# IDENTIFICATION, ASSESSMENT AND GOVERNANCE OF OTHER EFFECTIVE AREA-BASED CONSERVATION MEASURES IN THE MARINE FISHERY SECTOR

## A BACKGROUND DOCUMENT[1,2]

S.M. Garcia[1], J. Rice[1], K. Friedman[2] and A. Himes-Cornell[2]

[1.] Fisheries Expert Group of the IUCN Commission on Ecosystem Management (IUCN-CEM-FEG)

[2.] FAO Fisheries and Aquaculture Department



### ABSTRACT

### TABLE OF CONTENT

List of figures ..... 3
List of tables ..... 4
Acronyms and abbreviations ..... 5
Introduction ..... 7
**Historical background on OECMs** **7**
**Structure of the document** **8**
**Notes for the experts** **9**
1. Rationale for producing guidance for OECMs in the marine fishery sector ..... 10
**1.1 Objectives of OECMs in fisheries** **11**
**1.2 Possible incentives for establishing OECMs** **12**
**1.3 General concerns about the identification of OECMs in the marine fishery sector** **12**
**1.4 Why further guidance for fisheries?** **13**
**1.5 Target audience** **14**
**1.6 Relations with other FAO Guidelines** **14**
2. Definition of an OECM ..... 14
3. Guiding Principles and common characteristics ..... 15
**3.1 The roles and expected outcomes of OECMs** **15**
Principle (a): Significant biodiversity value ..... 16
Principle (b): Conservation role ..... 16
Principle (c): Dual role in in-situ conservation ..... 17
Principle (d): Complementary conservation role: ..... 17
Principle (e): Demonstrated outcomes ..... 18
Principle (f): Representativeness and connectivity ..... 18
**3.2 OECMs and governance** **18**
Principle (g): Consultation ..... 18
Principle (h): Legitimate governance capacity ..... 19
Principle (i) Indigenous people and local communities ..... 19
Principle (j): Cultural and spiritual values ..... 20

[1] This document was prepared to provide background information to facilitate the work of the Expert Meeting on OECMs in the Marine Fishery Sector organized by FAO, SCBD and IUCN-CEM-FEG , 7-10 May 2019 in Rome.

[2] Disclaimer: The views expressed in this document are solely those of the authors

Principle (j): Governance systems ..... 20
Principle (k): Best available information ..... 20
Principle (l): Transparency and evaluation ..... 20
**3.3 Relation between OECM and EAF principles** **21**
4. Criteria for identification and evaluation ..... 21
**Criterion A: The area is not currently recognized as a protected area:** **21**
**Criterion B: The area is governed and managed** **22**
Sub-criterion B1: Geographically defined space: ..... 22
Sub-criterion B2: Legitimate governance authorities: ..... 23
Sub-criteria B3: Managed. ..... 23
**Criterion C: Achieves sustained and effective contribution to in situ conservation of biodiversity** **24**
Sub-criteria C1: Effective. ..... 24
Sub-criteria C2: Sustained over long term ..... 24
Sub-criteria C3: In situ conservation of biological diversity. ..... 25
Sub-criteria C4: Information and monitoring. ..... 25
**Criterion D: Associated ecosystem functions and services and cultural, spiritual, socioeconomic and other locally relevant values** **25**
Sub-criteria D1: Ecosystem functions and services. ..... 26
Sub-criteria D2: Cultural, spiritual, socioeconomic and other locally relevant values. ..... 26
5. Key concepts and cross-cutting issues in a fishery context ..... 26
**5.1 expected roles and outcomes of OECMs** **27**
a. Biodiversity value ..... 27
b. Case-by-case assessment ..... 28
c. Comparable importance ..... 28
d. Complementary role (to MPAs) ..... 28
e. Connectivity ..... 29
f. Ecosystem functions and services ..... 31
g. Integrated ..... 31
h. In-situ conservation ..... 32
i. Safe Ecological Limit (SEL) ..... 33
j. Significant Adverse Impact (SAI). ..... 34
k. Uncertainty, threats and risk assessment and management ..... 35
**5.2 OECMs and governance** **35**
a. Governed and managed ..... 35
b. Cultural and spiritual and other locally-relevant values ..... 36
c. Effectiveness ..... 37
d. Legitimate authorities ..... 37
e. Free Prior and informed Consent (FPIC); ..... 38
f. Self-identification ..... 38
g. Sustained / long term ..... 38
6. Evaluating areas for inclusion in OECM reporting and management ..... 39
**6.1 Potential elements of a General process of OECM identification and management** **39**
**6.2 General approach to evaluations** **41**
**6.3 Property-by-property considerations** **44**
6.3.1 Area-based measure ..... 44
6.3.2 Importance for biodiversity and ecosystem services ..... 45
6.3.3 Conservation ..... 46
6.3.4 Effective measure and effectively managed. ..... 48
6.3.5 Equitably managed ..... 51
6.3.6 Ecologically representative and well-connected systems ..... 52

6.3.7 "Threats" and "Integrated into the wider …seascapes" ..... 53
**6.4 The assessment process** **56**
6.4.1 Reviewing the evidence ..... 56
6.4.2 The Assessment Steps ..... 58
7. Monitoring, evaluation and reporting (MER) ..... 63
**7.1 Defining clear goals and objectives for MER** **65**
**7.2 Historical understanding** **67**
**7.3 Review of knowledge, indicators and monitoring methods** **68**
7.3.1 Specify OECM management targets ..... 69
7.3.2 Identify threats to biodiversity values and their significance ..... 69
7.3.3 Identify indicators of Pressure, State and Response ..... 71
7.3.4 Identify appropriate MER methods ..... 73
**7.4 Spatial and temporal decisions for monitoring** **74**
**7.5 Evaluation of effectiveness and efficiency** **78**
**7.6 Reporting on OECMs in the fishery context** **79**
**7.7 Auditing** **80**
**7.8 Data and information management and communication** **81**
8. Re-evaluation of the OECM ..... 81
**8.1 The individual triggers and possible responses** **82**
8.2.1 The OECM-based periodic assessments. ..... 82
8.2.2 The changes to the fishery ..... 84
8.3.3 The environmental / ecosystem changes (including climate change) ..... 84
8.3.4 Changes in activity of other economic sectors ..... 85
**8.3 Reporting on re-evaluation outcomes** **85**
**8.4 Revision of the OECM status of an ABFM** **86**
9. Selected governance issues ..... 87
**9.1 The governance framework** **88**
**9.2 Equitable governance** **88**
**9.3 Integration** **89**
**9.4 Mainstreaming** **91**
**9.5 Note on the legal framework** **92**
**9.6 Governance process** **93**
**9.7 Spatial management issues** **94**
References ..... 96
Annex 1 – Typology of Area-Based Fishery Management Measures ..... 106
Annex 2 – references to available guidance on data collection, assessment methodology, monitoring and evaluation ..... 114

**LIST OF FIGURES**

**Figure 1**: Suggested OECM process. Green, red-dotted and red arrows correspond respectively to positive, conditional and negative statements

**Figure 2**: Levels of MER that offer OECM managers scalable options for the monitoring of the "State" of biodiversity and pressures exerted on them. Note that even within a level (1, 2 or 3), monitoring can be upgraded, and monitoring intensity can be adapted (e.g. number of indicators and sites assessed) to respond efficiently as well as effectively to issues emerging during the evaluation (adaptive design).

**Figure 3**. Management performance: Four possible time-series scenarios of Pressure, State and management Response, considering both effectiveness and efficiency. The thresholds related to the safe value for *in-situ* biodiversity (dashed line) and the upper tolerable limit for the pressure (dotted line) are shown

**LIST OF TABLES**

**Table 1**. Key activities, tasks and actions required for monitoring, evaluation and reporting. The list of actions does not pretend to be comprehensive

**Table 2**. Points to consider when planning 'where', 'when' and 'how frequently' to monitor

**ACRONYMS AND ABBREVIATIONS**

| | |
|---|---|
| ABFM | Area-based Fishery Management measure |
| ABM | Area-Based Measures |
| ACCOBAMS | Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area |
| ASCOBANS | Agreement on the Conservation of Small Cetaceans of the Baltic, north-east Atlantic, Irish and North seas (CMS regional agreement) |
| BACI | Before-After-Control-Impact (assessment approach) |
| BIM | Biodiversity Impact Mitigation (hierarchy) |
| CBD | Convention on Biological Diversity |
| CCFAM | Canadian Council of Fisheries and Aquaculture Ministers |
| CCRF | Code of Conduct for Responsible Fisheries |
| CITES | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| CMS | Convention on Migratory Species |
| COP | Conference of the Parties to the CBD |
| EAF | Ecosystem Approach to Fisheries |
| EEZ | Exclusive Economic Zone |
| EFH | Essential fish habitat |
| FAO | Food and Agriculture Organization of the United Nations |
| ICAM | Integrated Coastal Areas Management |
| IUCN | International Union for Conservation of Nature and Natural Resources |
| IUCN-CEM-FEG | Fisheries Expert Group of the IUCN Commission on Ecosystem Management |
| MPA | Marine Protected Area |
| MSP | Marine Spatial Planning |
| M&E | Monitoring and Evaluation |
| NBAP | National Biodiversity Action Plans (under the CBD) |
| NTZ | No-Take Zone |
| OECM | Other Effective Area-based Conservation Measure |
| OEABCM | Other Effective Area-Based Conservation Measure (see OECM) |
| OSPAR | The Convention for the Protection of the Marine Environment of the NE Atlantic |
| PET | Protected, Endangered or Threatened (species) |
| PSR | Pressure / State / Response Framework |
| SBSTTA | Subsidiary Body on Scientific, Technical and Technological Advice |
| SDGs | UN Sustainable Development Goals |
| SBSTTA | Subsidiary Body on Scientific, Technical and Technological Advice of the CBD |
| SSFs | Small-scale Fisheries |
| UN | United Nations |
| UNCLOS | United Nations Convention on the Law of the Sea |
| UNGA | United Nations General Assembly |

| | |
|---|---|
| UNEP | United Nations Environment Programme |
| UNEP-WCMC | See WCMC |
| UNFSA | United Nations Fish Stock Agreement |
| VME | Vulnerable Marine Ecosystem |
| WCC | World Conservation Congress (of IUCN) |
| WCMC | World Conservation Monitoring Centre (UNEP) |
| WCPA | World Commission on Protected Areas (IUCN) |
| WDPA | World Database on Protected Areas |

## INTRODUCTION

### HISTORICAL BACKGROUND ON OECMS

In 2010, the 10th Conference of the Parties (COP 10) of the Convention on Biological Diversity (CBD) adopted a Strategic Plan for Biodiversity 2011-2020 which contained 20 Aichi Biodiversity Targets to be achieved by 2020. This Strategic Plan provides the CBD Parties with an overarching framework on biodiversity for the entire United Nations system and all other partners engaged in biodiversity conservation and management and policy development. Aichi Biodiversity Target 11 (hereafter referred to as Target 11) falls under Strategic Goal C of the Plan *to improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity*. The Target states that "*By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures* [emphasis added] *and integrated into the wider landscapes and seascapes*" (https://www.cbd.int/sp/targets/). The wording reflects, *inter alia*, for all area-based conservation (including MPAs), the commitment to management effectiveness, equity (in line with the Convention Preamble, and articles 1, 8j, 15.7 and 19.2), connectivity, and spatial integration.

After the adoption of Target 11 in 2010, it became progressively more evident that the numerous closed areas used primarily to manage activities of various economic sectors, including fisheries, covered large areas with actual or potential positive impact on biodiversity conservation, and the question of their assessment and complementarity with MPAs networks has progressively emerged in the literature (e.g., in **Bax and Creswell, 2012; Spalding et al, 2014; Borrini-Feyerabend, 2014; Jonas et al, 2014; Rees et al., 2018; Rice, Garcia and Kaiser, 2018**). It also became evident that more guidance was needed (**Leadley *et al*., 2014; Jonas et al., 2014).** An IUCN-WCPA Task Force on Other Effective Area-based Conservation Measures (hereafter OECMs)[3] was established in 2015 and, through expert workshops, produced in 2018 and 2019 draft guidelines with considerations on various sectors including fisheries (**IUCN WCPA, 2018; 2019**).

At the 20th meeting of the CBD Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA 20; April 2016) and CBD COP 13 (December 2016), CBD Parties discussed progress on priorities in the Strategic Plan on Biodiversity, including Target 11. COP 13 *recognized the importance of building linkages among existing efforts on various area-based conservation measures within the framework of cross-sectoral and integrated marine spatial planning and implementation in support of achieving the Aichi Biodiversity Targets in marine and coastal areas* (Decision XIII/9). In Decision XIII/2, the COP requested further work on guidance for various aspects of efforts to achieve Target 11, including OECMs. Pursuant to the requests, the Secretariat of the Convention on Biological Diversity convened two parallel meetings (with some joint sessions on specific issues) in February 2018:

- The Technical Expert Workshop on Other Effective Area-based Conservation Measures for Achieving Aichi Biodiversity Target 11(https://www.cbd.int/meetings/PAEM-2018-01);
- The Expert Workshop on Marine Protected Areas and Other Effective Area-based Conservation Measures for Achieving Aichi Biodiversity Target 11 in Marine and Coastal Areas (https://www.cbd.int/meetings/MCD-EM-2018-01)

[3] The acronyms OECM and OEABCM have both been used in relation to this instrument. Neither of the two has been agreed by CBD COP in Decision 14/8 in which the expression "other effective area-based conservation measures" is used in full.

Four background documents were made available for the Expert Workshop on Marine Protected Areas and Other Effective Area-based Conservation Measures for Achieving Aichi Biodiversity Target 11 in Marine and Coastal Areas at https://www.cbd.int/meetings/PAEM-2018-01 on:

- Guidelines for recognizing and reporting other effective area-based conservation measures, prepared by the IUCN World Commission on Marine Protected Areas (**IUCN-WCPA, 2018**);
- Cross-cutting issues and key messages related to the achievement of Target 11 through the use of marine protected areas (hereafter MPAs) and OECMs, in document CBD/MCB/EM/2018/1/INF/1 (**Fuller, 2018**);
- Other effective area-based conservation measures for achieving Aichi biodiversity Target 11 in marine and coastal areas (in non-fisheries marine sectors, in document CBD/MCB/EM/2018/1/INF3 (**Azmi**, **2018**)
- OECMs used in marine fisheries: a working paper in document CBD/MCB/EM/2018/1/INF/4, prepared by the IUCN-CEM Fisheries Expert group (**Rice, Garcia and Kaiser, 2018**).

The two Expert Workshops produced a joint draft guidance on OECMs that was considered by SBSTTA 22, in July 2018, as recommendation 22/5 (**CBD SBSTTA, 2018**; Document CBD SBSTTA/REC/22/5). The guidance included the definition of OECMs (§2) and scientific and technical advice on management approaches and identification of OECMs and their role in achieving Target 11. SBSTTA recommendations were then considered at COP 14, in November 2018, as Decision 14/8, applicable in terrestrial and marine areas and to all economic sectors (**CBD, 2018c**). In this Decision, the CBD COP, *inter alia*:

- *Invites* IUCN, FAO and other expert bodies to continue to assist Parties in identifying other effective area-based conservation measures and in applying the scientific and technical advice (paragraph 9);
- *Urges* Parties, and invites other Governments, relevant organizations and donors in a position to do so to provide resources for capacity-building, and to support Parties and indigenous peoples and local communities to identify OECMs and to apply the scientific and technical advice and guidance (paragraph 11);
- *Urges* Parties to facilitate mainstreaming of protected areas and OECMs into key sectors, such as, *inter alia*, agriculture, fisheries, forestry, mining, energy, tourism and transportation, in line with the guidance contained in the annex to the decision (paragraph 12).

The Expert Meeting on OECMs in the Marine Fishery Sector was organized by FAO, SCBD and IUCN-CEM-FEG from 7 to 10 May 2019, in Rome (Italy) with support from the Nordic Council of Ministers to draft guidance for that sector.

#### STRUCTURE OF THE DOCUMENT

The purpose of this document is to provide the expert meeting with some common background when they will consider how the CBD COP decision 14/8 on OECMs can be applied in the marine fishery sector. Section 1 provides a rationale for the need for additional guidance on OECMs and their use in the marine fishery sector. Sections 2, 3 and 4 present the definition, guiding principles and identification criteria contained in the 2018 CBD COP Decision 14/8. Section 5 contains a more extended clarification and discussion on terms, concept, and issues, appearing in various ways and different forms, in sections 2 to 4. Section 6 reviews available approaches to identify OECMs among existing or new area-based fishery

management measures (ABFMs)[4]; Section 7 examines the monitoring, evaluation and reporting system and procedures needed for recurrent evaluation of OECMs once implemented; Section 8 addresses specifically the need for re-evaluating OECMs if their performance is found to have fallen below standards, upgrading them or removing them from the OECM records. Section 9 addresses selected governance issues, specifically related to fisheries and their specific legal and institutional contexts.

**NOTES FOR THE EXPERTS**

In drafting the document an *ad hoc* formatting convention has been used. First, the important direct quotes from the CBD COP Decision 14/8 and other sources are in *italic,* as usual. Second, in Sections 2, 3 and 4, when reproducing *in extenso* the OECM definition, guiding principles and criteria, some terms and expressions which, according to the authors, deserved a comment or clarification have been emphasized. The terms addressed immediately below the citation are underlined. The terms that were encountered many times in the Decision (reflecting cross-cutting issues) or requiring more extensive development are in **bold** and are addressed all together in **Section 5**.

Sections 2, 3 and 4, contain material that has been adopted in the CBD COP Decision 14/8 and provide guidance applicable to all sectors in which OECMs may be identified. Consequently, the definition, principles and identification criteria should be considered as a formal background to be reflected in any guidance elaborated for OECMs in the marine fishery sector.

Sections 1 and 5 to 9 contain arguments supporting the development of additional guidance for OECMs in the marine fishery sector as well as explanatory material and scientific and practical considerations on implications of Aichi Target 11 and CBD COP Decision 14/8 for this sector. The sections provide a common technical and scientific background to be considered by the experts when drafting the guidance on OECMs for the sector. Considering the wide range of implications for both fisheries' sustainability and biodiversity conservation, the sections may not be considered as exhaustive. The information contained in these sections is intended to assist but not constrain in any way the experts drafting their guidance. It may be used or not and modified by them, without citation of the source, and augmented as considered most appropriate by them.



[4] CBD COP Decision 14/8, Annex IV, paragraph Bc states that ABFMs *are 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*. When referring to ABFM in this text we refer both to the well-defined area and the special measures that apply in it.

## 1. RATIONALE FOR PRODUCING GUIDANCE FOR OECMs IN THE MARINE FISHERY SECTOR

It is believed that Parties to the CBD included "other effective area-based conservation measures" in Target 11 because some area-based management measures adopted by social agents (e.g. economic sectors; traditional communities), other than areas formally designated as "protected areas", were deemed to also potentially contribute to a varying and sometimes large extent to effective *in-situ* conservation of biodiversity (**IUCN-WCPA, 2019; Rice et al., 2018).** The areas concerned, with the special measures that characterize them, possibly used and managed by Statal institutions and/or private actors, indigenous peoples and local communities, in terrestrial, coastal and marine environments, can produce biodiversity conservation outcomes such as: (i) contributions to the conservation of important ecosystems, habitats, and corridors; (ii) support to the recovery of threatened species; (iii) maintenance of ecosystem functions and services; (iv) enhanced resilience against threats; and (v) retention and connection of remnants of fragmented ecosystems in developed areas. These outcomes are referred to as *benefits* –when expected, intended, included as objectives in the management plan– or *co-benefits* when generated unwillingly by the management measures in place, as a collateral effect (more details in **Section 6.3.3**). As such, these individual areas may constitute stepping stones within MPA networks improving connectivity and integration within wider landscapes and seascapes.

In the following sub-sections, we will look at the rationale of identifying OECMs in the marine fishery sector, in terms of objectives, incentives, concerns, needed guidance, target audience, and relationship with existing guidelines.

OECMs are a CBD concept and instrument, aiming at ecosystem-wide positive effects on in-situ biodiversity. However, OECMs would need to be identified or introduced in areas where economic sectors and communities are already active, and on which human population may depend for food, livelihoods, energy, recreation, etc. Their establishment requires the active participation of all the actors involved, within their area of competence, and hence their understanding, willingness and capacity to participate effectively. The actors, and particularly marine fisheries which are ubiquitous users of ocean space and biodiversity will benefit from guidance for the implementation of the concept, under the overall stewardship of the State.

As outlined in COP decision 14/8, an "*other effective area-based conservation measure*" (OECM) is "*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,*[5] *with associated ecosystem functions and services and where applicable, cultural, spiritual, socio–economic, and other locally relevant value*s" (See also **Section 2**). In other words, an OECM should be a well-defined area within which an effective management regime and special measures apply (such as access rules, authorized gears and practices, etc.) to achieve its expected positive in-situ biodiversity and other outcomes. Some ABFMs may be established specifically to reduce the pressure of the fishery on some biodiversity components, sometimes with an incremental cost to the fishery, consistent with **Annex III (§ C1c)** of Decision 14/8 , that "*some OECMs may be established, recognized or managed to intentionally sustain in situ conservation of biodiversity*. *This purpose is either the primary management objective, or part of a set of intended management objectives*". For both co-benefits and intended benefits, what matters is that these biodiversity outcomes are positive, secure and sustained.

Whether the biodiversity conservation outcomes are the primary management objective or part of a set of intended management objectives, when using the term "OECM" in this document, we therefore intend

[5] As defined by Article 2 of the Convention on Biological Diversity and in line with the provisions of the Convention

to refer both to the "area" and the "measures" and whether we refer more specifically to the location and boundaries or to the measures and management regime should be obvious from the context or specifically indicated. The same convention applies to the term ABFM.

### 1.1 OBJECTIVES OF OECMS IN FISHERIES

The CBD COP Decision recognizes that OECMs may be established, recognized or managed primarily for purposes other than *in situ* biodiversity conservation, but states that, in such cases, it is desirable that the expected co-benefit be stated explicitly as an objective of the OECM. The Decision states also that an OECM could be established with in-situ biodiversity conservation as primary objective. Whether the *in situ* biodiversity conservation outcome is a primary or secondary objective, the related management measures should be specified and enabled (**Annex III, § C1d, C1e**). In the CBD COP definition 14/8 (thereafter referred to as Decision 14/8), the objective of OECMs is expressed in broad and conceptual terms: to *achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity*[6]*, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio–economic, and other locally relevant values"*. As usual, however, such conceptual objectives must be decomposed in their more "operational components" for which indicators and reference values may be identified and measured.

In fisheries, ABFMs of various types, also referred to as "closed areas" of various types (**Rice et a., 2018**), are regularly implemented, and an ABFM producing positive biodiversity benefits and co-benefits may be also recognized as an OECM, provided that the criteria outlined in COP decision 14/8 are met. As such, their primary objective is often the fishery sustainability, helping to conserve the healthy target species needed to maintain the sources of food, livelihoods and human well-being of an ecosystem. For this purpose, ABFMs have been established *inter alia* to provide effective protection of critical life stages, essential habitats and biological processes of the target resources and their habitats (e.g., spawning, feeding and nursery areas; concentration of juveniles; refugia for old spawners). OECMs will be expected, in addition, as a co-benefit or in some cases as direct benefit, to reduce the collateral impact of fishing on non-target species and their habitats, contributing to bycatch reduction, and protection of emblematic or protected, endangered and threatened species (PET) species as well as well as vulnerable ecosystems, essential for the maintenance of ecosystems services. These objectives are aligned with The United Nations Convention of the Law of the sea (UNCLOS) obligations concerning target resources as well as *associated and dependent species* and on environmental protection and the extent to which they are reached depends on the quality of research, management and compliance.

ABFMs that are recognized as OECMs are intended to be reported as a contribution to Target 11 and the Sustainable Development Goals, and may also contribute to future goals/targets established as part of the post-2020 global framework for biodiversity. In line with the objective of Target 11, OECMs in the fisheries sector are expected to (i) help reduce/halt the loss of, and restore, *in-situ* biodiversity (in line with the Biodiversity Impact Mitigation Hierarchy (BIM) and (ii) complement the connectivity between MPAs across ecosystems and seascapes. This may be particularly important in or around densely populated and high-biodiversity areas – or where there are long established (typically multi-generational) uses of marine resources – where there may be heavy resistance and challenges facing the designation and enforcement of strictly protected MPAs.

Together, their primary and secondary sets of objectives make OECMs an important tool in fisheries management to further the implementation of the ecosystem approach to fisheries (EAF) including its

[6] As defined by Article 2 of the Convention on Biological Diversity and in line with the provisions of the Convention.

human dimensions. However, the two sets may be in tension, opening sensitive trade-offs, and an appropriate fishing-and-protection regime needs to be designed to find an effective and acceptable balance. Such a balance represents a complex challenge because the respective stakeholders have different risk tolerances (regarding human and nature well-being) and because fishery sustainability and biodiversity outcomes are often considered at two different scales: the fishery and the ecosystem.

It should be noted that creating an OECM in a fishery, or enhancing a conventional ABFM to become an OECM, implies not only that, in the OECM, the expected biodiversity conservation outcomes (i.e. the secondary objectives) need to be specified but also that the entire set of objectives of the fishery concerned my need to be revisited to ensure integration and balancing of the OECM into the fishery management plan to ensure: (i) compatibility of measures taken inside and outside the OECM; (ii) complementarity between the OECM and the technical non area-based measures taken for the fishery; (iii) that the means needed to enforce, monitor and evaluate the OECM performance, locally and at ecosystem level, are in place; and (iv) that the performance of the fishery (or fisheries) and the related OECMs are assessed regularly, in coordination, under the same oversight mechanism.

### 1.2 POSSIBLE INCENTIVES FOR ESTABLISHING OECMS

An obvious incentive for the CBD Parties is to comply with their commitments within the CBD Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets, particularly Target 11, as well as with their National Biodiversity Strategies and Action Plans (NBSAPs). Another related incentive is that of preparing better contributions to the achievements of the Sustainable Development Goals (SDGs), particularly SDG 14 and the post-2020 global framework for biodiversity, and the Sustainable Development Agenda and its goals (SGDs), particularly SDG 14.

OECMs provide a valuable opportunity to acknowledge where specific approaches in area-based fisheries management have tangible benefits for biodiversity conservation, and to work towards the common goals of biodiversity conservation and fisheries management.

Incentives for the fishery sector, while contributing effectively to maintain ecologically, socially and economically sustainable fisheries, could be to, *inter alia*:

- Show and strengthen the contribution of good fisheries management to the reduction of the collateral impact of fishing on biodiversity;
- Improve the image of fishing in that respect, to maintain the social licence for the sector operations;
- Facilitate ecolabelling, particularly if the presence of OECMs is made explicit in ecolabelling criteria (e.g., of the Marine Stewardship Council) and obtain associated market advantages; and
- Reduce tensions between biodiversity conservation and food security/livelihoods goals.

### 1.3 GENERAL CONCERNS ABOUT THE IDENTIFICATION OF OECMS IN THE MARINE FISHERY SECTOR

There is some concern that a laxed application of the OECMs definition, principles and criteria could lead to lowering conservation standards and threaten the expected benefits from progress in MPA coverage. The establishment of poorly designed and enforced “paper OECMs” could lead to: (i) a degradation of the quality of the conservation efforts (e.g., of conservation per unit-area) in Target 11, already significantly affected by “paper parks”; (ii) a general risk (and a precedent) of weakening conservation standards as socioeconomic and pressures from demand for ecosystem services (including food security) increase with demography and economic globalization; and (iii) a decrease of States’ efforts towards increasing the coverage of strict MPAs (No-take-zones, NTZs) in fisheries and MPAs networks.

