because of the widespread adoption of the ecosystem approach to fisheries management – in which spatial considerations and integration across space, at ecosystem level, are particularly prominent (FAO, 2003; Link, 2010)– and from the adoption of global coverage targets for area-based biodiversity conservation (CBD, 2010; 2022; cf. Section 1.2). However, it faces the potential consequences of the long-standing disregard to their potential social and economic consequences (cf. Section 2.1). The challenge, for ABMTs is therefore to find and maintain in the long-term an equitable balance between conservation and sustainable use. The solutions may be in part in the mix of ABMTs used, but also in transformative changes in the social-ecological system within which they operate, involving all rights holders and stakeholders in seeking options for change that address rights and needs.

b. Tensions about area-based conservation in the ocean

In the ocean, competition for space, resources, and security, have been fundamental and sometimes fierce, leading to global ocean space allocations and rules within which we live (cf. Prologue)[107]. Similar albeit generally less dramatic conflicts exist for similar reasons within community and national boundaries, between groups of stakeholders, and sometimes within them. The tensions tend to intensify as global and coastal populations and their demands increase, together with marine resources scarcity and degradation. The phenomenon described generally by Robert T. Malthus (1766-1834) was re-described for coastal traditional communities as "Malthusian overfishing" (Pauly, 1988). In modern times, all policy-makers, managers and the public at large have become globally aware of the problem and its ecological and socio-economic consequences.

[107] The Darwinian theory sees competition as a main evolutionary power in animals too.

As property does not exist in the oceans beyond 12 miles, oceans resources belong to national citizens (in the EEZ) or global citizens (beyond exclusive national jurisdiction) and States are entrusted to use and conserve them on their behalf (Sanchirico et al., 2002) justifying the importance of the public opinion on these matters.

The promotion of area-based biodiversity protection and sustainable use, has progressed through international events, as follows:

- 1980s and 1990s: several initiatives of the regional Seas Organizations in the 1980s and 1990s)to develop MPAs networks;
- 1992: UN Conference on Environment and Development (UNCED) and its Agenda 21 (United Nations, 1992); creation of the CBD, and adoption of the ecosystem approach; the IUCN World Parks Congress in Caracas in 1992, calling for a coverage by MPAs of at least 10% of each biome by 2000;
- 1995: adoption of the FAO Code of Conduct for Responsible fisheries (FAO, 1995)
- 2001, 2003: adoption of the Ecosystem Approach to Fisheries (FAO, 2001, 2003)
- 2002: World Summit on Sustainability Development (WSSD) agreement to establish representative networks of marine protected areas by 2012;
- 2003**:** IUCN World Parks Congress in Durban (South Africa) during which States committed to establish 200,000 km^2 of new MPAs and paid attention to the proposal to cover 12% of the ocean with MPAs[108];
- 2004: CBD COP target of a global MPA coverage target of 10% by 2012;
- 2010: CBD Strategic Plan on Biological Diversity 2011-2020 and its Aichi Target 11 to achieve a 10% coverage by MPAs and OECMs by 2020;
- 2011: FAO guidelines for the use of MPAs in fisheries (FAO, 2011);
- 2014: IUCN World Parks Congress in Sydney (Australia) which recommended a global coverage of 30% of MPAs;
- 2015: The Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication (FAO, 2015) which complement the 1995 FAO Code of Conduct for Responsible Fisheries
- 2015: adoption of the 2030 Agenda for Sustainable Development (SDGs) which referred to the CBD commitment on ABMTs coverage
- 2016. Adoption of a coverage Target of 30% by the IUCN Conservation Congress;
- 2018: Definition of OECMs and guiding governance for their identification and governance by the CBD (CBD, 2018);
- 2020-2022: The recognition of ABMTs' potential role in climate change mitigation, as Nature-based Solutions (cf. Section 4.4.3) for carbon storage (offsets), protection of biodiversity, and maintenance of ecosystem resilience (Smith et al., 2020; Miles et al., 2021; Bisaro & Meyers, 2022)

[108] See PARKS, Volume 14(2), Page 21

- 2022: the CBD Global Biodiversity Framework 2021-2030 agrees on a global target of 30% of MPAs and OECMs by 2030 (CBD, 2022).

The process has been influenced (if not triggered) by the action of a galaxy of NGOs including The Nature Conservancy (TNC; Worldwide Fund for Nature (WWF), Greenpeace; Pew Charitable Trust; Conservation International; Environmental Defense Fund, and foundations like the Rockefeller Family Fund; Rare; etc.

The increasing conservation commitments implied a rapid escalation of the areas in which economic activities are being constrained. Simultaneously, States need to maintain livelihoods and food security, and protect vulnerable human communities. Tensions are therefore unavoidable, within the policy frameworks, among constituencies and local communities, between sectors and sub-sectors, and conflicts may not always be avoided. The issue triggered numerous controversies about (i) The scientific basis of the commitments and their feasibility, (ii) the real effectiveness of MPAs and the enhancing and impeding factors; (iii) the existence of numerous "paper parks"; (iv) the lack of consideration about socioeconomic and cultural impacts of MPAs; (v) the top-down designation process of many MPAs; and (vi) the claims of violations on human rights and, dispossession of traditional tenure, with significant social and economic consequences on vulnerable coastal and fishing communities (Agardy et al., 2003, 2016; Jennings, 2009; Spalding et al., 2013; Leenhardt et al., 2013; Butchart et al., 2015; Caveen et al., 2015; Jones et al., 2016; O'leary et al., 2016; Smallhorn-west & Govan, 2018; Sowman and Sunde, 2018 ; Counsel, 2022; Section 2.1). As a consequence, a controversy developed also within the conservation constituency and outside it, on the real conservation value of the % coverage indicator (Cawardine, 2009; Spalding et al., 2016; Toropova et al., 2010; Devillers et al., 2014; Woodley et al., 2019).

c. Tensions between fisheries and MPAs

There is an abundant literature reflecting the specific tensions between fisheries and conservation, exemplified by the conceptual and practical conflicts between fisheries and MPAs, and particularly with no-take MPAs (NT-MPAs). These tensions may have started in the 1960s and 1970s, locally, when protected areas started to be promoted in the ocean, often with little concern for their social and economic impact on dependent communities. They have also grown with the progressive recognition of the collateral impact of fisheries[109] (Goni, 1998; NRC, 2000; Christensen et al., 2003; Duineveld et al., 2007; FAO, 2008; Branch et al., 2010; Rice and Ridgeway, 2010; Breen et al., 2016; Gascuel et al., 2016; Arlidge et al., 2020). An illustration of the tensions and conflicts and their evolution in the political environment in Australia can be found in Kearney et al. 2012a, 2012b ; Kearney et al., 2013 ; Gladstone, 2014 ; and Fletcher et al., 2015.

Tensions have probably developed locally as soon as the MPA movement started in the 1960s and 1970s, coinciding with the take-off of large-scale and long-distance fisheries development. The controversies took off in the 1990s when MPA proponents started aggressively advocating the use of MPAs and particularly no-take zones (NT-MPAs) as the conservation "silver bullet" <u>for effective fisheries management</u> despite a performance of

[109] E.g., stocks collapse; modification of food-chains; changes in population parameters and stock structure; negative interactions among fisheries; Bycatch and other interactions of fisheries with mammals, turtles, birds, sharks, rays, other protected species, and vulnerable bottom habitats; and waste though discards

MPAs that was as poor as that of fisheries management if one considers the proportion of poorly managed fisheries and of Paper Parks.

While agreement was rapidly reached about the impact of NT-MPAs inside their boundaries, interconnected controversies emerged around the negative impacts of MPAs on coastal populations by (i) restricting or prohibiting access to local fisheries as a source of livelihood; (ii) displacing some or all resource users and consequently increasing congestion on the remaining open fishing grounds; and (iii) creating immediate opportunity and variable costs, and possibly safety risks associated with the forced quest for new fishing grounds, targets, and fishing practices, farther away (Hilborn et al., 2004; FAO, 2011; cf. Section 6.1.2c).

Controversies emerged also regarding the claimed MPAs co-benefits to the sector, outside the boundaries e.g.: (i) the reality and importance of the spillover of larvae, recruits, and biomass; (ii) the MPA potential impact on yields and stock rebuilding; (iii) the socio-economic benefits and losses for fishing communities. A core issue has been whether and in which conditions MPA might perform as well or better as catch and effort controls, fishing rights and co-management. One important criticism of MPAs in this regards has been that MPAs alone would ineffectively address the symptoms of poorly managed fisheries and not the fundamental causes of overfishing and waste, (Sanchirico et al., 2000; 2002; Agardy, 2003; Agardy et al, 2003; Hilborn et al., 2004; Kaiser, 2005; Buxton et al., 2006; Jones, 2007; Bess and Rallapudi, 2007[110]**,** Berkes, 2009; FAO, 2011; Voyer et al., 2013; Hilborn, 2016; FAO, 2016; Westlund et al., 2016**,** to cite just a few). One aspect that seem to encounter agreement is that MPAs (just as the old fishery reserves) may be better equipped than non-spatial measures to protect habitats, conscious, however, that not all human impacts can be spared by ABMTs (e.g., land-based pollution and climate change).

It has been suggested that the controversies rested "simply" on two fundamental differences between fisheries and conservation: (i) the differing primary objectives; and (ii) the differing perspectives about the appropriate action under uncertainty (Jones, 2007)**.** These two points lead to different perceptions of risk, the amount of risk aversion needed, and its equitable allocation between biodiversity and people (Nowotony and Gibbons, 2001 ; Mace at al., 2014).

There are tensions and controversies also within the MPA scientific constituency regarding for example the effectiveness of <u>partially protected MPAs versus totally protected ones</u>, which very often is a tension between accepting or not fishing activities within MPAs unfished MPAs (Sciberras et al., 2013, 2015; Turnbull et al, 2021 ; Fidler et al., 2022 ; Andradi-Brown et al., 2023). The dominating view emerging is that partially protected MPAs (e.g., multiple-use MPAs), the study of which has been neglected for a long time, provide less biodiversity benefits within their boundaries, but offer a wider and more equitable range of benefits, including socio-economic and cultural benefits; improved food security; reduce frictions with users; and improve compliance. They are

---

[110] In New Zealand, undelimited and highly mobile quota-based fisheries clashed with the customary area-based rights and regulations of the Māori communities, recognized by the Crown, which allow subsistence uses of resources but not for commercial purposes, with obvious environmental implications (Bess and Rallapudi, 2007).

the one most likely to support an important increase of conservation coverage and effective production of long-term positive biodiversity outcomes.

The utility and optimal value of conservation coverage has also been a source of tension and controversy, between the fisheries and conservation communities as well as within the latter (cf. Section 6.1.2.a). (Cawardine, 2009 ; Spalding et al., 2016 ; Toropova et al., 2010 ; Devillers et al., 2014 ; Woodley et al., 2019

It important to recognise that the divergent views represent different perspectives on the challenges posed by marine fisheries and marine biodiversity conservation, and on different perceptions of risk for the resources and for people and of the proper balancing between the two (Jones, 2007 ; De Santo and Jones, 2007 ; Mace et al, 2014).

Despite the level of convergence achieved between the two streams of governance (Garcia et al, 2014) and the efforts made in the last decades to mainstream biodiversity concerns in fisheries and social concerns in conservation (Friedman et al 2018 ; FAO-COFI, 2021) the differences in primary objective and perspective, are exacerbated by the fact that the responsibilities are exerted by two different institutions, usually, the Ministries respectively in charge of fisheries and of the environment. The lack of coordination between the two national governance streams is clearly demonstrated by the conflicts between decisions taken by the same States in different international institutions regarding, for example, conservation and food security, and particularly in the developing parts of the world (Rice et al., 2018). The authors do not propose solutions to these conflicts regarding conservation and sustainable use policies, but emphasizes the need for the two communities of experts and policy-makers to collaborate in finding them.

Last but not least, tensions may emerge when the enabling frameworks for fisheries and conservation are not totally aligned. For example, in the EU, inherent tension stem from the fact that nature conservation is the remit of Member States while fisheries management is the exclusive legislative jurisdiction of the European Community (EC). This tension is of particular importance when addressing the conservation of habitats or species that are under threat from fishing activities. The authors also stress that the precautionary principle is a key factor in the tension between fisheries management and conservation , and is not always taken into account (De Santo and Jones, 2007 ; Ens et al., 2007).

Tensions vary between countries, both in timing and intensity and the literature is itself in tension between the numerous testimonies of conflicts and the calls for reducing tensions and improving synergies. Jones (2012), for instance, felt that a balance was achieved between top-down and bottom-up approaches in UK decision making about marine conservation. However, Caveen et al (2015) describe the same process as stormy, with periods of domination by preservationists, followed by periods of recovery by social conservationists in a still open conflict (in 2015).

It is fair, in closing, to mention that there may also be tensions between spatial and non-spatial measure used in different sub-sectors. If the first are allocated exclusive quotas on a resource which is also present, or migrates through, community-managed areas, the community fisheries may be deprived of their right to fish that resources in their area for lack of historical records and hence lack of quotas. This has led to serious conflicts and litigation in the French Mediterranean tuna fisheries (Bertrand Cazalet, pers. Com.). Similar conflicts have been reported in New Zealand (Bess and Rapalludi, 2007).

6.1.3 Reducing tensions

Tensions around ABMTs exist at the global, regional, national, fishery and local (ABMT) levels. They are a manifestation of the more general tensions that exist within the overall conservation paradigm, along the continuum from protection to sustainable use, affecting fisheries and conservation policies but also the ABMTs used, their objectives, and their performance. The large range of ABMTs identified in Annex 1, reflect that continuum, from strictly protected areas like reserves or no-take zones that separate humans from nature to a range of partially protected areas in which a certain amount of sustainable human use is allowed, balancing ecological and socioeconomic values. It is difficult to address tensions and synergies between and within ABMTs without considering the multi-layered ecological and socioeconomic and cultural contexts within which they operate and on which their performance largely depends.

Understanding and correcting tensions between institutions and sectors, is a way to improve synergies, and this requires a good understanding of the factors generating such tensions. A decade ago, Voyer and Gladstone (2013) noted the scarcity of research on the factors of resistance of fishing communities, recreational and professional fishers to marine parks. Their study indicated that resistance was based on the experience, expectations or perceptions of the negative social and economic impacts mentioned above (cf. Chapter 11). This feeling may be aggravated by the frustration to see their intimate knowledge on living conditions, recreation, local cultural values, and alternative futures, being neglected and overridden by extraneous knowledge and priorities regarding conservation. However, these issues had been abundantly stressed in the literature from the decade preceding Voyer's paper e.g., in Pimbert and Pretty, 1995 ; Brockington, 2004 ; Kooiman et al., 2005 ; Brockington et al., 2006 ; Jones, 2006 ; Pomeroy et al., 2007; and Berkes, 2008. The fact is that interest and research on these socioeconomic issues have significantly increased since, as shown for example in Mwaipopo et al., 2011 ; FAO, 2013 ; Garcia et al., 2013 ; Todd et al., 2013 ; Fox et al., 2014 ; Sowman et al., 2014; Oldekop et al., 2015 ; Gasalla et al., 2016 ; Westlund et al, 2016 ; Ban et al., 2017 ; CBD, 2018 ; Aburto et al., 2020 ; Friedman et al., 2020 ; Dawson et al., 2021 **;** (See also Section 2.1). Despite the progressively converging trajectories of fisheries and conservation governance since WWII (Garcia et al, 2014a; Friedman et al., 2018), the possibility to reconcile MPAs and fisheries has received less attention than the tensions between fisheries and conservation scientists, conservation paradigms and strategies, and between managers and coastal communities (cf. Section 6.2 on synergies**)**. Nonetheless, a number of papers address the issues and propose solutions to reduce or resolve tensions. The conflict-resolution processes needed are well known (See for instance Grafton et al., 2010) and are not addressed in this document

Management actions seeking to alleviate tensions and foster synergies may be taken at all nested levels of governance, from the global to the local/ABMT levels. The actions taken for centuries, to reduce or eliminate tensions between fisheries and conservation remain relevant today when considering tensions about ABMTs (Herrold-Menzies, 2006; Meguro, 2006; Meguro, 2008; Salafsky, 2011; Wright et al., 2016). They include:

- Sharing and raising stakeholders' awareness about the limitation of resources, the degradation of biodiversity, and its consequences on livelihoods and human resilience. For centuries this belief was integrated in the traditional communities. Today, most stakeholders are already aware of the situation;

- Respecting and recognising Indigenous and local rights and customary practices, norms and rules that are in place to conserve and manage resources, and seek ways of integrating these systems with proposals to introduce other state-proposed ABM measures;
- Demonstrating to stakeholders directly impacted by the measures that protected areas can produce biodiversity benefits supporting livelihoods in the long term. There seem to be a general agreement that this can be the case, but doubts or distrust often persists at local level for e people directly affected, particularly if they are not fully involved in the decision process. Partisan advocacy is not sufficient. Evidence is needed.
- Assessing explicitly the costs of the ABMTs for the stakeholders, their allocation to stakeholders' groups and, where supported, helping vulnerable stakeholders to absorb the short- and long-term costs of the measures, e.g., creating alternative livelihoods or providing compensations. Strategies and projects like Integrated Conservation and Development projects (IDCPs), Sustainable livelihoods approach (SLA), and Alternative (or additional) Income Generating Activities (AIGAs) have been used for decades for that purpose with mixed and often short-lived species for want of sustained projects financing and other practical reasons but they have also been recognized having been successful in transforming violent relationships between local people and managers into much more cooperative ones

The tensions between institutions mentioned above are also important, but of a different nature and the related conflict resolution is abundantly treated in the literature (e.g., in Ruddle, 1987 ; Marton-Lafevre, 2005 ; Redpath et al., 2013 ; Young et al., 2016; Dahlet et al., 2021) and we do not develop this question further here.

6.2 Synergy and complementarity

"Synergy" and "complementarity" are two important properties in data collection, assessment, management, and evaluation of ABMTs and networks of ABMTs, as well as between them and non-spatial measures. The two concepts are examined below.

6.2.1 The concept and properties of "synergy"

The use of the term "synergy" has increased exponentially between the 1960 and 2000, decreasing slightly afterwards[111] following a trajectory similar to that of terms reflecting growing environmental concerns illustrated in Figures 1.1 and 2.1. The following general points on synergies emerge from the literature on fisheries and biodiversity that we accessed.

In brief, "synergy" has been defined in many ways depending on the domain of application. When there is synergy between two or more factors, instruments, processes or institutions, their cumulative effect is larger than the sum of their single effects when

[111] From Google Ngram, 22 February 2022, searching for the term "synergy" in English. Similar responses are obtained in French or Spanish.

operating independently (synergistic effect[112]). Synergy is a systemic, multidimensional outcome resulting from the complex interactions at work in social-ecological systems. It may be sought at different levels i.e., within and between institutions, international agreements, sectors, policies and plans, management tools, assessment processes, and data systems. It exists naturally in the ecosystem and might be enhanced (or involuntarily impaired) by management. In good governance, conservation and fisheries management, synergies are often invoked and actively sought, and possibly enhanced, through specific actions. But synergy is demonstrated only by the synergistic effect. This effect is expected to be positive, generating a "premium", increase effectiveness and efficiency. However, negative factors may also be synergistic or complementary in producing the final outcome[113]. Measuring synergistic effects is challenging in complex socio-ecological systems, and particularly so in the ocean. (Beneke et al., 2007 ; Crain et al., 2008 ; CBD, 2010a ; UN Environment, 2016 ; Villasante et al., 2016 ; CBD, 2022 ; IUCN, 2021 ; United Nations, 2007, 2007a, 2015, 2016).

When the cumulative effect of various factors is equal to the sum of the independent effects, there is complementarity between two factors. When the cumulative effect of various factors is less that the simple sum of independent effects, there is antagonism between the factors (Crain et al., 2008). In Kenyan coral reefs, most effects have been found to be additive or antagonistic, not synergistic (Darling et al., 2010).

The purpose of governance and management is logically to increase positive complementarity –and possibly synergy– in the system, and to reduce antagonisms in order to increase effectiveness (higher total effects) and possibly efficiency (lower total costs).

These points are considered in more detail below with added references as appropriate, and examples will be found in Section 6.2.2.

Synergy is a systemic property. It is the result of complex interactions in the social-ecological system in the ABMT and around it, and it needs to be considered in relation to bioecological and socioeconomic processes affecting ABMTs' effectiveness. Therefore, synergistic effects in an ABMT or within a network of sectoral and conservation ABMTs will be easier to obtain obtained –albeit not guaranteed– if the respective institutions work together (in data collection, assessment, management and enforcement) the system level (Benecke et al.; 2007). However, good cooperation does not automatically produce a synergistic premium.

Synergies may be sought at different levels: between institutions; within and across sectors; between international agreements[114], financial institutions; policies and plans;

[112] For example, the introducing simultaneously a no-take zone, an effort reduction, and alternative sources of employment are very likely to produce more effect than any of the measures applied separately.

[113] For example, combining poverty, lack of alternative livelihoods, and cheap destructive gear (like dynamite or poison) is likely to produce more deleterious effects that when they occur separately.

[114] Third Global Conference on Strengthening Synergies between the Paris Agreement on Climate Change and the 2030 Agenda for Sustainable Development https://ias.unu.edu/en/events/archive/conference/third-global-conference-on-strengthening-synergies-between-the-paris-agreement-on-climate-change-and-the-2030-agenda-for-sustainable-development.html

management tools, assessment processes, and data systems (Benecke et al.; 2007). They can also be addressed at different scales (Villasante et al., 2916). Di Marco et al (2015) for example analyse the possible synergies between Aichi to see how far the action to reach the global Target 11 (about MPAs and OECMs) may also contribute to achieving other targets, producing more effects, overall, with the same investment (Venter et al. 2014). Carlson et al.; 2021, see amplified synergistic effects in jointly managing areas established to conserve neighbouring land and sea ecosystems like mangroves, seagrass beds and coastal reefs. At a more local level, synergies may be sought (i) in an ABMTs at any stage of its establishment and use; (ii) within ABMTs, among different uses or measures; (iii) between similar or complementary ABMTs in a fishery, a networks or an ecosystem; and (iv) between management inside and outside of the ABMTs.

Synergy is a premium. It increases the outcomes and is demonstrated by the synergistic effect. Processes and institutions may coordinate their action on ABMTs, and align their plans and targets, joining means, increasing complementarity, but there is synergy between them only if the coordination generates a synergistic premium. The fact is that the words most associated with "synergy" in policy documents are: teamwork, alliance, union, cooperation, collaboration, interaction, partnership, etc., paying more attention to synergy in the implementation inputs that in biodiversity outcomes. The synergistic premium may be obtained in the inputs, for example, when complementary workplans and policies generate economies of scale, producing for example in the ABMT or the network, more information and more comprehensive assessments for the same total budget than independent ones (cf. Section 6.2.2). Synergistic biodiversity outcomes are more complicated to forecast (if not by simulation), control, and empirically assess (cf. Chapter 7).

Synergetic outcomes may be positive or negative depending on their direction relative to the objectives. Two negative factors may jointly have more negative impact then when acting independently. For example, loss of land-cover and climate change impacts (Mantyka-Pringle et al., 2015). Despite their potential importance, antagonistic factors and outcomes seem to have received less attention than complementary or synergistic ones (Darling et al., 2010).

Measuring synergistic effects is challenging in complex socio-ecological systems (cf. Section 7.2.2)[115], particularly in the dynamic and variable ocean environment. Assessing in addition whether several ABMTs, or ABMTs and non-spatial measures, produce a premium when working together is even more challenging. Few Marine conservation studies use the rigorous counterfactual designs needed to accurately detect the effects and gaps exist in the social domains impeding assessments (Gill et al., 2019).

Causal relationships are hard to accurately determine Therefore, determining the effect of single ABMTs is challenging and determining the part of the effect that is due to a synergistic relation is even more challenging unless the synergistic effect is clearly beyond the range of natural variability, and sustained

[115] For example, if in a fishery, there is a closure to protect a nursery, a refuge to protect old spawners, and selectivity and effort measures to maintain the stock, it is practically impossible to empirically demonstrate the part that each measure has on the stock size,

Synergies may be intended or not. Synergy may occur between two ABMTs established by two institutions for different purpose at different times simply because of their inter-relations within the social-ecological system. For example, two agencies working separately towards compatible objectives may benefit from an unplanned synergy they may not even realize. Alternatively, the two institutions might align their objectives, organized joint working groups, join their experts and information systems, take coordinated measures. Some economies of scale may be obvious but assessing the existence of a synergistic bioecological premium may be more complicated.

Positive synergies increase effectiveness and efficiency if the actions produce more benefits (including a premium) at less cost per unit of effort. Measuring the effects and the premium (e.g., against a counter-factual) is a challenge because of the high natural variability and inherent difficulty to unequivocally determine causal relations in social-ecological systems and the difficulty to assess the relative contributions of several ABMTs and other measures. Assessing efficiency requires an assessment of costs and synergies are too often presented as a free good, a co-benefits obtained at no additional cost. In reality, however, the chase for synergy may often have costs that tend to be underestimated if profound changes are needed in institutions, capacity-building, multidisciplinary assessments, and enforcement (Goold and Campbell, 1998).

Synergy is a multidimensional property. There are as many possible types of synergy of interest to humans, as there are ecosystem services and related objectives (Villasante et al., 2016) and the synergistic effects may be a bioecological or socio-economic nature. In conservation, the synergies concerned have been mainly in the bioeconomic domain and socioeconomic synergies have not yet been properly addressed in performance assessment (Burgess et al., 2014 ; Gill et al., 2019). Chasing synergy to improve communities' livelihoods in a vulnerable community may call for actions working against the best outcomes for biodiversity. A positive synergy on biomass and species diversity would also be seen positively by tourists, but with indifference or antagonism by fishers in terms of equity. The trade-offs about ABMTs' effects are logically echoed when considering synergies, and win-win synergies are another "Holy Grail". Crain et al. (2008) stressed that the direction of a synergy may change when the number of dimensions considered increase, and warned about synergy studies addressing one or few parameters.

Because of the above, the "value" of the synergistic effect in in the eye of the stakeholder, and the net value of multiple synergistic effects between ABMTs, just as the net value of these ABMTs would be both useful to have and difficult to assess in one single common "currency".

6.2.2 Relation between synergy and complementarity

The terms "synergy" and "complementarity" tend to be used as synonyms because, in policy documents and programmes where the term "synergy" is used, the dimension, goals, and specific objectives of "synergy" are generally not defined. On the contrary the words most associated with "synergy" in these documents, teamwork, alliance, union, cooperation, collaboration, interaction, partnership, etc., focusing more on the interaction between actors, programmes…and ABMTs, than on undefined biodiversity premiums. Clearly, complementarity between factors is necessary but not sufficient for synergies between to occur. Because of that, however, and because of the difficulty in measuring the "synergistic effect", complementarity may be taken as a first step, if not a proxy for synergy, and efforts to achieve an elusive synergy tend to take the form of actions to increase complementarity. For this reason (but not explicitly) guidance on synergy tend to relate to complementarity of means. Information sharing, collaboration, integration, sharing of values and views, partnership, alignment, etc. are all key words related to "synergy", which may likely improve complementarity and are known to improve management performance, but not automatically synergy. "Working together" is good. Getting a synergistic premium is another, elusive matter.

Complementarity is indeed widespread. The general complementarity, coevolution and convergence between fisheries management and biodiversity conservation has been described but a lot of progress is still needed on the ground (Garcia et al.; 2014). By contrast, the evidence of synergy (to be expected from complex social ecological systems) seems controversial. Little empirical evidence was found in empirical studies in coral reefs were most observed effects of environmental and human factors have been found to be either additive (complementary) or antagonistic but rarely synergistic (Darling & Coté, 2008 ; Darling et al., 2010). However, in experimental studies, synergies have been found to be very important (Crain et al., 2008). Pending a comprehensive review of the issue, attention can be focused on ensuring complementarity, hoping for synergies.

Within an ABMT, there is potential for complementarity between spatial and non-spatial measures, in both fisheries management (Cochrane and Garcia, 2009) and biodiversity conservation (Pomeroy et al., 2005 ; Sutherland et al., 2021)[116]**.** For example, in a large MU-MPA or LMMA, smaller ABMTs –like reserves or taboos– interact with other non-spatial measures regulating the subsistence fishery in the entire area. A functional synergy between these measures is at least assumed to reach the objectives identified in for the ABMT. The synergy gets more complicated when other sectors interact (like tourism), but joint interests may be identified between conservation, fisheries and tourism. In some cases, modern non-spatial resources allocation strategies may conflict with traditional area-based community rights, as in New Zealand (Bess and Rapalludi, 2007).

Between ABMTs, there are many examples of complementarity in conservation ABMTs. MPAs, for example are expected to be more effective if functionally connected in a conservation network. At global level, MPAs and OECMs are complementary in the global conservation coverage targets (CBD, 2018) but also expected to be complementary in conservation networks[117] (CBD, 2018, 2022 ; IUCN-WCPA, 2019) or if OECMs are used as buffer zones around MPAs; between TURFs and no-take zones (cf. Gelchich and Donlan, 2015 ; Lester et al., 2016). Between no-take zones and the Biosphere Reserves or community-managed Areas in which they are used. He level of complementarity depends on local conditions (e.g., water flows, habitat fragmentation, activities outside the ABMTs) and may be enhanced by optimal ABMT size and locations, and complementary

---

[116] For example, in a marine mammal sanctuary, by-catch control measures are also needed outside the sanctuary to extend the protection, and tensions emerge when this additional protection is deemed insufficient.

[117] When ABMTs of similar nature are close enough to each other (like many fisheries VMEs in the North Atlantic), it has been suggested to merge them into single, larger OECMs, to improve control and surveillance and reduce habitat fragmentation (ICES, 2020).

measures protecting species and life-stages moving between ABMTs. Benthic corridors may be protected for benthic animals like lobsters and crabs in their spawning migrations. Pelagic corridors would be much more challenging, considering the size and dynamisms of the aquatic connections concerned. In both cases, complementary gear regulations and closed seasons in surrounding areas would be helpful. More generally, if conservation ABMTs happen to overlap significantly in space and objectives, synergies are very likely.

Conflicts and potential complementarity may exist also between sectoral ABMTs[118] but we did not look at them. Tensions between them would relate to competition for space and could be addressed through Marine Spatial Planning. For economic, technological and security-related security reason, sectoral ABMTs may not offer much in terms of synergies with other sectors. However, opportunities may emerge in relation to their secondary or unintended biodiversity co-benefits if their exist. There are tensions between fisheries and oil & gas platforms and fields of renewable energies production systems (aeolians and underwater turbines) (Alexander et al., 2013 ; Yates et al., 2015 ; Reily et al., 2015 ; Jia et al., 2022). However, these tensions and synergies are not addressed in this report.

Complementarity between fisheries and conservation ABMTs is central to this report and is essential in EEZs and in the High Sea. For example, zoning is used to reduce conflicts and accidents between fishery sub-sectors (Hall, 2009). However, conflict remains in resources allocation and equity if resources move between zones, affecting sustainability and calling for complementary spatial or non-spatial measures. A functional interaction is always expected between an ABFM established to protect juveniles and recruits, and the size of the stock outside it, through the life-cycle, migration and population dynamics. Effectiveness is usually assumed as long as the state of the resources is maintained and improved even though the respective contributions of the ABFM and of other measures applied in the surrounding fishing ground may be difficult to distinguish. For example, there may be a need to complement the protection of turtles obtained in an ABFM (e.g., by a total gear exclusion), with fishery measures applied outside the ABFM (e.g., turtle excluder device; turtle catch limit) to avoid dissipating the benefits gained in the ABFM by practices outside it. The same is true, obviously, for an MPA used in a fishery. The necessary complementarity should be facilitated by the existence of a formal fishery management plan, integrating the measures applied inside and outside the fishery-ABMT. Complementarity would also be facilitated if fisheries management and conservation shared similar long-term goals for an area and would jointly deal with the eventually necessary transitions – e.g., maintain a healthy ecosystem for sustainable fishing instead of supporting oil and gas development, as an example.

6.2.3 Pathways to synergies

In this section, we consider ways to increase positive synergies between ABMTs, keeping in mind that (i) synergistic effects are very difficult to measure and, as a consequence, increased complementarity will be considered as a proxy for increased synergy and, in any case, as a first step and necessary condition towards it; (ii) increasing synergy

[118] Used in oil and gas exploitation; production of renewable energy (aeolians and turbines); mining of minerals; navigation; navy firing ranges; etc.

between ABMTs requires complementarity between originating institutions, policies, management plans, and measures, as a necessary albeit not sufficient condition.(Section 6.2.1).

Mainstreaming of biodiversity concerns in economic sectors and of socio-economic concerns in conservation are a pathway to synergies. Mainstreaming of biodiversity is the process of embedding biodiversity considerations into policies, strategies and practices of key public and private actors that impact or rely on biodiversity, so that it is conserved and sustainably and equitably used both locally and globally (Huntley, 2014; Huntley & Redford, 2014). In capture fisheries a suggested definition is: "the progressive, interactive process of recognizing the values of biodiverse natural systems in the development and management of fisheries, accepting full accountability for, and effectively responding to, the broader impact of fishing and fishery related activities on biodiversity and related structure and function of ecosystems"(Friedman et al., 2018). Mainstreaming, in fisheries and biodiversity conservation have already led to: (i) improved mutual understanding (even if frictions persist): (ii) increasingly overlap between objectives ; (iii) memoranda of understanding; (iv) common approaches to management and governance; (v) joint working groups on "hot" common issues. The awareness of social and economic issues in conservation is increasing. Initiatives like the elaboration by FAO (2011) of guidelines on the use of MPAs in fisheries, and on management of Vulnerable Marine Ecosystems (FAO, 2009; Thompson et al, 2016); and the creation of OECMs by the CBD (2018), as an explicit complement to MPAs have increase opportunities for synergy on the ground. More mainstreaming at national level can accelerate the mobilisation of possible synergies.

As mentioned above, synergies may be sought at different levels of the governance and management process: (i) between institutions; (ii) between policies and goals; (iii) between management plans, objectives, targets, and indicators; (iv) between implementation processes, in data collection, assessments, generation of advice, enforcement, monitoring, i.e., coordinating the respective management cycle, to obtain synergistic outcomes.

Synergy may also be sought at various geographical scales: (i) at global level, at the UNGA, CBD, FAO or IUCN; (ii) at regional level, within and between RFMOs and RSCs; (iii) at national level through enabling legal and policy framework, including cross-sectoral frameworks; within the fishery sector, between sub-sectors or between ABMTs and non-spatial fishery measures; at local or community level.

Following on the analysis by Goold and Campbell (1998) we would argue that while many principles or approaches would apply to all levels, specific processes, actors, priorities and opportunities will likely differ. Looking for "One Synergy", applying a single blueprint approach to all levels would probably be an error as sectors, sub-sectors, communities, States and international organizations have their own characteristics and mandates, and require tailored approaches.

The suggestions of Goold and Campbell (1998) for improved synergy across the corporate private sector may be applied to fisheries management and biodiversity conservation (UN **Environment, 2016**). The possible strategic and operational actions include:

- Sharing know-how at the policy, management, assessment and operational levels, through: integration or at least inter-connection of information systems; open dialogues[119]; methodology transfer; Joint publications; learning communities (Clauset and Murphy, 2012); Managers' networks (cf. for example https://medpan.org/en).

- Sharing tangible resources: developing inter-operable or common data bases; sharing expertise; establishing joint expert groups; Joining means of observation (surveys);
- Pooling negotiating and bargaining power: through joint preparations for policy meetings; joint delegations and policy briefs; alliances[120]; networking; partnerships; coordinated strategies and plans[121] although their translation at local level is often weak (Ridgeway, 2014, 2014a).
- Improving governance through: Enhanced enabling frameworks (cf. Section 2.4); Identification and enhancement of positive overlap between institutional mandates, and objectives (e.g., broadening mandates); coordinating policies, goals, strategies and plans; decentralizing[122] responsibilities at local/community level ensuring capacity, social bond and strong leadership (FAO Benecke et al., 2007); providing incentives for collaboration; promoting education and capacity building at central and local levels. Promote Marine Spatial Planning (MSP) to harmonise inputs, and limit conflicts. Pooling management resources and funding (UN Environment, 2016);
- Improving management through: improved coherence and alignment of targets, indicators, and benchmarks, focusing on outcomes in addition to actions; effective participation; local leadership, accounting traditions; participatory identification of tangible and intangible values and mutual benefits; empowered local environmental stewardship; participatory management for improved compliance to increase trust; developing functional networks of ABMTs.

A process aiming at enhancing complementarity (or synergy) could undertake to identify: (i) Similar or complementary (synergistic) objectives and expected outcomes, even if with different ranking (cf. Section 4.2), with the view to align approaches and means of implementation as appropriate; (ii) Conflicting objectives and the possible trade-offs that might be considered to broaden alignment as much as possible, reducing obstacles to synergy; (iii) Social and economic incentives that would enhance virtuous behaviour or compensate unavoidable economic losses in the process (based on Benecke et al., 2007):

In brief, all of the above is in line with conventional long-standing guidance on governance and effective environmental and fisheries management. There is abundant guidance on the subject e.g., on (i) effective fisheries management and the ecosystem

[119] The CBD Sustainable Oceans Initiative (SOI), the UN summits, the UNGA discussions on oceans and coastal areas, are good examples.

[120] The Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Interest, in Oceania is a good example of synergy between States for improved area-based management of tuna resources (https://www.pnatuna.com).

[121] The UN summits outcomes, the SDGs and the GBF are good examples

[122] The term is used here to refer to a range of collaborations between the central State and the local communities.

approach to fisheries, including its human dimensions; (ii) biodiversity conservation and protected areas, in MPAs, biosphere reserves, World Heritage sites; (iii) marine spatial planning and integrated management of coastal areas; and (iv) on good governance. All this guidance, if properly applied would facilitate the search for synergies. There are gaps in the guidance, on social and economic aspects of synergy that absolutely need to be filled to avoid misinterpretations (cf. Section 6.2.1). A general lesson is that there is no "silver bullet" and no universal recipe.

The only and most important point when looking for enhancing synergies, is to do as much as possible of the above jointly, encouraging inclusive engagement and bearing in mind power differentials across sectors and groups. Talking at length about synergy in separate I of like-minded stakeholders, is unlikely to generate much synergy. Marine spatial planning (MSP) and other cross-sectoral integrated frameworks (like ICZM) would effectively support the efforts at cross-sectoral level (including conservation).

6.2.4 Contributions at international level

For decades, often under the aegis of the UNGA, numerous international agreements have proposed programmes of action in support of sustainable development and sustainable use, implying or explicitly looking at reduction of conflicts and fostering of synergies between socio-economic and environmental policies and strategies within which ABMTs may have a place. There is therefore no shortage of recent international declamatory commitments and high-level guidance towards better coherence, complementarity, and possibly more synergies between economic development and conservation: (i) The 2010 CBD Strategi Plan for Biodiversity 2011-2020 its Aichi Target 11 on protected areas and OECMs; (ii) The 2015 Convention on Sustainable Development (UNCSD) and its Sustainable Development Goals (SDGs) for 2030 (https://sdgs.un.org/goals); (iii) The 2019 FAO International Symposium on fisheries sustainability: Strengthening the science-policy nexus.; (iv) The 2022 Kunming-Montreal Global Biodiversity Framework of the CBD; and (v) The 2022 World Sustainable Development Summit (Stockholm + 50).

In the last two decades, the globalizing vision and concept of "Blue Economy", and the global threat of climate change have triggered respectively 1800 and over 400,000 publications (Google Scholar™), stressing the international need for synergy in all important initiatives.

a. The CBD framework

The CBD Kunming-Montreal Global Biodiversity Framework (CBD, 2022) is central to biodiversity conservation and sustainable use, food security and vulnerable communities, and related targets interconnected Targets. The most important target for area-based management tools is target Targets 3: *ensure … that by 2030 at least 30 per cent of …coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas (Pas) and other effective area-based conservation measures (OECMs)*. The Target and the CBD (2018) Guidance call for complementarity of MPAs and OECMs in conservation networks and it offers an opportunity for fisheries to identify and upgrade ABFMs and their contribution to global conservation, increasing synergy with fisheries. The GBF targets themselves are expected to be implemented synergistically. While contributing to meet Target 3[123], ABMTs has the potential to synergistically contribute also to many other Targets like Target 2 on ecosystem restoration; Target 5 on sustainable use of wild species; Targets 5, 9 and 10, on sustainable use of wild species; Target 11 on nature contributions to people (NCP) and nature-based Solutions (NbS); hopefully Target 14 and poverty eradication; and many others in a less conspicuous way.

There has been intense discussions on the conservation value of the global coverage Target 3 and the respective roles of MPAs and OECMs it, but the Global Biodiversity Framework has now been agreed (CBD, 2022) and States and regional organizations are facing the significant challenges of its implementation (Obura, 2023)[124].

b. The FAO framework

FAO and is Committee on fisheries are the only mandated UN Institutions dealing with fisheries development and sustainability. The FAO Code of Conduct for Responsible Fisheries (CCRF) and the related guidelines and Action Plans have, for decades, guided the sector towards more environmentally friendly fishing practices. The 2019 FAO symposium and the subsequent FAO-COFI (2020) highlighted *inter alia* the need to (i) integrate biodiversity objectives within fisheries management plans; (ii) increase focus on multispecies, networks and ecosystems, as well as on data-poor fisheries, traditional knowledge, gender issues, and equity; (iii) develop strong and diverse partnerships with the industry and civil society; (iv) align public support with the objective of sustainable development of just and resilient fisheries, within a strong and sustainable "blue economy"; (v) build capacity in data collection, monitoring, assessment, and communication; (vi) empower communities, considering explicitly livelihoods, well-being, and decent work; (vii) increase stakeholder involvement and secure rights and access; and (xi) reduce eliminate harmful practices leading to overcapacity, overfishing, IUU, and biodiversity degradation. All these objectives while not mentioning ABMTs specifically, reflect mainstreaming of biodiversity conservation and more inclusive management approaches, opening large opportunities to increase the role and complementarity of ABMTs.

---

[123] The utility of Target 3 has been hotly debated e.g., in Green et al. (2011) ; Klein et al. (2015) ; Jones and De Santos (2016) ; Foster et al. (2017) ; Obura et al. (2021).

[124] See also (1) https://enb.iisd.org/implementing-common-approach-biodiversity-post-2020-gbf; (2) https://www.weforum.org/agenda/2023/02/5-ways-businesses-can-implement-the-new-global-biodiversity-framework/; (3) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7327856/; (4) https://www.iucn.org/story/202212/post-2020-global-biodiversity-framework-gbf-and-environmental-human-rights-defenders; (5) https://www.iddri.org/en/publications-and-events/policy-brief/effective-implementation-post-2020-global-biodiversity

c. The IUCN framework

Through its World Conservation Congress, its World Parks Congress, and World Commission on Protected Areas (WCPA), expert groups and projects, IUCN is a recognized global promotor of area-based protection and strong driver of the global expansion of protected areas on land and in the ocean. As a complex organization, it reflects in its structure and work programme, the tensions that exist in the world along the continuum ranging from strict protection to sustainable use. These tensions appear also in the MPAs themselves, between MPA dedicated to strict protection (Type I and II) to multiple-use MPAs (Type VI) within which low impact subsistence fisheries can operate under restrictive conditions. IUCN-WCPA (2019) considers, implicitly in the bioecological dimension. The IUCN Fisheries Expert group has developed guidance specifically on fishery-OECMs (Garcia et al., 2021) touching on issues related to synergy, complementarity, conflict, and trade-off issues within and between OECMs, between OECMs and MPAs, and between non-spatial measures**.**

d. The MSC framework

Ecolabelling is an interesting private initiative, global in scope, but fishery-specific in its implementation. The main fishery label is that delivered by the Marine Stewardship Council (MSC) which, through an independent third-party certification process, assesses fisheries broad sustainability, and delivers a well-known MSC label based on three Principles_: no overfishing; no damage to the ecosystem: and effective management system. The Standard does not require ABMTs, but states that MPAs and other spatial management approaches are potentially valuable management tools, that are not explicitly required for the certification but may contribute to the delivery of a sustainable fishery, helping to meet the requirements regarding the required sustainability of fish and other species and healthy ecosystems. The Standard considers explicitly closed areas aimed at precautionary protection of more sensitive habitats and arising from move-on rules.

e. The BBNJ Framework

Since 2017, the ABMT concept has also been brought further into the international limelight by the process of development the International Agreement on the Conservation and Sustainable use of Marine Biological Diversity of Areas Beyond National Jurisdiction (referred to as the BBNJ Process). There are strong expectations that this process will provide a complementary framework to the UN Fish Stock Agreement that will facilitate the establishment and effective coordination and use of ABMTs also in areas beyond national jurisdiction (Vierros et al., 2016; De santo, 2018; FAO, 2022. https://www.un.org/bbnj/). The further revised draft agreement (United Nations, 2022) refers to *measures such as area-based management tools, including marine protected areas.* The BBNJ definition of ABMT is: *a tool, including a marine protected area, for a geographically defined area through which one or several sectors or activities are managed with the aim of achieving particular conservation and sustainable use objectives in accordance with this Agreement*. The Agreement not yet completed but based on that definition, one might reasonably expect that the future BBNJ Agreement will provide an additional enabling framework which, together with the UNFSA, within the UNCLOS framework, will allow a synergistic development of ABMTs in the High Sea. This evolution, however, appears to some parties as a surreptitious restriction –for environmental reasons– of the freedom of navigation and innocent passage enshrined in UNCLOS (CEMM, 2016).

6.2.5 Contributions at regional level

Action is undertaken by regional institutions such as RFMOs or Regional Seas Organizations, but also through programmes like the Large Marine Ecosystem (LME) Programme[125] for integrated management of the ocean (The et al., 2020), the FAO-Norway Fridtjof Nansen Programme[126] on the ecosystem approach to fisheries, or the Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security (CTI-CFF)[127].

To improve synergies between fisheries management and biodiversity conservation and between ABMT categories, RFMOs and RSOs need to improve their collaboration. The issues have been discussed for decades (IWCO, 1998; UNEP, 2001; FAO. 2005; Druel et al., 2012; Rochette et al., 2014; Asmundsson and Corcoran, 2015; ISSD, 2018; Gjerde and Wright 2019) and are gaining significant additional traction though the CBD Sustainable Ocean Initiative (SOI) in which the dialogue between regional organizations is a central theme (https://www.cbd.int/soi). Although some RSOs have been established in the High Sea (like OSPAR) and are cooperating with RFMOs operating in the same region (like NEAFC) (Asmundsson and Corcoran 201**5**), most RSOs have no management mandate in the High Sea, while RFMOs have no mandate in EEZs, complicating but not really impeding cooperation, e.g., on straddling ABMTs. This issue might be resolved within the ongoing BBNJ Agreement process and the new legal framework it will establish withing the Law of the Sea, clarifying the processes of establishment, registration, assessment and enforcement of ABMTs in areas beyond exclusive national jurisdiction or straddling between EEZs and the High Sea.

While they are not specifically addressed in this document, other regional frameworks like the Large Marine Ecosystems (LMEs) and seascapes, may help develop coherent networks of ABMTs.

6.2.6 Contributions at national level

A proper overarching national enabling framework facilitates the establishment and effective management of ABMTs in fisheries and other economic sectors. Marine Spatial Planning (MSP) or other integrated spatial management frameworks can improve coherence of cross-sectoral efforts, highlight overlaps and potential or actual conflicts, and provide opportunities for improved ABMTs' effectiveness and synergy.

[125] https://www.lmehub.net/#

[126] Most probably the longest-lived programme even funded by a country in support of sustainable fisheries, The Nansen Project started in 1975 without interruption. Its present avatar is the EAF-Nansen Programme "*Supporting the Application of the Ecosystem Approach to Fisheries Management considering Climate and Pollution Impacts*" (https://www.fao.org/in-action/eaf-nansen/en/).

[127] The CTI-CFF initiative is a multilateral partnership, established in 2009, by Indonesia, Malaysia, Papua New Guinea, Philippines, Solomon Islands and Timor-Leste to sustain marine and coastal resources, addressing food security, climate change and marine biodiversity in coral reefs environments. https://www.coraltriangleinitiative.org/about).

A modernized fisheries management framework covering conventional fisheries sustainability objectives as well as the broader objectives of biodiversity conservation, will reduce collateral impacts on non-target species and protect essential and critical habitats (cf. Chapter 9). The formal adoption and enforcement of the Ecosystem Approach to fisheries, is a necessary step in the right direction. The harmonization of the management plans of single fisheries operating in the same ecosystem has become necessary and would facilitate the development of networks of ABFMs and fishery-MPAs, complementing developing conservation networks. A parallel effort would be needed in the biodiversity conservation framework to fill the gaps in social and economic concerns and objectives.

A national inventory of ABMTs with their characteristics, objectives, and performance (as far as possible) would contribute to the national MSP framework referred above and would help developing a coherent national network of ABMTs, connected to Marine Spatial Planning initiatives[128].

Within EEZs, Community managed Areas (CMAs) like LMMAs, and multiple-use MPAs (MU-MPAs) fisheries and conservation use smaller ABMTs within their boundaries. The degree of possible synergy with fisheries may be rather limited in MU-MPAs allowing only very limited subsistence fisheries, even though virtuous community behaviour is expected to protect the no-take zones and other restrictions that MU-MPAs may contain. Potential synergies may be significantly more important in CABMs considering the wider range of objectives pursued in these areas.

6.2.7 Implementation factors

A number of practical considerations emerge from experience and from the literature regarding factors that may affect complementarity and synergy.

Good governance has demonstrated to be fundamental to multidimensional effectiveness. Active communication among institutions and stakeholders; effective participation, transparency and accountability, fostering alliances, coordination of policies and plans; alignment of goals and objectives; cooperation, partnership and, if possible, integration of implementation are all standard recommendations, that do not need to be developed here (PNUD, 1997; Healy and Luna, 2018; Adger et al., 2009; Grafton et al., 2020; Cochrane and Garcia, 2009; Raymond-Yakoubiana and Daniel, 2018; Rohe et al., 2019; Cochrane, 2020; Charles, 2021; Jonas et al., 2021). Most of the principles would contribute to enable ABMT synergies.

Because of the interconnections of fisheries and conservation concerns, integration of fishery and conservation ABMTs planning and implementation may be an attractive but difficult, lengthy, and costly strategy. It may not be necessary and some good progress may be achieved within existing frames. For example, the increased similarity of fisheries and conservation governance since WWII, as a result of convergence and co-evolution has been described in Garcia et al (2014) and reviewed in Section 2.2. The need to increase attention on human dimensions in all plans and decision-making processes, and

[128] Reckoning, however, that Marine Spatial Planning is also severely criticized for some confusion between theory and reality of the process; lack of realism; focus "Blue Growth" priorities with narrow focus on strategic sector planning and uses, undermining conservation (Jones et al., 2016; Trouillet, 2020).

in particular to recognise the rights and socio-economic needs of coastal and small-scale fishing communities when considering ABMTs, is recognized as a *sine qua non* condition to increase compliance and eliminate "paper ABMTs" (Wells et al., 2016). The efforts made in the European Commission towards harmonized management implementation of fisheries and environmental ABMTs (cf. Section 12) may be an informative example within a complex governance system., even though it is probably too early to assess its effectiveness. The establishment of OECMs offers an additional significant opportunity to integrate (literally) fisheries and conservation interests. Finally, the emerging BBNJ Agreement, may provide an instrument of harmonization in the High Sea. More efforts in the same direction, together with participative Marine Spatial Planning would benefit both fisheries and biodiversity protection as efforts towards higher integration proceed as much as possible and necessary.

Moreover, the systemic nature of synergy also implies the existence of non-linear relationships, multiple cause-effect relationships, cascading effects, and feed-back loops, that tend to produce unexpected outcome (surprises) as well as outcomes that evolve with time, as the ABMTs, potentially affecting the strength of the synergies and their directions.

Policy targets, like the 2010 Aichi Targets, the 2015 targets attached to SDGs, or the 2022 GBF targets, are usually recognized as interdependent, to be taken as a whole, implicitly recognizing their systemic nature and the opportunities of synergy between targets as efforts to achieve one target may produce also contribute to others without additional costs. In theory, actions might be taken, or modified to enhance these synergies, by enhancing collaboration between the institutions and actors involved. The international Agreements do not generally provide mush guidance about how to detect opportunities and activate synergies, with all the possible cost/benefit implications. These implementation matters are left to States which have the flexibility (within the Agreement) to implement their part of the global international agenda within the local kaleidoscope of bioecological and socioeconomic conditions, facing at local level, the tensions behind the "consensus" of the international agenda (Ridgeway, 2014).

Setting of common norms definitions, and criteria help ensuring stronger similarity, consistency and coherence in implementation. Many institutional categories of ABMTs have specific criteria but the vagaries of implementation introduces differences in effectiveness despite common references. Comparison of the sets of objectives that characterise these categories, may provide some clues about their potential synergies (cf. in Rice et al., 2018).

Aligning objectives between ABMTs is certainly a good way to promote synergy. However, different institutions often have different primary objectives. So, institutions and ABMTs with similar objectives will more naturally be synergistic. The primary objectives of sectoral ABMTs are likely to be rather rigid, but their secondary objectives may be aligned. As a consequence, these ABMTs may produce less positive impact but may nonetheless contribute to synergy e.g., in a conservation network. Aligning objectives is a way to dissipate tensions and improve trust. In addition, transparent discussions on objectives should clarity fundamental rationales, and help increasing mutual understanding.

Community-based management, of fisheries areas or MPAs, when effectively empowering communities may facilitate integration of objectives and concerns, facilitating the emergence of synergies within the areas. Synergies at a larger scale, however, require agreements between communities, which may also entail State's intermediation and support. Traditional communities may play a central role in MU-MPAs and certainly in CMAs. The traditional management and conservation paradigms (worldviews) of the small-scale communities are often given as successful examples of protection and sustainable use (Johannes, 1978, 1982; Berkes, 2003; Govan et al., 2008; Armitage et al., 2017; Truchet et al., 2022). Therefore, centralized intervention from States in these systems may be problematic if not properly oriented. Fortunately, an abundant literature exists already and numerous projects have been established in the last five decades to assist scientists and managers dealing with community-based fisheries management and conservation systems (Pomeroy et al., 2004; Christie and White, 2007; Govan et al., 2008; Cazalet et al., 2011; Claudet, 2011; Bustamante et al, 2014; FAO, 2019, to cite just a few) and we will not dwell on the issue.

Complementarity is needed between measures implemented inside and outside ABMTs which should be harmonized to avoid that the benefits generated inside the ABMT be dissipated by the fishing regime in place outside the ABMT (Garcia et al., 2021). For example, the protections of turtles from bycatch inside an ABMT specially located for that purpose, would need to be complemented by non-spatial measures, applying in the entire fishery, to (i) limit the risk of encounter of turtles; (ii) maximize the chances to release alive the turtles that may be caught. The alternative would be to apply to the whole fishing ground the same measures applied in the ABMT. This would eliminate the need for the ABMT but the resulting cost to the fishery might be prohibitive.

Balance between ABMTs and non-spatial measures depends to some extent on the nature of the biodiversity attribute concerned, the state of the resources, and the management capacity and local support for the measure. For example, Hilborn at al. (2004) argue that no-take zones are ineffective when the fishery resources are already well-managed and fished at or around their MSY level, but might be useful in areas with low management capacity, where direct input or output controls are difficult to implement (such as in artisanal multigear and multispecies fisheries). Non spatial measures are "technical" measures that tend to apply to the entire fishery, but might sometimes be applied differentially in space. The authorized level of catch or effort, for example, is determined for the whole fishery resource, but it can also be allocated in space to improve efficiency and selectivity. That spatialisation may be imposed a priori based on available historical information and modelling, or may dynamically result from a system of area-based incentives (incentivised by a system a space-based tax (Dunn et al., 2016; Kraak et al., 2012).

Good knowledge, both scientific and local, is essential, covering *inter alia* (i) bioecological and socio-economic properties in the ABMTs and surrounding areas, (ii) main spatio-temporal relationships between the ecosystem components, including human components, and (iii) possible factors enabling or limiting synergies between neighbouring ABMTs in that area. These factors may be bioecological e.g., related to habitat degradation or fragmentation, species life-cycle requirements, or oceanographic phenomena. For example, habitat restoration or protection of migratory corridors. These factors may also be socioeconomic e.g., related to ignorance, poor understanding of the social-ecological system, poor sectoral practices, poor governance, conflicting management practices etc. and might be corrected through better, more participative and integrated knowledge-sharing, governance and management, better aligned incentives, etc. The multi-dimensional nature of synergies call for multidisciplinary teams and cross-institutional collaborations, as well as robust engagement with rights holders and stakeholders. The needs change with the level of scale at which synergies are thought. At the local level, local traditional knowledge sources will be very useful.

Awareness of costs and benefits is essential when pursuing synergies, considering the chronic limitation of public budgets. Costs may be needed to (i) assess *ex-ante* the benefits that synergy would bring; (2) check and improve perception of synergy benefits among stakeholders, and hence their likelihood to collaborate in the process; (3) Build capacity to implement the improved framework and to assess the expected costs and benefit; (4) Identify and correct potential disincentives; (5) Develop implementation skills. "The best is sometimes the enemy of the good" and, If the bioecological and socioeconomic relationships needed for synergies to occur are not structured properly or adequately supported, obsessive efforts to generate elusive systemic synergies may divert limited management resources, and "tire" stakeholders (Goold & Campbell, 1998; UN Environment, 2016).

Protection from non-fishery impacts has been advocated as an advantage for fisheries established in MPAs. This is an issue rarely mentioned as a problem in global fisheries assessments. The relations (synergy or antagonism) with tourism depend *inter alia* on local conditions; capacity of the local community; its dependence on the ocean for food security; and the distribution of tourism benefits in and outside the community. Regarding external factors, MPAs may protect from coastal erosion (e.g., through coastal habitat recovery) but the role of ABMTs on ocean acidification, pollution, and climate change is controversial (Carilli et al., 2009 ; Johnson et al., 2018 ; Bruno, 2018 ; Reimer et al., 2021). Other broader impacts of MPAs on poverty eradication, food security, and other social and economic values are scarcely studied, and site specific. The potential threat of the Blue Economy or blue growth, on both fisheries and conservation provides an important and vital opportunity for both arenas to forge alliances instead of bickering in much less strategic conflicts.

In the following sections we look at some more details regarding synergies (a) between ABFMs and non-spatial tools; (b) between MPAs and fisheries; and (c) in the use of non-spatial tools in MPAs and Community-managed Areas.

6.2.8 Synergies between ABFMs and other fisheries management tools

A priori, ABFMs and non-spatial tools may be combined for the following purposes (based and adapted from Cochrane and Garcia, 2009):

- To reduce impact on biodiversity: (i) Redirect investments to environmentally-friendly non-spatial instruments: by-catch excluder devices; non-destructive fishing practices; accidental mortality limits (e.g. by-catch limits; Payments for ecosystem services (PES) and other economic measures for impact mitigation; (ii) Reduce fishing pressure; (iii) Promote more environmentally-friendly fishing gears at affordable cost; and (iv) Adapt ecolabelling to SSFs. Many of these effects may be achieved simultaneously, opening opportunities of synergy.

- To reduce conflicts: (i) Allocate fishing rights to sub-sectors; and (ii) Integrate planning and management in spatial frameworks (multiple-use MPAs, Marine Spatial Planning, ICAM, etc.). The effect is to reduce or eliminate tensions, also facilitating the consideration of possible synergies.;

During the last century or so, fisheries management has used a mix of spatial and non-spatial measures and the interest about spatial measures has increased since the 1990s together with the broadening of fisheries management objectives in the Ecosystem Approach to Fisheries (EAF) and related efforts to reduce fisheries' impact on broader biodiversity attributes. Table 6.1 indicates the overarching fisheries management goals, the main types of fisheries management objectives, the more specific objectives that ABFMs may address, and the non-spatial tools that might help ABMTs reaching these objectives.

Table 6.1: Complementarity between ABFMs and non-spatial tools in meeting fisheries management goals and ABFM's objectives. The fishery goals and ABFM objectives are taken from Table 4.1.

Fishery goals	Fishery objectives	ABFMs Specific objectives	Non-spatial management tools
Optimize the fishery performance	Protect/recover resources	Protect nurseries, recruitment	Mesh size and landing size regulations, closed seasons
		Protect spawning aggregations	Closed seasons
		Protect essential habitats	Ban/regulate gear types
	Control fishing pressure	Reduce fishing mortality in some key areas	General effort control
		Reduce pressure on selected ages/species	Regulation of gear types, selectivity, effort
		Deter/eliminate IUU	Stringent enforcement
	Reduce operational conflict	Allocate different activities/gears to specific zones	None available
		Protect traditional tenure and user rights	Allocation of user-rights in the whole fishery
Maintain or enhance food security	Maintain livelihoods	Protect livelihoods & access to resources & markets	Regulation on coastal settlements, feeder roads, integrated development
		Ensure equitable distribution of costs & benefits	Equity across the whole fishery (resources allocation)
Provide broader conservation	Reduce collateral impact	Protect rare, emblematic, threatened species	Gear and market regulations. Closed seasons
		Protect ecosystem structure (trophic chain)	Integrated regulation of the entire sector. This is not happening yet.
		Protect unique, critical or vulnerable habitats	Use of non-impacting gear
		Change or ban destructive fishing gear	Overall permanent ban (e.g., of poison or dynamite)
	Improve stewardship	Protect traditional rights, tenure, values, knowledge	Allocate/recognize rights, ensure participation in the fishery sector
		Empower local governance/co-management	Empower people across the fishery sector
Cross-cutting goal	Improve monitoring, scientific assessments and use of local knowledge		

The complementarity of spatial and non-spatial "tools" and governance was already advocated in fisheries decades ago, particularly in the Code of Conduct for Responsible fisheries (FAO, 1995) and the Ecosystem Approach to Fisheries (EAF; FAO, 2003). In Fisheries management, the ABFMs and the measures taken inside and outside the ABFM are usually "naturally" integrated and contribute jointly to the fisheries' outcomes. Spatial and non-spatial measures have usually been put in place at different times in the history of the fishery, to improve a situation considered as not optimal, but there has rarely ben cost benefits analyses to see whether the additional measures could be adding effectiveness. The risk of course is that the various regulations may pile up with time in complex unnecessarily overlapping "layers".

As stated above, a combined use of spatial and non-spatial tools could help (i) reducing impact on biodiversity and (ii) reduce conflicts. Spatial closures may be more effective than non-spatial measures to protect well known attributes that are concentrated in space and time. But permanent closures might not be justified and flexible spatio-temporal closures might be more economically and biologically efficient and effective as well as more socially just, particularly if dynamic (adaptable or established in real-time). However, area-based measures may be the only measures applicable to small-scale fisheries where input/output controls and economic incentives are often not practical. In addition, the decentralisation of fisheries management to communities in community-based frameworks, facilitates the combination of spatial and non-spatial instruments under local governance with better chances of compliance if adequately supported.

6.2.9 Potential synergies between MPAs and fisheries

a. Background: increasing convergence and persisting tensions

The development of synergies between MPAs and fisheries, faces some heterogeneity in the two fields and hence on the operational space within which the two types of ABMTs operate.

In fisheries, a diversity of governance approaches are still necessary e.g., between modern large-scale and traditional small-scale fisheries, between well-endowed and capacity limited States, between EEZs and the High Sea. Modern fisheries are managed mostly under a liberal economic paradigm, using resource-based rights. Small-scale fisheries are often under a customary governance or some type of community-based management system, with different levels of state support and oversight. These two perspectives raise tensions when spaces and resources are common (Section 7.1) and may complicate synergistic initiatives.

In conservation, several "currents" remain from hard core "nature protection" to "social conservation" (Miller et al., 2011) advocating respectively what has been referred to as "fortress conservation" versus a conservation model embracing sustainable use and poverty alleviation efforts in effective partnership with the private sector, right holders, and communities, to improve conservation performance. The potential for tensions to emerge remains high as apparent in the stormy ongoing process for the adoption of a CBD Post-2020 Global Biodiversity Framework. On the one hand, the creation of the OECM label (CBD, 2018) has created a specific opportunity for synergies, on the ground, between fisheries and conservation. Regarding the GBF, reaching 30% coverage by conservation areas may be a serious problems in densely populated coastal areas hosting vulnerable and resources-dependent communities. Fortunately, the GBF specifies that "

The goals and targets of the framework are global in nature and that *Each Party would contribute to attaining the goals and targets, of the global biodiversity framework in accordance with national circumstances, priorities and capabilities* (GBF Annex, § 11). This wise decision and the strong recognition accorded to IPLCs, has certainly contributed to reduce tensions.

However, positive changes in both fisheries and conservation have levelled the field on which complementarity and possibly synergies might be developed and some of them are developed below.

There is agreement about the need for synergy and complementarity and on the fact that they would benefit both fields. There is also a growing recognition that ABMTs can contribute to effectiveness in both fields particularly if explicitly harmonized or integrated in functional networks. For example, it was found that fishery closed areas (reserves or refuges) or effort controls could produce similar yields under a reasonable set of simplifying assumptions for populations with sedentary adults (Hastings and Botsford, 1999). In situations of high uncertainty, it has been shown that combining control methods (like catch quotas) and large closed areas was effective in reducing risk of stock collapse, maintaining short and long-term economic performance, and buffering uncertainty (Stefansson & Rosenberg, 2005). The use of Harvest Control Rules (HCR) in addition to spatio-temporal and input/output controls further improved management performance (Sun et al., 2021). It has also been argued that No-Take zones may be usefully combined with closed seasons and minimum market size regulations to better protect concentrations of juveniles and recruits (Auster and Shackel, 2000). These few examples indicate that there is potential to integrate ABMTs in fisheries management with measurable benefits (whether synergistic or not) and there is an abundant literature demonstrating the use of closed areas for stock rebuilding.

A good level of convergence of views exists between the two streams of governance (Jones, 2007; FAO, 2011; Jones et al., 2011; Rice et al.; 2012 ; Garcia et al., 2014). There has been, in particular, an increasing convergence of views on the fact that: (i) Environmental agencies have legitimate roles in ocean governance including fisheries; (ii) Fisheries agencies have legitimate roles in conservation of biological diversity; (iii) All agencies benefit from cooperating to select coherent and complementary measures; (iv) Spatial tools are essential for success in both fisheries management and conservation of biological diversity, but only as part of a larger suite of planned and integrated measures (Rice et al., 2012).

For example, the objectives overlap significantly even though they are given contrasting priorities, and only some of them are potential sources of conflict (cf. Section 4.3). Expert views on the use of MPAs in fisheries (reported in Rice et al., 2012) confirmed that 50% of all fisheries optimalization objectives and 40% of all biodiversity conservation objectives were considered likely to receive support from both perspectives. Conversely, only 25% of fishery objectives and 30% of conservation objectives were likely to be the cause of conflict between fisheries and conservation. This indicates ample room for complementarity but also a non-negligible probability of dissent on potentially fundamental issues as the outcomes expected from fisheries management may either be improved, unaffected, or worsened by MPAs, depending on the fisheries' history and how the MPAs are developed and managed.

As a matter of fact, many objectives are cross-cutting, equally serving the interest of fishing and biodiversity conservation, such as: (i) Recover and maintain resources; (ii) Reduce impact on and recover PET species, for their benefit and to reduce perturbation of fishing systems (choke species); (iii) Protect vulnerable, critical, essential habitats; (iv) Mobilize science and local knowledge in planning, monitoring and assessment; (v) Maintain or enhance food security and livelihood (to ensure compliance); (vi) Address uncertainty, improve foresight, provide buffers and insurance against threats; (vii) contribute to resilience of human and ecological components of social-ecological systems; (viii) Adopt good governance principles; effective participation, rule of law, etc.; (x) Develop management capacity; (xi) Reduce conflicts over social or economic objectives of fisheries or coastal communities.

The background is evolving favourably. In fisheries, in the last three decades the conservation landscape in fisheries has changed with the adoption of the FAO Code of Conduct for Responsible Fisheries (FAO, 1995); the Ecosystem Approach to Fisheries (FAO, 2003); an increased interest for the use of MPAs in fisheries (Martin et al, 2007; FAO, 2007, FAO, 2011); the voluntary guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication (FAO, 2013); and the consideration of human dimensions of MPAs (Westlund et al., 2016). At regional level, the General Fisheries Commission for the Mediterranean (GFCM) has established a Working Group on MPAs[129] and in many fisheries and some RFMOs (like NEAFC) fisheries reserves have been established with conservation as primary objective (like VMEs). In conservation, the further opening of the agenda to social and economic considerations has broadened the conservation agenda from species and habitat protection to address also issues such as poverty alleviation, food security, waste, decarbonization of energy and ecosystem services, (Bennet et al., 2017; Armitage et al., 2017, 2020). These issues are also of high relevance for fisheries, providing opportunities for synergy.

b. Proposals for action

Rice et al. (2012) stressed that an increasing convergence of views on the fact that: (i) Environmental agencies have legitimate roles in ocean governance including fisheries; (ii) Fisheries agencies have legitimate roles in conservation of biological diversity; (iii) All agencies benefit from cooperating to select coherent and complementary measures; (iv) Spatial tools are essential for success in both fisheries management and conservation of biological diversity, but only as part of a larger suite of planned and integrated measures.

Pathways and conditions for improved synergy between fisheries and MPAs proposed, e.g., in Martin et al. (2007), FAO (2007, 2011), Westlund et al. (2016) are summarized below.

In planning and design of MPAs, there is a need to: (i) conceive and design innovative MPAs, better adapted to the high diversity and mobility of ocean conditions and fisheries dynamics, that could be vertically zoned, mobile, or rotating; (ii) identify OECMs in fisheries, enhancing existing ABFMs and creating new ones as needed or possible; (iii) consider the establishment of effective networks of MPAs; (iv) better define and integrate fisheries and MPAs goals and objectives, being realistic about what stock

[129] Even though the sense given to that acronym corresponds to the FAO definition of MPAs and not the IUCN one.

enhancement and biodiversity conservation can realistically be jointly achieved[130] and how; (v) Account for uncertainty e.g., using reserves as insurance (precautionary approach) in in fisheries management and biodiversity protection plans.

On legal and institutional frameworks, there is a need for: (i) effective enforcement, using the best available technology and grounded on a strong participations of fishers and coastal communities; (ii) Harmonization of the legislations regulating fisheries and MPA; (iii) Increased collaboration between the respective authorities; and (iv) Improved governance ensuring fuller stakeholder involvement; improved capacity for multidisciplinary assessments; integrated management (whenever possible); education and communication. Key words are "empowerment" and "co-production" of assessments, regulations, management plans and enforcement.

On operational management, there is a need to:)i) Implement a more systematic and comprehensive Ecosystem Approach to Fisheries (with MPAs) and embrace a Human Rights approach; (ii) Institutionalize and improve monitoring and evaluation; (iii) strengthen adaptive management; (iv) institutionalize financial sustainability; (v) maintain and enhance a broad scientific and local/traditional knowledge base; (vi) improve existing ABFMs, enhancing their conservation objectives and ability to be labelled as OECMs; (vii) Focus on data-deficient and capacity-limited set-ups; (viii) and enhance community-based management and conservation, particularly in densely populated areas.

It can be noted that improvement of many of the items above, particularly those on governance, and operational management, would be required anyway nowadays for any improvement of conventional fisheries management and conservation systems to modern standards.

The main challenges for both fisheries and biodiversity conservation are: (i) the social, cultural and economic matters which, while better addressed in fisheries than conservation remain clearly insufficiently addressed in both; and (ii) climate change, because of the huge additional uncertainty and potentially unsustainable additional inequities mitigation and adaptation theories may bring with it.

More specifically, Rice et al. (2012) reported on the governance properties required to achieve synergies between fisheries and conservation, and their rationale (Table 6.2).

Table 6.2: Properties of MPA governance processes and rationale for setting objectives providing benefits for fisheries and biodiversity conservation (rows 1-3) and balancing socioeconomic, and ecological outcomes likely to gain broad support (esp. rows 4-10) (From Rice et al, 2012: Table 2)

	Property of processes	Rationale
1	They take into account the biology, habitat and the life cycles of the resources to be conserved	Ensure that any MPA can deliver the expected ecological outcomes for both fisheries and biodiversity conservation
2	They are flexible and adaptive	Allow new knowledge and changes in environmental

[130] Such objectives could refer to: (i) Critical and vulnerable habitat protection and restoration (particularly biogenic habitats, deepwater corals and sponge communities); (ii) Protection of spawning and nursery areas, particularly spawning aggregations; and (iii) Reduction of collateral impacts on biodiversity, increasing attention to protection of bycatch species and vulnerable habitats (including through reserves and gear-restricted areas).

		conditions to be incorporated in improved objectives and measures
3	They identify available management measures, considered effective in meeting biological objectives	Allow evaluation of efficiency of MPA vs alternative ways to achieve the objective(s).
4	They identify and ensure participation for all stakeholders likely to be affected by the MPA	Promote ownership among local communities taking into account their needs, usage patterns and proposals
5	They identify what participants would consider an equitable balance of (i) benefits to communities and ecosystems, and (ii) of restrictions on potential users of the areas	Build mutual understanding of social and economic values and weightings applied by different participants
6	They identify and map existing tenure rights, rights holders and benefits	Document the starting points from which participants will consider changes to be losses or gains
7	They identify forms of local governance of resources, local institutions, & existing practices contributing to conservation and sustainable use of resources	Understand the processes already comprising governance of the area, so they can be used to the extent possible, and accommodated with additional governance processes as needed
8	They draw on the experiences and knowledge of local people	Augment the information base on which discussions will draw, and communicate respect for the range of knowledge systems available.
9	They are transparent during operations, and accountable once agreements and compromises are reached	Give all stakeholders reason to trust that trade-offs were reached fairly, and that the spirit of all compromises will be respected in practice
10	They are sensitive to distribution of wealth and political power among interest groups	Encourage processes to produce outcomes which are equitable even if there is not equity of power among participants

The governance processes that would lead to better integration of MPAs in fisheries: (i) account for bioecological specificities of the area; (ii) are flexible and adaptive; (iii) identify effective management measures; (iv) ensure participation for all relevant stakeholders; (v) find out what participants consider equitable for the community and the ecosystem (costs, benefits, restrictions; (vi) identify and map existing tenure rights; (vii) identify forms of local governance and existing practices contributing stewardship; (viii) draw on the experiences and knowledge of local people; (ix) are transparent and ensure accountability; are sensitive to distribution of wealth and political power among interest groups.

It is recognized (e.g., In Pomeroy et al., 2007; Hilborn et al., 2004) that MPAs can only be one of the tools in the fisheries management toolbox and that for effective management, a mix of ABMTs and non-spatial measures should be considered. However, it has also been argued that, under certain assumptions and conditions, reserves and conventional management may deliver similar outcomes in terms of sustainable maximum yield (Hastings and Botsford, 1999) pointing to potential duplication. They may also improve yields in coastal reef fisheries but not in lightly fished ones (Holland and Brazee, 1996).

In small-scale fisheries, the use of MU-MPAs and CABM frameworks may: (i) be the only applicable measures in multigear multispecies fisheries, particularly in data-limited situations in which conventional non-spatial management measures are not sufficient or practical; (ii) foster decentralization and devolution of management responsibilities to coastal and fishing communities; (iii) protect and uphold traditional and cultural use rights and practices; (iv) protect and enhance local livelihoods; and (v) provide a local framework to resolve user conflicts, like through zoning that separates contenders or community-based area management with local conflict resolution mechanisms.

Whether the governance and socio-economic benefits mentioned above are obtained or not, and can be demonstrated, is very case-specific. Most of these benefits may also be already expected from conventional fishery closures and non-spatial fishery measures implemented within a non-delimited fishery management area. Consequently, uneasy questions emerge e.g., as to whether (a) MPAs would be more effective than conventional measures and fishery closures and (b)) there may be an optimal mix of MPAs and other non-spatial measures? Universally valid responses to these questions do not exist considering the large proportion of poorly performing MPAs and fisheries that still exist. The response would also depend on what MPA type is referred to, considering the large range of realities this acronym covers.

6.3 Trade-offs

6.3.1 The trade-off conundrum

Societal objectives for fisheries and conservation usually include optimizing socioeconomic returns to the operators and society (e.g., in terms of food security and livelihoods) while minimizing the collateral impact of the activities on biodiversity. The "Holy Grail" would be a win-win solution that durably satisfies both sets of objectives and stakeholders. Unfortunately, simplistic win-win solutions tend to generate also some losers in forgotten dimensions of the exercise (Gertjen et al., 2005; Harrold-Menzies, 2006; Xiao et al., 2018).

Trade-offs involve an explicit exchange between the different stakeholders' ideal requirements to reach a compromise that is considered by the majority of stakeholders as better than no compromise at all and conflict. The usual –and often simplistic- conceptualization of a trade-off is that there are two perspectives to consider (e.g., fisheries management and biodiversity protection) with positions that can be expressed along a single gradient (like the degree of biodiversity protection achieved). The preferred positions of each perspective on that gradient may be quite far apart, but a process of give-and-take exchange hopefully results in both perspectives accepting a mutually satisfactory position on the gradient. At this endpoint of the "trading" process, both perspectives feel they have retained an adequate amount of what they value most on the gradient, and each perspective feels that the amount that it has had to concede relative to its preferred position is equitable with the amount that the contrasting perspective has accepted to concede relative to its own preferred position (a Pareto-efficient solution[131]). However, there may be certain non-negotiables such as where human rights would be impacted by the introduction of the ABMT and this can only be addressed by exploring with relevant rights-holders what other mechanisms (e.g. compensation, alternative fishing grounds) could be considered to address these impacts.

[131] A Pareto-efficient or pareto-optimal situation in one in which no individual or preference criterion can be made better off without making at least one individual or preference criterion worse off. if it is impossible to improve it with respect to any objective without regressing on at least one other. The Pareto frontier is the set of all Pareto-efficient situations (based on Wikipedia and Jacobsen et al., 2016)

The assumption in such a trade-off is that the respective expected outcomes of each party are "fungible" (in economic sense) and can be equitably exchanged, as if expressed in a common currency or two currencies with a known exchange rate. That trade-off may be translated into an algorithm, and a range of potential outcomes can be calculated to identify the "win-win" position (see examples in Alban et al., 2011; Blanchard et al., 2017; Adams et al., 2019; Hilborn et al, 2021). It has been suggested that the trade-off would be easier to obtain and more effective at the objective-setting stage, so the parties to the negotiation trade off a portion of their respective objectives, and concentrate from the onset on how to get the maximum possible on the common set of objectives, at the lowest cost, in synergy instead of antagonism.

Increasingly, however, decision-making is occurring in multi-cultural and multi-sectoral contexts, among groups of stakeholders with different roles and powers (e.g., the central State, local communities, municipalities, sectoral and environmental NGOs) which challenge the ability to use equitable trade-offs as a pathway to successful policy outcomes. Important decisions on area-based measures may be made accommodating: (i) fisheries of different scales and/or culturally diverse communities; (ii) multiple sectors such as fishing, aquaculture, coastal energy sources, and tourism with their own development and optimization objectives and (iii) calls for increased biodiversity protection including through networks of highly protected areas excluding most extractive uses. There is no single continuum on which all these legitimate perspectives can be ordinated. In addition, different parties may have different legal status, complication negotiations.

In such contexts, trade-offs have to be developed in multi-dimensional space rather than along a single gradient. However, even when a sufficient number of dimensions of a decision are acknowledged by most perspectives, the individual groups of stakeholders may attach fundamentally different values to the different dimensions. Consequently, these groups perceive differently the costs and benefits of every movement along these dimensions, and a multi-dimensional trade-off, acceptable to all parties, becomes more complicated to obtain. Work on more creative alternatives to bipartite trade-offs is underway but no tested alternatives are yet available, aside from the time-consuming negotiation and trial and error processes that people have used for centuries to resolve these challenges (Jake Rice, Pers. Comm.).

6.3.2 Trade-offs in ABMTs

The way the trade-off develops as depend on the local context. If the spatial distribution of the biodiversity features of concern is patchy, and the species may be exploited using a range of gears, with different impact on different biodiversity attributes, It should be possible to regulate the use of gears in time and space to balance fisheries and biodiversity outcomes. Hilborn et al. (2021) simulated trade-offs between biodiversity and revenue levels in Alaskan and Californian fisheries as the weight managers put on preserving biodiversity increases e.g., though spatial or gear restrictions (cf. Figure 6.1). Biodiversity is measured by its weighted total abundance, with species of conservation concern being given more weight than target species (Hilborn, Pers. Comm.).

Conclusions are that:

1. As expected, the maximum biodiversity values are obtained when the fisheries are closed and nothing is removed from the ecosystem (as in a no-take area);

2. Biodiversity values decrease as revenues increase but not necessarily linearly;
3. When managed without considerations for by-catch species, fisheries develop at or near their maximum catch (or value) but the more sensitive non-target species might be extirpated;
4. As closures and gear restrictions are progressively introduced more biodiversity values are produced. In the Alaskan ecosystem, the best mix of measures yield 87% of the maximum revenue while maintaining 77% of the biodiversity. Off California, 77% of the biodiversity are maintained by a similar strategy without a noticeable loss in revenue. Maximizing benefits instead of revenues would yield even better biodiversity outcomes as maximum benefits are obtained at a lower cost and pressure then maximum value. This conclusion is confirmed by Lundstrom et al (2019)[132].
5. The ability to find trade-offs between biodiversity and yield depends critically on the existence of aggregations of the biodiversity attributes in time and/or space and their different vulnerability to different gears. If the distribution of biodiversity across the whole area was homogenous (random) –which is never the case– biodiversity would decrease linearly as catch increases and the trade-off would be linear, linear with no obvious "optimal" solution.

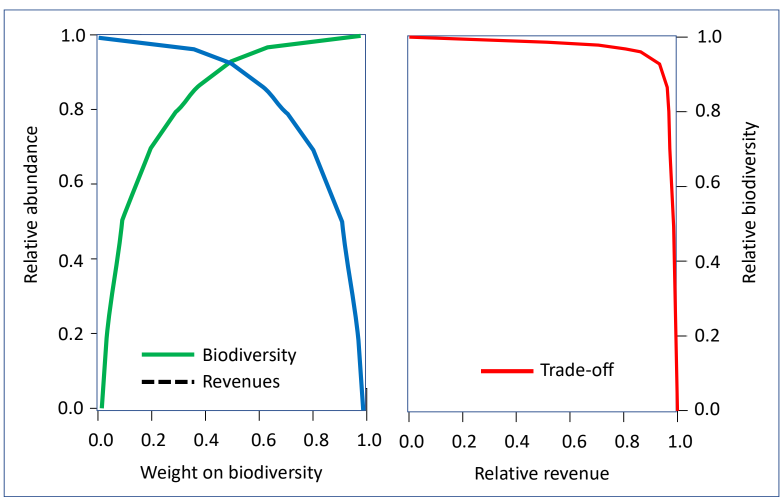


Figure 6.1: Left panel: Sketched relation between relative abundance of biodiversity attributes and revenues for different relative levels of biodiversity protection. Right panel: shape of the trade-off between relative biodiversity and revenues. Freely adapted from Figure 5 in Hilborn et al. (2020)

This confirms that in nature, where biodiversity is patchy and gears have different impact on different species, It is possible to use gear regulations and spatial closures to obtain results which might be considered satisfactory by all concerned (a sort of Pareto efficient solution). However:

[132] Lundstrom et al., (2019**)** showed that fishing stocks at the "pretty good yield" (PGY) level (e.g., at a fishing pressure lower than 80& of the MSY level) can give large conservation benefits.

1. The more complex and diverse the set of biodiversity attributes of concern, the more complicated the implementation of the optimal solution; The introduction of trophic relations between the species would add realism and complexity[133];
2. The more contrasted the patches of biodiversity features, the more effective the area-based measures;
3. The more diverse the mix of resources, the more numerous the types of gear needed to achieve the level of species selectivity required;
4. While the vulnerability of species to different gears is likely to be stable, the position of the biodiversity aggregations might be naturally variable in location and timing. In this situation, flexible closures, and real time closed areas (see Annex 1) would perform better than predetermined fixed ones (Little et al., 2015; Dunn et al., 2016);
5. No-Take areas do not appear as necessary unless the resources are homogenously distributed, but even in that case, eliminating only the impacting gear in the no-take may be an overall more effective strategy.

These results are mainly indicative but they stress that the potential for improved complementarity and synergy exist and that more studies of this kind should be undertaken, on different ecosystems and different types of fisheries.

The conventional approach to binary tradeoffs is getting increasingly challenged in the complex multi-dimensional settings in which economic development and biodiversity protection interact, necessarily affecting the way the interaction occurs and its outcomes.

[133] However, according to Hilborn, (Pers. Comm. 11/2022), the more complex the system (i.e., adding more areas, gears, and species) the more convex the trade-off curve and the easier the determination of a win-win solution.

CHAPTER 7- EFFECTIVENESS IN THE USE OF ABMTS

SUMMARY

What is "effectiveness"?

The effectiveness of Area-based management (ABM) and Area-based management tools (ABMTs) is the extent to which the expectations of the relevant stakeholders are satisfied by the outcomes of their action. For the administration, it is the degree to which goals and objectives are being met. The factors affecting the outcomes include as external environmental and socio-economic drivers, mediating factors including governance and management measures, and the characteristics of uses

General considerations on "effectiveness"

Assessing effectiveness is necessary. It is a multi-dimensional outcome of a complex social-ecological system. The outcomes observed may be positive or negative, intended or not (surprises). The relationships between actions and drivers and outcomes may neither be linear nor monotonic. Effectiveness is dynamic, evolving with time and in space because of natural variability and cascading effects. It is a relative judgement depending on how ambitious the objective was. Key questions are: who decides on objectives? What is effective or not? For whom? How is effectiveness measured? By whom? How much effectiveness is enough? How equitably is it distributed? Effectiveness of precautionary spatial measures will be demonstrated only when challenged by threats.

Methodological considerations

Few ABMTs are recurrently assessed, despite the rationale indicated above. Assessing effectiveness may be complex, requiring clear objectives and targets; multidisciplinary competences; a counter-factual control area or complex simulations to show the outcomes; accounting for impacts inside and outside the ABMT; assessment of net-benefits. Effectiveness may be assessed at many scales, for the single site, to the ABMT category. It may be assessed *ex-ante* (e.g., by simulation) or *ex-post*. Diverse sets of information are required on the various dimensions of "effectiveness" and factors affecting them. A monitoring system is essential. Cooperation between institutions is often needed to reach a critical data and assessment capacity. Objectives, criteria, targets and indicators are essential. A multidisciplinary assessment capacity is preferable. The ocean and resources dynamics and variability are sources of uncertainty. Effectiveness is ideally measured by the outcomes which may be delayed. Evidence of measures taken might be used as a temporary proxy of effectiveness. Conventional scientific surveys as well as expert opinion combined with local and traditional knowledge can be used.

Factors of effectiveness

Factors affecting effectiveness of MPAs relate to (i) the site characteristics, like its size, location, integration in a network, human population density; (ii) the biodiversity representativeness, productivity, mobility; (iii) economics, including distance from markets, market value of resources, benefit/cost ratio; (iv) governance with equitable representation, processes and distribution of costs and benefits; and (v) management, including: clarity of objective and rules; impact of uses (allowed or illegal); participation;

deterrence; exclusion of outsiders; early detection of threats; adaptive and/or reactive capacity.

Effectiveness of MPAs used in fisheries, relate in addition, to (a) the protection provided to essential habitats or vulnerable ecosystems; (ii) the integration in fisheries management plan; and (b) (ensuring synergy and avoiding duplication with conventional measures); and (c) effective monitoring and evaluation. Community-based MPAs are more effective when (i) the settlement population is small; (ii) there is a perception of a fishery crisis; (iii) alternative income-generating activities exist; (iv) community participation and empowerment where effective; and (v) management support remains available after projects' termination. MPAs networks are affected by the same factors but also: ecological coherence, connectivity and replication, and governance at scale. Factors of success of ABFMs include; (i) overall state of the environment, its oscillations and trends; (ii) ABFM parameters (e.g., size, location, state), history and general environment; (iii) complexity of the objectives and related issues; and (iv) fishery governance and management; (iv) control of fishing pressure; (v) habitat recovery tine; (vi) clear seasonal patterns; (vii) information timeliness, reactivity, and stakeholder's cooperation; and (vii) empowerment, decentralized governance, and local capacity-building.

How effective are ABMTs?

The literature analysis indicates that ABMTs are not "silver bullets" and cannot properly address large scale, diffused, or mobile threats. No-take MPAs tend to be effective within their boundaries if (i) if they are well-managed; (ii) they do not overstress local populations livelihoods; (iii) they do not lead to congestion and overuse in surrounding areas. Multiple-use MPAs, have been very rarely assessed. MPAs networks have not been extensively assessed. However, objectives clarity, data, regional capacity assessments, and social and economic focus are often considered insufficient. There are a few positive examples. Effectiveness of ABFMs has been hard to assess, because of lack of clarity in objectives, elusive causal relationships, compounded impacts of different measures; variability among ABFMs. Nonetheless, effectiveness have been assessed for some rotational closures, real time closures, no-trawl areas, essential fish habitats, partially protected areas, fishery-oriented marine managed areas, TURFs, "blue-water" ABFMs and, OECMs (ex-ante). Used in the open ocean; and early considerations are available on OECMs.

The effectiveness of ABM and ABMTs is the extent to which the expectations of the relevant stakeholders (e.g., society, the community, the legitimate authority, NGOs and the sector) are satisfied by the outcomes of the management action. These expectations may be reflected in the management plan objectives, or in informal decision or rationale developed at community level, often enshrined in traditions[134]. Objectives have been

[134] For example, in a lagoon of Cote d'Ivoire, in the 1960s, a traditional fishing community closed some areas to handline fishing and the measure was severely enforced by fishing team leaders. The rationale was that these areas *were catfish nurseries, and baby catfish having large mouths were likely to bite fairly large*

reviewed in Section 4.3 and may refer to: (i) the structure and state of biodiversity and its resilience to fishing pressure and climate change; (ii) the performance of the fishery in terms of stability and allocation of catches, revenues, and other related opportunities; and the broader well-being of the community, including food security; and (iii) the quality of governance e.g., in terms of equitable representation, procedures, involvement in decision-making, and distribution of costs and benefits. The term "performance" is often used as synonym of effectiveness. "Effectiveness" should not be confused with "efficiency" which is the extent to which the effects are produced at the lowest possible cost, and is not addresses in any detail.

Evaluating the effectiveness of management tools (including ABMTs), implemented to achieve fishery and conservation objectives or expectations, is key to any robust adaptive management process. The effectiveness of ABM and ABMTs are strongly inter-dependent: ABMTs require a supportive ABM framework within which to operate in optimal conditions, even though external drivers may affect their performance. Conversely, ABM 's objectives may be reached only if the tools selected (both spatial and non-spatial) are well designed, aligned, and effectively enforced. This section focuses on the performance of ABMTs.

7.1 Sources of information

There is a very abundant literature on "performance of MPAs" (1.3 million references according to Google Scholar). Many papers review MPAs overall effectiveness, for example in: Pomeroy et al., 2004; Hockings et al., 2006; Stolton et al., 2007; Lester and Halpern, 2008; Leverington et al., 2008; Lester et al., 2009; Kemp et al., 2012; Edgar et al., 2014; Fox et al., 2014; Oldekop et al., 2015; Pendleton et al., 2017; Ban et al., 2017; Johnson et al., 2018; Ovando et al., 2021; Turnbull et al., 2021; Pressey et al., 2021; Cardoso Andrade, 2022. Paradoxically, seeing this long, non-exhaustive list of works, a general conclusion is that there is a scarcity of performance assessment of single MPAs and, progressively, a recognition of the scarce attention given the social and economic dimensions of effectiveness. Nonetheless, there are also some more recent studies addressing specifically social and economic issues (e.g., in Sanchitico et al., 2002; Roncin et al., 2008: Gurney et al., 2014; Pressey and Feraro, 2015; Weigel et al., 2015; Russi et al., 2016; Haines et al., 2018), and a few addressing specifically the effectiveness of community-managed or other multiple objective areas **(**e.g., Pollnac and Crawford, 2000; Pollnac et al., 2010; Mascia et al., 2010; Mills et al., 2011; Voyer et al., 2013). There are also some studies looking at MPA networks and global coverage targets (Green et al, 2011; Klein et al., 2015; Jones and De Santos, 2016; Foster et al., 2017).

There is a much less abundant literature on "performance of fishery closures" (38,100 according to Google Scholar). However, the literature of success/failure factors in fisheries management (e.g., in Bennet, 2005) is relevant for ABFM success or failure. Specific reviews on the effects of fishing on habitats and non-target species have been produced (e.g., by Barnes and Thomas, 2005 ; Kaiser and De Groot, 2000). The potential effectiveness of ABFMs in meeting their primary or secondary objectives has been

---

hooks. The implicit objective was, therefore, to protect juveniles and maintain. The people had no doubt about effectiveness because the enforcement by fishing leaders was very effective.

reviewed by Petza et al.(2023). The potential of ABFMs to meet the OECM criteria has been assessed by Himes-Cornell et al. (2022). Many more specific analysis of effectiveness exist of sub-categories within ABFM such as : on spatio-temporal closures (Beets and Manual, 2017), No-trawl closed areas (Bloomfield at al., 2012); TURFs (Christy, 1993; Villaseńor-Derbez, 2019); Refugia (Dugan and Davis 1993); on partially-closed areas (Pastoors et al, 2000, and Sciberras et al., 2013, 2015; on partially closed areas (boxes); closures form fish stock recovery (Roberts and Hawkins , 2012) and High Sea/deep-sea bottom fishery closures (Wright et al., 2014).

Although the tensions between MPAs and fisheries have attracted much attention in the last three decades (see Section 6.1.2.c) only a few papers seem to have been specifically dedicated to evaluate these interaction such as in Fletcher et al., 2015 in Australia; Todd et al., 2013 in Hawaii; Whitmarsh et al., 2001, in Sicily, Italy; or Kerwath et al., 2013 in South Africa. These interactions and their outcomes are likely to be very case-specific and perhaps, for this reason, no overall general evaluation of these interactions can be made (but see Chapter 6 on tensions and synergies).

Various other guidelines and reports have been prepared that offer guidance on considerations that need to inform management effectiveness including human dimensions although again the focus has been largely on broader frameworks like EAF and spatial tools such as MPAs (Stolton et al., 2007; IUCN-TILCEPA 2010; FAO, 2011; Sowman, et al., 2014; Cochrane, 2021; Mann-Lang et. al., 2021).

7.2 What is effectiveness ?

The monitoring and evaluation process of an ABMT assists in ascertaining the effectiveness of the management actions and the degree to which goals and objectives are being met and what the outcomes are. This assumes that the goals and objectives have been set in a participatory manner incorporating the values, views and priorities of all relevant groups and rights holders and are broadly supported. How these goals and objectives get determined at the outset of the process, ideally in collaboration with rightsholders, resource users and other stakeholders, would be key to the management effectiveness study. The extent to which user values, priorities, goals and objectives guide the design, planning, implementation and management of the intervention contribute to effectiveness although there will be many other factors that determine management effectiveness.

The process followed to assess effectiveness will be extremely dependent on the local and national context; type and capacity of governance; data and assessment capacity available; stakeholders concerned; precision required; etc. The general principles are, however, generally the same. For example, The process leading to sustainable use described schematically by IPBES (Fromentin et al., 2022: Figure 5) may be adapted to represent the processes affecting ABMTs' effectiveness (Figure 7.1).

In the complex social-ecological system of conservation and sustainable use of (wild) biodiversity, internal and external drivers and mediating factors. including governance and management, shape the uses occurring in ABMTs (or around them but affecting them) and the ABMTs outcomes, and hence the degree to which the ABMTs fulfil their goals i.e., their effectiveness. The role of the drivers, mediating factors and uses on the outcomes need to be understood to inform adaptive management. However, the complex and dynamic nature of the interactions involved within and between the elements of the process mean that it is often not possible to separate the effects of each driver or factor whether human or natural. Short-term and long-term outcomes are likely to differ significantly as numerous feed-back responses take place. With environmental and other sources of variability blurring the picture, some outcomes and the causal relationships, may be more difficult to determine than others. All these considerations complicate the recommended adaptive approach to ABMT management.

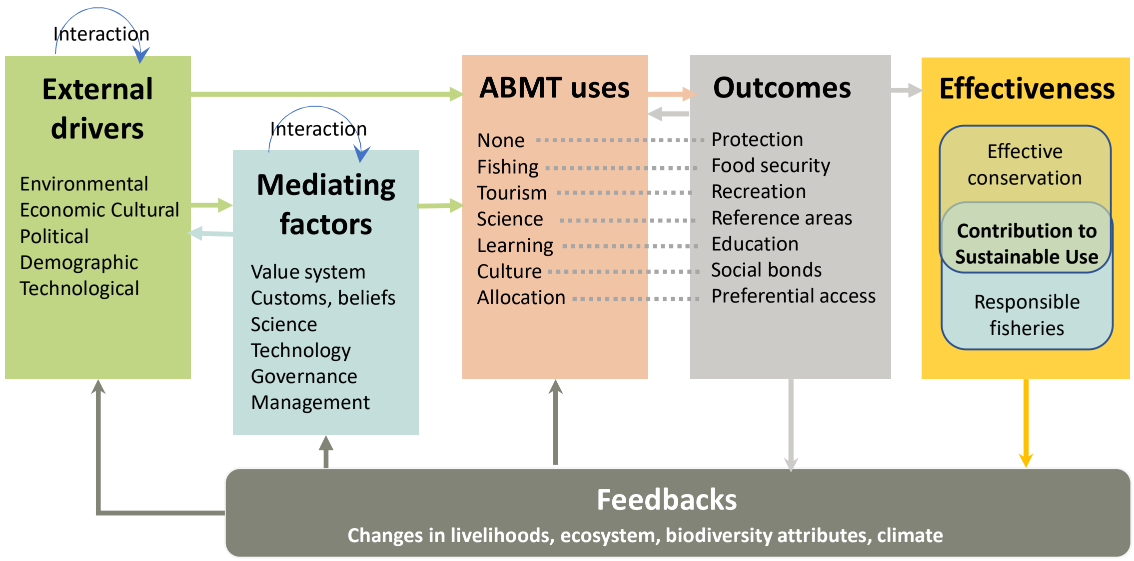


Figure 7.1: Conceptual approach to ABMTs' effectiveness assessment (adapted from Fromentin et al., 2022).

More specifically, the effectiveness of the ABMTs in producing their expected outcomes, depend: (i) on the quality of the ABM framework within which they operates (e.g., in terms of governance, location, design, special measures, enforcement)[135], which in turn depends on the quality of the national enabling framework ; (ii) the level of integration with the management regime around it, particularly the complementarity between measures taken inside and outside the ABMT; and (iii) external drivers like the socioeconomic conditions of the communities in and around the ABMT, environmental oscillations, climate change and surrounding pollution (Figure 7.2) (see Section 7.5). As adaptive decisions, based on effectiveness assessments may have consequences with ecological, economic and political costs, the assessment process and results may be audited.

As a consequence, determining ABMTs' effectiveness, in individual sites or in a network, to monitor its evolution with time, or to compare it with other ABMTs, in a fishery, an EEZ or an ecosystem, is a challenge. Nonetheless, some objective assessment can always be

[135] For example, measures to specifically restrict fisheries on forage species in the proximity of seabird breeding colonies may not be effective for seabird conservation unless, overall, the exploitation of the forage species was developed in an ecosystem-based framework, limiting depletion outside the area and providing a quota for the seabirds. Similarly, area-based measures intended only to resolve gear conflicts between competing fisheries, separating them, may in fact result also in broad unintended biodiversity benefits if the individual fisheries would use their respective gears in more responsible manners in their areas and comply more fully with limits on catches, effort and bycatch (Rice et al., 2018).

made on how well a specific ABMT operates compared to what was expected from it, even though the mechanisms leading to the good or bad results may not always be easy to distinguish. In the last few decades many papers have considered the effectiveness of different types of ABMTs and, while conclusions tend to be very category-specific and site-specific, some general conclusions may be drawn (see below).

In the following section we look at some general considerations on performance assessment, assessment methodology, findings on ABMTs 'effectiveness, and factors of effectiveness.

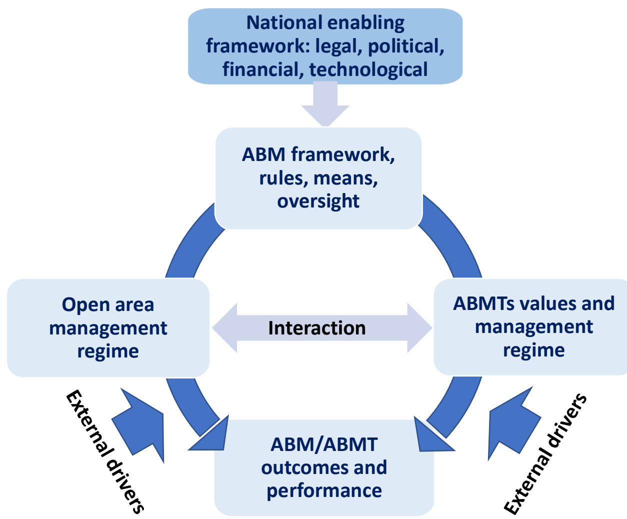


Figure 7.2: Interactions between ABMTs, their enabling frameworks, external drivers, and open fishing areas.

7.3 General considerations on "effectiveness"

a. Effectiveness assessment is necessary

Management has costs, for the State, the industry and the stakeholders. Assessing effectiveness is therefore needed to justify the continued use of constraining measures, support from financing administration, and from stakeholders, in order to maintain an effective adaptive management process. Statements on performance may be quite consequential for stakeholders (including right-holders and local users) and are therefore scrutinized by them. The result of the evaluations of performance contribute to fulfil the requirement for accountability of the management institution (Pomeroy et al., 2005). In case of doubts among stakeholders on the process, the quality of science, the degree and fairness of participation, etc., the ensuing controversies may be politically costly, leading to redefinition of policies, development and management plans, and eventually delisting or more formal degazettement of established ABMTs (Gladstone, 2014.; Voyer et al., 2013; Golder Kroner, 2019). Effectiveness may also be a prerequisite to obtain a particular ABMT label (like for OECMs[136] or Green-listed MPAs) (CBD, 2018). The expected effect of an ABFM may not always be formalised in written objectives.

Assessments, on a more or less regular basis, are recommended to check that the ABMT maintains or improves its performance with time, as planned, confirming or otherwise, the quality of management and governance. Such assessments can also provide insight into both the effectiveness of the international agreement that adopted and defined the management plan or the ABMT label, and on the way in which the evidence is acquired and used, for example to inform adaptive management (Rice et al., 2022). A central implication is that the assessment of effectiveness should be part of the formal or informal management plan and of the management culture.

In informal management systems, effectiveness can be assessed in qualitative terms and in any case, stakeholders perceive it.

b. *Effectiveness is a complex outcome*

Effectiveness is an outcome of a complex social-ecological system, with as many relevant dimensions as objectives in the inter-related bioecological, socio-economic, and governance dimensions. Complexity depends local situations. Effectiveness is likely to be different in different dimensions and for different objectives. Effectiveness might be represented, for example, in a spider diagram or radar plot (Figure 7.3). Fay et al. (2015) clearly show that for any management intervention, the evaluation thereof needs (i) to be tested (ideally via simulations against objectives), (ii) to measure effectiveness (relative to those objectives) across multiple variables, and (iii) to visually show how the multivariate response differentially departs from reference levels across the various socio-ecological factors. In the theoretical figure, the MPAs appears as more effective in conservation, ABFM in socio-economic dimensions, and the fishery OECMs appears better balanced, in line with the concept of sustainable use. Like objectives, effectiveness is likely to be perceived differently among stakeholders' groups with raising issues of equity.

ABMTs being characterised by many interdependent criteria, objectives, and expected outcomes (cf. Section 4.2) of bioecological and socioeconomic nature, it is unreasonable to expect an ABMT to simply be effective or not on one objective, with a binary gauge. Effectiveness is more likely to appear as a position on a gradient ranging from negative (detrimental), to neutral (no benefit), or positive, and fully meeting the expectation. In addition, in relation to a given objective, ABMTs may be more effective in some places, for some species and under certain some conditions, than in others.

Like any management measure applied to a complex system, ABMT may generate unexpected positive or negative outcomes. For example: in the world largest shark fishery, in Indonesia, positive impacts on sharks and many other species have been noted in NTZs established within an MPA. However, because of stress on livelihoods, fishing pressure was transferred on other sharks elsewhere and illegal trade activities developed as alternative livelihoods (Jaiteh et al., 2016**)**.

[136] Even though, at the moment, the WCMC database on OECMs does not require any evidence of effectiveness, either observed or reasonably expected.

Because they are used in complex social-ecological systems, and in combination with other management tools, there is no guarantee that the relations between factors of effectiveness and outcomes are linear or monotonic. Moreover, ABMTs may produce unanticipated results related to: (i) shifts in fishing effort due to the closure; (ii) cascading effects through the food chain; (iii) environmental oscillations and change, affecting fish behaviour; and (iv) changes in the economic situation (fuel costs, demand, prices) affecting the viability of the fleet and hence the fishers' behaviour. For example, the Georges Bank closure primarily established for haddock (Melanogrammus aeglefinus) led instead to increased abundance and biomass of scallops (*Placopecten magellanicus*). The Scotian shelf closed area for juvenile haddock on the Scotian Shelf did not meet its objectives for haddock, but increased the American Plaice (*Hippoglossoides americanus*) and winter flounder (*Pseudopleuronectes americanus*) (Kincaid, 2017).

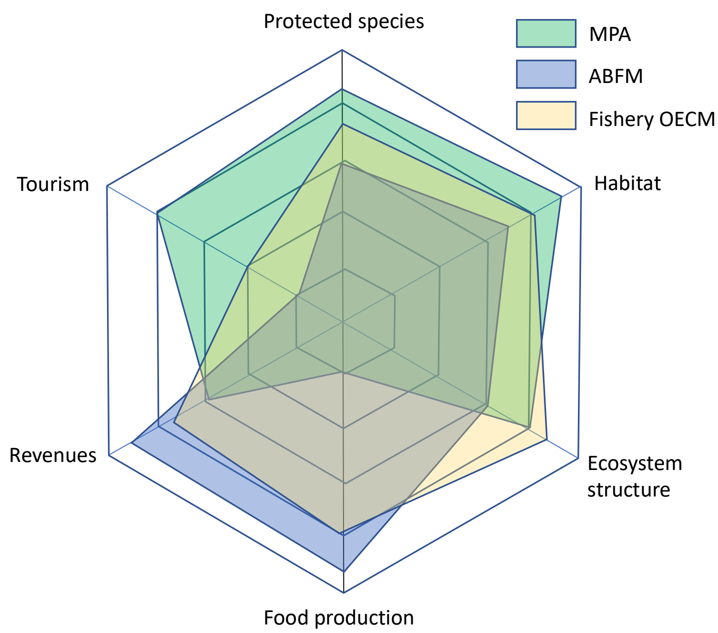


Figure 7.3 : theoretical effectiveness representation of an MPA, an ABFM and an OECM in a spider diagram

c. Effectiveness is dynamic

Effectiveness is dynamic in three different ways. First, it evolves naturally (and hopefully improves) as the ABMT matures and its bioecological and socio-economic components reach their final new "equilibrium" after completion of all the cascading effects of biological and human interactions[137;138]. Second it may oscillate or change "naturally"

---

[137] For example, in the world largest shark fishery, in Indonesia, positive impacts on sharks and many other species have been noted in NTZs established within an MPA. However, because of stress on livelihoods, fishing pressure was transferred on other sharks elsewhere and illegal trade activities developed as alternative livelihoods (Jaiteh et al., 2016),

[138] Hiddink et al (2017) found in Australia that benthic biota recovery time in trawled areas closed to fishing) was 1.9-6.4 years, depending on the species concerned indicating that on these grounds, the

with time together with the ecological and socioeconomic drivers of the broader ABMT environment. It will also certainly change with climate change. Third, the perception of effectiveness (and of the balance between different objectives) in a group of stakeholders also evolves with time, through experience, or though evolution of societal requirements.

d. *Effectiveness is relative.*

Effectiveness depends on how close the situation observed in the ABMT and around it is, compared to the expected situation considered as adequate or ideal by the stakeholders. This expected situation is formalized in the policy goals and management objectives. In less formal systems, it may be perceived by the community in line with its values. The ABMT score on effectiveness depends, therefore, on how ambitious the expectations or the objectives were: the less ambitious the expectations, the more effective the ABMT will appear for the same level of outcome. An important implication is that if expectations are unreasonable, ABMTs will fail and effectiveness can only be poor or nil. Another implication is that when objectives (and targets) are fuzzy or insufficiently defined, the ABMT effectiveness cannot be accurately assessed and statements on effectiveness become subjective. It should be stressed that perceptions of effectiveness might be as powerful in motivating stakeholders as robust scientific estimations. However, in case of conflict between stakeholders' groups, scientific estimates may be more consensual.

While the aim is to engage all stakeholders and users in the identification of ABMT objectives, in practice these objectives and expectations may differ across institutions (depending on their mandate) and amongst stakeholder and user groups, depending on their role in the system, their dependence on resources, educational background, gender and, consequently, on their own understanding, interests, and expectations: effectiveness is in the eye of the beholder and key questions emerge like. who decides on objectives? What is effective or not? How is effectiveness measured? By whom? For whom is it the ABMT effective? How much effectiveness is enough on any objective? How equitably is effectiveness distributed? Etc.

For example, effectiveness may be perceived differently by different institutions with different mandates. Marine reserves, for example, are implemented in an ecocentric framework, assuming that conventional fisheries management universally fails and that an extensive network of strictly protected and enforced reserves is the only way to protect fishery resources and biodiversity (the silver bullet syndrome). Alternatively, marine reserves might be implemented in a more holistic and integrated framework (like fishery reserves are), as one management tool among many others spatial and non-spatial measures, co-constructed by the State and local communities. The effectiveness of reserves is likely to be differently judged in these two frameworks even though this dichotomy between nature protection and social conservation strategies, proposed by Miller et al. (2011) and reviewed by Caveen et al. (2015) may really be a continuum of situations[139] between the two strategies within which the effectiveness of reserves tend to defy generalizations.

---

impact of a gear considered as highly destructive on sedimentary habitats was rapidly reversible. In deeper water, below 1000 meters, however, recovery may require decades (Jones, 1992).

[139] Gould (2003) elegantly explained why dichotomies may be conveniently constructed to support controversies, but that despite being grounded on historical realities, they may also generate *a false*

e. Effectiveness is demonstrated only when challenged

An effective ABMT is one with a demonstrated capacity to significantly contribute to: (i) maintaining or enhancing a favourable situation in front of a specific local or diffused threat; or (ii) restoring a favourable situation previously degraded. The implication is that, unless tested in a realistic simulation, the protection effectively offered by an ABMT located in an a priori favourable environment, away from any threat, will be known only when the expected protection will be challenged by significant changes around and inside it. Meanwhile it may only a reasonably precautionary measure, with little impact in the short term and unknown effectiveness in the long one. From that angle, however, all ABMTs are being continuously challenged by climate change and, in coastal areas, by pollution and demography but their effectiveness may often be only demonstrable in the long term.

7.4 Methodological considerations

There is a huge literature on assessment of various aspects of fisheries management and biodiversity conservation effects and effectiveness with respectively 630,000 references and 750,000 references in Google Scholar) and reviewing this entire field is well beyond the scope of this report. In this section, we will only consider often reported challenges met in these processes. Several methodological challenges are briefly described below

a. Few ABMTs are recurrently assessed

Recurrent assessment of effectiveness and of the factors effecting it is necessary for adaptive management. That necessity increases with climate change as the factors of effectiveness change, both in fisheries management (FAO, 1995[140]) and biodiversity conservation (Thomas and Gillingham, 2015; CBD, 2018; IUCN-WCPA, 2017, 2019). Notwithstanding, the routine of monitoring, elaborating indicators and assessing ABMTs' effectiveness is not yet a general good practice, even though numerous ad hoc assessment are conducted (Rice at al., 2018; Garcia et al., 2019; Gannon et al., 2019; cf. Section 7.6). The reasons for this situation may vary between regions but include lack formal requirement for evidence of effectiveness, weak assessment capacity, and insufficient budgets to face the related recurrent costs. The necessary frequency of performance assessment of an ABMT depend on the sector, its dynamism, the type of biodiversity concerned, the objectives, and the management regime.

In a TAC and quota-based fishery, performance regarding the stock is assessed annually in many advanced countries, less frequently in others. Socio-economic assessments are more ad hoc. If the management plan is multi-annual, the periodicity of the plan dictate the periodicity of the assessments. In any case, recurrent assessments of individual ABFMs' performance are unusual for target species and even scarcer for the broader biodiversity (but see Section 7.6.d). One key reason is that effectiveness is measured at the level of the whole fishery management, the state of the stock and the fishery viability,

---

contention when either side misperceives its limits and claims dominion on the other side particularly when aesthetical, ethical, and other non-scientific values are involved.

[140] Article 7.6.8 of the FAO Code of Conduct for Responsible Fisheries states that "The efficacy of management measures and their possible interactions should be kept under continuous review. Such measures should, as appropriate, be revised or abolished in the light of new information"

which result from several spatial and non-spatial measures acting simultaneously, and the respective effect of which is difficult to separate.

In biodiversity conservation, the reason may be that while performance has been advocated for decades, evidence of performance is not a necessity to maintain the "protected" area status.

In conservation, performance has been an important issue and a subject of strong advocacy for decades (e.g., Ward et al., 2001; Pomeroy et al., 2005; Hockings et al., 2006; Dalton et al., 2012; Pendleton et al., 2017; Meehan et al., 2020; Cardoso Andrade, 2022; Gissi et al., 2022; Hampton et al., 2023 to cite just a few) but continuous monitoring and recurrent assessment of individual sites remains rare. The reason may also be in the widespread paucity of core conservation budgets (particularly when fishery data are not available in the closed areas) and the historical strong dependence on short-term projects funds. Assessment may be conducted initially, to support the ABMT establishment proposal and provide baseline data and, later on, occasionally, e.g., in relation to short-term projects supported by NGOs. Attention to effectiveness increased in relation to important international events like the adoption of Aichi Targets (CBD, 2010); The United Nations BBNJ process (United Nations, 2023) or the Kunming-Montreal Global Biodiversity Framework (CBD, 2022), but during controversies regarding the role of MPAs in fisheries relationships (see Section 6.1.2.c)

b. Assessing effectiveness may be complex

The effectiveness of the ABMT is appraised by the extent to which its outcomes match the objectives or expected outcomes. This requires comparing the situation of the system with the ABMT measures in place, with the situation that would have been observed in the absence of the measures (i.e., in a control site or counterfactual). This control may be provided by (i) data from the area before the introduction of the measures, ideally as a time series or else as a set of data collected just before the ABMT implementation; or (ii) by areas located preferably nearby, considered similar enough in all their characteristics but the special measures applied in the ABMT. Unfortunately, while objectives are usually formulated for the whole fishery, they are often not clearly articulated, and rarely formulated for each single ABFM or technical measure used in that fishery, and baselines are often also missing. The assessment complexity depends on the size and complexity of the area; the number and nature of the activities taking place in the area and their interaction; the diversity of objectives (formulated or inferred) and features against which the assessment is required, e.g., in the bioecological, sociocultural, and economic dimensions. For example, a multi-dimensional, integrated assessment requires the cooperation of multiple disciplines and often institutions, using different models, combining qualitative and quantitative information, involving different knowledge holders.

Ultimately, the effectiveness of an ABMTs depends on its intrinsic bioecological and socio-economic characteristics, its design, the specific measures applied in, external drivers, and other factors acting outside the ABMT, including interactions with other ABMTs in the local or regional network (cf. Section 7.2.3). The distinction of the effects of the ABMT from the effect of other measures applied around it, may not always be easy to assess.

ABMTs are rarely closed systems. Predators may come in to feed and move out taking away part of the ABMT benefits. Poachers produce a similar effect. Fish looking for food may forage out of the ABMT and be caught by the fishers at the periphery or at some distance from the ABMT. The spillover from the ABMT may be rapidly depleted by excessive fishing outside it, masking it size in the natural variability. The overall effect of an ABMT for the fishery or the whole area is combined with the effect of all other regulations at work outside it, and the contribution of the ABMT to the overall outcome might be very hard to detect and robustly measure.

In addition, effectiveness may be assessed at many scaled. Performance assessment may be applied to an individual ABMT site, to a category of ABMT, labelled as MPA, ABFM, OECM, Gear-restricted areas, reserves (cf. Chapter 5), or to a network of one or more types of ABMTs. ABMTs may also be assessed at global level. This is the case of the Global Conservation targets adopted under the CBD Framework (e.g., Aichi Targets and successors in the 2022 GBF). In this latter case, effectiveness is related simply to the relative spatial coverage to be achieved by a certain date (CBD, 2010; 2022).

Moreover, effectiveness of an ABMT may be assessed within the ABMT boundary (internal effect) or within the total populations concerned in the fishing ground or ecosystem (total or systemic effect, including spillover and cascading effects). For example, Ovando et al (2021) estimated that targeted fin-fish had increased significantly inside the Channel Island MPAs but not overall at the total population level. Similarly, impacts of ABMT may often radiate well beyond their boundaries, on human settlements located in the neighbourhood (Alban et al, 2011; Boncœur et Alban, 2013).

Effectiveness may appear surprisingly different when assessed at different scales. For example, in an analysis of LMMAs in Rarotonga, it was found that, at the LMMA network level, no significant difference could be detected between abundance and biomass inside or outside the areas covered by LMMAs, indicating no effectiveness. In contrast, a site-level analysis exploring the effectiveness of single LMMAs compared to their control sites revealed significant positive difference confirming the LMMA effect (Rocliffe, 2015). A similar observation was made by Ovando et al. (2021) regarding the Channel Islands reserve network who found clear positive impacts of each reserve but no overall impact on the total population.

c. Diverse sets of information are required

The quantity and quality of the information available are central to the quality of the assessment. Elements of information useful to an effectiveness assessment in an ABMT echo their essential properties of ABMTs (cf. Section 5.2) and include: (i) ecological, socioeconomic, cultural and governance factors of relevance, inside the ABMT and ideally in the neighbouring region, network, and social-ecological system; (ii) the location, size and boundaries of the area; (iii) the main current pressures and impending threats the effects of which need to be controlled; (iv) the type, duration, and extent of restrictions applied to the area; (v) the ability of the management authority to enforce the adopted measures and to monitor their effects; (vi) the coordination of the technical measures taken inside and outside the ABMT, to assess the net benefit; (vii) the structure of the fisheries and the parts of it that would be excluded or affected by the measure; (viii) the likely response of the fishery operators impacted by the measure (e.g., local adaptation or transfer of the pressure outside the ABMT) with likely impacts; and (ix) The likely impact (net benefit) of the measures, accounting for the expected response, in the ABMT, more generally in the fishery and neighbouring region, and to the extent possible in the social-ecological system.

The baseline data needed to compare the situations before and after the ABMT is created may not be available. Analysing a time series of data in the area in which the ABMT is established is a good way to detect changes in situations before and after its establishment (the before-after BA strategy). In fisheries, having stock assessment going many years or decades back is usual in commercial fisheries but not in small-scale fisheries, or on broader biodiversity. Longitudinal data sets for the period preceding their establishment is very rare for MPAs. Similarly, without historical data outside the ABMT, it is not possible to determine whether the effect observed in the ABMT is really due to the ABMT or to other larger-scale effect that affected both the ABMT and the surrounding ecosystem. In the absence of time series, some data may have been collected just before the ABMT is put in place, but the absence of data on trend and temporal variability before the ABMT remains a problem that might be addressed by comparison with similar areas (not easy to find), or simulations of counter-factual situations. In order to fill data gaps, cooperation with environmental agencies would be essential, and expert views may be used (carefully) to develop an educated guess of performance of individual sites (cf. Petza et al., 2019) (see below). In case of absence of historical data, management may still aim to reach agreed and hopefully meaningful targets as proxy reference points. A monitoring system is essential.

Collaboration between sectors (like fisheries) and environmental institutions, and pooling of respective information systems, is more often an expressed desire than a reality, but it remains a fundamental requirement towards significant progress.

d. Objectives, criteria, targets and indicator are essential.

Having clear objectives (cf. Section 4.2) with related quantitative or qualitative targets and indicators, would allow coherent and consistent assessment of effectiveness. In the long term, recurrent assessment would allow an appreciation of effectiveness trends and variance. Effectiveness may be appraised through narratives and qualitative statements (e.g., obtained though surveys in local communities). But it can also be measured or scored, allowing comparisons between sites or across time.

Criteria provide quality benchmarks (at the local, national or international levels at which they have been established) that motivates improved performance and helps achieve conservation objectives. Criteria can be used *ex ante* to identify areas with good potential as ABMTs. During implementation, they act as a reminder of the roles and objectives of different institutions and, together with objectives and targets, they are central for performance assessment, setting the benchmark against which performance is assessed. Having agreed to a set of criteria for a category of ABMTs, is a condition for the robustness of the category, and for coherence among ABMTs' performance assessments, undertaken at national or higher levels of aggregation.

For example, lists of criteria (and indicators) have been formally adopted for EBSAs[141], VMEs[142](Thompson et al. 2016), OECMs (CBD, 2018), and Green listed MPAs (IUCN-WCPA, 2017) but are not available for all ABMTs. These criteria usually refer to inputs (measures taken) and outputs (state of the biodiversity of concern). They help determining whether the ABMT considered meets the basic requirements of a given category of ABMTs, even though they do not measure how effective they are in doing so.

The indicators of overall effectiveness of an ABMT would need to address its bioecological, sociocultural and economic. Numerous related indicators have been proposed by scholars, but few are available at the time and space scales required. The ecological indicators relate *inter alia* to biodiversity e.g., protection of genetic, specific, and ecosystemic diversity; populations and stocks biomass, age structure, and reproductive capacity; ecosystem structure, trophic chains, resilience. Social indicators refer to benefits to the community, equity and justice, livelihoods, food and nutrients security, use and property rights, rights to information and participation, and fair compliance. The economic indicators relate *inter alia* to outputs (quantity, value), yields, costs, benefits, quality, waste (bycatch), assets, prices and trade. Some of the indicators of performance like participation, equity, compliance or the quality of governance are both factors and outcomes of effectiveness.

e. Effectiveness assessment ought to be multidisciplinary

Effectiveness may be measured in relation to different primary or secondary objectives and expected outcomes, in the bioecological, sociocultural, and economic dimensions of the sector concerned and the ecosystem in which it operates. The approaches and challenges are classical multidisciplinary ecological and socioeconomic assessments[143] such as Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA) (CBD, 2006), and Environmental and Social Impact Assessment (ESIA)[144] (**IUCN, 2020**), Heritage Impact Assessment (HIA)[145] and Risk Assessment. A number of publications address the question of effectiveness assessments in general or for specific sites, e.g., in Bisset et al., 1983; World Bank, 1991; Underwood, 1994; Treweek, 1995; OECD, 2006; Hockings et al., 2006; Kemp et al., 2012; Therivel and Wood, 2018; Rice et al., 2018; IUCN, 2020.

Effectiveness might be appraised using a range of methods from simple qualitative analysis, questionnaires, expert opinions, to detailed quantitative surveys or modelling and relate to the bioecological, sociocultural, economic and political dimensions of

---

[141] EBSAs criteria are: Uniqueness or Rarity; Special importance for life history stages of species; Importance for threatened, endangered or declining species and/or habitats; Vulnerability, Fragility, Sensitivity, or Slow recovery; Biological Productivity; Biological Diversity; and Naturalness

[142] VMEs criteria are: Uniqueness or rarity; Functional significance of the habitat; Fragility; Life history traits of component species that make recovery difficult; and (5) structural complexity

[143] Evans (2021) stresses that conservation science itself has always been explicitly multidisciplinary but that the dominance of disciplines in that science has evolved with time with a progressive shift from a bioecological focus to a more balanced of social sciences after 2015 (see also Garcia et al, 2014).

[144] IUCN (2020): Environmental and Social Impact Assessment (ESIA) - guidance note.pdf. 6 p.

[145] Guidance and Toolkit for Impact Assessments in a World Heritage context. https://whc.unesco.org/en/guidance-toolkit-impact-assessments/

effectiveness. Methodologies are available but significant challenges exist is data-limited situations. Considering the lack of replication and randomness in ocean ecosystems, that often complicate or impede a credible determination of causal relationships, Hilborn et al., (2021) referred to quasi-experimental approaches that can be used to estimate a causal effect attributable to a conservation policy intervention in these conditions: (a) instrumental variable regression, (b) interrupted time series, (c) regression discontinuity designs, (d) statistical matching methods, (e) difference-in-differences (DiD), which includes the BACI approach largely used in assessing MPAs effectiveness; and (f) synthetic controls. However, all these methods have limitations in terms of assessing effectiveness across a range of ecological, conservation, socio-economic and cultural objectives.

f. Variability and uncertainty

The spatial variability hiding below the ocean surface may not always be appreciated. All sorts of uncertainties affect the accuracy and precision with which effectiveness may be measured. Long time series covering periods before and after the establishment (the BA strategy) is usually a preferred and more reliable strategy (Ovando et al., 2011). Comparing the situation inside and outside the ABMT – referred to as the control-Impact (CI) strategy– may be a way to circumvent the absence of time series but Because of the large spatio-temporal variability in the ocean, robust replication of assessments is difficult to achieve[146]. In the absence of analysis of spatial heterogeneity, variability, and connectivity, it is difficult to ensure that the differences observed between two areas (the ABMT area and the areas around it) are only due to the difference in the regulations respectively applying inside and outside the ABMT and may not have existed even before the ABMT establishment (Claudet and Guidetti, 2010; Osenberg et al., 2011; Kemp et al., 2012; Mesnildrey et al, 2013; Rocliffe, 2015; Ovando et al., 2021). Ideally, performance assessment would require monitoring of both the ABMT and the control site for a number of years before, as well as after, setting the ABMT in place, in a before-after and control-impact (BACI) framework (Underwood, 1994; Kemp et al., 2012).

It has also been shown that the likelihood of ABFMs and fishery-ABMTs categories to be good OECM candidates (based on their performance regarding governance, management, biodiversity outcomes, and other locally relevant values) could not be determined, because of the large variability of all these properties within and between categories (Rice et al., 2018; Himes-Cornell et al., 2022). Nonetheless, some generalizations were made regarding the most promising categories.

g. Discrete versus systemic assessment.

Separate assessments for different expected outcomes is useful for adaptive management and fine tuning of the ABMT on one or two key outcomes and improve its effectiveness by tweaking its characteristics or the measures applied into it. However, this convenient reductionist approach neglects that fact that, in a complex social-ecological systems, an effect may have multiple causes and one cause may have multiple effects. Therefore, with this approach, unexpected outcomes ought to be expected. For a

[146] Ovando et al., 2021 found that, in the Channel Islands reserve network in California, that an increase or decrease in an MPA outcome, of less than 30% of the current average value, is likely to be difficult to detect with enough statistical significance. The implication is that the capacity to demonstrate effectiveness will depend on the signal/noise ration of each case.

more systemic approach, qualitative multiple-criteria decision and decision trees, already strongly advocated for EAF implementation may be used, even when only a modest assessment capacity is available (Fletcher, 2005, 2008). Involvement of resource users and stakeholders in selecting the outcomes for assessment and reviewing the data used in the analysis will assist in strengthening support of the assessment. Complex modelling may be used when the required data and assessment capacity are available or the necessary collaborations can be established (Fulton et al., 2014, 2015).

h. Effectiveness may be input-based or outcome-based

Ideally, an ABMT's effectiveness regarding a given pressure (e.g., fishing effort) should be based on the ABMT's outcomes effectively observed (e.g., decreased bycatch and damage to a protected species or a habitat), and compared to expected ones. But that type of evidence requires an amount of monitoring and assessment that may not always be possible in the developing world and part of the developed one. Therefore, it has been suggested that, in some cases, the evidence of the quality of enforcement might be a sufficient evidence that the expected biodiversity outcome is or will be produced, taking the action as a proxy for the outcome (cf. Chapter 8). For example, when an ABMT area intends to exclude all fishing activities, and it can be shown (e.g., through satellite monitoring, on-board observers, and compliance data) that enforcement is fully effective, it might be considered that the expected outcome is or will be obtained, without the cost of continuous monitoring of biodiversity. Similarly, the demonstrated curtailing of dynamite blasts in a coral reef MPA might be taken as demonstrating the MPA's effectiveness in protecting the reef from that threat. In both examples, however, additional occasional surveys may confirm that the effective enforcement has really generated the expected stock or habitat recovery.

i. Effectiveness may be measured ex-ante or ex-post.

Effectiveness may (should) be assessed *ex-ante* e.g., to anticipate the bio-ecological and socio-economic effects of its designation, or of any foreseen change in the existing conditions due to foreseen changes in key conditions. Examples can be seen in Smith et al. (2009), Sanchirico and Wilen (2000) and Grafton et al. (2011). Effectiveness can also be assessed ex-post, empirically through experiments (e.g., in Boncoeur and Alban, 2013), using expert opinion as described briefly below (e.g., in , Petza et al., 2019 for OECMs), or though systematic reviews of the literature (e.g., Himes-Cornell et al., 2022; Petza et al., 2022).

j. Effectiveness should result in a net benefit

With regard to each objective and dimension of effectiveness, an ABMT may generate positive outcomes within its boundaries but negative ones outside them. For example, if the problem "solved" inside the ABMT by excluding some fishing pressure is simply transferred elsewhere creating a new damage or increasing an old one. The concepts of No Net Loss (NNL) and Net Gain enshrined in the Biodiversity Impact Mitigation (BIM) hierarchy (IUCN-WCC, 2012; Squires et al., 2018; Squires and Garcia, 2018) is very relevant in that respect. The concept might be easily applied to one variable, e.g., biomass or catch or one target species. It is more complex to apply when, at the species community level, if a new gear regulation aimed to protect a species or a habitat in an ABMT may negatively affects other species e.g., through trophic chains, or because the pressure is transferred elsewhere, in areas previously not used.

The overall net benefits should include benefits to the environment and users depending on the environment for food and livelihoods. However, there is ample evidence to suggest that achieving certain ecological objectives may lead to socio-economic impacts for local communities especially where they have not been part of the planning and decision-making process (Christie et al , 2003 ; Charles and Wilson, 2009 ; Sowman and Sunde, 2018)

k. The role of expert judgement

Quantitative assessments are not possible in situations in which data and capacity are limited, or when objectives are not precisely defined. In these cases, "measuring" effectiveness may need to rely on experts' views (including local knowledge). For multi-objective ABMTs, quantitative assessments and experts' views may need to be combined. Petza et al. (2019) provides an example on OECMs with a good description of methods used to control the quality of the approach.

In many developing and developed countries, the assessment may be conducted through scientific surveys (to generate scientific knowledge and collect local knowledge) using interviews and questionnaires. In complex multi-objectives ABMTs, the assessment will require multidisciplinary groups of experts (e.g., following a type of Delphi method), using scientific data, literature, and local knowledge. The certainty of the assessment outcomes is affected by the coherence or variation in the expert opinions. The relative benefit obtained may range from 0% (total failure) to 100% (full achievement of the objective). The relative certainty of the benefit might be indicated by the degree of coherence between the experts' opinions (cf. Petza et al, 2019; Sutherland at al., 2021) (Figure 7.4).

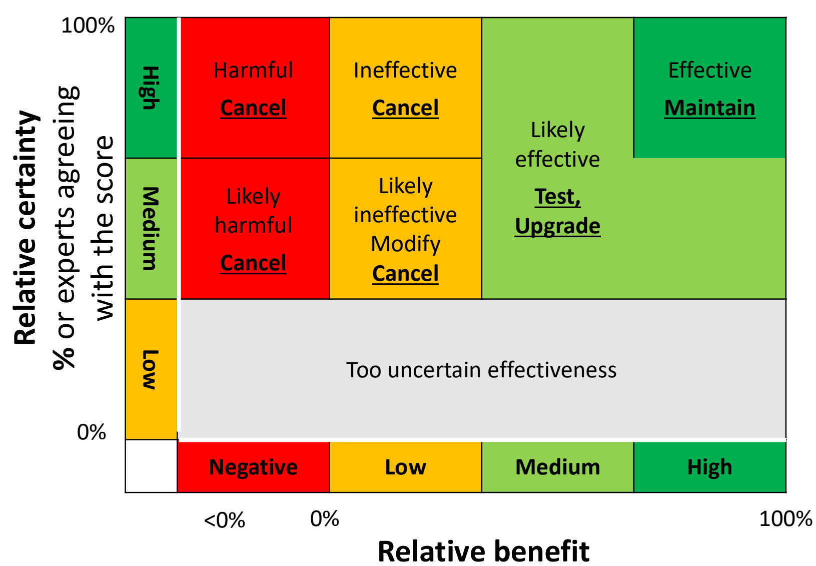


Figure 7.4: Relation between relative extent of the benefit (effectiveness), relative certainty in its assessment, and the actions (bold, underlined) that may be considered regarding an ABMT. (Modified from Sutherland et al., 2021). The extent of the benefit is relative to the objective or expectation. The relative certainty of the benefit is the proportion of experts agreeing on the benefit.

7.5 Factors of effectiveness

7.5.1 Introduction

There is an abundant literature on management effectiveness, in fisheries and conservation and on the ecosystem approach, with a strong convergence on the factors of success and failure, related logically to the natural and human dimensions of sustainability. The different dimensions or types of factors are relevant to ABMTs' effectiveness too, and are briefly recalled below (based on Grafton et al., 2008, 2010 ; Garcia et al., 2014 ; UN Environment, 2018a ; Fromentin et al., 2022).