In the fishery arena, there are still very few references to concern expressed formally by the sector or in scientific publications about the use of OECMs in fisheries. In the Northern hemisphere, fishing authorities referring to OECMs stressed the need for science-based decision making, transparency and partnering with the fishing industry, environmental organizations, and Indigenous Peoples, to advance both conservation and management goals[7]. Concerns have also been expressed in relation to the small-scale fishery sector (but mainly in relation to MPAs) about the potential impact of area-based management on traditional use rights and livelihoods and on human rights and the need for very active participation. These concerns would apply to OECMs as well and are generally already faced in fisheries, e.g., in the FAO Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication (**FAO, 2015**).

A concern, in both arenas, is the possible impact of other economic activities on the capacity of the OECMs established inside fisheries territories to produce the expected biodiversity outcomes (e.g., though land-based pollution; noise pollution; collision mortality; impacting tourism; or introduction of invasive species) either directly inside the OECM or outside it through cross-boundary effects (as indeed in MPAs). Such concerns require government attention and leadership within space-based, cross-sectoral, policy and management frameworks such as Integrated Coastal Areas Management (ICAM), Marine Spatial Planning (MSP) or other integrative frameworks.

### 1.4 WHY FURTHER GUIDANCE FOR FISHERIES?

OECMs are a CBD concept and instrument, aiming at ecosystem-wide positive effects on in-situ biodiversity. They may be used in terrestrial, freshwater, costal and marine environments with different characteristics on which human populations depend, by different economic sectors (e.g., navigation, mining, oil and gas exploitation, renewable energy production, fisheries and aquaculture; defence; tourism). Their establishment requires action by these sectors within their respective area of competence, and hence the development of their understanding, willingness and capacity to participate effectively, under the overall coordination and stewardship of the State.

Fisheries are one of the most important users of ocean space and biodiversity and their contribution to the success of the OECM concept is fundamental both in very diverse and productive coastal areas and in vulnerable deep-sea environments. Fishery decision-makers and managers could deploy OECMs in various aquatic ecosystems: lakes, rivers, flood plains, lagoons, shelves and deep seas, in coastal, offshore, benthic or pelagic domains. These OECMs may be implemented (and mainstreamed) in different types of fisheries, whether of small- or large-scale, artisanal or industrial, subsistence or commercial, operating in a three-dimensional environment, under different national, bilateral and international. They would need to operate effectively under and across various jurisdictions (inland or territorial waters; EEZs; or extended continental shelf).

These particularities outline the need for the elaboration of guidance and explanation of how CBD COP Decision 14/8 and the guidance it contains may be applied in the marine fisheries sector, as well as for its mainstreaming, and consistent with UNCLOS, the FAO Code of Conduct on Responsible Fisheries (CCRF) and complementing the IUCN-WCPA guidance.

[7]North Atlantic Fisheries Ministers Conference August 28 to 30, 2017, Shediac, New Brunswick, Canada. https://d3b1dqw2kzexi.cloudfront.net/media/9930/communique-final-2017.pdf

### 1.5 TARGET AUDIENCE

The additional guidance to be drafted by the expert meeting should aim at governments, primarily targeting those actors involved in the development of an enabling legal and policy framework and in the identification, assessment, implementation, monitoring and evaluation of OECMs in the fishery sector, at regional and national levels (including policy-makers, managers, advisers, scientists, and leaders of fishing associations and unions). It should also aim to be useful to those in charge of aquatic biodiversity conservation (e.g., authorities, managers, scientists, environmental non-governmental organizations) so that they the two sets of actors can understand how effective OECMs may be identified and intend to be implemented. This implies that the terminology and concepts used should be broadly comprehensible to this broad audience.

The guidance may also be useful, but is not generally intended for, fishing captains or crews and the local, indigenous and community-based management levels which would logically be the targets of subsequent efforts aiming at facilitating the on-the-ground implementation at sea.

### 1.6 RELATIONS WITH OTHER FAO GUIDELINES

FAO has already produced many guidelines in support of the CCRF (**FAO, 1995**) offering a good guide for the structural elements and style that might be used in the guidance on applying Decision 18/4 in the marine fishery sector. While such guidance needs to be self-contained, it should complement, be coherent with, and avoid duplicating the existing FAO guidelines on, e.g.,: fisheries management; integration of fisheries into coastal areas management; EAF; Precaution; conservation and management of sharks; reduction of bycatch; management of deep-sea fisheries in the high seas; MPAs in fisheries; and small-scale fisheries, food security and poverty alleviation.

The additional guidance needs to address the core aspects of the COP 14 Decision 14/8, i.e. regarding the definition, principles and criteria as well as the most relevant cross-cutting issues with implications for OECMs in the marine fishery sector (see for example **Fuller, 2018**).

## 2. DEFINITION OF AN OECM

The general definition of OECMs formally adopted by COP 14 states: *"Other **effective** area-based conservation measure" means "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**[8], with associated ecosystem functions and services and where applicable, **cultural, spiritual, socio–economic, and other locally relevant values**" [emphasis added](CBD/COP/DEC/14/8/Annex III) (**CBD, 2018c**).*

The meaning of "*geographically defined*" and of "governed and managed" is described in **Section 4**, under Criterion B. The intention and meaning of the terms *sustained* and *long-term* are described under Criteria C2. The terms and expression **in bold** are addressed in Section 5.

In fisheries, implementing an OECM is, first of all, implementing an area-based fishery management measure (ABFM). It would likely be managed under an FMP, the primary objective of which is the conservation of the target resources and sustainability of the fishery and which also increasingly have biodiversity conservation objectives. The existence of the ABFM should first be justified by good performance in relation to the fishery objectives. Then, the observed or expected outcomes on the ABFM in broader biodiversity conservation may qualify it as an OECM or justify its strengthening to be able to

[8] As defined by Article 2 of the Convention on Biological Diversity and in line with the provisions of the Convention.

reach the status of an OECM.

The COP definition of an OECM stresses the need for it to have a precisely located geographical ”area” and to effectively produce the expected biodiversity conservation ”outcomes”. It does not stress any particular nature of the specific measures needed within the area to produce the outcomes required for an area-based measure to be considered as an OECM. This is understandable considering the complexity and the contextual nature of such measures in different environments. However, without effective measures, OECMs would remain empty shells (”paper OECMs”) and the importance of such measures in the implementation stage cannot be overstated.

As mentioned in the chapeau of this Section, when using the “OECM” acronym in this document, we refer both to the “area” and the “measures” in it, and whether we refer more specifically to the location and boundaries or to the measures and management regime should be obvious from the context or specifically indicated.

## 3. GUIDING PRINCIPLES AND COMMON CHARACTERISTICS

The CBD COP 14 has also proposed 13 guiding principles (see below) that need to be considered when implementing OECMs in the bioecological, socioeconomic and technological context of fisheries.

The COP Decision 14/8 states: *“the guiding principles and common characteristics and criteria for identification of OECMs are applicable across all ecosystems currently or potentially important for biodiversity and should be applied in a flexible way and on a case-by-case basis [emphasis added]* ***(Preamble to Annex III)***.

The *applicability across all ecosystems* may be interpreted as implying that the guiding principles may be applied –and hence, OECMs may be identified– in all types of fisheries across the full range of jurisdictions.

The meanings and rationale of the expressions “*flexible way*” and “*case-by-case*” are given in Decision 14/8 (**Annex IV, sections Df and Dg**) (See also Section 5.1b).

Flexibility is important to enable the design of context-specific measures that address more than one outcome objective, rather than relying on prescriptive input requirements. The high variability in performance of the various categories of ABFMs (due to intrinsic and contextual factors (cf. **Section 6**) require that OECMs identification and evaluation be undertaken case-by-case and not at the scale of ABFM categories.

In the following sections, the guiding principles are examined in the order in which they appear in Decision 14/8 but have been divided in two sets: (1) those specifying the role and expected outcomes of OECMs; and (2) those referring to governance of OECMs. However, for easier cross-referencing in this document, the 13 principles are identified by a single set of letters, from (a) to (m). The key expressions requiring extensive clarifications of intended meaning are **emphasized in bold** and addressed in **Section 5**. The names of the Principles, based on their content, have been added for easier cross-reference in this text and in discussions at this expert meeting but have not been formally agreed anywhere.

### 3.1 THE ROLES AND EXPECTED OUTCOMES OF OECMS

The COP Decision (**Annex III, paragraph C2**) , refers to the role of OECMs in relation to Target 11. It states that, by definition, OECMs that fulfil the criteria contained in Annex III contribute to Target 11 both in quantitative terms (i.e., the 10% coverage) and in qualitative terms (i.e. representativeness, coverage of areas important for biodiversity, connectivity and integration in wider landscapes and seascapes, management effectiveness and equity) (**Paragraph C2a**).

It also states that since OECMs are diverse in terms of purpose, design, governance, stakeholders and management, they will often also contribute to other Aichi Biodiversity Targets, targets of the 2030 Agenda for Sustainable Development (SDGs), and the objectives or targets of other multilateral environmental agreements (**Paragraph C2b**). Other roles and expected outcomes are addressed in the following guiding principles.

***Principle (a): Significant biodiversity value***

*OECMs have **a significant biodiversity value**, or **have objectives to achieve** this, which is the basis for their consideration to achieve Target 11 of Strategic Goal C of the Strategic Plan for Biodiversity 2011-2020 [emphasis added]*.

The aim of this Principle is to ensure that the positive effects of the OECM on biodiversity are measurable and large enough. The term *significant* is undefined but it can be expected that the OECM contribution should be measurable (in absolute or relative terms) compared to some baseline reflecting the state of biodiversity values on the OECM area or in the fishing ground before the OECM was introduced. A measurable impact may be low or high and the Principle does not specify how big the outcome should be in order to be considered "significant". The term "*effective*" is used elsewhere in the COP guidance (**cf. Criteria C1**) for a similar purpose and raises similar issues. The nature of the *biodiversity value* is not specified either and may refer to market and non-market values, including the value for people (e.g., provisioning services) and the value for the ecosystem maintenance (e.g., functions and support services).

The expression "*or have objectives to achieve*" associated to the expression *"or is expected to achieve"* contained in **Criteria C1** indicates that in case the evidence of a positive impact on biodiversity value is not empirically available when the candidate OECM is assessed, it may be supported by an *ex-ante* assessment[9], and demonstrated in the subsequent recurrent performance assessments (cf. **Section 7**). This wording would allow the nomination (i) of candidate-OECMs that have been "upgraded" to the OECM level with additional measures designed to improve biodiversity outcomes and (ii) of new OECMs, created specifically as such and for which no case-specific empirical evidence is yet available. In both cases, the risk is that the OECM and the measures applied in it may not generate the expected outcome and a risk assessment would be approriate to operationalize the precautionary approach. In case of failure to deliver the outcomes as expected, the candidate OECM might be re-upgraded with better characteristics, or delisted.

ABFMs vary in terms of the degree to which they will positively benefit biodiversity. If degrees of *biodiversity value* could be defined, in each specific ABFM case, a decision would need to be made as to how significant the co-benefit must be in order to legitimize a candidate OECM in that case (cf. **Section 6**).

***Principle (b): Conservation role***

*OECMs have an important role in the conservation of **biodiversity** and **ecosystem functions and services**, complementary to protected areas and contributing to the coherence and **connectivity** of protected area networks, as well as in mainstreaming biodiversity into other uses in land and sea, and across sectors.*

[9] The ex-ante assessment should show that the the governance needed to have a credible probability to meet the Principle, the conservation objectives and the management measures are in place, together with the monitoring ane evaluation system are in place. Ideally, and mimicking what is done in good fishery-rebuilding programmes the maximum time within which the expected outcomes could be obtained could be set and trigger a rexamination of the identification.

*OECMs should, therefore, strengthen the existing protected area networks, as appropriate [emphasis added].*

The aim is to ensure that the outcomes of OECMs complement existing area-based conservation networks, filling gaps in connectivity or coverage. See also **Principle (d)**.

The Global Environmental Facility's Scientific and Advisory Panel (GEF-STAP) defines mainstreaming as: "*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 and Redford, 2014**).* This simultaneous mention of "complementarity" (with protected area networks) and "mainstreaming" (with sectoral management) in the same Principle highlights the reciprocal intent of OECMs to facilitate conservation planning taking sectoral tools into account, and sectoral management planning to take biodiversity considerations into account from their outset.

***Principle (c): Dual role in in-situ conservation***

*OECMs reflect an opportunity to provide **in situ conservation** of biodiversity over the long-term in marine, terrestrial and freshwater ecosystems. They may allow for sustainable human activity while offering a clear benefit to biodiversity conservation. By recognizing an area, there is an incentive for sustaining existing biodiversity values and improving biodiversity conservation outcomes [emphasis added].*

Related to Principle (a), this Principle reflects a key difference between MPAs –generally established primarily for protection purpose– and OECMs used in fisheries which are established for sustainable use of fishery resources and are also expected to contribute to reduce fisheries ecological footprint and to strengthen existing conservation networks.

***Principle (d): Complementary conservation role:***

*OECMs deliver biodiversity outcomes of **comparable importance** to and **complementary** with those of protected areas; this includes their contribution to representativeness, the coverage of areas important for biodiversity and associated ecosystem functions and services, connectivity and **integration in wider landscapes and seascapes**, as well as management effectiveness and equity requirements [emphasis added].*

This Principle extends Principle (b) on the complementarity of OECMs and MPAs in providing biodiversity conservation outcomes. The term "*importance"* is ambiguous as it may refer to the magnitude of the biodiversity outcome or its nature. If it refers to the magnitude, it represents a challenge in that the biodiversity outcomes of a candidate OECM may range from low to high and there is no explicit and agreed guidance about the level required. If the term refers to the nature of the outcome, it becomes subjective and related to the biodiversity component concerned (e.g., habitat or whales), the value system used by society to measure "importance", the seriousness of the risk incurred if the OECM is not put in place, etc. Moreover magnitude and nature inherently interact, because even a small incremental benefit may be "important" if it contributes to a serious conservation concern, whereas a larger benefit may be needed for society to consider it "important" where not specific conservation concern has been identified, and the biodiversity benefits are diffused among many species or habitat features.

In terms of *integration*, the OECMs, as ABFMs, need first to be integrated in the management plan of the fishery for which it has been designed. The fishery management plan of several fisheries may need to be coordinated to create synergy between OECMs (connectivity) or avoid one fishery that operates in an area, negating the OECM benefits expected from another carefully managed fishery in the area. In addition, both a sector-wide and cross-sectoral OECM perspective might be *integrated* in cross-sectoral

"landscapes" (In inland waters) or seascapes set up by the State, optimizing *connectivity* under broader spatial planning frameworks such as Integrated Coastal Area Management (ICAM) or Marine Spatial Planning (MSP). The notion of *representativeness* is discussed in **Principle (f)**.

***Principle (e): Demonstrated outcomes***

*OECMs, with relevant scientific and technical information and knowledge, have the potential to demonstrate positive biodiversity outcomes by successfully conserving in situ species, habitat and ecosystems and **associated ecosystem functions and services** and by preventing, reducing or eliminating existing, or potential threats, and increasing resilience [emphasis added].*

The use of the "best scientific evidence available", to manage resources and reduce fisheries footprint to increase resilience, is required by UNCLOS and when implementing the Ecosystem Approach to Fisheries (EAF). In complex and dynamic social-ecological systems, unequivocally demonstrating the impact of a single measure (be it area-based or not) is a high order challenge. Greater collaboration between conservation and fishery science would help to address this challenge. However, the reference to "*preventing, reducing or eliminating existing, or potential threats*" (cf. Annex IIIAe) may often be easier to demonstrate, as the potential impacts of various fisheries and other sectors have been identified in many reviews. It may be feasible to assemble information on the fisheries and other sectors active (or with plans to be active) in the area of the potential OECM. Then, by combining this information with the existing knowledge of ecosystem effects of various types of fisheries and commercial sectors, the major potential threats to biodiversity may be identified. It may then be feasible to demonstrate the potential (and after implementation, the reality) of threat reduction in the OECM.

***Principle (f): Representativeness and connectivity***

*OECMs can help deliver greater representativeness and **connectivity** in protected area systems and thus may help address larger and pervasive threats to the components of biodiversity and **ecosystem functions and services**, and enhance resilience, including with regard to climate change [emphasis added]*

This principle complements principles (b) and (d) on the relationship between OECMs and MPAs. It specifies that OECMs may improve the *representativeness* of existing MPA networks (e.g., in terms of presence/absence of major habitat types, key natural resources and ecologically important areas and processes), while also enhancing the network *connectivity* by filling eventual gaps (cf. **Section 5**), and hence, presumably, improving ecosystem *resilience*. It is conceivable that, in some cases, OECMs may duplicate the role of neighbouring MPAs but this might be considered as a positive overlap. An individual OECM can only be representative at the level of the local ecosystem (species assemblage) affected by the fishery. However, its contribution to *representativeness* of a *network* would be assessed at the scale of the network and could possibly be increased if several individual OECMs used in fisheries were all implemented with the scale of the network.

The ancillary role of single OECMs in addressing undefined *larger and pervasive threats* such as climate change, that are also addressed at other scales and with other and larger means may be conceptually argued (as is done for MPAs) but difficult to formally demonstrate.

### 3.2 OECMs AND GOVERNANCE

***Principle (g): Consultation***

*Recognition of OECMs should follow appropriate consultation with relevant governance authorities, land owners and rights owners, stakeholders and the public [emphasis added].*

The introduction of ABFMs as well as any other management measure, may be open to consultation in modern fisheries management set-ups. In general, the term "consultation" reflects a rather weak type of "participation". Empowerment would reflect a more decisive objective, particularly when user rights on resources are involved. It is generally agreed that in order to create a responsive and responsible management system, the management strategy and plans (including rebuilding plans) and the precautionary decision rules[10] ought to be discussed and, ideally, agreed upon by the main stakeholders to ensure buy-in and compliance.

***Principle (h): Legitimate governance capacity***

*Recognition of OECMs should be supported by measures to enhance the governance capacity of their **legitimate authorities** and secure their positive and **sustained outcomes** for biodiversity, including, inter alia, policy frameworks and regulations to prevent and respond to threats [emphasis added].*

*Capacity-building* is in constant and increasing need as States face continuously growing and more complex challenges as they consider a growing number of dimensions and drivers. Specifically, for OECMs, a broader biodiversity-oriented capacity will be needed in fisheries management, the additional cost of which might be reduced by a stronger collaboration with the ministry, or other relevant authority, responsible for biodiversity.

Compliance is affected by the sense of *legitimacy* of the decision-making authority. While, in the ocean, the State is the only recognized legal authority, in the EEZ, and particularly in coastal waters, the central authority might be decentralized, formally devolved (e.g., to local communities, municipalities, fishing associations, right-holder groups; and municipalities) or recognized as traditionally held by such communities (e.g., in case of Indigenous People). In the end, it is up to the State to determine, in the ways it finds most appropriate, what is the most *legitimate* authority to deal with OECMs.

***Principle (i) Indigenous people and local communities***

*Recognition of other effective area-based conservation measures in areas within the territories of indigenous peoples and local communities should be on the basis of **self-identification** and with their **free, prior and informed consent**, as appropriate, and consistent with national policies, regulations and circumstances [emphasis added].*

This principle refers to situations in which the governance, including management responsibility, and hence the right to establish OECMs, if so desired, has been devolved to coastal communities or recognized by the State under traditional or modern area-based rights. An example of traditional rights might be the "locally-managed marine areas" (LMMAs) in the South Pacific. An example or modern rights may be the "territorial use rights in fisheries" (TURFs[11]). Within these areas, the competent authorities might decide to establish OECMs.

[10] Rules that trigger pre-agreed action in foreseen situations to avoid damaging delays in responses

[11] TURFs allocate exclusive harvesting rights for one or more marine species in a specified geographical area. Ideal TURFs are ideal for species like abalone that will not move beyond TURF boundaries, but they can be designed for more mobile species as well. TURFs may occur independently, or they may be part of a broader system of TURFs. Well-designed networks of TURFs can be used to manage more complex fisheries, including those with mobile species and multiple groups of fishermen.

***Principle (j): Cultural and spiritual values***

*Areas conserved for **cultural and spiritual values**, and governance and management that respect and are informed by cultural and spiritual values, often result in positive biodiversity outcomes [emphasis added].*

The principle of accounting for values other than ecological and socio-economic may apply mainly in inland and coastal, small-scale, fishing communities more than offshore and in the high seas. However, in old fishing nations in the Northern Hemisphere the *cultural values* may be entrenched in centuries of fishing traditions, including in offshore areas far away from home.

***Principle (j): Governance systems***

*OECMs recognize, promote and make visible the roles of different governance systems and actors in biodiversity conservation; Incentives to ensure effectiveness can include a range of social and ecological benefits, including empowerment of indigenous peoples and local communities [emphasis added].*

Multiple forms of governance may be applied in fisheries ranging from authoritative top-down management by the State to complete devolution to coastal communities, municipalities, and fisheries associations. In the fishery sector, OECMs may be implemented under all of these forms of governance. except perhaps "private governance" as "property *sensu stricto, is very limited in the ocean.*

The various expected benefits (which include social and economic ones as well as other values of high local relevance (cf. **Criteria D2 below**) might hopefully be seen as incentives. Buy-in and compliance by participants in the fisheries with the OECMs, and their associated communities, is important for achieving the expected biodiversity outcomes. However, these actors will also be likely to consider themselves to be bearing many of the costs of maintaining OECMs and without their effective empowerment, they may challenge the authority, particularly if the expected benefits do not selectively accrue to the communities and fisheries bearing the costs.

An important governance issue is that OECMs intend to improve biodiversity in the OECM area but also in the whole fishery or exploited ecosystem– just as other ABFMs do in relation to their primary objectives.

***Principle (k): Best available information***

*The best available scientific information, and indigenous and local knowledge, should be used in line with international obligations and frameworks, such as the United Nations Declaration on the Rights of Indigenous Peoples, and instruments, decisions and guidelines of the Convention on Biological Diversity, for recognizing OECMs, delimiting their location and size, informing management approaches and measuring performance [emphasis added].*

The need to identify, collect and use local knowledge and best-informant stakeholders, together with scientific knowledge is progressively gaining more traction. This principle is particularly important in relation to indigenous or local ecological and technical knowledge (**Berkes, 1999; Fischer et al., 2015**) when formal scientific knowledge is unavailable or very scarce.

***Principle (l): Transparency and evaluation***

*It is important that OECMs be documented in a transparent manner to provide for a relevant evaluation of the effectiveness, functionality and relevance in the context of Target 11 [emphasis added].*

Transparency would be required for data sources, assumptions used in assessments, confidence limits of such assessments, identification and evaluation of management options, decision-making, management performance, etc., to allow a credible assessment of the performance (effectiveness) of the fishery-OECM in relation to all its objectives. One important implication of this principle is the existence of an

appropriate monitoring system, a recurrent assessment (the periodicity of which depends on the biodiversity feature being monitored) the results of which are fully made available, and some system of oversight ensuring the monitoring and evaluation quality and that adequate adaptive decisions are taken to follow up on the conclusions of the evaluation .

### 3.3 RELATION BETWEEN OECM AND EAF PRINCIPLES

The guiding principles developed for OECMs, when applied to fisheries, should ideally fit within the EAF principles, matching, complementing, or adding specifications.

Annex 2 of the FAO Guidelines on EAF (**FAO, 2003: 83-88**) lists a more detailed set of relevant principles: (1) Avoiding overfishing; (2) Ensuring reversibility and rebuilding; (3) Minimizing fisheries impact; (4) Considering species interactions; (5) Ensuring compatibility of measures between jurisdictions (for shared or straddling resources); (6) Applying the precautionary approach; (7) Improving human well-being and equity; (8) Allocating user rights; (9) Promoting sectoral integration; (10) Broadening stakeholders participation; and (11) Maintaining ecosystem integrity. As one should have expected, OECM guiding principles above are in line with the above principles 2, 3, 4, 5, 6, 9, 10 and 11 with more specification regarding the differences and complementarity between OECMs and MPAs.

## 4. CRITERIA FOR IDENTIFICATION AND EVALUATION

A priori, all ABFMs could be considered candidate-OECMs to be "tested" against the relevant requirements of the CBD COP Decision. Based on the CBD COP decision outlining the formal definition of OECMs and guiding principles (**cf. Section 3**), existing or planned ABFMs can be quickly screened and, as appropriate, more fully assessed against the set of criteria and sub-criteria proposed for OECM identification (as shown in **Section 6**). In the Decision 14/8, the Criteria are ordered as follows:

- Criterion A: The area is not currently recognized as a protected area.
- Criterion B: The area is governed and managed.
- Criterion C: The area achieves sustained and effective contribution to *in situ* conservation of biodiversity.
- Criterion D: The area supports associated ecosystem functions and services and cultural, spiritual, socio-economic and other locally relevant values**.**

These criteria and sub-criteria are reviewed in more detail in the following sections. Short elaborations are offered for each criteria and sub-criterion but short discussions on the cross-cutting issues met in the definition Guiding Principles and Criteria have been regrouped in **Section 5** to reduce repetitions.

#### CRITERION A: THE AREA IS NOT CURRENTLY RECOGNIZED AS A PROTECTED AREA:

*The area it is not currently recognized or reported as a **protected area** or part of a protected area; it may have been established for another function [emphasis added]*.

This criterion seeks to avoid double-counting of areas reported under Target 11 and subsequent reporting frameworks. This implies that, in a fishing ground or in the entire EEZ, all existing area-based measures (ABMs) should be identified and those which might have some conservation potential but have not been formally designated as MPAs might be considered as those ABMs within which OECMs might be identified.

To guide this identification, Decision 14/8 specifies, in the adopted definition of an OECM, that the term *protected area* is to be understood *as defined in Article 2 of the Convention and in line with the provision*

*of the Convention.* This definition states that a protected area is *a geographically defined area, which is designated or regulated and managed to achieve specific conservation objectives*".

The IUCN definition of "protected area" is more elaborated: *"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**). It adds to the CBD definition: (i) the need for *effective* management; (ii) the requirement that conservation benefits be *in the long term*; (iii) it specifies that the conservation target is *nature*; and (iv) introduces the notions of *ecosystem services and cultural values.* Most of these additional specifications have been also identified as important for OECMs in Decision 14/8 Guiding Principles and criteria (**Sections 3 and 4**). It should be noted, however, that while, for IUCN, the overall target of the protected area is *nature* (an all-encompassing concept referred to in IUCN WCPA 2019 as *nature as a whole*), for the CBD each protected area may have its *specific conservation objective and,* in the OECM definition (**Section 2**), this objective is clearly stated as *in-situ biodiversity*. However, the term "*in-situ*" is still not specific to whether all *in-situ* biodiversity in the OECM is to be protected or if a subset is sufficient for being an OECM, as long as the conservation benefits are significant and sustained.

For example, it has been argued (in **IUCN WCPA, 2019**) that buffer zones, established around no-take zones (NTZs), to at least partly insulate the NTZ biodiversity from the fishing in the surrounding areas should not be proposed as OECM. Based on the OECM definition and Criterion A, this argument is consistent if the buffer zone has been designated as integral part of the MPA and its area is already reported under Target 11 as an "MPA". If this was not the case, however, the possibility to examine these areas as potential OECMs (or any other designation) would seem to remain open.

#### CRITERION B: THE AREA IS GOVERNED AND MANAGED

The overall aim of this criterion is to avoid "paper OECMs" that would not produce the expected outcomes in the absence of good governance and effective management. The criterion has three sub-criteria: (i) the area is geographically defined; (ii) It has legitimate governance authorities; and (iii) it is managed. These will be briefly examined below

***Sub-criterion B1: Geographically defined space:***

This implies that: *(a) Size and area are described, including in three dimensions where necessary; (b) Boundaries are geographically delineated [emphasis added]*.