1. Ecology e.g., limited or decreasing ecosystem carrying capacity; species and habitats vulnerability; natural variability; climate change. The solutions will be easier to address within a comprehensive Ecosystem Approach accounting for complex interactions and the Precautionary approach to account for uncertainty and related risks;
2. Technology: e.g., excessive or even destructive uses; non-existent or unaffordable alternative technology; insufficient innovation to more safely use or enhance the ecosystem productivity. The difficulties may be addressed jointly with the private sector, both small- and large-scale;
3. Economy: e.g., primacy of short-term economic gains; lack of alternative viable livelihoods; inadequate incentives; insufficient investment; excessive costs of solutions (of compensation, alternative livelihoods, transition to better regimes); perverse subsidies. These serious difficulties can be addressed through objective economic analyses, accounting for market and non-market values, looking for the fairest possible allocation of costs and benefits. The transitional situations may often need State support, stressing national budgets;
4. Sociocultural issues: e.g., poverty; food insecurity; lack of alternatives; low capacity to act; marginalization; cultural barriers; violations of traditional rights and values; lack of equity; different perspectives on pathways to sustainability. There is no single recipe but very effective participation, and effective involvement of social sciences can help;
5. Governance: e.g., inadequate Enabling frameworks (legal, institutional, policy, financial); unclear objectives; uncertain tenure and use rights; participation deficit; poor planning; insufficient of performance assessment; inadequate resolution of conflicts between competing uses. The solution, well advocated 50 years ago, and still poorly used, is the scrupulous application of the Good Governance Principles, particularly regarding empowerment of stakeholders and right-holders, and the respect for law and institutions, including customary ones. It would help resolving many social issues. In addition, interlinkages between governance levels (e.g., from regional networks to local communities), and the existence of a cross-sectoral framework (to manage competition for space) would help, particularly in coastal areas. The transboundary nature of the ocean water masses and biodiversity, and the existence of different jurisdiction are important concerns when dealing with transboundary ABMTs, calling for effective international collaboration.

6. Management: e.g., unclear spatial focus, fuzzy objectives, poor participation, and lack of capacity that aggravate the factors above or impede changes in the right direction. The solutions are in a participative, co-constructed management system with:(i) a clear spatial focus and delimitation within which management is integrated; (ii) clear primary and secondary objectives against which performance can be assessed; (iii) a participative implementation; (iv) accounting for external drivers and interactions, considered at the appropriate local, national, or regional scales; and (v) adequate means of implementation at the ABM level. Considering the levels of uncertainty and the potential impact of climate change, ad adaptive management framework is highly desirable.
7. Information: it plays a central role and barriers come from knowledge gaps and related uncertainty; inadequate or no monitoring; inadequate data; lack of agreed indicators; poor communication; lack of transparency; insufficient or conflicting science; and insufficient consideration and incorporation of local and indigenous knowledge. The solution are in raising awareness, the use of multiple knowledges, including better involvement of social and economic sciences, and the use of traditional knowledge.

Capacity-building will never be sufficiently stressed as a continuous necessity in science, governance, management, communication, cooperation, and conflict-resolution.

All the factors listed above tend to affect also the effectiveness of ABMTs and may relate to: ecological attributes; pressure technology and type of impact; prevailing political, social and economic conditions; type of governance; management capacity; and available information. Assessing effectiveness is both a necessity and a challenge because measuring it is neither easy nor cheap, and severely constrained by the means available (e.g., Parsons et al, 2019). Guidelines are available on how to evaluate management effectiveness of various types of ABMTs (cf. Section 7.1).

In this section be briefly review a number if useful considerations to keep in mind about ABMT's effectiveness. these factors are often interconnected and generate convoluted effects. For example, TURFs work better when the management capacity is high, but TURFs also strengthen management capacity by strengthening local management and use rights. As a result, effective TURFs improve biomass, which in turn improves yields, and may increase revenues, increasing users buy-in and compliance, strengthening management effectiveness in a virtuous cycle.

The general conditions for effective governance and management have been discussed for decades and have now reached motherhood status. As mentioned earlier, the effectiveness of individual ABMTs is strongly dependent on the national or regional fisheries management and conservation enabling frameworks within which they operate (cf. Sections 2.4; 2.5; 7.1).

Very generally, the effectiveness of ABMTs will depend on the level of aggregation of the resources and the sectoral uses: the more aggregated the latter, the more effective ABMTs be both intrinsically and relative to non-spatial measures.

7.5.2 Factors of effectiveness of MPAs

The following factors have been identified as affecting MPAs' effectiveness (based on: Margules and Pressey, 2000 ; Claudet et al., 2010 ; Pollnac et al., 2010 ; Collette et al.

2011 ; Claudet et al., 2011 ; Edgar et al., 2014 ; Rocliffe, 2015 ; Ban et al., 2017 ; Vivacqua, 2018) :

- Area: Good design, location and size (>100km^2); visible boundaries; part of an effective network; age of the ABMT (>10 years); away from densely populated areas (controversial)
- Biodiversity: High productivity and low mobility of the resources; low market value; ecologically representative[147];
- Socio-economics: distance from markets; resources with low market value/demand; high benefit/cost ratio of the measure; raising fisheries benefits such as improvements in food security and livelihoods and human wellbeing; benefits equitably distributed; respects cultural values and attributes;
- Governance: Participative (in design, rule-making, monitoring and enforcement); equitable (in identification of stakeholders, fair procedures, and acceptable allocation of costs and benefits); Context-sensitive governance; the context, for ABMT; ; high compliance; improve human wellbeing (
- Management: clear objectives and rules of use; no or low impact uses; participative and deterrent enforcement; exclusion of outsiders; early detection of threats; adaptive, reactive.

The role of factors of effectiveness may not be generalisable. For example, it has been shown, in the case of marine reserves, that human population density and compliance had the strongest impact on fish biomass. However, the relationships between population density and the reserve effect were negative in the Caribbean, positive in the Western Indian Ocean, and not detectable in the Philippines, with no clear reason for the differences, implying an important role of other factors. Similarly, the relation with compliance was not always significant and high levels of compliance were more related to complex social interactions than simply to rules enforcement, stressing the importance of the social dimensions of ABMTs (Pollnac et al., 2010).

a. Factors of effectiveness of MPAs used in fisheries management

The effectiveness of MPAs for fisheries management has been very controversial from the onset in the early 2000s (see Section 6.1.2.c; Hilborn et al., 2004; Kaplan 2009; Kearney **and** Farebrother, 2012). Despite local specificities and high variability of the effects of MPAs used in fisheries, five major factors could be identified which modulated such usefulness Mesnildrey et al., (2013): (i) the size of the MPA area; (ii) the level of protection provided in the MPA for essential habitats for exploited resources (and vulnerable marine ecosystems), i.e. the extent to which the measures inside the MPA were adequate; (iii) the MPA integration in the integrated fisheries management plans; (iv) efficient monitoring and evaluation; and (v) and effective regulation systems, including participative decision-making, and effective enforcement.

[147] It is paradoxical that these favourable conditions are often absent or unachievable in coastal densely populated areas with poor or vulnerable communities (Rocliffe, 2015), indicating that in these areas, the only viable expansion of biodiversity conservation areas would be in multiple-use ABMTs.

The effectiveness of large-scale MPAs has also been controversial on two aspects: (i) the real additional conservation benefits provided by closing areas with little or no use-impact to meet global targets. The counter-argument is that these areas are precautionary and against future potential threats; (ii) the usefulness of large pelagic MPAs to manage highly migratory species.

b. Factors of effectiveness of community-based MPAs

For Community-based MPAs (CB-MPAs) numerous factors of success have been identified (Crawford 2000; Pollnac 1994, 2000; Salm, et al., 2000; WRI, 2000; Pomeroy et al., 2005; Cox et al., 2010). Pollnac and Crawford identified most important factors ranked by importance as follows: (i) a small settlement population; (ii) a perception of a fishery crisis materialized by reduced abundance of fish before the CB-MPA establishment that would be reinforced by a sense of Improvement in the status of the biodiversity feature of concern; (iii) successful alternative income-generation activities (AIGAs); (iv) high community participation in the MPA design and decision-making (empowerment); (v) efficient management of information; and (v) continuing advice after the end of the project. Factors of performance of MPA networks

Regarding the effectiveness of MPA networks, the information available is limited (e.g., Green et al., 2011; Grorud-Colvert et al., 2014; Foster et al., 2017; Meehan et al., 2020). Such effectiveness would need to be ideally measured against clearly defined objectives at network level. It is logical to assume that the factors affecting the effectiveness of MPA networks is closely related to the factors of effectiveness of the MPAs it contains (as listed in Table 6.1) , augmented by additional factors affecting network properties like ecological coherence (Cardoso-Andrade, 2022), replication, ecological representation, and connectivity (McLeod, Salm, Green, & Almany, 2009). It has been suggested that the importance of connectivity was inversely proportional to the MPA size: Overall governance of the network is very important to ensure clear overall objectives and coherence in implementation. It has also be stated that that MPA networks' effectiveness was not affected by the distance between its MPA components (Kemp et al., 2012) but it has also been shown that the smaller the MPAs of the network, the more important the role of connectivity (Thomas and Gillingham, 2015).

7.5.3 Factors of effectiveness of ABFMs

General statements on the factors of success of ABFMs are hard to find in the literature probably because there has been few assessments of ABFMs effectiveness. The reason for this scarcity may be found in STECF (2007) which was not in position to draw full conclusions on the effectiveness of the fishery closures evaluated and doubted whether the effects of the closures could be separated from the effects of other management measures (cf. Section 7.2.4.d). Nonetheless, factors of success/failure of fisheries management have been mentioned in the literature for specific fisheries and more general statements can be found for example in Bennet (2005); Cochrane and Garcia (2009); and Rice et al., 2018. These factors, related to governance, policy, and management, can affect the ABFM effectiveness.

Regarding policy and governance, general management factors of success include: (i) Enabling policy and legal frameworks (cf. Section 2.3.1) illustrating political support; (ii) Administration's integrity (lack of corruption); (iii) A consultative process, transparent and involving all relevant stakeholders; (iii) Provision of social and economic incentives in support of sustainability; (v) Forms of governance facilitating fair participation in decision-making and management such as co-management; (vi) Existence of multi-sectoral frameworks, allowing conflicts to be addressed earlier am more rationally; (vii) Absence or elimination of perverse subsidies; and (viii) Empowerment of consumers (e.g., through ecolabelling).

Regarding management, factors of success include: (i) efficient information collection system; (ii) fisheries' simplicity: lower numbers of target species and fishing[148]; (ii) Clear management objectives and targets; (iii) Adaptation of measures to the cultural context, scale and intensity of the fishery; (iv) Measures are applicable (manageability) and cost-effective; (v) Existence and respect of tenure systems customary systems of governance and use rights; (vi) Effective and supported ontrol of overall fishing capacity and pressure in and around the ABFM; (vii) Equitable allocation of costs and benefits; (viii) Deterrent, participative enforcement; (ix) Conflict resolution mechanisms; (x) Monitoring programme; (xi) Assessment capacity, and recurrent assessments, using science and local knowledge; (xii) Identification of alternatives to fishing; and (xiii) Foresight, adaptiveness, and precautionary approach.

The specific factors enabling or limiting factors the effectiveness of an ABFM include (Rice et al., 2018):

For total closures for ecosystem management, including Vulnerable Marine Ecosystems (VMEs); Benthic Protected Areas (BPA), ring-fencing, some Fisheries Restricted Areas (FRAs), enabling factors include: (i) explicit expansion of the mandate of Fisheries Management authorities to apply the Ecosystem Approach; (ii) efficient monitoring control and Surveillance (VMS, observers) (iii) sufficient data on spatial ecosystem features to identify areas of higher vulnerability; and (iv) as with all ABM systems, the size of the ABFM area. Limiting factors include: (a) Difficulties inherent to MCS, (b) The limited "best evidence" available to assess significant adverse impacts; (c) the long recovery-times of some species and habitat.

For partial closures to fishing, including rotational closures and seasonal gear specific closures, enabling factors included: (i) a clearly defined seasonal life history of the target species allowing concentration of protection in best predictable places; (ii) concentrated and less costly enforcement than more dispersed measures; (iii) risk of market gluts because of fishing on hyper-concentrated aggregations. Limiting factors include: (ia unclear seasonality of the biodiversity attribute to protect; and (b) a chronic overcapacity of the fishery which only delays overfishing by few weeks and produces very short-lived benefits.

For dynamic spatial management and real-time closures, including Real-Time Spatial Management (RTSMs) measures, Move on Rules (MoRs), Real-Time Incentives (RTIs), and oceanographic closures: For RTSMs, (i) risk of free-riders to avoid voluntary management costs aiming application to small homogenous and cohesive groups of operators (to reduce transaction costs) and in "high tech" fishery systems (to get and process the high-density data). For Real-Time Incentives, success requires; (i) quality information available for setting up the cost grid; (ii) a high value of the catch allowing fishers to invest in the

[148] Single-species and single gear strategies are easier to manage that multispecies multigear ones.

process; (iii) high assessment and management capacity. The approach may be better suited for valuable large-scale operations, but also offers a great potential to jointly satisfy economic and conservation concerns ("win-win" solution). for conservation purposes.

For community-based fishery closures including Marine Managed Areas (MMAs), Locally Marine Managed Areas (LMMAs). Marine Areas for Responsible fisheries (MARFs); Territorial Use Rights in Fisheries (TURFs) and community-managed MPAs (allowing low impact fisheries). In these fishery-ABMTs, effectiveness at conserving the fishery target species, biodiversity ,and habitats within the area, depends on factors we already reviewed briefly for CB-MPAs (Section 7.2.3.d). These measures are more effective with: (i) sedentary species; (ii) a sufficient capacity for monitoring, surveillance, and enforcement; (iii) authority or incentives to excluded non-authorized fishing; and (iv) alternative fishing opportunities elsewhere, and (v) when benefits accrue to local users impacted by the ABFM. Limiting factors are related to poor governance and include: (a) the perception of inequitable allocation of space and resources to communities, if not based on long-term traditions; and (ii) lack of transparency in the exclusion decisions, leading to perceptions of favouritism and inequity among stakeholders' groups (cf. Chapter 11).

TURFs are deemed to be effective with regard to their core fishery objectives if: (i) they cover a relatively small and clearly distinguishable territory; (ii) they provide rights of exclusion and determination of kind and amount of use and rights to extract benefits; (iii) they are relatively specific in ownership; (iv) they are not much affected by other uses outside the TURF; and (vi) the protected resources are resident (with little movement out of the TURF). The effectiveness of a TURF in generating broad biodiversity conservation outcomes Intended or not) would depend on its objectives, measures, management effectiveness (Aflerbach et al.; 2014; Gelcich and Donlan, 2015).

In a nutshell, effectiveness of ABFMs relates to (Rice et al., 2018):

- The overall state of the environment of the ABFM and its intrinsic oscillations and trends, including climate change, that may affect the distribution or survival of the species of their vulnerable life-cycle stages to be protected;
- The adequacy of the ABFM parameters (e.g., size, location, state) as well as its history and general environment);
- Their intended purpose(s) when adopted i.e., their implicit or explicit objectives, expected outcomes, or the issues they are intended to address;
- The fishery governance, particularly community involvement, access rules, additional management measures, integration between measures taken inside and outside the ABFM, enforcement; and
- The overall fishing pressure: excess capacity will reduce the effectiveness of most measures that do not directly reduce pressure, including those that are area-based.

Regarding the broader biodiversity, the benefits ABFMs provide are discussed in Section 7.2.4.d, but there is still very limited literature on the subject.

7.5.4 Synthesis

Factors affecting performance are mentioned in practically all papers dealing with fisheries, conservation governance and management. Often, these papers contain statements about factors of effectiveness noted in the case study, producing case-specific short lists, with sometimes, some sort of ranking by level of "importance". Some reviews have regrouped these factors into longer lists, sometimes structuring the list with some typology[149]. Although these reviews often used a different terminology and level of detail, it is clear that there is an overall strong convergence on the factors that affect "effectiveness, across all ABMTs dealing with fisheries and conservation. We have therefore regrouped in Table 7.1 all the factors we encountered in some of the publications we scanned, such as: Pollnac, 1994; Auster and Shackell, 2000; Crawford, 2000; Salm et al., 2000; WRI, 2000; Hilborn et al., 2004; Pomeroy et al., 2005; Kaplan, 2009; McLeod et al., 2009; Ehler and Douvere, 2009; Cox et al., 2010; Green et al., 2011; Kearney and Farebrother, 2012; Mesnildrey et al., 2013; Devillers et al., 2014; O'Keele et al., 2014; Edgar et al., 2014; Grorud-Colvert et al., 2014; Rocliffe, 2015; Foster et al., 2017; Gill et al., 2017; Rice et al., 2018; Meehan et al., 2020; Cardoso-Andrade, 2022 (this list is not exhaustive).

The list of factors below (Table 7.1) shows that practically all the factors are relevant for the effectiveness of the ABMTs we reviewed and, probably, for most ABMTs. The factors affecting the primary objectives of these ABMTs will certainly be given priority in assessing effectiveness. Others may only play a supplementary role. Moreover, many factors related to governance and management (see below) are indeed closely connected to factors of effectiveness of the whole governance/management system within which the ABMT operate, and which may "automatically apply to the ABMT. In any case, these factors are all real and the list may not be exhaustive, which ought to call for caution when asserting causal relationships between factors and effectiveness based on limited information, which is always the case.

Many of the factors listed are not binary filters (that can only take two values, like "present" or "absent") and they may more likely represented by a vector, ranging from "poor" to "good" or "excellent", and effectiveness is the complex outcome resulting from their interactions.

As a general statement, the effectiveness of an ABMT in the ocean will rarely be entirely dependent on the ABMT regime alone but also on what happens around it in the fishery, the EEZ or the regional ecosystem or seascape and, increasingly, climate change.

It has been often suggested also that using a combination of techniques, spatial and non-spatial improves the likelihood to meet biological and socio-economic fisheries goals (Hilborn et al., 2004; O'Keefe et al., 2014). Some factors such as equity or compliance are both factors and outcomes. An increase of compliance and equity would certainly

[149] For example, Pollnac and Crawford (2000**)** considered Contextual and project-related factors in community-managed MPAs, but also factors affecting the natural system, the human community, and the MPA design and conditions. Rice et al. (2018) looked at these factors within main categories of ABFMs. In this paper (Table 7.1) we grouped the factors relating to : Physical and bioecological factors, pressures and threats, characteristics of the community, community parameters of the area; Policy, governance principles, and management effectiveness.

improve effectiveness but, similarly, an increase in equity, can promote better compliance, which in turn improves effectiveness.

Altogether, the long list of references given above are complementary as many are partial or specific. They are in general agreement in that there are few disagreements about what factors are enabling or limiting the effectiveness of ABMTs, There is a controversy, however, about cross effectiveness, e.g., on the extent to which MPAS can be used for fisheries management, economic optimization and food security, or whether ABFMs may contribute to conservations (e.g., as OECMs.

Governance emerges also as a central factor to effectiveness of ABMTs and its expected properties, in line with good governance principles, include (based on Rice et al, 2022): (i) Support to identification of biodiversity, social and cultural features; (ii) Inclusive processes; (iii) IPLC self-regulation and consent; (iv) Multiple levels of legitimate governance processes; (v) Use of best available science and local knowledge; (vi) Clear legal status[150]; (vii) Management system and plans in place or being developed; (viii) Management integrated inside and outside the ABFM; (ix) Monitoring systems in place; (x) Assessment/feedback processes in place; (xii) Cultural values and practices are respected; (xii) Communities are involved in monitoring and evaluation; (xiv) Monitoring of social processes and benefits; (xv) Processes to ensure periodic reviews and recurrent evaluations; (xvi) Dependent community values respected; and (xvii) Site vulnerability assessed and considered.

It should also be remembered that the introduction of ABMTs in a social-ecological operating system may modify the common rules of access and use of space (enshrined in traditional or modern rights) and the established historical practices, with highly variable levels of concertation with and involvement of stakeholders, depending on the political and governance regimes in place. While a certain level of protection is scientifically justified, the change may not always be accepted by costal populations or traditional users and ABMTs may become stakes in power games which may affect their effectiveness and compliance (Cazalet et al., 2011).

Table 7.1: Factors influencing effectiveness identified in area-based fisheries management measures (ABFMs), Community-managed areas (CMAs), Marine Protected Areas (MPAs) and community-based MPAs (CB-MPAs). Dark grey: factors regularly mentioned. Light grey: factors logically present even if rarely mentioned. Specifications have been added when the factor can only be one (e.g., coastal, or rural), could apply to sub-sectors (e.g., SSFs, Recreational fishing) or take a special form (e.g., traditional, informal)

Factors affecting effectiveness		ABFMs	CMAs	MPAs	CB-MPAs
Physical	Small vs large dimension				

[150] The point may be controversial. A strong legal status seems a guarantee of stability and duration, but it may be argued that the acquisition of that status is often very time consuming, potentially retarding adaptive management responses to deleterious changes in uses or climatic context, new information, etc.

parameters of the area	Coastal vs oceanic		Costal		Coastal
	Pelagic vs demersal				
	Mineral vs biological substrate				
	Boundaries and marking (buoys)				
Bioecological parameters of the area	Vulnerable vs resilient				
	Mobile vs resident				
	Stable vs variable resources				
Pressures and threats	Fisheries (all sub-sectors)				
	Tourism	recreation			
	Other economic sectors				
	Climate change				
	IUU; Poaching				
	Land-based pollution				
	Local pollution				
Community Parameters	Urban vs rural settlement		Rural		Rural
	Size of settlements				
	Wealth. Poverty	SSFs			
	Health				
	Demography	SSFs			
	cultural and social bond	SSFs			
	Development level	SSFs			
	Alternative livelihoods	SSFs			
	Strong leadership	SSFs			
	Ecol. conscience, ethics, rituals				
	Awareness on crisis & benefits				
	Experience in collective action	SSFs			
Policy	Coordinated institutional frameworks				
	Adjusted institutional mandates				
	Adequate legal frameworks				
	Sustainable use: relative priority				
	Financial support (capacity build)				
	Incentives (economic and social)				
Good Governance Principles	Stakeholders' identification				
	Participation/empowerment				
	Clear, accessible procedures				
	equity; cost/benefits				
	Recognition of existing use rights				
	Local values, rights and rules	SSFs			
	Extension services (long term)	SSFs			
	Institutional collaboration (MSP?)	OECM		OECM	
	Cross-sectoral cooperation				
	Auditing, accountability		informal		Informal
Management effectiveness	Expanded mandate	Biodiv.	Tradition	socio-eco	Tradition
	Ecosystem approach		Tradition		Tradition

	Evidence: Science, local knowledge				
	Clear, agreed objectives & Plan		Informal		Informal
	Manageability (realism, applicability)				
	Intended degree of protection				
	Clear rules				
	Clear, applicable measures				
	No destructive practices				
	Capacity-building programmes				
	Diversified tool-box				
	Participative enforcement				
	Connect rights and responsibilities				
	Deterrent enforcement				
	Compliance (factor and outcome)				
	Graduated sanctions				
	Integration (inside/outside)				
	Alternative income generation				
	Conflict resolution				
	Monitoring		Informal		Informal
	Performance assessment		Informal		Informal
	Auditing. Accountability				
	Adaptive capacity				
	Eco-certification	MSC		Green list	

7.6 How effective are ABMTs?

Having considered the factors that affect effectiveness in ABMTs, what do we know about their outcomes? In trying to respond to this question, it is important to clearly distinguish the effects for which ABMTs are advocated (often with little or no evidence) and effects for which evidence is available, For ABFMs, MPAs and fishery-ABMTs in general, the outcomes have ranged from poor to very good and we review below the conclusions reached in several effectiveness assessments.

a. General statement on ABMTs

Fishery-ABMTs are not multi-purpose "silver bullets", however. This has been repeated many times about MPAs' role in fisheries but might be generalized to all fishery-ABMTs as well. Large-scale highly mobile threats as well as highly-mobile invasive species and global marine pollution and litter (including microplastics) may not be effectively addressed / reversed / mitigated by single fishery-ABMTs. The latter need to be combined with other spatial and non-spatial measures within much larger national, regional or ecosystemic frameworks. Widespread impacts such as coastal degradation may be slowed down, stopped, and perhaps reversed by effective coastal reserves and coastal biodiversity restoration programmes (e.g., in mangroves and wetlands) but their success and people's resistance in many densely populated areas in developing countries (and not only there) call for more systemic interventions at larger scales with appropriate support from the state.

Fishery-ABMT's potential effectiveness in addressing global threats such as global ocean warming (and related acidification), land-based pollution (with the related chemical contamination of seafood, eutrophication of essential coastal ecosystems, and spreading of "dead zones") can only be marginal at site level and is still controversial at network or global level (Kincaid, 2017; Reimer et al., 2021; Sala et al, 2021 vs Hilborn and Kaiser, 2022; Cabral et al., 2020 vs Ovando et al., 2020).

b. *Effectiveness of MPAs*

MPAs' performance has been reviewed and discussed abundantly in the last 30 years. The effectiveness of No-Take MPAs to produce significant biodiversity benefits inside their boundaries is generally recognized as well as their possible impact at a short distance from the reserves. The impact outside the MPAs is still controversial and cannot be generalized. Useful spillover has been reasonably established in some cases, not in others (Mangel, 2000; Hilborn et al., 2004; CBD, 2006; Kemp et al., 2012; Mensnildrey et al, 2013; Ovando et al., 2021; Medoff et al., 2022).

Specifically, in terms of benefits from MPAs (used in fisheries management)[151], Mesnildrey et al., (2013) stressed that the "reserve effect" on the fishery was easier to detect when the MPA was a strict reserve than when the MPA allows for fishing within its boundary, confounding the reserve and fishing effects. They confirmed the positive impact of MPAs (mainly reserves)[152] within their borders and hence their potential role for conservation purpose and resources restoration of resident or low-mobility species. They also confirmed the short-term losses by fisheries the extent of which is variable and related in part to the degree of constriction of the fishery. The vessels excluded may be able to redistribute effort outside the reserve (potentially increasing fishing intensity outside the reserve, or opening fishing operations in areas and on sub-stocks not yet exploited) or they might be forced to stop operating, because of lack of alternative quotas or unbearable increases in operational costs. These latter impacts are particular problematic for small-scale fishers due to their vulnerable circumstances.

The main limitations of MPAs seem to have been a lack of effective management in a large proportion of them (paper parks) and a lack of focus on their sociocultural and economic dimensions. These aspects are briefly examined below-

The lack of effective management is a recurring concern for a large majority of MPAs as stated, for example, in Pomeroy et al., 2005; Pelletier et al., 2005, 2008; Beliaeff and Pelletier, 2011; Burke et al., 2011; Fox et al., 2014; Caveen et al., 2014; Balmford et al., 2004; Burke et al., 2011; Samoilys and Obura, 2011; Rocliffe, 2015; Gill et al., 2017). The direct consequence is the high frequency of "paper parks" (Grimes and Ralston, 2003; Shipp, 2003, 2004; Mora et al., 2006; Jenkins, 2009; Halpern, 2014; Claudet et al.;

[151] In reality, these reserves are declared by fishery authorities and are strictly speaking ABFMs.

[152] Even though, following the closure, the reserve is often affected by trophic cascades (e.g., increasing lobsters reducing abalone population; the spread of harmful macroalgae in coral reef ecosystems is reduced by the increased biomass of their natural grazers (cited by Mesnildrey et al., 2013).

2020[153]) and a late but welcomes attempt in IUCN to more clearly state and strengthen the effectiveness criteria in Green-Listed MPAs (IUCN-WCPA 2017).

The weakness or lack of focus on social dimensions and food security has been obvious for two decades at least (in the ocean) as MPAs advocacy focussed primarily if not exclusively on bioecological performance. This has resulted in poor or inexistent monitoring and evaluation of the human dimensions, lack of assessment capacity in the disciplines required, and sometimes in using indicators of performance not agreed upon by all users and stakeholders (Merle Sowman, Pres. Comm.). This biased focus has neglected the social, cultural, political and economic variables that condition stakeholders' behaviour and MPAs' performance, particularly in densely populated areas (Mascia, 2004 ; Pomeroy et al., 2007 ; Mascia and Claus, 2009 ; Charles and Wilson, 2009 ; Gurney et al., 2014 ; Sowman and Hauck, 2011 ; Sowman et al., 2014 ; Rocliffe, 2015 ; Sowman and Sunde, 2018). Although the social issues in MPAs started to be mentioned in the 1980s (Gurney et al., 2014) the problem has tended to be neglected for decades despite evidence of the impact, highlighting positive bioecological effects without consideration of pertinent narratives of conflict and local resistance (Trist, 1999, Christie, 2003:2). The lack of past attention on these issues remains visible in the lack of socioeconomic data and indicators in MPAs information databases, particularly the long-term data series on both the protected areas and control sites (Christie, 2004; Claudet and Guidetti, 2010; Gurney et al., 2014) as well as in the paucity of studies of the performance of Type VI multiple-use MPAs. The scarcity of consideration of social and economic issues in the last decades, is aggravated in some community-managed MPAs by the short-term nature of many MPAs projects and of their external financing, leading to short-lived social and economic benefits that stop being provided as soon as the external assistance stops (Gurmey et al., 2014).

However, the situation has changed significantly in international guidance on governance and performance assessment of MPAs (e.g., in Green listing of MPAs (IUCN-WCC, 2017) as well as in practice (Section 2.1). There has been also a number of studies, recently, on partially protected MPAs (Sciberras et al., 2013,2015; Reimer et al., 2021; Turnbull et al., 2021; Andradi-Brown, 2023) starting perhaps a new controversy on whether or not these areas can and do contribute to more strategic conservation visions than narrow no-take areas of limited extension in the coastal densely populated areas.

A consequence of the historical neglect of human dimensions in many ABMTs and related stakeholders' protests in the past may have been downgrading, downsizing and degazetting MPAs[154] (Golden Kroner et al., 2019)[155], prompting increasing interest in

[153] In the Mediterranean, Claudet et al. (2020) find that 6.01% of the sea allegedly protected but 95% of this protected area shows no difference in regulations inside and the MPAs, confirming that the majority of MPAs in the region are paper parks)

[154] https://www.conservation.org/projects/paddd-protected-area-downgrading-downsizing-and-degazettement

[155] Governments of the United States and Amazonian countries enacted 269 and 440 downgrading, downsizing, and degazettement (DDD) events, respectively. Between 1892 and 2018, 73 countries enacted 3749 DDD events, removing 519,857 square kilometers from protection and tempering regulations in an additional 1,659,972 square kilometers. Most of these are connected with industrial scale developments

other, more inclusive approaches to coastal resource management and conservation (Mascia and Pailler, 2011; Rocliffe, 2015). Another more positive consequence might be the growing efforts to promote community-based multiple objectives management frameworks such as LMMA, MEABRs, TURFs, MARFs, ASRMs, CBFMP, CFMA, MCAIPs, SMAs, etc., following principles of Common Pool Resources Management (CPRM), co-management, and other forms of community-based area-based management, with demonstrated effectiveness, particularly in fisheries (Ostrom, 1990; Costanza et al., 1998; Dietz et al., 2003; Pretty, 2003; Beddington et al., 2007; Berkes, 2007; Gutierrez et al., 2011: Cinner et al., 2012c; Wamukota et al., 2012).

In terms of social ecological and governance performance of MPAs larger than 10,000 Km2, established to meet global conservation coverage targets and promote sustainable use, it was found that <u>fisheries improved</u> in older marine protected areas with higher levels of enforcement but <u>they declined</u> when targeting highly mobile, low productivity, or high market-value resources. High levels of participation were correlated with improvements in wellbeing and ecosystem health trends (Ban et al., 2017).

Discussions have started on the effectiveness of large scale MPAs. Together with the "race" to global conservation targets, the mixed performance of MPAs in coastal areas (except inside small strict reserves) seems to have contributed to a "race" to establish large-scale MPAs (LS-MPAs), practically untouched, and far away from these "problematic areas". These conditions led to some criticism regarding the real additional protection provided by their establishment (Butchart et al., 2015; Horta e Costa et al., 2016; Gil et al., 2017; Adams et al., 2019; Hampton et al., 2023), although proponents of LS-MPSAs have argued that these areas were, instead, conserving biodiversity values for the future[156].

It has been argued also that MPAs could increase resilience to climate change and facilitate the adaptation of biodiversity to the changing conditions, including distribution shifts. This function would be beneficial also to fisheries, maintaining resources supported by MPAs. However, understanding of this role was still poor a decade ago and many problems remained to be resolved (Gaston et al., 2008) and MPAs themselves are threatened by climate change (Bruno, et al., 2018). Empirical evidence collected during the last 40 years, have shown that, in the terrestrial domain, despite some losses of populations and species due to climate changes, protected areas (PAs) have: (i) continued to accommodate many species, which shifted to higher altitudes and cooler microhabitats within the PA; (ii) declining species remained more abundant inside PAs than outside them; (iii) losses from some PAs have been offset by increases in others; (iv) as species expanded poleward, the majority disproportionately colonize PAs as they go, as if PAs portfolios operated as stepping stones; and (v) there some evidence that, with appropriate management, PAs could slow climate-related declines and accelerate expansions The challenge for managers will be to consider the balance between retaining current species and encouraging colonization by new species (Thomas and Gillingham, 2015). Similar shifts of species distributions in latitude and depth (instead of altitude) have been noted in the marine populations (Barange et al., 2003; 2018) but, considering

(Golden Kroner et al., 2019**)** and happened mainly on land but apparently also in coastal areas and islands (see PADDD Tracker at https://www.padddtracker.org/

[156] As mentioned in the iMPAC5 presentations and speeches a few times.

the important differences between the terrestrial and marine domains, it is not obvious that these effects might be extrapolated to MPAs.

c. *Effectiveness of MPAs networks*

The information available regarding the effectiveness of MPA networks is limited (e.g., Williams et al., 2009; Green et al., 2011; Grorud-Colvert et al., 2014; Foster et al., 2017; Meehan et al., 2020). It is logical to assume that the effectiveness of MPAs networks is closely related to the effectiveness of the MPAs they contain, possibly augmented by synergistic effects, and might be judged on similar bioecological and socio-economic criteria. However, just as for their components, effectiveness is very likely to be network-specific

For example, Williams et al (2009) demonstrated that the impact of a reserves network in Hawaii improved aquarium-fish fisheries and increased greatly the biomass available inside and outside the reserves. Similarly, Moland et al (2021) demonstrated the effectiveness of a network of MPAs established to recover stocks of lobsters in Norway. Benefits included: increased population density, survival, body size and phenotypic diversity; changes in emigration and interaction with surrounding fisheries, and reduced selection pressure on morphological and behavioural traits. The assessment of the expected synergistic role of MPAs networks, i.e., the benefits produced by the network beyond the simple sum of the benefits of individual MPAs, is challenging. Notwithstanding, Grorud-Colvert et al. (2014) compared networked and non-networked MPAs in Hawaii and demonstrated that the observed biomass build-up was consistent with a synergistic network effect. But all these conclusions are likely to be sensitive to the size of the network, the ecological components concerned, the general oceanographic conditions, etc. The quality of networks is unlikely to improve if the proportion of "paper ABMT" in them does not decrease substantially. The impact on fisheries within the network will also depend a lot on the behaviour of the fleets, their capacity to adapt or find other opportunities in the network area or outside it.

However, the general conclusion of Green et al. (2011) was that despite considerable investments, management effectiveness was generally poor throughout the region and that not many large, formally declared MPAs were well managed. A decade later, comparing MPA networks performance in relation to the qualitative elements of Aichi Target 11[157], Meeham et al. (2020) showed that assessments of MPA network effectiveness still pre-dominantly focused on ecological characteristics and "effective" management (in its bioecological and governance dimensions only), neglecting equity, other social, economic dimensions, governance, and surprisingly, integration into the wider landscape and seascape.

Referring to the global network of protected areas, numerous scholars have questioned the conservation value of the global Targets for effective conservation adopted in the last three decades (cf. Sections 6.4, 7.1 ; Green et al, 2011 ; Klein et al., 2015 ; Jones and De Santos, 2016; Foster et al., 2017). More recently Maxwell et al. (2020) showed that the expansion of protected areas by national governments since 2010 has had limited success

[157] These elements are: (i) Areas of particular importance for biodiversity and ecosystem services; (ii) effectively managed; (iii) equitably managed; (iv) ecologically representative; (v) well connected; and (vi) integrated in seascapes.

in increasing the coverage across different elements of biodiversity such as ecoregions, threatened species, 'Key Biodiversity Areas' and wilderness areas as well as across ecosystem services (productive fisheries, and carbon services on land and sea).

d. Effectiveness of ABFMs

ABFMs' effectiveness can be assessed against the range of objectives listed in Table 2.2: (i) optimize the fishery performance, maintaining stocks and fleets around the optimal level; (ii) maintain/enhance livelihoods and food security (connected to the preceding); and (iii) provide broader conservation benefits, reducing collateral impact on species and habitats. Objectives (i) and (ii) usually constitute the primary goal of most ABFMs. Objective (iii) may be the primary objective on some ABFMs aiming at protecting habitats from degradation (like VMEs) or reduce mortality on non-target species, especially protected species.

ABFMs are rarely recurrently assessed for effectiveness despite the fact that modern fisheries management is strongly adaptive. The reason might be that the objectives are set at the level of the whole fishery and not for any single management tool (cf. Chapter 11). Indeed, a significant difficulty in measuring precisely the effect of an individual ABFM on the state of the fishery, is the fact that ABFMs are generally implemented alongside a mix of other management tools (such as gear selectivity, effort and catch controls, minimum landing sizes, etc.), confounding the management factors. Moreover, ABFMs operate in the context of variations and changes in broader environmental and socio-economic factors which complicate the identification of individual cause-effect relationships. Nonetheless, numerous ABFMs have been assessed in an *ad-hoc* basis, and there are scores of publication assessing their performance at the sub-category level (fishery reserves, spatio-temporal measures, rotational closure, etc.) and at site/fishery level.

A thorough assessment of a set of fishery closures established for various purposes ranging from stock sustainability to broader conservation purposes, STECF (2007) stressed that most of the measures concerned were established without clear objective and those had to be inferred from different sources. They also concluded that very few reliable conclusions could be made with the data available for two reasons: (i) The available information on stock status was too poorly spatially resolved to disentangle any closure effects from other identified causes of change; (ii) Effects were observed but it was not possible to determine to what extent the measures contributed to them; (iii) The measure appeared to produce positive outcomes in one place but not in others; (vi) no conclusions could be made at all. In brief, and with a small set of examples, 27% of the areas analysed (3/11) showed some evidence of positive outcomes and for 73% of them, either no conclusion could be drawn or the positive effects observed could not be reliably related to the ABFM as other important factors changed at the same time.

The variability in effectiveness of ABFMs sub-categories is highly variable (Rice et al., 2018; Himes-Cornell et al., 2022) and results concerning single ABFMs only give examples without leading to useful general conclusions. We will therefore focus below on reviews of large numbers of ABFMs.

In a systematic review of the literature and area-based fisheries management measures (ABFMs), Petza et al. (2023, submitted) found that, overall, the social, economic, and environmental impacts of ABFMs have been positive (56%), negative (22%), mixed (14%), and uncertain or not assessable (8%). When considering more specifically their intended outcome (i.e., the designation rationale), ABFMs were found to be effective (54%), ineffective (12%), or uncertain or unknown (35%). This implies that 80% of the ABFMs for which a reliable assessment could be made, were effective (54/(54+12)). Considering all cases (including uncertain ones), the effectiveness of ABMFs by gear type, appeared higher for ABFMs restricting static gears (69%), than for those restricting towed gears (51%) or all other or undefined gears (32%). It reached 68% when the ABFMs restricted all gears (no fishing zone). However, when omitting all uncertain cases from the analysis, no significant difference in effectiveness between types of gears was found. When considering the impact on the broader biodiversity, in 77% of the reviewed cases, the only biodiversity feature of concern identified in the study is the one reflected in the ABFM objective. No information was available on other/broader biodiversity components. In 96% of the cases, no pressures or threats on biodiversity were identified or discussed. In 8% of the cases, the potential for the ABFM concerned to be identified as OECM was mentioned. All these cases were described after 2010 when the concept was introduced by the CBD.

In brief, if we consider only the ABFMs for which the assessment is certain, a large proportion appear to be effective at meeting their primary objectives. There is close to no information about possible effects on broader biodiversity attributes other than those reflected in the primary objective. It is too early to figure out to what extent ABFMs with an explicit objective on biodiversity conservation may meet it.

Evil lurks sometimes in the details, so let's look at some specific examples of ABFMs and their outcomes. Examples are more specific but considering the spatio-temporal differences and variability in ABMTs' effectiveness, the examples and not be generalized.

e. *Rotational closures*

Rotational closures involve alternately closing and opening an area to fishing with the view to optimize the distribution of fishing pressure in space and time. The approach was not effective in Hawaii coral reef with a rotational cycle of 1-2 years closure periods. The biomass tended to increase during the closure but enough not compensate for depletion during open periods (Williams et al, 2006). However, the effectiveness of this approach depends on many factors including population parameters (and rebuilding time), the amount of space that is alternatively closed and open, and the rotational cycle (the relative length of open and closed times). Simulations on the Australian Great Barrier Reef Marine Park fishery on sea cucumber, led to a substantial reduction in the risk of localized depletion, higher long-term yields, and improved economic performance. Benefits increase with the length of the rotational cycle up to 6 years. The authors suggest that this result is applicable to most sessile or resident resources, and indicates the opportunity of increasing this relatively low-information, low-cost, co-management rotational harvest approaches in coastal and reef systems globally (Plagany et al. 2015).

f. *Real-time closures*

The effectiveness of real-time closures was tested in Islandic fisheries on Atlantic Cod, Haddock and Herring (1990-2014 on their capacity to protect juvenile fish of haddock. Results indicated that the measure was effective with haddock and herring (only under high fishing mortality) but not with cod (Woods et al., 2018). This suggests that as might have been expected, results depends on the species concerned.

The evaluation (by simulation) of the effects of temporal, static, and dynamic area closures on the bycatch and target catch of 15 fisheries around the world concluded that dynamic area closures could reduce bycatch by an average of 57% without sacrificing catch of target species, compared to 16% reductions in bycatch achievable by static closures. Effectiveness was related to the degree to which target and by-catch species distribution overlap in space and time (Pons et al., 2022).

g. No-Trawl areas

Many management measures have been implemented to reduce or prevent trawling impacts on seabed habitats, but the knowledge base to evaluate the effectiveness of these measures is fragmented (McConnaughey et al. 2020). However, it is often argued that strong enforcement of no-trawl areas, as evidenced by control and surveillance data and on-board observers, for example, may be taken as a proxy for effectiveness, assuming that if the pressure is suppressed the outcome is being produced.

h. Essential fish habitats (EFH)

It has been argued that the protection of EFHs is often insufficient or inexistent despite a good understanding of their importance, because of the external nature of the degradation (for which fisheries have no mandate) or because of a lack of inter-disciplinary science to fully understand the situation (Peterson et al., 2000 ; Gjersten, 2005; Levin and Stuz, 2005; Laman et al., 2018). Moreover, in addition to being potentially beneficial to fisheries, the protection and restoration of vegetated coastal habitats such as seagrasses, salt marshes, and mangroves, seem to have significant potential in enhancing coastal sedimentation and sequester carbon (Duarte et al. 2013). A problem may emerge as the number of "essential habitats" to protect increases with the number of species and other services to protect (including carbon trapping and food provision). Consequently, the area requiring protection for multi-functional EFHs becomes very large, complicating the trade-offs to consider when selecting the most effective areas to protect or sustainably use (Jason Link, Pers. Comm.).

i. Partially protected areas (PPAs)

We have mentioned in Section 7.2.4.i that (i) partially protected areas (PPAs) significantly enhance density and biomass of fish relative to areas more open to fishing; (ii) PPAs produce lower biodiversity benefits than reserves; (iii) even tough performance is highly variable. Moreover, PPAs may be valuable, particularly in areas where totally closed areas are not socio-economically and politically viable options (Sciberras et al., 2015).

j. Fishery-oriented Marine Managed Areas

The review of Mediterranean fishery MMAs performance reveals that few data are available to assess their effectiveness. For fishery and marine reserves, fish biomass has increased and some evidence of ecological and socioeconomic benefits has been documented. The environmental and geopolitical complexity of the Mediterranean region as well as the dominant top-down management approaches, constitute the weakest points in their management (Pipitone et al., 2014).

k. Marie Extractive Reserves

Santos and Schiavetti (2013), describe the problems of equity generated by the extension of this terrestrial (forestry) concept to marine areas and the related appropriation of the space by "traditional populations" excluding other type of citizens. The authors also stress (i) the difficulties encountered in separating human and natural effects on biodiversity and (ii) the lack of evidence that traditional populations may really ensure sustainable use in the long term.

L. Management and exploitation areas for benthic resources (MEABRs)

The biological and economic success of the MEABR policy has been publicized through government documents that demonstrate a significant increase in the abundance and individual sizes of the resources within MEABR in comparison with open-access sites (Subpesca, 2000, in Gelcich and Donlan, 2006) confirming the effectiveness on co-management.

m. Territorial use-rights in fisheries (TURFs)

Gelcich and Donlan (2015) show that well managed TURFs, particularly with well-enforced NTZs would be very effective for resident and sessile resources.

n. Blue-water ABFMs

Blue-water ABFMs (Hilborn et al., 2021) are ABFMs operating in the open ocean, from the edge of the continental shelf (most often inside EEZs) to the open ocean in High Sea beyond national jurisdiction. They have attracted increasing attention in relation to tuna fisheries management but also in the BBNJ debate[158] (Curnick et al., 2020; Game et al., 2009; Gilman et al., 2019; United Nations, 2023). In this oceanic domain, fishery resources and many emblematic or protected species are highly mobile, straddle jurisdictions, and concentrate dynamically in or close to ecosystem features such as fronts or gyres (which also tend to move within and across years). Concern has been expressed that Blue water ABMTs may not produce their expected bioecological and socioeconomic expected benefits (Edgar et al., 2014). Under these conditions, dynamic spatio-temporal closures may be used for management based on quasi-real-time monitoring of fishing operation (Hobday et al., 2010). However, there are relatively few "blue waters" ABMTs used in fisheries on which to assess effectiveness (see examples in Hilborn et al., 2021).

Attempts by Gilman et al., (2019) to assess effectiveness of several categories of Blue water fishery ABMTs concludes that the theoretical and empirical evidence available is scarce and equivocal, in part because the establishment of blue water ABMTs is recent, and in part because of the difficulty of collecting relevant data and no potential for replication, control and randomization, the three pillars of experimental science (Hilborn et al., 2021).

Nonetheless, a successful example is given by the near real-time dynamic spatial management of Southern bluefin tuna (*Thunnus maccoyii*) bycatch by the Eastern Australia pelagic longline fishery through the use of a habitat model to distribute fishing operations. A retrospective analysis of effectiveness found that the approach has effectively mitigated bycatch of Southern bluefin tuna (Hobday et al., 2009, 2010).

[158] The Agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine Biological diversity of areas Beyond National Jurisdiction

Theoretical approaches have also been developed for dynamic temporal and spatial management of pelagic fisheries based on the variable position of pelagic habitats and variable ecosystem processes. Howell et al. (2008, 2015) developed an application aimed to reduce the bycatch of turtles (*Caretta caretta* and *Dermochelys coriacea*) tin the Hawaiian shallow-set long-line swordfish fishery on billfish.

Conclusions by Hilborn et al. (2021) are that (i) blue water ABMTs are rare and underrepresented in the body of literature assessing ABMTs responses; (ii) many of them were extremely lightly fished prior to their establishment; (iii) The very large ones recently established may be aimed at protecting ecosystems for future generation, more than correcting any ongoing degradation. Central issues relate to critical assessment difficulties and, for many of them, a general lack of objectives against which to assess any performance in the future. It can be hoped that the situation will change as the State action in these areas will increase.

o. Effectiveness of fishery-OECMs

The CBD Decision 14/8 (Page 14) stresses that factors of effectiveness include: (i) availability of baseline data on data related to the Criteria; (ii) ongoing and long-term community-based monitoring (iii) incorporation of traditional knowledge; (iv) equitable governance and stakeholder involvement; and(v) an effective management systems. These criteria are very broad and represent really prerequisites for OECMs, i.e. expected outcomes that would justify the OECM label.

Fishery-OECMs are ABFMs that have been shown to meet the OECM Identification criteria established by the CBD (2018) (Garcia et al., 2021). This means that such ABFMs have a demonstrated (or reasonably expected) capacity to produce long-term positive biodiversity outcomes, in addition to meeting their conventional fishery sustainability objectives. This effectiveness is likely to be lower than that of well managed MPA reserves, but may be similar or better that of multiple-use MPAs (IUCN Type VI) MPAs with important fisheries. However, fishery OECMs have slowly started being identified in the last two years and there is no assessment of their effectiveness as this early stage of their implementation.

Notwithstanding, an *ex-ante* assessment of potential OECMs among the Fisheries Restricted Areas (FRAS)[159] in the Aegean Sea was conducted by Petza et al. (2019) using proxies for the OECM criteria not yet finalized in the CBD process. They use Multi Criteria Decision Analysis (MCDA) fed by expert opinion, to analyse 516 Fisheries Restricted Areas (FRAs) and to: (i) determine the level of contribution of potential OECMs to marine biodiversity conservation in the Aegean Sea; (ii) categorize the potential OECMs according to the level of effectiveness on marine biodiversity conservation; and (iii) provide scientific advice on which of the potential OECMs could be considered for identification of OECMs, thus contributing to the attainment of Aichi Target 11 and successor targets. The MCDA characterized only one of the FRAs as "extremely effective"; one as "very effective"; 20 as "effective"; 147 as "moderately effective"; 264 as "slightly effective"; and 83 as "ineffective". If the first three categories were considered as having

[159] Fisheries Restricted Areas (FRAs) are geographically-defined areas, in which all or certain fishing activities are temporarily or permanently banned or restricted, by fisheries, environmental, archaeological or maritime legislation in national, European, or international level (e.g., by RFMOs).

a high enough likelihood to produce the biodiversity benefits required for OECMs, they would represent just over 4% of the FRAs population concerned.

While this analysis is only preliminary, it is a good example of how to conduct an expert-based assessment with limited information. The proportion of ABFMs likely to produce enough broad biodiversity outcomes seems low but may be realistic as these outcomes are not part of the core objectives. Such proportion might be improved, though, by introducing these outcomes in the objective list and adding dedicated measures in the ABFM accordingly. The proportion (4%) is of the same order as the one obtained By Petza et al (2023), submitted) following a different protocol, based on a systematic analysis of the literature (8%). This indicates that most likely, without a strong programme to upgrade conventional ABFMs to meet the OECM label requirement, the proportions of fisheries measures contributing significantly to area-based biodiversity conservation, beyond the important conservation of target species, are likely to be small, albeit possibly significant in terms of spatial coverage and additional contribution to conservation networks.

Himes Cornell et al. (2022) have undertaken a systematic analysis of fishery-ABMTs, defined as *ABMTs used to manage fisheries*, to assess the extent to which they met the OECMs identification criteria established in CBD (2018). The list of ABMT considered in the analysis (e.g., in the authors' Table 3) shows that these ABMTs included conventional fishery closures[160] (i.e., ABFMs *sensu stricto*) but also several multiple-use community-managed areas into which small-scale and traditional fisheries operate such as community-conserved areas (CCAs); Locally Managed Marine Areas (LMMAs); marine reserves and sanctuaries, etc. We separated these two groups of ABMT categories (Table 7.2).

The criteria considered in the analysis relate to: (A) the legal status of the area (i.e., presently designated as MPA or not); (B) their governance and effective management; (C) their long-time biodiversity outcomes (benefits); and (D) the extent to which the relevant local values were taken into consideration. It is important to stress that: (i) when testing ABFMs as potential OECMs, their capacity to meet their primary objective is not considered; and (ii) the statistics in Table 7.2 below reflect thew extent to which, in the publications that have been examined, the criteria in question was addressed or not. The fact that a criteria is not addressed in a publication does not mean that this issue was not considered or the activity was not conducted in the site concerned, but only that it was not considered in the publication.

The results indicate that in the case of ABFMs: (i) 65% of the sites referred to in the literature being examined were not registered as MPAs in the global MPAs database but some are, which is interesting; (ii) in 61% of the cases, governance and management are explicitly addressed in the literature (but effectiveness is not always known). This does not mean that 39% of the ABFMs are not managed but simply that the papers in question did not focus on this matter; (iii) In 50% of the cases considered, positive biodiversity outcomes where mentioned, beyond the outcomes related to the ABFM target species; (iv) In 67% of the cases, local relevant values where addressed.; (v) Overall, only 15% of the sites described could be considered as potential OECMs, subject to a case-by-case

[160] i.e., measures applied to control specific fisheries, established by fisheries administrations

assessment; and (vi) only few of them (6-15% depending of which group of cases) would possibly meet all the required OECM criteria (again, subject to a case-by-case assessment). The extent to which these statistics would change considering a much larger sample of areas than those for which publications were found is unknown.

Table 7.2: Number of fishery-ABMTs meeting concerning OECMs criteria (A to D). Top panel: ABFMs *sensu stricto*. Bottom panel: Community-managed areas. Data extracted from Table 3 in Himes Cornell et al., 2022

Area Type	Case Studies	A	B	C	D	Meet all criteria
		Not an MPA	Managed	Biodiv. benefit	Local values	
Number of ABFMs *sensu stricto*						
Benthic protected area	9	7	8	4	4	2
Closed area	86	36	56	52	62	9
Closed season	65	56	28	34	47	18
Fisheries reserve	15	7	8	9	9	1
Fisheries restricted area	35	14	26	14	20	3
Fisheries sanctuary	7	3	4	3	4	2
Gear ban	15	12	8	10	13	2
Moratorium	23	20	9	12	12	2
Move on rule	5	4	5	1	2	1
Real time closure	15	15	14	2	14	2
Ring Fencing	1	1	0	1	0	0
Rotational closure	7	5	3	5	7	1
TURF	11	8	7	6	8	2
Managed VME	19	15	15	5	7	3
Totals N	**313**	**203**	**191**	**158**	**209**	**48**
Totals %		**0.65**	**0.61**	**0.50**	**0.67**	**0.15**
Number of Community-managed areas						
Biosphere reserve	15	1	9	5	5	0
CCA	39	20	19	17	24	4
LMMA	45	24	20	30	37	9
Marine reserve	100	13	66	43	59	0
Marine sanctuary	9	4	6	3	6	1
MPA	79	20	55	32	46	6
National Park	43	5	27	16	25	0
Totals N	**330**	**87**	**202**	**146**	**202**	**20**
Totals %		**0.26**	**0.61**	**0.44**	**0.61**	**0.06**

In the case of community-managed areas, and with the same caveats as above, the results indicate that: (i) 26% only are not designated as MPAs, which is logical as many community-managed areas tend to already fall in that ABMT category;(ii) In 61% of the cases, governance and management are considered in the literature; (iii) 44% have produced broad positive biodiversity outcomes, which may seem low, but may be logical as their primary objectives are often food security and livelihoods; (iv) 61% account for locally relevant values, which is also very logical for community-based management); and (v) 6% only met all OECM criteria. Surprisingly, there is little difference in the literature regarding the outcomes of ABFMs and area-based community areas for the key criteria B, C and D.

PART II: CASE STUDIES

CHAPTER 8 - VMES IN THE NEAFC AREA[161]

Prepared by Darius Campbell

SUMMARY

This chapter describes the evolution of NEAFC's measures to protect vulnerable marine ecosystems from the effects of bottom fisheries. The measures starting before the adoption of the relevant UN Generally Assembly resolution and have now matured to a comprehensive system of closed and restricted areas to bottom fishing. The closures and restrictions have been in place over the vast majority of the regulatory area for 15 years and are well enforced. Details of the scientific process which supports regular renewals of the areas are set out.

In the early 2000s, NEAFC started to implement measures to address the possible adverse impacts of bottom fisheries for deep-sea species on target and bycatch species, and on other components of the marine ecosystem. From 2005 onwards, the Commission adopted measures to ensure protection of VMEs from any possible significant adverse impacts (SAI) caused by bottom fishing gears. The measures currently in force ensure that the only areas where bottom fisheries can legally take place in the Regulatory Area, apart from the potential for restricted exploratory fisheries, are in areas that are established bottom fishing areas where the best available scientific advice has suggested that VMEs do not, or are unlikely to, occur (Figure 8.1).

The 2014 VME Recommendation.

NEAFC Recommendation 19:2014 followed the fundamental review of the regulations NEAFC had in place to protect Vulnerable Marine Ecosystems. It was as elaborated to include (i) closure of areas to bottom fishing, (ii) move on rules, (iii) definition of existing and new/restricted[162] bottom fisheries areas; (iv) exploratory fishing protocols; and (v) lists of VME indicator species. This Recommendation also underlined a process of annual advice from ICES, including the possibility of advice on revision of the closed areas. Subsequent amendments in 2015, 2018, 2021 and 2022 refined some elements of the Recommendation. Other existing NEAFC measures, such as the Scheme of Control and Enforcement, were also amended at the time of the initial adoption. These amendments introduced reporting requirements for Contracting Parties on bottom fishing activities in the Regulatory Area. In addition, the Secretariat was required to report on bottom fishing activity to the Annual Meeting.

The 5-yearly Renewals of Areas.

Apart from the annual ICES advice process, the VME Recommendation also includes a requirement to renew the closed areas every 5 years. These review processes

[161] Based on a submission by NEAFC to a UN report on actions addressing the impacts of bottom fishing on vulnerable marine ecosystems and the long-term sustainability of the deep sea fish stocks; https://www.neafc.org/other/31810.

[162] New areas have been renamed as "restricted areas in 2021)

demonstrate an ecosystem-based management approach, where the latest scientific information informs regular decision making by the Commission. Note also that relevant stakeholders/observers attend the annual meetings of the Commission. The last time this review and renewal occurred was in the update to the Recommendation in 2018, the closures being due to end by 31 December 2017. Following advice from ICES, the 2022 Annual Meeting renewed to end 2027 all closures under the Recommendation along with significantly enlargement of one of the areas. It is expected that the 2027 Commission will further renew the areas until end 2032.

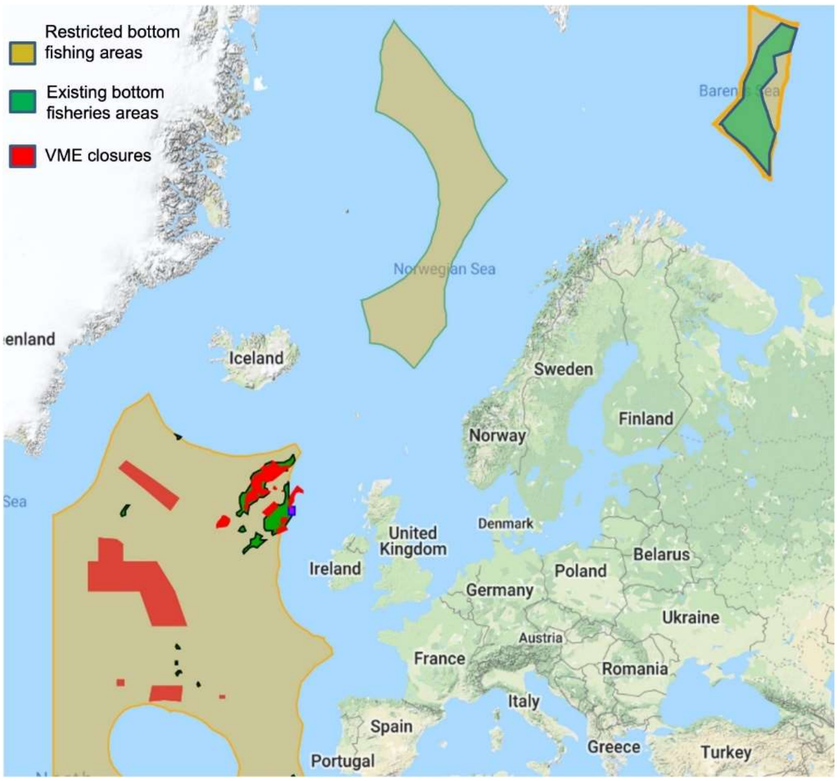


Figure 8.1: Map of the NEAFC existing fishery areas, restricted bottom fisheries areas, and VME closures

The NEAFC VME Recommendation includes clear requirements to assess compliance alongside regular review to ensure it is achieving its VME protection objectives. Given no other significant risks exist currently from other activities and the level of compliance being achieved, the recommendation effectively eliminates the threats to the VMEs in the closed areas.

NEAFC receives each year advice each year from ICES on new evidence arising on VME presence in the Regulatory Area. This will lead to decisions each year whether to increase or decrease the areas closed to bottom fisheries. So far, since the closures have been in place, no areas have been reduced in size while coverage has increased in some cases.

The 2019 Review of the Recommendation.

In 2019 NEAFC reviewed its binding Recommendation 19:2014 on the protection of Vulnerable Marine Ecosystems. The requirements and objective for such a review is set out in Article 10.1 of the Recommendation itself which states that "*The Commission shall every 5 years from the date of this Recommendation entering into force examine the effectiveness of this Recommendation in protecting VMEs from significant adverse impacts. In addition, this review process shall be supplemented by modifications required as a result of new scientific advice*."

The Scope of the Article 10 review is clearly stated to be on the effectiveness of the Recommendation in protecting VMEs [from bottom fisheries activities]. This can be stated in another way; how effective is the Recommendation in preventing [new] damage to the VMEs by fishing activity since 2014? This question was explored in detail in the 2019 review by examining what bottom fisheries had occurred in the closed areas since 2014, and if any activities had occurred, whether NEAFC had any information on likely/actual damage? Was there any information on the effectiveness of the elements of the Recommendation pertaining to VMEs in the existing fisheries areas or in exploratory fisheries areas outside the closed areas? Both NEAFC's monitoring and compliance committee and ICES were able to produce evidence on these questions. The Secretariat also had provided evidence from an automated system triggered if vessels were noted in the closed areas steaming at low enough speeds for fishing and carrying bottom gear. Analysis highlighted the fact that the vast majority of the alerts were in fact false positives. Nevertheless, two apparent infringements in the five-year period were followed up via NEAFC compliance reporting. The cases were subsequently dismissed by national authorities.

An ICES review of its advice on the VMEs and NEAFC activities described the annual scientific advice process. ICES noted no reductions in protections to the closed areas. ICES advice also highlighted the ongoing issue false positive signals indicating presumed bottom fishing in some areas outside existing bottom fishing areas. A solution to this would be providing up-to-date information on the gear used at the time of the activity which would be offered by following the planned implementation of the new NEAFC Electronic Reporting. Based on the above review, and following the 2019 Annual Meeting:

- NEAFC 2021 considered new advice from ICES on a closure not acted on previously (Josephine Seamount). ICES did not advise any new closures in this case, based on a lack of new evidence of VMEs being present.
- NEAFC now receives an enhanced reporting system from the Secretariat which has significantly reduced false positive reports of bottom fishing activity. There remain very few infractions per year that required further investigation/enforcement action.
- ICES has continued its work to improve the use of VME indicators to develop management advice, with a benchmarking activity in 2022.

CHAPTER 9 – FISHERY-ABMTS IN SOUTH AFRICA FROM AN INDUSTRY PERSPECTIVE

Prepared by Carel. J. Augustyn and Colin, G. Attwood

SUMMARY

South African marine species richness is high and ABMTs are concomitantly quite diverse and varied. Several interesting examples are discussed in terms of their geographic locale and political context, implementation and effectiveness, including coastal and marine protected areas and reserves and areas managed through time/area closures (including general trawl and purse-seine exclusions, kingklip and squid spawning area closures, rock lobster seasonal and area management and block closures for purse-seine by-catch management). The reasons for their effectiveness or otherwise are discussed. Some, like those related to large offshore fisheries such as kingklip, squid and small pelagic species have been quite successful, while others such as rock lobster have failed, largely due to socio-economic factors and poor compliance.

South Africa's marine species richness ranks third in the world (Tolley et al. 2019) straddling the Indian, Atlantic and Southern Oceans. It harvests about 800,000 t per annum (DFFE, 2020), split among industrial-scale fishing, small-scale and subsistence fishing, recreational fishing and a small aquaculture industry. Of the reported 61 stocks, the most recent assessments class 24 (39%) of them in a category of concern (biomass is less than that which is expected to produce maximum sustainable yield) (DFFE, 2020). However, the total diversity of exploited species is an order of magnitude larger than that reported on by DEFF (2020). As might be expected of a developing nation with limited fisheries monitoring and assessment capacity the majority of stocks are not assessed, and their management is rudimentary. Output controls such as total allowable catches are used to regulate the few valuable industrial-scale fisheries, but for the rest, a combination of effort control, daily catch limits and spatial restrictions are used to manage catches.

9.1 Coastal and offshore MPAs and reserves

South Africa's use of marine protected areas (MPAs), starting in 1964, was inspired by successes of the terrestrial reserves, which played a large role in the conservation of iconic African fauna and the associated tourism trade. South Africa now has 41 MPAs in its EEZ, of which approximately half include the coastal zone, and the remainder protect offshore resources (Figure 9.1; Kirkman et al., 2022).

The relationship between MPA management and fishery management has shifted over the years. Initially MPAs were seen as parks which protected coastal diversity but had no bearing on fishing activity. In 1973, the Sea Fisheries Act specifically made provision for *Marine Reserves*, and several were proclaimed under this act. The 1998 Marine Living Resources Act(MLRA) which regulates biodiversity conservation made provision for MPAs and explicitly listed their fishery objectives. Later, under the Protected Areas Act of 2005, all existing MPAs were removed from the fisheries management responsibility to be aligned with the broader national biodiversity management. Nevertheless, many MPAs still play a strong role in fisheries management, some by design (as former fishery measures) and others as a general consequence of the exclusion of anthropogenic disturbances (including fisheries).

9.1.1 The Goukamma MPA

The Goukamma MPA, declared more than 30 years ago as a fishery management tool, covers 40 km^2 of coastal water and 18 km of coastline and serves as an example of the country's experiences of area-based management in fisheries (#25 in Figure 9.1).

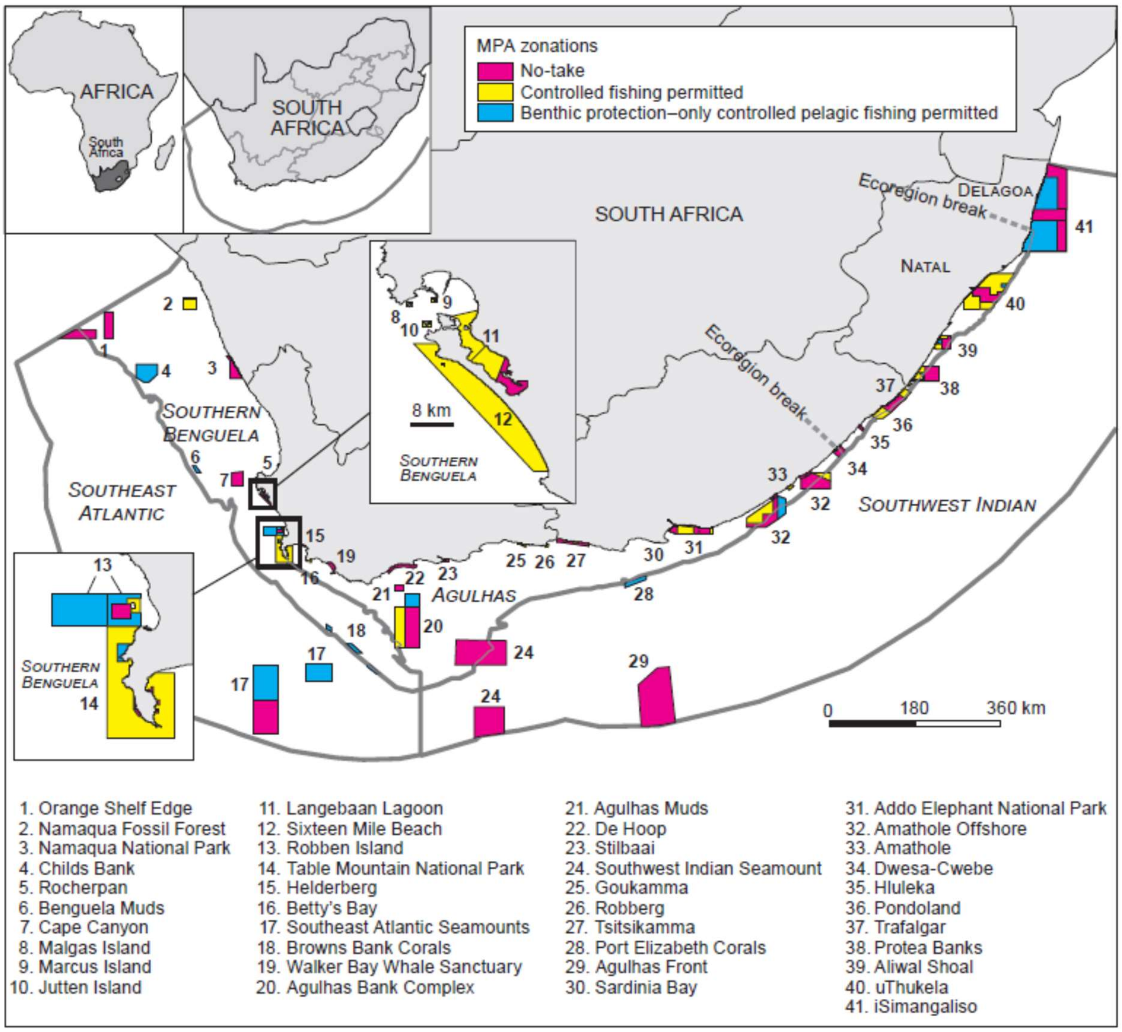


Figure 9.1. Marine protected areas in South Africa in 2022

It excluded boat-based fishing, of which the two principal types were commercial handline-fishing and recreational angling. Shore-based recreational angling was allowed to continue, but all forms of invertebrate harvesting (including a commercial oyster fishery) and recreational spearfishing were banned from the MPA (Götz et al., 2010). Of greatest concern was the status of a number of South African endemic reef-fishes which had declined alarmingly over a period of 100 years of exploitation countrywide (Griffiths, 2000). A series of investigations in the early 2000s revealed a strong positive effect of the MPA on the density of the sequential hermaphroditic seabream, the Roman

(*Chrysoblephus laticeps)*. Roman were more abundant and larger inside the MPA than on comparable exploited reefs within two miles of the MPAs (Götz et al., 2009a). The success of the protection resulted from their small home-range (Kerwath et al., 2007).

Further investigation suggested that the protection led to a change in the fish and invertebrate species composition in the MPA relative to outside reefs (Götz et al. 2009b). Among other changes, brittle stars, the primary prey of the Roman, had been depleted in the MPA. Presumably as a consequence, the condition of Roman was poorer in the MPA than outside (Götz et al., 2009a). This was a rare demonstration of how a cessation of reef-fishing affected fish abundance, fish reproductive potential, nutritional physiology and ecosystem structure. The depletion of the fish prey was an interesting confirmation of a density-dependent process that regulates abundance, and suggested that the roman density might have approached the MPA carrying capacity.

9.1.2 Area-based Management Tools and the Impact of exclusion

As there were many MPAs around the coastline and because the reef fish had been depleted nation-wide, a broader investigation into the effect of this, and potentially other, MPAs on the fishery was needed. How did the exclusion of boat fishing affect the fishery? The question was tackled by examining time-series of commercial catch records over the entire range of the species. The analysis showed that catches of Roman near the MPA increased despite the loss of the fishing ground, and that the catches of Roman in distant grounds were unaffected. Kerwath et al. (2013) interpreted this pattern in catches as evidence of a positive effect of the MPA on the fishery for Roman. A large research effort was required to elucidate the patterns described above. Nevertheless, there were criticisms that the effort focused on only one target species, and that effects of the MPA on other species did not receive equal treatment. We do not know to what extent these results can be generalized to other seabreams (of which there were several), or indeed all harvested species.

Pelc et al. (2009) argued that the spawning products of black mussels protected in the Goukamma MPA enhanced recruitment in adjacent areas depleted of mussels, a claim which mirrors that for Roman. The medium-sized MPA, situated along a coastline that is fast being developed appears to not only protect but also sustain at least some coastal resources. The impact of the closure on the beleaguered oyster fishery has yet to be studied.

The failure to exclude shore-based angling has been questioned, considering the poor status of many surf-zone fishes. Roving creel surveys[163] revealed the status of surf-zone fishes were a matter of concern (Pradervand et al., 2006). The high effort, low CPUE values and high rates of transgressions of fishery regulations (primarily bag limits and size limits) indicated that the MPA was not providing any protection to surf-zone fishes, of which 30 species appeared in catch records. A repeat survey a decade later showed that the catch rates deteriorated further (Attwood et al., 2016). Because no restriction was placed on shore-angling, the MPAs had no effect on this sector, but it did raise questions about fairness among sectors. Spear fishers were not allowed in the area, despite them targeting the same fish as shore-anglers. It was never clear why this one sector was

[163] a method of collecting anglers' catch and effort data per species using fisheries patrols, interviews with anglers, and stratified sampling

excluded but the other not. An attempt to exclude shore-angling will, however, likely lead to protests.

One clear benefit of the Goukamma MPA has been the provision of undisturbed or lightly disturbed ecosystems which has been used as a reference against which the effects of exploitation has been gauged. The provision of data from an undisturbed site leads to a greater understanding of the species it protects and the fishery on those species.

9.2 Time/Area closures

In the following sections, we describe briefly different types of time/area closures used in South Africa such as : trawl and purse-seine exclusions, Kingklip spawning block, squid spawning ground closures ,and rock lobster seasonal and area restrictions.

South Africa's south coast follows a sequence of 'half-moon' bays, long but shallow coastal indentations marked by a headland in the west, typically sheltering an estuary mouth from the predominant westerly swell, and long high-energy sandy beaches running eastward (Figure 9.1). False Bay in the south-western corner of south Africa, in contrast, is a deeply indented square bay, roughly 30 nautical miles wide and deep. Many of these bays were closed to trawling and purse-seining. Closures begin in the early 1900s, in response to concerns on the effect of industrial-scale fishing on young fish in the recruitment grounds and to remove conflict between line and net fishers.

Initial accusations by the line fishers were that the nets scraped the seafloor and destroyed the eggs of the commonly targeted species (von Bonde, 1956). This claim proved to be unfounded (Gilchrist, 1916a, b). Later came the accusation that the line-caught fish in False Bay fed primarily on anchovies and sardines and that the purse-seine fishery was destroying the prey base of the many predatory and reef fish species that were caught in the line fishery. These claims were found to be exaggerated for reef fish but schooling predatory fish did rely on the clupeids (Nepgen, 1982). Even later came the accusation that the trawl nets were catching a high diversity of fish as bycatch in the shallow waters, which was wasteful and destructive. This claim was largely upheld (Smale and Badenhorst, 1991; Walmsley et al., 2007). With this mixed bag of evidence and unanimous public opinion, coastal bays were closed and remain closed to industrial fishing by the fishing authority.

9.2.1 Kingklip spawning block time/area closures

Kingklip (*Genypterus capensis*) is a valuable by-catch species in South African hake (*Merluccius capensis and M. capensis*) trawl and long-line fisheries, with annual catches in recent years fluctuating around 4000 metric tons. It occurs in depths of 50-550m, largely in rocky areas and on the Southern African shelf edge, from Walvis Bay in Namibia to KwaZulu-Natal on the east coast. (Smith et al., 2013).

In 1983 a targeted long-line fishery for kingklip was launched, whereafter catches rapidly increased to over 8 000 mt by 1986. The CPUE also dropped rapidly, and it became clear that the resource had become depressed. (Leslie, 2004). The fishery was then closed by the Fisheries Management Authority (FMA) and the operators in the fishery were left stranded with unproductive vessels. They subsequently successfully lobbied to be able to target hake and a hake long-line fishery sector was launched in 1994 with, however, kingklip as a by-catch. The kingklip by-catch increased in both the trawl and long-line fisheries in the early 2000s, leading to a Precautionary Upper Catch Limit (PUCL) being introduced in 2005. (Smith et al., 2013). Since that time the kingklip PUCL has been managed at between 3 500 and 4 500 mt and the stock appears to be fairly stable.

Spatial measures in the hake deep-sea trawl fishery (in which kingklip is also a by-catch) include the exclusion of tidal lagoons, tidal rivers, and estuaries, closed areas and MPAs[164], and large bays to the east of Cape Town, no fishing being permitted east of Cape Agulhas in water depths of less than 110m or within 20 nautical miles from the coast, whichever is the greater distance from the coast. The hake inshore trawl fishery catches hake and sole up to a depth of 100 m. 100-110m acts as a buffer zone, since inshore hake and sole fishing occurs only up to 100m.

Before 2004, a substantial proportion of the kingklip catch on the South Coast was being taken on an annual spawning aggregation off Port Elizabeth. Leslie (2004) recommended that regulations to protect the spawning aggregation in the form of a time/area closure should be implemented by the FMA in addition to setting a precautionary upper catch limit (PUCL). He noted that although a time/area closure to protect the spawning aggregation would not be sufficient on its own to reduce the annual kingklip catch to sustainable levels, the FMA's demersal scientific working group believed that such a time/area closure should be an integral part of any management plan aimed at rebuilding the kingklip stock. It was therefore recommended that the area bounded by 24° 20' to 25° 00' E longitude and 34° 40' to 35° 00' S longitude (shaded in red in Figure 9.2) be closed to access by both trawl and longline vessels during the months of September and October to protect the spawning aggregation of kingklip from 2004. This was implemented since 2008 through the inclusion of a clause in the permit conditions of the fishing licence as a seasonal closure for a slightly longer period in September-November. DFFE (2020) also notes that the spatio-temporal closure was implemented "as a management tool to assist the recovery of the stock by protecting a spawning aggregation".

Finally, no fishing may take place outside of the areas defined as the "Hake Trawl Ring Fence" (this ring-fencing relates to MSC conditions that restrict the trawl fishery to grounds that have been systematically fished in the past, where the benthos has already been altered, grey shading in Figure 9.2).

9.2.2 Squid spawning grounds closures

Chokka squid (*Loligo reynaudii)* occurs around most of the Southern African coastline, from southern Namibia to the east coast of South Africa, in depths up to about 200m. Although it has been a common by-catch species of trawl fleets since the beginning of commercial trawling which started in 1920 in South Africa, a targeted jig fishery only began in 1984 on the south-east coast of South Africa. It mostly operates close inshore in shallow depths, commonly between 20 and 50 m. The fishery largely targets spawning aggregations (Augustyn, 1989) in shallow bays up to about 60m deep, using hand-held jigs. The main spawning grounds and oceanographic features in the region are shown in Figure 9.3 . Chokka squid paralarvae are found offshore and to the west of the spawning grounds (Roberts et al., 2005)

[164] These MPAs were established by the Department of Environmental Affairs and Tourism, which housed both Environmental Management and Fisheries Management.

Although the annual catch averages only about 6 000 t per annum, it is a valuable fishery that exports almost the entire catch to southern Europe, where it fetches high prices in Italian, Spanish and Portuguese markets. The annual landed value is in the vicinity of $40-60 million, caught by an effort-regulated maximum of 2 422 crew, with the number of vessels being allowed to vary around 200. The current Total Allowable Effort is 295 000 person-days. In total this fishery provides around 3 000 direct jobs in the Eastern Cape province, one of the poorer and economically depressed areas of the country where jobs are scarce.

The fishery expanded rapidly during its early stages and considering that most squid species around the world have short life cycles and fluctuate dramatically due to the current year's abundance depending almost entirely on the previous year's recruitment (Augustyn, 1994), it was considered by the FMA to be a priority to protect the spawning grounds during peak spawning periods (spring to early summer). In 1988 a mandatory closed season of five weeks in October-November was declared for the whole fishery, and strictly enforced in the inshore spawning grounds on the South Coast from Mossel Bay to Port Alfred. An additional closed winter season of three to five months' duration has been introduced since 2014 to guard against the Total Allowable Effort (TAE) being exceeded.

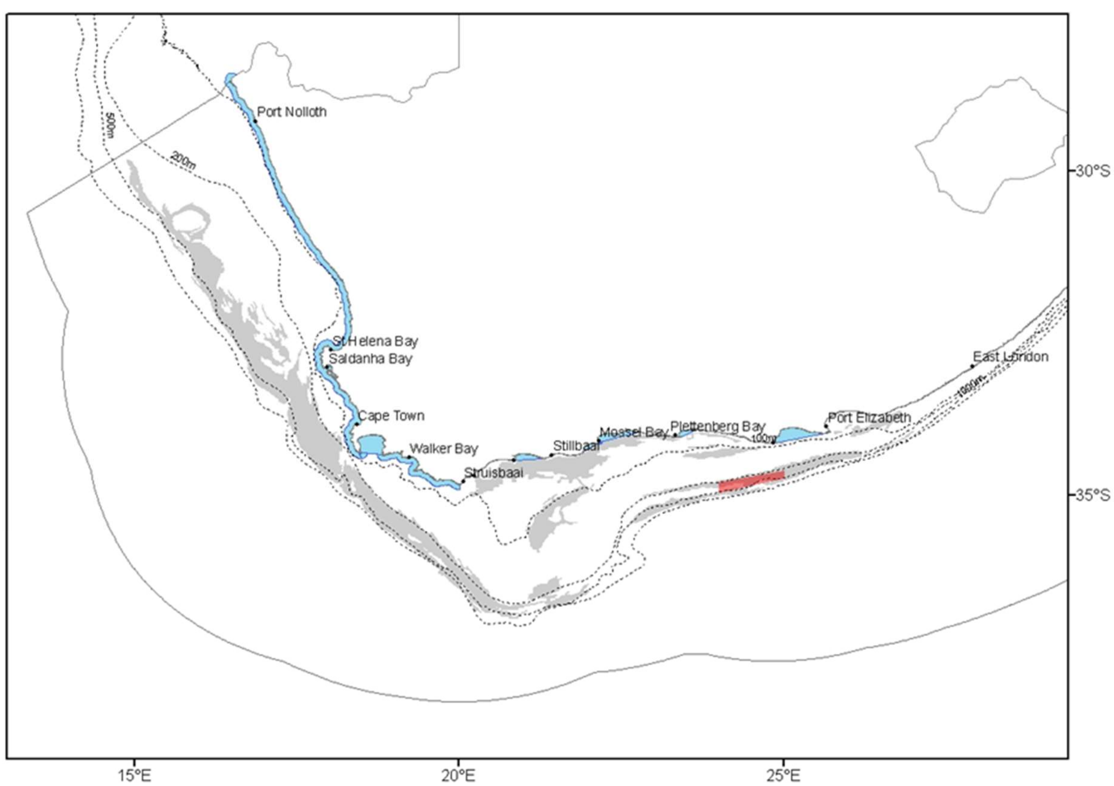


Figure 9.2: Spatial extent of the hake trawl fishery (hake deep-sea and hake inshore trawl) (shaded in grey) showing also the nearshore protected areas (shaded in in blue) and the kingklip spawning box (shaded in red) (after Smith et al., 2013)

The current permit conditions do not specifically designate these spatio-temporal closures of spawning areas. Only marine and estuarine areas managed by South African National Parks and MPAs are referenced as areas that may not be impacted by fishing activities, and where no fishing gear is allowed (DEFF, 2020).

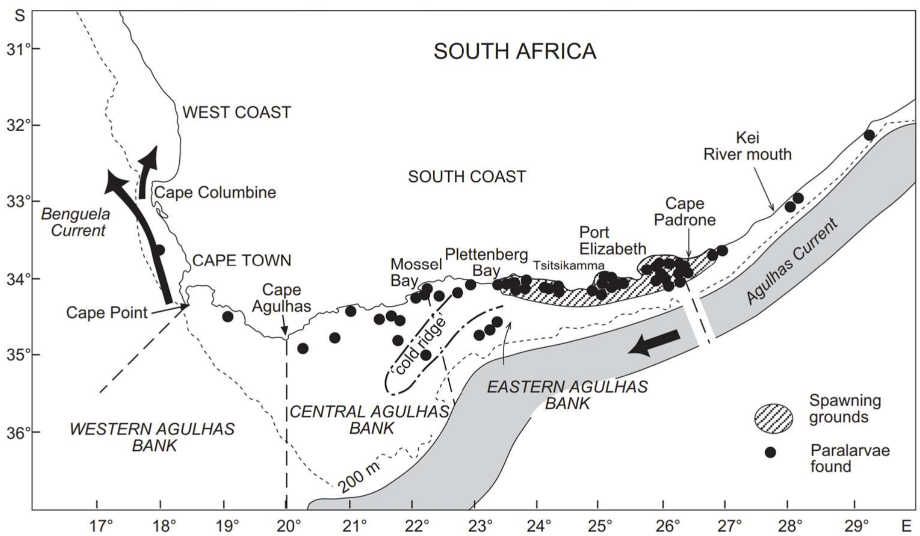


Figure 9.3: Chokka squid (*Loligo reynaudii*) spawning grounds on the South-East Coast of South Africa, showing oceanographic features of the region (from Roberts and Van den Berg, 2005).

The current management objective for the squid fishery is stated by **DEFF (2020)** as: "to cap effort at a level which secures the greatest catch, on average, in the longer term without exposing the resource to the threat of reduction to levels at which future recruitment success might be impaired or catch rates drop below economically viable levels". Time/area closures of spawning grounds are meant to contribute towards this objective.

9.2.3 Rock lobster seasonal and area management

The West Coast rock lobster *(Jasus lalandi*) is the most important crustacean fishery in South Africa, with a landed wholesale value of around US$ 20 million. It provides employment for about 4 200 people (DFFE 2021) from mainly coastal communities. It is fished from Southern Namibia to the east coast of South Africa, close inshore (mainly in kelp beds, by recreational divers and small-scale fishers using hoop-nets and small-boats) and by commercial trap-fishing vessels from about 100-200 m depths (Figure 9.4).

The fishery's management is complex, consisting of four subsectors: Commercial offshore, commercial inshore, small-scale and a small recreational component.

Average annual catches slowly declined from a high of over 10 000 mt in the mid-20th century, and then stabilized at around 3 500 to 4 000 t until 1989 when the resource started to decline further. This continued decline in the resource during the 1990s and early 2000s was attributed to mass strandings of lobster and reduced growth caused by low oxygen events along the West Coast. During this period the size limit was decreased from 89 to 75 mm carapace length to reduce mortalities of undersized lobsters caused by on-board grid sorters. By 1996 catches had declined to about 1 500 t annually, with no signs of recovery. In the early 2000s recruitment failure and increased fishing pressure (in part driven by political pressure) led to a further decline (Figure 9.5).

The fishery has also been negatively affected by climate change which has impacted the distribution of the lobster and the fishing effort (Cockcroft et al., 2008; Augustyn et al., 2015) and by IUU fishing inshore which has impeded rebuilding (Augustyn et al., 2018).

There is a harvest strategy in place, using a so-called Operational Management Procedure, but this is continually being undermined by IUU fishing. An OMP adopted in 2011 aimed to rebuild the stock by 35% over 10 years but has completely failed and the stock declined even further as poaching ramped up due high fishing pressure and very poor enforcement.

Recent TACs and legal catches have further declined to less than 1000 mt in 2021. Annual illegal catches are currently estimated to be between 245 and 945 mt (DFFE, 2022).

The fishery has a TAC management system in place, for which annual catch limits are subdivided for the 10 traditional West Coast fishing areas (Figure 9.4, zones A-D). New zones in False Bay (zone E), and Zone F were added following the eastward shift in distribution of lobster towards the area east of Cape Hangklip and the fishery is managed by zone (referred to as "super-area"). The resource in zones A, E and F is exclusively harvested by small-scale fishers using hoop nets close inshore.

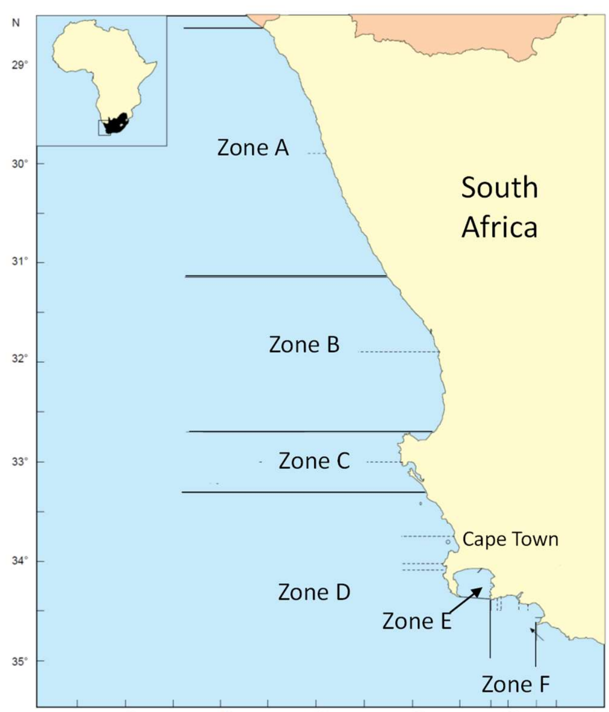


Figure 9.4: Fishing management zones and areas for *Jasus lalandi* (West Coast rock lobster) in South Africa (from DEFF 2020).

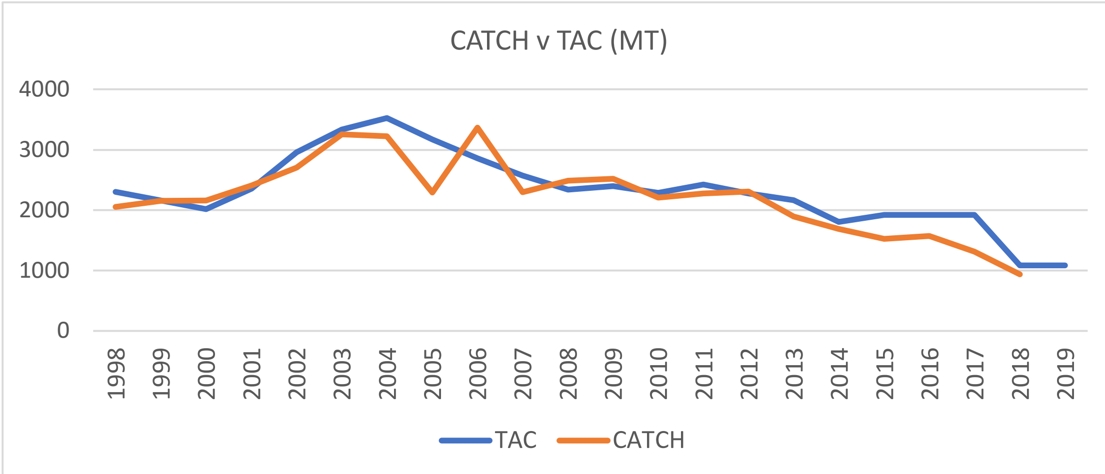


Figure 9.5: South African West Coast rock lobster TACs and reported catches 1998-2021 (source: DEFF)

Table 9.1: Fishing seasons by area for various sectors in the West Coast rock lobster fishery

Area	Commercial Nearshore, Interim Relief/ Small-Scale:	Commercial Offshore, Small-Scale: Offshore
Super-area 1+2	15 Oct, Nov, Dec, Jan, 15 Feb	
Super-area 3+4	15 Nov, Dec, Jan, Feb, 15 Mar	15 Nov, Dec, Jan, Feb, 15 Mar
Super-area 5+6	15 Nov, Dec, Jan, Feb, 15 Mar	
Super-area 7		Dec, Jan, Feb, Mar
Areas 8 and 11	15 Nov, Dec, Jan, Feb, 15 Mar	Jan, Mar, Apr, May
Area 8 (Deep water)		Jun, Jul
Areas 12, 13 and 14	15 Nov, Dec, Jan, Feb, 15 Mar	

9.2.4 Block closures for small pelagic bycatch

This case illustrates a successful co-management between the industry and the FMA.

The South African small pelagic fishery is the largest fishery by catch (averaging around 400 000 metric tons) and the second largest in terms of value (around $200 million) (DFFE, 2021). The two main products are fishmeal from anchovy (and to a lesser extent sardine) and fresh and canned sardine. It directly employs more than 5 000 people, with thousands more involved in service industries. It is therefore economically and politically important, especially in the Western Cape, where coastal villages, towns and some cities often have limited economic opportunities.

The fishery spans a large part of the South African coastline, from the northern west coast near the border with Namibia to roughly Port Alfred on the East Coast, a longshore distance of some 2 000 km and on the adjacent shelf area up to about 100m depth in places.

Norman et al. (2018) have noted that management of the small pelagic fishery sector is probably the most complex of all the main commercial fisheries in South Africa, targeting three main lower trophic level (LTL) species: anchovy (*Engraulis encrasicolus*), sardine (*Sardinops sagax*) and round herring (*Etrumeus whiteheadi)*. Juvenile horse mackerel (*Trachurus capensis*) are sometimes targeted. The catch of horse mackerel is limited by a Precautionary Upper Catch Limit (PUCL) to protect the stock, since adults are targeted by a midwater trawl fishery and by the hake deep-sea trawl fishery, for which TACs are set.

These sub-sectors characterized by the various target species overlap spatially and seasonally and have limits on bycatch and other measures relating to mesh size and area controls, making spatial management a critical aspect of management.

There have recently been other spatially related developments, i.e., the management of catches in the vicinity of islands to protect penguin feeding grounds.

The occurrence of different stocks of sardine and the relationships between them has important implications for management, to prevent over-exploitation of the species as a whole and maintain the separate stocks above critical thresholds (Norman et al., 2018). In 2015 and 2016 this was done through an informal agreement between the FMA and the fishing industry that the proportion of the TAC that could be caught west of Cape Agulhas would not exceed 70% and 45.6%, respectively, the rationale being that overall sardine recruitment was primarily dependent on spawning products from the area to the west of Cape Agulhas reaching the West Coast nursery area. The aim of this measure was to ensure a sufficiently large spawner biomass in this western area. The economic and operational implications of a spatially divided TAC are not negligible, but it was crucial to take a spatial approach to avoid negative impacts on the resource and the ecosystem given the current spatial mismatch between the distribution of the sardine resource and the location of the most important landing and processing facilities (Norman et al., 2018). This combination of a non-spatial measure (the TAC) and a spatial allocation (East and West of Cape Agulhas) provides an example of interaction between spatial and non-spatial measures.

Adaptation by the industry to the spatial distribution of the stock is further complicated by annual and seasonal variability in the distribution of the two stocks between the west and the south coasts, making planning for future infrastructure development difficult.

Formal spatial measures apply to the small pelagic fisheries, as applied though specific permit conditions that are revised each year if necessary. Permit conditions prohibit purse-seine fishing in all Marine Protected Areas and Closed Areas as declared under the Marine Living Resources Act (MLRA), as well as in specific other areas and times, including as described above in the section on trawl and purse-seine exclusions (False Bay, Mudge Point, Gansbaai, Cape St Blaize – Mossel Bay), and around certain islands such as St Croix and Bird on the South-East Coast and Robben and Dassen Islands on the West Coast, Dyer Island and Riy Bank.

The fishery also applies other measures to control catch, in particular limits on bycatch, TAC and Precautionary Catch Limits for some species, e.g., round herring, small sardine and juvenile horse mackerel.

The fishery catch reporting is done on a 10'x10' grid allocation. Move-on rules[165] and block closures (see examples below) are applied when bycatch of horse mackerel or chub mackerel is high (above threshold levels).

The small pelagic fishery provides an interesting example of self- and co-operative management with the FMA. There are specific management measures in place to avoid targeting of by-catch species, for which individual total allowable bycatches (TABs) are set. This is to an extent self-managed by the industry. The South African Pelagic Fishing Industry Association (SAPFIA) established a so-called Sea Management Committee with designated Area Controllers that report to a Chief Area Controller. The Sea Management Committee meets regularly and *inter alia* reports on by-catch relative to TAB limits. In practice, fishing block closures are real-time closures triggered for a period of 7 days if horse mackerel and/or chub mackerel catches exceed 20% of the total landing by a vessel. This follows a specific protocol that is described in the permit conditions, involving designated FMA officials and area controllers from the fishery. Designated and nominated so-called "voorlooper" (forerunner) vessels are then used to test the species composition in the closed block(s) from time to time. The Chief Area Controller will declare a block open once the "voorlooper" vessel's by-catch is less than 20% and inform the FMA officials who confirm it. At the same time a real-time record of all species landings is kept and monitored to ensure that TABs are not exceeded.

In the case of horse mackerel, the targeting of juveniles in the St Helena Bay area for fishmeal, to supplement catches of other species, is seasonal with high levels of availability from January through to March. This has raised concerns about recruitment to the spawner stock caught by the midwater trawl on the eastern part of the Agulhas Bank As with other components of the catch, fishing blocks are closed when thresholds are exceeded.

In the case of chub mackerel, which concerns a small bycatch in the fishery, local areas of high availability have been identified to the north-west of St Helena Bay, off Cape Point, off Mossel Bay and possibly Cape St Francis. Again, when thresholds are exceeded, blocks are closed.

9.3 Conditions when different ABMTs have been effective, or not.

9.3.1 Kingklip spawning block – offshore

The kingklip time/area block closure to limit the impact of fishing on spawning kingklip is considered to have been quite effective. Following the stock decline of the 1990s and the introduction of the Precautionary Upper Catch Limit (PUCL), the kingklip spawning block closure was discussed and debated at great length by the FMA and the stakeholders before it was eventually adopted and included in the permit conditions.

Although there may be instances when the prohibition to fish there is violated, it has been largely accepted and adhered to by all the fisheries active in the area, which include

[165] The move-on rule simply requires that if the threshold by-catch is exceeded during a haul the vessel must immediately vacate the block and fish elsewhere. The block is then closed until the process described below allows re-opening.

the hake inshore trawl fishery, hake deep-sea trawl fishery and the hake longline fishery. There are a few factors responsible for this relatively good compliance:

- The area is exposed to rough weather conditions, is relatively far offshore, and so is only really accessible to larger, ocean-going vessels;
- All vessels larger than 13m are compelled to have Vessel Monitoring System (VMS) installed and are tracked by the FMA via a control room (most fishing vessels also carry Automatic Identification Systems, AIS);
- The area is relatively small (see Figure 9.2) and is closed for the peak spawning period only, not year-round.
- There is also relatively well-established understanding by commercial interests that spawning is crucial for recruitment and so the time/area closure has some buy-in;
- The two trawl fisheries are Marine Stewardship Council certified and have much to lose should certification be lost due to over-exploitation of a by-catch species (apart from the threat that their fishing rights can be withdrawn by the FMA).

9.3.2 Squid spawning ground time/area closures

The SA squid fishery was first formally permitted by the FMA in 1986, roughly three years after European markets were first identified and the fishery started, using small boats. Larger boats quickly replaced them and the fishery rapidly expanded. There were more than 200 boats with more than 2 000 fishers involved and it was decided not to allow any further increase in the fleet or vessel size. If vessels were replaced the number of men on board were not to be increased. This led to consolidation of vessels and manpower into larger vessels which were economically more efficient, but it had the effect of freezing participation at an early stage. At the same time, it was realized that the spawning aggregations would need some protection at peak spawning time to maximize recruitment in a fishery where almost the entire effort was directed at those spawning aggregations. Initially a time/area closure was declared for 6 weeks in December and January 1986/7. From 1998 onwards, after it became clear that the peak of spawning was in fact a little earlier, this was shifted to October/November. In 2005, longer-term fishing rights were allocated to 120 right-holder companies, with a Total Allowable Effort (TAE) of 2 422 men and 136 vessels and these rights were renewed in 2015 for a period of 15 years.

Some of the research on the species and the spawning grounds was supported by a fund managed by the fisheries association the South African Squid Management Industrial Association, SASMIA, to which most of the right-holders belonged, and these measures were strongly supported by the majority of SASMIA members. The research was conducted by scientists based in the FMA, as well as in local universities in the Eastern Cape, with a lot of interest and support from the fishery. The closures were therefore perceived to be effective in protecting recruitment and enjoyed the support of most of the fishers, vessel owners and right-holders. There have been very few violations of the closures over the years. While the stock has fluctuated considerably over the years, catches remained sustainable (Figure 9.6). The time/area closure can therefore be considered to have been highly successful.

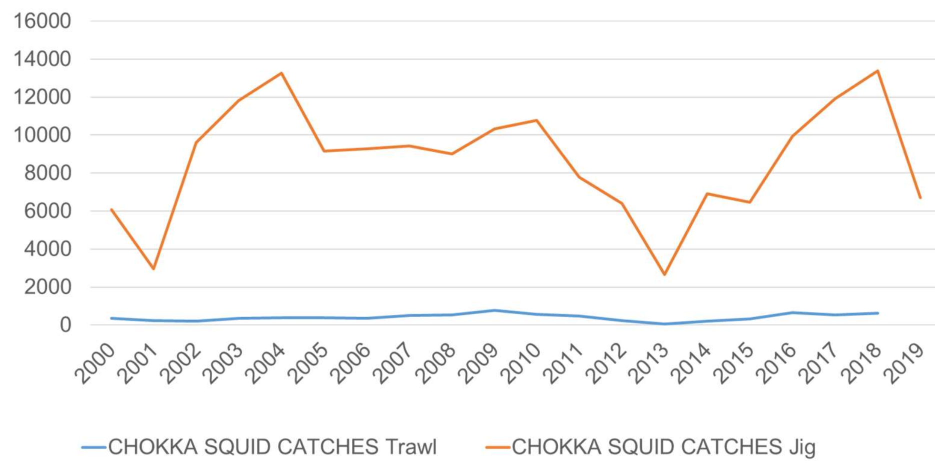


Figure 9.6: Jig and Trawl catches of Chokka squid (*Loligo reynaudii*) since 2000

Apart from the fisher support aspect, there are other factors that may be important with regard to effectiveness. The fact that the FMA acted quickly (soon after the fishery started) to protect spawning squid at the peak spawning period was probably crucial in preventing future collapses, since this is clearly a species with a short life-cycle (Augustyn 1989). It is not always necessary to have all the information on the stock status and to have exploitation models worked out. Those can come later – sometimes it is simply necessary to take common sense, practical steps to act.

One aspect that does need to be considered, however, is the impact on the fishers who need to survive over the closed period. In poor communities, there is often little space for financial planning, and it is difficult to build up a financial cushion to protect against potential loss of income.

9.3.3 Time/Area Closures in the West Coast Rock Lobster (WCRL) fishery

The strategy of having several aspects of ABMTs in place, by having zonal allocations in combination with varying time/area closures in the WCRL *Jasus lalandi* fishery is in theory a good one, because it aims at preventing localised as well as generalised depletion of the rock lobster stock and catering for differences in timing of the life cycle in different areas.

However, this fishery has proved a nightmare to manage, because of difficulties in controlling fishing effort, both by legal and illegal fishers. The fishery has been targeted for development as a small-scale fishery because the resource is relatively accessible by relatively inexpensive gear and political pressure for access from coastal communities that had been marginalized under the *apartheid* regime was intense. The problem has been controlling access at a sustainable level. The FMA (DFFE) was forced by a court decision in 2007 to develop a formal SSF policy, which was ultimately included in the MLRA in 2013 as an amendment. The first phase of the implementation of the regulations allowed designation of small-scale fishing areas Which have not yet been finalized), as well as registration of fishers considered to be bona fide small-scale fishers. The registration process was politically fraught and was ultimately declared invalid by a court order. The process was only re-started in 2022. The further phases include establishment of community co-ops and local co-management. In all the zones, particularly the southern ones, IUU fishing is rampant, aided and abetted by crime syndicates (some with international connections) and gang activity, as well as corruption (Sundstrom, 2015; Augustyn et al., 2015: 134-135)

The OMP attempts to account for poaching by indirectly estimating the IUU take from indices provided by the Wildlife Trade Monitoring Network (TRAFFIC), a global non-governmental organization monitoring the trade in wild animals and plants and the FMA's statistics from compliance data, such as apprehensions and confiscations. These indices are combined to provide an overall time series for poaching in absolute terms. The approach is applied to these indices separated by North and South areas. Results for four options for overall poaching time series are reported; these four series differ with respect to the value assumed for current local sales from poaching, which ranges from 200mt to 945mt, while the current (2022) recommended TAC is only 837 mt.

Political factors have however resulted in scientifically-based TAC recommendations being overridden by social considerations. On several occasions the Minister involved has overridden the recommended level and approved higher TACs. In 2012 the Minister overrode the scientific recommendation after political pressure but returned the following year to scientifically recommended TACs after criticism from the World Wildlife Fund (WWF). In 2015, a different Minister was taken to court by WWF after a higher TAC than recommended was again set, and the court responded with a landmark judgement that instructed the Minister to use best scientific advice in following years. In 2021 the recommendation was referred to a Ministerial advisory committee called the Marine living resources Act Consultative Advisory Forum (MLRA CAF) which again recommended a higher TAC than the scientifically recommended one.

Scientifically recommended TACs, set in terms of an OMP that have a stock rebuilding plan at its core, and that are based on the best available data about the dynamics of the resource and the fishery, and also taking account of regional aspects by employing ABMTs, should in theory be successful at ensuring a sustainable fishery with its attendant social and economic benefits.

This example illustrates, however, that it may be possible to develop a highly sophisticated ABMT in terms of zonal management that in theory should provide such benefits, but that it can be seriously undermined by social conditions and political factors that fail to take into account biological limitations and realities. It illustrates the fact that any well planned ABMT will fail within a poor ABM framework, whether underpowered for the task, or undermined by poaching and corruption.

9.3.4 Small pelagic block closures

The block closure management system, jointly managed by the small pelagic fishing industry and the FMA, aims to limit bycatch of small pelagic species like horse mackerel, chub mackerel and juvenile sardine in the small pelagic fishery for sardine, anchovy and round-herring. It has been in place for some 30 years.

Although abundance of lower trophic level species such as these are inherently highly variable and TACs fluctuate along with abundance, there is a record of good compliance with the bycatch limits and block closure processes over the years. In addition, as explained, the fishery itself has co-managed this system with the FMA. On some occasions, as Total Allowable Bycatch limits have been approached by the fishery due to higher than expected by-catch abundances they have been revised by the FMA on accession of new abundance and /or distribution information.

CHAPTER 10 - AREA-BASED MANAGEMENT IN THE COMMON FISHERIES POLICY

Prepared by Ernesto Penas Lado

SUMMARY

The chapter summarises the evolution of the common fisheries policy of the European Union as regards the establishment of area-based measures, both with a view to manage and conserve commercial fish stocks and to introduce environmental protection as part of that policy. Closed areas and seasons were first introduced in the 1980s and 1990s to protect aggregations of juveniles and spawners of commercial stocks, therefore as purely fisheries management measures. Gradually, more area-based measures were introduced in the policy for a broader objective: to protect specific vulnerable habitats or species, and that, in a border policy context: that of the coordination of the fisheries and the environmental policy of the EU. The common fisheries policy became, gradually, an instrument to implement the habitats directive of 1992 which, after the turn of the century, started to be applied to the marine environment. Today, there is a wide scope of area-based measures, with a very broad range of objectives, both related to fisheries and to the protection of marine habitats and marine biodiversity.

10.1 Introduction

When the Common Fisheries Policy (CFP) was established in 1983 for the Atlantic façade of the -then- European Economic Community, area-based management was not identified as one of the main tools to manage European fish stocks. These tools were primarily two: (1) annual catch limitations per individual stock (EU, 1983a) and (2) technical conservation measures (EU, 1983b). These included, initially, mesh sizes and minimum landing sizes. Around these tools, other pillars of fisheries' policy were also established either before or after 1983, such as a structural policy as of 1970 or a fleet policy that adopted the first fleet size limitations in 1986.

Over time, however, elements of area-based management were gradually introduced in the policy. But these instruments were not fully integrated into the evaluation/management system of the CFP. When TACs were set (for individual fish stocks), the contribution of fishery closures to fish management was not integrated in the evaluation or the decision-making process. Fishery closures were generally introduced as stand-alone measures with specific objectives (protection of juvenile fish, protection of the spawners, protection of biodiversity, etc.) but always without a clear linkage to TAC levels for the stocks concerned or affected. In addition, they tended to be permanent and not evaluated and revised regularly. This was in fact a common feature for all technical conservation measures.

In the gradual process of incorporating area-based measures, we can distinguish three main phases:

- The gradual introduction of area/time closures as part of the technical conservation measures applicable to the Atlantic façade of the EU, during the 1980s and 1990s.
- The introduction of some area-based management principles and objectives in the technical conservation measures for the Mediterranean as of 2006 (EU, 2006).
- The implementation, from the 2000s, of the marine Natura 2000 network as part of the implementation of the Habitats Directive (EU, 1992).

Let's examine these three phases.

10.2 Area/time closures in the technical measures' regulation

The initial regulation on technical conservation measures (Regulation 171/83) was subject to many amendments over time and was updated and revamped several times too. These frequent changes included the introduction of a number of area/time closures. These had different objectives and were not complete closures to all gear. The objectives were notably of several types:

a. The protection of juvenile fish.

A number of closures aimed at protecting well-identified areas where juvenile fish aggregated at certain times of the year, and in cases where the exploitation pattern of certain stocks was considered as inappropriate and detrimental for yield-per-recruit levels. The closure of two areas off the coast of Galicia, NW Spain, to protect the juveniles of the Iberian hake stock is a case in hand. The closure affected only bottom trawlers, responsible for high levels of catches of immature hake. Another example was that of the so-called 'plaice box', a large area of the eastern coast of the North Sea, a nursery ground for this stock (*Pleuronectes platessa*) where specific rules were adopted to limit the number and size of vessels authorized to fish within the area.

b. The protection of spawners.

In some limited cases, closures were adopted to protect spawners, such as for example the area/time closures adopted in the 1990s to protect spawning aggregations of herring in different areas. These were carried over in successive regulations on technical conservation measures (EU, 1998).

c. The protection of bycatch species

In some cases, area closures were incorporated into industrial fisheries to avoid excessive catches of bycatch fish. The best example is that of the industrial fisheries for Norway pout (*Trisopterus esmarkii*), where a series of area closures were adopted to avoid the bycatch of roundfish (in particular Gadoids) which were known to be particularly abundant in certain areas when conducting fisheries for Norway pout. This was also triggered by the very unselective nature of the fisheries for fishmeal. These measures were an integral part of the general technical measures' regulation since the late1990s (EU, 1998).

d. The protection of biodiversity.

A specific case must be mentioned in this context. An area of the North Sea was closed to fishing for sandeel (*Ammodites tobianus*) in order to protect the kittiwake seagull (*Rissa* *tridactyla*) which was known to feed primarily on the fish concerned. This measure, adopted in 2000 in the framework of the regulation on the technical conservation measures, was an isolated one, following increased awareness about the effects of fishing on biodiversity. In other words, it was not part of a systematic approach to protect the food source of threatened seabirds, but just one related to a well-identified case.

e. *Management of national fleets*

A fourth type of closure was one corresponding to the complexity of the integration of EU waters into a common policy. In particular, the accession of Spain to the EU in 1986 gave rise to an area-based measure to limit the number of Spanish vessels fishing in a large area around Ireland (the so-called 'Irish box'). Later on, this was complemented by a general limitation on the total effort deployed by Member States by area, in order to prevent large displacements of the fleets among large oceanic areas of the Atlantic EU waters (EU, 1995). This scheme was only a general limitation of total fishing effort by large area and was not specifically related to any specific stock.

The Irish box was maintained until its discriminatory nature (it applied only to Spanish vessels) forced a revamping whereby the limitation would apply to all Member states and would encompass an area based on a biological criterion: the so-called biologically-sensitive area, based on the main area of distribution of juvenile hake around Ireland. The new area, adopted in 2003 (EU, 2003), was not closed to fisheries, but had a specific limitation to the number of vessels by member State. This area does coincide fully with the old Irish box but largely overlaps with it, which gives a hint about its real motivation: controlling the number of vessels around Ireland.

e. *Other cases*

It is also important to refer to other cases that were discussed and sometimes adopted, though they were not consolidated over time. The idea of area-based management tools was considered as an additional method to address the problem of the management of mixed fisheries under the recovery plans for depleted stocks. The best example is that of cod in the North Sea, a stock that was subject to the first ever recovery plan as part of the CFP (EU, 2004).

In this context, the need to reduce fishing mortality on cod, when other stocks in the mixed fishery (notably the other gadoids, haddock, and whiting) were in a good conservation status forced the CFP to apply effort limitations, as strongly recommended by ICES. But these were extremely hard to accept since they led to under-exploitation of healthy stocks associated to cod. One possible way around this problem was the establishment of area-based limitations, in areas of high concentration of cod juveniles and/or spawners, so as to allow full consumption of quotas for healthy associated stocks outside these areas. It was well demonstrated that the level of association in the catch between cod, haddock and whiting was variable on a geographical basis, opening up the door for area-based solutions to dissociate the three species in the catch. However, the data on distribution of cod juveniles and spawners proved that their areas of distribution were extremely variable and changed dramatically between the years and even within years. This made it impossible to establish such area-based instrument, at least as a stable one.

Another instrument, largely identified in the context of cod recovery, was the possible use of real-time closures. Generally agreed as an effective and flexible tool and known to be applied in Norway and other countries with -reportedly- considerable success, the idea was finally incorporated into EU legislation though, strangely enough, as part of the control regulation of 2009 (EU, 2009). The tool, however, was never used at EU level. The reasons are two-fold: (a) the tool's *raison d'être* is quickness, something hardly compatible with the EU's heavy-handed decision-making procedures, and (b) the lack of the basic conditions to make the tool operational, and notably the establishment of quick information and alert system allowing the rapid closure once an aggregation of juveniles is identified. The lack of trust among EU's Member States fleets did not allow for the establishment of a quick, reliable and trustworthy system of alert to trigger the system, based on the observations from the industry. It is noteworthy, in this vein, that the system was applied by Scottish fishermen on a voluntary basis, and not extended even to the rest of the UK.

f. The protection of deep-sea stocks and habitats

The protection of Europe's deep-sea has been also subject to area-based measures. Characteristically, this started as a regime to protect deep-sea stocks, but gradually evolved towards a more environmentally-oriented objective: the protection of the vulnerable ecosystems of the seabed.

Fisheries for deep-sea stocks were developed in Europe in the 1990s, taking place at considerable depths, for such stocks as alfonsinos (*Beryx decadactylus*), black scabbardfish (*Aphanopus carbo*), roundnose grenadier (*Coryphaenoides rupestris*), red seabream (*Pagellus bogaraveo*) and some deep-water shark species. The first management measures were adopted in 2002: biannual TACs (EU, 2002a) and access limitations (EU, 2002b).

In 2016, after years of decreasing TAC levels for the stocks concerned, the management of deep-sea stocks, combined with the protection of deep-sea marine habitats gave rise to the adoption of a new deep-sea access regulation (EU, 2016). This regulation set out to improve the state of deep-sea stocks and vulnerable deep-sea ecosystems by establishing new area-based rules and limits for access to these fisheries and fishing grounds. It was the first time in which the CFP established area-based measures with a declared double purpose: manage fish stocks and protect the environment. To that end it established area-based limitations to the access of fishing vessels to deep-sea areas, along three lines:

1) Limit fishing for deep-sea fish to areas where they have fished in the past (their so-called 'fishing footprint'), thus ensuring that pristine environments remain untouched. To that effect, vessels had to report their fishing areas in the period 2009-2011, and their future fishing was made limited to these areas.
2) Bottom trawling was banned in waters of more than 800m of depth, and
3) Six years later, in 2022, 87 areas with vulnerable marine ecosystems (VMEs) or where such ecosystem were likely to exist, were closed to bottom fishing, meaning bottom trawls, dredges, bottom-set gill nets, bottom-set longlines, pots and traps. The areas concerned were situated in the continental slope of the EU Atlantic façade, between 400 and 800m of depth (EU, 2022).

It is to be noted that, contrary to the first closures on deep water coral communities, that did not ban all gear, the last measures adopted in 2022 are complete and affect all gear that can have contact with the sea bottom. To this day, these three measures are the most complete and systematic area-based management system in the CFP.

In addition, the reform of the CFP in 2013 considered area-based management as one of the possible instruments of the policy. In particular, it established the notion of 'fish stock recovery area', where specific area-based measures would apply to recover specific stocks (EU, 2013). This provision, however, was made dependent upon Member State's initiative, under the newly-created mechanism of regionalization. However, this mechanism, in a policy characterized by initiative from the European Commission, has not produced results since Member States generally refrain from proposing new closures beyond those already adopted or under consideration. The provision in question, in any case, consolidated the continuity of existing 'biological sensitive areas', in a reference to the above area around Ireland.

g. *Evaluation*

The evaluation of the above measures is not straight-forward. The Commission has carried out evaluations by the STECF but these have been largely inconclusive. The main reason for this was the lack of specific objectives for many of these area closures. This means that it was difficult to evaluate the usefulness of an area closure when its very objective was not always clear in the first place. In addition, its relationship with the other management tools (in particular TACs) was never established, so it was difficult to evaluate the contribution of these closures to the overall status of the stocks. Last but not least, the closures tended to be permanent features when the problems they addressed were not necessarily permanent or even stable. In some cases, the closures remained for a long time when the problem that gave rise to their establishment was long over. In any case, in a specific report of STECF in 2007 the evaluation concluded that for some of the closures, it was not possible to identify any conservation benefit (STECF, 2007). As a result, some of these closures were removed as unnecessary, and their contribution to fish management went fundamentally unknown.

It is important to understand that one of the reasons for the inability by STECF and the Commission itself to identify the management objective of the closures adopted in the 1980s and even the 1990s was the lack of transparency of the regulations in this regard. This, in turn, was often the result of certain closures being established to address questions of competition among fleets, something that, understandably, did not leave a trace in the text of the regulations. The knowledge of these circumstances and motivations remained only known to certain -and very limited- number of people with a long historical memory and was largely unavailable to scientists in STECF.

The case of the closure for the protection of the kittiwake seagull required a different evaluation, since its objective was environmental, not fisheries-related. This closure has been considered as having positive effects on seabird conservation in the area concerned (Wanless et al., 2008). As for the real-time closures applied by the Scottish fleet, the preliminary evaluations show beneficial results (Needle & Catarino, 2011)

Finally, a more recent evaluation of technical conservation measures, concluded *inter alia* that: "*The use of spatial and temporal measures may have unintended consequences in that by closing areas to fishing either permanently or temporarily could led to* *displacement of effort into other areas and also the possibility of creating gear conflicts between static gear and towed gears*" (STECF, 2017). This encapsulates the problem with area-based instruments as part of mainstream management of fish stocks in the EU: their value is depending upon what happens outside these areas, and this is in turn dependent on other instruments such as catch or effort limitations.

10.3 Area-based management in the Mediterranean

The case of the Mediterranean must be examined separately for a reason: the instruments of the CFP of 1983 were not applied to the Mediterranean. In this sea, the first management measures established by the CFP in 1983 did not apply (regulations 170/83 and 171/83 did not even mention the Mediterranean Sea). The first measure was the technical measures regulation adopted in 1994 (EU, 1994), and these were basically a harmonization of existing national measures of the time.

The first attempt to establish management tools for Mediterranean stocks was the regulation of 2006 where, in the absence of TACs (strongly opposed by all concerned Member States and considered poorly adapted to the Mediterranean's generally multi-species fisheries), the main tools identified for management, beyond the already existing mesh sizes and minimum landing sizes, were (1) effort management and (2) closed areas. This was in fact the first time in which the CFP identified area-based measures as a primary instrument for fisheries management, but id did so because the traditional Atlantic tools (TACs and quotas) did not apply.

In the absence of stock-specific management measures, management in the Mediterranean basin concentrated on effort and spatial management. As for spatial management, the regulation established a basis to establish two kinds of closed areas: at national level to be established by Member States within their territorial seas, and beyond these areas, through an EU procedure. Interestingly, by the time this regulation was adopted, the consideration of environmentally-oriented measures within the CFP was already becoming mainstream, and the regulation reflected that by establishing the closures as based on fisheries management and/or environmental protection from fishing.

Contrary to the practice in the Atlantic, the Mediterranean approach was to establish the basis for the establishment of area closures but leaving the specific closures for a bottom-up procedure, led by Member States. This, in turn, resulted in a very low number of closures being established in practice, although the exact number and extension has not been subject to specific reporting. It is important to note, however, that in order to facilitate their establishment, the structural regulation of 2014 established specific subsidies for fleets that would be affected by the closures established under the regulation (EU, 2014).

Despite this apparent failure, the value of area-based instruments in the Mediterranean was demonstrated by the first-ever multiannual management plan for demersal stocks adopted in this sea, for the western Mediterranean. This plan included provisions restricting trawlers from operating on the seabed less than 100m deep, from 1 May to 31 July each year, to reserve the coastal zone for more selective gears, in addition to an effort scheme applicable to the fisheries for the main stocks (EU, 2019). In addition, the plan contemplates the possibility of adopting additional closed areas to protect aggregations of spawning individuals of hake.

a. Other cases

The Mediterranean system has also some specific cases. One of them was the protection of seagrass beds of the phanerogam *Posidonia oceanica*. This protection did not have specific coordinates, so it was dependent upon Member States' mapping of the areas where their vessels operated. In fact, the only fleet identified as operating on Posidonia beds was the French fleet of *gangui*, a small-scale trawl. After many years of discussion, *gangui* on Posidonia beds was authorized only under certain conditions in 2018 (EU, 2018).

Another, more specific case of area-based management, included in the 2006 regulation on technical measures (EU, 2006) was the ban on fishing in areas of more than 1000m of depth. This was a preemptive measure since, at the time, there were no Mediterranean fisheries at those depths. The reason for this large closure was two-fold: (a) the protection of seabed biodiversity in the basin and (b) the preservation of the 'refuge effect' that, allegedly, allowed the pursuit of Mediterranean fisheries at very high fishing mortality levels without collapse. Though the evidence of this refuge effect (including depths of more than 1000m) was and remains controversial, the absence of fisheries in these areas made the measure a preemptive one that was easily acceptable by operators.

b. Evaluation

There is a noticeable deficit in reporting on the use of area-based measures in the Mediterranean Sea as part of the implementation of the 2006 technical conservation measures. Nevertheless, different authors have studied the question, at least for some subregions. For example, Tuset *et al.* (2021) have demonstrated that the closed areas for demersal fisheries have increased biomass and altered species composition in the areas concerned, particularly as a result of the exclusion of bottom trawl fisheries. Another evaluation referred to the closure of bottom trawl fisheries in all areas within the 50m isobath. The authors found that the measure was not sufficient to address overexploitation and that it forced small scale trawlers to convert to other gear, thus increasing pressure on the coastal areas that the measure intended to protect, thus compromising its very objective (Pranovi *et al*., 2015).

10.4 Environmentally-led closures: Natura 2000

The third type of area-based fishery measure is the implementation of the Habitats Directive of 1992. Initially intended to protect land habitats, its purpose was extended to marine habitats at a later stage. It is to be noted that although the objective of these measures was the protection of marine habitats, the implications for fisheries were implemented using the legal instruments of the CFP, because this policy is of exclusive EU competence, so Member states cannot regulate fisheries in these areas on their own. This is significant, because it means that the EU fisheries policy is in fact the main instrument to implement environmental protection of the European seas.

a. The cases

A number of area closures were established on that basis over the years. The closures were permanent but did not include all gear. All of them banned bottom trawling and none of them banned long-lining. As for gillnets, this was more variable, depending upon the type of habitat to protect and the estimated damage by gear type.

The first of these cases was that of the Darwin Mounds, an area of deep-water corals discovered in 1998, and closed in 2003 through an amendment to the 2003 regulation on technical measures. Other areas followed, such as the Porcupine Bank or El Cachucho in different areas of the EU's Atlantic waters. Among these areas, it is the Darwin Mounds that have been subject to more research. While the area was reasonably well enforced and prevented further deterioration of the deep-water coral communities, the monitoring of the area after the closure showed relatively little recovery of the areas previously affected (Huvenne *et al.*, 2016).

It is to be noted that, unlike the CFP, where the Commission has the exclusive right of initiative, the Natura 2000 network is initiated by Member states. This gives rise to a very different number of proposals for closures under the Natura 2000 framework. As a result, a report of the European parliament in 2010 revealed that 31.5% of the German EEZ was covered by Marine Natura 2000 sites, compared to 19% for the Netherlands, 12.3% for Denmark and 2% for the United Kingdom (EP, 2010).

This is a problem of the EU environmental policy: since it is a mixed-competence policy, there is very limited capacity to ensure a coherent implementation of the policy, as it is the case with the CFP. And it is another example of how fisheries policy is increasingly influenced by environmental policy: the Natura 2000 areas were designated to protect the marine environment, with relatively little consideration of the effects on fishing activity.

b. A fast-track procedure under the CFP

The i9mplñememtation of marine Natura 2000 closures under the CFP, however, posed a problem of competence: while the habitats directive is a mixed-competence legislation, the initiative to protect marine areas was for member states. But since the CFP is an exclusive competence policy, member States could protect these areas from different human activities but not from fishing. This produced a difficult situation where a Member State proposed to protect a marine area but the Council of Fisheries Ministers would not agree to ban fisheries in such area.

To overcome this difficulty, the CFP reform of 2013 introduced a fast-track mechanism whereby, when a member State proposes to close an area under Natura 2000, the CFP will adopt the necessary measures to protect the area from fishing under a fast-track regionalized procedure. This procedure speeds-up the implementation of fisherie's part of the Habitats Directive but, at the same time, limits considerably the ability of the CFP itself to adopt its own measures taking into account fisheries considerations.

c. The Aichi targets of the CBD

EU policy implemented the Aichi targets of the CBD primarily through the Natura 2000 network referred to above. The evaluation of the implementation of the Aichi targets is complex, because of the different nature and implications for fisheries of the different closure adopted at EU level, either as part of the CFP or through environmental policy. The question of whether certain area-based management measures qualify as Marine protected areas, or as other area-based environmental measures (OECMs) remains controversial. The European Commission, in any case, has evaluated the status of protection of EU waters through area-based management measures as corresponding to 11% of these waters, in the communication on the EU biodiversity strategy published in 2020 (EU, 2020). The Commission, in this framework, anticipated the objective being discussed at the Convention on Biological Diversity and set out to achieve a 30% protection of EU waters by 2030 through area-based measures, thus concluding that for the years to come an additional 19% of the EU maritime waters should come under the protection of area-based measures.

d. The Marine Strategy Framework Directive

In addition to the Nature 2000 network, another piece of EU environmental legislation may give rise to area-based measures within the CFP: the Marine Strategy Framework Directive (MSFD). Adopted in 2008, the directive sets out to achieve the so-called "good environmental status" for all marine waters by 2020 (EU, 2008). This generic objective is broken down in 11 descriptors. While none of them is in principle area-based by definition, there is one that is likely to lead to area-based implementation. It is descriptor 6: seabed integrity.

The MSFD is an integrated instrument, which means that, if and when an area of the seafloor will be eventually closed, it should be on an overall evaluation of impacts, including, but not being exclusive to fishing. At present, the mapping of activities that can affect seabed integrity is being elaborated, and this will, eventually, lead to area-based limitations on a number of activities, which may include fishing.[166]

e. The future biodiversity conventions

In the future, the use of area-based management in the EU will be primarily dependent upon the implementation of the two biodiversity conventions under development: the new objectives of the Convention on Biological Diversity for 2030, and the new UN Convention on the protection of biodiversity beyond areas of national jurisdiction (BBNJ), already anticipated by the EU biodiversity strategy of 2020 mentioned above.

The consequences of this development on EU fisheries will depend on a number of questions, but notably two: (a) who will decide what are the areas included in the 30% of marine protected areas by 2030, what would those areas be and what role will fisheries play in determining such areas, and (b) whether the marine protected areas will imply a complete ban on fisheries (as was the case with the 87 fishing areas closed to all bottom fishing in the continental slope in 2022) or, on the contrary, what fisheries, and under which conditions, will be allowed to be conducted under conditions that will respect marine biodiversity. This should lead to the discussion on the possible muse of other effective area-based conservation measures to achieve the objectives of the conventions. These instruments have been already used successfully to achieve biodiversity objectives (Dudley *et al*., 2018; Garcia et al., 2022).

---

[166] https://ec.europa.eu/environment/marine/good-environmental-status/descriptor-6/index_en.htm

10.5 Conclusions

From the brief descriptions above, certain conclusions can be drawn:

- In the Common Fisheries Policy for the Atlantic, area-based solutions have not been a central instrument in the management of fisheries. They have been complementary measures, never fully combined with the management of individual fish stock measures.
- Existing and past area-based measures in the CFP have very different objectives, from the protection of juveniles and spawners to the general management of fishing effort among large oceanic areas. These objectives have sometimes not been well spelled out.
- There is little or no relationship between these closed areas and the general management regime for individual stocks in the Atlantic area, notably TACs and multiannual plans. For this reason, the contribution of these areas to the management of individual stocks is not easy to determine.
- In the Mediterranean, area-based measures are a more relevant instrument of fisheries management, given that there is no management of individual stocks in this basin.[167]
- The introduction of area-based measures on a systematic basis has been determined by environmental policy, primarily by the habitats directive of 1992, and subsequently by the EU and international policy to protect biodiversity.
- The evaluation of the environmentally-led is relatively straightforward because they have allowed the preservation of ecosystems with high diversity that might otherwise have been lost. However, the closed areas as part of the mainstream fisheries policy are made difficult because of often unclear objectives, lack of connection with the main management measures for fish stocks, and the effects of fishing outside the areas concerned.

[167] With the exception of measures for bluefin tuna, adopted multilaterally by the International Commission for the Conservation of Atlantic Tunas (ICCAT).

CHAPTER 11 - THE COMMERCIAL FISHING INDUSTRY AND MPAs

by Carel Johann Augustyn and Claire Ward[168]

SUMMARY

The views of some South African and other international commercial fisheries are increasingly that rigorous fisheries management and improved governance are more effective for sustainability than primarily focusing on the development of new MPAs. Scientific collaboration among governments, ENGOs and the fishing industry is key and South African examples are given where it has led to the declaration of new MPAs where appropriate. A blanket approach to the declaration of MPAs such as the CBD's "30x30" initiative is however not supported. Rather it appeals for closer stakeholder consultation and collaboration and suggests alternatives such as better fisheries management, given that climate change is mostly driving change in the ocean, not fishing, and that MPAs cannot protect against the impacts of climate change. Fisheries Associations around the world are beginning to apply rigorous science to study their impacts and effective alternatives to blanket MPA expansion.

Although fish populations are still declining in some parts of the world where management is poor (FAO, 2022), in many others rigorous fisheries science and improved governance have led to stock recovery, improved catch rates and enhanced profitability for fishing industries. At the same time, scientists are starting to disprove the commonly held notion within part of the conservation constituency, that declining fish populations cannot be rebuilt without closing off large areas of the ocean to fishing (Hilborn et al., 2020). It is against this backdrop that fishing industry representatives and associations from around the world are confronting a strident global campaign to protect 30 percent of the world's land and oceans by 2030 – a lobby that is neatly captured by the slogan "30x30".

Over the past 50 years, most commercial fisheries around the world have become organised into fisheries associations. Among other things, such associations strive to deal formally with authorities that allocate rights, enact legislation and enforce regulations at the local level. At a global level, the associations contribute to the policy and strategy development of large international organizations. A good example is the Marine Stewardship Council (MSC) which has included in its Stakeholder Advisory Council representatives of several commercial fisheries associations who engage it on scientific and other matters relating to the global management of fisheries.

Whereas in the past, fisheries associations largely worked with scientists employed by fisheries authorities, over time many of the larger and better resourced associations have engaged their own experts to scrutinise scientific processes and decision making, as well as management practices and compliance activities that affect all aspects of their operations. In such cases, working groups of recognised scientists representing a range of

[168] South African Deep-Sea Trawling Industry Association (SADSTIA). The paper is based on the experience and views of the South African fishing industry and following consultation with colleagues and fisheries associations in other parts of the world.

interests, including environmental non-governmental organisations (ENGOs), have been set up as a means of consulting on scientific issues, including the setting of total allowable catch, permit conditions and new management measures. Consequently, it is now no longer unusual for fisheries associations, scientists and managers to arrive at consensus positions. This has certainly been the case over at least the last 30 years in South Africa and Namibia, where such a system has evolved and resulted in most fisheries being managed in a sustainable way. Where fisheries have declined despite such cooperation, this is has largely been caused by illegal, unreported and unregulated fishing on easily accessible inshore resources.

Given the spirit of cooperation that has characterised fisheries management in South Africa, it is unsurprising that over a period of approximately 10 years (2007–2016) fishing industry associations supported and actively contributed to an initiative to increase protection of offshore ecosystems. As a result of this initiative, 20 new marine protected areas were declared in 2019. Currently, a total of 39 marine protected areas safeguard 14.56 percent of South Africa's oceans. The hake trawling industry, which is by far South Africa's most important commercial fishery and has been certified as sustainable and well-managed by the MSC since 2004, specifically observes the boundaries of 12 offshore marine protected areas (Figure 1).

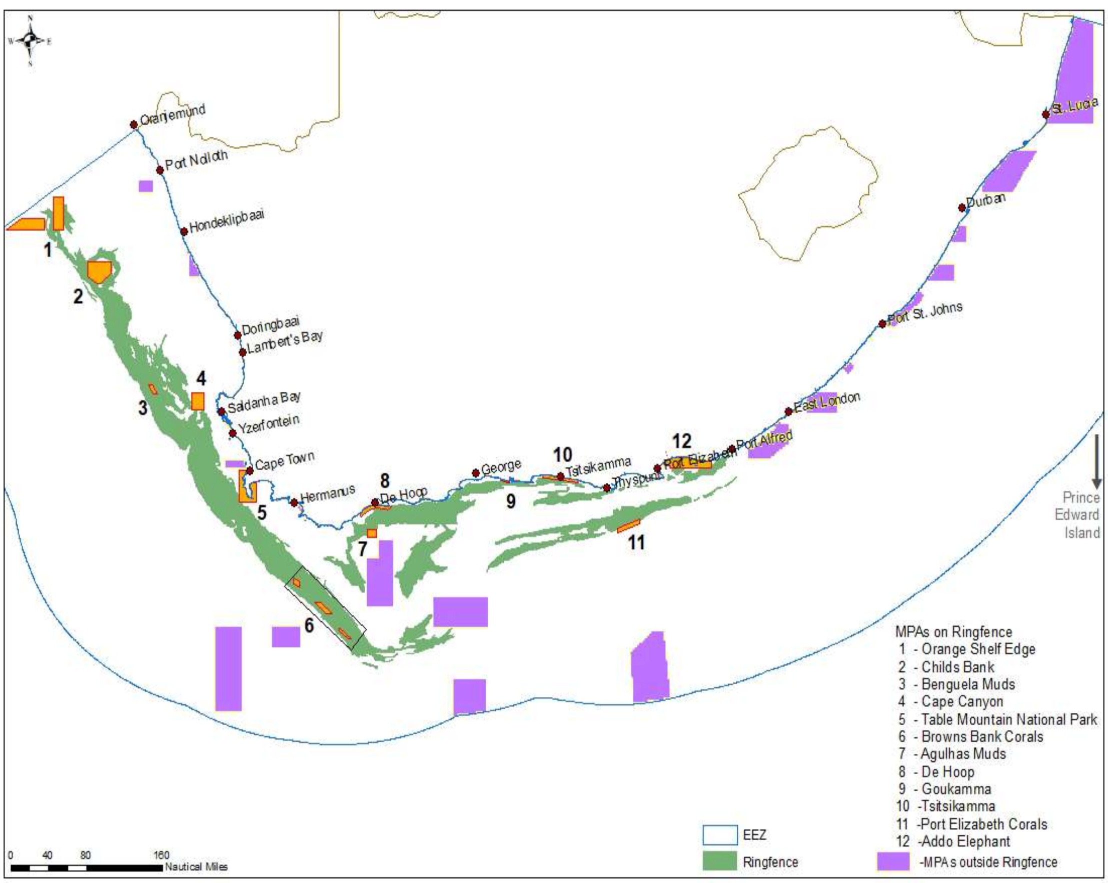


Figure 11.1: The footprint of the South African trawl fishery for hake and the position of the marine protected areas that impact the fishery (courtesy of Nozipho Mkhabela, Irvin & Johnson (Pty) Ltd).