One consequence of this sub-criterion is that the OECM can be localized on a map, possibly with coordinates and its area should be calculated to be accounted for in Target 11.

Like those of ABFMs, OECMs limits might be fixed or mobile over time, depending on the dynamics of the biodiversity elements to protect and the fishing operations. The protection of bottom habitats and low-mobility demersal species may use fixed areas. The protection of migratory species, often related to large and medium-scale oceanographic features such as current, gyres and fronts is likely to require mobile limits that are susceptible to significant seasonal and inter-annual shifts. However, it can be argued that such "mobile" OECMs would present significant challenges for reporting, since the potential change in size and the changes in location of the OECM changing within the year would complicate the reporting of both the location and the relevant (effective) size of the area.

In the marine realm, depth is one of the *three dimensions* mentioned in the sub-criteria and it is of high biogeographic importance, both in the water mass and in determining ecological boundaries. Moreover, in the aquatic ecosystem, boundaries are very permeable, accentuating the importance of horizontal and vertical connectivity. The oceanographic and ecological vertical layering of the ocean, its biotopes,

resources assemblages (e.g., over the extended continental shelf) leads to the need to seriously consider the possibility of vertical layering of OECMs (e.g., in benthic and pelagic OECMs with their own relevant localisation and management measures.

An ABFM that only was applied in one layer (range of depths) of the ocean would be fully appropriate to consider as an OECM if the biodiversity in that layer received effective protection, and the area could be reported as an OECM. However, having layers OECMs of different overlapping boundaries and "thickness", although justifiable from ecological and management point of views raise significant issues for reporting.

In addition, the "geographically defined space" of relevance to both sustainable use and conservation may cross jurisdictions horizontally, between two national jurisdictions (shared OECM) or between the national and international jurisdictions. The latter type may be straddling horizontally (between an EEZ and the High Sea) or vertically, between the extended continental shelf of a State and the subjacent suprajacent High Sea. In such cases the effectiveness of the joint governance of the straddled area would be crucial to the likelihood of realizing biodiversity benefits, and thus to its status as an OECM.

***Sub-criterion B2: Legitimate governance authorities:***

*(a) Governance has **legitimate authority** and is appropriate for achieving in situ conservation of biodiversity within the area: (b) Governance by indigenous peoples and local communities is self-identified in accordance with national legislation; (c) Governance reflects the equity considerations adopted in the Convention; and (d) Governance may be by a single authority and/or organization or through collaboration among relevant authorities and provides the ability to address threats collectively [emphasis added].*

The implication of this sub-criterion is that, in fisheries, the OECM is expected to be formally under the responsibility of a mandated fishery authority (e.g., central, local, hybrid, traditional). That authority should be in charge of implementing the fishery-wide management plan and of taking and enforcing the measures needed to maintain effective OECMs, ensuring the other considerations of relevance for OECMs, such as equity in the distribution of costs and benefits of the OECM, and addressing actual or potential threats to these outcomes (from fishing or other sources) (cf. **Section 5.1.k** on threats and risk assessment).

***Sub-criteria B3: Managed.***

OECMs are expected to be*: (a) managed in ways that achieve positive and **sustained outcomes** for the conservation of biological diversity. (a) Relevant authorities and stakeholders are identified and involved in management; (b) A management system is in place that contributes to sustaining **the in-situ conservation of biodiversity**; (c) Management is consistent with the ecosystem approach with the ability to adapt to achieve expected biodiversity conservation outcomes, including long-term outcomes, and including the ability to manage a new threat [emphasis added].*

This sub-criterion is particularly important and cross-connected with the two preceding ones. The aim is to ensure that OECMs be used in an active fishery management system in which objectives are clear and decisions are taken and enforced in a participative and adaptive manner, consistent with EAF. The connected meanings of *sustained* and *long-term* are addressed under **Criterion C3**. The *ability to manage threats* is discussed in **Section 5**.

This sub-criterion does not say anything about the specific measures (*a priori* ranging from total closure of reserves, to specific gear restrictions, economic incentives, etc.) that might be taken by the competent authorities to reach the objectives of biodiversity conservation relevant to the OECM status. However, their effective implementation is fundamental to avoid "paper OECMs". Very little guidance has been

offered on that matter thus far, perhaps because of the complexity and contextual nature of most if not all fishery management measures, area-based or not. It might be sufficient to say that all the measures already used in fisheries to reduce the ecosystem effects of fisheries might in principle be used inside the OECM boundaries, combined and enhanced as needed to produce the expected biodiversity benefits.

#### CRITERION C: ACHIEVES SUSTAINED AND EFFECTIVE CONTRIBUTION TO IN SITU CONSERVATION OF BIODIVERSITY

This criterion is fundamental as it is the one really identifying the elements that indicate whether an existing ABFM, or a planned one, produces, or is likely to produce the expected in-situ biodiversity outcomes. It defines *effectiveness* in terms of obtaining sustained biodiversity conservation outcomes and outlines the conditions for leading to it. It defines the types of *in-situ* biodiversity components that need attention. It stresses the importance of *information, monitoring, evaluation of effectiveness and communication.* These points are further clarified below.

***Sub-criteria C1: Effective.***

In order to be effective: (a) *The area achieves, or is expected to achieve, positive and* ***sustained outcomes*** *for the* ***in-situ conservation*** *of biodiversity; (b) Threats, existing or reasonably anticipated ones, are addressed effectively by preventing,* ***significantly*** *reducing or eliminating them, and by restoring degraded ecosystems; (c) Mechanisms, such as policy frameworks and regulations, are in place to recognize and respond to new threats; and (d) To the extent relevant and possible, management inside and outside the OECM* ***is integrated*** *[emphasis added]*.

*Effectiveness* will be achieved if the expected biodiversity outcomes are produced and *sustained* in the long-term. The latter requires some level of risk assessment and risk management to anticipate risks and develop contingency plans to avoid, reduce, or restore biodiversity (in line with the Biodiversity Impact Mitigation hierarchy and with the precautionary approach and use of decision rules in adaptive fisheries management. Effectiveness also requires dedicated institutions and frameworks (repeating elements of **sub-criterion B3**). The *integration* of management inside and outside of the OECM area should not be a problem if formal management plans are in place, because OECMs which have sustainability of the fishery as primary objective should be naturally integrated in such plans, with all other management instruments.

***Sub-criteria C2: Sustained over long term***

The criterion stresses that *: (a) The OECMs are in place for the* ***long term*** *or are* ***likely to be****; (b) "****Sustained****" pertains to the continuity of governance and management and "****long term****" pertains to the biodiversity outcome [emphasis added].*

Effectiveness will have been achieved if the expected biodiversity outcomes are produced and sustained in the long-term. The latter requires a sufficient level of threat assessment to identify current threats and anticipate likely new ones. For threats that are identified as present or likely, an appropriate risk assessment should be used to develop contingencies and inform a risk management plan to avoid, reduce, or restore biodiversity (in line with the Biodiversity Impact Mitigation hierarchy). At each step in the threat and risk assessments and management planning, the precautionary approach and the use of decision rules –as done in adaptive fisheries management– would be necessary for the final EABM to be "effective".

Effectiveness also requires dedicated institutions and frameworks (repeating elements of sub-criterion B3). The integration of management inside and outside of the OECM area should be facilitated if formal management plans are in place, integrating primary and secondary objectives and management measures across the whole fishing ground. However, if the threat assessment identified other fisheries in the same area, or other sectors active in the area that could be threats to the biodiversity outcomes, the necessary integration with measures used in those fisheries or sector could still be challenging. The failure to

integrate across pressure could compromise effectiveness by not making the biodiversity outcomes secure in the long term. These issues are discussed in more detail in **Section 5**

***Sub-criteria C3: In situ conservation of biological diversity.***

*Recognition of OECMs is expected to include the identification of the range of biodiversity attributes for which the site is considered important (e.g., communities of rare, threatened or endangered species, representative natural ecosystems, range restricted species, key biodiversity areas, areas providing critical **ecosystem functions and services**, areas for ecological **connectivity**) [emphasis added].*

This sub-criterion aims to ensure that: (1) OECMs have clear conservation objectives in addition to their fisheries and resources sustainability objectives; (ii) Competent authorities clearly identify the range of conservation attributes (i.e., components and emerging properties listed in the criteria) for which positive outcomes are expected; and (iii) due diligence is taken to identify locations within the total operational area of the fishery that are of particular importance for biodiversity. The intent is to give managers developing ABMs the information needed to prioritize where the greatest biodiversity benefits could be produced by the measures.

***Sub-criteria C4: Information and monitoring.***

The sub-criterion stresses that: (a) *Identification of an OECM should, to the extent possible, document the known biodiversity attributes, as well as, where relevant, **cultural and/or spiritual values**, of the area and the governance and management in place as a baseline for assessing effectiveness: (b) A monitoring system informs management on the **effectiveness** of measures with respect to biodiversity, including the health of ecosystems; (c) Processes should be in place to **evaluate the effectiveness** of governance and management, including with respect to equity; and (d) General data of the area such as boundaries, aim and governance are available information [emphasis added].*

OECMs should be well described, including all their attributes and**,** when describing the biodiversity attributes inside the OECM, the "value" of those attributes on multiple value systems (for ecosystem structure and function, for economic benefits locally and on larger scales, and for cultural and spiritual identity of nearby communities, etc) should be explicitly acknowledged. All of these values should be taken into account when setting targets for conservation outcomes, with**:** (i) those targets informing the development of a corresponding set of reference values (when the information is sufficient to develop them)**;** (ii) specified trends that management systems can be accountable for delivering**;** and (iii) a description of what a "healthy ecosystem" for the general area would be, to provide a general benchmark for evaluating success of the OECM at protecting the biodiversity values at risk from the fishery.

These supporting products would also provide guidance for the monitoring and evaluation system (cf. **Section 7**) that can be used to measure the OECM contribution to biodiversity conservation, particularly through reporting on progress towards the outcomes (i), (ii) and (iii) mentioned above**.** The latter will require the most development of new approaches, because although the concept of **"**ecosystem health**"** is a widely used expression, there is no internationally agreed set of indicators or reference values. It tends to be equated to ecosystem structure and function and avoidance of Significant Adverse Impact (SAI) and Safe Ecosystem Level (SELs) as used in Target 6 in reference to vulnerable ecosystems and threatened species and for which international standards are still missing (Garcia and Rice, 2019).

#### CRITERION D: ASSOCIATED ECOSYSTEM FUNCTIONS AND SERVICES AND CULTURAL, SPIRITUAL, SOCIOECONOMIC AND OTHER LOCALLY RELEVANT VALUES

This criterion expands the range of elements to consider when assessing the effectiveness of candidate or implemented OECMs, with considerations on human dimensions of OECMs and the interaction

between human and natural wellbeing from two perspectives: (i) ecosystem functions and services and (ii) other human values.

***Sub-criteria D1: Ecosystem functions and services.***

*The sub-criterion stresses that: (a)* ***Ecosystem functions and services*** *are supported, including those of importance to indigenous peoples and local communities, for OECMs concerning their territories, taking into account interactions and trade-offs among ecosystem functions and services, with a view to ensuring positive biodiversity outcomes and equity; and (b)Management to enhance one particular ecosystem function and service does not impact negatively on the sites overall biological diversity [emphasis added].*

This criterion indicates that the maintenance of ecosystem services and their sustainable use, is a valid contribution to –and a condition of– successful biodiversity conservation. Moreover, it adds to that common goal explicit prioritization for uses by people depending directly on those services. The criterion also calls for accounting for trade-offs and interaction between services. Part a of the criterion explicitly acknowledges that use of provisioning ecosystem services, such as by harvesting seafood, is impossible without some impacts on biodiversity, but those impact can be kept sustainable for the harvested species, the ecosystem, and dependent communities. However, Criterion D2b also highlights that actions to enhance particular ecosystem systems for greater human uses (such as habitat modifications to make an area more suitable for a harvested species, should not be done in ways that reduce the value of the area for other native biodiversity.

***Sub-criteria D2: Cultural, spiritual, socioeconomic and other locally relevant values.***

Addressing relevant values requires that*: (a) Governance and management measures identify, respect and uphold the cultural,* ***spiritual, socioeconomic, and other locally relevant values*** *of the area, where such values exist; and (b) Governance and management measures respect and uphold the knowledge, practices and institutions that are fundamental for the in-situ conservation of biodiversity [emphasis added]*.

The criterion is clear, and it indicates that the establishment of OECMs should not only account for ecological values but also for the human dimensions of the initiatives (including social, cultural, spiritual, and economic values). This is in line with the CBD concern equitable sharing of benefits, as well as with the CCRF (**FAO 1995**), the guidelines on human dimensions of EAF (**De Young, Charles and Hjort, 2008**) and the Code of Ethics for fisheries (**FAO, 2005**).

## 5. KEY CONCEPTS AND CROSS-CUTTING ISSUES IN A FISHERY CONTEXT

The definition of OECMs adopted at COP 14 and the Guiding Principles and criteria annexed to CBD COP Decision 14/8, contain many terms, expressions and concepts. Some occur multiple times within the Decision (and prior CBD documents related to Target 11), in usages that are overlapping and usually, but not always fully consistent. Moreover, some of these terms, expressions and concepts are commonly encountered in documents from fisheries policy and management sources, and in each sets of documents usages have important nuances that are not always identical between the two sources. Consequently, some of the terms, expressions and concepts may require clarification for a fishery audience or for potential users of the guidance who did not follow the CBD scientific, technical and policy debates leading to the Decision. The clarifications provided below are intended to help put the CBD guidance into the context of the range of fisheries and situations in which OECMs may be considered, as the CBD guidance would be approached from the perspective of practitioners in fisheries policy, management and science. Just as with the Guiding Principles presented in **Section 2**, the concepts and issues may be clustered

around two themes: (1) the role that OECMs are expected to play and their outcomes; and (2) the governance of and around OECMs.

### 5.1 EXPECTED ROLES AND OUTCOMES OF OECMS

#### *a. Biodiversity value*

The term *biodiversity value* is referred to only in Principle (b). However, the term *biodiversity* is clearly central to an OECM's role in *in-situ biodiversity conservation* in the whole guidance and in the CBD itself. In order to avoid misinterpretations of the term, the OECM definition refers to the definition of biodiversity in Article 2 of the Convention: *the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems*.

The "*biodiversity value"* is not defined in the Decision but the first preambular paragraph of the Convention refers to the *ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components.* This definition reflects the broad range of values that should be considered in identifying and assessing OECMs. These values are linked to those of ecosystem functions and services which are discussed below, but as the IPBES regional assessments (Annex II) documented in depth, the "values" of ecosystem goods and services are very different among cultures and economies, and even when considering the "value" of an ecosystem structural property (species, habitat structural feature, etc.) depends on its role in serving various ecosystem functions, and that role can be very different for the same species when present different ecosystems. The work of IPBES is attaching high priority to developing consistent foundations for appropriately inclusive approaches to assessing biodiversity "values" taking the diversity of natural ecosystems and human cultures into account, and their major Thematic Review of "Uses of Values of Biodiversity in assessments " expected in 2020 should be useful in bringing greater standardization to this complex topic.

In practice, for fisheries, the "biodiversity" about which action is expected and can be taken is the one impacted by the sector itself in its fishing operations and on which the sector directly depends. This biodiversity may be brought on board the fishing vessel or not, in commercial, subsistence of recreational fisheries. It includes target and non-target species; threatened and protected species (usually accidentally taken as bycatch) and habitats found to be critical, essential or vulnerable habitats (e.g., living habitats like seagrass and algal beds and coral and sponge reefs).

Many of these biodiversity components can be routinely identified and effectively monitored in a fishery management system, although for bycatch, and particularly bycatch of benthic macro-invertebrates, accurate identification of species (and often even higher taxa levels) is very challenging for standard fisheries monitors. Special training and vigilance in catch monitoring is often necessary for accurate monitoring of bycatches of rare species of high conservation priority - even species of fish or seabirds. Viruses, bacteria, phytoplankton and micro-benthos species may also be affected by fisheries (e.g., by bottom trawling). However, they are not and cannot be monitored with fishery-dependent data. Where potential impacts on such taxa are a concern monitoring and evaluation of impacts is likely to require directed study and modelling, and may be assessed only periodically.

Some changes in species composition of an area are essentially irreversible, such as those resulting from the opening of new pathways for species to enter an area (e.g., from opening of the Suez or Panama canals), anthropogenic changes to the physical structure of habitats (increasing common as urban infrastructure development and large watershed runoff of land-based sediment and pollutants alters coastal ecosystems) and changes to the oceanographic conditions linked to climate change). Incoming species (often called "invasive") may be irreversibly settled and can to be functionally significant in the

reconfigured ecosystem as predators, prey or ecosystem engineers, and even come to provide new ecosystem services to people (support new fisheries, such as king crab in the Bering sea or multispecies fisheries in the Eastern Mediterranean). As such they are to be sustainably used by fisheries, and such harvests as well as their functional roles in the ecosystems might be considered as part of the evolving biodiversity value. In some cases, the *biodiversity value* of an area might have already been identified as part of an Ecologically and Biologically Significant Area (EBSA), like the Disko Fan OECM in Canada.

***b. Case-by-case assessment***

This concept is addressed in the preambular paragraph 3 and Annex III to the Decision. It means that the actual or likely biodiversity outcomes of OECMs cannot be reliably inferred solely from the ABFM category they belong to. They have to be assessed on a case-by-case basis, accounting for the specific measures that may be operational in it, the type of habitat and species to be protected, the ecosystem in which the ABFM is implemented, and the overall management context in which the OECM sits. The requirement calls for specific efforts at national or fishery level, to assess existing or potential ABFMs, using the guidance available in **Section 6**.

***c. Comparable importance***

Principle (d) refers to biodiversity outcomes of comparable importance…with those of protected areas…

Some of the biodiversity outcomes relate to components of ecosystem structure and function, and more integrated properties of species, habitats and ecosystems, such as representativeness, provision of specific ecosystem services, and ability to integrate the OECM biodiversity outcomes into larger-scale conservation frameworks. Even in these contexts, the Principle does not seem to refer to the absolute or relative size of this outcome, but to how the outcome from the OECM complements and contributes to overall health of the larger associated ecosystems. This, already, becomes an elusive factor to assess empirically and consistently, given the lack of an operational definition of ecosystem health referred to in **Section 4, Sub-criterion C4a**. In addition, the challenges with measuring the "value" of biodiversity features discussed in **Section 51a** mean that there is no quantitative standard on the "importance" of the conservation outcomes that can be highly variable. The same should be expected of OECMs depending on how well they are sited, managed, etc.

Nonetheless, this criterion could be interpreted as saying that the parameters on which OECMs will be assessed are [*inter-alia*]: representativeness, coverage, services, and integration/connectivity within landscapes or seascapes and, if there are practices in place for assessing the contributions of MPAs to those seascapes, those practices could be at least a starting point for assessing of the contributions of OECMs. Assessments producing similar results would be reassuring, although if there were differences, they would be hard to interpret because undoubtedly even different MPAs , similar in some features such as extension and location in a special habitat, might make different contributions to seascapes, however those contributions were measured

***d. Complementary role (to MPAs)***

Principles (b) and (d) refer to complementarity roles between OECMs and MPAs, particularly on connectivity.

The concept indicates that not only the parameters used to measure biodiversity conservation outcomes of OECMs should be similar to those used to measure MPAs' biodiversity conservation outcomes (point c above), but the outcomes of OECMs and MPAs should be complementary, ensuring additionality and synergy. This implies that wherever MPAs exist in the vicinity of OECMs, connectivity channels are identified (e.g., life cycles, major connecting drivers, etc.). At the very least OECMs should not provide biodiversity outcomes that would conflict with the objectives of MPAs to which they had some

connectivity, and where an MPA could not provide full protection to a key feature of biodiversity (e.g. the species migrated outside the MPA for part of its annual life history cycle), it is desirable that OECMs try to add protection to those "connected" biodiversity features at times and places when the protection provided by the MPA was weak or unavailable.

Complementarity is important because it can be used strategically. Complementary OECMs should strengthen the efficiency of MPAs (through connectivity) but additionally, when the biodiversity conservation benefits from an MPA could be larger or more secure, adding complementary measures in other connected places, could provide additional incentives for establishing OECMs. Complementarity may be realized in providing additional "step-stone" areas in the life cycles of protected species, or in protecting critical habitats or food sources for these species. As appropriate, complementarity with other areas defined in the ocean for biodiversity-related purposes such as Ecologically and Biologically Significant Areas (EBSAs) or Key Biodiversity Areas (KBAs), might be considered.

Defining this complementarity may require additional "bridges" and specific collaboration between fishery and conservation science. Complementarity in area-based networks might be shown by the similarity in the biodiversity elements protected in OECMs and nearby MPAs (positive adjacency) or enhanced by connectivity, e.g., through migration and diffusion of life stages, even if the areas were physically some distance apart.

However, complementarity cannot be an important feature of OECMs until functional networks of MPAs have been established, within which the OECMs established for fisheries could show a complementary role. However, it could be argued that OECMs might also play a complementary role to MPAs by providing protection to some species/habitats not yet protected by MPAs, or where local opposition to MPAs is strong or the governance processes to establish MPAs does not exist while sectoral conservations measure may have community support.

***e. Connectivity***

The OECM contribution to *connectivity* is referred to in Principle (d) and (f) and Criterion (C3).

Addressing this concept in the ocean is a non-trivial task which would require tight collaboration between conservation and fishery science. There is significant literature on ecological connectivity is huge (see key references in **Meiklejohn, Ament & Tabor, 2010)**.

Connectivity between OECMs and MPAs is a property of the network of species and habitats they host and that enhance the flow of energy and biomass in ecosystems, maintaining biodiversity. Connectivity may be structural and functional and is species- and context-dependent and can be defined as the extent to which movements of genes, propagules (e.g., eggs and larvae), individuals (e.g., juveniles, adults) and populations (mass migrations) during the life cycles, are facilitated by the network structure and the dynamics of the surrounding and supporting environment. Connectivity is reduced or even eliminated by degradation of habitats and population structures (adapted from **Rudnick et al., 2012**).

Structural connectivity depends on the shape, size, and adjacency of MPAs and OECMs as well as the physical and oceanographic connections between them. The relevance of these properties varies with the species, their behavior (e.g., pelagic or demersal) and life stages (e.g., larvae, juveniles or adults). Consequently, areas with complex biodiversity assemblages will need different structural connectivity pathways on the bottom and in the water column, that will be used differently by diverse species at different life stages. The largely static and bi-dimensional concept of "corridors" between protected areas used in terrestrial conservation becomes strongly dynamic and three-dimensional in the ocean. Structural connectivity may be modified more easily by fishing on the bottom (e.g., by trawling on biogenic habitats) than in the pelagic domain. However even benthic invertebrates with high mobility rarely depend solely

on traversing the seafloor to distribute across the seabed, but have egg and/or larval stages that are transported by currents, so patches of degraded seabed pose less of a barrier to dispersal of marine species than corridors of human infrastructure (highways, railways, pipelines, etc.) do to terrestrial species.

Functional connectivity relates partly to the extent to which the structural connectivity of OECMs and MPAs, facilitates the movements of biodiversity components (e.g., eggs, larvae, adults, genetic material) between them, in the three dimensions, in the completion of their life-cycle (i.e., spawning, feeding, growth, maturity, mating). In addition, functional connectivity can relate to providing linkages of mobile predators to patches of prey, provision of refugia, etc. The various elements of the 3-D structural connectivity in the marine environment play different roles for different species, facilitating or not functional connectivity, depending on the species and life stages concerned, and on the way they move. Consequently, it must be considered at different scales, from neighbouring reefs (e.g., for feeding mating) to very large oceanic gyres for completion of a whole life-cycle (e.g., in the case of tunas, turtles, or lobsters). Connectivity, in the context of which food webs, and trophic cascades can be expected to occur though connectivity, with different results for predators and preys. For example, protection of forage fish in an OECM might enhance the feeding of protected seabirds and their reproduction in a distant protected rookery.

The resulting total connectivity among OECMs in an ecosystem and between them and the MPA network is, therefore, a complex 3-D phenomenon that might be conceptualized based on ecological and oceanographic knowledge, which is hard to quantify and monitor (**Goulletquer et al., 2013**). It depends not only on the size, composition and vicinity of OECMs and other protected areas but also on what happens between areas (e.g., fishing pressure, noise pollution, contamination, predation), affecting movements and energy flows between them. As such total connectivity is an emergent property of the ecosystem, and the interaction between its natural and human components.

Maintaining or improving connectivity between areas under different jurisdictions has international implications and thus may require multilateral agreements for OECMs that transboundary, extending in more than one EEZ and/or straddling into the High Sea[12].

Specifically, for OECMs resulting from FMPs, the 3-D aspects of connectivity can require special considerations. Horizontal connectivity can be reduced through partial obstruction (e.g. gears like pelagic drift nets) or interception by fisheries in areas that are neither OECMS nor MPAs, or through harvesting, reducing the sizes of the populations moving between areas Vertical connectivity in the water mass through nocturnal migrations and feeding behaviour can make biodiversity components receiving protection from measures applied only at some depths vulnerable to the fisheries when they move to depths where the measures do not apply. Such vertical stratification of measures to protect biodiversity can be important because demersal biodiversity (both fish communities and habitats) are more structured, more diverse, and usually considered more vulnerable than pelagic ones. Generally, vertical connectivity decreases with depth and may be weak in deep oceans (**Kerr, 2019**), except over high seamounts where the structural connectivity created by the seamount may facilitate a functional one, which also has to be taken into account in conservation measures.

Vertical zoning is used in management of some sectoral activities in the ocean to allocate resources or reduce conflict and risks of accidents, and fishery regulations commonly distinguish the demersal and pelagic domains as they often apply to specific fisheries resources that are in turn either demersal or

[12] Although the OECM concept has emerged in the CBD and therefore applies only in areas under national jurisdiction (e.g., EEZs), nothing impedes CBD members to use them in regional fishery management organizations (RFMOs).

pelagic. However, vertical connectivity is sometimes used as an argument against vertical zoning of protected areas and OECMs. The argument may be valid in shallow coastal areas (down to 100 meters) where fishing on demersal fish can result in bycatch of pelagic species and vice-versa (see a review by **Kerr, 2019**). If differing vertical zones of fisheries management measures were to be considered OECMs, benthic OECM would often have fixed locations whereas pelagic ones may often be dynamic, bringing with them the challenges discussed in **Section 4 – Criterion B1**. Vertical connectivity also may be a serious issue over the extended continental shelf where demersal resources are under national jurisdiction and those in the water column are under international jurisdiction, implying a legally-binding vertical zoning. Similarly, in the High Sea, the International Seabed Authority has a mandate to regulate mining in the seafloor, but not of activities in the water column above it.

### *f. Ecosystem functions and services*

*Ecosystem functions and services* are referred to in Guiding Principles (b), (c) and (f) as well as in criteria C3 and D1.

The Millennium Ecosystem Assessment states that *ecosystem services are benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other non-material benefits* (**Hassan, Schole and Ash, 2005**). This framework is evolving, with the IPBES inputs to the CBD moving to use of Nature's Contributions to People (NCP), to acknowledge the diversity of value systems that can be used to measure ecosystem services (see **Section 5a**) (**Diaz et al 2018**).

Aquatic ecosystems provide a range of services essential for human life and ecosystem maintenance. Most important to fisheries are: (i) provisioning services such as provision of food and related revenues, employment and recreation; (ii) regulating services such as regulation of meteorology and climate (affecting fisheries productivity and working conditions; living conditions); (iii) cultural services (including rituals and taboos that support emblematic species conservation); and (iv) supporting services such as primary production and food chains. OECMs may contribute to the protection and sustainable use of all other services. As actions to realize these services may sometimes be in conflict (e.g., biomass decreases as catch increases) their balance needs to be considered carefully, consistent with the last argument in Criterion D1.

### *g. Integrated*

Spatial *Integration* is referred to in Principle (d) referring to integration *within wider landscapes and seascapes* and Criterion C1, referring to integration of management within and outside the OECM.

In Principle (d), the issue is related also to *connectivity* (**Section 5.1.e**) and to *complementarity* with MPAs within those landscapes and seascapes. MSP, ICAM and other spatially integrative management frameworks would facilitate such integration. ICAM is specifically cross-sectoral and beyond fishery management mandate but FAO (1996a) has published guidelines for the integration of coastal fisheries into ICAM. MSP principles and tools might be applied at sector level to integrate OECMs among them and with MPAs at EEZ level. Compliance by the fishery sector with this aspect of OECMs requires the direct intervention of the State to put in place and coordinate the implementation of a cross-sectoral legal and policy framework.

In Criterion C1, the issue refers instead to the need to ensure compatibility of management measures inside and outside the OECM. This consideration is particularly important for MPAs as what happens inside an MPA and outside it is usually under two different jurisdictions of ministries respectively in charge of fisheries and of environment. As OECMs are also ABFMs, aiming at the sustainability of the fishery

surrounding them as primary objective, they should be *integrated in* the fishery management plan ensuring synergy between the measures inside the OECM (e.g., where a gear might be prohibited to protect a bycatch species) with the related measures outside the OECM (e.g., bycatch excluder device, bycatch ban, economic incentives). However, in cases where a formal management plan is not yet in place (as is often the case in small-scale fisheries) a specific management plan for the OECM would need to be established. Moreover, even in developed management systems, objectives contributing to *in-situ* biodiversity conservation necessary to be considered an OECMs may need to be better specified in the plan together with the special measures applying within the plan and the additional elements needed in the monitoring and evaluation system.

***h. In-situ conservation***

This important expression and concept is referred to in the formal definition of OECMs, in Principle (c) and Criterion B3, C1 and D2.

The term ”conservation” covers a range of conservation degrees, from preservation (no-use) to sustainable use. In order to avoid inappropriate interpretations of the Parties' intention, the adopted OECM definition refers explicitly to CBD Article 2 which defines in-situ conservation of biodiversity as "*the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties*".

In marine fisheries management, the conservation of the target wild stocks and their associated and dependent species as well as the protection of essential fish habitats (e.g., mangroves, seagrass and algal beds) are necessarily undertaken *in their natural surroundings*, hence *in-situ,* except perhaps for highly threatened species (e.g., some aquarium species and anadromous species such as eels and salmons) for which reproduction might be augmented by production in artificial environments.

OECMs should have significant *in-situ biodiversity conservation* outcomes for the biodiversity values of concern locally (cf. **Section 51a**). In terms of priority, OECMs could consider: threatened, declining or endemic ecosystems (e.g. VMEs); ecosystem services; habitats that are unique and/or critical and or play a vital role in supporting seasonal or migrant species; endemic, threatened or declining species; species of cultural value to society; and irreplaceable biodiversity not found elsewhere. Priority could also be given to opportunities to enhance biodiversity through restoring, re-creating or rehabilitating natural habitat, and to full compensation of unavoidable negative impacts on biodiversity (**CBD, 2006**) in line with the Biodiversity Impact Mitigation (BIM) hierarchy (**BBOP, 2012; ten Kate and Crowe, 2014**).

Nonetheless, it is impossible for any OECM (or any other measure) to have a positive impact on all the surrounding biodiversity. Like MPAs, OECMs may significantly enhance the conservation of some species or ecosystem features (e.g., sedentary species and habitats) leaving other features less protected (e.g., highly migratory species). Also like MPAs, they may expose some parts of the resources and habitats outside of the OECM to an even greater pressure if they were to displace fishing effort.

The CBD definition on *in-situ* biodiversity conservation requires that habitats identified for protection in an OECM have all their natural features maintained or restored and the populations of the characteristic species are viable or recovering (if they have ben depleted). The “natural” features that need to be conserved can in turn be taken from the properties included in the 2006 Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment (COP Decision VIII/28) and its foundation documents (includinbg, but not restrcted to CBD Decision VI/7-A; the Ramsar Convention on Wetlands Resolution VIII.9; and the Convention on Migratory Species Resolution 7.2) which refer to “biodiversity composition, structure and processes” (**Rice et al, 2018**).

The standards for *maintenance or recovery* of viable populations of species are defined in UNCLOS and the UNFSA. However, the standards for the conservation of ecosystems and natural habitats needs standards that have not been internationally agreed. The concepts of Significant Adverse Impact (SAI) and Safe Ecological Limit (SEL) referred to in Target 6 have no agreed indicators and reference levels. Consequently, statements in that respect may be subjective and pose problems in application examined in depth in **Garcia and Rice 2018**)

**IUCN-WCPA (2018)** argues that most areas managed for industrial production which also have biodiversity benefits (e.g., sustainably managed resources), should not be considered as OECMs and should rather be reported under Aichi Target 6. This argument assumes that fisheries directed at large commercial markets are always more damaging for biodiversity than artisanal ones, or may not allow for significant area-based biodiversity conservation. This issue has been debated for decades, for example in the case of VMEs, without consensus among all viewpoints. Recognizing that it is not possible to generally and reliably determine *a priori* whether any one ABFM category in any type of fishery meets the OECM criteria (**Rice et al., 2018**) the strict and consistent application of the OECM identification process provided by Decision 14/8 is the only way to objectively identify OECMs (cf. **Section 6**). The same reasoning could apply to buffer areas established around protected areas in the marine environment. Based on Criteria A, a buffer area already declared as part of an MPA and accounted as such in Target 11 should not be declared also as OECM. But if such buffer areas, in which regulations are less strict than in the core protected area but less strict than in the outer environment, might be considered as potential OECMs, case by case..

**IUCN-WCPA (2018)** also argues that OECMs are expected to achieve the conservation of *nature as a whole*, rather than only selected elements of biodiversity. The expression, however, does not appear in the COP Decision which requires to achieve *in-situ biodiversity* as defined in Article 2 of the Convention. Clearly, as argued by IUCN-WCPA, single species can only exist *in-situ* as part of an interconnected web with other species and the abiotic environment. Therefore, and as advocated in the Ecosystem Approach to Fisheries, the outcomes of conservation measures like OECMs should be considered both at local level (within the OECM, for "intrinsic" efficiency) and at the level of the entire fishing gound or local ecosystem, e.g. to maintain its structure and function.

### *i. Safe Ecological Limit (SEL)*

The concept of *Safe Ecological Limit (SEL)* is not referred to in Decision 14/8 but it is worth considering in the evaluation OECMs of how contribute to biodiversity conservation.

Aichi Target 6 calls for impacts of fishing on species, stocks and ecosystems to be kept within *SELs* and Targets 4 and 5 also refer to the concept. However, the concept has never been precisely defined (and agreed) in operational terms, e.g., with clear measurable targets and units for its quantification (**Donohue et al., 2016**). The concept, its origin in the "Planetary Boundaries" framework, its intent, the related concept of "safe operating space for humanity", the support to the concept and resistance to it, etc. have been discussed in detail in **Rice and Garcia (2019**). The framework provides a direct link to well-established fishery stock assessment frameworks identifying limits for stock status, minimum spawning biomass, stock-recruitment relationships, maximum fishing mortality, etc., which are the foundation for contemporary single-species fisheries management, with strategies and decision rules to maintain stocks within safe limits. The possible difference is that it gives greater focus to tipping points, regime limits and shifts, factors that are also proving to be challenging within established and less disputed management frameworks such as fixed fisheries reference points in variable ocean ecosystems (also discussed in **Rice and Garcia, 2019**).

These concepts could be applied for broader biodiversity conservation, defining safe limits below which ecosystem properties (e.g., structure and function) may not be driven. The relation between a state and

a function it supports, often has a critical inflexion point defining a limit for a state beyond which a function is threatened (**Rice, 2009**). Parametric and non-parametric methods may be used to define relations and critical inflexion points for safe limits, including in situations of uncertainty (**ICES, 2001; 2002; Cadrin and Dickey-Collas, 2015**), are well known and do not require an understanding of the full functional relationship between the ecosystem state property and the functions it serves. Approaches exist to deal with data-rich and data-poor situations (**Canales et al., 2017, Fulton et al., 2016**).

### *j. Significant Adverse Impact (SAI).*

The concept of *significant adverse impact* (SAI) is also not mentioned in Decision 14/8 but might however be very relevant to the determination of OECMs in their role in impeding, limiting or reducing negative impact on *in-situ* biodiversity. The requirement to avoid SAIs is embedded in UNGA Resolution 61/105 (related to Vulnerable marine Ecosystems, VMEs) and used in Aichi Target 6 in relation to both target and non-target species.

Referring to vulnerable ecosystems, the UNGA resolution, does not provide a definition or standards for what "adverse" means or when impacts can be considered "significant". A definition and standards are provided by the FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas (**FAO 2009b: § 17)** which states "*Significant Adverse Impacts are those that compromise ecosystem integrity (i.e., ecosystem structure or function) in a manner that: (i) impairs the ability of affected populations to replace themselves; (ii) degrades the long-term natural productivity of habitats; or (iii) causes, on more than a temporary basis, significant loss of species richness, habitat or community types. Impacts should be evaluated individually, in combination and cumulatively*"[13]. This definition indicates a very close link between the concepts of SEL and SAI and the fact that avoiding SAIs contributes to maintaining ecosystems within *safe ecological limits*. However, assessing SAIs or quantifying the contribution of a VME (and more generally an ABFM) to biodiversity conservation, case by case, is far from simple.

The FAO Guidelines cited above also indicate that the following factors should be considered when assessing biodiversity outcomes in OECMs: (i) the intensity or severity of the impact at the specific site being affected; (ii) the spatial extent of the impact relative to the availability of the type of habitat being affected; (iii) the sensitivity/vulnerability of the ecosystem to the impact; (iv) the ability of an ecosystem to recover from harm, and the rate of such recovery; (v) the extent to which ecosystem functions may be altered by the impact; and (vi) the timing and duration of the impact relative to the period in which a species needs the habitat during one or more life-history stages "(paragraph 18). All these important considerations mitigate against the use of single indicators and fixed reference points for assessing if a SAI has occurred. No conflict has been noted between the intent of SAIs as used in the CBD and the FAO guidance on SAIs in VMEs which has been acknowledged in CBD COP Decision X/29 (paragraph 54)..

For fisheries, avoiding SAI requires that threatened species, essential habitats or VMEs are accorded a high degree of protection to prevent further harm from fishing and allow recovery. However, this protection has no effect on factors other than fishing that may be contributing to the degraded status of the stock, species or ecosystem, thereby potentially limiting protection and recovery. Maintaining the ecosystem within SEL might be interpreted as requiring the persistence of overall structure and functions (e.g., maintaining impacts below some thresholds and balancing all other requirements).

[13] A complete FAO guidance is available at http://www.fao.org/in-action/vulnerable-marine-ecosystems/en/

### *k. Uncertainty, threats and risk assessment and management*

The complexity of the biodiversity elements to be considered in assessing the contribution of an OECM or a candidate OECM to in situ biodiversity conservation, the complex relationships within the local social-ecological system, and the relative scarcity of empirical data on many of the components of such system, imply a high level of uncertainty in deciding about the identification in many OECMs and the assessment of their performance, inside and outside them. Tools such as Multi-Criteria Decision Analysis (MCDA) and Risk Assessment approaches (see **Section 6.3.7**) can contribute to addressing these difficulties, but are highly dependent of availability of the necessary information. The challenges posed by the inescapable uncertainties involved in OECM evaluations and assessments will increase as evaluations progress from identifying and the prioritizing potential threats, to assessing risks associated with particular fisheries and biodiversity attributes, to estimating the potential of alternative options to mitigate the risks associated with the fisheries, to the more inclusive assessments of SEL and SAI (**Section 6.2.7**).

When assessments may only be available with a high level of uncertainty (confidence limits), the assessment of risk entailed in choosing between uncertain options would assist decision-makers in making the best- informed decision. This would entail:

- Identification of the source of risk (e.g., the environment; the fishery; other economic activities); product risk, management risk, environmental risk vis-à-vis human health risk);
- The identification of the element at risk (e.g., biodiversity components; ecosystem services; fisheries; coastal communities);
- Assessment of the risk characters (e.g., duration, extent, amplitude, cost, probability to occur);
- The risks, both socio-economic and environmental associated with alternative decisions, including no action (Business-as-usual)
- The communication of risks to recipients of the advice and other stakeholders;
- The level of uncertainty with the above.

## 5.2 OECMs AND GOVERNANCE

### *a. Governed and managed*

The terms *"governed and managed"* are used together in the OECM definition and Criterion B3. The purpose, addressing specifically governance and management issues, is also to avoid "paper OECMs", ensuring stewardship and enforcement.

The two terms address two interconnected and partially overlapping levels of governance: (1) the strategic level institutions, processes, policies, strategies, laws, rules; and oversight; and (2) the operational level management, regulations, measures, means, monitoring control and surveillance (MCS) and their implementation during the fishing operations. In both levels a degree of active stakeholder participation is usually recommended.

An OECM established in a fishery is "governed" when it is under the responsibility of a mandated fishery authority. Because of the potential interactions already mentioned, such authority should collaborate, under the leadership and stewardship of the State, with the authorities managing other sectors whose activities may impact the OECM, including the authority in charge of conservation. Collaborations would require cross-sectoral, spatially integrated policy frameworks, nested from EEZ-wide to regional to local levels. Governance of OECMs under fisheries mandate may be top-down (state-driven), bottom-up (by fishery associations, local communities, Indigenous People, municipalities), or shared (e.g., co-management). Fully private governance of areas containing OECMs in the marine domain may be possible

in internal waters and coastal lagoons where forms of terrestrial property may be extended. In the ocean, however, the conditional exclusive use rights are allocated by UNCLOS to the States usually recognized as inalienable (cannot be taken away) and imprescriptible (do not decay with time).

Consequently, marine fisheries management in the ocean is usually undertaken under the State overarching responsibility (alone in EEZs or cooperatively through special agreements and RFMOs). In coastal and offshore waters of the EEZ, management responsibilities may be delegated, shared or devolved to local institutions such as communities, municipalities, fisheries associations, etc.

Governance is expected to follow good governance principles (Rule of law, participation, equity, etc.) (**Graham, Amos and Plumtre, 2003**).

Like any ABFM, an OECM is not likely to be managed alone, i.e. with its own management plan, system of surveillance, etc. Its objectives (primary and secondary) and special measures (regulating access, gears and practices) should be integrated in the fishery management plan of the fisheries in which it applies. Its control and surveillance would be integrated in the one conducted for the whole area covered by the fishery. The expected conservation benefits and co-benefits should be described in the management plan together with any special monitoring and evaluation in place.

The requirement of a formal governance and management implies logically (and is argued by **IUCN WCPA, 2018**) that an area that is not used and is possibly in a natural or near-natural state, nevertheless cannot be identified as an OECM until it is formally delimited, identified and regulated by appropriate authorities

### *b. Cultural and spiritual and other locally-relevant values*

The reference to *cultural and spiritual and locally-relevant values* is found in the definition of OECMs itself –underlining its importance– as well as in Principle (J) and criteria C4 and D2.

These values are not mentioned explicitly in Target 11 but are of importance in many small-scale fisheries. They draw attention to the wide diversity of human dimensions of biodiversity conservation and should be considered in addition to the more material values of food, revenues, recreation and livelihoods which are accounted for in the fisheries sustainability objective of OECMs.

- Cultural values relate to peoples' history, identity, traditional institutions and rights. They reflect the accepted rules and behaviour of the community/society that depend on or will be affected by the OECM.
- Spiritual values relate to religious, moral or ethical beliefs, specifically related in this case to the relations between humans and nature and more specifically to biodiversity and its conservation.
- Other locally-relevant values can also play important roles. For example, a common such value is a 'sense of place' that may or may not be cultural or spiritual, but in any case, can often be crucial in producing stewardship actions locally. In coastal Indigenous or traditional communities, protection of key species, habitats and biodiversity may be a part of cultural and spiritual practices, and should be recognized.
- Other social values, not specifically mentioned, such as social cohesion, community stability, conflict resolution and power-structures are incredibly important in general, and specifically relevant to the success of spatial management measures. The importance of accounting for and incorporating these values into OECM discussions is as important in OECMs as it is in MPAs. to ensure stakeholders' buy-in and compliance, and to improve effectiveness.

### *c. Effectiveness*

The terms "*effective*" and "*effectiveness*" are used in the OECM definition, Principles (d), (i) and (j), and in Criteria C1 and C4. The terms are applied to governance, management, and measures and their ability to produce the intended outcomes (e.g., a significant improvement in biodiversity conservation and reduction of threats to it). Effectiveness of governance and management depends on the degree to which the objectives of the OECM, the selection of measures, their implementation as well as monitoring and communication, followed appropriate practices of Good Governance as already noted in paragraph (a) above, and especially inclusiveness, consultation, devolution and coordination with other sectors (see also **Spalding et al., 2016:198)**.

The challenge of assessing *effectiveness* has implications for governance. both inside the OECM and outside it, in the fishery, the sector or the ecosystem. Both inside and outside a sector-specific "*effectiveness"* is affected by the other measures implemented around the OECM (e.g., control of fishing pressure; additional economic incentives; Control and surveillance). In addition, because of ecosystem connections, the "effectiveness" of one OECM in a given fishery might be higher than its sole impact because of reinforcing connections with other OECMs and MPAs. Hence activities of other sectors both within and outside the OECM may affect its effectiveness, and if sectoral management has been devolved to more local scales, effectiveness can be affected by decisions made by management authorities of the same sector (fishing) in places outside the OECM. Hence "effective governance" needs to provide the fora, instruments, and resources to allow consultation and coherence of policy and management choices both across sectors and over areas larger than individual OECMs.

### *d. Legitimate authorities*

Legitimate authorities are referred to in Principle (h) and Criterion B2.

The implication of requiring that OECMs be put in place by a *legitimate authority* is that the area must be formally under the responsibility of an authority entitled to take and enforce the measures needed to maintain effective OECMs. When OECMs are established or recognized in a specific sector, the *legitimate authority* is the entity entitled by the government to manage this sector. This authority would then be responsible to identify the OECMs, enhance them if needed and possible, and integrate them into the relevant fisheries management plans. The authority might be locally-based (in case of traditional or devolved management authority), national (centralized)[14], bilateral (for transboundary OECMs), and regional (e.g., in RFMOs). In cases when governance of fisheries is highly devolved so the "legitimate authorities" of OECMs are at local scales, some or all aspects of OECM planning and identification might be conducted at higher governance levels, but with full participation by the more local "legitimate authorities". As an integral part of the management tool-box, OECMs will benefit from the existing monitoring control and surveillance capacity of the fishery and suffer from its eventual deficiencies. Participation and empowerment are usually accepted as ways to increase the sense of legitimacy by stakeholders and, presumably, their sense of stewardship.

In most cases, the available capacity for data collection and assessment of non-target resources will need to be upgraded and available budgets will be a constraint, particularly for small, low-value fisheries. Economies of scale might be possible addressing the OECM issue at ecosystem or EEZ level instead of at the single fishery level.

[14] In federated States, the single States usually have mandate over internal and costal waters while the federal authority is in charge of shared, bilateral, straddling and high seas resources.

### *e. Free Prior and informed Consent (FPIC);*

This important governance principle is raised in Principle (i).

Free and Prior Informed Consent (FPIC) is a principle protected by international human rights standards that state that all peoples have the right to self-determination. The right to self-determination implies that all peoples have the right to freely pursue their economic, social and cultural development. Backing FPIC are the United Nations Declaration on the Rights of Indigenous Peoples, the CBD and the International Labour Organization Convention[15].

The FPIC principle raises numerous questions regarding implementation, such as: Which person or institution is entitled to provide consent for the community? Would community consent override individual rights of non-community members? How to resolve conflicts? Who are the best information providers; What documentation should be provided to the community? How far in advance? In what language? How can full awareness of the community be ensured? How can existing imbalances in power structures be addressed? How can local knowledge be used for communities' benefits? What appeal mechanisms may exist in case of violation of FPIC? (**UN ECOSOC. 2005**).

The issue is raised mainly in relation to indigenous and coastal communities, with the standards for truly free and informed consent often contested judicially. Effective consultation and participation to data collection, assessments, analysis, decision-making, implementation and enforcement, with due respect to traditional rights and social structures all contribute to attaining free, prior and *informed* consent, even though the outcomes may not always pleas every community member. Often the issue may be best addressed under co-management schemes or pure community-based management.

### *f. Self-identification*

The concept of *self-identification* is referred to Principle (i) and Criteria B2.

In both instances, it refers to *indigenous and local communities*, the governance system within which the decisions are made and the specific measures they adopt. Measures established by these communities may have a better probability to be efficiently enforced and complied with.

Criteria B2 reminds that such *self-determination* should be *in accordance with national legislation*, framing the right of indigenous (or local) communities to decide who is member of the "community" or excluded from it. In fact, the American Declaration of the Rights of Indigenous Peoples (2016)[16] declares that *the States shall respect the right to such self-identification as indigenous, individually or collectively, in keeping with the practices and institutions of each indigenous people.*

### *g. Sustained / long term*

The terms "*sustained*" and "*long-term*" are often associated in the OECM definition, Principle (h) and criteria B3, C1 and C2, underlining the importance of the issue. Criteria C2 specifies that the term *sustained* refers to governance and management while *long-term* refers to biodiversity outcomes. However, the two are highly connected and used with seemingly interchangeable meanings.

A possible concern for conservation is that once the expected biodiversity outcomes have been reached, the OECM would be closed or the measures in it removed, and a return to the previous fishing regime

---

[15] https://www.un.org/development/desa/indigenouspeoples/publications/2016/10/free-prior-and-informed-consent-an-indigenous-peoples-right-and-a-good-practice-for-local-communities-fao/

[16] https://www.narf.org/wordpress/wp-content/uploads/2015/09/2016oas-declaration-indigenous-people.pdf

would lead to their rapid erosion. Indeed, in well-managed fisheries, the rebuilding regime, once legally completed, is formally closed and followed by an enhanced fishing regime intended to avoid "back-sliding" into the old negative situation, the primary objective and the measures might be revised. However, as argued elsewhere, the status as an OECM is judged fundamentally on biodiversity *outcomes* and not on merely the presence of a well-defined area with measures and objectives. In the example of the rebuilding regime example above, the management authorities that oversee the rebuilding then continue to manage the fishery, with responsibility to maintain the rebuilt stocks in a healthy condition, thus providing sustained governance. Similar continuity of a governance regime with objectives focused on biodiversity outcomes related to restoring depleted species or degraded habitats, to subsequent objectives for outcomes to maintain them in healthy status would be providing the necessary "sustained" biodiversity benefits and co-benefits.

The duration of a fishery closure may be very different from a real-time closure (e.g., days or weeks), a seasonal closure (usually few months), a medium to long-term closure (few years, e.g., related to a rebuilding plan, or permanent (e.g., for gear bans in particular habitats, or for critical habitat restoration). A priori, short-term ABFMs (e.g., real-time, ad hoc, or seasonal) may not be considered as potential OECMs. However, seasonal area-based closures may play an important role as seasonal stepping-stones in the lifecycle of key species, generating significant biodiversity benefits. If the measures are part of an overall management regime that results in the year-round conservation of the biodiversity attributes in the broader area where their life cycles develop then the governance system does deliver the biodiversity outcomes in the long-term (**CCFAM, 2017; IUCN WCPA, 2019)** and would meet the necessary standard of an OECM.

The evidence regarding the willingness to "*sustain*" the management effort for "*long-term*" outcomes could be included in the documentation used to identify and report an OECM. The expectation of sustained and long-term biodiversity benefit also raises, implicitly, the problem of the existence or likely occurrence in the future of non-fishery threats that fishery-regulations would not be able to impede. It also raises the issues of risk assessment, monitoring, enforcement and adaptation to new situations (including climate change) as well as revision and revocation procedures, e.g., if an OECM is found to not satisfy anymore the conditions that led to its nomination.

Formal stakeholder involvement and support may increase the likelihood of a measure to persist in the long-term. Conversely, the perception that flexibility or adaptability might be unnecessarily threatened by OECMs would be a strong disincentive for their adoption.

Governance to meet these challenges to "sustain" the outcomes should be transparently assessed, case-by-case. Stakeholder formal involvement and support may increase the livelihood of a measure to persist in the long-term. Conversely, the perception that flexibility or adaptability might be unnecessarily threatened by OECMs would be a strong disincentive for their adoption

## 6. EVALUATING AREAS FOR INCLUSION IN OECM REPORTING AND MANAGEMENT

### 6.1 POTENTIAL ELEMENTS OF A GENERAL PROCESS OF OECM IDENTIFICATION AND MANAGEMENT

This section deals with the initial evaluation of ABFMs to assess whether they could meet the Guiding Principles and the criteria for OECMs, set in CBD COP Decision 18/4. Many of the considerations in this **Section 6**, including on data and assessment methodology, apply to **Section 7** on recurrent evaluation of OECMs performance while they are implemented.

In principle, OECMs may be established in two ways:

1. They might be recognized among the various ABFMs already implemented in national and international fisheries as meeting or likely to meet the OECM requirements contained in Decision 14/8. If needed and worthwhile, their performance might have to be enhanced to meet the requirements (upgrading);
2. They might be created specifically and integrated in the fishery management system, for enhancing *in-situ* biodiversity conservation, as secondary or even as primary objective.

The considerations contained in CBD COP Decision 14/8, Annex IV, Section 4, on "*Assessing and reporting progress in achieving the qualitative aspects of Aichi Biodiversity Target 11 Assessment"* stress the need to:

1. Ensure the appropriate conditions are in place to facilitate the assessment, e.g., legal basis, policies, conservation objectives and expertise.
2. Develop a common understanding of what effectiveness means for an OECM, across stakeholder groups, in line with the objectives of these areas;
3. Develop clear, reliable and cost-effective indicators and benchmarks for assessing the effectiveness of the areas in achieving their objectives;
4. Select most appropriate assessment methods and standardize assessment protocols to ensure consistency across time and space;
5. Undertake assessments at individual area and network level; and
6. Develop and foster communities of practice to support the assessment.

The assessments should ideally be based on empirical data. They might also be based on expert opinion or ecological modelling, pending verification through monitoring and evaluation.

The overall process of identification, establishment, implementation, monitoring and performance evaluation of OECMs might be graphically summarized as on **Figure 1.**

Starting from existing ABFMs established primarily to ensure fishery sustainability or from any other area deemed potentially adequate, a multistage process is needed to undertake the case-by-case analysis required for OECMs and proceed towards implementation, monitoring and evaluation for performance assessment, and eventually for revision of the measure and, if necessary, its status (adaptive management). The process may proceed through stages that may be arranged/combined differently by different teams and Figure 1 gives but one possible representation of the flow of information and actions:

1. Inventory of existing ABFMs;
2. Assessment of ABFMs to check whether: (i) they meet OECMs requirements (assessed OECMs), (ii) or they could be upgraded to meet the standards in the future, or (iii) they should be rejected. For increased efficiency, the assessment may be preceded by a quick screening of the ABFMs in the inventory to identify the best potential OECMs and the most likely threats and issues that the full assessment will need to address.
3. Decision based on the assessments to (i) recognize effective OECMs, (ii) decide whether to upgrade those ABFMs for which this is possible and worthwhile (considering costs and benefits).
4. Reporting of the decisions: (i) into the national OECM records in which all assessments are recorded (whether positive, conditional or negative) with the rationale for the decision; (ii) to CBD and WCPA through WCMC, if so decided, to be accounted against Target 11 of post-2020 targets.