In addition, where there have been clear and specific objectives for closing areas to fishing –such as spawning ground closures that may enhance recruitment and benefit a fishery – there has been unequivocal support from the South African fishing industry. This is the case with the so-called "kingklip box", which was introduced in 2008 to protect spawning aggregations of kingklip, a valuable bycatch of the trawl fisheries for hake (See Chapter 8 – Case study 1).

Despite these examples of constructive cooperation, the overall rationale and strategy of the South African state on marine protected areas has not been communicated to stakeholders and to date the fishing industry has been absent from discussions around the target of the Convention on Biological Diversity (CBD) to conserve at least 30 percent of land and sea areas in protected areas by 2030. South Africa is a signatory to the CBD and if the country is to meet the targets set out by the Convention, it would need to double the size of its existing marine protected areas, or declare many more.

As is the case in many other countries, ENGOs often set the scientific and political agenda in South Africa, but stakeholders that may be negatively affected by an increasingly strident environmental lobby often are not consulted and eventually find themselves fighting a rear-guard action. A good example is the declaration in the early 2000s of the Sixteen Mile Beach marine protected area, ostensibly to protect a sandy beach and intertidal ecosystem. However, the marine protected area also excludes small pelagic fishing up to 3 nm offshore of a prime fishing ground. Although fishers rightly contend that purse seine fishing for sardine and anchovy has no impact on the ecosystem objectives of the protected area, all attempts to lift the fishing prohibition have been unsuccessful, in spite of the fact that no logical reasoning for the ban has been put forward by the State.

A comparable lack of a comprehensive and coherent suite of policies to understand and address ecological and socioeconomic displacement issues is identified by the National Federation of Fishermen's Organisations and the Scottish Fishermen's Federation which recently published a strongly worded objection to proposals by the Department for Environment, Food and Rural Affairs to designation a number of Highly Protected Marine Areas in English waters.[169] The two fisheries associations object to "*the absence of policies to deal with large-scale displacement from customary fishing grounds*", an *"inadequate approach to evidence*", the abandonment of "*a careful, evidence and dialogue-based approach to establishing and managing a network of marine protected areas*" and a "*rushed and inadequate process that sidesteps the elephant in the room: displacement*".

In their statement, the NFFO and the Scottish Fishermen's Federation capture the experience of many commercial fishing associations who engage with ENGOs and environment agencies around the question of marine protected areas, characterising the problem of displacement, and the profound consequences it might have as "a spatial squeeze". In the view of many associations, marine protected areas encroach on and limit fishing in areas that have, in some cases, been fished for centuries. Trawlermen, for example, may consider trawl grounds to be akin to agricultural land, where they have harvested demersal resources sustainably, almost in perpetuity. In some countries, fishers

[169] https://www.nffo.org.uk/highly-protected-marine-areas-nffo-response

may have historical use rights that have been recognized in international and national legislation.

As the NFFO and Scottish Fishermen's Federation point out, 38 percent of the United Kingdom's waters are already designated as marine protected areas of one kind or another. South African law is unusual in the sense that marine protected areas are generally no-take areas and the older protected areas in particular are emphatically no-take areas.

It is against this backdrop that the South African trawl fishery for hake recently developed a position on marine protected areas. The position is informed by the notion that marine protected areas cannot be the only solution for ocean challenges. Six distinct points are made:

1. Climate change is driving most of the change in the oceans – not fishing**.** Increases in the frequency of high sea surface temperature events, ocean acidification and rising sea levels are responsible for most of the change that is taking place in the oceans, at both global and coastal scales. Shipping, organic chemical pollution and nutrient pollution from land-based sources, as well as some forms of fishing, are also having impacts but these are far outweighed by climate change (Halpern *et al*., 2019). In the case of Alaskan cod, this has recently been investigated by the United States' National Oceanic and Atmospheric Administration.[170] In addition, while fishing impacts on stocks and on trawlable habitats have been demonstrated to be reversible with good management, this is unlikely with heavy forms of pollution and climate change. Experience in the Northern Hemisphere e.g. with Gulf of Alaska king crab (Bechtol et al., 2009), St Paul and St Matthew's blue king crab, Pribilof Islands blue king crab (Stockhausen, 2017), Pacific cod and Bogoslof pollock (Bailey, 2011) has demonstrated that climate change and large, abrupt, persistent changes in the structure and function of ecosystems (regime shifts) can upset historic harvest levels. Scientists are learning that climate change may require a change in expectations for species that are most vulnerable and that even the most restrictive management measures – fishery closures for example – may not result in a return to pre-climate change catch levels, e.g. in the case of the Walleye Pollock in the Aleutian Basin (Bailey, 2011). Rather than looking to marine protected areas as a solution, managers should focus on how to create robust, data-rich management structures that provide flexible and adaptive responses to climate change impacts (the opposite of static area closures).

2. Marine protected areas cannot safeguard marine ecosystems from climate change**.** Researchers studying a marine protected area on the west coast of the United States of America in 2020 demonstrated that fish communities inside the protected area were not shielded from the impacts of a marine heat wave (Freedman et al., 2020).

---

170 https://www.fisheries.noaa.gov/feature-story/alaska-cod-populations-plummeted-during-blob-heatwave-new-study-aims-find-out-why

3. The objectives of declaring a marine protected area are often primarily focused on biodiversity conservation and can seldom be shown (especially in the case of migratory species) to provide any real benefits to fisheries. There may be exceptions to this rule, but these primarily apply to sedentary species rather than to the stocks that are targeted by most demersal and pelagic fisheries. Most fish are highly mobile and fishers follow them outside the protected area where they can potentially catch the same number but at greater cost. Fishing effort is displaced, not reduced, potentially resulting in greater habitat impacts and more incidentally caught fish.

4. The key to sustainably managed fisheries is to follow the science-to-management blueprint. Rigorous, science-based fisheries management is a far better method for ensuring sustainable fisheries than marine protected areas designed for biodiversity protection purposes with little or no consideration for their social, cultural and economic consequences. South Africa's hake deep-sea trawl fishery provides an excellent example of how regular stock assessments and a science-based approach to fisheries management can establish and maintain the sustainability of an economically important fishery. A science-based management strategy that was introduced in 2006 aimed to restore the stock of deep-water hake to a level which could provide the maximum sustainable catch over a 20-year period, but this level was achieved five years ahead of schedule. Today, stock assessment models suggest that the biomass of both species of Cape hake is well above the maximum sustainable catch level. (SADSTIA, 2022)A similar example is provided by the scallop fishery on the Georges Bank (Tran et al., 2022).

5. A sustainable fishery results in real socio-economic benefits. In South Africa, the hake deep-sea trawl fishery makes an R8.5 billion (USD 500 million) per year contribution to the South African economy and supports an estimated 12 600 jobs. Closing areas to fishing can have negative socio-economic consequences (Hilborn ***et*** al., 2006) and can impact the cultural history of fishers.

6. Marine protected areas should not be a substitute for poor management**.** The management of the South African hake deep-sea trawl fishery is highly regarded internationally and there is empirical evidence to show that fisheries management is working in many parts of the world, especially but not exclusively in North America and Europe, Australia, New Zealand and Japan. Rather than striving to meet the 30 percent protection target of the CBD, the fishing industry advocates investments in stock assessment surveys, promoting science-based fisheries management and demonstrating that government and industry can work together constructively for the benefit of the environment, the economy and society. The use of marine protected areas in fisheries should be limited to areas or fisheries which cannot be managed in any other way. The views of a northern European fisheries association are pertinent in this regard: "*large-scale use of MPAs may be appropriate if you have very data poor fisheries and fishing grounds. In such a situation a good level of precaution can be achieved without knowing too much*

about ecological status and your own impact. It is a blunt tool (and there is nothing wrong with that if that is what the job requires). However, when you have a sophisticated science and management system, with stock surveys, ecosystem monitoring, seabed mapping, vulnerable marine ecosystem protection and gear regulations, etc., it is simply *<u>the wrong tool</u>*. *The consequences of using this blunt tool for a sophisticated job most importantly leads to increased fishing effort to catch the same amount of food, leading to increased carbon emissions, increased habitat impact in areas outside the MPA, and increased costs*".

The South African fishing industry is taking a scientific approach to marine protected areas and this approach has been endorsed and supported by representatives of other fisheries from around the world, e.g. Norway, Canada, the United States and Spain – all major fishing nations that have been consulted by the authors for their comments.

On a global level, there is recognition that the fishing industry needs to collect its own data on its impacts on, and recovery of, habitat to counter what are perceived to be biases with respect to fishing impacts, particularly bottom trawling and the extent of bottom trawling coverage. The European Bottom Fishing Alliance has been set up to address this issue within a scientific framework, because there is a realisation that the interaction of trawl fisheries and marine protected areas is likely to lead to serious problems in the European Union. Similarly, the South African Deep-Sea Trawling Industry Association has since 2013 supported a study on trawl habitat recovery on the northwest coast of South Africa. Over a five-year period, trawled areas were compared with non-trawled areas in a specific set of experimental trawl lanes (SADSTIA, 2016). Analysis of the data is still underway, but indications are that the impacts of trawling on benthic fauna are relatively light and that recovery does take place. Recent work out of the east coast of the United States is showing recovery of habitat from scallop dredging in a six-year period (Tran et al. 2022; Gallagher, et al. 2022). This research, when combined with the limited size of the grounds actually impacted by the fishery, paints a very positive picture of the habitat impacts of the Canadian scallop fishery and indicates that impacts might be more effectively dealt with by rotational fishery closures instead of permanent marine protected areas. The rationale is that a valid alternative would need to be more cost-effective, or as effective but easier to implement.

These views have not been canvassed comprehensively, but they represent a snapshot view of what are common perceptions and reactions to the powerful 30x30 lobby in many commercial fisheries around the world, particularly larger fisheries that are certified as sustainable by the MSC.

BIBLIOGRAPHICAL REFERENCES

Abbott, J.K. & Haynie, A.C. 2012. What are we protecting? Fisher behaviour and the unintended consequences of spatial closures as a fishery management tool. Ecological Applications, 22(3): 762—777.

Aburto, J.A.; Gaymer, C.F.; Govan, H. 2020. A large-scale marine protected area for the sea of Rapa Nui: from ocean grabbing to legitimacy. Ocean and coastal management, 198: 13p. https://doi.org/10.1016/j.ocecoaman.2020.105327

Adams, V.A.; Iacona, G-D. & Possingham, H.P. 2019. Weighing the benefits of expanding protected areas versus managing existing ones. Nature Sustainability, 404 (2) : 404–411. https://doi.org/10.1038/s41893-019-0275-5

Adger, N. & Jordan, A. (Eds). 2009. Governing sustainability. Cambridge. Cambridge University Press: 338 p.

Afflerbach, J.C.; Lester, S.E.; Dougherty, D.T. & Poon, S.E. 2014. A global survey of ‘’TURF- reserves’’, Territorial Use Rights for Fisheries coupled with marine reserves. Global Ecology and Conservation, 2: 97–106

Agardy, T. 1997. Marine Protected Areas and Ocean Conservation. Academic Press, San Diego, CA.

Agardy, T. 2003. An environmentalist' perspective on responsible fisheries: the need for holistic approaches: 65-85. *In:* .Sinclair, M. & Valdimarsson, G. (eds). *Responsible fisheries in the marine ecosystem*. Wallingford (UK) and Rome (Italy). CABI publishing and FAO: 426 p.

Agardy, T., Bridgewater, P., Crosby, M.P., Day, J., Dayton, P.K., Kenchington, R., Laffoley, D., McConney, P.; et al. 2003. Dangerous targets? Unresolved issues and ideological clashes around marine protected areas. Aquatic Conservation: Marine and Freshwater Ecosystems, 13: 353-367.

Agardy, T.; di Sciara, G.N. & Christie, P. 2011. Mind the gap: addressing the shortcomings of marine protected areas through large scale marine spatial planning. Marine Policy, 35: 226-232.

Agardy, T.; Claudet, J. & Day, J.C. 2016. "Dangerous targets" revisited: old dangers in new contexts plague marine protected areas. Aquatic conservation: Marine and freshwater systems, 26 (Suppl. 2): 7-23

Agrawal, A. & Gibson, C.C. 1999. Enchantment and disenchantment: the role of community in natural resource conservation. World Development, 27: 629-649.

Alban, F., Boncœur, J. & Roncin, N. 2011. Socio-economy-Assessing the impact of marine protected areas on society's well-being: an economic perspective: 226-246 in *Marine protected areas. A multidisciplinary approach*. Claudet, J. (Ed.). Cambridge. Cambridge University Press.: 375 p.

Alexander, K.A.; Wilding, T.A. & Heymans, J.J. 2013. Attitudes of Scottish fishers towards marine renewable energy, Marine Policy, 37: 239-244. https://doi.org/10.1016/j.marpol.2012.05.005

Andradi-Brown, D.A.; Veverka, L.; Amkieltiela; Crane, N.L.; Estradivari; Fox, H.E.; Gill, D.; Goetze, J. et al. 2023. Diversity in marine protected area regulations: Protection approaches for locally appropriate marine management. Front. Mar. Sci. 10:1099579. doi: 10.3389/fmars.2023.1099579

Apollis, G. 1981. L’emprise maritime de l’État côtier. Paris. Pedone

Arlidge, W.N.S.; Squires, D.; Shigueto, J.A.; Booth, H.; Mangel, J.C.; & Milner-Gulland, E.J. 2020. A mitigation hierarchy approach for managing sea turtle captures in small-scale fisheries. Frontiers in marine science. Doi: 10.3389/fmars.2020.00049: 26 p.

Arthington, A.H.; Dulvy, N.K.; Gladstone, W. & Winfield, I.J. 2016 . Fish conservation in freshwater and marine realms: status, threats and management. Aquatic Conservation Marine and Freshwater Ecosystems, 26: 838-857

Armitage, D.; Charles, A.; Berkes, F. 2017. Governing the coastal commons. Communities, resilience and transformation. Earthscan from Routledge: 272 p.

Armitage, D.; Mbatha, P.; Muhl, E-K.; Rice, W. & Sowman, M. 2020. Governance principles for community-centred conservation in the post-2020 global biodiversity framework. Conservation Science and Practice (Review). https://doi.org/10.1111/csp2.160

Arthington, A.H.; Dulvy, N.K. ; Gladstone, W. & Winfield, I.J. 2016 . Fish conservation in freshwater and marine realms: status, threats, and management. Aquatic Conservation Marine and Freshwater Ecosystems, 26: 838-857. https://doi.org/10.1002/aqc.2712

Asmundsson, S. & Corcoran, E. 2015. On the process of forming a cooperative mechanism between NEAFC and OSPAR from the first contact to a formal collective arrangement. UNEP Regional Seas Reports and Studies, 196: 35 p

Aswani, A. 2005. Customary sea tenure in Oceania as a case of rights-based fishery management: Does it work? Reviews in Fish Biology and Fisheries 15 : 285–307.

Attwood, C.G.; Van Zyl, C.S.; Lombard, A.T. & McCagh, C. 2016. Seasonally and spatially referenced estimates of recreational shore-angling effort, catch composition, catch rates and total catch in the Goukamma Marine Protected Area, South Africa. African Journal of Marine Science, 38: 563-579.

Augustyn, C.J. 1989. Systematics, life cycle and fisheries potential of the chokker squid *Loligo vulgaris reynaudii*. Ph. D. thesis, University of Port Elizabeth: 378 pp.

Augustyn, C.J.; Cockcroft; A.; Coetzee, J.; Durholtz, D. & Van der Lingen, C.D. 2018. Rebuilding South African Fisheries: Three case-studies. In: Rebuilding of marine fisheries Part 2: Case studies. Rome. FAO. FAO Fisheries and Aquaculture Technical Paper 630/2. Garcia, S.M. and Ye, Y. (Eds): 107-143

Augustyn, C.J.; Lipinski, M.R.; Sauer, W.H.H.; Roberts, M.J. & Mitchell-Innes, B.A. 1994. Chokker squid on the Agulhas Bank - Life history and ecology. South African Journal of Science, 90(3): 143-154.

Augustyn, J.; Cockcroft, A.; Kerwath, S.; Lamberth, S.; Githaiga-Mwicigi, J.; Pitcher, G.; Roberts, M. & Van der Lingen, C. 2017. Chapter 15. South Africa. *In:* Phillips, B.F. & M. Pérez-Ramírez. *The Impacts of Climate Change on Marine Fisheries and Aquaculture*: 479-522. Wiley & Sons.

Auster, P.J. & Shackell, N.L. 1997. Fishery reserves. *In:* Boreman, J.G.; Nakashima, B.S.; Wilson, J.A. & Kendall, R.L. (Eds*.), Northwest Atlantic groundfish: perspectives on a fishery collapse.* American Fisheries Society, Bethesda, Maryland: 159–166.

Auster, P.J. and Shackell, N.L. 2000. Marine protected areas for the temperate and boreal Northwest Atlantic: the potential for sustainable fisheries and conservation of biodiversity. North-eastern Naturalist, 7(4): 419-434

Azmi, K. & Dunstan, P. 2018. Other effective area-based conservation measures (in non-fisheries marine sectors). Delivering outcomes towards the achievement of Aichi biodiversity Target 11. CBD/MCB/EM/2018/1/INF/3: 23 p. available at: https://www.cbd.int/doc/c/fc8f/6ab8/264774781e7f4f09933d6b07/mcb-em-2018-01-inf-03-en.pdf

Bachelard, G. 1934. Le nouvel esprit scientifique, 1934

Bailey, K. M. 2011. An empty donut hole: the great collapse of a North American fishery. Ecology and Society 16(2): 28. Hpp://www.ecology andsociety.org/vol16/iss2/art28/

Bambridge, T. & D'Arcy, P. 2014. Large-Scale Marine Protected Areas in the Pacific: Cultural and Social Perspectives. In Féral, F. & Salvat, B. (eds.). Gouvernance, enjeux et mondialisation des grandes aires marines protégées. Recherche sur les politiques environnementales de zonage maritime : le challenge maritime de la France de Méditerranée et d'Outre-mer. Paris: Harmattan: 113-132

Ban, N.C.; Bax, N.J.; Gjerde, K.M.; Devillers, R.; Dunn, D.C.; Dunstan, P.K.; Hobday, A.J.; et al. 2013. Systematic conservation planning: a better recipe for managing the high seas for biodiversity conservation and sustainable use. Conservation Letters. Policy Perspectives, 7(1): 1–14. https://doi.org/10.1111/conl.12010

Ban, N.C.; Davies, T.A.; Aguilera, S.E.; Brooks, C.; Cox, M.; Epstein, G.; Evans, L.S.; Maxwell, S.M. & Nenadovich, M. 2017. Social and ecological effectiveness of large marine protected areas. Global Environmental Change, 43: 82-91

Bandimere, A.; Brenner, H.; Casale, P.; DiMatteo, A.; Hurley, B.; Hutchinson, B.; et al. 2021. Important Marine Turtle Areas. In: Guidelines 1.0. IUCN SSC Marine Turtle Specialist Group. Available at: https://static1.squarespace.com/static/5e4c290978d00820618e0944/t/61e0557f9c2cdd4c4bec8037/1642091906570/IMTA+Guidelines+1.0.pdf.

Barange, M.; Bahri, T.; Beveridge, M.C.M.; Cochrane, K.L.; Funge-Smith S.; Poulain, F. 2018. Impacts of climate change on fisheries and aquaculture. Synthesis of current knowledge, adaptation and mitigation options. Rome, FAO. FAO Fisheries and aquaculture technical paper, 627: 628 p.

Barange, M. & Cochrane, K. 2018. Impact of climate change on fisheries and aquaculture: conclusions: 611-628. *In:* Barange, M.; Bahri, T.; Beveridge, M.C.M.; Cochrane, K.L.; Funge-Smith, S. & Poulain, F. (Eds). *Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options* . FAO Fisheries and Aquaculture Technical Papers, 627: 628 p.

Barange, M.; Wener, F.; Perry, I. & Fogarty, M. 2003. The tangled web: Global fishing, global climate and fish stock fluctuations. Global Change Newsletter, 55: 24-27

Barbault, R. 2006. Un éléphant dans un jeu de quilles. L'homme dans la biodiversité. Paris : Éditions du Seuil.

Barnes, P.W. and J.P. Thomas, (eds.) 2005. Benthic habitats and the effects of fishing. American Fisheries Society Symposium 41, Bethesda, Maryland, US

Barnes, R. 2010. Fisheries and Biodiversity. *In* Fitzmaurice, M.; Ong, D. & Merkouris, P. (Eds.). *Research Handbook on International Environmental Law*. Edward Elgar. Cheltenham: 542-63

Bari, A., 2017. Our oceans and the blue economy: Opportunities and challenges. Procedia engineering, 194, pp.5-11.

Baumann, J.H.; Zhao, L.Z.; Stier, A.C.; Bruno. J.F. 2021. Remoteness does not enhance coral reef resilience. Global change biology, 28(2): 417-428. DOI: 10.1111/gcb.15904

Bavinck, M. 2005. Understanding fisheries conflicts in the south—A legal pluralist perspective. Society & Natural Resources, 18(9): 805-820, DOI: 10.1080/08941920500205491

Bavinck, M.; Chuenpagdee, R.; Diallo, M.; van der Heijden, P.; Kooiman, J.; Mahon, R. & Williams, S. 2005. Interactive fisheries governance: a guide to better practice. Delft, The Netherlands. Eburon Academic Publishers: 72 p.

Bavinck, M.; Berkes, F.; Charles, A.; Dias, A. C. E.; Doubleday, N.; Nayak, P. & Sowman, M. 2017. The impact of coastal grabbing on community conservation – a global reconnaissance. Maritime Studies, 16(1). https://doi.org/10.1186/s40152-017-0062-8

Bavinck, M.; Jentoft, S.; Pascual-Fernandez, J.J. & Marciniak, B. 2015. Interactive coastal governance: The role of pre-modern fisher organizations in improving governability. Ocean and Coastal Management, 117: 52e60

Bailey, M.; Favaro, B.; Otto, S.P.; Charles, A.; Devillers, R.; Metaxas, A.; Tyedmers, P.; et al. 2016. Canada at a crossroad: The imperative for aligning ocean policy with ocean science. Marine Policy, 63:53-60

Beer-Gabel, J. & Lestang, V. 2003. Les commissions des pêches et leur droit. Bruxelles. Bruylant : 298 p.

Beets, J. and Manuel, M. 2017. Temporal and Seasonal Closures used in Fisheries Management: A Review with Application to Hawai`i. Department of Marine Science, University of Hawai`i-Hilo: 13p. https://dlnr.hawaii.gov/coralreefs/files/2015/02/BeetsTempClosuresRpt08.pdf

Bein, F. L.; Wagner, J. & Wilson, J. 2007. Food Garden Capacity and Population Growth: A Case in Papua New Guinea. Focus on Geography, 50 (2): 28–34.

Benda-Beckmann, F.V. 2002. Who's afraid of legal pluralism? J. Leg. Plural. Unoff. Law 34: 37e82.

Beneke, G.; Shurinck, W. & Roodt, G. Towards a substantive theory of synergy. SA Journal of Human Resource Management, 5 (2) : 9-19

Benjaminsen, A. & Bryceson I. 2012. Conservation, green-blue grabbing and accumulation by dispossession in Tanzania. The Journal of Peasant Studies, 39(2): 335-355

Bennet, E. 2005. Success in fisheries management: a review of the literature. Pp 21-44*, In* Cunningham, S. & Bostock, T. (Eds.). *Successful fisheries management :Issues, case studies, and perspectives*. Delft, Eburon Academic Publishers: 238 p.

Bennett, N.J.; Cisneros-Montemayor, A.M.; Blythe, J.; Silver, J.J.; Singh, G.; Andrews, N.; Calò, A.; et al. 2019. Towards a sustainable and equitable blue economy. Nature Sustainability, 2: 991–993. DOI: 10.1038/s41893-019-0404-1.

Bennett, N. J.; Teh, L.; Ota, Y.; Christie, P.; Ayers, A.; Day, J. C.; Franks, P.; Gill, D.; et al. 2017. An appeal for a code of conduct for marine conservation. *Marine Policy*, *81*, 411–418. https://doi.org/10.1016/j.marpol.2017.03.035

Bennett, N.J.; Roth, R.; Klain, S.C.; Chan, K.; Christie, P.; Clark, D-A. Cullman, G. et al. 2017. Conservation social science: Understanding and integrating human dimensions to improve conservation. Biological Conservation (Review), 205: 93–108

Bergen, M. 2016. Protected area or 'paper park'? https://www.conservation.org/blog/protected-area-or-paper-park-ocean-protection-means-more-than-lines-on-a-map/

Bergesen, H. O. 1988. Reformism doomed to failure? A critical look at the strategy promoted by the Brundtland Commission. International Challenges. Bd. 8, Ausg. 2.

Bergh, M.; Lallemand, P.; Donaldson, T. & Leach, K. 2016. The economic impact of West Coast penguin island closures on the pelagic fishing industry. Unpublished report. FISHERIES/2016/JUN/SWG-PEL/18.

Berkes, F. 2003. Alternatives to conventional management: lessons from small-scale fisheries. Environments, 31(1): 5-19

Berkes, F.; Colding J. & Folke C. 2003. Introduction. In: Berkes F., Colding J. and C. Folke (eds), *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press, Cambridge, UK.

Berkes, F. 2009. Community conserved areas: policy issues in historic and contemporary context. Conservation Letters, 2: 19–24

Berneri, M. L. 1950. Journey Through Utopia. London: Routledge and Kegan Paul.

Beurier, J.P. 2016. A la recherche d'un régime juridique pour l'océan Arctique » pp. 287-300 *in Le droit de la mer face aux Méditerranées.* Napoli. Editoriale Scientifica. Cahiers de l'ASSIDMER ⟨hal-01084344⟩

BFAR. 2010. Managing Municipal Fisheries in the Philippines: Context, Framework, Concepts and Principles. Fisheries Improved for Sustainable Harvest (FISH) Project, Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR), Cebu City, Philippines: 276 p.

Bhola, N.; Klimmek, H.; Kingston, N.; Burgess, N.D.; van Soesbergen, A.; Corrigan, C.; Harrison, J. & Kok, M.T. 2021. Perspectives on area-based conservation and its meaning for future biodiversity policy. Conservation Biology 35(1): 168–178. https://DOI: 10.1111/cobi.13509

Bianchi, G. and Skjoldal, H.R. (Eds). 2008. The Ecosystem approach to fisheries. CABI (Wallingford, UK) and FAO (Rome, Italy): 363 p.

Bisaro, A. & Meyer, K. 2022. Integrating Nature-based Solutions into policies for climate change adaptation and disaster risk reduction : A regional comparative policy analysis in the Western Balkans. IUCN, Regional Office for Eastern Europe and Central Asia (ECARO). Gland. IUCN: 95 p.

Bisset, R. 1983. Introduction to Methods for Environmental Impact Assessment. In: Environmental Impact Assessment. NATO ASI Series, vol 14. Springer, Dordrecht. https://doi.org/10.1007/978-94-009-6795-3_9

Blanchard, J.L.; Watson R.A.; Fulton, E.A.; Cottrell , R.S.; Nash, K.L.; Bryndum-Buchholz, A.; Büchner, M. et al. 2017. Linked sustainability challenges and trade-offs among fisheries, aquaculture and agriculture. Nature, ecology and evolution, 1: 1240-1249. Doi: 10.1038/s41559-017-0258-8

Bloomfield, H.J.; Sweeting, C.J.; Mill, A. C.; Stead, S. M. & Polunin, N.V.C. 2012. No-trawl area impacts: Perceptions, compliance and fish abundances. Environmental Conservation, 39(3): 237-247

Bolster, J. 2012. The mortal sea. Fishing in the Atlantic in the age of sail. Cambridge (MA, USA) and London (UK). Bellknap Press of Harvard University Press: 378 p.

Boncœur, J. & Alban, F. 2013. Troisième partie : Approche socio-économique : 139-187. *In* Les aires marines protégées et la pêche : bioécologie, Socioéconomie et Gouvernance. Garcia, S.M. ; Boncœur, J. & Gascuel, D. (Eds.). Presses Universitaires de Perpignan : 431 p.

Bond, P. 2019. Blue Economy threats, contradictions, and resistances seen from South Africa. *Journal of Political Ecology*.26(1):341-362.

Bonizzoni, Si.; Furey, N.B.; Nina L.; Eddy, L.; Valavanis, V.; Bearzi, G. 2019. Modelling dolphin distribution within an Important Marine Mammal Area in Greece to support spatial management planning. Aquatic Conservation: Marine and Freshwater Ecosystems, 29 (10): 1665–1680. doi:10.1002/aqc.3148. ISSN 1099-0755. [4]

Borgés Da Silva, R. 2013. Taxonomie et typologie : est-ce vraiment des synonymes ? Santé Publique, 25 : 633-637. DOI 10.3917/spub.135.0633

Borgès Da Silva, R. 2014. Taxonomy and typology: how to reconcile the conceptual frameworks of various schools of thought? Santé Publique, 26(1):87-88 DOI 10.3917/spub.137.0087

Borrini-Feyerabend, G. & Hill, R. 2015. Governance for the Conservation of Nature: 169-206 *in* Worboys, G.I.; Lockwood, M.: Kothari, A.; Feary, S. & Pulsford, I. Eds. *Protected Area Governance and Management.* ANU Press, Canberra.

Borrini-Feyerabend, G., Kothari, A. & Oviedo, G. 2004. Indigenous and local communities and protected areas: Towards equity and enhanced conservation. Best Practice Protected Area Guidelines Series No. 11. IUCN, Gland, Switzerland

Borrini-Feyerabend, G.; Dudley, N.; Jaeger, T.; Lassen, B.; Pathak Broome, N.; Phillips, A. & Sandwith, T. 2014. Gouvernance des aires protégées : de la compréhension à l'action. Collection des lignes directrices sur les meilleures pratiques pour les aires protégées N°20, Gland, Suisse : IUCN. xvi + 124pp,

Botsford, L. W., J. F. Quinn, S. R. Wing, and J. G. Brittnacher. 1993. 'Rotating Spatial Harvest of a Benthic Invertebrate, the Red Sea Urchin, *Strongylocentrotus franciscanus*. In *Proceedings of the International Symposium on Management Strategies for Exploited Fish Populations*, 409–28. Alaska Sea Grant Report AKSG-93-02. Alaska Sea Grant Program: Anchorage, Alaska.

Bourg, D. 2003. Considérations relatives à l'histoire de la Nature. In : C. Lévèque and S. Van der Leeuw (Eds.). Quelles natures voulons-nous. Pour une approche socio-écologique du champ de l'environnement. Paris : Elsevier SAS : 64–75.

Branch, T.A.; Watson, R.; Fulton, E.A.; Jennings, S. ; McGilliard, C.R. ; et al. 2010. The trophic fingerprint of marine fisheries. Nature Letter, 468: 431-435

Breen, M.; Graham, N.; Pol, M.; He, P.; Reid, D. & Suuronen, P. 2016. Selective fishing and balanced harvesting, Fisheries Research, Available online 6 April 2016, ISSN 0165-7836, http://dx.doi.org/10.1016/j.fishres.2016.03.014.

Brockington, D. 2004. Community conservation, inequality and injustice: myths of power in protected areas management. Conservation and society, 2(2): 411-432

Brockington, D.; Igoe, J. & Schmidt-Soltau, K. 2006. Conservation, human rights and poverty reduction. Conservation biology, 20(1): 250-252

Brown Scott, J. 1916. " Hugo Grotius *The Freedom of the Seas*, New York: Oxford University Press

Brown, C. J., & Mumby, P. J. 2014. Trade-offs between fisheries and the conservation of ecosystem function are defined by management strategy. Frontiers in Ecology and the Environment, 12: 324–329.

Bruno, J. F.; Bates, A.E.; Cacciapaglia, C.; Pike, E.C.; Amstrup, S.C.; van Hooidonk,R.; Henson, S.A.; & Aronson, R.B. 2018. Climate change threatens the world's marine protected areas. Nature Climate Change, 8:499–503. https://www.nature.com/articles/s41558-018-0149-2

Buck, P.H. 1938. Vikings of the Sunrise. Philadelphia, USA. Philadelphia. Lippincott. Translated as *Les migrations des Polynésiens* by Foulque-Villaret, J. Paris, Payot.

Büscher, B. & Fletcher, R. 2020. The conservation revolution: radical ideas for saving nature beyond the Anthropocene. London, Verso Books.

Büscher, B, Fletcher, R.; Brockington, D.; Sandbrook, C., Adams, W.M.; Campbell, L.; Corson, C. et al. 2017. Half-Earth or Whole Earth? Radical ideas for conservation, and their implications. Oryx, 51: 407–410. https://doi.org/10.1017/S0030605316001228

Bush, S.R. & Oosterveer, P., 2015. Vertically differentiating environmental standards: The case of the Marine Stewardship Council. Sustainability, 7(2): 1861-1883.

Bustamante, G.; Canals, P.; Di Carlo, G.; Gomei, M.; Romani, M.; Souad, H. & Vanzella-Khouri, A. 2014. Marine protected areas management in the Caribbean and Mediterranean seas: making them more than paper parks. Aquatic Conserv: Mar. Freshw. Ecosyst., 24(Suppl. 2): 153–165

Butchart, S., M. Clarke, R. Smith, R. Sykes, J. Scharlemann, M Harfoot, G. et al. 2015. Shortfalls and Solutions for Meeting National and Global Conservation Area Targets. Conservation Letters, 8(5): 329–337. Doi: 10.1111/conl.12158. Accessible at : https://digitalcommons.odu.edu/cgi/

Buxton, C.; Barret, N.; Haddon, M.; Gardner, C. & Graham, E. 2006. Evaluating the effectiveness of marine protected areas as a fisheries management tool. Australian Government. Fisheries Research and Development Corporation. FDRC Final Report 1999/162: 393 p

Cabral, R.B. & Alino, P.M. 2011 Transition from common to private coasts: Consequences of privatization of the coastal commons. Ocean and Coastal management, 54: 66-74

Cabral, R.B.; Bradley, D.; Mayorga, J.; Goodell, W.; Friedlander, A.M.; Sala, E.; Costello, C. & Gaines, S,D. 2020. A global network of marine protected areas for food, Proc. Natl. Acad. Sci. U.S.A., 117: 28134-28139. 10.1073/pnas.2000174117.

Caddell, R. 2005. International law and the protection of migratory wildlife: An appraisal of twenty-five years of the Bonn Convention. Colorado Journal of International Environmental Law and Policy, 16(1): 113 - 156

Caddy, J. F. 1993. Background concepts for a rotating harvesting strategy with particular reference to the Mediterranean red coral, *Corallium rubrum*.' Marine Fisheries Review, 55 (1): 10–18.

Caddy, J.F. 1999. Fisheries management in the twenty-first century: will new paradigms apply? Reviews in Fish Biology and Fisheries, 9: 1-43

Calderón, M. 1998. La teoría del Mar Presencial y su aplicación. Instituto de Estudios del Pacífico. http://www.ugm.cl/documentos/pacifico/monograf/marpres.htm

Campbell, A., Harbo, R.M. & Hand, C.M. 1998 Harvesting and distribution of Pacific geoduck clams, *Panopea abrupta*, in British Columbia. Can. Spec. Publ. Fish. Aquat. Sci., 125, 349–358

Campese, J.; Borrini-Feyerabend, G.; de Cordova, M.; Guigner, A. & Oviedo, G. 2007. Just' conservation? What can human rights do for conservation…and vice versa? Policy Matters, 15: 6–9

Capistrano, G. & Charles, A.T. 2012. Indigenous rights and coastal fisheries: A framework of livelihoods, rights and equity. Ocean & Coastal Management, 69: 200-209. https://doi.org/10.1016/j.ocecoaman.2012.08.011

Cardin, S.; Howe, A.; Correia, S. & Currier T. 1995. Evaluating the effects of two coastal mobile gear fishing closures on finfish abundance off cape cod. North. Am. J. Fish. Manag., 15:300–315

Cardinali, M.; Dumitru, A.; Vandewoestijne, S. & Wendling, L. 2021. Evaluating Nature-based Solutions. A summary for policy-makers. Brussels. European Commission: 36 p. https://op.europa.eu/en/publication-detail/-/publication/aeb73167-0acc-11ec-adb1-01aa75ed71a1

Cardoso-Andrade, M.; Queiroga, H.; Sousa, R. M.; Belackova, A.; Bentes, L.; Oliveira, F.; Monteiro, P., and et al. 2022. Setting performance Indicators for Coastal Marine Protected Areas: An Expert-Based Methodology. Front. Mar. Sci., 9:848039. 12 p.

Carilli, J.E.; Norris, R.D.; Black, B.A.; Walsh, S.M. & McField, M. 2009. Local stressors reduce coral resilience to bleaching. PLoS ONE, 4(7): e6324. doi:10.1371/journal.pone.0006324

Carlson, R.R.; Evans, L.J.; Foo, S.A.; Grady, B.W.; Li, J.; Seeley, M.; Xu, Y. & Asner, G.P. 2021. Synergistic benefits of conserving land-sea ecosystems. Global Ecology and Conservation, 28: e01684

Castilla, J.C. 1994. The Chilean small-scale benthic shellfisheries and the institutionalization of new management practices. Ecol. Int. Bull., 21, 47–63.

Castilla, J.C.; Manrıquez, P.; Alvarado, J.; Rosson, A.; Pino, C.; Espoz, C.; Soto, R.; et al. 1998. Artisanal 'caletas' as units of production and co-managers of benthic invertebrates in Chile. Canadian Special Publication in Fisheries and Aquatic Science 125:407–413

Cataldi G. & Féral, F. 2016. The maritime dispute in South China Sea and warmongering effects of exclusive economic zoning. https://www.academia.edu/29831038/

Catchpole, T. L., Frida, C. S. J. and Gray, T. S. 2005. Discards in North Sea fisheries: causes, consequences and solutions. Marine Policy, 29: 421–430

Caveen, A.; Polunin, N.; Gray, T. & Stead, S. M. 2015. Chapter 5. Critique of the Scientific Evidence for Fisheries Benefits of marine reserves. In Caveen et al. The controversy over marine protected areas. Science meets policy. Switzerland. Springer Briefs in Environmental Science: 51-80. DOI 10.1007/978-3-319-10957-2_5

Caveen, A.; Polunin, N.; Gray, T.; Stead, S.M. 2015. The controversy over marine protected areas. Science meets policy. Switzerland. Springer Briefs in Environmental Science. DOI 10.1007/978-3-319-10957-2

Caveen, A.J.; Fitzsimmons, C.; Pieraccini, M; Dunn, E.; Sweeting, C.J.; Johnson, M.L.; Bloomfield, H.; Jones, E.V.; et al. 2014. Diverging Strategies to Planning an Ecologically Coherent Network of MPAs in the North Sea: The Roles of Advocacy, Evidence and Pragmatism in the Face of Uncertainty. Advances in Marine Biology, 69: 325-370.

Cawardine, L.; Klein, C.I.; Wilson, K.A. Pressey R.I. and Possigham H.P. 2009. Hitting the target and missing the point: target-based conservation planning in context. Conservation Letters, 2:3-10

Cazalet, B. Leenhardt, P. 2014. Le phénomène mondial de multiplication et d'extension des surfaces des AMP pp. 25-52 in Féral, F. et Salvat, B. (Eds) *Gouvernance enjeux et mondialisation des grandes aires marines protégées.* Paris. L'Harmattan

Cazalet, B.; Féral. F. & Garcia, S.M. 2011. Gouvernance, droit et administration des aires marine protégées. Annuaire du Droit de la Mer, 16. Le régime juridique des grands fonds marins. Edition Pédone: 121-152

CBD. 2001. Report of the Ad hoc Technical Expert Group on Marine and Coastal Areas. First meeting. Leigh, New Zealand, 22-26 October 2001

CBD. 2004. Programme of Work on Protected Areas (CBD Programmes of Work) Montreal: Secretariat of the Convention on Biological Diversity: 31 p.

CBD. 2004b. Decision adopted by the conference of the Parties to the CBD at its 7th meeting. Kuala Lumpur, 9-20 and 27 February 2004. Document UNEP/CBD/COP/DEC/VII/5 on Marine and coastal biological diversity: 49 p.

CBD. 2006. Biodiversity in Impact assessment. Background Document to Decision VIII/28 of the Convention on Biological Diversity: Voluntary Guidelines on Biodiversity- inclusive Impact Assessment. SCBD. Netherlands Commission on Environmental Assessment. CBD Technical Series, 26: 73 p.

CBD. 2010. The Strategic Plan for Biodiversity and the Aichi biodiversity targets. Decision X2 taken at CBD COP 10, Nagoya, Japan, 18-29/10/2010. Document UNEP/CBD/COP/DEC/X/2: 13 p.

CBD. 2010a. Biodiversity indicators and the 2010 Target: Experiences and lessons learnt from the 2010 Biodiversity Indicators Partnership. Secretariat of the Convention on Biological Diversity, Montréal, Canada. Technical Series No. 53, 196 pages.

CBD. 2018. Decision adopted by the Conference of the Parties to the Convention on Biological Diversity. 14/8. Protected areas and Other Effective Area-based Conservation Measures. CBD COP 14th

Meeting. Sharm El-Sheikh, Egypt, 17-29 November 2018. Document CBD/COP/DEC/14/8: 19 p. Https://www.cbd.int/doc/decisions/cop-14/cop-14-dec-08-en.pdf

CBD. 2021. First draft of the Post-2020 Global Biodiversity Framework. Open-ended Working Group (OEWG) on the Post-2020 Global Biodiversity Framework. Document CBD/WG/2020/3/3: 12 p.

CBD. 2021a. Draft report of the open-ended working group on the Post 2020 Global Biodiversity Framework. On its third meeting (Part I). Document CBD/WG2020/3/L.1: 7 p.

CBD-2022. Kunming-Montreal Global biodiversity framework. Draft decision submitted by the President. CBD COP 15, Part II. Montreal, Canada, 7-19 December 2022. Document CBD/COP/15/L.25: 14 p.

CEMM. 2014. Études remises au Chef d'État-Major de la Marine le 1er Décembre 2014- Étude n°1 : Usage et liberté de la haute mer. Paris. Académie de Marine. Chef d'Etat Major de la Marine. Rapport d'étude CEMM-2016, N° 1: 5-9.

CEMM. 2016. Conséquences de la territorialisation des mers en particulier en Mer de Chine. Paris. Académie de Marine. Chef d'État-Major de la Marine. Rapport d'étude CEMM-2016. N°1 : 11 p.

CESM. 2012), Brèves Marines. Centre d'Études Stratégique de la Marine N°142 - Planète mer : un océan de richesses https://www.defense.gouv.fr/sites/default/files/cesm/bm-142-colloque-ocean-de-richesses.pdf

Chape, S.; Spalding, M. & Jenkins M.D. 2008. The World's Protected Areas. Status, values and prospects in the 21st century. Prepared by the UNEP World Conservation Monitoring Centre. University of California Press. Berkeley, USA : 384 p.

Charles, A. 2001. Sustainable Fishery Systems. Oxford: Blackwell Science.

Charles, A. (ed.). 2021. Communities, conservation, and livelihoods. Gland, Switzerland: IUCN and Halifax, Canada: Community Conservation Research Network: 154 p. https://www.doi.org/10.2305/IUCN.CH.2021.01.en

Charles, A. T. & Sanders, J. 2007. Issues arising on the interface of MPAs and fisheries management. In: FAO. Report and documentation of the Expert Workshop on Marine Protected Areas and Fisheries Management : Review on Issues and Considerations. Rome, 12.14 June 2006. FAO Fisheries Report, 825: 301-332

Charles, A., Garcia, S. M. & Rice, J. 2014. A tale of two streams: synthesizing governance of marine fisheries and biodiversity conservation: 413-428 in Garcia, S. M., Rice, J., and Charles, A. (Eds) *Governance of marine fisheries and biodiversity conservation. Interaction and coevolution*. Chichester, UK. Wiley-Blackwell: 511 p.

Charles, T. & Wilson, L., 2009. Human dimensions on marine protected area management. ICES J. Mar. Sci., 66, 6–15.

Chimba, N. & Musuka, C.G. 2014. Impact of closed fishing Season on the livelihood of fishers: A Case of stratum I of Kafue fishery. International Journal of Life Sciences Research (online), 2(1): 49-62. Available at: www.researchpublish.com

Chollett, I.; Box, S.J. & Mumby, P.J. 2016 Quantifying the squeezing or stretching of fisheries as they adapt to displacement by marine reserves. Conservation Biology, 30:.166-175

Christensen, V.; Garces, L.R.; Silvestre, G.T. & Pauly, D.2003. Fisheries impact on the South China Sea large marine ecosystem: A preliminary analysis using spatially-explicit methodology. In G. Silvestre et al. eds. Management, assessment and future directions for coastal fisheries in Asian countries. WorldFish Center. Conference Proceedings, 67(1): 120p.

Christie, P., 2004. Marine protected areas as biological successes and social failures in Southeast Asia. American Fisheries Society Symposium 42, 155–164.

Christie, P. & White, A.T. 2007. "Best Practices for Improved Governance of Coral Reef Marine Protected Areas." Coral Reefs, 26 (4) : 1047-056.

Christie, P. & White, A.T. 2007. FAO. Best practices in governance and enforcement of marine Protected areas: an overview. In: FAO 2007. *Report and documentation of the Expert Workshop on Marine*

Protected Areas and Fisheries Management: Review of Issues and Considerations. Rome, 12–14 June 2006. FAO Fisheries Report, 825: 183-200

Christie, P.; McCay, B.J.; Miller, M.L.; Lowe, C.; White, A.T.; Stoffle, R.; Fluharty, R.; et al. 2003. Toward developing a complete understanding: A social science research agenda for marine protected areas. Fisheries, 28(12): 22-25.

Christophersen, L .E. 1997. IUCN, a bridge builder for Conservation of Nature. Green Globe Yearbook 1997: 59-69.

Christy, Jr. F. T. 1993. Enhancement, efficiency and equity turfs: experiences in management. Papers presented at the FAO/Japan Expert Consultation on the Development of Community-Based Coastal Fishery Management Systems for Asia and the Pacific ; Kobe, Japan. Rome: FAO; 1993: 143-156.

Cinelli, C. 2014. Non-Artic States as partners and contenders of the Arctic Ocean ; pp 748-764 in Sobrino Heredia, J.M. (Ed.) *La contribution de la convention du droit de la mer à la gouvernance des mers et océans.* Napoli. Editoriale Scientifica. Napoli. Cahiers de l'ASSIDMER: 908 p.

Claudet, J. (Ed.). 2011. Marine protected areas. A multidisciplinary approach. Cambridge. Cambridge University Press: 375 p.

Claudet, J., Guidetti, P., 2010. Improving assessments of marine protected areas. Aquatic Conserv: Mar. Freshw. Ecosyst. 20, 239–242. doi:10.1002/aqc.1087

Claudet, J. ; Loiseau, C. ; Sostres, M. ; Zupan, M. ; Claudet, J. ; Loiseau, C. ; et al. 2020. Under-protected marine protected areas in a Global Biodiversity Hotspot. One Earth, 2, 380–384. https://doi.org/10.1016/j.oneear.2020.03.008

Claval, P. 1977. Le marxisme et l'espace. In *l'Espace géographique* n° 3 : 145-164

Clay, P.M and J. R. Mc Goodwin. 1995. Utilizing social sciences in fisheries management. Aquatic Living Resources, 203-207.

Coad, L.; Watson, J. E. M.; Geldmann, J.; Burgess, N. D.; Leverington, F.; Hockings, M.; et al. 2019. Widespread shortfalls in protected area resourcing undermine efforts to conserve biodiversity. Frontiers in Ecology and the Environment, 17, 259–264.

Cochrane, K.L. and Garcia, S.M. 2009. A fishery managers' guidebook. Chichester UK and Rome (Italy). Wiley-Blackwell and FAO. 2nd edition :518 p.

Cochrane, K.L. 2020. Reconciling sustainability, economic efficiency, and equity in marine fisheries: Has there been progress in the last 20 years? Fish and Fisheries, 22(2): 298-32326 p. DOI: 10.1111/faf.12521

Cockcroft, A.C.; Van Zyl, D. & Hutchings, L. 2008. Large-scale changes in the spatial distribution of South African West Coast rock lobsters: an overview. African Journal of Marine Science, 30(1):149-159.

Cohen, P.J.; Allison, E.H.; Andrew, N.L.; Cinner, J.; Evans. L.S.; Fabinyi, M.; Garces, L.R. et al. 2019. Securing a just space for small-scale fisheries in the Blue Economy. *Frontiers in Marine Science*. 1-50.

Cole-King, A. 1993. Marine conservation: a new policy area. Marine Policy, 7(3): 171-193.

Cormier, R. ; Kelble, C.R. ; Anderson, R.; Allen, I.; Grehan, A. & Gregersen, Ó. 2017 Moving from ecosystem-based policy objectives to operational implementation of ecosystem-based management measures. ICES Journal of Marine Science 74: 406-413. https://doi.org/10.1093/icesjms/fsw181

Costello, M.J. & Ballantine, B. 2015. Biodiversity conservation should focus on no-take Marine Reserves. TREE. 30(9): 507-509

Counsel, S. 2022. Conservationists claim that their aim to place thirty per cent of the planet in protected areas by 2030 is supported by science. It isn't. What the science does and doesn't say about 30×30. https://redd-monitor.org/2022/03/07/conservationists-claim-that-their-aim-to-place-thirty-per-cent-of-the-planet-in-protected-areas-by-2030-is-supported-by-science-it-isnt-what-the-science-does-and-doesnt-say-about-3/

Cox, M.; Arnold, G. & Villamayor Tomas, S. 2010. A Review of Design Principles for Community-based Natural Resource Management Source: Ecology and Society, 15 (4): 20 p

Crain, C.M.; Kroeker, K. & Halpern, B.S. 2008. Interactive and cumulative effects of multiple human stressors in marine systems. Ecology Letters, 11: 1304–1315. Doi: 10.1111/j.1461-0248.2008.01253.x

Crawford, B.; Balgos, M. & Pagdilao. C.R. (Eds). 2000. Community-based marine sanctuaries in the Philippines: A report on focus group discussions. Coastal Management Narragansett, RI, USA and Los Banos, Laguna, Philippines: Coastal Resources Center and Philippine Council for Aquatic and Marine Research and Development. Report #2224. PCAMRD Book Series N° 30.

Cornick, D. J.; Collen, B.; Koldewey, H. J.; Jones, K. E.; Kemp, K. M.; & Ferretti, F. 2020. Interactions between a large marine protected area, pelagic tuna and associated fisheries. Frontiers in Marine Science, 7, 318. https://doi.org/10.3389/fmars.2020.00318

Dahlet, L.I., Himes-Cornell, A. & Metzner, R., 2021. Fisheries conflicts as drivers of social transformation. Current Opinion in Environmental Sustainability, 53: 9-19.

Dalton, T.; Forrester, G. & Pollnac, R. 2012. Participation, process quality, and performance of marine protected areas in the wider Caribbean. Environmental management, 49: 1224-1237.

Darling, E.S. & Cōté, E.M. 2008. Quantifying the evidence for ecological synergies. Ecology Letters, 11: 1278–1286. Doi: 10.1111/j.1461-0248.2008.01243.x

Darling, E.S.; McClanahan, T.R. & Cōté, I.M. 2010. Combined effects of two stressors on Kenyan coral reefs are additive or antagonistic, not synergistic. Conservation letter. doi: 10.1111/j.1755-263X.2009.00089.x

Dasgupta, P. 2021. The economics of biodiversity: The Dasgupta Review. London, UK. HM Treasury 606 p.

Dawson, N. M.; Coolsaet, B.; Sterling, E. J.; Loveridge, R.; Gross-Camp, N. D.; Wongbusarakum, S.; Sangha, K. K.; et al. 2021. The role of Indigenous peoples and local communities in effective and equitable conservation. Ecology and Society 26(3):19. https://doi.org/10.5751/ES-12625-260319

Day. J.; Dudley, N.; Hockings, M.; Holmes, G.; Laffoley, D.; Stolton, S. & Wells, S. 2012. Guidelines for applying the IUCN Protected Area Management Categories to Marine Protected Areas. Gland, Switzerland: 36 p

Day, J.; Dudley, N.; Hockings, M.; Holmes, G.; Laffoley, D.; Stolton, S.; Wells, S. & Wenzel, L. (eds.). 2019. Guidelines for applying the IUCN protected area management categories to marine protected areas. Second edition. Gland. Switzerland: IUCN

De Bruin, S. 2022. Understanding equity perceptions of the Half Earth and sharing the planet's scenario narratives, The Hague: PBL Netherlands Environmental Assessment Agency: 26 p. https://www.pbl.nl/en/publications/understanding-equity-perceptions-of-the-half-earth-and-sharing-the-planet%E2%80%99s-scenario-narratives

De Cola, P.N. & Joyner, C.C. 1993. Chile's Presential sea proposal: Implications for straddling stocks and the international law of fisheries. Ocean Development and International Law: 24(1): 99-121 online. https://doi.org/10.1080/00908329309546000

Degnbol, P. & McCay, B.J. 2007. ICES Symposium on Fisheries Management Strategies. ICES Journal of Marne Sciences 64: 793-797

De Santo, E. M. 2013. Missing marine protected area (MPA) targets: How the push for quantity over quality undermines sustainability and social justice. Journal of Environmental Management, 124, 137–146.

De Santo, E. 2018. Implementation challenges of area-based management tools (ABMTs) for biodiversity beyond national jurisdiction (BBNJ). Marine Policy, 97. 34-43. 10.1016/j.marpol.2018.08.034.

De Young, C. and Charles, A. (eds.). 2008. *Human dimensions of the ecosystem approach to fisheries: an overview of context, concepts, tools and methods*. FAO fisheries technical paper No.489. Food and Agriculture Organization of the United Nations. Rome.

De Yturriaga, J.A. 1997. The international regime of fisheries. From UNCLOS 1982 to the Presential Sea. The Hague Boston, London. Martinus Nijhoff Pub. KLuver Law International

Defeo, O., Castilla, J.C. 2005. More than one bag for the world fishery crisis and keys for co-management successes in selected artisanal Latin American shellfisheries. Rev. Fish. Biol. Fisheries, 15: 265–283. https://doi.org/10.1007/s11160-005-4865

DEFF. 2020. Status of the South African marine fishery resources 2020. Cape Town. Department of Environment, Forestry and Fisheries

Degnbol, P. & McCay, B.J. 2007. ICES Symposium on Fisheries Management Strategies. ICES Journal of Marne Sciences, 64: 793-797

DeSanto, E. M. 2013. Missing marine protected area (MPA) targets: How the push for quantity over quality undermines sustainability and social justice. Journal of Environmental Management, 124, 137–146.

Descartes, R. 1637. Discours de la méthode. reis. Peyturaux, S. in la Philothèque, Bréal 2003

Devillers, R.; Pressey, R.L.; Grech, A.; Kitinger, J.N.; Edgard, G.J.; Ward, T.; Watson, G. 2014. Reinventing residual reserves in the sea: are we favouring ease of establishment over need for protection? Aquatic Conserv: Mar. Freshw. Ecosyst., 25, (4): 480-504. DOI: 10.1002/aqc.2445

De Young, C., Charles, A. and Hjort, A. 2008. Human dimensions of the ecosystem approach to fisheries. An overview of context, concepts, tools and methods. FAO Fisheries Technical Papers, 489: 152 p.

Di Marco, M.; Butchart, S.H.M; Visconti, P.; Buchanan, G.M.; Ficetola, G.F. & Rondinini, C. 2015. Synergies and trade-offs in achieving global biodiversity targets. Conservation Biology, 30 (1): 189–195. DOI: 10.1111/cobi.12559

Diaz, S.; Pascual, U.; Stenseke, M.; Martin-Lopez, B.; Watson, R.T.; Molnar, Z.; Hill, R.; et al. 2018. Nature's Contributions to People. Science,,359 (6373): 270-272. http://dx.doi.org/doi:10.1126/SCIENCE.AAP8826

Dinerstein, E; Vynne, C; Sala, E; Joshi, A.R.; Fernando, S.; Lovejoy, T.E.; Mayorga, J. et al. 2019. A global deal for nature: guiding principles, milestones, and targets. Science advances, *5*(4): eaaw2869.

Diz, D.; Johnson, D.; Riddell, M.; Rees, S.; Battle, J.; Gjerde, K.; Hennigeg, S.; Roberts, J.M. 2018. Mainstreaming marine biodiversity into the SDGs: The role of other effective area-based conservation measures (SDG 14.5). Marine Policy, 93: 251-261. https://pureportal.strath.ac.uk/en/publications/mainstreaming-marine-biodiversity-into-the-sdgs-the-role-of-other-OECMs in fisheries and other sectors

Donald, P.F.; Fishpool, L.D.C.; Ajagbe, A.; Bennun, L.A.; Bunting, G.; Burfield, I.J.; et al. 2019. Important Bird and Biodiversity Areas (IBAs): The development and characteristics of a global inventory of key sites for biodiversity. Bird. Conserv. Int., 29 (2): 177–198. doi: 10.1017/S0959270918000102

Douvere, F. 2015. World Heritage Marine Sites. Managing effectively the world's most iconic Marine Protected Areas. Paris. UNESCO: 116 p.
https://unesdoc.unesco.org/ark:/48223/pf0000235316/PDF/235316eng.pdf.multi

Druel, E.; Billé, R. & Chiarolla, C. 2013. A long and dwindling road. International discussion on the governance of biodiversity in areas beyond national jurisdiction. Studies 07/13, IDDRI: 42 p.

Druel, E.; Ricard, P.; Rochette, J. & Martinez, C. 2012. Governance of marine biodiversity in areas beyond national jurisdiction at the regional level: filling the gaps and strengthening the framework for action. Case studies from the NE Atlantic, Southern Ocean, Western Indian Ocean, Southwest Pacific, and Sargasso Sea. Paris, IDDRI and AMMP, 4(12): 102 p.

Duarte, C.M., Losada, I.J.; Hendriks, I.F.; Mazarrasa, I. & Marbà, N. 2013. The role of coastal plant communities for climate change mitigation and adaptation, Nature Climate Change, 3(11), 961–968

Dugan, J. E. & Davis G. E. 1. 1993. Applications of marine refugia to coastal fisheries management. Can. J. Fish. Aquat. Sci., 50 :2029-2042.

Duineveld, G.C.A.; Bergman, M.J.N. & Lavaleye, M.S.S. 2007. Effects of an area closed to fisheries on the composition of the benthic fauna in the southern North Sea. – ICES Journal of Marine Science, 64: 899–908.

Dunn, D.C.; Ardron, J.; Bax, N.; Bernal, P.; Cleary, J.; Cresswell, I. et al. 2014. The Convention on Biological Diversity's Ecologically or Biologically Significant Areas: Origins, development, and current status. Mar. Policy, 49: 137–145. doi: 10.1016/j.marpol.2013.12.002

Dunn, D.C.; Maxwell, S.M.; Boustany, A.M. & Halpin, P. N. 2016. Dynamic ocean management increases the efficiency and efficacy of fishery management. Proceedings of the National Academy of Sciences of the United States of America (PNAS), 113(3): 668-673 DOI: 10.1073/pnas.1513626113

Ebanks, A.E.; Miller, M. & Mahon, R. 2009. Best Management Practices for Marine protected Areas of the Wider Caribbean Region. Cave Hill Campus, Barbados. Centre for Resource Management and Environmental Studies. University of the West Indies. CERMES Technical Report, 17

Edgar, G.J.; Stuart-Smith, R.D.; Willis, T.J.; Kininmonth, S.; Baker, S.C.; Banks, S., Barrett, N. et al. 2014. Global conservation outcomes depend on marine protected areas with five key features. Nature, 506, 216–220. https://doi.org/10.1038/natur e13022

Ehler, C. & Douvere, F. 2009. Marine Spatial Planning: a step-by-step approach toward ecosystem-based management. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme. IOC Manual and Guides, 53, ICAM Dossier No. 6. Paris. UNESCO: 98 p.

Eikeset, A.M.; Mazzarella, A.; Davidsdottir, B.; Klinger, D.; Levin, S.; Rovenskaya, E. & Nils, S. 2018. What is blue growth? The semantics of "Sustainable Development" of marine environments. Marine Policy. 87. 177-179. 10.1016/j.marpol.2017.10.019.

Ellis, E.C. & Mehrabi, Z. 2019. Half Earth: promises, pitfalls, and prospects of dedicating Half of Earth's land to conservation. Curr. Opin. Environ. Sustain., 38:22-30.

EMPAFISH. 2006. Economic analysis of marine protected areas: a literature review. Booklet #3. Available at: www.cimar.org/ epbrs/Documents/Reports/ Economic%20evaluation%20of%20MPAs.pdf

Ens B.J., Dankers, N.M.J.A.; Leopold, M-F-; Lindeboom, H.J.; Smit, C.J.; van Breukelen, S. & van der Schans, J.W. 2007. International comparison of fisheries management with respect to nature conservation. Wageningen, Statutory Research Tasks Unit for Nature and the Environment. WOT-rapport, 42: 116

Esch, G.G. Ed. 2006. Marine Managed Areas: Best practices for boundary making. Federal Geographic Data Committee (FGDC) Marine Boundary Working Group. NOAA, USA: 38 p.

Evans, M.C. 2021. Re-conceptualizing the role(s) of science in biodiversity conservation. Environmental Conservation: 1-10. doi: 10.1017/S0376892921000114

Fairhead, J.; Leach, M.; & Scoones, I. 2012. Green Grabbing: A new appropriation of nature? Journal of Peasant Studies, 39(2), 237–261. https://doi.org/10.1080/03066150.2012.671770

FAO. 1968. Situation of the fisheries in the world. Fishery department FAO UNO Coll. FAO, cahier n° 7, Rome.

FAO. 1993. Marine fisheries and the law of the sea: a decade of change. Special chapter (revised) of The State of Food and Agriculture. Rome, FAO. FAO Fisheries Circular, 853: 66 p

FAO. 2001. The Reykjavik Declaration on responsible fisheries in the marine ecosystem: 105-108

FAO. 2003. Appendix 2: The Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem: 409-411 In Sinclair, M. and G. Valdimarsson. Responsible fisheries in the marine ecosystem. Rome (Italy) and Wallingford (UK). FAO and CABI Publishing: 426 p.

FAO. 2003a. Fisheries management. The ecosystem approach to fisheries. FAO Technical Guidelines for Responsible Fisheries, 4 (suppl. 2): 112 p.

FAO. 2003b. Strategies for Increasing the Sustainable Contribution of Small-scale Fisheries to Food Security and Poverty Alleviation. Committee on Fisheries, 25th Session. Food and Agriculture Organization, Rome.

FAO. 2005. Ecosystem-based management of fisheries Strengthening cooperation between UNEP and FAO, the Regional Seas Programme and the Regional Fishery Bodies. Fourth Meeting of Regional Fishery Bodies. 14-15 march 2005. Rome, FAO. Report RFB/IV/2005/8: 19 p.

FAO. 2007. Report and documentation of the Expert Workshop on Marine Protected Areas and Fisheries Management: Review of Issues and Considerations. Rome, 12–14 June 2006. FAO Fisheries Report. No. 825. Rome, FAO. 2007. 332 pp.

FAO. 2008. Report of the FAO workshop on vulnerable ecosystems and destructive fishing in deep-sea fisheries, Rome: 26-29 June 2007. FAO Fisheries Report, 629: 18 p.

FAO. 2008a. Bangkok Statement. Securing Sustainable Small-Scale Fisheries: Bringing Together Responsible Fisheries and Social Development. In: Proceedings of the 2008 FAO Small Scale Fisheries Conference, Bangkok, 13−17 October. Food and Agriculture Organization, Rome.

FAO. 2009. International guidelines for the management of deep-sea fisheries in the high seas. Rome, FAO: 73 p.

FAO. 2011. Fisheries Management. 4. Marine Protected Areas and Fisheries. Rome. FAO. FAO Technical Guidelines for Responsible Fisheries, 4(supp. 4.): 199 p. FAO, Rome, 199 pp.

FAO. 2013. Voluntary guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication. Rome. FAO: 27 p. Available at www.fao.org/cofi/42011-0d2bdfc444f14130c4c13ecb44218c4d6.pdf

FAO. 2015. Voluntary guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication. Rome, FAO: 14 p. Available at: www.FAO.org/3/a-i4356e.pdf

FAO. 2016. FAO Workshop on impacts of marine protected areas on fisheries yield, fishing communities and ecosystems. Rome, Italy. 16-18 June 2015. FAO Fisheries and Aquaculture Report: 35 p

FAO. 2019. Participatory monitoring and evaluation in marine protected areas: experiences from North and West Africa. FAO Fisheries and Aquaculture Circular, 1173 : 96 pp. www.fao.org/3/CA2898B/ca2898b.pdf)

FAO. 2021. COFI Declaration for sustainable fisheries and aquaculture. Committee on Fisheries 1-5/02/2021. Conference Document COFI/2020/2.3: 5 p.

FAO. 2022. FAO and the marine biological diversity beyond national jurisdiction (BBNJ) process. Rome, FAO: 36 p.

FAO, 2022a. The State of Fisheries and Aquaculture 2022. Towards Blue Transformation. Rome, FAO. https://doi.org/10.4060/cc0461en

FAO-COFI. 2020. Summary report of the International Symposium on fisheries Sustainability. COFI 24th Session, 1-5/02/2021. Rome, FAO. Document COFI/2020/SBD.17: 18 p.

FAO-COFI. 2021. Biodiversity mainstreaming across fisheries and aquaculture. COFI 24th Session, 1-5 February 2021. Rome, FAO. Document COFI/21/9.1: 30 p.

FAO-WECAFC. 2015. Report of the Technical Workshop on bottom fisheries in the high seas of the Western Central Atlantic. Barbados, 30 September – 2 October 2014. FAO Fisheries and Aquaculture Report, 1087: 71 p.

FAO-WECAFC-2015a-Report of the regional workshop on marine protected areas as a tool for responsible fisheries and sustainable livelihoods in the Caribbean. Barbados, 6-8 November 2014. FAO Fisheries and Aquaculture Report, 1096 : 45 p.

Féral, F. & Salvat, B. (Eds). 2014. Gouvernance enjeux et mondialisation des grandes aires marines protégées. Paris. L'Harmattan

Féral, F. 2001.Sociétés maritimes, droits et institutions des pêches en Méditerranée occidentale. Rome, FAO. FAO Fisheries Technical Paper, 420: 67 p.