5. Integration of OECMs and upgradable ABFMs into the fisheries management plans for implementation.
6. Monitoring and evaluation of implementation performance to check if OECMs and upgraded ABFMs meet expectations. Confirm the OECM status of the latter if the evaluation is positive. The same assessment mechanism used to identify OECMs may be used to evaluate performance. The periodicity of the evaluations is case-specific, depending on the biodiversity components expected to benefit. An OECM found to not meet the standards anymore may be upgraded to restore its status as OECM or delisted from that status and from the WCPA database. The area may still be used as a conventional ABFM in the management plan if its effectiveness in relation to the fisheries sustainability objective is adequate.

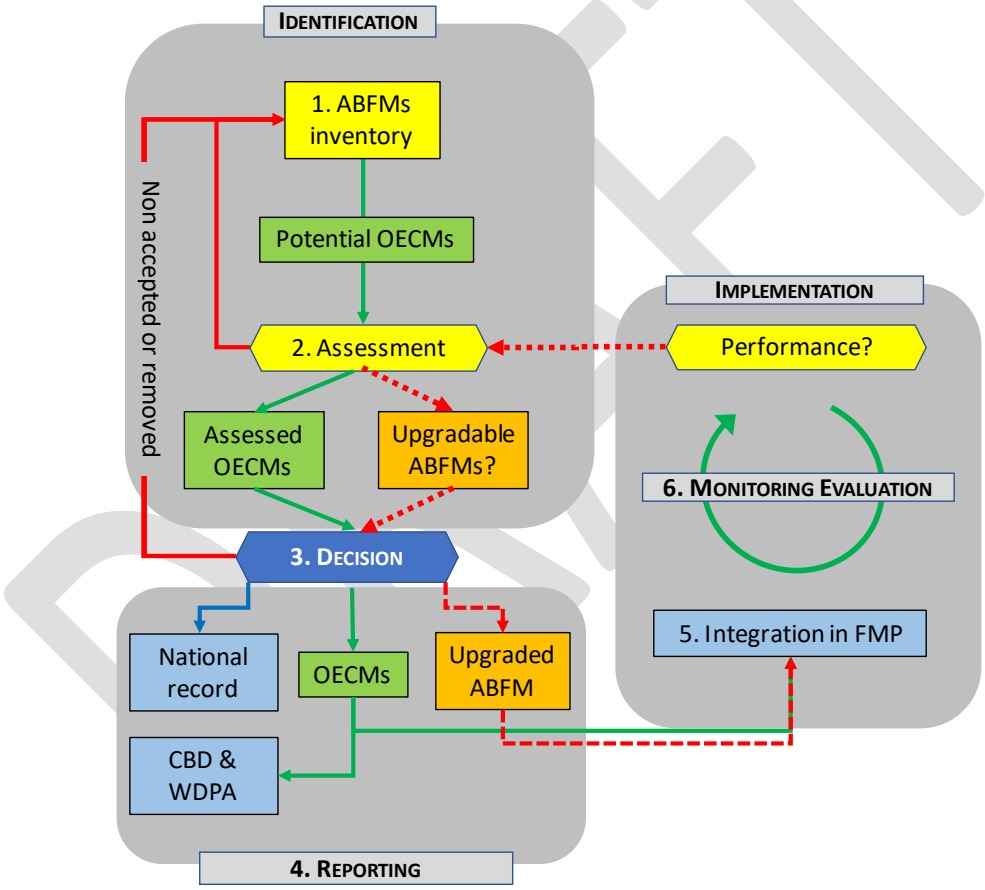


**Figure 1: Suggested OECM process. Green, red-dotted and red arrows correspond respectively to positive, conditional and negative statements.**

## 6.2 GENERAL APPROACH TO EVALUATIONS

### Purpose of the Evaluation

The purpose of this type of evaluations is to identify area-based fishery management measures (ABFMs) that may be considered OECMs, demonstrating their realized or potential effectiveness in producing *in-situ* biodiversity *benefits* and *co-benefits* (cf. **Section 6.3.3**).

Benefits and co-benefits should be reflected in net positive difference between the state of the *in-situ* biodiversity of concern with the OECM in place, and the situation of that biodiversity if the OECM would not have been in place (i.e. the counter-factual, empirically observed or modelled). Such outcomes might be improvements of (i) species abundance and biomass, particularly of threatened species; (ii) composition of species assemblages; (iii) structure of the trophic web; (iv) genetic variability (e.g., number of sub-populations); and in (v) retention, restoration and inter-connection of essential or vulnerable ecosystems, corridors and habitats, particularly remnants of habitats fragmented by development. These outcomes should assist in (vi) maintaining ecosystem functions services; and (vii) enhancing resilience against threats. Moreover, individual OECMs areas may constitute stepping stones within MPA networks improving connectivity and integration within wider landscapes and seascapes.

A significant reduction of threat to biodiversity may also be considered a positive outcome, in line with the Biodiversity Impact Mitigation (BIM) hierarchy. The related concepts of No Net Loss (NNL) and Net Gain (NG) would be particularly relevant for habitats conservation.

The evaluation may be undertaken *ex-post* when the ABFM has already been in operation for enough time to generate the empirical data needed to evaluate realized effectiveness, or *ex-ante* when an old ABFM is upgraded to meet the OECM standards or a new one is introduced as a potential OECM.

**Case-by-case analyses**

It would have been convenient to be able to reliably consider, *a priori* some categories of ABFMs as OECMs. However, this is not possible, due to the number and range of factors that condition their effectiveness: (i) characteristics of the area (e.g., physical or hydrographic features, space-time restrictions, gears and practices; jurisdictions, legal and management frameworks); (ii) the measures applied in the area and around it; and (iii) and (ii) external drivers (e.g., economy, climate, demography, social cohesion, pollution). Consequently, the technical advice of CBD COP (**Decision 14/8, Introduction of Annex III**) is that the identification of OECMs be undertaken case-by-case against the criteria. Nevertheless, the ABFM literature indicates certain types of ABFMs and certain enabling/limiting factors appear more likely than others to generate the properties expected from OECMs (**Rice at al., 2018**).

**Internal versus spill-over benefits**

The primary outcomes of an ABFM on a target stock are not only expected inside the ABFM but also and often mainly outside it, on the total stock and the fishery performance, e.g., when the ABFM protects juveniles, recruits, spawners or migration routes to increasing spawning potential, stock sizes and yields. Similar spill-over effects may also occur for non-target species using the OECM in their life-cycle and the habitat features or life stages protected in the OECM supports biodiversity components that subsequently distribute more widely. Such spill-over effects depend greatly on the life history of the species and the state of the populations concerned before the closure.

**Approach to the evaluation/assessment**

Aichi Biodiversity Target 11 contains a quantitative target for marine coverage to be reached by 2020, but also seven different “Properties” that require consideration when evaluating whether an area in which specific area-based regulations apply (usually within a management plan) should be treated as an OECM when reporting to CBD against the Target. These Properties (identified as such in the rest of the document) are identified in the following extract from target 11, in square brackets and underlined.

*"…10 per cent of coastal and marine areas, especially [areas of particular importance for biodiversity and ecosystem services], are conserved through [effectively] and [equitably managed], [ecologically representative and well-connected systems] of protected areas and other [effective] [area-based] [conservation] measures, and [integrated into the wider … seascapes]"*

The approach adopted in Decision 14/8 (Paragraph 3; Annex IVDd) is that any candidate area should be evaluated individually (case by case) against the definition of an OECM as facilitated by 13 Guiding Principles numbered P(a) to P(m) (cf. **Section 2**), a set of 4 criteria subdivided in 10 sub-criteria and 27 bullet points numbered C1a to D2b (cf. **Section 3**). While the Criteria and sub-criteria names appear fairly distinct, the commonality of many bullet points at their lowest level underscores their functional overlap and complicates the assessment of the OECM property criteria by criteria. Moreover, many of the key issues to be addressed during the OECM identification and evaluation are relevant for many Criteria. Finally, all the Criteria can be easily connected to the relevant Property in Target 11. Consequently, we decided to structure the discussion on assessments by Property of the Target 11, noting for each property the Criteria and sub-criteria of relevance.

For the reasons elaborated in **Sections 1.1, 3.3** and **5.1,** the background marine environment in which fisheries are prosecuted and management measures are implemented is globally so variable, as are the related priority biodiversity concerns, that there is no single quantitative outcome of any type of management measure (including OECMs) that can serve as a global benchmark for successful performance.

Consequently, the approach adopted by the CBD COP does not set absolute benchmarks for any single Target 11 Property or OECM Criteria or their aggregate. Each evaluation is relative to the background environment in which it is applied and considers incremental benefit to biodiversity relative to the biodiversity outcomes that would be expected if the OECM was not included in the management plan. The default for what constitutes the background environment is the entire area in which the fishery under consideration operates. The area covered by the possible OECM would be a subset of the total area in which the fishery management plan applies and in which the special measures will be enforced. Alternative "backgrounds" might be selected but with case-specific justification with regard to comparability of the ecosystems, the fisheries, and the expected biodiversity outcomes. For example, if one biodiversity benefit expected from the OECM is protection of a type of habitat, the reference background is the total area covered by that habitat in the fishing ground. The protection provided might be 100% inside the OECM, 30% in the fishing ground and 5% overall in the EEZ.

A decision to consider an area as an OECM would be based on the aggregate outcome of performance on all 4 Criteria adopted in Decision 14/8. Consistent with **Section 5.1,** it would be possible to justify a decision on whether an area is an OECM for any of several aggregate outcomes, such as:

- A positive decision based on high performance on a few properties, given the context of the overall location of the fishery and the potential impacts of the fishery on biodiversity if the measure were not in place. These would typically be cases where the area-based measure addresses very well an important conservation concern in the area;
- Positive decision based on moderate performance across most of the properties being evaluated. The footprint of the fishery on biodiversity is reduced overall, even if no specific biodiversity feature received full protection;
- A negative decision based on poor performance on crucial properties for the context of the area, such as failing to reduce pressure of the fishery on a high priority biodiversity feature impacted by the fishery, even if other biodiversity benefits were expected;

- A negative decision if the evaluations conclude that the area-based measure just contributes to sustainable use of target species of the fishery, with few incremental benefits to other features of biodiversity.

Consequently, our examination of the issues to be kept in mind when undertaking case-specific evaluations (**Section 6.3**, below) addresses:

- Factors to consider when evaluating each of the seven properties of the OECM in Target 11;
- Relevant considerations when deciding if some of the properties are of such a high concern for conservation of biodiversity in that case, that high performance on them would be strong support for calling the area and OECM,
- Relevant considerations when deciding if some properties would be fatal flaws if performance on them were poor. These will often be the same features as in the bullet just above, but in reverse (such as presence of particularly effective governance being a strong positive factor, and very ineffective governance a serious flaw). However, in some cases absence of a feature could be a serious shortcoming, whereas its presence, in itself, is at best a modest positive factor.

### 6.3 PROPERTY-BY-PROPERTY CONSIDERATIONS

The seven properties identified in Target 11 have been re-arranged below in an order that increases the efficiency of the evaluation of potential OECMs. The properties have been grouped with category labels to match the OECM Criteria in Decision 14/8 but do not follow the same order as the Criteria and sub-Criteria in the Decision. Moreover, in some cases, a single property in Target 11 would match many paragraphs in various sub-criteria of Decision 14/8 and because these paragraphs will be inter-dependent in evaluations, they are grouped together below. The logical order reflects a sequence of Target 11 properties[17] when certain ones must be established before evaluation of subsequent ones to be meaningful, worthwhile, or both[18].

In the following sections, we will follow the numbering system of Criteria and Principles used in Sections 3 and 4 above.

#### *6.3.1 Area-based measure*

The relevant Criteria are: B1 (the area is a *geographically defined space*); and A (*the area is not currently recognized as a protected area*)

An OECM is an area-based conservation measure by name. It is one type of such measure in among many others including MPAs. It is also an area by its definition and identification criteria, and an area within which other special measures apply that may be area-based themselves or not. So, when referring to an OECM, we implicitly refer to the area (and its physical characteristics, its ecological content, and its management regime.

[17] Throughout **Section 6**, for consistency, the term ”Properties” will be used to refer to the term or concept as it appears in the Target itself. ”Criteria” will be used to cross-refer to the AnnexIII of Decision 14/8. Although these may be intercahngable in many parts of the Section, in some cases the distinction is imporant. Therefore, using the different terms will reduce potential for confusion.

[18] By ”meaningful” we mean that the strength or weakness of the OECM on other properties would be strongly dependant on the responses to this property. By ”worthwhile”, we mean that if an OECM were to perform particularly poorly on this Criterion or Property, continuing with the evalaution would not be justified unless there was serious intent to correct the shortcoming identified at this point in the evaluation.

In fisheries, the taxonomy and features of different types of area-based management measures (ABFMs) is well described (cf. **Annex 1** of this document). **Garcia et al. (2018: §3)** present a catalogue appropriate for case-specific evaluations as potential OECMs. In evaluating the appropriateness of an area as an OECM, as specified in Criterion B1, it is necessary to specify not only the area (it location and extent) but also the type of area-based measure being applied in it and included in the fishery management plan or customary management practices. In addition, it would be useful to specify the temporal extent of its application (full year, season, triggered by some environmental event, or other facts) and any other conditional factors relevant to when, where and how it might be applied.

All this information should be included in the justification of any area accepted as an OECM and should be updated should changes in the management plan or practices occur. For reasons stated in the preceding section, the evaluation should rarely consider the selection of any type of area-based measure as being *a priori* more or less likely to be considered an OECM. It is the biodiversity outcomes of the measure that are the most relevant considerations in the evaluation. This specificity in delineating the area in which the measure is applied is crucial to bounding the evaluation of all other properties of the candidate OECM and determining when management or practice has changed the area, relative to an appropriate background comparative reference (see **Section 6.3.3**). Hence its occurrence as the first Property considered in evaluations.

### *6.3.2 Importance for biodiversity and ecosystem services*

The relevant Criterion is: C3 (*in situ conservation of biological diversity*)

Compared to the appropriate background, is there evidence that the area within which the area-based measure is being used is one or more of:

- A Biodiversity Hotspot?
- Crucial for life history of species of special conservation concern?
- Important for provision of specific ecosystem services?

The CBD has provided much guidance for determining what constitutes biodiversity hotspots and areas or species of special conservation concern. In addition to the CBD, many other conventions and agreements can be the basis for conclusions about the "importance" of biodiversity components including species, habitats, and community attributes, including Ramsar, CITES (Annexes), IUCN (Red list); CMS, European Directives, OSPAR, Barcelona Convention, ASCOBANS, ACCOBANS and CBD National Biodiversity Action Plans (NBAPs). Together these can inform those conducting OECM evaluations on scales from local to regional of areas having the types of properties listed illustratively in Decision 14/8: "*communities of rare, threatened or endangered species, representative natural ecosystems, range restricted species, key biodiversity areas, areas providing critical ecosystem functions and services, areas for ecological connectivity*".

Through the CBD EBSA process and the experience of fisheries with VMES, there is also guidance available on identification of areas important to life histories of species or important for specific ecosystem services. This guidance is summarized in **Section 3.3** and tabulated in **Annex 2** of the present document. Many jurisdictions may also have regional, national or sub-national guidance on identification of biodiversity hotspots, priority species, and areas comparable to EBSAs or VMES, and such guidance would be appropriate as well. Guidance on determining areas important for specific ecosystem services is less mature than guidance on biodiversity features but is progressing through IPBES and many sectoral agencies (see **Annex 2** of the present document). In each case-specific evaluation the justification for considering the area to be of importance for biodiversity or provision of specific ecosystem services should be specified clearly.

Just as "*representativeness*" in MPAs applies to common as a well as rare marine ecosystems (**Rice and Houston, 2011**), an area does NOT have to be a biodiversity hotspot or particularly important for life histories or ecosystem services to be an OECM. However, being evaluated as important on this property strengthens the case for including the area as an OECM, if the other properties are at least adequately present.

The features identified in the evaluation of this property of candidate OECMs will be referred to as the expected biodiversity benefits for this Background paper. Thus, improved protection for or availability of ecosystem services will be intended as being included in the expression "biodiversity benefits" whenever co-benefits are ecosystem services are considered in the evaluation. They are the second Property presented here because many subsequent Properties in the evaluation can only be addressed in the context of the "expected biodiversity benefits".

### *6.3.3 Conservation*

The relevant Criteria are: C1a (*effective*); C2 (s*ustained over the long term*); and B3a (*managed …to achieve conservation*).

The Property "*Conservation*" in Target 11 is covered in the Decision 14/8 by four different paragraphs, appearing in two of the Criteria. The most relevant aspects are reflected in Criterion C, about achieving "*sustained and effective contribution to in situ conservation of biodiversity*" both through the outcome specified in C1 paragraph a – "*The area achieves, or is expected to achieve, positive and sustained outcomes for the in situ conservation of biodiversity*" and the commitment in C3 that the measures "are in place for the long term or are likely to be" and that the measures will be "*sustained*" by a "continuity of governance and management " *that the outcome will be sustained over the long term*". Moreover, Criterion B3 confirms these conservation commitments in the standard that the area will be "*managed in ways that achieve positive and sustained outcomes for the conservation of biological diversity*"

Hence all fisheries management plans would be expected to provide conservation benefits while also allowing sustainable use to occur. However, due to species interactions, competition, and density dependence, no management measures, including total exclusion of all human uses, can benefit all biodiversity (**Rice et al. 2018; Section 3.3**). The aspect(s) of biodiversity that do receive benefits from an ABFM and the magnitude of those benefits are important considerations on evaluation this measure as an OECM. These biodiversity benefits can arise intentionally as a consequence of how the ABFM was designed and implemented (expected or intended benefits), or occur because in making the fishery more sustainable in the context of the target species, the measure also changes the ecosystem impacts of the fishery in ways that result in other positive biodiversity outcomes (also referred to as co-benefits). Such co-benefits may be unexpected or unintended. They might also have been foreseen at the time the measure was adopted, but at the time were not a major consideration in the design and adoption of the measure. Unless explicitly differentiated in the text, reference to "*biodiversity benefits*" and "*positive biodiversity outcomes*" always includes both intended benefits and co-benefits.

Evaluations of performance of an OECM in relation to a "conservation" Property therefore take three aspects of "conservation" into account:

- The expected outcomes from application of the relevant management measure(s): the benefits intended for general biodiversity, for specific species or places of particular conservation concern, or for particular ecosystem services;
- The "null" or "counter-factual" outcome: How well would the biodiversity feature(s) in the "expected outcome" be conserved in the area, were the relevant management measures not being applied, all other factors remaining identical?

- The difference between those to outcomes, which constitutes the incremental conservation benefit, from the establishment of the OECM.

If the measure has been in place for some period at the time the OECM evaluation is conducted, strong empirical evidence for estimating the incremental conservation benefit would be an appropriate assessment of the status of the biodiversity feature(s) expected to benefit from the measure, inside and outside the area under evaluation. Appropriate assessment methods for various aspects of biodiversity are tabulated in **Annex 2** of this document, and briefly addressed in **Section 7.3.4**. The larger the positive difference in the biodiversity feature(s) the stronger the support for considering the area an OECM. The "positive difference" could be higher biomass or numbers of the biodiversity feature(s) inside the area, lower fishery-induced mortality on the biodiversity feature(s) inside the area than in the background, lower rates of impact of the fishery on the biodiversity feature (for ecosystem structural properties), higher aggregate biodiversity metrics (such as diversity indices, less truncated size composition etc.) and possible others – for discussion at the meeting. Results of such comparative analyses would need to be interpreted in light of how other potential threats to the biodiversity components expected to benefit from the measure were managed (see **Section 6.3.4 and 6.3.7** for guidance on how that is approached).

If the positive evidence was lower rates of impact on structural habitat features, or lower mortality rates on key species, the impact or mortality rate would need to be below the recovery rate of the feature from disturbance or mortality (**Garcia and Rice, 2018:§5.3; Rice et al., 2018:§4.4.1**) for the assessment to support considering the area to be an OECM.

If the area-based measure is only under consideration for use, or no *in situ* information is available about how it has performed, then the evaluation of potential conservation benefits would have to be based on modelling results (**Section 5.1; Rice et al., 2018: §4.3**), review of the literature (**Rice et al, 2018: §4.4, 4.5**) and inferential knowledge of how the measure typically performs for the particular species and in the habitat and ecosystem type under consideration, and for any species of particular concern for the evaluation ("*expected outcomes*").

Such evaluations based on modelling or literature reviews would have to pay particular attention to literature reports of both enabling and impeding circumstances that have occurred in similar uses of the type of measure, and evaluate the specific application taking into account the presence of enabling features and the absence of impeding features in the area and fishery being evaluated. Both enabling and impeding features vary with the type of area-based measure used , the biodiversity features expected to benefit, and the scale of application of the measure (**Rice et al. 2018: §4**), so a general tabulation of such features is not possible (although some information in **Section 6.3.4** has general relevance to factors that promote or impede conservation). However, a thorough literature review of application of similar measures in similar ecosystems on comparable scales would be a necessary part of a sound assessment. The intent of such a literature review would be identification of the enabling features and impediments relevant to the specific case being considered, and not just finding a few case histories that are generally similar and have consistent positive (or negative) outcomes.

Strong evidence that use of the measure in the area would produce conservation benefits would be presence of main relevant enabling features and absence of key impediments to success. Weak evidence would the absence of even a single but especially multiple enabling feature. Serious shortcomings would be presence of major impediments to successful delivery of the expected biodiversity benefits.

When evaluating the conservation benefit of an area-based fishery measure, other sources of habitat impacts or biodiversity loss / mortality have to be part of the evaluation, since they shape the background features and features inside the area being evaluated (**Section 3.2**). If there are serious sources of impact or mortality present that are likely to continue while the area-based measure is implemented in the

fishery, this weakens the justification for considering the area an OECM. Even if the fisheries management has a good record of producing positive biodiversity benefits when applied effectively, if the biodiversity benefits have a high likelihood of being dissipated by other pressures on the same area, then it cannot be argued that conservation benefits will accrue. However, an exception is when the area-based fishery measure is part of a more comprehensive plan to increase the conservation of the area (and ideally the background) through the reduction of all major threats (integrated management – see **Section 9.3**). Fisheries should not be discouraged from "taking the first step" in such plans (see **Section 6.3.7** for more on this).

The "*conservation*" Property is evaluated at this point, because the expected biodiversity benefits have to be known (**cf. Section 6.3.2**) in order to evaluate if the measure has the potential to produce those benefits. If the potential for "*conservation*" is not likely, then there is little point to proceeding further with the evaluation.

#### *6.3.4 Effective measure and effectively managed.*

The relevant Criteria are: B (*effective);* B2a (*legitimate authority*); B2d (*single or collaborative authority*); B3b (*relevant authorities and stakeholders*); B3c (management system in place); B3d (*consistent with ecosystem approach*); and C1a (*achieve in-situ conservation of biodiversity*).The expressions "*effective… measure*" and "*effectively managed*" occur in two different places in Target 11, presenting two different but complementary aspects of effectiveness. The first, reflects the potential of the measure to provide the expected biodiversity benefits. The second, reflects the potential of the management system to enforce the measure and the regulations applying into it, avoiding "paper OECMs). Similarly, these twinned concepts are scattered through various Criteria in Decision 14/8, including:

- How the area is governed (Criterion B2): "*by a legitimate authority and is appropriate for achieving in situ conservation of biodiversity*" although this could be "*a single authority and/or organization or through collaboration among relevant authorities and provides the ability to address threats collectively*";
- How the area is managed (Criterion B3): "*A management system is in place that contributes to sustaining the in situ conservation of biodiversity* ", with "Relevant *authorities and stakeholders … identified and involved in management*"; and "*Management ... consistent with the ecosystem approach with the ability to adapt to achieve expected biodiversity conservation outcomes, including long-term outcomes*"; and
- The performance of the actual area-based measure in practice (Criterion 3a): such that "*threats, existing or reasonably anticipated ones are addressed effectively by preventing, significantly reducing or eliminating them, and by restoring degraded ecosystems*" by using "*Mechanisms, such as policy frameworks and regulations, are in place to recognize and respond to new threats*"..

Because effectiveness has such a broad and interconnected scope of relevance, an evaluation of the potential biodiversity outcome of a specific candidate OECM would require an evaluation of the *potential* of the measure to provide the expected biodiversity outcome as well as the likelihood that such measure would be properly implemented to allow its fully potential to be realized. Hence, generally the two properties and associated Criteria should be assessed together when evaluating an area as an OECM.

*In situ* empirical evidence that conservation benefits are being achieved and attribution of the effect to the area-based measure is high would be strong evidence that the area can be considered an OECM (**section 3.1** and **3.3**). In the absence of empirical evidence of conservation benefits, and pending the collection and analysis of such evidence, *in situ* effectiveness of the measure and its implementation could be evaluated by comparison of the biodiversity outcomes relative to a similar area where the measure

has not been implemented, but with otherwise similar ecological background, conduct of fisheries, and presence of other pressures on the biodiversity components expected to benefit from the measure. The more similar the conditions, the stronger the evidence for how effective the measure is likely to be. Then the greater the assessed or likely difference between the candidate OECM area and the background area, the more effective the measure and its implementation are or are likely to be.

When *in situ* comparisons are not possible (no monitoring or measure not yet implemented) and comparisons with other areas not practical, it is necessary to rely on modelling studies or literature information on performance of the type of the area-based measure being considered. As the evidence of effectiveness increasingly has to be drawn from modelling and literature sources, the more likely it is that effectiveness of the measure and effectiveness of its implementation have to be evaluated separately. Considerations to take into account when reviewing sources of model parameters or literature information include similarity of the fisheries, the biodiversity properties expected to benefit, match of the size, placement and timing of the measure to the biodiversity feature(s) intended to benefit, and (as with evaluation of "conservation") the enabling and impeding factors reported in other applications.

The authors of the present document are unaware of any literature that differentiates enabling and limiting factors of a measure to provide the expected conservation benefits from factors that make a measure more or less "*effective*" in delivering such benefits. There are no obvious reasons why they would be different, but it is another topic for discussion at the workshop. In practice, it will be highly likely that when literature sources or modelling simulations are used as sources of information on the (intrinsic) effectiveness of area-based measures, the same sources would be used for information on the types of factors, related to the *use* of the measure, that would affect such effectiveness. Consequently, the tabulation of enabling and impeding features for both the "*conservation*" outcome the area and "*effectiveness*" of its use would be done at the same time, with experience providing guidance on the degree to which the types of enabling and impeding factors are similar or different for the two properties.

If *in-situ* information is not available, and the evaluation of a candidate OECM is based on modelling studies or literature review, the presence of any enabling and impeding factors may constitute the differential evaluation of the possible "*effectiveness*" of the measure and of its management. Evidence that the area-based measure has the potential to be successful at providing conservation benefits, i.e. can be an "effective measure", may be provided by the selectively best-case examples of what conservation benefits have been attributed to the measure in the literature. A case-specific evaluation must consider the similarity of the areas in the literature sources (or the modelling parameters) to the area under evaluation, with regard to properties of the species, ecosystems and fisheries. The area-based measure has potential to be effective if there are circumstances where it has been documented (field studies elsewhere, expert opinion) to produce high conservation benefits or if properly parametrized simulations indicate such potential. The strength of the potential effectiveness of the measure increases as the similarities of the areas in the literature (or model parameters) and the area under consideration increases. Then the effectiveness of management is evaluated as increasingly likely as important enabling factors for effectiveness are increasingly present and impediments to effectiveness are absent in the specific case. Based on information in **Sections 3.2 and 4.2**, key considerations here are likely to include:

- The management capacity of the authority implementing the measure, noting that effective management can be provided by either by top-down management –to the degree to which the agency has good MCS capacity– or bottom-up management or co-management, assuming a degree of social and cultural cohesion in the community (**IPBES, 2018; FAO, 2015)**; and
- The acceptance of the measure by the participants in the fishery, expressed as likelihood of willing compliance with the measure. Depending on the governance processes and customs in place,

other ecosystem or governance factors may also result in certain enabling and impeding factor taking special importance.

These considerations are discussed in **Section 9**. A low evaluation of either the overall potential effectiveness of the area-based measure (the "*effectiv*e" property) or the absence of important enabling factors or presence of important impeding factors (the "*effectively managed*" property) would constitute serious weaknesses in the evaluation outcome.

Regardless of whether the area-based measure has been in place long enough to base the initial evaluation on *in situ* information or is a new component of the fishery management plan, *effectiveness* will require some evidence that the measure will be in place long enough to contribute to the expected conservation benefits. The evidence does not have to be that the measure is entrenched in legislation or overarching policy. However, evaluation of the likelihood that the measure will stay in place long enough to be "*effective*" would consider:

- The process that could remove the measure or alter it in ways that reduced its effectiveness at providing the expected conservation benefits, and
- The likelihood that proposals to remove or alter the management measure will occur. With the diverse and complex approaches to governance of fisheries (**Section 9**), simple standards for ensuring continuity of a measure into the future cannot be specified.

Evaluations should also consider factors such as:

- The overall policy environment in which the measure in imbedded (**Sections 9.4** and **9.5**);
- The possible resistance to or low compliance with the area-based measure by the participants in the fisheries being managed (**Section 3.2** and **9.6**); and
- The ease with which a measure can be removed from a management plan if it fails to perform as expected or generates opposition (**Section 9.1**).

Because of the subjectivity likely to be necessary in evaluating this aspect of being "*effective*" (the likelihood of remaining in place into the future), the documentation of the results of the evaluation should be clear and explicit about the factors leading to either a positive or negative conclusion.

Target 11 is silent with regard to the need to take the possible impacts of climate change into account in evaluating OECMs, or Marine Protected Areas for that matter. However, it is being raised as a factor in area-based approaches or conservation (**Johnson and Kenchington, 2019**) and can be a relevant factor in "*effectiveness*" of delivery of conservation outcomes. As long as climate change is expressed as incremental changes to background conditions, its impacts on effectiveness of the area-based measure can be included in periodic reviews of OECM performance that are likely to occur on any case (**Section 8**).

However, impacts of climate change on marine ecosystems may be non-linear with tipping points (**IPCC, in press**), and if such changes were to occur evaluations of the effectiveness of the full range of management measures in place is warranted (**IPCC, in press**). Such re-evaluations should include OECMs and MPAs, as well as the feasibility and appropriateness of the "expected" conservation outcomes under the new environmental and socio-ecological system regimes (**Cochrane et al., 2009**). In the short term, if authorities are seeking areas as candidate OECMs, resilience to climate change could be a relevant consideration when choosing among otherwise comparable areas (REF). However, when evaluating a specific area as a possible OECM, it is the ecosystem and socio-economic features of the area under current and short-term future conditions that are most relevant to the evaluation, inasmuch as revisions are possible and foreseen.

The property of the OECM of being an *effective measure* and *effectively managed* is placed at this point in the evaluation sequence, because once the potential for the OECM to provide conservation benefits has been confirmed, the likelihood of the actual outcome, and key enabling or deterring factors need to be considered for the particular place. All the subsequent properties are more aspirational, and legitimate OECMs may not perform strongly on some of the following properties. However, for "*effective*" as well the other preceding properties, adequate performance is essential for a strong case that the area is an OECM.

### *6.3.5 Equitably managed*

The relevant Criterion is B2 (*legitimate governance); B2b (Indigenous peoples and local communities); B2c (equitable governance*)

This term "*equitably managed*" applies to all areas reported under Target 11, including OECMs. Equity is reflected in two of the aspects of Criterion B, by requiring that "*legitimate governance authorities*" (B2) both "*reflects the equity considerations adopted in the Convention*" (Criterion B2c) and the "*governance by Indigenous peoples and local communities is self-identified in accordance with national legislation and applicable international obligations*". Consequently, evaluations of candidate OECMs should consider the socio-economic dimensions of how the fishery in the area is being managed, how the area-based measure was implemented and, where relevant, give priority attention to Indigenous people and local communities in these evaluations.

Nothing in the language of the Target or Decision14/8 restricts the OECM concept to specific scales of fisheries (large scale or small scale) or to specific ecosystem features. Rather, the inclusion of "*equitably managed*" makes the history of fisheries in the area necessarily part of the evaluation framework. The area and fisheries in which the OECM will be implemented has usually been providing livelihoods and employment to local communities, and/or economic benefits to well-established stakeholders and governments (**Sections 1.3, 1.5** and **4: Criterion B**), and changing the access rule or the type of gears that might be used might affect the distribution of benefits and costs. Consequently, the decision-making process needs to be evaluated with regard to ability to do at least two things:

- Assess and take into account how well the outcomes of the area-based measure are able to maintain an equitable distribution of benefits and new costs among all established participants who shared in fishery (or related) benefits before the measure was introduced. Reducing inequity in distribution of benefits is a positive consideration, increasing inequity would be an undesirable feature of the measure.
- Allow presence and participation of all established participants in the historical uses of the area in the assessment and decision process. For this guidance, that would mean particularly but not exclusively the fisheries users of the area if the area-based measures were likely to affect other individuals or groups as well.

Moreover, the decision-making process must fully accommodate the Rights and practices of Indigenous Peoples and local communities as fully as national legislation and applicable international obligations allows.

As with evaluation of possible biodiversity benefits from a candidate OECM, evaluation of the degree to which the area was equitably managed would be based either on observed outcomes (if the area based measure had been implemented before the evaluation of the area as an OECM was conducted) or likely outcomes for area-based measures not yet implemented, based on experiences with implementation of similar measures in other fisheries in similar ecosystems and socio-economic conditions.

When evaluating the equitability of outcomes from application of an area-based measure, it is thought that this property would more frequently be used to identify areas of concern for including the area an OECM, rather than using a particularly high degree of equity to strengthen an otherwise weak case. An "appropriate" degree of equity is a culturally complex construct on which consensus can be difficult to reach, whereas cases of substantial inequity of outcomes can be more readily identified (**Christie and Lewis, 2016**). Two likely types of concern about inequity of management in fisheries would be when the area-based measure:

- Disrupts traditional livelihoods and fisheries, forcing participants to relocate or to change careers without an expressed preference to make such a change (**Section 9.2**);
- Alters user access of the area in ways that concentrate benefits and impacts on different sectors of society (**Section 5.1f**).

In cases where application of an area-based measure may result in increased inequity in either of these two factors or in other ways relevant to the traditional users of the area, several options are possible, including

- Adapting the measure to avoid increasing inequity among traditional users;
- Using alternative measures that might result in no longer considering the area as an OECM;
- Applying economic instruments including offsetting or compensation for reducing the costs to those least able to bear them.

Adaptations of the measures to reduce the inequity of their outcomes will be case-specific to the particular ecosystem, fishery and community (**Shankar et al., 2018**), whereas if offsetting or compensation is a preferred approach, then there would have to be extensive consultation with the affected societal sectors, with a high degree of equity in the decision-making processes used to determine the appropriate degree of compensation or offsetting. If the governance processes developing the area-based measure to begin with preferred a measure with highly inequitable consequences, there may be scepticism that the same governance processes would produce such equity in compensation or offsetting estimates (**Ayers et al., 2018**). Consequently, in contested evaluations, this property may increase the difficulty in reaching consensus on considering the area to be an OECM and increase doubts about the future compliance with (and effectiveness of) the OECM.

#### *6.3.6 Ecologically representative and well-connected systems*

This Property of OECMs and MPAs specified in Target 11, is also included as Principle (f) in Decision 14.8, which says "*Other effective area-based conservation measures can help deliver greater representativeness and connectivity in protected area systems and thus may help address larger and pervasive threats to the components of biodiversity and ecosystem functions and services, and enhance resilience, including with regard to climate change"*. However, none of individual points in the Criteria in that Decision explicitly refers to *representativeness* or connectivity of OECMs. This dissimilarity suggests that the Property is desirable, but it is most appropriately evaluated for the *collection* of MPAs and OECMs identified in a larger geographic area, i.e. at the network scale.

The concepts of representativeness and connectedness among areas being managed with spatial tools remains a work in progress, even for MPAs (**Section 3.1 b** and **3.1 f**). Some brief considerations on connectivity are made in **Section 5.1.e**. There is no *a priori* reason to expect lessons learned from evaluating connectivity and representativeness among MPAs would not apply in a similar manner to a mixture of MPAs and OECMs or just of OECMs, although consensus among experts has not yet been reached on exactly what those lessons are (**Laffoley et al., 2017; Fraschetti et al., 2018**). Relevant factors

are generally recognized, including use of different geographic areas or habitats by different life history stages of a species, migration of species, oceanographic transport processes and spatial heterogeneity of ecosystems (**Rice et al., 2018**). However, a complete and coherent scientific basis for network planning has not yet been consolidated. These aspects of networks of spatial conservation tools remain a rapidly developing field, with papers reporting new information and insights continuing to appear. Hence any detailed guidance on best practices for evaluating representativeness and connectedness would soon be incomplete or obsolete.

In evaluating specific cases for inclusion as an OECM, however, the role of this property is the inverse of the role of "equitably managed". To the authors' knowledge, few if any MPAs have been excluded from being included in Target 11 reporting based on arguments that the MPA is not sufficiently connected or representative. However, a clear case for an area being well chosen because of its representativeness or connectivity would strengthen the case for designation of the area as an MPA **(Laffoley et al., 2017**; CBD Decision 14/8, Annex II). In evaluating a candidate OECM, it is considered unlikely that absence of reasons to expect connectivity or representativeness would justify excluding it from Target 11 reporting, if other properties on the list were strong. However, evidence for a high degree of connectivity and/ or representativeness would strengthen the evidence for inclusion of the area in Target 11 reporting, as long as other key properties were considered to be moderately well present. This approach is consistent with the absence of specific reference to the Property in the Criteria of Decision 14/8, but their inclusion in the Guiding Principles Common Characteristics that are "*applied in a flexible way and on a case-by-case basis*."[19]

#### *6.3.7 "Threats" and "Integrated into the wider …seascapes"*

The relevant criteria are: B3d (*ability to manage threats*); C1 (*Effective*); C1b (*threats are anticipated*); C1c (*mechanisms are in place*); and C1d (*integration of inside and outside*).

Criterion C includes several provisions that focus on the need not just for the OECM to be based on a measure that have the potential to be *effective* but also to make sure that external threats to biodiversity (and to effectiveness) are dealt with at the appropriate spatial scale. This means that the area-based measure addresses:

- "*Threats, existing or reasonably anticipated ones* […] *effectively by preventing, significantly reducing or eliminating them, and by restoring degraded ecosystems* (Criteria C1b);
- "*Mechanisms, such as policy frameworks and regulations, are in place to recognize and respond to new threats*" (Criteria C1c), and that
- "*To the extent relevant and possible, management inside and outside the other effective area-based conservation measure is integrated* (Criteria C1d).

Both Criteria C1b and C1c are also partially addressed in evaluation of *effectiveness* as a Property (cf. **Section 6.3.4**). However, they are placed in a more complete context by acknowledging that effectiveness can be strongly affected by how other pressures on biodiversity being managed (**Criteria C1d**). This intent is supported by the portion of Criterion B3d that requires that management has "*the ability to manage a new threat*". Together these features in the Criteria address the Target 11 Property of "*integrated into wider … seascapes* because the seascape includes: (i) the overall biodiversity (including the target species.) of the larger area considered as the "Background" (**Section 6.3.4**); (ii) the natural oceanographic and climatic drivers of dynamics in that biodiversity; and (iii) the ways that anthropogenic activities have altered and are altering that biodiversity. It is the collective managing of the individual anthropogenic

[19] Chapeau to Annex III of Decision 14/8

threats that integrates the measures used by one sector (in this case fisheries management) with the measures used by other sectors to sustain that biodiversity in the context of that natural variation (the seascape)

This property of the Target 11 language is the context required for taking into account the impacts on biodiversity of other sectoral activities in the area where fishery management is applying the area-based measure(s). It is difficult to strongly justify that an area-based measure taken in fisheries is likely to be providing incremental biodiversity benefits when other threats to biodiversity are present in the area and actively degrading key components of it, particularly those components included in the "expected biodiversity benefits" (**Section 6.3.2**). Correspondingly, the expression "*integrated into the wider seascapes*" justifies taking efforts made to take into account integrated management when evaluating areas as potential OECMs. Several relevant aspects of Criteria B and C discussed above make this justification a necessary part of the evaluation.

Approaching this aspect of evaluating candidate OECMs will be complex whenever biodiversity faces multiple threats, which is the normal situation (**Halpern et al. 2015, Piet at al. 2019**). In cases where comprehensive efforts at Marine Spatial Planning (MSP; **Section 9.8**) have been undertaken and/or an Integrated Management Plan (IMP) for the area has been adopted, usually this aspect of the evaluation can be approached in the most structured way, because all major threats to biodiversity would have been identified and responsibility for managing each one (or at least staying informed of them, in cases like climate change as a threat) would have been allocated among the participants in governance. However, the overhead in terms of time, costs, information, expertise and consultation are usually high and very little of the ocean and coasts are covered by comprehensive MSP initiatives or completed IMP. The opportunity cost of waiting for them to be completed before progressing with area-based conservation initiatives, including OECMs would be high, even if the reporting timetable allowed such lags. Consequently, when MSP and/or IMPs are established, they should be central to this component of OECM evaluation, but when they are not, other ways to address this Property and the corresponding Criteria are necessary.

The OECM Criteria place most of these considerations within sub-criteria C1c (on integration) as a component of Criteria C on *effective contribution … to biodiversity conservation*. However, processes for assessing the effectiveness of fully or even partially integrated management (both within the entire fishery sector and at cross-sectoral level) are not yet fully developed (**Cormier et al., 2019**). However, in addition to all the OECM properties discussed in the other parts of **Section 6.3,** an evaluation of fisheries measures within an integrated context would consider, *inter alia*:

- The nature and scale of other anthropogenic pressures (threat assessment)
- The information available on the potential biodiversity impacts of those pressures (scales of the potential threats);
- The measures being considered for application in the other sectors (mitigation measures);
- The information available on the effectiveness of those measures for mitigating adverse impacts on biodiversity;
- The potential for synergies or antagonistic interactions of the area-based fisheries measures with the measures being considered for mitigating the impacts of other pressures.

Possible mechanisms to evaluate the considerations above are discussed in **Section 6.4.2c**, but the desired outcomes regarding threats and integration, needed to present a coherent case for integration can be proposed. If other sectors known or believed to be impacting biodiversity are also showing efforts to manage their impacts within sustainable limits, then evaluating fishery measures within that broader context would be appropriate.

As with other parts of this evaluation, *in situ* information on the nature and magnitude of other pressures and impacts would be preferred when available. When such information is not available, literature sources can be used, taking into account the similarities of the pressures and the ecosystem in the area being evaluated. For anthropogenic threats, site-specific, or at least general local information will usually be needed with regard to what sectors are presently or soon likely to be operating. For natural threats (e.g., severe storms; marine heat pools), literature sources regarding similar areas can be appropriate. For describing the potential biodiversity impacts of each threat and the biodiversity features expected to benefit from the mitigation measures, including the spatial measure(s) being applied in the candidate OECM, both in situ and literature information should be reviewed.

The most positive outcome for evaluation of whether the OECM is "integrated into seascapes" would arise when the major sectors imposing pressures on biodiversity have implemented or are in the process of adopting and implementing measures that have been found to be generally effective at mitigating similar pressures under similar conditions, and the sectoral measures work in harmony. As an increasing number of sectors have not conducted credible assessments of the risks that their actions pose to biodiversity and/or have not commenced activities to manage those risks effectively, the positive outcome weakens.

If another sector is found to be having or likely to have serious adverse impacts on the components of biodiversity expected to benefit from the OECM, a negative outcome on this property of an OECM would be appropriate. The magnitude of that negative outcome would increase in proportion to the magnitude of the adverse impacts of the other sector. It could become a serious weakness in the OECM evaluation if the impacts of the other sectors were expected to be on the same scale or larger than the benefits to biodiversity expected from the fisheries measure. However, as with the evaluation of "*conservation*", if there is evidence that a comprehensive plan for integrated management, or at least integrated conservation efforts across sectors imposing the greatest pressures on biodiversity are seriously under development, fisheries should not be discouraged from taking the first step towards improved conservation and could receive a positive evaluation on this initiative.

These considerations may force a well-intentioned fishery to bear the opportunity cost of not receiving OECM recognition for area-based conservation measures it is willing to apply, for example where the larger marine area becomes increasingly deoxygenated due to runoff from coastal or remote land-based activities outside the control or even influence of the fisheries authorities. This is unfortunate, but a jurisdiction cannot present a credible case that biodiversity benefits are expected from an area-based conservation measure, when it is fully aware that those very components of biodiversity are being consistently degraded by another pressure and the fisheries measure is not sufficiently effective at conservation to offset that decline. However, this type of situation is an incentive to have sectoral authorities reach out to other authorities and jurisdictions to undertake more coherent and integrated planning, so perhaps the same fisheries measure could be evaluated positively when it is well-integrated into a seascape-scale plan.

In addition, the possibility of positive (synergetic) or negative (contrastive) effects of OECMs established in different economic sectors raises also possibility for the State to establish cross-sectoral OECMs merging sectoral ones were appropriate, for improved effectiveness. In such "merged" OECMs, the one-to-one relation between the management regime and the area –that exists in a single-sector OECM– disappears as the different management regimes are overlaid. This perspective implies a cross-sectoral process between the sectors concerned, with State's oversight, to harmonize the regimes applying to the area, increasing synergy and reducing conflicts.

The possibility of new anthropogenic sectors becoming active in an established OECM in the future is not a justification for a negative evaluation of this OECM with regard to "integrated into … seascapes". The

reason is that qualified OECMs will always require re-evaluation if there are major changes in the circumstances that were found to be important in the initial evaluation (see **Section 6.4.1** and **Section 8**).

## 6.4 THE ASSESSMENT PROCESS

### *6.4.1 Reviewing the evidence*

Area-based measures have been used in fisheries management for decades, and spatially-based cultural practices for centuries (**Rice et al., 2018: § 3.0**). In an initial reporting for Target 11, it could be burdensome on many governments to do a full assessment and evaluation of every area-based fisheries management measure in place to find out which ones may be OECMs or could be turned into OECMs with some adjustments. However, the evaluation focuses on instances where the area-based measure provides some level of incremental benefit to biodiversity. In many cases, such incremental benefits may be co-benefits of a measure implemented to make a fishery more sustainable relative to its primary target species, and not immediately apparent or of enough interest in the past to be assessed. Thus, the sequential nature of the Target 11 Properties and OECM Criteria in **Section 6.3** can be used in a fishery – or more effectively in a region or State– to sort out the candidate areas most likely to warrant more complete evaluations, so if resources for evaluations are limited, they can be directed at the more appropriate cases.

*a. Assessing positive biodiversity outcomes*

For any cases that are considered to warrant a full evaluation against the properties of an OECM, the actual ways to measure the many features involved in evaluating an OECM have not been discussed in depth in this report (See **Annex 2** of this document). However, since the 1980s there has been a growing body of research and guidance on methods and indicators for quantifying the usually negative ecosystem effects of fishing (e.g. on abundance, stock structure, food chain composition, benthic cover) with such effects depending heavily on types of gears and practices. In principle, the same methods used to show a negative change in biodiversity might be used to show a positive one. Therefore, unless research directly investigating robustness of these analysis methods, metrics and indictors for assessing the magnitude of benefits to biodiversity due to spatial management measures provides counter-results, using the methods typically employed in assessing ecosystem effects of fishing is considered a reasonable approach. The difference is that changes in the metrics and indicators that would be interpreted as measuring harm to biodiversity due to the fishery impacts would have an opposite sign if measuring benefits from the OECM.

Even in a full assessment, it may be possible to reach a conclusion that the case for reporting the area as an OECM would be too weak to pursue further, without necessarily completing the full evaluation. These would be cases when any of the serious flaws noted in **Section 6.3** were found to be present. The nature of the serious shortcomings should be documented, both to inform interested parties of the reasons for not considering the area an OECM and to guide management actions if the authority did want to strengthen the ability of the OECM to provide biodiversity benefits. That recording may help review the decision later if new information emerge.

For the full evaluation, the central question is how great a contribution does the OECM (and the special area-based measures in that place) make to the conservation of biodiversity. The text of Target 11 only requires that the contributions be positive and sustained.

The CBD COP guidance in Decision 14/8 interprets and augments the text of Target 11 (**Section 4**). The definition of OECM and associated Criteria indicate that the biodiversity benefits (Principle (a)) and the reduction of threats (Criteria C1) need to be significant and sustained, without further specification. For both sources of the guidance on standards to be met, the biodiversity benefits may have been intended when the measure was chosen and incorporated into the fisheries management plan or customary

practices; or unintended as co-benefits that arise from the role that the measure plays in making the fishery sustainable for its target species. However, together the guidance highlights what needs to be featured in the outcome of the evaluation: a summary of the evidence for concluding that biodiversity benefits are positive, sustained, and significant; and/or that meaningful threats to biodiversity have been reduced.

In reviewing the evidence of whether or not an area is an OECM, the "significance" of its benefits and co-benefits will be strongly influenced by the evidence examined in the sections on "*importance*" (**6.3.2**), "*conservation*" (**6.3.3**) and some aspects of "*effective*" ( **6.3.4**), and the parts of the Decision 14/8 Criteria associated with each of those sections. As discussed in those sections there are many different ways that a conservation benefit can be "significant", from being focused on priority species or habitats to broadly distributed across many ecosystem components. The degree to which the area is representative and/or part of a network of areas receiving enhanced protection is a secondary consideration in determining the level of "significance" and could be used to strengthen a case being made on the other OECM properties. A decision and justification that the standard for *positive biodiversity outcomes* is met will focus primarily on the evidence that the measure is "*effective*" and the area is "*effectively managed*" (**Section 6.3.4**). However, such positive biodiversity outcomes can be reduced by negative outcomes on the issues of equitable management (**Section 6.3.5**) and integration (**Section 6.3.7**). Conclusions about the requirement in the OECM definition that the benefits be "*sustained*" will be primarily based also on the aspects of the Criteria associated with the property "*effectively managed*" (**Section 6.3.4**) but with greater emphasis on the fact that OECMs need to be "*equitably managed*" (**Section 6.3.5**) and "*integrated*" (**Section 6.3.7**).

*b. Reducing threats*

When the justification for considering an area to be an OECM is based on reducing threats that are meaningful (as defined in **Section 6.3.2**), the evaluation of "meaningful threat" would have to take into account what aspects of biodiversity were under threat, and what natural or anthropogenic pressures posed the threats. This would again mean first considering all the factors and associated Criteria related to "*importance*" (**Section 6.3.2**) and "conservation" (**Section 6.3.3**), to identify the biodiversity features that require enhanced protection form threats. The justification would also require that some form of threat assessment has been completed, showing both that the fishery could cause serious adverse impacts on the biodiversity components of concern, and that the measures in place in the OECM had the capability to mitigate that threat (i.e. they were "*effective*", **Section 6.3.4**). Then the case that the establishment of an OECM would reduce the threats posed by the fishery would be based on the OECM being "*effectively managed*" (**Section 6.3.4**), well "integrated" with the management of other threats (**Section 6.3.7**) and might take into account aspects of being "equitably managed" (**Section 6.3.5**).

*c. Benchmarks and reference points*

In the end, there will be unavoidable scope of interpretation of whether or not an area provides sufficient incremental benefit to biodiversity to be considered an OECM. This situation is encountered for several targets, including other targets relevant to fisheries. For example, the benchmarks in Target 6 of avoiding "*serious adverse impacts*" and keeping ecosystem impacts within "*safe ecological limits*" (**Garcia and Rice 2018**) have been criticized for ambiguous meanings and lack of universal agreement on measurement methods and indicators, complicating consistent reporting and meaningful aggregation of Parties' responses at the regional or global level (**Donohue et al., 2016**).

For conventional fisheries management, reference points and benchmarks (often relative to key life history properties) play a central role in assessing sustainability of fisheries at least for the target species and sometimes more broadly (**Garcia and Rice, 2018: § 3**). Such specified reference levels become more problematic when dealing with depleted or highly vulnerable ecosystem components, or more aggregated

measures of general biodiversity (**Garcia and Rice, 2018: § 4, 5**). These complexities carry over to most OECM evaluations. For example, there are many ways that an OECM could effectively deliver significant conservation benefits. For example, an OECM could include measures that greatly reduce mortality within the OECM, for a species of high conservation priority (**Section 6.3.2**), and be considered to be an OECM, even if the incremental decrease in mortality for the full population was below a threshold for rapid and secure recovery. On the other hand, an area could contain measures that might not reduce mortality by as much on any species, and the area might not contain any severely depleted species. However, the area could still be considered an OECM making a "significant" contribution to biodiversity protection because secure benefits accrued to a range of species or a full ecological community (see considerations such as "*representativeness*" in **Section 6.3.6**).

Because of the unavoidable breadth of scope for interpretation, it is important that a coherent and integrated case being made and documented for each decision. In cases when the evaluation stops before completion of a full evaluation against all the OECM properties, some record should be made of the reason for not considering the area further. These records are valuable both for transparency when the final reports are made, and for establishing precedents to support consistency of practice over time and across cases. Undoubtedly there will be some controversies over what is and is not accepted in OECM reporting, and these records could also help develop more consistent practices as experience accumulates.

### *6.4.2 The Assessment Steps*

#### *a. Step 1: Eligibility*

Eligibility, for an ABFM, is the quality (fitness, suitability) required when the ABFM is considered for an application as a potential OECM. An initial review of all areas where ABFMs are in place (in a fishery or an EZZ, depending on the scale of the evaluation) should be sufficient to establish their eligibility, by documenting three points:

- First that the ABFM under consideration is not already designated as an MPA (**Criterion A**).
- Second the ABFM area is geographically defined (**Criteria B1b**) and some recognized governance authority exists (**Criterion B2a**). It is likely that the requirement of a legitimate governance will rarely eliminate any areas, since in general all fisheries within an EEZ are under the authority of a Ministry of the central (federal or State level) government, and decentralization or total/partial devolution of management authority to local communities is legitimate (**Section 9.7**) and recognized in **Criteria B2b and B2c**.
- Third, that special conservation measures needed to produce the biodiversity outcomes inside the ABFM area are in place or will be adopted and implemented. Inclusion of these types of measures in an FMP solely with the intent to provide benefits to some biodiversity features is happening with increasing frequency as fisheries authorities implement EAF. This may increase the opportunity and even the incentives to the sector to develop better and larger OECMs with greater conservation benefits.

Such first screenings should be quick, requiring only a small demand on expert time or resources. Because they all deal with governance aspects of the OECM such as:

- Has the area concerned been designated as an MPA?
- Has some jurisdiction been given authority to manage the area? This should normally be the case in fisheries;
- Will some area-based measures be in place?