Féral, F. 2011. L'extension des Aires Marines protégées : une augmentation de la taille inversement proportionnelle à leur normativité. In : Gestion durable des zones côtières et marines et marines

Vertigo 3[ième] trimestre 2011. Revue de l'UQAM Institut des sciences de l'environnement Hors-série 9 http://vertigo.revue.org/10998

Féral, F. 2021. Les territoires marins et les aires marines protégées en Océanie : affichages naturalistes et enjeux souverainistes. In : Giraudeau, G. (dir.) *Les enjeux territoriaux du Pacifique*. Presses universitaires de Nouvelle-Calédonie UNC Nouméa : 137-158

Féral, F. 2022. Les droits ancestraux kanaks sur les espaces marins. in Otis, G. (Ed.). Le titre ancestral kanak dans le droit positif en Nouvelle Calédonie. IFJD diffusion Lextenso/LGDJ

Feydel, S. & Bonneuil, C. 2015. Prédation. Nature, le nouvel Eldorado de la finance. Paris. Edition de la découverte : 213 p.

Fidler, R. Y.; Ahmadia, G. N.; Amkieltiela, A.; Cox, C.; Estradivari; Glew, L.; et al. 2022. Participation, not penalties : Community involvement and equitable governance contribute to more effective multiuse protected areas. Sci. Adv., 8: eabl8929. Doi: 10.1126/sciadv.abl8929

Field, J.C.; Punt, A.E.; Methot, R.D. & Thomson, C.J. 2006. Does MPA mean 'Major Problem for Assessments'? Considering the consequences of place-based management systems. Fish and Fisheries, 7: 284–302

Fitzpatrick, D. & Anderson, M. 2022. Seafarers' Rights. SRI Seafarers' Rights International © 2022 · Registered in England and Wales: No. 7217092

Fletcher, R. 2008. Implementing an ecosystem approach to fisheries management: lessons learned from applying a practical EAFM framework in Australia and the Pacific. In: Bianchi, G. & Skjoldal, H.R. (Eds) *The ecosystem approach to fisheries*. CABI (Wallingford, UK) and FAO (Rome, Italy): 112-124

Fletcher, R.W. 2005. The application of qualitative risk assessment methodology to prioritize issues for fisheries management. ICES Journal of Marine Science, 62:1576-1587

Fletcher, W. J.; Kearney, R. E.; Wise , B. S. & Nash, W. J. 2015. Large-scale expansion of no-take closures within the Great Barrier Reef has not enhanced fishery production. Ecological Applications, 25(5):1187-1196

Foster, N. L.; Rees, S.; Langmead, O.; Griffiths, C., and Oates, J. & Attrill M. J. 2017. Assessing the ecological coherence of a marine protected area network in the Celtic Seas. Ecosphere; e01688

Fox, H.E.; Holtzman, J.L.; Haisfield, K.M.; McNally, C.G.; Cid, G.A.; Mascia, M.B.; Parks, J.E. & Pomeroy, R.S. 2014 How Are Our MPAs Doing? Challenges in Assessing Global Patterns in Marine Protected Area Performance. Coastal Management, 42:3, 207-226, DOI: 10.1080/08920753.2014.904178

Fox, H.E., Holtzman, J.L., Haisfield, K.M.., McNally, C.G.., Cid, G.A., Mascia, M. B., Parks, J.E, and Pomeroy, R.S. 2014 How Are Our MPAs Doing? Challenges in Assessing Global Patterns in Marine Protected Area Performance. Coastal Management, 42:3, 207-226, http://dx.doi.org/10.1080/08920753.2014.904178

Freedman, R.M.; Brown, J.A.; Callow, C. & Caselle, J.E. 2020. Marine protected areas do not prevent marine heatwave-induced fish community structure changes in a temperate transition zone. Scientific reports, 10: 21081

Frey, O. & DeVogelaere, A.P. 2014. A Review of Resource Management Strategies for Protection of Seamounts. Silver Spring, MD. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD. Marine Sanctuaries Conservation Series ONMS-14-08: 52 pp.

Friedman, K.; Bridgewater, P.; Agostini, V.; Agardy, T.; Arico, S.; Biermann, F.; Brown K.; et al. . 2022. The CBD Post-2020 biodiversity framework: People's place within the rest of nature. People and Nature, 00, 1–10. https://doi.org/10.1002/ pan3.10403

Friedman, K.; Garcia, S.M. & Rice, J. 2018. Mainstreaming biodiversity in fisheries. Marine Policy, 95: 209-220. https://doi.org/10.1016/j.marpol.2018.03.001

Fromentin, J-M. ; Emery, M.R.; Donaldson, J. et al. 2022. Summary for policymakers of the thematic assessment of the sustainable use of wild species of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. IPBES. Advanced unedited version. 7 July 2022. 33 p.

Fulton, E.A.; Bax, N. J.; Bustamante, R. H.; Dambacher, J. M.; Dichmont, C.; Dunstan, P. K.; Heyes, K. R.; et al. 2015. Modelling marine protected areas: insights and hurdles. Phil. Trans. R. Soc. B., 370: 20140278. http://dx.doi.org/10.1098/rstb.2014.0278

Fulton, E.A.; Smith, A. D. M.; Smith, D. C.& Johnson, P. 2014. An integrated approach is needed for Ecosystem Based Fisheries Management: Insights from ecosystem-level management strategy evaluation. PLoS ONE 9(1): e84242. doi:10.1371/journal.pone.0084242

Fulton, E.A.; van Putten, E.I.; Dutra, L.X.C.; Melbourne-Thomas ,J.; Ogier, E.; Thomas, L.; Murphy, R.P. et al. 2020. Adaptation of Commonwealth fisheries management to climate change Handbook, CSIRO, Australia.: 100 p.

Gallager, S. Lerner, S. & Fairclough, C. 2022. Impact of disturbance on habitat recovery in habitat management areas on the northern edge of Georges Bank: ecosystem perturbation experiment. NOAA-NMFS-NEFSC-2016-2004548. Wood Hole Oceanographic Institution and New England Fisheries Management Council

Gallic, B.L., Mardle, S., & Metz, S. 2018. Brexit and fisheries: A question of conflicting expectations. EuroChoices, 17(2), 30-37.

Game, E. T.; Grantham, H.S.; Hobday, A.J.; Pressey, R.L.; Lombard, A.T.; Beckley, L.E.; Gjerde, K.; et al. 2009. Pelagic protected areas: The missing dimension in ocean conservation. Trends in Ecology & Evolution, 24, 360–369. https://doi.org/10.1016/j.tree.2009.01.011

Gannon, P.; Dubois, G.; Dudley, N. ; Ervin, J.; Ferrier, S.; Gidda, S.; MacKinnon, K., et al. 2019. Editorial essay and progress towards Aichi biodiversity Target 11. PARKs, 25(2) : 12 p

Garcia, S.M. & Charles, A.T. 2007. Fishery systems and linkages: from clockwork to soft watches. In: ICES. Fishery management strategies. Oxford University Press. ICES Journal of Marine Science, 64(4): 580-587.https://doi.org/10.1093/icesjms/fsm013

Garcia, S.M. 2014. Annex 1. History of fisheries and biodiversity conservation. A timeline of key events: 1850-2012: pp 429-460. In : *Governance of marine fisheries and biodiversity conservation. Interaction and coevolution*. Garcia, S.M.; Rice, J. and Charles, A. (Eds). Wiley-Blackwell:: 511 p.

Garcia, S.M., Boncœur, J. & Gascuel, D. 2013. Les aires marines protégées et la pêche: bioécologie, socioéconomie et gouvernance. Presses Universitaires de Perpignan (France): 432 p.

Garcia, S.M.; Bianchi, G.; Soto, D. & Subasinghe, R. 2014. Overview. Growth and conservation in marine and coastal fisheries and aquaculture. Background paper (Working Group 1) prepared for the Global Oceans Action Summit for Food Security and Blue Growth., 22-25 May 2014, The Hague, The Netherlands. Rome. FAO: 17 p.

Garcia, S.M. ; Rice, J. & Charles, A. (Eds). 2014a. Governance of marine fisheries and biodiversity conservation. Interaction and coevolution. Chichester, UK. Wiley-Blackwell: 511 p

Garcia, S.M.; Rice, J. & Charles, A. 2014b. Governance of marine fisheries and biodiversity conservation: a history: pp 3-17 in Garcia, S.M.; Rice, J. and Charles, A. (Eds.). *Governance of marine fisheries and biodiversity conservation. Interaction and coevolution*. Chichester, UK. Wiley-Blackwell: 511 p.

Garcia, S.M.; Rice, J.; Charles, A. & Diz, D. 2021. OECMs in Marine Capture Fisheries: Systematic approach to identification, use and performance assessment in marine capture fisheries (Version 2). Fisheries Expert Group of the IUCN Commission on Ecosystem Management, Gland, Switzerland. European Bureau of Conservation and Development, Brussels, Belgium: 141 p. Available at www.ebcd.org/feg.

Garcia, S.V. 2021. Los Balleneros y el conocimiento de los mares del sur en la primera parte del siglo XIX. Varia Historia, 37 (75). Https://doi.org/10.1590/0104-87752021000300005

Gardner C.J.; Cripps, G.; Prémesnil Day, L.; Dewar, K.; Gough, C.; Peabody, S.; Tahindraza, G.; Harris, A. 2020- A decade and a half of learning from Madagascar's first locally managed marine area. Conservation Science and Practice, 2(12). https://doi.org/10.1111/csp2.298

Gasalla, M. & Gandini, F.C. 2016. The loss of fishing territories in coastal areas: the case of seabob-shrimp small-scale fisheries in São Paulo, Brazil. Maritime Studies, 15(9): 18 p. DOI 10.1186/s40152-016-0044-2RCH

Gascuel, D.; Coll, M.; Fox, C.; Guenette, S; Guitton, J.; Kenny, A.; Knittweis, L.; et al. 2016. Fishing impact and environmental status in European seas: a diagnosis from stock assessments and ecosystem indicators. Fish and fisheries, 17: 31-55

Gaston, K.J.; Jackson, S.F.; Cantś-Salazar, L. & Cruz-Pińón, G. 2008. The Ecological Performance of Protected Areas. Annual Review of Ecology, Evolution, and Systematics, 39: 93-113. https://doi.org/10.1146/annurev.ecolsys.39.110707.173529

Gavin, M.C.; McCarter, J.; Mead, A.; Berkes, F.; Stepp, J.R.; Peterson, D. & Tang, R. 2015. Defining biocultural approaches to conservation. Trends in Ecology & Evolution 30: pp. 140–145.

Gelcich, S. & Donlan, C.J. 2015. Incentivizing biodiversity conservation in artisanal fishing communities through territorial user rights and business model innovation. Conservation Biology, 29 (4): 1076-1085. https://conbio.onlinelibrary.wiley.com/doi/10.1111/cobi.12477

Gilchrist J.D.F. 1916a. Eggs and larvae of Cape fishes. Marine Biological Report, Cape Town 3: 1-16.

Gilchrist J.D.F. 1916b. An enquiry into the fluctuations in the fish supply on the South African coast (continued). Marine Biological Report, Cape Town 3: 27-38.

Gill, D.A.; Mascia, M.B.; Ahmadia, G.N.; Glew, L.; Lester, S.E.; Barnes, M.; Craigie, I. et al. 2017. Capacity shortfalls hinder the performance of marine protected areas globally. Nature, 543: 665-679. doi:10.1038/nature21708

Gill, D.A.; Cheng, S.H.; Glew, L.; Aigner, E.; Bennett, N.J.; & Mascia, M.B. 2019. Social synergies, tradeoffs, and equity in marine conservation impacts. Annual Review of Environment and Resources, 44:347–72

Gillet, R. 2017. A review of special management areas in Tonga. FAO Fisheries and Aquaculture Circular, 1137. Apia, Samoa: 54 p.

Gilman, E., Kaiser, M. J., & Chaloupka, M. 2019. Do static and dynamic marine protected areas that restrict pelagic fishing achieve ecological objectives? Ecosphere, 10, e02968. https://doi.org/10.1002/ecs2.2968

Gilman, E.; Chaloupka, M.; Fitchett, M.; Cantrell, D.L. & Merrifield, M. 2020 Ecological responses to blue water MPAs. PloS ONE 15(7): e0235129. https://doi.org/10.1371/journal.pone.0235129

Girardin, C.A.J.; Jenkins, S.; Seddon, N.; Allen, M.; Lewis, S.L.; Wheeler, C.E.; et al. 2021. Nature-based solutions can help cool the planet — if we act now. Nature, 593, 191-194. doi: 10.1038/d41586-021-01241-2.

Gissi, E.; Maes, F.; Kyriazi, Z.; Ruiz-Frau, A.; Frazão Santos, C.; Neumann, B.; Quintela, A.; et al. 2022. Contributions of marine area-based management tools to the UN sustainable development goals. Journal of cleaner productions: 1-13. DOI 10.1016/j.jclepro.2021.129910

Gjerde, K. & Wright, G. 2019. Towards ecosystem-based management of the global ocean: Strengthening regional cooperation through a new high seas treaty ', STRONG High Seas Project, 2019ISSD. 2018.Summary of the second meeting of the SOI Global Dialogue with RSOs and RFBs on accelerating progress towards the AICHI Biodiversity Targets and SDGs. !0-13 April 2018. SOI Bulletin, 186 (11) 1-14

Gjerde, K.M.; Currie, D.; Wowk, K.; et al. 2013. Ocean in peril: Reforming the management of global ocean living resources in areas beyond national jurisdiction. Mar. Pollut. Bull. (2013), http://dx.doi.org/10.1016/j.marpolbul.2013.07.037

Gjertsen, H. 2005. Can Habitat Protection Lead to Improvements in Human Well-Being? Evidence from Marine Protected Areas in the Philippines. World Development, 33(2): 199-217. Https://www.sciencedirect.com/journal/world-development

Gladstone, W. 2014 . Criticisms of science, social impacts, opinion leaders, and targets for no-take zones led to cuts in New South Wales' (Australia) system of marine protected areas. Aquatic Conserv. Mar. Freshw. Ecosyst., 24: 287-296. https://doi.org/10.1002/aqc.2469

Golden Kroner, R.E.; Qin, S.; Cook, C.N.; Krithivasan, R.; Pack, S.M.; Bonilla, O.D.; Cort-Kansinally, K.A.; et al. 2019. The Uncertain Future of Protected Lands and Waters. Science, 364(6443):881–886.

Goñi, R. 1998. Ecosystem effects of marine fisheries: an overview Original Research Article . Ocean & Coastal Management, 40(1): 37-64

Goold, M., & Campbell, A. 1998. Desperately Seeking Synergy. A healthy dose of scepticism can help executives distinguish real opportunities from mirages. Harwards Business Review, September-October: 131-143

Götz A.; Kerwath, S.E.; Attwood, C.G. & Sauer, W.H.H. (2009a) Effects of fishing on a temperate reef community in South Africa I: Ichthyofauna African Journal of Marine Science 31(2): 241-252

Götz A.; Kerwath, S.E.; Attwood, C.G. & Sauer W.H.H. 2009b. Effects of fishing on a reef community in South Africa 2: Benthic invertebrates and algae. African Journal of Marine Science. 31(2): 253-262.

Götz, A.; Kerwath, S.E., Attwood, C.G. & Sauer W.H.H. (2010) A change of the seaward boundary of Goukamma Marine Protected Area could increase conservation and fishery benefits. South African Journal of Science 105: 330-331.

Gould, S.J. 2003. The hedgehog the fox and the magister's pox: Mending the gap between science and humanities. Harvard University Press, 1st edition. Harmony Books: 286 p.

Govan, H. 2009. Status and potential of locally-managed marine areas in the South Pacific: meeting nature conservation and sustainable livelihood targets through wide-spread implementation of LMMAs. SPREP/WWF/WorldFishReefbase/CRISP. 95pp. http://www.sprep.org/att/publication/000646_LMMA_report.pdf

Govan, H., Aalbersberg, W., Tawake, A. & Parks, J. 2008. Locally-Managed Marine Areas: A guide for practitioners. The Locally-Managed Marine Area Network: 70 p Available at www.LMMAnetwork.org

Govan H. & Jupiter S. 2013. Can the IUCN 2008 protected areas management categories sup port Pacific island approaches to conservation? PARKS 19(1):7380.

Govan, H.; Jupiter, S.; & Comley, J. 2012. Recognition and support of ICCAs in Fiji.; pp 138-139 *In Recognising and Supporting Territories and Areas Conserved By Indigenous Peoples And Local Communities: Global Overview and National Case Studies*. Edited by Kothari, A. et al Eds. Secretariat of the Convention on Biological Diversity, ICCA Consortium, Kalpavriksh, and Natural Justice, Montreal, Canada. Technical Series no. 64, 160 pp.

Govan, H.; Tawake, A.; Tabunakawai, K.; Jenkins, A.; Lasgorceix, A.; Schwarz, A.M.; Aalbersberg, B.; et al. 2009a. Status and potential of locally-managed marine areas in the South Pacific: meeting nature conservation and sustainable livelihood targets through wide-spread implementation of LMMAs. Suva, Fiji: SPREP/WWF/WorldFish-Reefbase/CRISP.

Govan, H.; Tawake, A.; Tabunakawai, K.; Jenkins, A.; Lasgorceix, A.; Techera, E.; Tafea, H. et al. 2009b. Community Conserved Areas: A review of status & needs in Melanesia and Polynesia. ICCA regional review for CENESTA /TILCEPA /TGER/IUCN/ GEF-SGP. IUCN, Switzerland.

Grafton, Q.R.; Akter, S. & Kompas, T. 2011. A Policy-enabling framework for the ex-ante evaluation of marine protected areas. Ocean & Coastal Management, 54: 478e487

Grafton, Q.R., Hilborn, R., Squires, D., Tait, M., & Williams, M. (Eds). 2010. Handbook of Marine Fisheries Conservation and Management. Oxford University Press: 770 p.

Grafton, Q.R.; Hilborn, R.; Ridgeway, L. et al. 2008. Positioning fisheries in a changing world. Marine Policy, 32: 630-634

Grafton, Q.R.; Kompas, T. & Ha, P. V. 2006. The Economic Payoff from Marine Reserves: Resource Rents in a Stochastic Environment. Economic Record. 82(2599):469-480.

Grafton, Q.R.; Kompas, T. & Schneider, V. 2005. The Bioeconomics of Marine Reserves: A Selected Review with Policy Implications. Journal of Bioeconomics, 7(2):161-178.

Grafton, Q.R.; Segerson. K. & Squires, D.. 2016. 4. Promoting green growth in fisheries. In: Bennet. J. (Ed.) Protecting the environment. Privately. Singapore. World Scientific Publishing Co. Pte. Ltd; 63-87

Graham, J.; Amos, B. & Plumptre, T. 2003. Principles for Good Governance in the 21st Century. Policy Brief Number 15. Ottawa. Institute of Governance. Policy Brief, 15: 9p. unpan1.un.org/intradoc/groups/public/documents/UNPAN/UNPAN011842.pdf

Grainger, R.J.R and Garcia, S.M. 1996. Chronicles of marine fishery landings (1950-1994): trend analysis and fisheries potential. FAO Fisheries Technical Paper, 359: 51 p.

Green, S.J.; White, A.T.; Christie, P.; Kilarski, S.; Meneses, A.B.T.; Samonte-Tan, G.; Karrer, L.B.; et al. 2011. Emerging marine protected area networks in the coral triangle: Lessons and way forward. Conservation & Society, 9(3): 173-188

Griffiths, M. H. 2000. Long-term trends in catch and effort of commercial linefish off South Africa's Cape Province: snapshots of the 20th century. South African Journal of Marine Science, 22: 81–110

Grimes, C.B. & Ralston, S. 2003. Marine reserves: the best option for our oceans? Front. Ecol. Environ., 1(9):496–497

Grip, K. & Blomqvist, S. 2020. Marine nature conservation and conflicts with fisheries, Ambio, 49: 1328-1340

Griscom, B.W.; Adams, J.; Ellis, P.W.; Houghton, R.A.; Lomax, G.; Miteva, D.A.; et al. 2017. Natural climate solutions. Proceedings of the National Academy of Sciences of the United States of America, 114(44), 11645–11650. doi: 10.1073/pnas.1710465114.

Grober-Dunsmore, R. & Wooninck, L. (Eds). 2017. State of the Nation's De Facto Marine Protected Areas. National Marine Protected Areas Centre (NMPAC), Silver Spring, Maryland. Page 10, Box 4 & 5. https://nmsmarineprotectedareas.blob.core.windows.net/marineprotectedareas-prod/media/archive/helpful_resources/inventoryfiles/defacto_mpa_report_0608.pdf. Accessed on 21 Nov 2017

Grorud-Colvert, K. ; Claudet, J. ; Carr, M.H. ; Caselle, J.E. ; Day, J. ; et al. 2011 The assessment of marine reserve networks: Guidelines for ecological evaluation. In: Claudet J, editor. Marine Protected Areas–A Multidisciplinary Approach. Cambridge, U.K.: Cambridge University Press. pp. 293–321.

Grorud-Colvert, K.; Claudet, J.; Tissot, B.N.; Caselle, J.E.; Carr, M.H.; Day, J.C.; et al. 2014. Marine protected area networks: Assessing whether the whole is greater than the sum of its parts. PloS One, 9, 1–7.

Grotius, H. 2013. La liberté des mers. Mare Liberum. Re-edition in French and Latin of the original text of H. Grotius (1609). Editions Panthéon Assas Université. Collection: Introuvables Paris : 150 p. https://www.u-paris2.fr/fr/recherche/editions-pantheon-assas/ouvrages/la-liberte-des-mers-mare-liberum

Grüss, A., Kaplan, D.M., & Guénette, S. 2011. Consequences of adult and Juvenile movement for marine protected areas. Biological Conservation, 144(2): 692-702

Gurney, G.G.; Cinner, J.; Ban, N.C.; Pressey, R.L.; Pollnac R. ; Campbell, S.J.; Tasidjawa , S.; Setiawan , F. 2014. Poverty and protected areas: An evaluation of a marine integrated conservation and development project in Indonesia. Global Environmental Change, 26: 98-107

Guthrie, D.A., 1971. Primitive Man's Relationship to Nature, BioScience, 21 (13): 721–723, https://doi.org/10.2307/1295922

Haines, R.; Hattam, C.; Pantzar, M.; & Russi, D. 2018. Study on the economic benefits of MPAs. Final report (Revised draft): 82 p. ICF Consulting Services Ltd. with the Institute for European Environmental Policy and Plymouth Laboratory: 82 p.

Halpern, B.S.; Frazier, M.; Afflerbach, J.; Lowndes, J.S.; Michelle, F.; O'Hara, C.; Scarborough, C. & Selkoe, K.A. 2019. Recent pace of change in human impact on the world's ocean. Scientific Reports, 9:11609.

Hampton, J.; Lehodey, P.; Senina, I.; Nichel, Phillips, J.S.; & Tiamere, K. 2023. Limited conservation efficacy of large-scale marine protected areas for Pacific skipjack and bigeye tunas. Front. Mar. Sci., 9:1060943. doi: 10.3389/fmars.2022.1060943

Harrison, J.; Lobach, T.; Morgera, E. & Manoa, P. 2017. Review and analysis of international legal and policy instruments related to deep-sea fisheries and biodiversity conservation in areas beyond national jurisdiction. Rome. FAO: 78 p.

Harrop, S.R. 2011. Living In Harmony With Nature'? Outcomes of the 2010 Nagoya Conference of the Convention on Biological Diversity. Environmental Law, 23(1): 117-128. DOI: 10.1093/jel/eqq032

Harvey, D. 1975. The geography of Capitalist Accumulation: a reconstruction of Marxian theory. Antipode, 7(2): 9-21. https://doi.org/10.1111/j.1467-8330.1975.tb00616.x

Hastings, A., & Botsford, L.W. 1999. Equivalence in yield from marine reserves and traditional fisheries management. Science 284: 1537–1538

Healy, N. & Luna, M. 2018. Exclusion and non-participation in Marine Spatial Planning. Marine Policy, 88: 32-40. https://doi.org/10.1016/j.marpol.2017.11.001

Heizer, S. 1993. ''Knob Cod''–Management of the Commercial Sea Cucumber Fishery in British Columbia.'' Journal of Shellfish Research, 12 (1): 144–45.

Herrenschmidt, J.B. & Le Meur P-Y. 2016. Politique foncière et dynamiques coutumières en Nouvelle-Calédonie et dans le Pacifique. Nouméa (NCL) ; Koné : IRD ; GIE Océanide ; Province Nord de Nouvelle-Calédonie, 198 p. ISBN 978-2-7099-1904-3. https://www.documentation.ird.fr/hor/fdi:010069086

Herrold-Menzies, M. 2006. Integrating Conservation and Development: What We Can Learn From Caohai, China. The Journal of Environment & Development, 15(4), 382–406. https://doi.org/10.1177/1070496506294491

Hickey, F.R. 2006. Traditional marine resource management in Vanuatu: Acknowledging, supporting and strengthening indigenous management systems. SPC Traditional Marine Resource Management and Knowledge Information Bulletin, 20:11-23.

Hiddink, J.G.; Jennings, S.; Sciberras, M.; Szostek, C.L.; Hughes, K.M.; Ellis, N.; Rijnsdorp, A.D.; et al. 2017. Global analysis of depletion and recovery of seabed biota after bottom trawling disturbance. PNAS, 114(31): 8301-8306. www.pnas.org/cgi/doi/10.1073/pnas.1618858114

Hilborn, R.; Stokes, K.; Maguire, J.J.; Smith, T.; Botsford, L.W.; Mangel, M.; Orensanz, J. et al. 2004. When can marine protected areas improve fisheries management? Ocean and Coastal Management, 47(2): 198-205

Hilborn, R. & Kaiser, M. 2022. A path forward for analysing the impacts of marine protected areas. Nature, 607: 4 p,

Hilborn, R. 2016. Marine biodiversity needs more than protection. Nature, 535: 224-226

Hilborn, R., 2017. Are MPAs effective? ICES J. Marine Sci. https://doi.org/10.1093/icesjms/fsx068.

Hilborn, R., Agostini, V.N., Chaloupka, M., Garcia, S.M., Gerber, L.R., Gilman, E., Hanich, Q., Himes-Cornell, A., Hobday, A.J., Itano, D. and Kaiser, M.J., 2022. Area-based management of blue water fisheries: Current knowledge and research needs. Fish and Fisheries, 23(2): 492-518.

Hilborn, R.; Akselrud, C.A.; Peterson, H. & Whitehouse, G.A. 2021. The trade-off between biodiversity and sustainable fish harvest with area-based management, ICES Journal of Marine Science, Volume 78, Issue 6, September 2021, Pages 2271–2279, https://doi.org/10.1093/icesjms/fsaa139

Hilborn, R.; Amoroso, R.O.; Anderson, C.M.; Baum, J.K.; Branch, T.A.; Costello, C.; De Moor, C.L.; et al. 2020. Effective fisheries management instrumental in improving fish stock status. Proceedings of the National Academy of Sciences, 117(4), pp.2218-2224.

Hilborn, R.; Micheli, F. & De Leo, G.A. 2006. Integrating marine protected areas with catch regulation. Canadian Journal of Aquatic Science, 63: 642—649.

Hilborn, R.; Stokes, K.; Maguire, J-J.; Smith, T.; Botsford, L.W.; Mangel, M.; Orensanz, J.; et al. 2004. When can marine reserves improve fisheries management? Ocean Coast. Manag., 47, 197–205.

Himes-Cornell, A.; Lechuga Sánchez, J.F.; Potter, C.; McKean, C.; Rice, J.; Friedman, K.J.; Garcia, S.M. & Fluharty, D.L. 2022. Reaching Global Marine Biodiversity Conservation Goals With Area-Based Fisheries Management: A Typology-Based Evaluation. Front. Mar. Sci., 9:932283. doi: 10.3389/fmars.2022.932283

Hiriart-Bertrand, l.; Silva, J.A. & Gelcich, S. 2020. Challenges and opportunities of implementing the marine and coastal areas for indigenous peoples policy in Chile. Ocean & Coastal Management, 193. https://doi.org/10.1016/j.ocecoaman.2020.105233

Hoagland, P.; Kaoru, Y. & Broadus, J.M. 1995. A methodological review of net benefit evaluation for marine reserves. Environmental Economics Series Paper No.027, World Bank, Washington

Hobday, A.J.; Hartog, J.R.; Timmiss, T. & Fielding, J. 2010. Dynamic spatial zoning to manage southern bluefin tuna (*Thunnus maccoyii*) capture in a multi-species longline fishery. Fisheries Oceanography, 19, 243–253. https://doi.org/10.1111/j.1365-2419.2010.00540

Hobday, A.J.; Maxwell, S.M.; Forgie, J.; McDonald, J. Derby, M.; Seto, K.; et al. 2013. Dynamic ocean management : Integrating scientific and technological capacity with law, policy and management. Stanford Environ Law Journal,33(2):125–165. https://heinonline.org/HOL/LandingPage?handle=hein.journals/staev33&div=7&id=&page=

Hockings, M.; Stolton, S.; Leverington, F.; Dudley, N. & Courrau, J. 2006. Evaluating Effectiveness: A framework for assessing management effectiveness of protected areas. 2nd edition. IUCN, Gland, Switzerland and Cambridge, UK. xiv + 105 pp

Holland, D.S. & Brazee, R.J. 1996 Marine Reserves for Fisheries Management. Marine Resource Economics, 11: 157–171. 0738-1360/96 $3.00 + .00

Hopkins, C.R.; Bailey, D.M. & Potts, T. 2016. Perceptions of practitioners: Managing marine protected areas for climate change resilience. Ocean & Coastal Management, 128: 18-28 https://doi.org/10.1016/j.ocecoaman.2016.04.014

Horta e Costa, B.; Claudet, J.; Franco, G.; Erzini, K.; Caro, A. & Goncalves, E.J. 2016. A regulation-based classification system for marine protected areas (MPAs). Marine Policy, 72: 192-198. https://doi.org/10.1016/j.marpol.2016.06.021

Horta e Costa, B.; Claudet, J.; Franco, G.; Erzini, K.; Caro, A. & Goncalves, E.J. 2017. A regulation-based classification system for marine protected areas. A response to Dudley et al. Marine Policy, 77: 193-195. Doi: 10.1016/j.marpol.2016.11.025A

Horwood, J.W.; Nichols, J.H. & Milligan, H. 1998. Evaluation of closed areas for fish stock conservation. Journal of Applied Ecology, 35: 893-903

Howell, E. A., Hoover, A., Benson, S. R., Bailey, H., Polovina, J. J., Seminoff, J. A., & Dutton, P. H. 2015. Enhancing the TurtleWatch product for leatherback sea turtles, a dynamic habitat model for ecosystem-based management. Fisheries Oceanography, 24, 57–68. https://doi.org/10.1111/fog.12092

Howell, E. A., Kobayashi, D. R., Parker, D. M., Balazs, G. H., & Polovina, J. J. 2008. TurtleWatch: A tool to aid in the bycatch reduction of loggerhead turtles *Caretta caretta* in the Hawaii-based pelagic longline fishery. Endangered Species Research, 5, 267–278. https://doi. org/10.3354/esr00096

Huntley, B.J. & Redford, K.H. 2014. Mainstreaming Biodiversity in Practice: a STAP Advisory Document, Global Environment Facility, Washington, DC: 88 p.

Huntley, B.J. 2014. Good news from the South: biodiversity mainstreaming – A paradigm shift in conservation? South African Journal of Science, 110 (9/10): http://dx.doi.org/10.1590/sajs.2014/a0080

Huxley, T. 1883. Inaugural address, Fisheries Exhibition, London. http://aleph0.clarku.edu/huxley/SMS/fish.html

Hviding, E., 1998. Contextual flexibility: present status and future of customary marine tenure in Solomon Islands. Ocean & Coastal Management, 40(2-3), pp.253-269.

Hyde, C.A.; Notarbartolo di Sciara, G.; Sorrentino, L.; Boyd, G.; Finucci, B.; Fowler, S.L.; Kyne, P.M. et al. 2022. Putting sharks on the map: A global standard for improving shark area-based conservation. Frontiers in Marine Science, 9(22): 16 p. https://doi.org/10.3389/fmars.2022.968853

ICES. 2020. Report of the ICES/IUCN-CEM Workshop on testing OECM practices and strategies (WKTOPS). Edited by Kenchington, E.; Rice, J.; Diz, D.; Kenny, A.; & Petza, D. ICES Scientific Reports, 3(42): 195 p. https://doi.org/10.17895/ices.pub.8135

ICSF. 2008. Reserved Parking Marine Reserves and Small-scale Fishing Communities: a Collection of Articles from SAMUDRA Report. SAMUDRA Dossier. International Collective in Support of Fishworkers, Chennai, India.

ICSF. 2010. Getting it Right: Incorporating Social Aspects into MPA Planning and Implementation. International Collective in Support of Fishworkers, Chennai, India.

Immovilli, M & Kok, M.T.J. 2020. Narratives for the "Half Earth" and "Sharing the planet" scenarios. A literature review. Background report. PBL Netherlands Environmental Assessment Agency: 5 p.

IMO. 2006. Revised guidelines for the identification and designation of particularly sensitive sea areas (PSSAs). Resolution A.982(24), adopted on 1 December 2005 adopted by the 24th IMO Assembly. Document A.24/Res.982: 13 p.

Independent World Commission on the Oceans. 1998. The ocean: our future. Mario Soares, ed. Cambridge, UK, Cambridge University Press. 248 pp.

IPBES. 2022. Assessment on Sustainable Use of Biodiversity; Summary for Policymakers. Advanced unedited version. By Fromentin, M.; Emery, M.R. & Donaldson, J. Intergovernmental Science-Policy Panel on Biodiversity & Ecosystem Services. IPBES Plenary 9, Bonn, July 2022: 33 p.

IPBES. 2022b. Methodological Assessment Report on the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Balvanera, P.; Pascual, U.; Christie, M.; Baptiste, B.; & González-Jiménez, D. (eds.). IPBES secretariat, Bonn, Germany. DOI: https://doi.org/10.5281/zenodo.6522522

ISBA. 2011. Environmental Management Plan for the Clarion-Clipperton Zone. International Seabed Authority. Legal and Technical Commission Seventeenth session, Kingston, Jamaica, 11-22 July 2011. Document ISBA/17/LTC/7: 18 p.

IUCN, UNEP, & WWF. 1980. World Conservation Strategy: Living Resource Conservation for Sustainable Development. IUCN, Gland, Switzerland: 77 p.

IUCN, UNEP, & WWF. 1991. Caring for the Earth. A strategy for sustainable living. Gland, Switzerland. IUCN: 236 p.

IUCN. 2008. Indigenous and community conserved areas. Available from URL http://cms.iucn.org/about/union/commissions/ceesp/topics/governance/icca

IUCN. 2016. A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0 . First edition. Gland, Switzerland: IUCN: 46 p.

IUCN. 2016a. WCC-2016-Res-069: Defining Nature-based Solutions. World Conservation Congress. Hawai'i. https://portals.iucn.org/library/sites/library/files/resrecfiles/WCC_2016_RES_069_EN.pdf

IUCN. 2020. Environmental and Social Impact Assessment (ESIA). Guidance Note – ESMS Manual Environmental & Social Management System (ESMS) Version : 15 March 2020. Accessed 09/02/2023 at: https://www.iucn.org/sites/default/files/2022-05/iucn-esms-manual_0.pdf

IUCN. 2021. Nature 2030. One nature one future. A programme for the Union 3021-2024. Resolution adopted at the World Conservation Council (WCC). Marseille, 2021: 24 p.

IUCN-TILCEPA, 2010. Joint PAEL-TILCEPA Workshop on Protected Areas Management Evaluation and Social Assessment of Protected Areas. International Union for Conservation of Nature, Gland, Switzerland.

IUCN-WCC. 2012. IUCN policy on Biodiversity offsets. Appendix 1 - Resolution WCC-2012Res-110-N: 2p. https://portals.iucn.org/library/node/44077

IUCN-WCPA. 2008. Establishing resilient marine protected area networks: making it happen. Washington, DC, IUCN World Commission on Protected Areas (IUCN-WCPA); National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce; and The Nature Conservancy. 118 pp.

IUCN-WCPA. 2017. IUCN Green List of Protected and Conserved Areas: Standard, Version 1.1. IUCN. World Commission on Protected Areas (WCPA). Gland, Switzerland. IUCN: 48 p.

IUCN-WCPA. 2019. Recognising and reporting other effective area-based conservation measures. Gland, Switzerland. IUCN: 36 p.

IWCO. 1998. Ocean Governance in the 21st Century: Democracy, Equity and Peace in the Ocean. The 1998 Lisbon Declaration. Independent World Commission on the Oceans. Final session. 30 August - 1 September 1998. Lisbon, Portugal.

Jaiteh, V.F.; Lindfield, S.J.; Mangubhai, S.; Warren, C.; Fitzpatrick, B. & Loneragan. N.R. 2016. Higher abundance of marine predators and changes in fishers' behavior following spatial protection within the world's biggest shark fishery. Frontiers in Marine Science, 3(43): 1-15. Doi: 10.3389/fmars.2016.00043

Jakobsen, N.S.; Burgess, M. J. and Andersen, K.H. 2016. Efficiency of fisheries is increasing at the ecosystem level. Fish and Fisheries, 18(2): 199-211. DOI: 10.1111/faf.12171

Jia, R.; Gao, J.; Gao, F. 2022. . Robust ocean zoning for conservation, fishery and marine renewable energy with co-location strategy. Applied Energy, 328: 120166. https://doi.org/10.1016/j.apenergy.2022.120166

Jennings, S. 2009. The role of marine protected areas in environmental management. ICES J. Mar. Sci. 66, 16–21. doi:10.1093/icesjms/fsn163.

Jentoft, S.; Minde H. & Nilsen, R. 2003. Indigenous Peoples: Resource Management and Global Rights. Eburon Academic Publisher, The Netherlands.

Jentoft, S. & Bavinck, M. 2014. Interactive governance for sustainable fisheries: dealing with legal pluralism. Curr. Opin. Environ. Sustain., 11:71–77.

Jentoft, S.; Chuenpagdee, R. & Pascual-Fernandez, J.J. 2011 What are MPAs for: On goal formation and displacement. Ocean ad Coastal Management, 54: 75-83

Jentoft, S.; van Son, T.C. & Bjorkan, M. 2007. Marine protected areas: a governance system analysis. Human Ecology 35(5):611–622

Jiang, H.; Cheng, H-Q; Le Quesne, W.J.F.; Xu, H-G; Vu, J.; Ding, H.; & Arreguin Sanchez, F. 2008. Ecosystem model predictions of fishery and conservation trade-offs resulting from marine protected areas in the East China Sea Environmental Conservation, 35 (2): 137–146. Doi:10.1017/S0376892908004852

Johannes, R.E. 1978. Traditional Marine Conservation Methods in Oceania and their Demise. Annual Review of Ecology and Systematics, 9: 349-364P. http://www.jstor.org/stable/2096753

Johannes, R.E. 1982. Traditional conservation methods and protected marine areas in Oceania. Ambio, 11(5): 258-261

Johannes, R.E. 2002. The Renaissance of Community-Based Marine Resource Management in Oceania. Annual Review of Ecology and Systematics, 33: 317-40.

Johnson, D.; Ferreira, M.A. & Kenchington, E. 2018. Climate change is likely to severely limit the effectiveness of deep-sea ABMTs in the North Atlantic. Mar. Policy 87:111–122.

Johnston, S.J. & Butterworth, D.S. 2022. Overall poaching time series for west coast rock lobster, resulting from combining estimates of illegally exported and locally sold lobsters and compliance time series as at June 2021. Unpublished working group document. Department of Forestry, Fisheries and the Environment, South Africa. FISHERIES/2022/JUN/SWG/WCRL13

Jonas, H.D.; Ahmadia, G.N.; Bingham. H.C.; Briggs, J.; Butchart, S.H.M.; Cariño, J. et al. 2021 Equitable and effective area-based conservation: Towards the conserved areas paradigm. PARKS, 27(1): 71-84. Doi 0.2305/IUCN.ch.2021.PARKS]271HJ.en

Jones P.J.S. & De Santo E.M. 2016. Viewpoint - Is the race for remote, very large marine protected areas (VLMPAs) taking us down the wrong track? Marine Policy, 73, 231-234 http://dx.doi.org/10.1016/j.marpol.2016.08.015

Jones, J.B. 1992. Environmental impact of trawling on the seabed: A review, New Zealand Journal of Marine and Freshwater Research, 26 (1): 59-67, DOI: 10.1080/00288330.1992.9516500

Jones, K.R.; Klein, C.J.; Halpern, B.S.; Venter, O.; Grantham, H.; Kuempel, C.D.; Shumway, N. et al. 2018. The Location and Protection Status of Earth's Diminishing Marine Wilderness. Current Biology ,28: 2506-2513. https://doi.org/10.1016/j.cub.2018.06.010

Jones P.J.S. 2006. Collective action problems posed by no take zones. Marine Policy, 30(2), 143-156.

Jones, P.J.S. 2007. Point-of-View: Arguments for conventional fisheries management and against no-take marine protected areas: only half of the story? Rev .Fish Biol. Fisheries , 17: 31-43. DOI 10.1007/s11160-006-9016-8

Jones, P.J.S. 2012. Marine protected areas in the UK: challenges in combining top-down and bottom-up approaches to governance. Environmental Conservation, 39(3):248–258

Jones, P.J.S.; Lieberknecht, L.M. & Qiu, W. 2016. Marine spatial planning in reality: Introduction to case studies and discussion of findings. Marine Policy,71: 256–264

Jones, P.J.S., Qiu, W., & De Santo, E.M., 2011. Governing Marine Protected Areas – Getting the Balance Right. Technical Report. United Nations Environment Programme, Nairobi.

Jorgensen, L.L.; Bakke, G. & Hoel A.H. 2020. Responding to global warming: New fisheries management measures in the Arctic. Progress in Oceanography, 188: 102423. https://doi.org/10.1016/j.pocean.2020.102423

Juan-Jordá, M-J.; Murua, H.; Arrizabalaga, H.; Merino, G.; Pacoureau, N.; & Dulvy, N.K. 2022. Seventy years of tunas, billfishes, and sharks as sentinels of global ocean health. Science, 378 (6620). www.doi.org/10.1126/science.abj0211

Kaiser, M. J. 2005. Are marine protected areas a red herring or fisheries panacea? Canadian Journal of Fisheries and Aquatic Sciences, 62: 1194-1199

Kaiser, M.J. and S. J. de Groot. 2000. The effects of fishing on non-target species and habitats: biological conservation and socio-economic issues. Blackwell; Science, Ltd. Oxford, UK

Kaplan D.M., 2009, Fish life histories and marine protected areas: an odd couple? Mar. Ecol. Prog. Ser., 377, 213−225.

Kearney, R. 2013. Australia's out-dated concern over fishing threatens wise marine conservation and ecologically sustainable seafood supply. Open Journal of Marine Science, 3(2): 55-61 doi:10.4236/ojms.2013.32006 Published Online April 2013. http://www.scirp.org/journal/ojms

Kearney, R.; Buxton, C.D.; Farebrother, G. 2012a. Australia's no-take marine protected areas: Appropriate conservation or inappropriate management of fishing?, Marine Policy, Volume 36, Issue 5, September 2012, Pages 1064-1071, ISSN 0308-597X, 10.1016/j.marpol.2012.02.024. http://www.sciencedirect.com/science/article/pii/S0308597X12000413.

Kearney, B.; Buxton, C.D.; Goodsell, P. & Farebrother, F. 2012b. Questionable interpretation of the Precautionary Principle in Australia's implementation of 'no-take' marine protected areas. Marine Policy, 36: 592–597Kearney R. & Farebrother G., 2012, Marine management: Expand Australia's sustainable fisheries. Nature, 482, 16

Kearney, B. & Hilborn, R. 2022. Solutions to world-wide fisheries problems are mostly local or regional. ICES Journal of Marine Science, 79 (4) : 997–1004, https://doi.org/10.1093/icesjms/fsac033

Kemp, J.; Jenkins, G.P.; Smith, D.C. & Fulton, E.A. 2012. Measuring the performance of spatial management in marine protected areas. Oceanography and Marine Biology: An Annual Review, 50: 287-314.

Kenchington, R. 2010. Strategic roles of marine protected areas in ecosystem-scale conservation. Bulletin of Marine Science, 86(2): 303–313

Kenchington, R., Vestergaard, O. and Garcia, S.M. 2014. Spatial dimensions of fisheries and biodiversity governance: 110-123 In Garcia, S.M.; Rice, J. and Charles, A. (Eds). *Governance of marine fisheries and biodiversity conservation. Interaction and coevolution*. Chichester (UK). Wiley-Blackwell : 511 p

Kerwath, S.E.; Götz, A.; Attwood, C.G.; Sauer, W.H.H. & Wilke, C. 2007. Area utilization and activity patterns of roman *Chrysoblephus laticeps* in a small South African marine protected area. African Journal of Marine Science, 29(2): 259-270.

Kerwath, S.E.; Winker, H.; Götz, A. & Attwood, C.G. 2013. Marine protected area improves yield without disadvantaging fishers. Nature Communications, 4: 2347.

Kettunen, M.; Dudley, N.; Gorricho, J.; Hickey, V.; Krueger, L.; MacKinnon, K.; Oglethorpe, J.; et al. 2021. Building on Nature: Area-based conservation as a key tool for delivering SDGs. IEEP, IUCN WCPA, The Nature Conservancy, The World Bank, UNDP, Wildlife Conservation Society and WWF: 236 p. https://ieep.eu/publications/building-on-nature-area-based-conservation-as-a-key-tool-for-delivering-sdgs

Kincaid, K.G. 2017. The role of closed areas in marine ecosystem-based management. In Partial fulfilment of a PhD. St John's ,Newfoundland & Labrador. Memorial University of Newfoundland: 255 p. available at: https://core.ac.uk/reader/154914698

Kirkman, S.P.; Mann, B.Q.; Sink, K.J.; Adams, R.; Livingstone, T.C.; Mann-Lang, J.B.; Pfaff, M.C. et al. 2021. Evaluating the evidence for ecological effectiveness of South Africa's marine protected areas, African Journal of Marine Science, 43(3): 389-412, DOI: 10.2989/1814232X.2021.1962975

Klein, C.J.; Brown, C.J. Halpern, B.S.; Segan, D.B.; McGowan, J.; Beger, M.; Watson, J.E.M. 2015. Shortfalls in the global protected area network at representing marine biodiversity. Nature. Scientific reports, 5: 7 p. DOI: 10.1038/srep17539

Kooiman, J.; Bavink, M.; Jentoft, S. and R. Pullin, (Eds). 2005. Fish for life. Interactive governance for fisheries. Amsterdam. Amsterdam University Press. Mare publications series, 3: 457 p.

Kraak, S. B. M.; Reid, D. G.; Gerritsen, H. D.; Kelly, C. J.; Fitzpatrick, M. et al. 2012. 21st century fisheries management: a spatio-temporally explicit tariff-based approach combining multiple drivers and incentivising responsible fishing. ICES J. Mar. Sci., 69(4): 590-601. Doi:10.1093/icesjms/fss033

Kuempel, C. D., Jones, K. R., Watson, J. E., & Possingham, H. P. 2019. Quantifying biases in marine-protected- area placement relative to abatable threats. Conservation Biology, 33(6): 1350–1359. https://doi.org/10.1111/cobi.13340

Lagarde, L. 2021. Les Vikings du soleil levant : exploration appropriation et exploitation du Pacifique par les océaniens : pp 23-32 in Gireaudeau, G. (Editor). *Les enjeux territoriaux du Pacifique*. Presses Universitaires de Nouvelle Calédonie (PUNC) Nouméa

Lai, H., & Bradbury, A. 1998. ''A Modified Catch-at-Size Analysis Model for a Red Sea Urchin (*Strongylocentrotus franciscanus*) Population.'' Canadian Special Publication of Fisheries and Aquatic Sciences ,125:85–96.

Laman, E.A.; Rooper, C.N.; Turner, K.; Rooney, S.; Cooper, D.W. & Zimmermann, M. 2018. Using species distribution models to describe essential fish habitat in Alaska. Canadian Journal of Fisheries and Aquatic Sciences, 75(8). https://doi.org/10.1139/cjfas-2017-0181.

Lambert, R.A.; Linnell, J.D.; Watt, A. & Gutierrez, R.J., 2013. Understanding and managing conservation conflicts. Trends in ecology & evolution, 28(2). 100-109.

Latour, B. 1991. We have never been modern. Translated by Catherine Porter, 1993, Harvester Wheatsheaf and the President and Fellows of Harvard College, Harvard.

Latour, B. 2005. Changer de société, refaire de la sociologie. Paris, La Découverte, Sciences humaines et sociales

Leenhardt, P.; Cazalet, B.; Salvat, B. ; Claudet, J. and Feral, F. 2013. The rise of large-scale marine protected areas: Conservation or geopolitics? Ocean & Coastal Management, 85: 11-118

Lefebvre, H. 1970. Du rural à l'urbain. Paris. Anthropos : 285 p. and Cahiers Internationaux de sociologie, n° 6 : pp. 63-78

Lefebvre, H. 1997. Le marxisme. EAN : 9782130435815. Presses Universitaires de France (PUF). Que sais-je, 300 16°éd.

Lefèvre F. 2007. Histoire du monde grec antique. Le livre de poche, 606. Sciences humaines et sociales : 632 p.

Leslie, R.W. 2004. Declaration of a seasonally closed area off the south coast to protect seasonal spawning of kingklip. Unpublished document: WG/08/04/D:K:15. Department of Environmental Affairs and Tourism: Marine and Coastal Management, South Africa.

Lester, S.E. & Halpern, B.S. 2008. Biological responses in marine no-take reserves versus partially protected areas. Marine Ecology Progress Series, 367: 49-56

Lester, S.E.; Halpern, B.S.; Grorud-Colvert, K.; Lubchenco, J.; Ruttenberg, B.I.; Gaines, S.D.; Airamé, S.; et al. 2009. Biological effects within no-take marine reserves: a global synthesis. MEPS 384:33-46. https://doi.org/10.3354/meps08029

Lester, S.E.; McDonald, G.; Clemence, M.; Dougherty, D.T. & Szuwalski , C.S. 2016. Impacts of TURFs and marine reserves on fisheries and conservation goals: theory, empirical evidence, and modeling. Bull Mar Sci., 93(1):173–198 https://doi.org/10.5343/bms.2015.1083

Leverington, F., Hockings, M., Pavese, H., Costa, K.L. and Courrau, J. 2008. Management effectiveness evaluation in protected areas – a global study. Supplementary report No. 1: Overview of approaches and methodologies. The University of Queensland, Gatton, TNC, WWF, IUCN-WCPA. Australia.

Levin, P.S. & Stuz, G.W. 2005. Habitat triage for exploited fishes: Can we identify essential "Essential Fish Habitat?". Estuarine, Coastal and Shelf Science, 64 (1): 70-78

Link, J.S. 2010. Ecosystem-based fisheries management. Confronting trade-offs. Cambridge. Cambridge University Press: 207 p.

Little, A.S.; Needle, C.L.; Hilborn, R.; Holland, D.S.; Marshall, T.C. 2015. Real-time spatial management approaches to reduce bycatch and discards: experiences from Europe and the United States. Fish and fisheries, 16 (4): 576-602. Https://doi: 10.1111/faf.12080

Liu, O.R.; Kleisner, K.M.; Smith, S.L. & Kritzer, J.P. 2018. The use of spatial management tools in rights-based groundfish fisheries. Fish and Fisheries, 19: 821-838. https://doi.org/10.1111/faf.12294

Løbach, T. & al. (ed.) 2020. Regional fisheries management organizations and advisory bodies. FAO Fisheries and Aquaculture Technical Paper, 651

Locke, H.; Ellis, E.C.; Venter, O.; Schuster, R.; Ma, K.; Shen, X.; Woodley, S.; et al. 2019. Three global conditions for biodiversity conservation and sustainable use: an implementation framework. National Science Review, 6(6):1080–1082.

Locke, H. 2015. Nature needs (at least) half: a necessary new agenda for protected areas. Protecting the wild, Springer: 3–15.

Lonely Planet. 2020. "Kamiali Wildlife Management Area | Papua New Guinea Attractions." Accessed November 20, 2020. https://www.lonelyplanet.com/papua-new-guinea/huon-gulf-coast/attractions/kamiali-wildlife-management-area/a/poi-sig/1529134/1337361

Lopoukhine, N. and Ferreira de Souza Dias, B. 2012. Editorial: What does Target 11 really mean? PARKS 18 (1): 5–8.

Louis XIV, 1681. Ordonnance de la Marine de 1681. Edition Commentée avec les anciennes Ordonnances, & le Droit Écrit Paris 1714. https://gallica.bnf.fr/ark:/12148/bpt6k9606758r/f21.item#

Mace, G. 2014. Who's conservation? Science, 345: 1558-1559

Mace, P.; O'Criodain, C.; Rice, J. & Sant, G. 2014. Conservation and risk of extinction in marine species: 181-1994 in *Governance of marine fisheries and biodiversity conservation. Interaction and coevolution*. Garcia, S.M., Rice, J. & Charles, A. (Eds). Wiley Blackwell, Chichester UK.: 511 p.

Mangel, M. 2000. Trade-offs between fish habitat and fishing mortality and the role of reserves. Bulletin of Marine Science, 66(3): 663–674

Mann-Lang, J.B.; Branch, G.M.; Mann, B.Q.; Sink, K.J.; Kirkman S.P. & Adams, R. 2021. Social and economic effects of marine protected areas in South Africa, with recommendations for future assessments. *African Journal of Marine Science* 43(3):367-387, https://www.doi.org/10.2989/1814232X.2021.1961166.

Mantyka-Pringle, C.S.; Visconti, P.; Di Marco, M.; Martin, T.G.; Rondinini, C. & Rhodes, J.R. 2015. Climate change modifies risk of global biodiversity loss due to land-cover change. Biological Conservation, 187:103– 111.

Marnewick, D.; Stevens, C.; Antrobus-Wuth, R.; Theron, N.; Wilson, N.; Naude, K. & Jonas H. 2020. Assessing the Extent of OECMs in South Africa: Final Project Report. BirdLife South Africa, Johannesburg : 50 p.

Martin, K.; Samoilys, M.A.; Hurd, A.K.; Meliane, I. & Lundin, C. G. 2007. Experiences in the use of marine protected areas with fisheries Management objectives a review of case studies. In: FAO. Report and documentation of the Expert Workshop on Marine Protected Areas and Fisheries Management : Review on Issues and Considerations. Rome, 12.14 June 2006. FAO Fisheries Report, 825: 21-108

Martin, S.M.; Cambridge, T.A.; Grieve, C.; Nimmo, F.M. & Agnew, D.J., 2012. An evaluation of environmental changes within fisheries involved in the Marine Stewardship Council certification scheme. Reviews in Fisheries Science, 20(2), pp.61-69.

Marton-Lafevre, J. 2007. Peace parks: conservation and conflict resolution. MIT Press

Mascia, M.B. & Claus, C.A. 2009. A property rights approach to understanding human displacement from protected areas: the case of marine protected areas. Conservation Biology, 23 (1), 16–23.

Mascia, M.B.; Claus, C.A.; Naidoo, R. 2010. Impacts of Marine Protected Areas on fishing communities. Conservation biology, 24(5): 1424-1439

Matsuda, H.; Makino, M.; Tomiyama, M.; et al. 2010. Fishery management in Japan. Ecological Research, 25: 899-907.

Maxwell, S.L.; Cazalis, V.; Dudley, N.; Hoffmann, M.; Rodriguez, A.S.L.; Stolton, S.; Visconti. P. et al. 2020. Area-based conservation in the twenty-first century. Nature, 586. 217–227. https://doi.org/10.1038/s41586-020-2773-z

Maxwell, S.M. ; Hazen, E.L.; Lewison, R.I.; Dunn, D.C.; Bailey, H.; Bograd, S.J.; Briscoe, D.K.; et al. 2015. Dynamic ocean management: Defining and conceptualizing real-time management of the ocean. Marine Policy, 58:42-50

Maxwell, S.M; Gjerde, K.M.; Conners, M.G. & Crowder, L.B., 2020. Mobile protected areas for biodiversity on the high seas. Science, 367(6475), pp.252-254.

Mbatha, N.P., 2018. The influence of plural governance systems on rural coastal livelihoods: The case of Kosi Bay. Marine Resources Assessment Group Ltd. (MRAG). PhD Dissertation. University of Cape Town. http://hdl.handle.net/11427/29768

McCay, B.J. 1976. "Appropriate Technology and Coastal Fishermen of Newfoundland, Columbia University

McConnaughey, R.A.; Hiddink, J.G.; Jennings, S.; et al. 2020. Choosing best practices for managing impacts of trawl fishing on seabed habitats and biota. Fish Fish 21:319–337. https://doi.org/10.1111/FAF.12431

McLeod, E.; Salm, R.; Green, A. & Almany, J. 2009. Designing marine protected area networks to address the impacts of climate change. Frontiers in Ecology and the Environment, 7, 362–370.

Medoff, S.; Lynham, J. & Raynor, J. 2022. Spillover benefits from the world's largest fully protected MPA. Science, 378 (6617): 313-316.

Meehan, M.C.; Ban, N.C.; Devillers, R.; Singh, G.G. & Claudet. J. 2020. How far have we come? A review of MPA network performance indicators in reaching qualitative elements of Aichi Target 11. DOI: 10.1111/conl.12746

Meguro, T. 2008. Chapter 1. Introduction: Paradigms of conservation. In Meguro, T. (Ed). *Re-conceptualization of wildlife conservation. Towards resonation between subsistence and wildlife*. African Centre for Technology Studies (ACTS): 98 p.

Mesnildrey, L.; Gascuel, D. & Le Pape, O. 2013. Integrating marine protected areas in fisheries management systems: Some criteria for ecological efficiency. Aquatic Living Resources, 26(2), 159-170.

Meyer, A.D.; Tsui, A.S. & Hinings, C.R. 1993. Configurational approaches to organizational analysis. Acad. Manage., J.36(6):1175-95

Michelet, J. 1861. La mer. Paris. Librairie de L. Hachette. Also published by Good Press (2022). Goodpress@okpublishing.info. Also accessible at: https://journals.openedition.org/aes/2187

Miles, L.; Agra, R.; Sengupta, S..; Vidal, A. & Dickson, B. 2021. Nature-based solutions for climate change mitigation. Nairobi. Gland. UNEP. IUCN : 35 p. ISBN: 978-92-807-3897-1

Millennium Ecosystem Assessment. 2005. Ecosystems and human well-being: Synthesis. Washington, D.C. Island Press: 137 p.

Miller, T.R.; Minter, B.A. & Malan, L.C. 2011. The new conservation debate: the view from practical ethics. Biological conservation, 144: 948-957.

Mills, M.; Jupiter, S.D.; Pressey, R.L.; Ban, N.C. and Comley, J. 2011. Incorporating Effectiveness of Community-Based Management in a National Marine Gap Analysis for Fiji. Conservation biology, 25(6) : 1155–1164

Moland, E.; Fernández-Chacón, A.; Knutsen Sørdalen, T.; Villegas-Ríos, D.; Huneide Thorbjørnsen, S.; Tallaksen Halvorsen, K.; ,Huserbråten, M.; et al. 2021. Restoration of abundance and dynamics of coastal fish and lobster within northern Marine Protected Areas across two Decades. Frontiers in marine science, 8: 12 p. https://doi.org/10.3389/fmars.2021.674756

Molenaar, E. J. 2013. Area-Based Management Tools. In *Intersessional Workshops on the Conservation and Sustainable Use of Marine Biodiversity Beyond Areas of National Jurisdiction.* Oceans and Law of the Sea division, United Nations: 20 slides; https://go.nature.com/3m5jylf.

Morzaria-Luna, H.N.; Ainsworth, C.H.; Kaplan, I.C.; Levin, P.S. & Fulton, E.A. 2012. Exploring Trade-Offs between Fisheries and Conservation of the Vaquita Porpoise (Phocoena sinus) Using an Atlantis Ecosystem Model. PLoS ONE, 7(8): e42917. https:// doi:10.1371/journal.pone.0042917

Napoletano, B.M. & Clark, B. 2020. An Ecological-Marxist Response to the Half-Earth Project. *Conservation & Society* 18(1):37-49. https://www.jstor.org/stable/26869216

Nardini, B. 1999. Portrait of a Master. Leonardo. Florence, Giunti :190 p.

Nédélec, C. & Prado J., 1990. Définition et classification des catégories d'engins de pêche. Doc. Tech. FAO, FIDI/FIIT/T222, Révision 1. FAO, Rome. 92 p.

Nepgen, C.S. 1982. Diet of predatory and reef fish in False Bay and possible effects of pelagic purse-seining on their food supply. Fisheries Bulletin 16: 75 – 94.

Ngoc, Q.T.K. & Flaaten, O., 2010. Protected areas for conflict resolution and management of recreational and commercial fisheries. Marine resource economics, 25(4): 409-426. https://doi.org/10.5950/0738-1360-25.4.409.

New Zealand. 2007. Fisheries (Benthic Protection Areas) Regulations 2007 (SR 2007/308). (Version 28/10/2021) https://www.legislation.govt.nz/regulation/public/2007/0308/latest/whole.html#DLM973998

NIWA. 2013. Sensitive marine benthic habitats defined. Report prepared for New Zealand Ministry for the Environment. National Institute of Water and Atmospheric Research Ltd (NIWA). Wellington, New Zealand. Report WLG2013-18: 72 p.

Norman, S.; Wilkinson, S.; Japp, D. W.; Reed, J. & Sink, K. J. 2018. A Review and Strengthening of the Spatial Management in South Africa's Offshore Fisheries. Capricorn Marine Environmental (PTY) Ltd., Cape Town, South Africa, on behalf of the South African National Biodiversity Institute, the Centre for Environmental Rights and the Responsible Fisheries Alliance. https://capmarine-sa.co.za/wp-content/uploads/2021/04/A-Review-of-Spatial-Management-in-South-Africas-Offshore-FisheriesF.pdf

Norse, E. A.; Crowder, L.B.; Gjerde, K.M.; Hyrenbach, D.; Roberts, C.; Safina, C. & Soule, M.E. 2005. Place-based Ecosystem Management in the Open Ocean. In: Norse, E.A. & Crowder, L.B. (Eds). *Marine conservation biology: the science of maintaining the sea's biodiversity*. Island Press: 302-317

Nowotony, H.; Scot, P. & Gibbons, M. 2001. Re-thinking science: knowledge and the public in the age of uncertainty. Polity, Cambridge

NRC. 2001. Marine Protected Areas: Tools for Sustaining Ocean Ecosystems. National Resources Council, Washington, D.C.

O'Leary, B.C.; Winther-Janson, M.; Bainbridge, J.M.; Aitken, J.; Hawkins, J.P.; Roberts, C.M. 2016. Effective Coverage Targets for Ocean Protection. Conservation Letters, 9(6), 398–404. Doi: 10.1111/conl.12247

Obura. D. 2023. The Kunming-Montreal Global Biodiversity Framework: Business as usual or a turning point? One Earth. Commentary. Cell Press.: 4 p. https://doi.org/10.1016/j.oneear.2023.01.013

Obura, D.O.; Katerere, Y.; Mayet, M.; Kaelo, D.; Msweli, M.; Mather, K. & Harris, J. 2021. Integrate biodiversity targets from local to global levels. A shared Earth approach links biodiversity and people. Science Magazine, 373, August: 746-748.

OECD. 2000. Marine protected Areas. Economics, management and effective policy mixes. Paris. OECD. 16 p.

OECD. 2006. Applying Strategic Environmental Assessment: Good Practice Guidance for Development Co-operation, DAC Guidelines and Reference Series, OECD Publishing, Paris, https://doi.org/10.1787/9789264026582-en.

Ojeda, J.; Salomon, A.K.; Rowe, J.K. & Ban, N.C. 2022. Reciprocal contributions between people and nature: A conceptual Intervention. Bioscience, 72(19): 952-962 https://doi.org/10.1093/biosci/biac053

Oldekop, J.A.; Holmes, G.; Harris, W.E.; Evans, K.L.; et al. (2015). A global assessment of the social and conservation outcomes of protected areas Conservation Biology, 30(1): 133-141

Olsen, E.; Kleiven, A.R.; Skjoldal, H.R. & von Quillfeldt, C,H. 2011. Place-based management at different spatial scales. J. Coast. Conserv., 15:257–269. DOI 10.1007/s11852-010-0108-1

Olsen, E.M.; Johnson, D.; Weaver, P.; Goñi, R.; Ribeiro, M.C.; Rabaut, M.; Macpherson, E.; et al. 2013. Achieving ecologically coherent MPA networks in Europe: science needs and priorities. Marine Board Position Paper 18. In: Larkin, K.E. and McDonough, N. (Eds.). European Marine Board, Ostend, Belgium: 88 p.

Osenberg, C.W.; Shima, J.S.; Miller, S.L. & Stier, A.C., 2011. Assessing effects of marine protected areas: confounding in space and possible solutions, in: Claudet, J. (Ed.), Marine Protected Areas: A Multidisciplinary Approach. Cambridge University Press

Osipova, E.; Emslie-Smith, M.; Osti, M.; Murai, M.; Åberg, U. & Shadie, P. 2020. IUCN World Heritage Outlook 3: A conservation assessment of all natural World Heritage sites, November 2020. Gland, Switzerland: IUCN. x + 90pp.

Ostrom E. 1990. Governing the commons: the evolution of institutions for collective action. Cambridge (UK): Cambridge University Press.

Ovando, D.; Caselle, J.E.; Costello, C.; Deschenes, O.; Gaines, S.D.; Hilborn, R.; Liu,O. 2021. Assessing the population-level conservation effects of marine protected areas. Conservation biology, 35 (6): 1861-1870. DOI: 10.1111/cobi.13782

Ovando, D.; Liu, O.; Molina, R. & Szuwalsky, C.S. 2021. Models of marine protected areas must explicitly address spatial dynamics. PNAS, 116(23) : e20255958118. https://doi.org/10.1073/pnas.2025958118

Pacific Community. 2021. Pacific Framework for Action on Scaling up Community-based Fisheries Management: 2021–2025. Noumea, New Caledonia: Pacific Community: 20p.

Palomo, I.; Martín-López, B.; Potschin, M.; Haines-Young, R. & Montes, C. 2013. 'National Parks, Buffer Zones and Surrounding Lands: Mapping Ecosystem Service Flows', *Ecosystem Services*, 4: 104–116.

Palumbi, S.R. 2001. Humans as the world's greater evolutionary force. Science 293: 1786–1790.

Paredes, P.; Flores, D.; Figueroa, A.; Gaymer, C.F. 2019. Science, capacity building and conservation knowledge: The empowerment of the local community for marine conservation in Rapa Nui. Aquatic Conserv. Mar. Freshw. ecosyst., 29 (Supp. 2): 130-137

Parent, F & Jouquan, J. 2014. Taxonomies and typologies: complementary clarifications. Taxonomies and typologies: some additional clarifications. Public Health, 26: 227-228. DOI 10.3917/spub.138.0227

Parsons, E.C.M.; MacPherson, R.; Villagomez, 2017. Marine "conservation": you keep that word but I don't think it means what you think it means. Frontiers in marine science, 4, article 299: 4 p.

Pastoors, M. A.; Rijnsdorp, A. D. & Van Beek, F. A. 2000. Effects of a partially closed area in the North Sea (''plaice box'') on stock development of plaice. – ICES Journal of Marine Science, 57: 1014–1022.