These quick-screening are likely to be done in a single first step, by a group that includes some officials of the Party exercising jurisdiction over the area (e.g. a national or regional competent fisheries institution, along with appropriate communities in the case of Criterion B2b). Assuming that the first step produces a positive outcome, to facilitate later steps in the evaluation, this group is also likely to have appropriate knowledge to identify other major economic sectors likely to be active in the area being evaluated and inform appropriate national or regional authorities in these other sectors. Some later steps in the evaluation process will need information back from these other sectors about their activities, possible impacts and mitigation measures in place or under considerations.

*b. Step 2: Biodiversity components of concern*

For all areas passing the three requirements for eligibility, the second step should be to evaluate if the area to which the area-based measure applies contains any species or habitat types of particular concern. Species that may be of high priority (*importance*)for conservation are presented in **Section 6.3.2**, and range maps, surveys, community knowledge and catch monitoring can all provide information on the presence of any priority species in the area. For priority habitats, maps of the locations of all areas found to meet criteria for EBSAs or VMEs can be used directly as the source of information on their presence in the area where the OECM is (or will be) put in place. This case-specific evaluation should be done by an expert process with full documentation of the information reviewed.

*c. Step 3: Identification of threats*

The third step is to determine the major potential threats to the species and habitats inside the OECM area, the fishing ground or in the broader ecosystems in which the OECM is set. This step is a part of the evaluation of the "*conservation*" potential of the candidate OECM (**Section 6.3.3**). If species or habitats of high conservation priority have been found to be present in the area (Step 2), then the sources used to inform of their presence should be consulted to determine if such threat assessments of have been conducted and reviewed appropriately for the priority biodiversity features. If so, these assessments can be accepted as sufficient for the evaluation of area-based fishery measures in the area.

If no priority biodiversity features have been identified for the area, or if the area-based measure is being considered because of other possible benefits or co-benefits to biodiversity conservation, including benefits to the larger surrounding ecosystem, than an expert process should assess the potential threats that the fishery (or fisheries) to which the measure would be applied might pose to biodiversity, if the OECM was not in place. The amount of quantitative content in these threat assessments from the fishery will be dependent on the information available. The more precisely the potential threat from the fishery without the OECM can be characterized, the more fully any conservation benefits (in terms of threat and harm-reduction) can be characterized in subsequent steps. The expert process should include knowledgeable experts regarding both the fisheries of concern and the biodiversity features potentially impacted by the fishery.

Many of the threats to the biodiversity features may be of anthropogenic origin, including but not restricted, to the fishery using the OECM or potential OECM being evaluated. Although the existence and potential seriousness of threats to biodiversity (**assessed in Step 3**) can be evaluated by biodiversity experts, ways to reduce the threats to biodiversity (in subsequent steps) are very likely to have social and economic consequences, including for access to ecosystem services, employment, livelihoods, and cultures. Evaluating all these potential consequences is a necessary part of developing management plans within any sector. In such cases, the intent of **Criteria B2** on inclusive governance calls for the inclusion of appropriate experts from the other economic sectors potentially posing threats, and participants from those sectors, when deciding if and how to implement the area-based measures in each sector, and when evaluating an OECM. Such inclusiveness also lays a foundation for constructive cooperation of all perspectives in the subsequent steps in the evaluation.

In all cases, this extended expert group should also consider any other industries likely to be active in the same area, as included in the inventory prepared in **Step 1**. The threats to the relevant biodiversity features from other sectors do not need to be characterized as fully as the potential threats from the fisheries of concern. The review only needs to identify any other fisheries, industry sectors, or major environmental events that have a high enough likelihood of occurrence and magnitude of harm to the biodiversity features, that these other factors should be considered in the subsequent steps. If any such "external" threats are identified, experts on the ecosystem effects of those factors should be included in the subsequent steps in the evaluation.

Ideally, the threat identification of **Step 3** should be concluded some time before the following steps are undertaken. This would allow preparations for the subsequent evaluation steps to focus on the major threats and the ability of the OECM to mitigate them. However, this may be costly in time and meeting overhead. The assembled information could be made available to those preparing the materials for the rest of the evaluation, who would take it into account in their preparation of material. During the actual evaluation, however, the threat assessment(s) should be completed before evaluation of the potential biodiversity benefits of the area-based measure commences.

*d. Step 4: Assessing biodiversity benefits*

Step 4 is the actual evaluation of the nature, likelihood and magnitude of biodiversity benefits from the OECM. It considers the potential conservation benefits (**Section 6.3.3**) and effectiveness of the measure and its implementation (**Section 6.3.4**) and the equity of the consequences of use of the measure (**Section 6.3.5**). Relevant questions include:

- Is the OECM producing or likely to produce significant and sustained *in-situ* positive biodiversity outcomes (relevant to potential for intended benefits or co-benefits)?
- Could the OECM become more effective in providing those or additional outcomes, and if so how?
- Is the OECM likely to be implemented on the long-term, and are its outcomes likely to be sustained?
- What are the direct and indirect consequences of the OECM *in situ* (inside it), and for the fishery or local socio-ecological system? How are any potential social and economic costs and benefits being distributed among communities and economic interests affected by the measure?
- Are the expected biodiversity benefits or co-benefits likely to be negated (reduced or cancelled?) by activities of other fisheries, other industries, or other imminent changes to the environment?

These are all questions requiring expert knowledge and relevant evidence, as described throughout **Section 6.3**. The inter-relatedness of the considerations means a single meeting to evaluate simultaneously all these aspects of *Conservation, Effectiveness*, and *Equity* of the measure is typically necessary. The nature of the discussions inherent in providing credible answers to these types of questions means that experts in fisheries science and management, in conservation of biodiversity, and in the social and economic sciences all need to participate. Moreover, holders of knowledge from the relevant fisheries (and other sectors when other potential threats were identified during step three), communities, Indigenous groups and other social sectors with a stake in the outcomes should participate. Even in information-poor situations, the available evidence and expert discussion leading to the conclusions needs to be documented and made publicly available.

Where and how such "expert" meetings are conducted is the prerogative of the jurisdictional authority. There are "best practices" for assessments (**UNEP and IOC-UNESCO, 2009**), and processes generally reflecting such practices have been established widely. Examples include the International Council for the Exploration of the Sea (ICES) in Europe; the Stock Assessment Review Committee (SARC) of the National Marine Fisheries Service (NMFS) in the USA; the Canadian Science Advisory Secretariat (CSAS) in Canada).

Key success factors across the processes are: inclusiveness of participation, rigour of review, and completeness and transparency of documentation.

Full meetings of this complexity and inclusiveness often have high costs and logistical overheads and may be beyond the capacity of some jurisdictions. Less costly meetings can be held with more limited participation, to the extreme of having a small number of experts conduct a systematic review of many candidate OECMs by correspondence. The reliability, legitimacy and credibility of such more cost-cutting approaches depends greatly on the expertise and objectivity of those that are included in these more streamlined processes (**UNEP and IOC-UNESCO, 2009**), noting that credibility and legitimacy to all interests affected by an outcome of such processes is necessary for effective policy-making.

*e. Step 5: assessment of ancillary properties*

Step 5 is the evaluation of the ancillary properties of *representativeness, connectivity* (**Section 6.3.6**) and *integration* (**Section 6.3.7**) of those candidate OECMs that receive positive outcomes from Step 4. It is often efficient to conduct this evaluation at the same meeting or process that conducts Step 4, because if sufficient knowledgeable expertise has been assembled for that step, it is very likely that they will also have sufficient knowledge to evaluate these properties as well. The conservation biology experts and jurisdictional management authorities should be aware of progress on any MPA network, and the management authorities and participants from other industries of any integrated management or marine spatial planning initiatives. This part of the OECM evaluation process is just listed as a separate step because if serious concerns are raised in step four, there is little justification for proceeding with these latter aspects of the candidate OECM.

*f. Step 6: Reporting*

Step 6 is the reporting out on the assessment/identification process and its outcomes. In the cases when it is concluded that the area fails to meet the expectations for an OECM under Target 11 (and any relevant post-2020 biodiversity frameworks requiring similar information), the report would need to document the information considered (both sources and locations where it can be located for future reviews) and the key shortcomings in the evidence available. It is constructive when actions to address the shortcomings can be proposed as well.

When the conclusion of the evaluation is that the area can be considered an OECM, the justification for reaching that conclusion should be presented. In a coherent narrative. The narrative would highlight

- The primary biodiversity (and ecosystem service) outcomes expected from the area-based measure;
- The reasons why those benefits are expected to be sustained, the main threats which the measure mitigates;
- Any key enabling factors that were considered important to enhancing the effectiveness of the measure, and if any possible deterrents to the expected biodiversity benefits are identified, the factors expected to manage and mitigate them;
- The key equity considerations in terms of sectors of society and economy that would receive benefits or incur costs from the consequences of implementation of the measure;
- The major interactions and interdependencies among the above factors such that setbacks in in one property might alter the strength of support from other properties as well.
- Any conclusions regarding the network properties and integrated management aspects of the OECM.

**Box 6.1: Possible elements for the submission of a candidate-OECM to a national or regional fishery authority for decision and possible reporting to CBD/WCMC/WDPA**.

**NAME OF THE OECM**

**1. RATIONALE FOR THE CREATION OF THE OECM:** Summary on :(1) Present situation; (2) Biodiversity issues; (3) Expected biodiversity and socio-economic outcomes (including equity).

**2. GEOGRAPHICAL CHARACTERISTICS OF THE AREA**: (1) geographical coordinates and boundaries; sub-areas; (2) area covered and depth range; map;

**3. DESCRIPTION**: (1) Main physical features: geomorphology; hydrography; oceanography; others; (2) Biodiversity features: habitats, species assemblages and species of importance; relevant bio-ecological processes; (3) Natural resources and use of these resources: by fisheries and by others? (4) Ecosystem services; (5) species/habitats under threat;

**4. REGIONAL IMPORTANCE**: (1) Presence of ecosystems or habitats important for the region; (2) Presence of habitats critical for protected, endangered, threatened, endemic or emblematic species; (3) OECM on straddling or international resources/fisheries or highly migratory species; (4) Other relevant features: educational interest; scientific interest.

**5. FISHING ACTIVITIES**: inside and outside the OECM: (1) National, regional, or international fishery? Description of the nature of the fisheries (national, foreign, scale and gears); (2) Trends in fishing pressure and catches;

**6. OTHER IMPACTS**: (1) Impacts and activities within the site: exploitation of natural resources; threats to habitats and species; (2) Impacts and activities around the site: pollution; other external, natural and/or anthropogenic threats; (3) actual and expected trends.

**7. MANAGEMENT AND PROTECTION REGIME**: (1) Legal background and status: Jurisdictional boundaries; High sea; EEZ; straddling or high Sea OECM; (2) Management background; objectives; current regulatory measures; current fishery management plan (3) Legal provisions for management: Zoning; Legal competence; (4) Other legal provisions. Need/provisions for integrated management (within the sector and between sectors).

**8. PROPOSED MEASURES**: gear controls; effort controls; zoning; Monitoring, control and surveillance measures; reserve;

**9. EXPECTED OUTCOMES**. (1) Local (in the OECM) and in the surroundings (fishery, local social-ecological system); (2) in-situ biodiversity; ecosystem services (including food) and socio-economic outcomes;

**10. CONDITIONING FACTORS:** (1) Enabling factors: reasons for benefits to be sustained; cost/benefit analyses; incentives; deterrents for non-compliance ; social buy-in; (2) Limiting factors and threats: human resources; Means for MCS; (3) Main threats that the measure can mitigate and related measures; (4) interdependence and interdependencies (synergies and contrasts among factors).

**11. OTHER RELEVANT CONSIDERATIONS**

**12. CONTACT**

When the documentation for the OECM decision is complete, there are multiple target audiences for the information. The complete body of information should be made readily available to those jurisdictions and other governance processes in charge of implementation of the OECM and the special measures in it or responsible for conservation of the biodiversity properties expected to benefit from the measure, Such information should also be appropriately archived for future reference. It will also serve in the short term for guiding the review and, when necessary, enhancement of monitoring and periodic performance evaluation (**Section 7**) of the OECM, whatever authority is responsible for those tasks. It would also be the foundation for future reviews and revisions, should any key circumstances change (**Section 8**).

A second mandatory target audience is CBD and WCMC. These institutions are still in the process of developing reporting standards and formats. Although technically it is the national point of contact for CDB that has responsibility for submitting information on all the Aichi Targets, the preparation of the required information in the proper formats is likely to best be done by those directly participating in the evaluation and management processes.

A third target audience is civil society, and particularly those participating in the fisheries being affected by the measure or in conservation efforts in the area. States and agencies are adopting an increasing wide range of communications strategies and vehicles for outreach to the larger society. This Background Paper will not attempt to summarize or be prescriptive about such strategies and vehicles. Since they are so diverse, and many are culturally sensitive. But it does stress the importance of this aspect of the reporting process.

## 7. MONITORING, EVALUATION AND REPORTING (MER)

This section is about assessing the performance of the OECM through a Monitoring, Evaluation and Reporting System (MER). MER systems of some sort exist in most fisheries to assess the performance of the fishery and its management (often only indirectly) with various degrees of sophistication. Within the policy and legal frameworks, an MER system, ideally would have a strategy (outlining the high-level approach towards the goals), objectives (what to aim at, specifically), a plan (how to organize the work and the means, in space and time and across actors), and measures (what instruments can be used). The management strategy, objectives, plan and measures for the fishery are established in the formal management plan (FMP) of the fishery, if available. The MER for an OECM operating in a fishery, is necessarily a subset of the MER needed for the fishery itself, within which it must be integrated for practical and economic reasons. The objectives of the OECM-MER are necessarily a subset of those of the fishery-MER and must be related directly to the overarching objectives of the fishery in which the OECMs are established.

OECMs and their specific objectives and performance standards may be established by States in the fishery sector (and other sectors) using the voluntary guidance offered in the CBD COP Decision 14/8 (Annex III). The decision *encourages* CBD Parties to ensure that the performance of the OECMs they establish meet their stated objectives for a specified broad range of biodiversity "values" (including *in-situ* biodiversity and other values specified in the Decision). This requires the establishment of a monitoring, evaluation and reporting (MER) system at the levels of: (i) the individual OECMs; (ii) the fishery in which the OECM operates; and, possibly, the conservation network to which the OECMs may be connected.

The information provided by the MER system informs important decisions to be made for adaptive management. For example, if the OECM performance is found to meet the standards, it will be confirmed in the management plan of the fishery. If the performance appears slightly below the standards but could be improved, options for improvements may be proposed to the management authority. If the performance is found to be well below the standard implying a strategic or structural inadequacy, the OECM might be thoroughly revised (cf. **Section 8**) to restore its performance up to the standard or OECM status of the ABFM would be removed.

If the State had decided to report to CBD on OECMs as a its contribution to Target 11, the results of the recurrent evaluation of their performance should be reported to CBD and WCPA (Through WCMC) with the State's decision to maintain or withdraw the OECM in question from the Target 11 (and other post-2020 reports on that matter), depending on the outcome of the evaluation.

Understanding the extent and causes of the changes in the state of biodiversity (including management and other factors) generally requires a systematic and standardised approach to data collection, evaluation and reporting, over extended periods.

Trends in the Pressure (P) resulting from the interplay between natural or anthropogenic factors (including climate change) on in-situ biodiversity, the resultant State (S) of such biodiversity values and the management response (R) of ) (S) of the *in-situ* biodiversity is a result of the interplay between natural, anthropogenic and climate change pressures (P) and the effectiveness of the management responses (R) to mitigate these pressures[20] (**Harding and Traynor, 2003; Thomas, and Murfitt, 2011**). A fundamental purpose of monitoring programs aiming at checking the performance of OECMs, therefore, is to provide information on P, S and R, and on the understanding needed to inform and enable adaptive management (**OECD, 1993; Lindenmayer and Likens, 2010**). In the case of OECMs, monitoring, evaluation and reporting (MER) are specific to the OECM, the nature and importance of the biodiversity and other values it hosts, and of the special measures taken in it.

A fundamental characteristic of most socio-ecological marine systems is that they are complex, highly dynamic and connected. Monitoring, evaluation and reporting (MER) programs therefore, must be designed to ensure that, if a positive or negative change in the OECM conditions is detected, an assessment is undertaken that determines whether the change was caused primarily by natural variability, anthropogenic pressures (including climate changes or by the management measures in place. The results of the evaluation are fed back signal into the on-going management operations for eventual adjustments (adaptive management).

MER programs are expected to provide datasets that enable: (i) learning from past experience; (ii) improvement of service delivery; (iii) better planning and allocation of resources; and (iv) demonstration of whether management actions have resulted in the expected fisheries management and conservation outcomes. Following "good governance" principles, the results should be published as part of accountability to key stakeholders (**Hockings, 1998**; **OECD, 2004; Lindenmayer and Likens, 2010; Hatry, 2006**). As such, MER is a key component of the management strategy and plan, for measuring the OECM performance), early detection of new or changing pressures and detrimental impacts, and timely implementation of adaptive management responses (**Hockings, 1998; Lindenmayer et al., 2012**). However, for optimal efficiency, and because of the importance of the context on OECM effectiveness (See **Section 6**), the structure of each MER program needs to be elaborated case by case and fully integrated into the MER system established for the whole fishery. The latter is required because: (i) the same means may be used, providing economies of scale; and (ii) the effectiveness of the OECM depends to a great extent also on the management of the fishery outside it, and on the complementarity of the measures taken inside and outside the OECM.

Development of a functioning long-term MER program is understood to be a complex task (**Fancy, Gross and Carter, 2008**). To ensure that a MER program for an OECM is robust to uncertainty and effective in delivering timely, scientifically credible information to managers, six main activities and nine primary tasks are identified, each requiring several actions (**Table 1**). More details on the tasks are given below.

[20] usually referred as the Pressure/State/Response (PSR) or Pressure/State/Impact/Response (PSIR) framework

**Table 1. Suggested activities, tasks and actions to consider when monitoring, evaluating and reporting on OECMs performance. The list of actions does not pretend to be comprehensive**

| ACTIVITIES | KEY TASKS | ACTIONS |
|---|---|---|
| **Strategic Planning and Coordination** | **1. Define clear goals and objectives** | 1.Identify the objectives of the OECM within the FMP<br>2.Identify in-situ biodiversity and other values of importance |
| | **2. Historical understanding** | 1. Retrieve / analyse historical data sets & existing information<br>2. Review and update past status and trends analyses |
| | **3. Review of knowledge, indicators and monitoring methods** | 1.Specify OECM management targets/thresholds/outcomes<br>2.Identify threats to biodiversity values<br>3.Assess significance of threats<br>4.Determine Pressure/State/Response indicators<br>5.Describe methods and Standard Operating Procedures<br>6.Ensure stakeholder participation |
| **Monitoring and evaluation** | **4. Monitoring: spatial and temporal decisions** | 1.Establish sampling scheme (where), time (when) and periodicity<br>2.Identify other sources (non-fishery data)<br>3.Identify practical indicators<br>4.Consider budget constraints, priorities and trade-offs; |
| | **5. Evaluation** | 1.Quick and in-depth assessments at different times (costs issue)<br>2.Undertake risk assessment and management<br>3.Develop/select methods & procedures to assess achievements.<br>4.Use local knowledge as appropriate<br>5.See considerations in **Section 6** |
| **Reporting & Auditing** | **6. Reporting** | 1.Develop standard reporting procedures and formats<br>2.Report regularly on performance assessment<br>3.Make appropriate conclusions publicly available |
| | **7. Auditing** | 1.Implement periodic audits of achievements (performance) |
| **Information Management** | **8. Data & Information management** | 1.Develop data and information management frameworks<br>2.Ensure data safety and coherence /consistent time series |
| **Communication** | **9. Communication** | 1.Communication with stakeholders and the public<br>2.Adapt communication to recipients |

The **FAO (2003a)** Strategy for Improving Information on Status and Trends in Capture fisheries is a useful source of guidance regarding principles, actions, quality assurance, data security, role of States and institutions in monitoring of target fishery resources and other ecosystem considerations. The **FAO (2009d)** Technical Guidelines on Information and Knowledge Sharing may provide an even more detailed information on the sources, access and affordability, generation, recording, dissemination, and sharing (networking) of information and related constraints. Both were developed with the implementation of the CCRF in mind but are fully relevant for any monitoring system implemented in a fishery environment.

### 7.1 DEFINING CLEAR GOALS AND OBJECTIVES FOR MER

OECMs are area-based fishery management measures (ABFMs) with particular outcomes on *in-situ* biodiversity and other values. Their objectives are to contribute (with the other measures in the FMP) to the sustainability of the target resources and the fishery and to sustain or restore biodiversity values (cf.

**Section 6.3.3**). Both types of objectives relate as much to socio-economic, cultural and other locally relevant human values as they do to biodiversity. Performance on the fisheries and resources sustainability is what justifies maintaining the ABFM in operation. Performance on the biodiversity conservation objective is what justifies the maintenance of the OECM status of the ABFM (cf. **Sections 1.1; 6.3.2** and **6.3.3**).

For obvious reasons of efficiency (economies of scale), the same MER system and program will probably be used to monitor the fishery performance and that of the OECM in relation to all their objectives, so that the OECM-MER operates as a subset of the fishery-MER. However, in relation to Target 11 reporting, what is most important is the performance in relation to conservation objectives.

The goal of monitoring an OECM is therefore to ensure, *inter alia*, that its performance in relation to the conservation objectives is, and remains in the long-term, at a level consistent with the OECM standards. Its specific objectives, indicators, and benchmarks, however, are highly case-specific and depend on the state of the area in which the OECM will be established, the key biodiversity values at risk or to be enhanced, and the types of threats to be addressed. For an effective evaluation of performance, the conservation objectives need to be clearly stated in the monitoring, evaluation and reporting strategy and plans, with the related indicators and reference values. Understanding the level of additional biodiversity monitoring needed in the OECM to meet the standards is, therefore, of primary importance in setting in train subsequent decisions regarding the MER set-up and operations (see **Sections 5.1.a** and **6.4.2b**).

Due to the large requirement for MER activity, and the usual limitation on financial and human resources, the fishery-MER design should focus on delivering sufficient information for decision-making by managers, and hence be directly related to the objectives in the management plan of the fishery and the OECM (cf. **Section 1.1.1**), at the expense of delivering data for longitudinal research e.g. on ecosystem structure and function (**Field et al., 2004, 2005, 2007**). As such, the targets of the monitoring and evaluation should be related mainly to the fishing threats and impacts on biodiversity values that, within the FMP, the OECM is designed and expected to reduce through special measures applying into it. The specific objectives of the OECM-MER, therefore, need to be defined sufficiently operationally to be useful in the fishery management context (see **Sections 5.1.a** and **6.4.2b**) and sufficiently specific to evaluate the performance of the OECM and its measures. Such objectives should refer both to the key *biodiversity values* **(Principle (a) in Section 3** and **Section 5.1.a***)* as well as *cultural, spiritual, socio-economic and other locally relevant values* (**Sub-criterion D2**, **in Section 4**) that the OECM is offering to protect from fishing and then setting management objectives, strategies and targets in relation to these values, compatible inside and outside the OECM.

The in-situ biodiversity values selected for MER in a given OECM might include: (i) the species and communities targeted by the fishery; (ii) the species and communities that are ecologically related to the target species and also impacted by fishing (by-catch species; associated and dependent species in UNCLOS); (iii) the living habitats which are key structural components of the ecosystem such as macroalgae and seagrass communities, and are essential to the productivity of the target species as well as species that have special conservation status (e.g., endangered or rare species); and (iv) ecosystem services (**Sub-criterion D1, Section 4**) and properties such as *connectivity* and *representativeness* (**Principle (f)** in **Section 3**; **Section 6.3.6**).

Social values should also be included, related to the major cultural, aesthetic, recreational and economic attributes of the area (**cf. Sub-criterion D2**, **Section 4**) that were or could have been impacted by fishing in the past and could be restored, e.g.: traditional rights, taboo species, cultural rituals, sense of "community" as well as food security and support for artisanal fisheries and coastal livelihoods. Examples of the specific objectives or targets of the OECM-MER might be as follows (cf. also **Section 1.1.1**):

- In relation to the fishery and resources sustainability: (i) Provide quantitative evidence on the status and trends in the condition of a range of in-*situ* biodiversity values, their state, the pressures exerted on them, the management responses and their resulting outcomes, using suitable indicators. The contribution to it by the OECM and its measures needs to be assessed. Performance in this regard is not relevant for maintaining an OECM "status" and will not be dealt with further in this section. It is very relevant, however, for reporting under Target 6 and, more importantly, for the decision to maintain or not the ABFM in operation, and hence for the "existence" of the OECM and its positive biodiversity outcomes.
- In relation to the secondary objective of an OECM (*in-situ* biodiversity conservation), the MER might: (i) Foster improved appreciation and engagement in marine conservation issues; (ii). Provide information and data to assist other government, industry and community management programs; and (iii) To be able to report on conservation achievements and challenges to a range of local, State, National and International stakeholders and partners.
- In relation to both objectives: (i) Provide data to meet legislated audit requirements and service the need for measuring the costs and benefits of investment in OECMs, especially progress made in maintaining or improving (as required) the state of biodiversity, management performance and towards general community goals; (ii) Provide better understanding of the dynamic nature of the OECM protected system as well as a reference for comparisons with adjacent fished environments. This will assist with partitioning the effects of fishing and other pressures like global warming; (iii) Provide early warnings of critical change in pressures relative to the condition of the components of primary or secondary interest, to allow development of more timely and effective mitigation measures; (iv) Contribute data to assist in strategic planning of fishery management and biodiversity conservation; and (v) Improve fishery management and conservation capability by helping to refine thresholds and targets for management and recovery plans.

Documentation on the selected in-situ biodiversity values that can be termed Key Performance Indicators (KPI's), is needed to inform the process (**Simpson et al., 2015**) and can be prioritized for MER (cognizant of their costs and benefits) to objectively measure the overall effectiveness and efficiency of OECMs management in relation to these values. The monitoring of compliance is an important part of MER in the OECM, in connection with the Monitoring, Control and Surveillance of the fishery (MCS) .

Once the goals and objectives of relevance to the OECM and the MER have been clarified, and they have informed the characterization and definition of a sub-set of biodiversity values to monitor, then the following tasks need to be undertaken.

### 7.2 HISTORICAL UNDERSTANDING

Globally, the broad value of utilizing historical information –including paleorecords– has been highlighted for: (i) establishing ecological baselines (**Hobday, 2011; Lotze and Worm, 2009; MacKenzie and Schiedek, 2007**); (ii) understanding changes in the condition of *in-situ* biodiversity components (**Hoeksema et al., 2011; Muxika et al., 2007**; **Tittensor et al., 2010**); (iii) assessing exploitation of marine resources ((**Baumgartner et al., 1992; Rosenberg et al., 2005; MacKenzie and Myers, 2007; Ojaveer and MacKenzie, 2007; Schwerdtner, Máñez and Ferse, 2010; McClatchie et al., 2017**); and (iv) determining the nature and impact of chronic human-induced pressures like climate change recognising the usefulness of retrospective quantitative data, qualitative anecdotal evidence and modelling of change (**Eddy et al., 2010; Fowles, 2007; Pauly, 1995**). This historical information enables greater understanding of past temporal and spatial change of indicators of interest and their variance, which can be used to optimise the design of monitoring. Often data prospecting, mining, evaluation and analysis of information pedigree of information can deliver a useful indicative historical time-series.