Pauly, D. 1988. Some definitions of overfishing relevant to coastal zone management in Southeast Asia. Tropical Coastal Area Management, 3(1): 14-15

Pedersen, E. J.; Thompson, P.L.; Ball, R. A.; Fortin, M-J; Gouhier, T. C.; Link, H.; Moritz, C.; et al. 2017. Signatures of the collapse and incipient recovery of an overexploited marine ecosystem. Royal society open science, 4: 1-15. available at http://dx.doi.org/10.1098/rsos.170215

Pelc, R.A.; Baskett, M.L.; Tanci, T.; Gaines, S.D. & Warner, R.R. 2009. Quantifying larval export from South African marine reserves. Marine Ecology Progress Series, 394:65-78. https://doi.org/10.3354/meps08326

Pendleton, L.H.; Ahmadia, G.N.; Browman, H.I.; Thurstan, R.H.; Kaplan, D.M. & Bartolino, V. 2017. Debating the effectiveness of marine protected areas. – ICES Journal of Marine Science, doi:10.1093/icesjms/fsx154.

Pereira, L.; Davies, K.; Den Belder, E. Ferrier, S.; Karlsson-Vinkhuysen, S.; Kim, H.; Kuiper, J.J.; et al. 2020. Developing multi-scale and integrative nature-people scenarios using the IPBES Nature Futures Framework. People and Nature, 00:1–24. DOI: 10.1002/pan3.10146

Peterson, C.H.; Summerson, H.C.; Thomson, E.; Lenihan, H.S.; Grabowski, J.; Manning, L.; Micheli, F. & Johnson, G. 2000. Synthesis of linkages between benthic and fish communities as a key to protecting essential fish habitats. ICES Bull. Mar. Sci., 66(3) 759-774

Petza, D.; Anastopoulos A.; Kalogirou, S.; Coll, M.; Garcia, S. M.; Kaiser, M.; Koukourouvli, N.; et al. 2023 (submitted). Contribution of Area-Based Fisheries Management Measures to Fisheries Sustainability and Marine Conservation: a global scoping review. Reviews in Fish Biology and Fisheries, 00 (00): xx-xx

Petza, D.; Chalkias, C.; Koukourouvli, N.; Coll, M.; Vassilopoulou, V.; Karachlef P.K.; Markantonatoua, A.C.; et al. 2019. An operational framework to assess the value of fisheries restricted areas for marine conservation. Marine Policy, 102: 28-39. https://doi.org/10.1016/j.marpol.2019.01.005.

PfertzelJ-P 1981. « Marx et l'espace. De l'exégèse à la théorie » Espace-Temps, 18-20 : 65-76

Pfister, C.A. & Bradbury, A. 1996. Harvesting red sea urchins: recent effects and future predictions. Ecol. Applic., 6, 298–310.

PFMC. 2020. Pacific Coast Groundfish Management Plan for the California, Oregon, and Washington groundfish fishery. Pacific Fishery management Council. Portland (Oregon, USA): 159 p.

Phillipson, J., & Symes, D. 2018. 'A sea of troubles': Brexit and the fisheries question. Marine Policy, 90, 168-173.

Piketty, T. Capital et Idéologie. Editions du Seuil. Les Livres du nouveau monde : 1232 p.

Pimbert, M.P. & Pretty, J.N. 1995. Parks, people and professionals: putting "participation" into protected areas management. UNRISD: 65 p.

Pipitone, C.; Badalamenti, F.; Vega Fernandez, T.; D'Anna, G. 2014. Chapter 10. Spatial management of fisheries in the Mediterranean sea: Problematic issues and a few success stories. Advances in Marine Biology, 69: 372-401. http://dx.doi.org/10.1016/B978-0-12-800214-8.00010-4

PISCO, 2007. The Science of Marine Reserves [2nd Edition, United States Version], Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO)."PISCO: Outreach Events".

Plaganyi, E.V.; Skewes, T.; Murphy, N.; Pascual, R. & Fischer, M. 2015. Crop rotations in the sea: Increasing returns and reducing risk of collapse in sea cucumber fisheries PNAS, 112(21): 6770-6795. www.pnas.org/cgi/doi/10.1073/pnas.1406689112

PNUD. 1997. La gouvernance en faveur du développement humain durable. Document de politique générale du PNUD. PNUD. New York. http://mirror.undp.org/magnet/policy/

Pollnac, R. ; Christie, P. ; Cinner, J. E. ; Dalton, T. ; Daw, T.M. ; Forrester, G.E. et al. 2010. Marine reserves as linked social-ecological systems. PNAS, 107(43): 18262-18265

Pollnac, R.B. 2000. Summary of factors influencing success (impacts) from a literature review. In Crawford, B., Balgos, M. & Pagdilao, C.R. (Eds). *Community-Based Marine Sanctuaries in the Philippines: A Report on Focus Group Discussions.* Annex 4, Pp. A9-A12. Coastal Management Report #2224. PCAMRD Book Series N° 30. Narragansett RI, USA and Los Banos, Laguna, Philippines: Coastal Resources Center and Philippine Council for Aquatic and Marine Research and Development.

Pollnac, R.B. & Crawford, B. 2000. Discovering factors that influence the success of community-based marine protected areas in the Visayas, Philippines. Coastal Management Report # 2229. PCAMRD Book Series N° 33. CRC (University of Rhode Island) and PCAMR (Philippines).

Pollnac, R.B. 1994. Research directed at developing local organizations for people's participation in fisheries management. in Pomeroy, R.S. (Ed.) *Community Management and Common Property of Coastal Fisheries in Asia and the Pacific: Concepts, Methods and Experiences*. pp. 94-106. Manila. ICLARM.

Pomeroy, R.S.; Mascia, M.B. & Pollnac, R.B., 2006. Marine Protected Areas: the Social Dimension. In: FAO Expert Workshop on Marine Protected Areas and Fisheries Management: Review of Issues and Considerations, 12–14 June.

Pomeroy, R.S.; Watson, L.M.; Parks, J.E. & Cid. G.A. 2005. How is your MPA doing? A methodology for evaluating the management effectiveness of marine protected areas. Ocean and Coastal Management, 48: 485-502

Pons, M.; Watson, J.T.; Ovando, D.; Andraka, S.; Brodie, S.; Domingo, A.; Fitchett, M.; Forselledo, R. et al. 2022. Trade-offs between bycatch and target catches in static versus dynamic fishery closures. PNAS, 119(4): e2114508119. https://doi.org/10.1073/pnas.2114508119

Pradervand, P. & Hiseman, R. 2006. An analysis of the recreational shore fishery in the Goukamma Marine Protected Area. African Zoology, 41: 275–289.

Pressey, R.L. & Ferraro, P.J. (Comp.). 2015. Introduction: Measuring the difference made by conservation initiatives: protected areas and their environmental and social impacts. Phil. Trans. R. Soc. B, 370 (1681) 20140270. . DOI: 10.1098/rstb.2014.0270. PMID: 26460123; PMCID: PMC4614727.

Queffelec, B.; Bonnin, M.; Ferreira, B.; Bertrand, S.; Teles da Silva, S.; et al.. 2021. Marine spatial planning and the risk of ocean grabbing in the tropical Atlantic. ICES Journal of Marine Science, Oxford University Press (OUP). DOI: 10.1093/icesjms/fsab006.. .hal-03156514: 14 p.

Raillet A. 1984. La marchandisation de l'espace. Les aventures de l'espace en économie politique. in *Espace-Temps.* 26-28 : 118-130

Rauch, D. 2014. Les prud'homies de pêche à l'époque contemporaine (1790-1962). La permanence d'une institution hybride en Méditerranée française. Université Sophia Antipolis. Thèse pour l'obtention du grade de docteur en droit présentée et soutenue publiquement le 9 octobre 2014: 569 p.

Raymond-Yakoubiana, J. & Daniel, R. 2018. Indigenous approach to ocean planning and policy in the Bering Strait region of Alaska. Marine Policy, 97: 101-108. https://doi.org/10.1016/j.marpol.2018.08.028

Redpath, S.M.; Young, J.; Evely, A.; Adams, W.M.; Sutherland, W.J.; Whitehouse, A.; Amar, A.; et al. 2013. Understanding and managing conservation conflicts. Trends Ecol Evol. , 28(2):100-109. Doi: 10.1016/j.tree.2012.08.021. Epub 2012 Oct 3. PMID: 23040462.

Reilly, K; O'Hagan, A-M & Dalton, G. 2015. Attitudes and perceptions of fishermen on the island of Ireland towards the development of marine renewable energy projects. Marine Policy, 58 : 88-97. https://www.doi.org/10.1016/j.marpol.2015.04.001

Reimer, J. M.; Devillers, R. ; & Claudet, J. 2021. Benefits and gaps in area-based management tools for the ocean Sustainable Development Goal. Nature Sustainability, 4(4), 349-357. https://www.doi.org/10.1038/s41893-020-00659-2

Rice, J. & Ridgeway, L. 2010. Conservation of biodiversity and fisheries management: 139-149. In Grafton, Q.R., Hilborn, R., Squires, D., Tait, M., and Williams, M. (Eds). *Handbook of Marine Fisheries Conservation and Management*. Oxford University Press: 770 p.

Rice, J.; Ticktin, T.; Díaz -Reviriego, I.; Furukawa, T.; Gandiwa, E.; Lavadinović, V.; Margayan, L.; et al. 2022. Chapter 2: Conceptualizing the sustainable use of wild species. In: Fromentin, J.M.; Emery, M.R.; Donaldson, J.; Danner, M.C.; Hallosserie, A.; & Kieling, D. (eds.). *Thematic Assessment Report on the Sustainable Use of Wild Species of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. IPBES Secretariat, Bonn, Germany: 138 p.. https://doi.org/10.5281/zenodo.6053970

Rice, J.; Garcia, S.M: & Kaiser, M. 2018. Other effective area-based conservation measures (OEABCMs) used in marine fisheries: a working paper. Background information document for the CBD Expert Workshop on marine protected areas and other effective area-based conservation measures in coastal and marine areas (6-9/02/2018; Montreal, Canada). CBD/MCB/EM/2018/1/INF/4: 70 p. https://www.cbd.int/doc/c/0689/522e/7f94ced371fa41aeee6747e5/mcb-em-2018-01-inf-04-en.pdf

Rice, J.; Moksness, E.; Attwood C.; Brown, S.K.; Dahle, G.; Gjerde, K.M.; et al. 2012. The role of MPAs in reconciling fisheries management with conservation of biological diversity. Ocean & Coastal Management, 69: 217-230

Rice, J.C & Garcia, S.M. 2011. Fisheries, food security, climate change, and biodiversity: characteristics of the sector and perspectives on emerging issues. ICES Journal of Marine Science, 68(6): 1343-1353. Https://doi:10.1093/icesjms/fsr041

Ridgeway, L. 2014. Chapter 10. Global levels and processes: assessment of critical roles, foundations of cooperation and integration of their contribiution to integrated marine governance. Pp: 148-165 In Garcia, S.M.; Rice, J. and Charles, A. (Eds.). *Governance of marine fisheries and biodiversity conservation. Interaction and coevolution.* Chichester, UK. Wiley-Blackwell: 511 p.

Ridgeway, L. 2014a. Chapter 11. Global level institutions and processes: Frameworks for understanding critical roles and foundations of cooperation and integration. Pp: 138-147. In Garcia, S.M.; Rice, J. and Charles, A. (Eds.). *Governance of marine fisheries and biodiversity conservation. Interaction and coevolution*. Chichester, UK. Wiley-Blackwell: 511 p.

Roberts, C. 2007. The unnatural history of the sea. Washington. Island Press: 435 p.

Roberts, C. M. and Hawkins, J. P. 2012. Establishment of fish stocks recovery areas. European Parliament.

Directorate General for Internal Policies. Policy Department B. Structural and cohesion policies; 2012(Fisheries; IP/B/PECH/2012-53 : 66 p.).

Roberts, M.J. & Van den Berg, M. 2005. Currents along the Tsitsikamma Coast, South Africa, and potential transport of squid paralarvae and ichthyoplankton. African Journal of Marine Science, 27(2): 375–388.

Rochette, J.; Unger, S.; Herr, D.; Johnson, D.; Nakamura ,T.; Packeiser, T.; Proelss, A. et al. 2014. The regional approach to conservation and use of marine biodiversity in areas beyond national jurisdiction. Marine Policy, 49: 109-117

Rocliffe, S. 2015. Scaling and sustaining Locally Managed Marine Areas. PhD. New York University. New York: 237 p.

Rodwell, L. D., & Roberts, C. M. 2004. Fishing and the impact of marine reserves in a variable environment. Canadian Journal of Fisheries and Aquatic Sciences. 61(11): 2053-2068. DOI: 10.1139/F04-142

Rogers, S.I. 1997. A review of closed areas in the United Kingdom Exclusive Economic Zone. Science Series. Lowestoft. Centre for environment, fisheries and aquaculture science (CEFAS). Technical Report , 106:

Rohe, J.R.; Govan, H.; Schlüter, A. & Ferse, S.C.A. 2019. A legal pluralism perspective on coastal fisheries governance in two Pacific Island countries. Marine Policy, 100: 90-9724 p.

Roncin, N.; Alban, F.; Charbonnel, E.; Crec'hriou, R.; de la Cruz Modino, R.; Culioli, J-M.; Dimech, M.; et al. 2008. Uses of ecosystem services provided by MPAs: How much do they impact the local economy? A southern Europe perspective. Journal of nature conservation, 16: 256-270

Ros, N. & Galletti, F. (Eds.). 2016. Le droit de la mer face aux « Méditerranées. Cahiers de l'ASSIDMER. Editoriale Scientifica Napoli. Papers of intern. associ. law of the sea: 410 p. + XVIII

Ros, N. 2015. Les nouvelles zones économiques exclusives en Méditerranée, pp 7-33, in *Le droit de la mer face aux Méditerranées, Quelle contribution des mers semi-fermées au développement du droit international de la mer*? 3, Napoli. Editoriale Scientifica. Cahiers de l'ASSIDMER ⟨hal-01084344⟩

Rousseau, J-J. 1755. Discours sur l'origine et les fondements des inégalités entre les hommes. Online BNF https://gallica.bnf.fr/essentiels/rousseau/discours-origine-inegalite

Rozwadowski, H.M. 2002. The sea knows no boundaries. A century of marine science under ICES. Copenhagen, Seattle, London. ICES, Univ. of Washington Press: 410 p.

Ruddle, K., 1987. Administration and conflict management in Japanese coastal fisheries. FAO Fisheries Technical Paper, 273: 93 p.

Ruddle, K. 1998. Social Principles underlying Traditional Inshore Fishery Management Systems in the Pacific Basin. Marine Resource Economics, Volume 5(4): 351-363

Ruddle, K., Hviding, E. & Johannes, R.E. 1992. Marine resource management in the context of customary tenure. Marine Resource Economics, 7: 249-273.

Russi D.; Pantzar M.; Kettunen M.; Gitti G.; Mutafoglu K.; Kotulak M. & ten Brink P. 2016. Socio-Economic Benefits of the EU Marine Protected Areas. Report prepared by the Institute for European Environmental Policy (IEEP) for DG Environment. London, IEEP: 96 p.

SADSTIA (South African Deep-Sea Trawling Industry Association). 2016. Seabed experiment enters www.sadstia.co.za/news/seabed-experiment-enters-its-third-year.

SADSTIA. 2022. South African Deep-Sea Trawling Industry Association Annual Review 2021. Cape Town, South Africa, SADSTIA. www.sadstia.co.za/publication/2021-annual-review

Sala, E.; Mayorga, J.; Bradley, D.; Cabral, R.B.; Atwood, T.B.; Auber, A.; Cheung, W; et al. 2021. Protecting the global ocean for biodiversity, food and climate, Nature, 592: 397-402. https://doi.org/10.1038/s41586-021-03371-z

Salafsky, N. 2011. 2011. Integrating development with conservation: A means to a conservation end, or a mean end to conservation? Biological Conservation, 144(3): 973-978

Salm, R.V.; Clark, J.R. & Siirila, E. 2000. Marine and Coastal Protected Areas: A Guide for Planners and Managers. Washington, D.C. IUCN.

Sanchirico, J.N. 2000. Marine protected policy: a discussion and benefits. Discussion Paper 00–23. Washington, DC: Resources for the Future,

Sanchirico, J.N. & Willen, J.E. 2000. The impacts of marine reserves on limited-entry fisheries. Resources for the future, Discussion paper 00-34: 23 p. https://www.rff.org/publications/journal-articles/the-impacts-of-marine-reserves-on-limited-entry-fisheries/

Sanchirico, J.N.; Cochran, K.A. & Emerson, P. 2002. Marine protected areas: economic and social implications. Washington. Resources for the future. Discussion paper 02-26

Santos, C.Z. & Schiavetti, A. 2013. Marine Extractive Reserves of Brazil: Contradictions of legal order, sustainability and ecological aspects. Bol. Inst. Pesca, Sćo Paulo, 39(4): 479-494

Schleicher, J.; Zaehringer, J.G.; Fastré, C.; Vira, B.; Visconti, P. & Sandbrook, C. 2019. Protecting half of the planet could directly affect over one billion people. Nature Sustainability. Brief communication, 3 p. https://doi.org/10.10398/s41893-019-0423-y

Schwartz, M.W. 2020. A social movement for conservation. https://ssir.org/articles/entry/a_social_movement_for_conservation. Poster 14/05/2020

Sciberras, M.; Jenkins, S.R.; Mant, R.; Kaiser, M.J.; Hawkins, S.J.; & Pullin, A.S. 2015. Evaluating the relative conservation value of fully and partially protected marine areas. Fish and Fisheries, 16(1): 58-77. DOI: 10.1111/faf.12044

Sciberras, M.; Jenkins, S.R.; Kaiser, M.J.; Hawkins, S,J. & Pullin, A.S. 2013. Evaluating the biological effectiveness of fully and partially protected marine areas. Environmental Evidence, 2(4): 31 p. http://www.environmentalevidencejournal.org/content/2/1/4

Selig, E.R.; Kleisner, K.M.; Ahoobim, O.; Arocha, F.; Cruz-Trinidad, A.; Fujita, R. Hara, M; Katz, L. et al. 2016. ,A typology of fisheries management tools: using experience to catalyse greater success. Fish and Fisheries. DOI: 10.1111/faf.12192: 20 p.

Sexton, N.R.; Leong, K.M.; Milley, B.J.; Clarke, M.M.; Teel, T.L.; Chase, M.A. & Dietsch, A.M. 2013. The State of Human Dimensions Capacity for Natural Resource Management: Needs, Knowledge, and Resources. The George Wright Forum, 30 (2): 142-153

Sherman, K.; Alexander, L.M.; Gold, B.D. 1993. Large Marine Ecosystems. Stress, mitigation and sustainability. Washington, AAAS Press: 376 p.

Shipp, R.L. 2003. A perspective on marine reserves as a fishery management tool. Fisheries 28(12):10–21

Shipp, R.L. 2004 Harvest benefits: marine reserves or traditional fishery management tools. Am Fish Soc. Symp., 42:125–131

Silva Villagra, E.J. 2012. La Mar presencial, aplicación futura des sus postulados. Monografias y Ensayos. Revismat 2/2012: 136-146. https://revistamarina.cl/revistas/2012/2/silva.pdf

Simpson, L. 2006. Review of Tsawalk: A Nuu-chah-nulth Worldview. University of Toronto Quarterly, 75(1): 179-180. *Project MUSE*, doi:10.1353/utq.2006.0213.

Sluczanowski, P. R. 1984. A management-oriented Model of an abalone fishery whose substocks are subject to pulse fishing. Canadian Journal of Fisheries and Aquatic Sciences, 41 (7): 1008–14.

Smale, M. J. & Badenhorst, A. 1991. The distribution and abundance of linefish and secondary trawlfish from the Cape south coast of South Africa, 1986–1990. South African Journal of Marine Science, 11: 395–407.

Smallhorn-west, P. & Govan, H. 2018. Towards reducing misrepresentation of national achievements in marine protected area targets. Marine POlicy, 9; 127-129 Critics of the MPA database information.

Smith, A. 1776. An Inquiry into the nature and causes of the wealth of nations. London. Strahan W. and Cadell, T. Modern edition in Shine Classics (2014): 524 p.

Smith M., Cochrane, K. & Japp, D. 2013. Kingklip (Genypterus capensis) in the South African Hake-Directed Trawl Fishery. In: Review of Significant Bycatch and "Joint Product" Species in the South African Hake-Directed Trawl Fishery. Capricorn Fisheries Monitoring Report: 1-15.

Smith, M. D.; Sanchirico, J. N. & Wilen, J. E. 2009. The economics of spatial- dynamic processes: Applications to renewable resources. Journal of Environmental Economics and Management, 57: 104-121

Smith, N., 2019. Planet Ocean: the last frontier. Engineering & Technology, 14(7), pp.58-63.

Smith, R.; Cannizzo, Z.J.; Belle, E. & Wenzel, L. 2020. Role of Protected Areas in Climate Change Mitigation, Adaptation, and Disaster Risk Reduction. In: Leal Filho, W.; Azul, A.M.; Brandli, L.; Özuyar, P.G.; Wall, T. (eds). *Climate Action*. *Encyclopaedia of the UN Sustainable Development Goals*. Springer, Cham. https://doi.org/10.1007/978-3-319-71063-1_142-1

Smith, T. D. 1994. Scaling Fisheries: The Science of Measuring the Effects of Fishing, 1855-1955. New York, NY: Cambridge University Press

Smith-Godfrey, S., 2016. Defining the blue economy. Maritime affairs: Journal of the national maritime foundation of India, 12(1), pp.58-64.

Soulé, M.E. & Wilcox, B. A. 1980. Conservation Biology: An Evolutionary-Ecological Perspective. Sunderland, MA: Sinauer Associates

Soulé, M.E. 1985. What is conservation biology? BioScience, 35: 727–734.

Sowman, M.; Hauck, M.; Van Sittert, L. & Sunde, J. 2011. Marine protected area management in South Africa: New policies – old paradigms. Environmental Management, 47(4): 573-583

Sowman, M.; Raemaekers, S. & Sunde, J. 2014. Guidelines for Integrating Human Dimensions into Marine Protected Area (MPA) Planning and Management. Prepared for WWF-SA, Environmental Evaluation Unit, University of Cape Town.

Sowman, M.; Sunde, J.; Raemaekers, S. & Schultz, D. 2014. Fishing for equality: policy for poverty alleviation for South Africa's small-scale fisheries, Mar. Policy, 46: 31–42, https://doi.org/10.1016/j.marpol.2013.12.005

Sowman, M. & Sunde, J. 2018. Social impacts of marine protected areas in South Africa on coastal fishing communities. Ocean and Coastal Management, 157: 168–179.

Spalding, M.; Meliane, I.; Bennet, N. J.; Dearden, P.; Pati, P. & Brumbaugh, R. D. 2016. Building towards the marine conservation end-game: consolidating the role of MPAs in a future ocean. Aquatic Conserv: Mar. Freshw. Ecosyst., 26 (Suppl. 2): 185–199. DOI: 10.1002/aqc.26

Spalding, M.D.; Meliane, I.; Milam, A.; Fitzgerald, C. & Hale, L.Z. 2013. Protecting marine spaces: global targets and changing approaches. Pp: 213-248 in Chircop, A.; Coffen-Smout S. & McConnel, M. (Eds.) *Ocean Yearbook 27.* Koninklike Brill, Netherlands. Martin Nijhoff publ.; 786 p.

SPC. 2007. SPC Activities. Fisheries management section. Refresher programme for the Niue's community-based fisheries management plan. SPC Fisheries Newsletter, 121: 3 p.

Squires, D. & Garcia, S.M. 2018. The least-cost biodiversity impact mitigation hierarchy with a focus on marine fisheries and bycatch issues. Conservation biology, 35(2): 989-997 https://doi.org/10.1111/cobi.13155

Squires, D.; Restrepo, V.; Garcia, S. & Dutton, P. 2018. Fisheries bycatch reduction within the least-cost biodiversity mitigation hierarchy: Conservatory offsets with an application to sea turtles. Marine Policy, 93: 55-61

STECF. 2006. Report of the Scientific, Technical and Economic Committee for Fisheries Opinion on 'Sensitive and Essential Fish Habitats in the Mediterranean Sea''. Brussels 3–7 April 2006, http://stecf.jrc.cec.eu.int/ : 63 p.

STECF. 2007. Working Group report on Evaluation of closed areas schemes. ISPRA, Italy.5-9 November 2007. Sub-Group on Management of Stocks (SGMOS) of the Scientific, Technical, and Economic Committee for Fisheries (STCEF). Commission of the European Communities. Rep *STECF/SGMOS-07-*

03 145 p. Available at: http://stecf.jrc.ec.europa.eu/documents/43805/44876/07-09_SGMOS+07-03+-+Evaluation+of+closed+areas+II.pdf.

Stefansson, G. & Rosenberg, A. 2005. Combining control measures for more effective management of fisheries under uncertainty: quotas, effort limitation and protected areas. Philosophical Transactions of the Royal Society B: Biological Sciences, 360: 133 - 146}

Stockhausen, W.T. 2017. Assessment of Pribilof Islands blue king crab. Alaska Fisheries Science Center, National Marine Fisheries Service. https://www.npfmc.org/wp-content/PDFdocuments/resources/SAFE/CrabSAFE/2018/5-PIBKC_SAFE_2018.pdf

Stolton, S.; Hockings, M.; Dudley, N.; MacKinnon, K.; Whitten T. & Leverington, F. 2007. Management Effectiveness Tracking Tool Reporting Progress at Protected Area Sites. Second Edition. WWF International

Subpesca. 2004. Concepto de areas de manejo y recursos bentonicos. Subsecretaria de Pesca, Valparaiso, Chile. Documento de difusion 1. http://www.subpesca

Sullivan M.S. 1997. The case in international law for Canada's extension of fisheries jurisdiction beyond 200 miles. Ocean Development and International Law, 28(3): 203-268

Sun, M.; Li, Y.; Ren, Y. & Chen, Y. 2021. Rebuilding depleted fisheries towards BMSY under uncertainty: harvest control rules outperform combined management measures. ICES Journal of Marine Science, 78(6): 2218 – 2232. doi:10.1093/icesjms/fsaa078

Sunde, J. 2010. Conceptualising human dimensions of marine protected areas (MPAs) in relation to small-scale fisheries in South Africa: The evolution of the human dimensions discourse. Prepared for the Environmental Evaluation Unit, University of Caope Town, 25 November 2010. Unpublished report.

Sunde, J., 2014. Customary Governance and Expressions of Living Customary Law at Dwesa-Cwebe: Contributions towards Small-Scale Fisheries Governance in South Africa. Doctoral thesis, University of Cape Town.

Sunde, J. 2014b. Marine Protected Areas and Small-scale Fishing Communities in South Africa: Promoting Governance, Participation, Equity and Benefit-sharing. International Collective in Support of Fishworkers, India, Chennai.

Sundstrom, A. 2015. Covenants with broken swords: Corruption and law enforcement in governance of the commons. Global Environmental Change, 31: 253-262.

Sutherland, W.J.; Dicks, L.W.; Petrovan, S.O.; Smith, R.K. Editors. 2021. What works in conservation. Conservation Evidence. Cambridge. Open Books Publishers. 1040 p. http://www.openbookpublishers.com

Sutinen, J.G. & Soboil, M. (2003) The performance of fisheries management systems and the ecosystem challenge. In Sinclair, M & Valdimarsson, G. (Eds.): Responsible Fisheries in the Marine Ecosystem. CAB International, Oxford, UK.

Symes, D. 2009. Reform of the European Union's Common Fisheries Policy: Making Fisheries Management Work. Fisheries Research, 100: 99-102.

Teh, L.S.L.; Cashion, T. ; Cheung, W.W.L. ; et al. 2010. Taking stock: a Large Marine Ecosystem perspective of socio-economic and ecological trends in East China Sea fisheries. Rev Fish Biol Fisheries, 30: 269–292. https://doi.org/10.1007/s11160-020-09599-8

Tempier, E. 1984. Mode de régulation de l'effort de pêche et le rôle des Prud'homies. Université d'Aix-Marseille II Centre d'Etudes des Relations Sociales Contrat de recherche IFREMER n° 84 / 3173, centre de documentation d'IFREMER

Teulières-Preston, M-H. 2015. Le droit maritime kanak et ses transformations. In Bensa, A. & Lebic, I. (Eds): En pays kanak. Ethnologie, linguistique, archéologie, histoire de la Nouvelle Calédonie- Maison des Sciences de l'Homme- DOI: 10.4000/books.editionsmsh.2755.

Therivel, R. & Wood, G. (Eds). 2018. Methods of Environmental and Social Impact Assessment. 4th Edition. Routledge: 740

Theutenberg, B.J. 1984. Mare clausum and mare liberum. Artic, 37(4): 481-492

Thomas C.D. & Gillingham, P.K. 2015.The performance of protected areas for biodiversity under climate change. Biological Journal of the Linnean Society, 115: 718–730

Thompson, A.; Sanders, J.; Tandstad, M.Carocci, F. and Fuller, J. 2016.Vulnerable marine ecosystems. Processes and practices in the high seas. Rome, FAO. FAO Fisheries and Aquaculture Technical Paper, 595: 200 p.

Thorpe, A.; Bavinck, M. & Coulthard, S. 2011. Tracking the Debate Around Marine Protected Areas: Key Issues and the BEG Framework. Environmental Management (2011) 47:546–563. DOI 10.1007/s00267-011-9632-5etcon

TNC, WWF, CI and WCS. 2008. Marine protected area networks in the Coral Triangle: development and lessons. TNC, WWF, CI, WCS and USAID, Cebu City, Philippines. 106 p. https://en.wikipedia.org/wiki/Marine_Protected_Area_Network

Todd C.; Stevenson, B.N. Tissot, W.J. 2013. Socioeconomic consequences of fishing displacement from marine protected areas in Hawaii. Biological Conservation, 160: 50-58

Tolley, K.A.; da Silva, J.M. & Jansen van Vuuren, B. (2019). South African National Biodiversity Assessment 2018 Technical Report. Vol. 7: Genetic Diversity. Pretoria: South African National Biodiversity Institute. hdl:20.500.12143/6376.

Toropova, C.; Meliane, I.; Laffoley, D. ;Matthews, E. & Spalding, M. (Eds.) . 2010. Global Ocean Protection. Present Status and Future Possibilities. Gland (Switzerland). Arlington (USA). Cambridge (UK) Nairobi (Kenya). Tokyo (Japan). Brest (France). CN/TNC/UNEP/WCMC/UNU-IAS/AAMP: 96 p.

Torquebiau, A. 1965. L'aménagement du littoral languedocien et la situation juridique des étangs côtiers, Doctoral Thesis, Law Faculty Montpellier University.

Tran, M.; Fay, G.; Stewart, B.D.; Stokesbury, K.D.E. 2022. Resiliency of Marine Benthic Communities in sea scallop rotational management areas on Georges Bank. Journal of Shellfish Research, 41(3): 301-309.

Treweek, J. 1995. Ecological Impact Assessment. Impact Assessment, 13(3): 289-315. https://doi.org/10.1080/07349165.1995.9726099

Trouillet, B. 2020. Reinventing marine spatial planning: a critical review of initiatives worldwide. Journal of Environmental Policy & Planning, 22(4): 441-459. Doi: 10.1080/1523908X.2020.1751605

Truchet, D.M.; Noceti, B.M.; Villagran, D.M. & Truchet, R.M. 2022. Alternative conservation paradigms and ecological knowledge of small-scale artisanal fishers in a changing marine scenario in Argentina. Human Ecology, 50:209–225. https://doi.org/10.1007/s10745-022-00309-5

Turnbull, J.W.; Johnston, E.L. & Clark, G.F. 2021. Evaluating the social and ecological effectiveness of partially protected marine areas. Conservation biology, 35(3): 921-932. DOI: 10.1111/cobi.13677

Twyford, K. 2021 Towards a Protected Areas Classification System for the Cook Islands. Policy paper prepared for Cook Islands National Environment Service and Ridge to Reef (R2R) Project. PACS policy paper. https://r2r.environment.gov.ck/wp-content/uploads/sites/2/2021/05/38.-Cook-Islands-PACS-policy-paper-2021.pdf

Underwood, A.J. 1994. On beyond BACI: sampling designs that might reliably detect environmental disturbances. Ecological Applications, 4:3–15.

UNDP. 1997. Governance for sustainable human development : a UNDP policy document. Document: DP(09)/H9181. New York. UNDP.: 40 p. https://digitallibrary.un.org/record/492551

UN Environment. 2016. Understanding synergies and mainstreaming among the biodiversity related conventions: A special contributory volume by key biodiversity convention secretariats and scientific bodies. UN Environment, Nairobi, Kenya: 67 p.

UN Environment. 2018. Applying area-based management approaches to achieve multiple sustainable development goal targets. Summary for policy-makers. UNEP, Nairobi. UNEP Regional Seas Reports and Studies, 206: 28 p.

UN Environment. 2018a. Applying area-based management approaches to achieve multiple sustainable development goal targets. Summary for policy-makers. UNEP, Nairobi. UNEP Regional Seas Reports and Studies, 206: 28 p.

UN Environment. 2018b. The contribution of marine and coastal area-based management approaches to sustainable development goals and targets.. UNEP, Nairobi. UNEP Regional Seas Reports and Studies, 205: 100 p.

UNEP & IUCN. 2021. Nature-based solutions for climate change mitigation. Nairobi and Glan: 42 p

UNEP, FAO, IMO, UNDP, IUCN, GRID-Arendal. 2012. Green Economy in a Blue World. Synthesis report. ISBN: 978-82-7701-097-7: 24 p. https://grid.cld.bz/Green-Economy-in-a-Blue-World-Synthesis/2/

UNEP. 2001. Ecosystem-based management of fisheries: Opportunities and challenges for coordination between marine Regional Fishery Bodies and Regional Seas Convention. Nairobi. UNEP. UNEP Regional Seas Reports and Studies, 175: 52 p.

UNEP. Undated. A handbook for the Indigenous and Community Conserved Areas Registry. Version 2: 15 p. https://www.unep.org/resources/report/handbook-indigenous-and-community-conserved-areas-registry (accessed 23/11/2022)

UNESCO Institute for Statistics. 2009. UNESCO Framework for Cultural Statistics and UNESCO, Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972. http://uis.unesco.org/en/glossary-term/natural-heritage

UNESCO, 2012. Managing World Heritage. World Heritage resource manual series. UNESCO / ICCROM / ICOMOS / IUCN. Paris (France). UNESCO: 101 p.

UNESCO. 2015. World Heritage Marine Sites. Managing effectively the world's most iconic Marine Protected Areas. Paris. UNESCO. World Heritage Convention: 116 p. https://unesdoc.unesco.org/ark:/48223/pf0000235316/PDF/235316eng.pdf.multi

United Nations. 1992. Earth Summit Agenda 21. The United nations programme of action from Rio. New York, United Nations: 294 p United Nations, 2002. Report of the Secretary General to the Fifty-seventh session of the General Assembly, Agenda item 25(b), Oceans and the Law of the Sea, Resolution A/RES/57/142

United Nations. 2006. Oceans and the law of the sea. The Impacts of Fishing on Vulnerable Marine Ecosystems: Actions taken by States and regional fisheries management organizations and arrangements to give effect to paragraphs 66 to 69 of General Assembly resolution 59/25 on sustainable fisheries, regarding the impacts of fishing on vulnerable marine ecosystems. Report of the Secretary-General. Document A/61 Advanced Unedited Text: 44 p.

United Nations. 2007. Oceans and the law of the sea. Report of the Secretary-General of the United Nations General Assembly on Oceans and the Law of the Sea (10 September 2007). The role of area-based management tools. UN Doc. A/62/66/Add.2 , paras. 122-161: 83 p

United Nations. 2007a. Ecosystem Approaches and Oceans. Panel Presentations during the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea (UNICPOLOS). Seventh meeting, United Nations Headquarters, New York, 12 to 16 June 2006. Sales No. E.07.V.4: 185 p

United Nations. 2012. Blue Economy Concept Paper: Rio + 20 United Nations Conference on Sustainable Development. United Nations, Rio de Janeiro, Brazil. https://wedocs.unep.org/handle/20.500.11822/11129

United Nations. 2015. Transforming our world: the 2030 Agenda for Sustainable Development. UNGA Resolution A/RES/70/1 of 25 September 2015: 35 p. https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=EA

United Nations. 2016. Report of the resumed Review Conference on the 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: United Nations. New York. A/CONF.210/2016/5: 50 p.

United Nations. 2021. United Nations Climate Annual Report 2021: 63 p. https://unfccc.int/annualrepor

United Nations. 2022. Further revised draft text of an agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction. Advance Unedited Version: 55 p. https://digitallibrary.un.org/record/3847798?ln=en

United Nations. 2023. Draft agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction. Advanced, unedited, pending paragraph renumbering: 54 p. https://www.un.org/bbnj/

Urbina, I., 2019. The Outlaw Ocean: Journeys across the last untamed frontier. Vintage.

Vacher, L. & Argounes F. 2011. L'Océanie un continent marin menacé. *Carto* le monde en Carte, n° 6, pp 10-21

Vacher, L. 2014 La représentation des frontières maritimes dans les cartes régionales in Dousset L. & al. *Les sciences humaines et sociales dans le pacifique Sud*. Cahier du CREDO, Pacific CREDO Publication : 69-86

Valderrama, D. & Anderson, J.L. 2007. Improving Utilization of the Atlantic Sea Scallop Resource: An Analysis of Rotational Management of Fishing Grounds. Land Economics, February: 86-103

Venter, O.; Fuller, R.A.; Segan, D.B.; Carwardine, J.; Brooks, T.; Butchart, S.H.M; Di Marco, M.; et al. 2014. Targeting global protected area expansion for imperilled biodiversity. PLoS Biology, 12(6): e1001891. https://www.doi.org/10.1371/journal.pbio.1001891

Vierros, M.; Dunn, D.; O'Hara, T.; Grorud-Colvert, K.; Morgan, L. & Halpin, P. 2016. Policy Brief. Space for conservation and sustainable use: area-based management in areas beyond national jurisdiction. Nereus Programme. Oregon State University. Nereus Scientific & Technical Briefs on Marine Areas Beyond National Jurisdiction (ABNJ) series , 6: 10 p. http://archives.nereusprogram.org/policy-brief-bbnj-area-based-management/

Vigne, D.; Cataldi, G & Casado Ragon, R. 2000. Le droit international de la pêche maritime. Bruyland Bruxelles

Villasante, S.; Lopes, P.F.M.; & Coll, M. 2016. The role of marine ecosystem services for human well-being: Disentangling synergies and trade-offs at multiple scales. Ecosystem Services, 17: 1–4

Villaseñor-Derbez, J.C.; Aceves-Bueno, E.; Fulton, S.; Suarez, A.; Hernandez-Velasco, A.; Torre, J.; et al. 2019. An interdisciplinary evaluation of community-based TURF-reserves. PLoS ONE 14(8): e0221660. https://doi.org/10.1371/journal.pone.0221660

Vitousek, P.M.; Mooney, H.A.; Lubchenko, J. & Melillo, J.M. 1997. Human domination of the earth's ecosystem. Science, 277: 494–499.

Vivacqua, M. 2018. Coastal-Marine Extractive Reserves: reflections on the pre-implementation stage. Ambiente & Sociedade, 21: 22 p. https://doi.org/10.1590/1809-4422asoc0032r3vu18L1AO

Von Bonde, C. 1956. So great thy sea. A study of the oceans. AA Balkema. Cape Town.

Voyer, M.; Quirk, G.; McIlgorm, A. & Azmi, K. 2018. Shades of blue: what do competing interpretations of the Blue Economy mean for oceans governance? Journal of Environmental Policy & Planning, 20: 595–616.

Voyer, M.; Gladstone, W. & Goodall, H. 2013. Understanding marine park opposition: the relationship between social impacts, environmental knowledge and motivation to fish. Aquatic Conserv: Mar. Freshw. Ecosyst., 24(4): 441-462. DOI: 10.1002/aqc.2363

WCED. 1987. Our common future. World Conference on Environment and Development. Oxford University Press (UK) : 400 p.

Walmsley, S.A.; Leslie, R. W. & Sauer, W.H.H. 2007. Bycatch and discarding in the South African demersal trawl fishery. Fisheries Research, 86: 15–30.

Ward T.J.; Heinemann, D. & Evans, N. 2001. The Role of Marine Reserves as Fisheries Management Tools: a review of concepts, evidence, and international experience. Bureau of Rural Sciences, Canberra, Australia: 192 pp. Https://www.academia.edu/27944026/

Weigel, Y. ; Morand, P.; Mawongwai, T. ; Noel, J.F. & Tokrishna, R. 2015. Assessing economic effects of a marine protected area on fishing households. A Thai case study. Fisheries research, 161: 64-76

Wells S.; Addison, P.F.E.; Bueno, P.A. et al. 2016. Using the IUCN Green list of Protected Areas to promote conservation impact through marine protected areas. Building networks of MPAs: 24-44 In IUCN-WCPA (Eds.). *The legacy from the 2014 Sydney World Parks Congress*. Aquatic conservation, 26(2): 255 p.

Westley, F. 1997. "Not on Our Watch": The Biodiversity Crisis and Global Collaboration Response. Organization & Environment, 10(4), 342–360. https://doi.org/10.1177/192181069701000402

Westlund, L.; Charles, A.; Garcia S.; Sanders, J. (eds). 2016. Marine Protected Areas: Interactions with Fishery Livelihoods and Food Security. FAO Fisheries and Aquaculture Technical Paper, 603:172

Whitmarsh, D.; James, C.; Pickering, H.; Pipitone, C.; Badalamenti, F., and D'Anna, G. 2001. Economic effects of marine protected areas on small-scale fisheries : a case study of the trawl ban in the gulf of Castellammare, Sicily. 2001; 151, 1-11. IIFET 2000 Conference Proceedings. European Project EC 97/0063

Willer, D.F.; Aldridge, D.C.; Gough, C. & Kincaid, K. 2023. Small-scale octopus fishery operations enable environmentally and socioeconomically sustainable sourcing of nutrients under climate change. Nature Food. https://doi.org/10.1038/s43016-022-00687-5

Williams, I.D.; Walsh, W.J.; Claisse, J.T.; Tissot, B.N. & Stamoulis, K.A. 2009. Impacts of a Hawaiian marine protected area network on the abundance and fishery sustainability of the yellow tang, Zebrasoma flavescens. Biological Conservation, 142(5): 10661-073. https://doi.org/10.1016/j.biocon.2008.12.029

Williams, I.D.; Walsh, W.J.; Miyasaka, A. & Friedlander, A.M. 2006. Effects of rotational closure on coral reef fishes in Waikiki-Diamond Head Fishery Management Area, Oahu, Hawaii. Marine Ecology Progress Series, 310: 139–149

Wilson, D.C. & McCay, B.J. 1998. How the participants talk about "participation" in Mid-Atlantic fisheries management. Ocean and Coastal Management, 41: 41-61

Wilson, E.O. 2016. Half-Earth: our planet's fight for life. New York: Liveright Publishing Corporation, W. W. Norton & Company : 213 p.

Witbooi, E.; Ali, K.D.; Santosa, M.A.; Hurley, G. ; Husein, Y.; Maharaj, S.; Okafor-Yarwood, I.; et al. 2020. Organized crime in the fisheries sector threatens a sustainable ocean economy. Nature 588: 48–56. https://doi.org/10.1038/s41586-020-2913-5AB

Woodley, S.; Baillie, J.E.M.; Dudley, N.; Hockings, M.; Kingston, N.; Laffoley, D.; Locke, H. et al. 2019. A bold successor to Aichi Target 11. Science Letters, 365 (6454):

Woods, P.J.; Elvarsson, B.Z.; Sigurdsson, T. & Stefánsson G. 2018. Evaluating the effectiveness of real-time closures for reducing susceptibility of small fish to capture. ICES Journal of Marine Science, 75 (1): 298–308. Https://doi.org/10.1093/icesjms/fsx152

World Bank. 1991. Environmental Assessment Sourcebook. Volume I. Policies, Procedures, and Cross-Sectoral Issues. Environment Department. World Bank Technical Paper, 139: 246 p.

World Bank. 2006. Scaling up marine management. The role of Marine Protected Areas.. Washingtion, DC. World Bank: 100 p.

World Resources Institute. 2000. Fish for the Future? Testing Conservation Assumptions Behind a Portfolio of Small-Scale Marine Reserves in the Indo-Pacific—the Sulu-Celebes Region. Workshop held at the Sarabia Manor, Iloilo City, the Philippines, 15-18 August 2000.

Wright, G.; Ardron, J.; Gjerde, K., & Rochette, J. 2014. Advancing marine biodiversity protection through regional fisheries management: a review of high seas bottom fisheries closures. Paris: IDDRI (Sciences PO); 2014;28 p.(Working Paper; v. 14/14).

Wright, G.; Gjerde, K.; Finkelstein, A. & Currie, D. 2020. Fishing in the Twilight Zone: Illuminating governance challenges at the next fisheries frontier. Paris, IDDRI Study, 06: 1-26

Wright, J.H.; Hill, N.A.O.; Roe, D.; Rowcliffe, J.M.; Kümpel, N.F.; Day, M.; Booker, F.; Milner-Gulland, E.J. 2016. Reframing the concept of sustainable livelihoods. Conservation Biology 30(1): 7-13. https://www.doi.org/10.1111/cobi.12607

Xiao, H.; Dee., L.E.; Chades, I.; Peyrard, N.; Sabbadin, R.; Stringer, M. & McDonald-Madden, E. 2018. Win-wins for biodiversity and ecosystem service conservation depend on the trophic levels of the species providing services. Journal of Applied Ecology. https://doi.org/10.1111/1365-2664.13192

Yates, K.L.; Schoeman, D.S. & Klein, C.J. 2015. Ocean zoning for conservation, fisheries and marine renewable energy: Assessing trade-offs and co-location opportunities. Journal of Environmental Management, 152 : 201-209. https://doi.org/10.1016/j.jenvman.2015.01.045

Young, J.C.; Searle, K.; Butler, A.; Simmons, P.; Watt, A.D. & Jordan, A. 2016. The role of trust in the resolution of conservation conflicts. Biological Conservation, 195: 96-202. https://doi.org/10.1016/j.biocon.2015.12.030

Zackrison, J.L. & Meason, J.L. 1997. Chile, "Mar Presencial", and the Law of the Sea Naval War College Review , U.S. Naval War College Press SUMMER 1997, Vol. 50, No. 3 (SUMMER 1997), pp. 65-85. Available at: https://www.jstor.org/stable/44638751

Zanre, E. 2014. Community-based subsistence fishing area designation procedures guide. Pilot version. Hawaii (USA). Division of aquatic Resources (DAR): 59 p.

Zupan, M.; Fragkopoulou, E.; Claudet, J.; Erzini,K.; Horta e Costa, B. & Gonçalves, E.J. 2018. Marine partially protected areas: Drivers of ecological effectiveness. Frontiers in Ecology and the Environment, 16, 381–387

ANNEX 1 - EXAMPLES AND DEFINITIONS OF FISHERY-ABMTS' CATEGORIES

As stated in the introduction, we focus here on fishery-ABMTs which include: (i) area-based measures used in fisheries management to optimize the fisheries and to reduce collateral impact (ABFMs *sensu stricto*) and (ii) in multiple-use areas, established at central level for conservation, like MPAs, IMMA, IBAs, etc., in which fisheries may operate, often under special conditions; and (iii) community-managed Areas (CMAs) in which both fisheries and conservation are important for the community wellbeing. Fishery ABMTs may be attached to institutional categories often established at Institutional level (e.g., MPA, OECM, PSSA, EPEI) and may have been given different local names in different areas (cf. Section 5.4). The areas concerned may overlap if not explicitly prohibited (like for MPAs). For example, a zone reserved to small-scale fishing, may contain fishing closures or MPAs.

Fisheries operate also around or in the vicinity of sectoral ABMTs (e.g., oil and gas fields, renewable energy production fields, navigation channels) from which fisheries are excluded, reducing fishing territories, often with significant impact on accessible fishing space and on fishing intensity in areas that remain open to fishing. These areas are not considered in any detail below. These areas have been referred to as "*de facto* MPAs" assuming that their impact on conservation is mostly nil or positive (Azmi and Dunstan, 2018), and they include: anchorage grounds; various danger zones; restricted or prohibited areas; regulated navigation areas; safety or security zones; and traffic separation schemes (NMPAC, 2008; Grober-Dunsmore and Wooninck, 2017). They also include Particularly Sensitive Sea Areas (PSSAs). Some of these areas may be mentioned in the text, as examples, but are not analysed in any detail.

This Annex deals mainly with fishery-ABMT categories identified in the literature. The categories' names of the following examples (listed in alphabetical order) is taken from the anglophone literature and may have been translated from other languages. The list may not be exhaustive and only intend to illustrate how rich the ABMT tool-box is and how variegated the name of these categories are. Individual ABMT sites take even more variegated names to reflect local specificities .

The ABMT terminology is not standardized. As a consequence, the same name (e.g., MPA, or Marine Managed Area) used in different places, may in actually correspond to areas with different objectives, management processes and expected outcomes. Conversely, areas with different names may in fact be extremely similar in these regards. The IUCN-WCPA has elaborated very explicit categories of MPAs (cf. Day et al., 2019) based on the management objectives of the areas, but conflicts with local terminology abound (see below).

Areas of Particular Environmental Interest (APEI)

APEIs are established ty the International Seabed Authority (ISBA). There is no formal definition of APEIs but it has been indicated that they are *large areas with self-sustaining populations and a broad range of habitat variability. Those should not be affected directly by physical activity or indirectly by mining effects such as plumes, although the degree of impacts raised by potential deep-sea mining is still unknown*." (ISBA, 2011).

The Clarion-Clipperton fracture zone area-based management tools is a good example of a large area managed with ABMTs, including contract areas allocated to various States or companies, as well as Areas of Particular Environmental Interest (APEIs).

ISBA identifies also Areas in Need of Protection (ANIPs) and Sites In Need of Protection (SINPs). AINPs *are large-scale areas of ecological importance due to their uniqueness and/or biodiversity. They have been described using the scientific criteria of the CBD EBSAs*. SNPS are *finer-scale sites, where there is observation or evidence of vulnerable or sensitive species/ecosystems*. They are described on an individual basis, using, within the context of ISA11, the Food and Agriculture Organization's criteria for vulnerable marine ecosystems (VMEs).

Area of sustainable resources management (ASRM/AGDR)

Specific to New Caledonia, an ASRM[171] is a natural area managed to ensure long-term protection of biological diversity and maintenance of the production of natural goods and/or services satisfying the needs of the population. Industrial scale uses, mineral exploitation and pollution are prohibited. Their governance is devolved to the Provincial level, and may be ensured by the Province, a local association or a customary system. ASRMs correspond to IUCN MPAs of Type VI (multiple-use MPAs). <u>In the Southern Province</u>, ASRMs aim to (i) protect/maintain in the long term biological diversity, ecological processes and associated cultural values; (ii) reconcile long-term biodiversity protection development activities; (iii) promote sustainable management methods, particularly traditional ones (only low-impact fishing is allowed); (iv) protect the natural resources capital against any form of alienation; (v) contribute to local economic development and to adapted sustainable discovery and touristic activities.[172]. In <u>the Northern province</u>, the ASRMs are permanent, in principle, but may also temporary or periodic when compatible with the area objectives. Dugongs are totally protected while turtles are protected except for two ritual ceremonies[173].

Artificial reefs area

Area equipped with artificial reefs intended to increase fishing yields; to reduce conflicts among different fisheries sectors (e.g., mobile and fixed gear); to protect coastal sensitive habitats against trawling (e.g., *Posidonia oceanica* beds); and for research and recreation purposes (Pipitone et al., 2014).

Ban

A measure that prohibits some or all fishing activities in a given area. The ban may apply inside a reserve, a fishing ground, an EEZ or globally and may not always be geographically defined. The ban might be permanent like the 1991 United Nations ban on large-scale pelagic drift nets (United Nations, 2002). It may be total and seasonal like the monsoon ban in India over all the East Coast (from April to June) and the West Coast (

[171] Translated from French : Aires de Gestion Durable des Ressources (AGDR)

[172] http://temeum.ofb.fr/fr/juridique/fiches-juridiques/aire-de-gestion-durable-des-ressources-nouvelle-caledonie-province-sud.

[173] http://temeum.ofb.fr/fr/juridique/fiches-juridiques/aire-de-gestion-durable-des-ressources-nouvelle-caledonie-province-nord

from in June and July), The dates have sightly changed since its first inception. A ban may also apply to a practice and apply to the whole jurisdiction like the EU Discards bans specifically referred to as landing obligation. The obligation affected all stocks managed through catch quotas across EU waters as well as those managed with landing size restrictions in the Mediterranean.

See also: *Moratorium; seasonal closure*

Benthic Protected Area (BPA)

In New-Zealand, the 1996 Fisheries Act focuses on enabling sustainable use of fishery resources on seamounts but also allows for the creation of Benthic Protection Areas (BPAs) to limit fishing pressure (Frey and DeVogelaere, 2014). The purposes of BPAs is to provide benthic protection, regulating trawling and prohibit dredging within the BPA, and creating offences and penalties to enforce such regulations (New-Zealand, 2007). BPAs have also been unilaterally established by the Southern Indian Ocean Deepwater Fishers Association (SIODFA) in the Indian Ocean to protect deep-sea benthic habitats, deepwater corals and sponges as well as sharks, tuna, marine mammals and commercially important deep-sea fish species. A process of formalization has started in the Southern Indian Ocean Fisheries Agreement (SIOFA). See Figure 1.

See also: *VME*

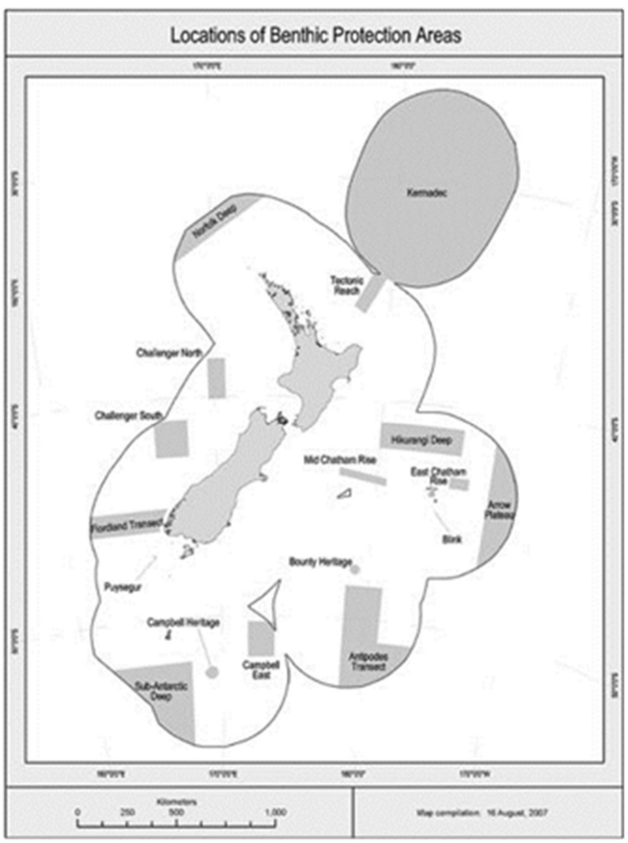


Figure 1: Benthic Protection Areas in New Zealand EEZ (Dark grey shaded areas) (New-Zealand, 2007)

Biological Protection Zone

In Italy, ABFMs established by the Government in areas deemed critical for fisheries sustainability and in which fishing is more strictly regulated.

See also: *Fisheries Restricted areas (FRAs).*

Block Areas Closure (BAC)

In the US, a groundfish bottom trawl-specific management tool . Their boundary lines (latitudes and depth contour) may be closed or reopened in-season. One or more BACs may be closed to control harvest of groundfish species or to reduce bycatch of protected species. BACs are available off Oregon and California, and are intended primarily as a catch control mechanism, not for habitat protection (PFMC, 2020). Also referred to as Bottom *Trawl Closed Area (BTCA).*

See also: seasonal closure

Bottom Contact Closed Area (BCCA)

In the US, areas which are closed to any fishing gear with operating in contact with the bottom. They may specifically prohibit the use of trawling (in Bottom Trawl Closed Areas, BTCAs). They aim to protect ecologically important groundfish habitats like Essential Fish Habitats (EFH) or VMEs. Their extent and configuration are fixed and, as a permanent regulation, they require a formal process for modification and may be considered MPAs. (PFMC, 2020).

Bottom Trawl Closed Area (BTCA)

See: *Bottom contact closed area (BCCA)*

Buffer zone or area

An area around a *reserve* (or *no-take zone*) in which fishing is controlled to limit/avoid negative impacts from fishing or other activities active surrounding activities operating in the surrounding area on the reserve.

Coastal-Marine Extractive Reserve

Born as Extractive Reserves[174] or “Reservas extrativistas” (RESEX) in Brazil, as a community-based management model of forestry (rubber harvesting) legitimized in the National Environment Policy. They were initially intended as areas protected for “sustainable use “ to foster social justice, good quality of life, use of technology based on local knowledge, and conservation of local livelihoods and natural resources. After 1992, they progressively focused more towards areas protected for environmental priorities, based on scientific knowledge, and top-down State governance intervention under a form of co-management with strong involvement of environmental NGOs.

Community-managed areas (CMAs)

CMAs are ABM frameworks used by local communities to manage the resources use within their jurisdictional area. The area within which community-based management takes place, with its explicit boundaries, usually contains smaller areas (ABMTs)

[174] Reservas extrativistas (RESEX) in Portuguese.

established for specific purposes or activities. While the management area is usually permanent, the closures it contains may be temporary (e.g., seasonal, intermittent, or rotational) to regulate sustainable use, permanent (e.g., in reserves or sacred areas). The term “community” may refer to Indigenous Peoples and local Communities (IPLCs), other traditional communities, or non-traditional communities like municipalities or associative institutions (cooperative, unions). In these areas, the communities have substantial flexibility if not exclusive authority to manage activities often with assistance and oversight of the central government. The effectiveness of the framework and the ABMTs it has in place, in protecting resources, livelihoods and biodiversity, depends on many factors including the strength of the social bond between stakeholders, the degree of penetration of the market economy, the positive or negative contribution made by States and the demography, ecological and socioeconomic drivers in the surrounding area. It can only be determined case by case, even though their use sometimes for centuries implies a recognition of their utility by the communities concerned.

Examples include: *CCA, Extractive reserve, Fishery community-based MPA, ICCA, LMMA, MARF, MCAIP, MEABR, MMA, Territory of life, TURF*. These areas are further considered below but depending on their size and complexity, may often considered as ABM frameworks than ABM tools.

Community-based fisheries Management (CBFM)

Community-Based Fisheries Management” (CBFM) is a concept of locally-driven fisheries management, broadly used in the developing world by Indigenous People and Local Communities (IPLCs) as well as modern communities, municipalities, fisheries associations, etc. The generally shared vision is: *Sustainable well-managed inshore fisheries, underpinned by community-based approaches that provide food security, and long-term economic, social and ecological benefits to the communities* (Pacific Community, 2021). CBFM is area-based and requires specific definitions of the area within which it is implemented (Pacific Community, 2021: 11).

In the Marshall Islands, CBFM plans are elaborated for particular geographical locations through a community-based process, under the community responsibility. The focus is on the fisheries management plan, drafted on behalf of the entire community which determines the vision, objectives and eventual name and relies significantly on local knowledge and traditions. Management is performed by the community with technical support from the Marshall Islands Marine Resources Authority (MIMRA) (SPC, 2007). In American Samoa Islands, CBFM programmes define “subsistence fishing” *as any legal fishing activity where the catch is not sold or marketed but is shared within the family or Village for the purpose of home consumption and cultural uses.* Village Marine Protected Areas are created within well-defined marked management boundaries, and internal zoning when appropriate, to ensure that the CBFM territory and surrounding waters are safe habitats, maintenance of resources and for people’s enjoyment. Fishing is allowed using small-scale traditional gear[175].

[175] https://nauru-data.sprep.org/dataset/community-based-fisheries-management-program.

Community-Based Subsistence Fisheries Area (CBSFA)

In Hawaii (USA) CBSFAs were created in the 1990s to *protect and reaffirm fishing practices customarily and traditionally exercised for purposes of native Hawaiian subsistence, culture, and religion.* "Subsistence" means the *customary and traditional native Hawaiian uses of renewable ocean resources for direct personal or family consumption or sharing*. CBSFAs are managed by the Hawaii Department of Land and Natural Resources (DLNR). They refer to the Hawaiian value of "aloha 'āina", which emphasizes the connection between the environment and communities, whereby if you care for the land, the land will care for you. CBFSAs are co-managed by the DLNR and the coastal communities. The local community groups may propose regulatory recommendations and management activities to sustain the health and abundance of marine resources for current and future generations, upholding local traditional knowledge, cultural values and associated codes of conduct traditionally governing fishing practices. Such proposals may need to be adapted to adhere to Federal, State and County law as well as to DLNR's management mandates and priorities (Zanre, 2014).

Community conservation area (CCA)

Also referred to as *Community Conserved Area*; *Conserved area;*

See: Indigenous and Community Conserved Areas (ICCAs); *Community-based Area Management (CABM)*

Community Fisheries Management Area (CFMA)

CFMAs are defined in the Republic of Nauru Coastal Fisheries and Aquaculture, Act 2020 as : *coastal fishing areas that have been declared by the Minister to be managed by district communities for the purpose of protecting the coastal fisheries and marine resources to ensure its long-term sustainability*. A district community may apply to the Minister for the delineation of an area in its coastal fisheries waters. The Ministry approves and delineates the CFMA, after consultation with the Nauru Fisheries and Marine Resources Authority, the Coastal Fisheries Advisory Council, the Community Fisheries Stakeholder Forum, and any other relevant stakeholders, and taking into account (i) the purpose and justification for the request; (ii) the geographical location and size of the proposed area in relation to the district involved; (iii) the community management plan for the area; (iv) the population of each district; (v) the customary marine tenure in each district; and (vi) any traditional fisheries practices and usages.

Conserved area

There is no internationally agreed definition of "conserved areas. However, some definitions have been proposed: (1) *Area-based measure that, regardless of recognition and dedication, and at times even regardless of explicit and conscious management practices, achieve de facto conservation and/or are in a positive conservation trend and likely to maintain it in the long term*." (Borrini-Feyerabend and Hill, 2015). (2) *Areas that are not recognised as protected areas and which may satisfy the criteria for "other effective area-based conservation measures" (OECMs).* (3) In South Africa, *areas that are not formally protected by the Protected Areas Act but are nevertheless managed at least partly for biodiversity conservation. They contribute to the broader conservation estat*e" (Marnewick et al., 2020). Conserved areas are mentioned in the ICCAs title: the "Territories and Areas Conserved by Indigenous Peoples and Communities (IPLCs)". The term may also apply to all areas that for which biodiversity conservation may not be the primary objective, but may nonetheless produce *de facto* positive conservation outcomes (Borrini-Feyerabend et al., 2014; Jonas et al., 2021). Criteria for effective protected and conserved areas can be found in IUCN-WCPA (2017).

See: *Other Effective Area-based Conservation Measure (OECM)*; *Conservation area*;

Conservation area

Areas aimed to the protection and conservation of one or more significant species, natural values, habitats, and/or ecosystems (Cook Islands, Tyford, 2021). A possible difference between "conserved area" and conservation areas" may be that in the first the outcomes are being (they ae de facto conserved) while in the second, these outcomes are aimed at, expected.

Critical habitat Area

An area containing a "critical habitat" *A habitat needed to support recovery of a listed species. When a species is listed under the Endangered Species Act, NOAA Fisheries is required to determine whether there are areas that meet the definition of critical habitat*. (2) *A habitat area essential to the conservation of a listed species, though the area need not actually be occupied by the species at the time it is designated* (U.S. Endangered Species Act-ESA; Wikipedia). (3) *A sea area that may be essential for the survival, function, or recovery of fish stocks or rare or endangered marine species, or for the support of large marine ecosystems (IMO resolution* (IMO, 2005[176]). (4) *Habitat areas with which endangered, threatened, sensitive or monitored plant, fish, or wildlife species have a primary association (e.g., feeding, breeding, rearing of young, migrating)*[177]. These definitions imply that a "critical habitat" is a category of "essential habitat characterized by the fact that it is essential for the recovery and protection of species listed as threatened or endangered. More specifically, a critical habitat may be located the geographical area occupied by the species at the time of listing or outside it if the Agency determines that the area itself is essential for conservation. Except in circumstances determined by the Agency, critical habitat shall not include the entire geographical area which can be occupied by the species[178]. In the USA, the designation of an area as "critical habitat" does not create a closed area, but obliges federal agencies to consult with NOAA Fisheries to ensure actions they fund, authorize, or undertake are not likely to destroy or adversely modify the critical habitat[179].

[176] IMO. 2005. Resolution A.982(24) Adopted on 1 December 2005 on Revised Guidelines for the identification and designation of particularly Sensitive Sea Areas https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/A24-Res.982.pdf

[177] https://www.lawinsider.com/dictionary/critical-habitat

[178] Source: Legal Information Institute (LII) U.S. Code, Title 16, Chapter 35, § 1532; and US Endangered Species Act. https://www.fisheries.noaa.gov/national/endangered-species-conservation/critical-habitat

[179] https://www.fisheries.noaa.gov/national/endangered-species-conservation/critical-habitat

Ecological corridor

Or connectivity corridor. A clearly defined geographical space that is governed and managed over the long term to maintain or restore effective ecological connectivity. They may or not be MPAs or OECMs (Kettunen et al, 2021).

Ecologically and Biologically Significant Area (EBSA)

In 2008, CBD COP 9 (Decision IX/20) did not adopt any definition for EBSAs but adopted instead a set of criteria for their identification related to the properties of the biodiversity they include: (i) uniqueness or rarity; (ii) special importance for life history stages of species; (iii) importance for threatened, endangered or declining species and/or habitats; (iv) vulnerability, fragility, sensitivity, or slow recovery; (v) biological productivity; (vi) biological diversity; and (vii) naturalness[180]. However, in Canada, OECMs have been also defined as: *areas within Canada's oceans that have been identified through formal scientific assessments as having special biological or ecological significance when compared with the surrounding marine ecosystem*. Areas identified as EBSAs should be viewed as most important areas where, with existing knowledge, regulators and marine users should be particularly risk averse to ensure ecosystems remain healthy and productive[181]. EBSAs are meant to draw attention of States on areas very important for biodiversity. They are not ABMTs *sensu stricto* as their identification does not necessarily trigger any management action (as do VMEs that have similar criteria) but are areas in which special measures may be needed, including protected and conservation areas. From that angle EBSAs may be nonetheless considered as area-based management framework within which States decide how they want to proceed.

Essential Fish Habitat (EFH)

(1) All types of aquatic habitat where fish spawn, breed, feed, or grow to maturity, without which fish would not be able to survive (e.g., Coral reefs. Seagrasses). An *EFH especially important ecologically or particularly vulnerable to degradation are referred to as "habitat areas of particular concern" (HAPC)*[182]**.** (2) T*hose waters and substrate necessary for spawning, breeding, feeding, or growth to maturity* (US Magnuson-Stevens Act). **(***3) Habitat identified as essential to the ecological and biological requirements for critical life stages of exploited fish species, and which may require special protection to improve stocks status and long-term sustainability* (STECF, 2006). See also Figure 2. Fishing impacts on EFHs should be minimized to ensure stocks and fisheries sustainability. EFHs may be reviewed regularly (e.g., every 5 years) to confirm their need and adequacy.

See: *Habitat Area of Particular concern*

Exclusive fishing zone (EFZ)

Extensions of their territorial waters claimed by some states to protect fishery resources and coastal fishery sector from foreign industrial fishing fleets. Example: EC Regulations

[180] https://www.cbd.int/ebsa/about

[181] https://open.canada.ca/data/en/dataset/d2d6057f-d7c4-45d9-9fd9-0a58370577e0

[182] https://www.fisheries.noaa.gov/national/habitat-conservation/essential-fish-habitat

1626/1994 and 813/2004 allows Malta a 25-mile fisheries management zone where fishing effort, vessel size and type of gear are strictly regulated by Malta Authorities. (based on Pipitone et al., 2014). EFZs may be seen as a first step towards establishing an EEZs**.**

Extractive reserves

See: *Coastal Marine Extractive Reserves*

Fisheries Community-based MPAs

Clearly identified marine area, which is managed through law or other effective means while giving consideration to the utilization form, with the aim of conserving the biodiversity that supports the healthy structure and function of marine ecosystems and/or ensuring sustainable use of ecosystem services (Japan; Matsuda et al, 2010). They are managed by local fishing communities.

See: *community-based closure; Community conservation area*

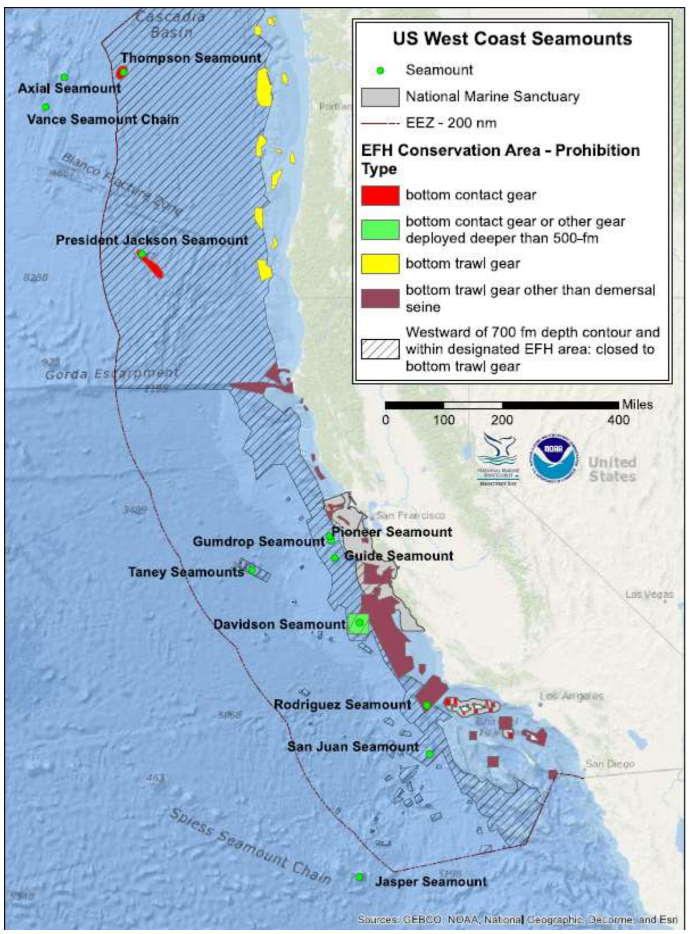


Figure 2. Example of a zoned designated Essential Fish Habitat (EFH) area containing seamounts (in bold) and various exclusion areas for bottom-contact gear (red); bottom-contact gear and other gear below 700 fathoms (green); Bottom trawl gear (yellow); and bottom trawl other than demersal seine (purple). From Frey and DeVogelaere (2014). Map credit: Chad King. Monterey Bay National Marine Sanctuary (MBNMS). Courtesy NOAA, US Department of Commerce.

Fisheries management zone (FMZ) area (FMA) or unit (FMU)

FMZs/FMAs are, in effect, *area-based fisheries management frameworks in which coordinated participatory management is organised*[183]. The term is used by Esch (2006) in USA as one example of <u>Marine Managed Area (MMA)</u>. The term is used also in USA for inland fisheries to identify areas with individual fisheries management needs e.g., in terms of catch limits, seasonal closures, fishing intensity; vulnerable fisheries; or recovery plans (Figure 3).

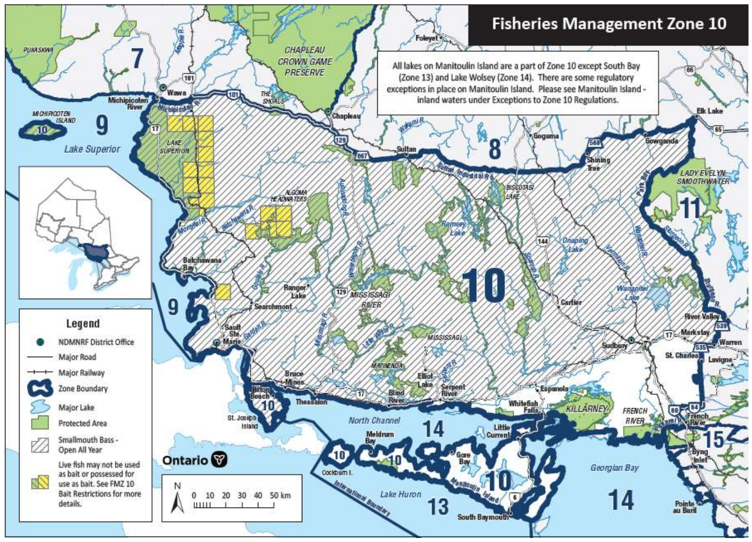


Figure 3: Fishery management Zone 10, in Northern Ontario (USA).
Https://www.ontario.ca/page/fisheries-management-zone-10-fmz-10

Each FMZ has its own rules[184]. Each regional Fisheries Management Council, in the US and indeed any RFMO has a FMZ in which it exerts its responsibility with its own management plans and advisory Council[185]. In this sense, regional FMZs are area-based management <u>frameworks,</u> corresponding to jurisdictional mandates. Twelve *Fisheries Management Areas* (FMAs) were established in 2019 in The Philippines mainly for the sustainable production of a multispecies set of sardine populations/species (Figure 4). They are defined as: *[large scale] delineated bodies of water, based on approximation of fish stocks and their boundary, range and distribution, and other considerations for the purpose of fisheries management or governance that is science-based, participatory and transparent, applying the ecosystem approach to fisheries management (EAFM*). The General fisheries Commission for the Mediterranean (GFCM) has defined <u>Fisheries Management Units</u> (FMUs) as areas for which: (i) management action can (but does not necessarily have to) be distinct; (ii) scientific information on stock status is available, or can be made available by the Scientific Advisory Committee (SAC); (iii) SAC would ideally be in a position to give management advice. Implicitly, ABFMs may be used inside FMUs (See Figure 3).

---

[183] https://ph.oceana.org/our-campaigns/fisheries-management-areas

[184] https://www.ontario.ca/page/fisheries-management-zones

[185] For Alaska, Caribbean, Gulf of Mexico, Highly Migratory Species, Pacific Islands, New England, Mid-Atlantic, South Atlantic, West Coast, and international waters.

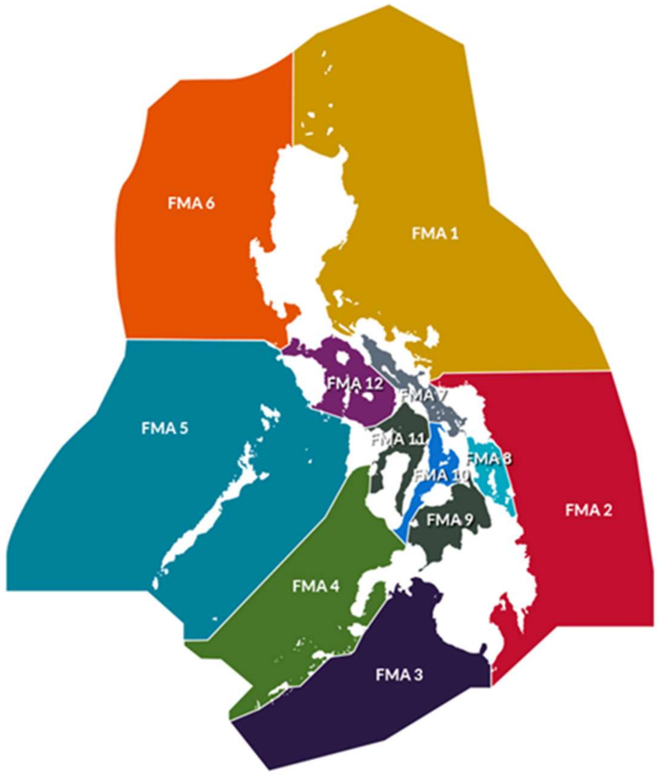


Figure 4: Fisheries management areas in The Philippines. From https://ph.oceana.org/our-campaigns/fisheries-management-areas

Fisheries protection zone

The term is mentioned without definition for the system of classification of protected areas in Cook Islands (Twyford, 2022) referring to a UNDP Project Document. The latter does not define the term either but refers to it as a *Community Conserved Area* in the Aiutaki lagoon. (UNDP, 2015: §87).

Fisheries Restricted Area (FRA)

Multi-purpose spatial management tool established by GFCM to protect marine resource and habitats (e.g., aggregations of vulnerable sponges, seamount areas, coral reef building formations, seagrass meadows, spawning grounds and reproduction sites for fish resources, etc.) from relevant fishing activities, in EEZs or the High Sea, following the FAO criteria established for VMEs:

See: *No-trawl zone; Reserve; Closed area*.

Grid-based closures

Closures based on the overlaying of a spatial grid on an area of interest and closing fishing in individual grid cells where bycatch has exceeded a threshold level. They have been implemented on a daily or weekly basis with cell sizes as small as ∼50 km2 (Dunn at al., 2016)

Groundfish conservation area (GCA)

Depth-based management measures, that may be imposed on any sector of the groundfish fleet using specific boundary lines that approximate depth contours with *latitude/longitude coordinates*. GCAs may be used to protect and rebuild overfished stocks; extend the fishing season; minimize disruption of traditional fishing and marketing patterns; reduce discards; spread the available catch over a large number of anglers; to discourage target fishing while allowing small incidental catches to be landed; and to allow small fisheries to operate outside the normal season (USA, in PFMC, 2020). For example, Rockfish conservation areas (RCAs) or Cowcod Conservation Areas (CCAs) used to help rebuild stocks are GCAs (PFMC, 2020).

Groundfish Fishing Areas (GFAs)

Areas of known higher abundance of a particular species or species group, enclosed by straight lines connecting a series of coordinates. A GFA designated for a more abundant species may be used to constrain fishing for that species within that particular area (a concept opposite to that of a conventional closed area from which fishing is excluded). For example, fishing for schooling species, such as petrale sole or chilipepper rockfish, could be allowed within GFAs for those species, but not permitted outside of the GFAs where fisheries for those species might have higher incidental catches of overfished species (PFMC, 2020).

Habitat area of Particular Concern (HAPC)

A designation that encompasses discrete subsets of Essential Fish Habitat (EFH) that are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. They are discrete areas of special interest due to their unique geological and ecological characteristics (e.g., seamounts).Their purpose is to highlight areas within EFH in which protection**,** conservation, management, and research efforts should get higher priority. The HAPC designation does not automatically confer additional protections or restrictions upon an area, but they help to prioritize and focus conservation efforts. The use of certain fishing gears might be restricted. Their designation and management measures may differ between places. HACPs may overlap, e.g., a seagrass HACP may be a layer within an estuary HACP[186].

Habitats types of Community Interest

They are: (i) in danger of disappearance in their natural range; or (ii) have a small natural range following their regression or by reason of their intrinsically restricted area; or (iii) present outstanding examples of typical biogeographical regions. They are similar to *Sensitive Benthic Habitats*.

Important Birds and Biodiversity Area (IBA)

An area identified using an internationally agreed set of criteria as being globally important for the conservation of bird populations (Wikipedia). The concept was developed and sites are identified by BirdLife International. There are over 13,000 IBAs worldwide. These sites are small enough to be entirely conserved and differ in their character, habitat or ornithological importance from the surrounding habitat. The legal

[186] https://marinecadastre.gov/SiteCollectionDocuments/SoWhat_HAPCs_final_template.pdf

https://www.fisheries.noaa.gov/west-coast/habitat-conservation/habitat-areas-particular-concern-west-coast status of IBAs varies between countries. In some countries, IBAs may be legally protected as part of a national protected area network. In others, protection is completely lacking. See details on https://www.birdlife.org/ and in Donald at al. (2019).

See: *Key Biodiversity Area (KBA); Important Marine mammal area; Important Marine Turtle area; Important shark and rays area*

Important Marine Mammal Area (IMMA)

The concept intended to fill a gap in marine conservation efforts and the general MPA concept (Bonizzoni et al., 2019) increasing attention on marine mammals. The criteria identify sites that host vulnerable species, a significant percentage of the members of a species, or a wide variety of species ,as well as sites that are important for reproduction or feeding of mammals.

See: *Key Biodiversity Area (KBA); Important Birds and biodiversity area; Important Marine Turtle area; Important shark and rays area*

Important Marine Turtles Area (IMTAs)

Discrete areas within existing marine turtle regional management units (RMUs) that are of particular biological significance for the persistence of marine turtles, and/or where the contributions of marine turtles to traditions and cultures of local people are particularly significant. IMTAs may be biologically or/and culturally significant. They meet one of the following criteria: (1) Relative importance to the population because of the age class or the number of individuals included, proportion of the total nesting area covered, importance as foraging area); (2) Abundance of species or populations of particular conservation concern when the area contains essential habitats for recovery or populations at particularly high risk of extinction and/or under most severe threats (e.g., in IUCN Red List, national list of endangered species lists, or under documented significant historical depletion; (3) Support of aggregations or congregations especially of multiple species or populations, and for the persistence of turtle populations or related human cultural practices (Bandimere et al., 2021).

See: *Key Biodiversity Area (KBA); Important Birds and biodiversity area; Important Marine mammal area; Important shark and rays area;*

Important Sharks and Rays Area (ISRA)

ISRAs are "discrete, three-dimensional portions of habitat, critical for one or more shark species, that are delineated and have the potential to be managed for conservation". ISRAs are not marine protected areas (MPAs) and they have no legal or regulatory mandate associated with them. ISRAs are therefore completely removed from the regulation or mitigation of any human-based activities that may be occurring. However, one of ISRA's main goals is to attract the attention of policy- and decision-makers who design and develop these MPAs to the need of maintaining the favourable conservation status of sharks in those specific areas. Criteria include: (A) Vulnerability; (B) Range restricted; (C) : Life history (reproductive areas, feeding areas, resting areas, movement, and undefined aggregations; (D) Special Attributes (distinctiveness[187] and diversity) (Hyde et al. 2022).

See: *Key Biodiversity Area (KBA); Important Birds and biodiversity area; Important Marine mammal area; Important Marine Turtle area;*

Indigenous and Community Conserved Area (ICCA)

*Indigenous and community conserved areas (ICCAs) are natural and/or modified ecosystems containing significant biodiversity values, ecological services, and cultural values, voluntarily conserved by indigenous mobile and local communities through customary laws and other effective means (*IUCN, 2008, cited by Berkes, 2009). See also UNEP (undated). ICCAs essential characteristics are: (i) They are areas or sites with which Indigenous Peoples and Communities (IPLCs) have a close and profound relationship; (ii) The people or community is the major player in decision-making and has *de fact* or *de jure* capacity to develop and enforce regulations; and (iii) These decisions and efforts lead to the conservation of biodiversity, ecological functions, and associated cultural values, regardless of original or primary motivations (Feyerabend et al., 2014). ICCAs are probably among the oldest ABMTs on Earth and as numerous as there are indigenous communities. They help maintain genetic diversity, conserve threatened species, and provide corridors for species' movements. The cultural and economic livelihoods of millions of people depend on them for securing resources such as energy, food, water, fodder, shelter, clothing, and for providing income. ICCAs contribute to global food security by conserving important crop wild relatives, and traditional and threatened landraces. ICCAs play a critical role in ensuring access and respecting rights to customary sustainable use of biodiversity and also provide a fertile classroom for the passing on of inter-generational environmental knowledge, innovations and practices (Khotari et al., 2012). ICCAs have been referred to as *territories of life* (https://report.territoriesoflife.org/).

Key Biodiversity Area (KBA)

Promoted by IUCN, KBAs are areas identified as being of international importance in terms of biodiversity, using globally standardized criteria and thresholds (IUCN, 2016: 11-16). A KBA is intended contributes significantly to the global persistence of biodiversity, and particularly of vulnerable and irreplaceable species. Its protection is deemed complementary to other forms of space-based and species-specific management. The KBA concept extends the concept of Important Birds and Biodiversity Areas (IBA) of BirdLife International) to other taxonomic groups (e.g., Important Marine Mammal Areas (IMMAs). Although emerged independently at different times and through different processes, KBAs and EBSAs present significant similarities. Over 3990 KBAs exist in the marine realm and about 45% of them are protected areas. This proportion may increase with the potential recognition of many of them as OECMs (Gannon et al., 2019).

See*: EBSA; Important Birds and biodiversity area; Important Marine mammal area; Important Marine Turtle area; Important shark and rays area*

[187] The term is used in reference to the genetic diversity of the populations concerned, or their importance as part of traditional cultural practices (Bandimere et al., 2021).

Locally Managed Marine Area (LMMA)

(1) Area of nearshore waters and coastal resources that are largely or wholly managed at a local level by the coastal communities, land-owning groups, partner organizations, and/or collaborative government representative who reside or are based in the immediate area (Govan et al., 2008; http://lmmanetwork.org/). (2) *Area of inshore waters governed by local residents and involving a collective understanding of, and commitment to, management interventions in response to threats to marine resources* (Mills et al., 2011**)**. LMMA's objective, in addition to transferring management competence to local authorities, is to rebuild and maintain resources through strong community-based adaptive management, combining fishery management and biodiversity conservation. The word "local" was chosen over "community" recognizing that conservation projects in these areas were often collaboratively-managed by both the community and the government or some other external body (Govan et al, 2008). LMMAs are used in in the Western and Central Pacific Ocean, Fiji, Papua New Guinea, Pohnpei, and Tuvalu (H. Govan Pers. Comm, Rocliffe, 2015). They are also in use in the Western Indian Ocean (Rocliffe, 2015). LMMAS are similar to Collaborative Fisheries Management Area (CFMA) and Community Conservation Area (CCA) **(**Kettunen et al., 2021).

See also: *Marine Coastal Areas of Indigenous People (MCAIP) ; Community Conserved Area (CCA)**;** Area-Based Community Framework**;** TURF*

Long-term Bycatch Mitigation Closed Area

A variety of time/area closures used by the Pacific Fisheries Management Council (USA) to reduce incidental catch of protected species in fisheries targeting groundfish. Their coordinates, extent and configuration are usually fixed and published in permanent regulations and their modification would require a formal process (PFMC, 2020).

Management and Exploitation Areas for Benthic Resources (MEABR)188.

In Chile, measures defined as: (1) G*eographically limited areas with a regime of access which allocates to artisanal fishermen organizations –in the artisanal fishing zone- exclusive exploitation rights of benthic resources based on a management and exploitation plan aiming to conservation of the benthic resources (invertebrates and algae) they contain*[189]. (2) *A co-management tool (zoning of coastal areas), where fishing grounds are allocated exclusively to artisanal communities through non-transferable user rights* (Castilla, 1994). (3) *Areas in which Chilean Undersecretary of Fisheries assigns temporary property rights to artisanal fisher unions in defined geographical coastal areas, including the right to exclude non-members from exploiting the same area of seabed* (Gelcich et al., 2006). MEABRs were established to rebuild fisheries and the ecosystem after the total ban of the fishery on the gastropod *Concholepas concholepas* (Loco) in 1980-1991. Following common-property management principles (Ostrom, 1990), the MEABR rationale is that property rights create incentives for long-term resource use or stewardship and promote sustainable bottom-up development. In MEABRs, fishers share management decision with the State which, however, controls the MEABR boundaries, extraction rates, access rules, conflict resolution, modification of operational rules, and

[188] In Spanish: Área de Manejo y Explotación de Recursos Bentónicos (AMERB).

[189] https://www.subpesca.cl/portal/616/w3-propertyvalue-50830.html

institutional development. In areas in which no previous traditional management existed, MEABRs have proved to be effective means of establishing sustainable fisheries for loco and other benthic resources (Castilla and Defeo 2005). In areas where traditional lottery-based allocation of "parcelas"[190] were still functioning, tensions emerged as in MEABRs, total allowable catches based on western scientific protocols clashed with the traditional socially-sensitive allocation system losing its flexibility and hence the system capacity to buffer changes (Gelcich et al., 2006: 964-965). This example confirms the importance of the general political and socioeconomic context in the failure or success of ABMTs.

Marine Area for Responsible Fishing (MARF)

In Costa-Rica, *areas with important biological and sociocultural characteristics, delimited by geographical coordinates and any other mechanisms identifying their limits, within which fisheries are regulated to ensure particularly the use of fishery resources in the long term, and for the conservation, use and management…[with] the support of coastal communities and/or other institutions*"[191]. They aim at use of fishery resources in harmony with the environment. They are managed by local communities and the management plan is approved by the central fishery authority. Enforcement is jointly undertaken by the communities and coast guards. Management implementation is supervised by an Oversight Commission.

Marine Coastal Area of Indigenous People (MCAIP)

MCAIP areas are delimited marine spaces for which administration rights have been granted by state institutions to Indigenous communities or associations whose members have exercised customary uses within the areas (Hiriart-Bertrand et al, 2020).

in Northern Patagonia (Chile), MCAIPs aim to maintain Indigenous Peoples customary uses (fisheries, traditions, and ceremonies) with environmental sustainability goals, giving these Peoples access and rights to manage marine spaces. The policy offers the opportunity to locally control unregulated activities, restore marine ecosystems, develop management plans and foster traditional knowledge, but the implementation is dominated by top-down State institutions and management under western science protocols. MCAIP require a demonstration of historical (customary) area-based uses, leading to conflicts about access with non-indigenous artisanal fishers with legal access rights to fisheries. A MCAIP management plan should contain: the objectives of the initiative and the conceptual and operative framework for all the activities to be implemented in the area, considering the natural, sociocultural and institutional contexts, and the territorial dynamics including: (i) the uses and activities, and the regularity in which they will be implemented in the area; (ii) external indigenous and non-indigenous users of the area; (iii) requestor Indigenous community statutes, internal structure and norms; (iv) conflict resolution norms; (v) a program that contemplates outreach activities; all within a two-year periodical accountability system. Key challenges stem from the

[190] Parcelas were decades- or centuries-old traditional community-based management areas based on rotational harvesting of bull-kelp, Durvillaea antarctica (Cochayuyo) and of Loco by Indigenous communities (Gelcich et al., 2006). The top-down introduction of MEABRs have affected fishers' access rights, their control over resources, compliance, and the way in which local knowledge is used.

[191] Translated from Decree N° 35502-MAG of 2008, from the President of the Republic and the Minister of Agriculture and Cattle-raising of Costa Rica.

different worldviews of indigenous communities and state institutions, and limited financial resources available (Hiriart-Bertrand et al, 2020; Karr et al., 2021). The centrally-driven granting process can take many years because of bureaucracy and resistance from industrial interests, such as salmon farming (**Ojeda et al, 2021**).

See also: *TURF* implemented also in Chile

Marine Conservation Zone (MCZ)

An area that protects a range of nationally important, rare or threatened habitats and species. There are 91 MCZs in waters around England[192], designated in a process closely involving stakeholders[193]. The term is also used in Cook islands (Twyford, 2021).

See: *Marine protected area*

Marine Managed Area (MMA)

(1) An area of marine, estuarine, and adjacent terrestrial areas designated using federal, state, territorial, tribal, or local laws or regulations intended to protect, conserve, or otherwise manage a variety of resources and uses (Govan 2009). Under local governance they are believed to play an important role in customary biodiversity stewardship, management, and conservation (Twyford, 2021). (2) *in the broadest sense, geographic areas designed to protect or manage resources within the marine environment.* An umbrella category that may include national marine sanctuaries, fishery management zones, national parks, national monuments, critical habitats, wildlife refuges and wildlife reserves, and research reserves. MMAs are often internally zoned for managing resources and activities (Esch, 2006: 6; Pipitone et al., 2014). Marine Managed Areas under local jurisdiction exist usually within the territorial sea (12 miles) and is often limited to 3 miles to limit international jurisdictional issues (Esch, 2006:10). Key implicit or explicit socioeconomic objectives of communities in MMAs may include: (i) prevention of access from neighbouring villages; (ii) restriction of access to immigrants; (iii) protecting the source of income for custom owners; and (iv) establish property rights to reef/land areas. Often, community members assign a relatively high value to preserving the ecosystem for use by future generations, independent of their own use of the ecosystem (bequest value), reflecting a community sense of "duty of care" and conservation ethic (Govan, 2009).

See: *LMMA*

Marine protected area (MPA)

There are many definitions of "protected areas" (Pas) and many countries have adopted their own definition in their bylaws. The IUCN and CBD definitions have a particularly high international relevance: *(1): A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values* (Dudley. 2008; Day et al, 2019). The IUCN definition focuses on a general and implicitly

---

[192] https://jncc.gov.uk/mpa-mapper/

[193] https://www.gov.uk/government/collections/marine-conservation-zone-designations-in-england

comprehensive "long-term protection" but while this is the primary objective, some PA categories recognize other (secondary) objectives. (2) *A geographically defined area, which is designated or regulated and managed to achieve specific conservation objectives* (CBD, 1992). The definition refers to "specific conservation objectives", recognizing implicitly that different MPAs may have different objectives. (3) *Any defined area within or adjacent to the marine environment, together with its overlying waters and associated flora, fauna, and historical and cultural features, which has been reserved by legislation or other effective means, including custom, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings (*CBD, 2004b; Decision VII/5). (4) MPAs *include permanent shallow marine waters; sea bays; straits; lagoons; estuaries; subtidal aquatic beds (kelp beds, seagrass beds; tropical marine meadows); coral reefs; intertidal muds; sand or salt flats and marshes; deep-water coral reefs; deep-water vents; and open ocean habitats* (CBD, 2001; OECD, 2000). (5*) Any marine geographical area that is afforded greater protection then the surrounding waters for biodiversity conservation or fisheries management purposes* (FAO, 2011), a broader definition applying to a broader range of ABMTs; *(6) Any area of the marine environment that has been reserved by Federal, state, territorial, tribal, or local laws or regulations to provide lasting protection to part or all of the natural or cultural resources therein (*US Executive Order 13158, 2000); (7) *All marine areas closed to fishing for any or all gear group(s)… and which have stable boundaries over time (thereby providing lasting protection*) (PFMC, 2020). An RFMO definition focused on MPAs used in fisheries management or "fishery-MPAs". (8) *A geographic marine space, clearly defined, notably a subtidal, intertidal and supratidal, and the lakes and lagoons temporarily or permanently linked to the sea as well as suprajacent waters, recognized, dedicated and managed, by legal or other means, to ensure long-term conservation of nature with related ecosystem services and cultural values* (Mediterranean Protected Areas Network, Medpan). This definition is aligned to the IUCN one but is more specific on the ecological environments that MPAs may cover. (9) *An area with legal boundaries in which fishing is prohibited for all or a subset of species, or particular fishing gears are disallowed with some degree of permanence* (Field et al., 2006). Similar to the PFMC (2020) definition, focused on "fishery-MPAs".

The definition adopted in the BBNJ Agreement (March 2023) is "*a geographically defined marine area that is designated and managed to achieve specific long-term biodiversity conservation objectives and may allow, where appropriate, sustainable use provided it is consistent with the conservation objectives* (United Nations, 2023).

The multiple definitions generate significant confusion through the literature. There is a general requirement that the primary objective of MPAs is conservation. MPAs are usually managed by central governments, through an environmental authority (Pipitone et al., 2014). Multiple Use MPAs (MU-MPAs; Type VI MPAs) may be zoned to distinguish a core no-take zone, a highly regulated buffer zone around it, and a sustainable use zone in which low-impact economic activities are tolerated. MU-MPAs tolerate some small-scale and recreational fishing. In the Mediterranean, MPAs are also used to assign user rights to local fishers. MU-MPAs are very often community-managed under some degree of oversight and assistance by the State. In this case, conservation is only one of the key objective of the measure, which aims also to support livelihoods. The tension that this may generate explains why local communities may refuse the no-take MPA status (example of the Rapanui MUMPA (Paredes et al., 2018).

Other ABMTs may be called or formally designated as MPAs *like parks, sanctuaries, refuges, reserves, preserves, marine conservation zones; Important Bird& Biodiversity Area; Indigenous and Community Conserved Areas (ICCA); Key Biodiversity Areas (KBA); Important Marine Mammals areas (IMMAs), Marine Protection Zone* (Twyford, 2021) *etc*. From that angle, MPAs appear to be a "meta-Label" for a category of ABMTs which include several other categories of ABMTs which, in principle, meet the MPA definition and primary objective.

Marine Park

(1) An area of the sea or seabed set aside for the conservation of marine organisms[194]. *(2) A multiple-use MPA with different zones allowing different types of activities, including recreational activities, such as boating, snorkelling, and sport fishing*[195]. Different activities may be allowed in marine parks in different countries. For example, in Australia, the Great Barrier Reef Marine Park (GBRMP) allows small and medium scale fisheries. A global list of marine Parks is available at: http://dictionary.sensagent.com/Marine%20Park/en-en/#Africa

Marine reserve

Area of the sea in which all consumptive or extractive uses, including fishing, are effectively prohibited and other human interference is minimized to the extent practicable (Dahlgren and Sobel, 2004).

See: *Reserve; Refuge; No-Take Zone*

Moratorium

A declaration by an authority that a particular activity or action (e.g., the use of a given fishing gear) will be stopped or delayed for a certain period of time, including in perpetuity[196]. A moratorium may implicitly or explicitly apply to areas of different sizes.

See: *Ban*

Mosaic closure

A closure consisting in many independent areas containing significant biodiversity features of concern that can be closed and shifted from year to year in a pattern likely to differ between years (see Pons et al., 2022). Mosaic closures result from dynamic management and the use of *move-on rules* or *real-time incentives*

Move-on Rule (MOR)

A rule triggered by the encounter of a fishing activity with a threshold concerning e.g., a bycatch species or a habitat of concern. The MOR requires that (a) the activity be immediately moved to a set distance away from the point of encounter, and (b) the encounter be reported. Within hours or days, the report triggers the establishment of a

---

[194] https://www.lexico.com/en/definition/marine_park

[195] https://www.nationalgeographic.org/encyclopedia/marine-park/

[196] adapted to fisheries from the Longman dictionary of contemporary English). Longman Group Ltd (1978)

"real-time" fishing closure lasting day to weeks over distances as short as 2–10 km in radius (12-300 km2). In case of encounter with a Vulnerable Marine Ecosystem, the MOR may trigger the establishment of long-term static VME. Well-implemented MORs can allow substantial fishing to occur while maintaining a low collateral impact. MORs operate, for example, in the Eastern Australia pelagic longline tuna fishery, to reduce bycatch of *Thunnus maccoyii,* as well as in a number of deep-sea fisheries, to protect VMEs (Based on Dunn et al., 2016).

See also: *Real-time closure (RTC)*

Multiple-use marine protected area (MU-MPA)

An ABMT category sometimes given to sites matching the requirements of the IUCN MPA category VI. MU-MPAs are also sometimes referred to as "Marine Parks" (Gladstone, 2014)

See: Marine protected area (*MPA)*

National park

(1): An area of countryside, or occasionally sea or fresh water, protected by the state for the enjoyment of the general public or the preservation of wildlife (Oxford Languages); (2) A natural park established for conservation purposes, created and protected by national governments, often as a reserve of natural, semi-natural, or developed land that a sovereign State declares or owns (Wikipedia).

Natura 2000 site network

Natura 2000 is a network of core breeding and resting sites for rare and threatened species, and some rare natural habitat types which are protected in their own right. Stemming from the EC Habitat Directive, It stretches across all EU countries, both on land and at sea. The aim of the network is to ensure the long-term survival of Europe's most valuable and threatened species of birds listed under the Birds Directive (in Special Protection Areas**,** SPAs) or of a wide range of habitats and species other than birds listed in the Habitats Directive (in Special areas of conservation, SACs). Some Natura 2000 sites are strict reserves in which all activities are prohibited, but numerous others are areas for conservation and sustainable use, largely centred on people working with nature rather than against it, and managed in an ecologically and economically sustainable manner. Measures to be taken in Natura 2000 areas include: (i) Setting of conservation objectives; (ii) Implementation of necessary conservation measures (enforcement); (iii) Formal designation: legal, statutory or contractual arrangements by the Scientific Advisory Council; (iv) elaboration and implementation of management plans; (v) Full stakeholder engagement; (vi) strengthened regional cooperation ; and (vii) adequate financing[197].

Natural World Heritage Site (WHS)

The 1972 World Heritage Convention does not provide a definition of a World Heritage Site (WHS). However, a WHS has been defined as: (1) *A natural or man-made site, area, or structure recognized as being of outstanding international importance and therefore as*

[197] https://ec.europa.eu/environment/nature/natura2000/index_en.htm

deserving special protection[198]. (2) N*atural features, geological and physiographical formations and delineated areas that constitute the habitat of threatened species of animals and plants and natural sites of value from the point of view of science, conservation or natural beauty. It includes private and publicly protected natural areas, zoos, aquaria and botanical gardens, natural habitat, marine ecosystems, sanctuaries, reservoirs etc.* (UNESCO, 2009)**[199].**

The Convention intends to protect (i) the world cultural heritage and (ii) the world natural heritage and mixed natural and cultural sites. World marine heritage sites (in August 2021) are shown in Figure 5.

Some 70% of the marine World Heritage sites are currently under threat from climate change, according to the 2020 IUCN World Heritage Outlook (Osipova et al., 2020): Under a business-as-usual emissions scenario, World Heritage Listed coral reef systems are expected to cease to exist by 2100. Natural Heritage Sites contribute to human wellbeing in many ways. For example, about half of the Belize population depends on the Belize Barrier Reef for their livelihoods and 15% of the country's gross domestic product (GDP) comes from the reef. The Simangaliso Wetland Park in South Africa supports over 12,000 jobs for local and indigenous communities.

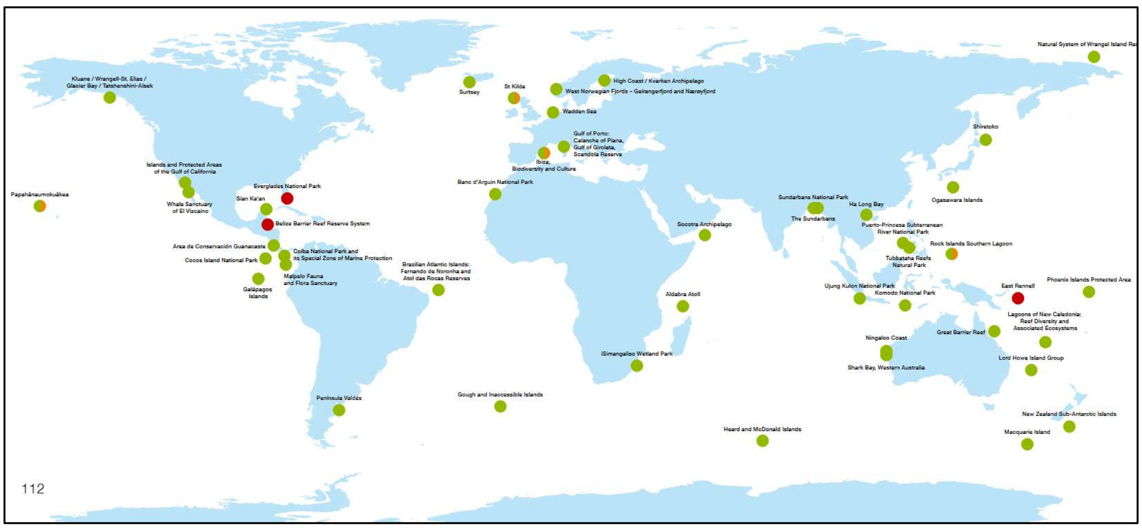


Figure 5: World map of the Marine Heritage sites. Red circle: Sites declared in danger. Bicolour cercles: Mixed cultural and natural heritage.

https://unesdoc.unesco.org/ark:/48223/pf0000235316/PDF/235316eng.pdf.multi.

World Heritage sites are managed by the sovereign State with the international support the WHS label provides. Management challenges are those of all multiple-use conservation areas (Including national parks) and they increase with the complexity of allowed uses, the vulnerability of the natural features, the capacity of the management systems, and the importance of external factors (climate change, politics, economic situation of the State; armed conflicts, etc.). Management guidance is available (cf. UNESCO, 2012; Douvere, 2015).

[198] https://www.lexico.com/definition/world_heritage_site

[199] See also http://uis.unesco.org/en/glossary

No-Take zone (NTZ)

Also referred sometimes as No-Take MPAs (NT-MPA, Jones 2007). They correspond to IUCN MPA categories I and II. (1) *A no-take zone is an area set aside by a government (or any other legitimate authority) where no extractive activity is allowed. Extractive activity is any action that extracts, or removes, any resource* (National Geographic Society, 2022)[200]. (2) *No-take marine protected areas can be defined as marine areas in which the extraction of living and non-living resources is permanently prohibited, except as necessary for monitoring or research to evaluate effectiveness* (NRC 2001). NTZs are also referred to as *no-take MPAs* and *reserves* (Day et al, 2019), *strictly protected areas* or *fully protected areas*, *preservation areas*, *ecological reserves*, *refuges*. Etc., with no guarantee, however, that they have identical properties.

Oceanographic closures

Mobile closed fishing areas defined by combining information on habitats requirements and conditions environmental conditions (e.g., sea surface temperature) to predict moving areas of concentration of biodiversity elements of concern (life stages or protected species) that fishers can voluntarily avoid catching. They have been implemented on a daily and biweekly basis (Dunn et al., 2016).

See: *Real-time closure (RTC)*

Other effective Area-Based Conservation Measures

OECM: *A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio–economic, and other locally relevant values* (CBD 2018). While no categories of OECM exist yet, these areas may diversify in the future, expressing e.g., the biodiversity of concern, the oceanographic domain, or perhaps their level of effectiveness (Aten and Fuller, 2019; Petza et al, 2019)

Particularly Sensitive Sea Area (PSSA)

A PSSA an area that needs special protection through action by IMO because of its significance for recognized ecological or socio-economic or scientific reasons and which may be vulnerable to damage by international maritime activities (IMO Resolution A.982(25) of 2005; IMO, 2006*). In many cases a Particularly Sensitive Sea Area may be identified within a Special Area and vice versa.* PSSA identification need to also account for local human dependencies, related to fishing, livelihood, subsistence, food production, or cultural resources. Indeed, PSSA criteria are particularly comprehensive, including: (1) Ecological criteria like (i) Uniqueness or rarity; (ii) Critical habitat; (iii) Ecological dependency; (iv) Representativeness; (v) Diversity (biodiversity); (vi) Productivity; (vii) Spawning or breeding grounds; (viii) Naturalness; (ix) Integrity; (x) Fragility of the area; and (xi) Bio-geographic importance; (2) Social, cultural and Economic criteria like: (i) Social or economic dependency (for sectors and livelihood); (ii) Human dependency: subsistence and culture; (iii) Cultural heritage, historical and archaeological

[200] https://education.nationalgeographic.org/resource/no-take-zone

sites; (3) Scientific and educational criteria like: (i) Research / scientific interest; (ii) Baseline conditions for monitoring studies; and (iii) Education

PSSA may be referred also as Special Areas (Under MARPOL) and various Associated Protective Measures (APMs) might be in PSSAs, such as (i) application of special discharge restrictions within the area; (ii) ships' routeing and reporting systems in or the near the PSSA; and (iii) or measures aimed at protecting specific sea areas against environmental damage from legally identified ships. In addition, consideration may be given to declare a PSSA also as a Natural World Heritage or a Biosphere Reserve, or other areas of international, regional, or national importance*;* IMO, 2005)[201]. PSSAs do not appear to be directly relevant for fisheries, except: (i) in PSSAs in which fisheries are important for surrounding communities, and might be impacted by the PSSA measures; (ii) and (ii) in case a navigation-related accidental pollution would affect fisheries resources and local livelihoods, as in most coastal oil spills.

Protected area (PA)

(1) *A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*" (IUCN, Dudley et al., 2008). (2) *A geographically defined area, which is designated or regulated and managed to achieve specific conservation objectives*" (CBD Article 2)-

See: *Marine protected area*

Ra'ui

In Cook Islands*, a sign, usually leaves or a branch, set in place by the owner of a piece of land or water reserving it or its produce for his own or some special use; a prohibition. A [temporary] restriction on certain activities in a certain area for a certain time and purpose as determined by a traditional leader or leaders of a village area*. A **Ra'ui mutukore (motukore**) is a *traditional custom of imposing permanent (ever-lasting) restrictions on the use of the resources of any land, reef, or lagoon (*Twyford, 2021: 22-23***)***. Ra'ui expresses a traditional area-based use right and are extensively used in Cook Islands and Polynesia.

Also referred to as: *tapu**,** tabu**,** taboo*.

Real-time closure (RTC)

Or Real-Time Spatial Closure (RTSC). Dynamic area-based measures used for real-time spatial management (RTSM, Hobday et al. 2014) in which measures change in space and time in response to changes in the ocean or its users' practices, based on the integration of biological, oceanographic, social and/or economic data in near real-time (e.g., based on habitats distribution models). RTCs may be used to avoid by-catch hotspots and high concentrations of protected species that may lead to premature closures of fishing activities. They are advocated for dynamic forms of ocean and fisheries management. Often voluntarily implemented in modern fisheries RTCs may be difficult to implement in

[201] (https://www.imo.org/en/OurWork/Environment/Pages/PSSAs.aspx

capacity-limited management systems (Hobday et al., 2014; Maxwell et al., 2015; Dunn et al.,2016; Hilborn at al., 2021).

See also: *Move-on rule****;*** *oceanographic closure****;*** *Real-time Incentive*

Real-time incentive (RTI)

Incentives giver to fishers to induce them to minimize impact on ecosystem features of concern. Fishers would be given "impact credits" to spend as parsimoniously as possible, according to spatio-temporally varying tariffs per fishing day. RTI quotas and tariffs could be based on the state and management targets for commercial stocks and ecosystem features (Kraak et al., 2012). The result is not a closed area but spatio-temporal distribution of fishing pressure minimizing the impact on biodiversity features of concern. Third Party companies may collect, process and re-distribute the information allowing fishers to optimize the spatial distribution of their activity. In addition, fishing opportunities may be adjusted up or down depending on avoidance achieved. The result is a dynamic mosaic-type of closure, very different from a single fixed define area. RTIs may be difficult to implement in capacity-limited management systems

Refuge

(1): Generally, "*an area inhabited by one or more relict species…* a*n area where conditions have enabled a species or a community of species to survive after extinction in surrounding areas*. (2) In South China Sea fisheries: *spatially and geographically defined, marine or coastal areas in which specific management measures are applied to sustain important species during critical stages of their life cycle, for their sustainable use*" (Paterson et al., 2013). (3) In Mexico[202], refuges are "*areas established in waters under federal jurisdiction, with the primary objective to conserve and contribute, naturally or artificially, to the development of fisheries resources, their reproduction, growth or recruitment, and to preserve and protect the surrounding environment*. Refuges have been also referred by their Latin name: *refugium, refugia*

Regulated Fishing Zone203 (RFZ/ZPR)

The RFZ/ZPR allow the application in a delimited geographical zone of specific context-sensitive rules elaborated with the participation of local fishermen. Spread over the whole of French Polynesia, RFZs are part of a wide variety of socio-economic, cultural and environmental contexts, making each of them a special case. Nevertheless, their management committee faces similar issues for the implementation of effective management, such as control and surveillance, knowledge and resource monitoring, and reconciliation of different stakeholders' interests.

Reserve

A reserve is *a spatial area where some or all species receive long-term protection from harvesting* (Grafton et al., 2005). It is a *place that is permanently protected from all preventable anthropogenic threats. The term "preventable" recognizes that external threats like land-based or marine pollutants, alien species, pathogens, and effects of global warming do not respect the boundaries people draw* (Norse et al. 2005).A marine

[202] Referred to as "zonas de refugio"

[203] Translated from French: *Zone de pêche règlementée*

reserve is *a geographically defined space in the marine environment where special restrictions are applied to protect some aspect of the marine ecosystem including plants, animals, and natural habitats*. (NOAA-NMFS Glossary, 2006)[204]. A fishery reserve is a *spatially delimited area created to manage fisheries, in which fishing is restricted or forbidden permanently or for limited periods to one or more fishing gears* (Agardy, 1997; Auster & Shackel, 1997). A nature reserve is *a natural or near natural land area set aside to protect and conserve biodiversity and where applicable, heritage, cultural and spiritual values. Where consistent with the primary objective above, provide for ecologically sustainable use of the natural resources of the reserve* (Twyford, 2021). *MPA categories I and II* are de facto similar to *reserves; no-take zones****;*** *refuges.* In Spain, the fishers 'guilds (Cofradias) have created *Marine Reserves of Fishing Interest*[205]*.* Many variations on the term exist such as *recreation reserve* (Cook Islands, Twyford, 2021) or *Wildlife reserve* (USA**,** Esch, 2006**).**

Ring-fencing

A type of measure "freezing" an entire fishery within its historical footprint, beyond which the fishery will not expand without previous environmental impact assessment, limiting fishing impact beyond its boundary. The area "protected from the fishery is the one outside the boundary. In the South African hake fishery, the initially voluntary measure is now integrated in the national vessel monitoring (VMS) and permit systems. Similar measures have been applied in the GFCM (as a Fishery Restricted Area covering the entire Mediterranean bottom below 1000 m depth), In EU waters below 800 m, in Norwegian waters (from below 300 m to below 800 meters); and on the US West Coast (below 700 fathoms or 1120 m). The area "protected" outside the fishery concerned may also have a lower boundary (e.g., 3500 m off the US Pacific Coast)(PFMC, 2020) or not (as in the Mediterranean). The closure is usually not expected to generate immediate significant socioeconomic impacts.

Rockfish conservation area (RCA)

A depth-based, seasonally varying, gear-specific closure implemented by the Pacific Fishery Management Council in 2002 to reduce incidental catch of overfished rockfish species (*Sebastes alutus*) along the west coast of the United States. Following the recovery of multiple rockfish species, the trawl RCAs off Oregon and California were reopened to fishing in 2020 (Pons et al., 2022).

Rotational closure / harvest

A rotational closure is a temporary, inter-annual and usually recurrent closures and re-opening of areas to specific fisheries or gears, to optimize the distribution if fishing in time and space. In the long-term, all fishable areas are fished on some pre-established multi-year schedule. The approach is also referred to as "Pulse fishing". The rotational cycle (the length of the open and closed periods) is a key factor of effectiveness and should be adapted to the target population traits and the fishing intensity i.e., to the resources and habitats recovery rate (during the closed period) and the depletion rate (during the open period). Rotational closures are relatively low-information low-cost tools, for co-

[204] https://repository.library.noaa.gov/view/noaa/12856

[205] In Spanish: Reserva Marina de Interes Pesquero.

management, applicable for example to coastal and reef systems, on resident or sessile resources, reducing the risk of local depletion, improving yields and economic performance, (Plaganyi et al. 2015). Rotational harvest has been implemented often when confronted to severe overfishing or outright collapse of stocks, and following a period of total moratorium or spatially delimited strict closures that demonstrated the positive effect of fairly long closures, as a precautionary and more effective way to harvest. The optimal length of the closure needs to account also for the increasing risk of non-compliance as the value of the resources inside the closed area increases. Also referred to as rotational harvest (Plaganyi et al., 2015), the approach is quite appropriate for bivalves (Valderrama and Anderson, 2007; Campbell et al., 1998) , gastropods and kelp (Gelcich and Donlan, 2006), sea urchins (Botsford et al., 1993; Pfister and Bradbury, 1996; La and Bradbury, 1998) , precious corals (Caddy, 1993), sea cucumbers (Heizer, 1993), and abalone (Sluczanowski, 1984).

Sanctuary

A sanctuary is an area adequate ecological, faunal, floral, geo-morphological, natural or zoological significance. The Sanctuary is declared for the purpose of protecting, propagating or developing wildlife or its environment. Certain rights of people living inside the Sanctuary could be permitted[206]**.** *(2) An area that is designated for the protection of wild animals (refuge), where animals can breed without interference or danger and hunting and fishing are either prohibited or strictly controlled*[207]. The area is reserved and managed for conservation and provides special opportunities for study or research. Nature reserves fall into different IUCN categories depending on the level of protection afforded by local laws. Normally, a" sanctuary" is more strictly protected than a "nature park". Sanctuaries may provide protection to wide range of biodiversity (e.g., wildlife sanctuary**;** wildlife refuge**,** biosphere reserve**,** bioreserve**,** natural or nature preserve**,** nature conservation area**,** managed nature reserve**,** fish sanctuary (Jamaica), or to particular species or groups of species e.g., Trochus Sanctuary**;** Whale sanctuary**;** Shark sanctuary (Twyford, 2021).

Seasonal closure

Also referred to as *seasonal closed area*, or *closed season*. A closure enforced every year during a few weeks or months, practically indefinitely. It intends to limit/eliminate disturbance of an important process (e.g., spawning, recruitment) or to protect a vulnerable life stage (e.g., spawning nests; juveniles; recruits; or seasonal aggregations of protected species). Such closures are *a priori* adequate to protect habitats. Their dates and duration may be fixed or determined every year, e.g., based on the time-space distribution of the biodiversity element to be protected. The seasonal closure may affect the entire EEZ or fishing ground, in which cased it will not be further geographically designed. It may instead be explicitly limited to a part of the fishing ground and referred to as *spatio-temporal closure* (Hall, 2009; Kincaid, 2017), and its delimitation may be fixed or modified every year (to account for inter-annual variations in the location of the biodiversity of concern) following scientific surveys or move-on rules.

---

[206] http://natureconservation.in/definition-of-wildlife-sanctuary-according-to-wildlife-protection-act-1972/

[207] https://www.oxfordreference.com/view/10.1093/oi/authority.20110803122505650

Sensitive Benthic Habitats (SBH)

Sensitive benthic habitats are areas on the seafloor that form essential components of marine ecosystems. They provide protection, habitat, and food for marine species that are culturally, socially, and economically important. The "sensitivity" of a species or habitat is usually related to (i) the tolerance of a species or habitat to damage from an external factor, and (i) the time taken for its subsequent recovery after the pressure has been removed (related to resilience)[208] (NIWA, 2013). Such habitats may include: deep-sea hydrothermal vents; methane or cold seeps; glass sponge reefs and other sponge gardens; cold-water coral reefs; beds of algae (including coralline algae like maerl[209]), kelp, eelgrass, large bivalve molluscs, brachiopods, bryozoans; sea-pen fields; and stony coral thickets or reefs (NIWA, 2013). In Canada, VMEs are established to protect sensitive habitats in response to the 2006 Resolution of the United Nations on the subject (United Nations, 2006). They are similar to *Habitats Types of Community Interest.*

See: *Vulnerable Marine Ecosystem (VME); critical habitats* **;** Habitat Types of Community Interests.

Spatio-temporal closure

Cf. *Seasonal closure*

Special areas (MARPOL)

A "special area" under MARPOL is defined as: "*a sea area where for recognized technical reasons in relation to its oceanographical and ecological conditions and to the particular character of its traffic, the adoption of special mandatory methods for the prevention of sea pollution by oil, noxious liquid substances, or garbage, as applicable, is required*". These areas address risk from of pollution by oil, other noxious liquid substances, sewage, and garbage from ships. They are of relevance to fisheries to the extent that (i) they call for stricter environmental stewardship of fishing vessels regarding their discharges, e.g., potential release of oil, sewage, discard or abandonment of derelict fishing gear and related threat of "ghost fishing"; and (ii) the identification criteria for these areas include ecological conditions, such as critical habitats for marine resources and rare or fragile marine ecosystems (MARPOL 73/78)[210].

Special Management Area (SMA)

In Tonga, following growing momentum to enhance the country centralised fisheries management approach by a community-based management concept in the 1990s, the fishery legislation was changed in the early 2000s, allowing fisheries management by local communities through Special Management Areas (SMAs). Initially designed to enable communities' control on overfishing activities in nearby waters, SMAs give them exclusive management and use rights, allows them to ban fishing outsiders, and is relatively painless for the community. As shown in Figure 6, SMAs may be zoned and include no-take and other zones. Common SMA objectives, established by the communities assisted

---

[208] https://www.marlin.ac.uk/sensitivity/sensitivity_rationale

[209] Maerl algae deposits lime in their cell walls as they grow, creating a hard, brittle skeleton. They are a priority marine feature in the Northeast Atlantic.

[210] https://www.imo.org/en/OurWork/Environment/Pages/Special-Areas-Marpol.aspx

by the fishery authority, are to improve fish catch and livelihoods, increase fish abundance, and decrease environmental degradation. Initially exclusively fisheries-oriented, the SAM' s programmes have progressively been broadened to include the development of alternative livelihood activities (first in the fisheries sector, then outside it), including coastal infrastructure development (Gillet, 2017). A thorny issue as in many such re-allocation processes, is the lack or loss of access to coastal resources by the landlocked, excluded, communities, and related food security issues.

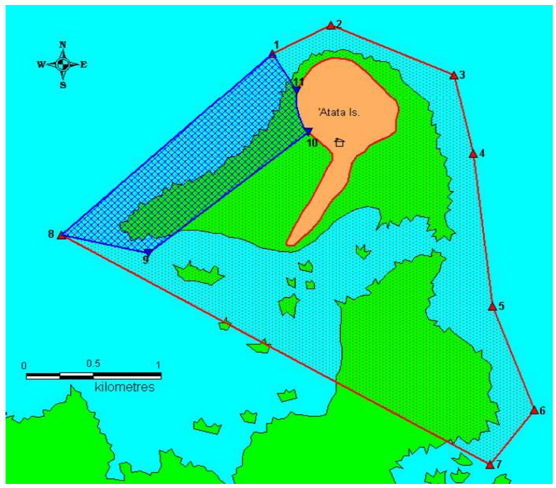


Figure 6. Atata Special Management Area in Tongatapu. The SMA boundary is in red and the no-take zone boundary in blue (from Gillet, 2017).

Specially Protected Areas of Mediterranean Interest (SPAMI)

SPAMIs are marine and coastal protected areas established under the Barcelona Convention to promote cooperation in the management and conservation of natural areas, as well as in the protection of threatened species and their habitats (the conservation of the natural heritage). SPAMIs may be established in the marine and coastal zones subject to the sovereignty or jurisdiction of the Parties and in areas situated partly or wholly on the high sea. The SPAMI List may include sites which: (i) are of importance for conserving biodiversity attributes; (ii) contain specific ecosystems or the habitats of endangered species; and (iii) are of special interest at the scientific, aesthetic, cultural or educational levels. The SPA/BD Protocol provides the identification criteria as well as the procedure and the steps to be followed with the view of including an area in the List. All the Parties to the Protocol are committed to respecting the protection and conservation measures defined in the proposal for inclusion (https://www.rac-spa.org/spami).

Temporary closure

Closure of variable duration. Contrary to a seasonal closure, it is not repeated every year indefinitely. It may be established for a given duration, e.g., for a specific rebuilding programme. Its duration may be fixed by law, or depend on the depleted species rebuilding rate. A temporary closure may also result from a move-on rule, i.e., from a real time encounter with a biodiversity feature of concern (juveniles, protected species, VME) and pending an eventual decision to close the area for a longer time.

Territorial Use Rights in Fisheries (TURFs)

There is no internationally agreed definition. A TURF has been defined as an *area-based measure allocating explicitly use and management rights to the right holder (individual, private, cooperative, association or community* (Costello and Kaffine, 2017). The TURF policy gives the government the authority to assign exclusive access rights to artisanal fisher organizations for the sustainable harvesting of benthic resources (Castilla et al, 1998). In addition to a geographic delimitation, an effective TURF requires a strong governance setting; effective coordination among TURF members; and active participation and empowerment of small-scale fishers. In addition, enforcement of no-take areas in TURFs could usefully be considered (Gelcich and Donlan, 2015). The rights allocated include the rights to use and manage but may be differently defined in different countries and for different resources. TURFs are particularly appropriate for benthic or sessile resident resources with little or no conflict between adjacent TURFs. The tenure duration may vary but should at least be sufficient to produce an acceptable return on investments (Based on Christy, 1982). The definition could apply to an EEZ with the coastal State as right-holder. In a community-based framework, a TURF may relate to the surface, the bottom, or to the entire water column within the area. Its performance depends on its size relative to the distribution area of the resources to be managed and on management regimes in neighbouring TURFs. Zoning of a TURF, like the creation of reserves within it (creating TURF-Reserves or TURF-NTZ) may improve their conservation effectiveness under some conditions related to species mobility, TURF size, and fishing intensity outside the TURF (Afflerbach et al, 2014). Indeed, Gelcich and Donlan (2015) suggest to the possibility to us TURF-NTZs, as biodiversity offsets to compensate biodiversity damage caused by nearby coastal industries, generating payments for ecosystem services within TURFs.

See also: *Area of Management and Exploitation of Benthic Resources* ***(**AMEBR**)***

Territory of life

See: *Indigenous and Community Conserved Area (ICCA)*

Total fishery closure

Also referred to as ban. Such a closure which stops the whole fishery is implicitly area-based as the entire fishing ground –albeit not formally delimited– is closed to a specific fishery. In reality, however, what is closed is the activity, either entirely or only the most impacting components.

See: *Ban*

Vulnerable marine Ecosystem (VME)

There is no internationally agreed definition. The term tend to be used both for (1) benthic populations, communities, or biogenic habitats, vulnerable to substantial alteration from short-term or chronic disturbance, with limited likelihood to recover in an acceptable time frame (Significant Adverse Impact, SAI); and (2) the area established to protect them and the ecosystem they represent. These areas may also be important spawning and nursery areas for deep-sea fish (FAO-WECAFC, 2015). VMEs characteristics are: (i) Uniqueness or rarity; (ii) Functional significance of the habitat; (iii) Fragility; (iv) Life-history traits of component species that make recovery difficult; (v) Structural complexity (FAO, 2009). These criteria are similar to those of EBSAs but the identification of a VME is usually immediately followed by management action which is not the case for EBSAs. VMEs protective action may be triggered by a Move-on rule**,** or based on scientific surveys, or habitat vulnerability analyses. Indeed, practically all regional institutions dealing with fisheries (including CCAMLR, NAFO, NEAFC, NPFC, SEAFO, and SPRFMO) have established protocols for deep-sea fisheries identifying and eventually protecting VMEs (**Harrison et al., 2017**).

Wildlife management area (WMA)

A reserve of biodiversity established in Papua New Guinea, protected and managed by local government, people and NGOs (Bein et al., 2007, Lonely Planet, 2020). It may host rare species in a variety of biomes such as lakes, rivers, wetlands, coral reefs, sandy beaches, waterfalls and tropical forests.

Zone

Generic name of a geographically identified area in a given jurisdiction and in which a different regulatory regime applies. The term may be considered as a synonym of "area" or "ABMT". The term is applied, for example, to the *Exclusive Economic Zone* (EEZ) but most often reflects a sub-division of a larger ABMT. Large jurisdictions like EEZ, LMMAs, or large MPAs, may contain smaller zones designated for specific purpose. For example, in Cook islands, the Marae Moana Park Act establishes a system of six zones, each with a stated purpose: (a) general use zone; (b) restricted commercial fishing zone; (c) seabed minerals activity buffer zone; (d) island protection zone ; (c) ocean habitat preservation zone ; (f) national marine park zone (Twyford, 2021). Marine Spatial Planning is a "zoning " process. Other examples include: *fisheries protection zone***,** *biological protection zone***,** *buffer zone***,** *exclusive fishing zone, fisheries management zone, fisheries protection zone***,** *marine conservation zone.*

ANNEX 2 – GLOSSARY

Note: Definitions of ABMTs are given in Annex 1.

Area-Based Fishery Management Measure (ABFM): *A formally established, spatially-defined fishery management and/or conservation measure, implemented to achieve one or more intended fishery outcomes. Their outcomes are commonly related to sustainable use of the fishery. However, they can also often include protection of, or reduction of impact on, biodiversity, habitats, or ecosystem structure and function* (CBD, 2018).

Area-based Management Tool (ABMT): *A geographically defined area in which human activities are regulated for one or more purposes, delivering one or more social, [economic,] and ecological outcomes to achieve objectives for biodiversity conservation, sustainable resource use or both* (Molenaar, 2013; Reimer et al., 2021, square bracket added).

Area-based management (ABM): A spatially integrated approach to management of the full suite of human activities, organized and regulated in formally delimited spaces or zones, of different sizes, based on geomorphological, bioecological, sociocultural, technoeconomic, legal, jurisdictional, or political considerations, in which different regulations may apply to reach agreed objectives

Area-based planning. A forward-looking, cross-sectoral public process of analysing and allocating the spatial and temporal distribution of human activities in areas to achieve ecological, economic, and social objectives that are usually specified through a political process. Management starts when planning ends. Example: Marine Spatial Planning (MSP)

Biodiversity attributes of concern: The biodiversity attributes (feature, element or component) beyond the target species, that are (1) impacted by fishing operations and for which conservation measures are required to eliminate, reduce, mitigate the impact, and eventually restore healthy conditions; or (2) identified by a mandated agency, or widely supported social process, as a conservation priority, e.g., listed as endangered, threatened or protected in national or international legislation (Garcia et al., 2021). These attributes include rare, protected, endangered, and threatened species, accidentally taken as bycatch; depleted target species requiring a rebuilding plan; essential, or vulnerable habitats(such as seagrass and algal beds and coral and sponge reefs; representative natural ecosystems; range-restricted species; key biodiversity areas [KBAs]; areas providing critical ecosystem functions and services; and areas important for ecological connectivity (Garcia et al., 2021; CBD, 2018 Criterion C3).

Complementarity: There is complementarity between 2 or more factors when their cumulative effect is equal to the sum of the effects they would have had when acting in isolation. The factors are complementary and their effect is additive

Critical habitats: In the USA, the term used in relation to species listed as threatened or endangered means: (1) the specific areas within the geographical area occupied by the species…on which are found those physical or biological features which are essential to the conservation of the species and which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the listed species upon a determination by the Secretary that such areas are essential for the conservation of the species. Critical habitats may be established for listed species for which no critical habitat has heretofore been established. Except in circumstances determined by the Secretary, critical habitat shall not include the entire geographical area which can be occupied by the species[211]. **H**abitat areas with which endangered, threatened, sensitive or monitored plant, fish, or wildlife species have a primary association (e.g., feeding, breeding, rearing of young, migrating)[212].

Cultural and spiritual values: These include recreational, religious, aesthetic, historic and social values related to tangible and intangible benefits that nature and natural features have for people of different cultures and societies, with a particular focus on those that contribute to conservation outcomes (e.g. traditional management practices on which key species, biodiversity or whole ecosystems have become reliant or the societal support for conservation of landscapes for the maintenance of their quality in artistic expression or beauty) and intangible heritage, including cultural and spiritual practices (Marnewick et al., 2020)

Effectiveness. For Area-based Management (ABM) and Area-based management tools (ABMTs), it is the extent to which the expectations of the relevant stakeholders (e.g., society, the community, the legitimate authority, NGOs and the sector) are satisfied by the outcomes of their action. The extent to which formal or informal objectives are met.

Nature contribution to people (NCP): a concept similar to and inclusive of ecosystem services. Refers to all the contributions from biodiversity to people's well-being or quality of life. They include (a) material contributions, such as the production of food, feed, fibre, medicines and energy, (b) regulating services, such as the regulation of air and water quality, climate regulation, pollination, regulation of pests and diseases and provision of habitat, and (c) other non-material contributions, such as learning, inspiration, health, physical, psychological, spiritual well-being and experiences and supporting identities and culture, as well as maintaining options for future generations (CBD/SBSTTA/24/3/Add.2/Rev.1, para. 35).

Nature-based Solutions (NbS): actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (IUCN Glossary. https://portals.iucn.org/library/node/7040).

Network of ABMTs: (1) a collection of individual ABMTs operating cooperatively and synergistically, at various spatial scales, and with a range of outcomes, that are designed to meet objectives that a single ABMT cannot achieve" (generalized from a definition of MPA networks by TNC, WWF, CI and WCS, 2008**).** (2) A group of ABMTs that interact with one another ecologically and/or socially form a network (Christie et al. 2007**).** Networks include areas different sizes, locations and purposes interconnected by the movement of animals and propagules (PISCO, 2007). If the component areas are not functionally connected, the group of ABMTs may be referred to as a "portfolio". Communication and cooperation networks may also connect individuals (stakeholders, managers) working on

[211] Source: Legal Information Institute (LII) U.S. Code, Title 16, Chapter 35, § 1532; and US Endangered Species Act. https://www.fisheries.noaa.gov/national/endangered-species-conservation/critical-habitat

[212] https://www.lawinsider.com/dictionary/critical-habitat

ABMTs, to promote education and cooperation among them, to address both environmental and socio-economic needs

PTE species: species formally registered as "Protected", "Threatened", or "Endangered"

Sensitive habitat: (1) A fragile type of habitat that is recognized internationally as ecologically important and which support important assemblages of commercial and non-commercial species and which may require protection e.g., Posidonia bed (STECF, 2006). (2) The specific areas within the geographical area historically or currently occupied by a species or community of species in which are found those physical or biological features essential to the establishment or continued existence of the species and which may require special management[213].

Subsistence fishing: Any legal fishing activity where the catch is not sold or marketed but is shared within the family or Village for the purpose of home consumption and cultural useshttps://nauru-data.sprep.org/dataset/community-based-fisheries-management-program.

Sustainable use (SU): The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations (CBD 1992). This definition was also adopted in the BBNJ Agreement (United Nations, 2023). IPBES (2022) added that SU is also "an outcome of social-ecological systems that aim to maintain biodiversity and ecosystem functions in the long term, while contributing to human well-being. It is a dynamic process as wild species, the ecosystems that support them, and the social systems within which uses occur, change over time and space.

Synergy between two or more factors occurs when their cumulative effect is larger than the sum of the single effects they would have had, operating independently. The difference or "premium" is a synergistic effect

Target species: Those species that are primarily sought by the fishermen in a particular fishing trip or in an established specific fishery. These species have a market and are the main object of fisheries management attention. In multispecies, multi-gear fisheries, there may be primary and secondary target species.

Non-target species: Species or sizes not aimed at but accidentally caught during fishing operations. They may be discarded at sea (9ften dead) or kept on board for a secondary market or if the fishery is under a discard ban (landing obligation). In UNCLOS, non-target species are referred to as *associated and dependent species* and their reproductive capacity should be maintained.

Tension: a state of latent hostility, distrust, or opposition between individuals or groups. Tension may lead to open conflict, triggering the need for conflict-resolution and negotiations on trade-offs.

Territorialization: Attempt by States, within their EEZ or beyond, to acquire rights as similar as possible to those that have been granted by UNCLOS within their territorial sea.

[213] Source: Law Insider: https://www.lawinsider.com/dictionary/sensitive-habitat