### 7.3 REVIEW OF KNOWLEDGE, INDICATORS AND MONITORING METHODS

Identifying appropriate indicators for monitoring in-situ biodiversity values in an OECM and around it, and determining which methods are most appropriate for measuring those indicators, requires an understanding of the local conditions (in the OECM area) and of their relations with the broader ecosystem around it (including its structure and function) in order to develop conceptual models of how the system works and how it may vary through space and time (**Noss, 1990**). This, along with some knowledge of the value of different types of information for decision-making relative to their benefit/cost ratio, guides targeted monitoring to retrieve at the lowest possible cost the information most needed to inform management on critical change and available options for action.

The process of evaluating and selecting indicators from a broad range of potential options is a foundational task for any MER program (**Lindenmayer and Likens, 2010**). Generally, and within a Pressure/State/Response framework, this process uses knowledge on the functional relations between "pressures", the "state" of the biodiversity values of concern in the OECM and the fishery, and the management "responses" for indicator selection. The process needs to recognize also that, in complex systems, a given pressure (or removal of a pressure) may produce various outcomes and that a given outcome may result from various pressures or management responses (**Garcia and Charles, 2008; Garcia et al., 2009)**. Selected structural and functional indicators should, *inter alia,* be based on a sound theoretical scientific framework, clearly defined, representative, sensitive (reactive to pressures and measures), understandable by stakeholders, and repeatable (**Hunsaker and Carpenter, 1990; Hunsaker et al., 1990; Shomaker, 1997; Dale and Beyeler, 2001**). They should satisfy the local management requirements, helping to select management options and fulfil reporting requirements (**Noss, 1990; Keough and Quinn, 1991; Andersen, 1999; Pannel, 2003; Harding and Traynor, 2003; Green et al., 2011).** They should also be adapted to the local **r**esearch capacity and financial resources constraints **(Pannell and Glenn, 2000).** A cost-effective way to achieve all these requirements for good indicators and to increase stakeholders' collaboration in the collection of needed data, is to co-develop those indicators with them (**Garcia et al., 2009**)

Accordingly, a review of the knowledge available on biodiversity values and factors affecting them should be undertaken as a prerequisite to delivering on-going MER[21]. This review provides a guide to what indicators should be monitored and the tools or techniques that are best suited for their measurement considering resource constraints. The review should also yield guidance on the development of the Standard Operating Procedures (SOPs) that describe the required protocols needed to ensure long-term standardisation of data collection, processing, analysis and interpretation in relation to objectives and reference values. Such instruments should facilitate consistency in the time series and the assessments and coherence of the conclusions of the MER in the local context across time.

The knowledge review should provide guidance for systematically identifying and selecting the most relevant indicators and methods for monitoring, evaluating and reporting on biodiversity values, in the specific OECM and in the fishery and ecosystem in which it is established. With experience, generic guidelines might be developed to be adapted to specific OECMs. If the knowledge review was scientifically conducted, comprehensive, well-documented, and the information was safely recorded, it will be an invaluable asset for when the conclusions will need to be updated or the process may need to be revised.

[21] The **FAO (2018)** synthesis on impacts of climate change on fisheries and aquaculture, for example is a comprehensive source on information, globally and by regions, on climate change impacts, vulnerabilities, adaptations, current and projected threats, drivers impacts and policies, extreme events and disasters, measure that might be taken in the fisheries and aquaculture sector, etc.

### *7.3.1 Specify OECM management targets*

Management objectives identify what the of management. Objectives for the management of the fishery and for its monitoring and evaluation, have been discussed in **Sections 1.1** and **7.1**. However, in order to objectively assess the performance of an outcome-based (adaptive) management system, more specific, quantitative or qualitative, desirable states (targets) or trajectories (trends) need to be identified and agreed by key actors beforehand. Such targets help selecting relevant indicators and provide the reference values or benchmarks that management aims for (e.g. for "Pressures" and "States") and against which the achievements can be match to assess the performance of management "Responses. Because of the large differences in data available between the numerous components potentially monitored, both indicators and reference "values" and "trends" might be quantitative or qualitative (e.g. as in a "traffic-light" framework).

It must be stressed that, in general, the OECM management targets can only be a subset of and a contribution to the management targets identified for the fishery if not the fishery sector or the local ecosystem (cf. **Sections 6.3.7** and **9.8**). This implies an integration of the OECM management targets into the fishery management plan and a coordination or integration of the two monitoring systems as well as some coordination with the MPA network management if it exists.

An example of a management target for benthic communities in an OECM that might previously have been impacted by deep set net fisheries could be: "No Net Loss or recovery (net Gain) of coral community biomass (or extension) and/or diversity as a result of fishing in the OECM". The wording and concepts are consistent with the largely accepted Biodiversity Impact Mitigation hierarchy (**BBOP, 2012; ten Kate and Crowe, 2014)**. For non-target or threatened species that could move in and out of the OECM, the objective might be: "No Net Loss or Net Gain of biomass of the species (that is recovery to at least the level at which Significant Adverse Impact (SAI) do not occur, within the OECM and/or in the fishing ground". The effectiveness of OECMs in such case would be enhanced significantly if the OECMs were coordinated in a network, complementary to the MPA network. Such an objective would make sense for species with limited movement in and out of the OECM. It would not be practical for highly migratory species (e.g., tunas and tuna-like fish, marine mammals, turtles). In both cases, the impact of the fishery outside the OECM or the synergy of measures taken inside and outside the OECM would be important to consider by the MER system.

Such wordings are consistent with the fishery management responsibilities within the OECM and the broader fishery and ecosystem within which the OECM is established. In the examples, the terms "biomass" and "diversity" are used generically but for the OECM, more specific structural and functional indicators might be developed through the knowledge review and as better data is collected. For example, structural indicators, for coral communities, could include live cover, diversity, composition and size-frequency while examples of functional indicators could be recruitment, growth, survival and calcification rate. Many of these indicators could be monitored using remotely sensed imagery mixed with some *in-situ* photo or video transects (also see **Green et al., 2011**) using divers and increasingly Remotely Operated Vehicles (ROVs) or airborne or underwater drones (e.g. https://earth.stanford.edu/news/mapping-coral-reefs-drones#gs.4b9eqm).

### *7.3.2 Identify threats to biodiversity values and their significance*

In Decision 14/8, *Threats* are referred to abundantly. *Pressures* are referred only once, in reference to pressures emerging from threats, and *risk* is mentioned twice, always in the context of *risk reduction.*

Dictionaries (e.g. Webster Dictionaries on line) distinguish pressures (on-going forces) from threats (incumbent forces) and risk is the cost, the damage resulting from on-going pressures and/or incumbent threats. The terms "pressure" and "threat" have been used somewhat interchangeably as distinctions are

not always that easy. For example, an ongoing fishery is a pressure, by definition. But if it is not conducted responsibly or/and is illegal, unregulated and unreported (IUU) then it is a threat to sustainability. Similarly, on-going land-based pollution may be an ongoing pressure on coastal OECMs while tankers wreckage and related oil spills are threats. From the same perspective the human-induced global change is both a global "pressure" ongoing already for decades and a threat as the pressure continues to increase creating imperfectly known "risks".

In the Decision 14/8, all pressures, actual or potential, that might impact biodiversity values and OECM's effectiveness are referred to as "threats" (cf. **Sections 5.1k; 6.3.7; 6.4b; 6.4c**). Such threats could be natural or man-induced, internal or external:

- Internal threats to the OECM are those originating from within the fishery in which the OECM is established whether operating inside or around the OECM (e.g. destructive practices, bycatch of threatened species, damage to vulnerable habitats). They may also emerge from other fisheries in or around the OECM outside the OECM, if their practices and impacts are incompatible with the OECM objective. In both situations, the issues can be dealt with within the fishery sector by the mandated sector authority, optimizing the various management plans, dealing with trade-offs between fisheries. The overall objective might be to optimize the total biodiversity benefits and co-benefits
- External threats originate from outside the fishery sector, either from within the EEZ or from outside it. Threats from within the EEZ (e.g. cross-sectoral conflicts between navigation and fisheries biodiversity interests; land-based pollution) can be dealt with through governmental authority and facilitation of inter-sectoral negotiations. Threats from outside the EEZ (e.g. whether transboundary (between EEZs), straddling (between EEZs and the High Sea) or global (like climate change) require international collaboration mechanisms.

External threats cannot be dealt with in any detail in here but the minimum for an OECM-MER would be to acquire the information about such threats, undertake some assessment of their likely impact on the OECM and more broadly on the biodiversity of the area, and inform the authority of the possible consequences (risks) and responses (in terms of risk reduction, impact mitigation, and adaptation). An active collaboration with the environmental authorities on these threats would certainly be advisable.

The MER team should review the known natural and anthropogenic threats (including climate change) that significantly impact in-situ biodiversity values in worldwide, in comparable ecosystems and may impact the specific fishing ground and OECM. The team should apply this 'global' understanding to identify the pressures considered to (i) have occurred, (ii) be occurring, or (iii) likely to occur in the foreseeable future, on the OECM e.g., over the next 10 years. A foresight of 10 years is chosen here as this represents a reasonable time for a forecast to be made with existing knowledge and it aligns well with major review periods in a fishery management and conservation management contexts. This review of threats is required to ensure that: (1) all pressures known (or susceptible) to impact on the expected biodiversity values of the OECM and surrounding areas, are considered within the assessment process; and (2) only that subset of the 'global' threats are included in the monitoring plans and considered in the evaluation (e.g. in a section on "risks").

Within a review of knowledge, pressures and threats are only assessed to be *significan*t (or potentially *significant*) if evidence indicates they are known to have occurred, are occurring (or are likely to occur) in the local context and are documented have (or there is evidence to believe that they may have) a 'significant impact' on biodiversity values. The concept of Significant Adverse Impact (cf. **Section 51j**) referred to in Aichi Target 6 is a good example, referring, in fisheries, to the negative impact of fishing on

the reproductive capacity of the resources and to the degradation of critical, essential, of vulnerable habitats.

The pressures assessed as *significant* should be monitored by the MER as a priority and included in the initial design of the MER program with the required implementation means. Such pressures should also require priority action in the fishery and OECM management plan. The pressures assessed as *potentially significant* might benefit from a light (precautionary) element of the MER aiming to better this conclusion, particularly if the evaluation was conducted with limited data. Pressures assessed as *not significant* should get the least attention in the design of the MER until more information from other sources (e.g. academic work) indicate a need to modify the judgement.

It might be stressed that <u>all</u> pressures indicated as important by the stakeholders need to be listed and examined for <u>significance</u>. All the conclusions on all of them, should be archived with the data and the reasoning supporting them, for future reference. Those conclusions may be re-assessed if evidence emerge, e.g., of changes in the pressures, methodology, understanding of the relation between the P, S, and R features; or a different appreciation of the risks level (see **Section 7.6**).

### *7.3.3 <u>Identify indicators of Pressure, State and Response</u>*

Considering the OECM and surrounding fishery system within a simple Pressure/State/Response (PSR) framework, a change in the pressures (P) exerted for example by fishing, affect the States (S) of key biodiversity values, provoking eventually some management Responses (R). If we assume that we have a good enough understanding of the structural and functional relations between the (Ps), the (Ss) and the (Rs), indicators of these features would be sufficient to monitor the condition and trends in the fishery and the OECMs located in it. As there may be more than one indicator for each feature, a selection will be needed related to their usefulness, cost and implementation practicality in the local capacity context.

Cross-tabulation of Ps, Ss, and Rs of relevance and their potentially available indicators allows the OECM manager to select one or more versatile indicator(s) that are responsive to changes across many of the recognised PSR features offering value for monitoring. They could otherwise or also select more specialized indicators, even those that only provide signal on a specific pressure, if, for example they relate to a 'significant' feature for which there no alternative. A suite of suitable indicators are then developed from a number of scientific and practical (institutional) criteria such as : responsiveness and sensitivity to a range of pressures (i.e. power); routine use in related fishery controls; measurability; cost; resolution for cross-OECM applicability; simplicity of the indicator elaboration pathway; clarity in the relation between the indicator and the feature; easy communication to stakeholders (**OECD, 1993; Breckinridge et al., 1995; Walker and Reuter, 1996; Niemeijer and de Groot, 2008; Dale and Beyeler, 2001; Feld et al., 2010; Parks, Canada 2011; Pannell and Glenn, 2000**).

The problem with the approach is that, in complex social-ecological systems like fisheries, a causing factor may have many consequences, foreseeable or not, and any given consequence may stem from many interacting causes, know or not (**Garcia and Charles, 2009**).This reality complicates substantially the cause-effect relationships between P, S and R and increases the level of uncertainty inherent to the evaluation and decision-making processes. This, in turn, calls for higher levels of precaution in decision and for the use of comprehensive ecosystem models, the use of which at operational level has been increasing in the context of EAF (**Plagànyi, 2007; Collie et al., 2014; Fulton et al., 2015**). Fortunately, there is also good literature indicating that despite the recognized complexity of social-ecological systems the use of indicators, indispensable in data- and capacity-limited situations, remains practicable and sufficiently reliable in many cases to recognize significant shifts in biodiversity values(**Fulton, Smith and Punt, 2005; Trenkel, Rochet and Mesnil, 2007; MacKinson, Heymans and Raid, 2010; Shin et al., 2010). Smith et al. (2007)** provide a short but useful review of the possible approaches, using both qualitative

and quantitative methods, modelling and indicators, data and expert opinion, in the frameworks of Management Strategy Evaluations (MSE) to evaluate broader ecosystem-based fishery management strategies, the development of new approaches for ecological risk assessment for the effects of fishing (ERAEF) and the development a Harvest Strategy Framework (HSF) derived from the more conventional Harvest Control Rules (HCRs) used conventionally for fishery target species.

**a. Indicators of fishing "Pressure"**

When the "pressures" refer to the general fishing pressure *sensu lato*, the conventional indicators used in stock assessment and fisheries may be used. These may refer to fishing effort, expressed in various fishery-dependent ways (e.g., days at sea; Number of fishing trips; Hours trawled; total length of nets used; fuel consumption; ); fishing intensity (effort per unit-area); fishing capacity (e.g., in gross tonnage; number of vessels; storage hull capacity; total horse power); or fishing mortality (more precise, but species-specific and not always well related to the other indicators). For specific OECMs, the measure of pressure can usually be established more precisely, based on the nature of the conservation value at stake. Total area trawled, relative to total area of the habitat might be an index of impact on the bottom. Catch (and bycatch), alone, are not stable indicators of pressure as they may not evolve linearly with fishing pressure and may be affected by management decisions.

The reference values (e.g., maximum pressure authorized) are specific to the fishery and the biodiversity value of concern (and the state of such value relative to its safe biological limit). There is not yet any agreed measurement of "overall" fishing pressure or any objective guide to limit such pressure, a role played by the MSY concept for target species, but proposals are increasing (e.g. **Murawski, 2000; Coll et.al., 2008; Libralato et al., 2008**). The concept of '*health of ecosystem*' is referred to in Decision 14/8 (**Criteria C4b**) but has no agreed reference level. The related concept of (or *Safe Ecological Limit (SEL)* is referred to in Target 6 and has been reviewed by **Garcia and Rice (2019)** but is also not yet operational (cf. **Section 5.1i)**

For external threats and pressures on the OECM, susceptible to impact or already impacting OECMs, data and indicators will come from other sectors (navigation, tourism, etc.), from the authorities in charge of the environment or global data bases (e.g. on climate change).

**b. Indicators of "state" of biodiversity values**

For non-target species, indicators like those used for target species may be used if available, e.g. biomass, abundance, age structure, spawning-stock potential, average size relative to maturation size at maturity. Such data may be fishery-dependent (e.g. provided by fishery statistics or on-board observers) or collected through dedicated scientific surveys (e.g. trawl, acoustic or virtual surveys, airborne of underwater drones). In terms of reference points, a limit might be the equivalent of Biomass at MSY, that is the biomass at which natural productivity (P/B) is the highest. Otherwise both UNCLOS and the CBD call for avoiding Significant Adverse Impacts (SAIs; cf. **Section 5.1j**) on reproductive potential. Consequently , any indicator of spawning potential considered as a safe biological limit would be fine. Relative trends (e.g. in bycatch of protected species) could also be useful.

For habitats, the proportion of the total habitat in the fishing ground, or in the ecosystem, that is protected by the OECM, may be relevant. In terms of reference value, there is no general agreement on what proportion of protected habitat would be sufficient. Reducing the rate of loss compared to the counter-factual (reduced net loss), avoiding further degradation (no net loss), or restoring some of the degraded habitat (Net gain) could be considered.

**c. Indicators of management "Response"**

The “responses” of the management system to changes in “state” and/or “pressures” produce benefits (e.g., in terms of biomass and yield) as well as cost, to the public sector in change of management, and, generally also to the sector which activity is constrained. Two management responses may need to be considered: (i) in the OECM; (ii) in the fishery. After all, an OECM is a special type of ABFM and what matters is primarily, the whole fishery’s sustainability, hence the spill-over of the OECM for the target stock. The same might be true for non-resident species of the OECM that may move in and out of it. It would make little sense to prohibit a given gear inside the OECM, to protect turtles, for example, to kill them in the neighbouring fishery. The management response would need to be integrated on both sides of the OECM boundary, e.g., imposing turtle-excluder devices and other economic disincentives in the fishery, to complement the gear prohibition in the OECM. Such intra-sectoral integration is provided for in the OECM Criterion C1d. Similarly, to be effective, response against IUU need to be integrated at the fishery and at national level, at least.

Measures taken for protection on the OECM (and the coordinated ones outside it) would be good indication of the OECM intent to be confirmed though implementation: for examples: gear prohibitions, economic incentives, fish refugia, integral reserves, overall reduction of capacity, adoption of a formal habitat restoration plan, improved Monitoring, control and surveillance (MCS).

Higher expenditures in Monitoring, Evaluation and reporting (MER) programmes would also provide a positive signal, for example to improve: (i) available human resources; (ii) education and communication; (iii) stakeholders’ participation; (iv) management interventions; and (v) research.

#### *7.3.4 Identify appropriate MER methods*

The Decision 14/8 does not provide any guidance on methodology and rightly so. There are numerous methods to measure the “state” of biodiversity values, the “pressures” exerted on them and the management responses to both. Many of these have been scientifically validated, field-tested and are in current use worldwide in fisheries and conservation arenas, as evidenced in the scientific literature. When measuring the same indicator, all methods may not give the same answer and each of them may react differently to uncertainty. Consequently, in the interest of getting consistent and comparable time-series trends for assessment of change, it is important to maintain a standard sampling strategy and assessment methods to minimise variations in the ‘signal’ that can arise from changes in assessment protocols (included in Standard Operating Procedures, SOPs) (cf. **Section 7.3**). And the action of data collection (where, when (day, year) practicalities of monitoring – see **Table 2**).

Selecting the appropriate method in the context of an individual OECM will involve comparison across a number of choices and the selection of the most appropriate ones based on scientific and practical considerations including: (i)) the biodiversity values of importance in the OECM and the specific MER’s objectives, in line with the objectives of the fishery management plan; (ii) the type, quantity and quality of data and information available; (iii) the indicators selected as suggested in **Section 7.3.3**; (iv) the robustness of the method to known and foreseeable uncertainties; (v) the time, the scientific capacity, and the financial resources available; Historical precedence may also influence the decision, i.e. whether the method been routinely used in this fishery and elsewhere.

The potential tool box is too rich to be opened here but, as indicated in the introduction to this section, description and analyses about models and methods that might be used can be found in the literature, e.g.). (**Fulton, Smith and Punt, 2005; Trenkel, Rochet and Mesnil, 2007; Smith et al., 2007; Plagànyi, 2007; MacKinson, Heymans and Raid, 2010; Shin et al., 2010; Collie et al., 2014; Fulton et al., 2015).** Assuming that the scientific capacity needed to use it is available, the Management Strategy Evaluation (MSE) process used in advanced fisheries management programmes, modified to deal with broader

biodiversity values (**Smith at al., 2007**) could be used test the robustness of a Standard Operating Protocol (SOPs) to uncertainties in data, assessment methods and decision processes.

### 7.4 SPATIAL AND TEMPORAL DECISIONS FOR MONITORING

While **Sections 7.1 to 7.3** refer to "strategic" tasks, this section is of a more "tactical". Once P, S and R indicators have been defined, and methods for their collection have been selected, a process of determining the spatial and temporal characteristics for the monitoring programme is required, in connection with –and as a subset of– the MER of the whole fishery. Fishery-dependent data (outside the OECM and inside it, if any fishing is allowed) will be collected as usual, through statistical recording, log-books, on-board observers, etc. and may provide a continuous flow of data. Collection of fishery-independent data, e.g. regarding benthos, visual information, etc. requires the establishment of monitoring sites based on historical information (**Section 7.2**) or initial exploratory surveys. These should provide a baseline or benchmark for measuring changes.

The optimal periodicity of the iterative re-sampling needed to collect new information and create a time-series will depend on the speed at which change is expected on each biodiversity value (very low for some habitats but quite fast for high turn-over species) as well as on the budget available. Noting that a large proportion of the costs for monitoring are related to the spatial and temporal sampling design and frequency, sampling programs need to be optimised accounting for the requirements of each biodiversity value (**Jameson, 1986**) while considering ways of increasing precision, reducing or removing bias, and ensuring sufficient detection rates (**Ward et al., 1979, Seavy and Reynolds, 2007**).

Information collected in nearby MPAs (if well monitored) might help optimizing the sampling plan in the OECM and in assessing representativeness and connectivity (see also **Section 6.3.6**). Some information will also be needed on the fishing ground around the OECM to measure not only its performance inside the boundary but in the whole fishery or local ecosystem.

1. To establish an effective and efficient monitoring design, the following spatial and temporal aspects of sampling design need to be considered (**Table 2**):Where to establish sites and how broadly to sample?
2. When to collect information: Does timing influence monitoring records?
3. How often to collect information? What frequency of sampling through time optimises understanding of change?

Decisions of where, when and how often to sample should consider the inherent nature of the biodiversity values of relevance (directly related to the objectives of the OECM (**Section 7.1**) and the scales at which natural, anthropogenic and climate change pressures are acting (**Underwood 1992; Morrissey et al. 1992**). The question of deciding sampling frequency is multifactorial (**see Table 2**), as it needs to consider the 'default' plan for sampling frequency (i.e. the one adopted initially, with limited information), and go through a risk assessment process to decide subsequent levels of sampling (**Figure 2**). Sampling initially delivered against 'default' timescales decided at the onset of sampling can be revised as the need for updated information becomes more or less urgent.

MER programs require an orderly system for deciding on the spatial and temporal scales of monitoring. Dealing with questions of 'where', 'when' and 'how frequently' to monitor, for a broad range of in-situ "biodiversity values" is a challenge for active decision making that needs to consider available resources (**Table 2**).

**Table 2. Suggested points to consider when planning 'where' (sampling sites), 'when' (sampling time) and 'how frequently' to monitor.**

| | POINTS TO CONSIDER |
|---|---|
| **1. WHERE** | |
| **1.1** | Are sites placed where environmental conditions are similar, and environments adequately represented across the range of sampling? |
| **1.2** | Is the site in a place where the metric of interest is plentiful or has the potential to be plentiful? |
| **1.3** | Are sites/samples well replicated and spatially independent? |
| **1.4** | Are sites placed across differing levels of anthropogenic pressures? |
| **1.5** | Is it possible to locate sites in areas that have relevant historical records? |
| **2. WHEN** | |
| **2.1** | **Time of the day**: What endogenous (activity and movement) and exogenous (light and tides) influences affect the precision and repeatability of measures across 24-hour periods? |
| **2.2** | **Time of the year:** What endogenous (migrations, reproductive cycles and shifts in demography) and exogenous (environmental pressures) influences affect the precision and repeatability of measures across seasonal and annual cycles?<br>Are these intra-annual factors regular or asynchronous, short term or sustained? |
| **3. HOW OFTEN** | |
| **3.1** | Do inherent life history traits characterise the rate of change of relevant values?<br>Is the frequency and intensity of pressures understood across the values range? |
| **3.2** | Will the feedback of information to management be timely enough for a management response |
| **4. LOGISTICS** | |
| **4.1** | Are there constraints to access, resources, capacity and occupation, health and safety (OHS) requirements that need to be considered that will influence spatial and temporal decisions for sampling?<br>With multiple biodiversity values to monitor, is there scope to share sampling sites and timings across values and pressures of interest? |

In the absence of historical data on the distribution and variation of the biodiversity values of interest that can be used to indicate appropriate sampling regimes, it is recommended that spatial and temporal sampling be designed, first, to minimise variance associated with known natural processes (e.g. away from flooding river mouths, exposure to storm surges and cognizant of daily and seasonal cycles). This first setting is referred to in the following sections as the "default" setting.

To understand and inform management of the impacts of human activity, sampling should target areas of both low and high anthropogenic pressures in order to link change in condition indicators to recognised pressures.

To minimise operational field costs monitoring sites should also be located to maximise collection of information relevant to multiple biodiversity values and pressures. This would also help checking correlations between "pressures" and "states", remembering, however that, in the ocean, more than on land, changes in "states" may result from remote "pressures" and be delayed in time, that can reduce the efficiency of simultaneous sampling (**Garcia and Charles, 2009**).

Because of the uncertainties involved, MER programs should be adaptive, allowing for adjustments of the sampling design information and understanding builds up (**Figure 2**), cognisant of the need to avoid introducing distortions in trends. Collaboration and standardization of data collection and assessment

protocols with teams monitoring neighbouring MPAs and other fisheries will be essential to pool data and assess connectivity and representativeness within overall conservation setting.

| | 1 - BASIC | | 2 - STANDARD | | 3 - INVESTIGATIVE | |
|---|---|---|---|---|---|---|
| | Assess for changes in S or P using simple methods | | Assess P, S and R trends using methods outlined in the knowledge reviews | | Get comprehensive S and R records to respond to critical changes identified in 1 & 2 | |
| Agent | Community MER | Fishery and government agencies | Fishery and government agencies | Fishery and government agencies | Fishery | Specialist team |
| Data | Qualitative and semi quantitative data | Semi quantitative and quantitative data | Quantitative data | Quantitative data | Quantitative data | Quantitative data |
| Frequency | Opportunistic and intermittent sampling | Intermittent and in response to anecdotal reports | Establishment of sites, then default schedule | Default schedule, but with flexibility to be responsive | Targeted sampling period | Targeted sampling period |
| Scope | Broad spatial scales | Broad spatial scales and scope | All sites & indicators | All or subset of sites & indicators | Subset of fixed sites & indicators | Unlimited |

**Figure 2: Possible adaptive steps in MER. Basic, Standard and Investigative are three levels of monitoring intensity that OECM managers can use depending on the evolution of the "State" of biodiversity values and Pressures exerted on them and the potential risk from these changes. Note that even within a monitoring level (1, 2 or 3), the monitoring intensity can be adapted (e.g. number of indicators considered and sites assessed) to respond efficiently as well as effectively to issues emerging during the evaluation (adaptive design)**.

Because of the uncertainties involved, MER programs should be adaptive, allowing for adjustments of the sampling design as information is received and understanding builds up (**Figure 2**), cognisant of the need to avoid introducing distortions in trends. Collaboration and standardization of data collection and assessment protocols with teams monitoring neighbouring MPAs and other fisheries will be essential to pool data and assess connectivity and representativity within overall conservation setting. Moreover, unless fishing is the only anthropogenic pressure being exerted in the area, any biodiversity monitoring incremental to surveys of target fish stocks should be coordinated with the monitoring of these other sectors, to minimize redundancies and maximize ability to capture status and trends of the key biodiversity features in the wider area (see **Section 6.3.2** ), that are likely to be of concern to all sectors operating the same area, even if their potential impacts on those features differ.

There are several expert guidance documents available (**Annex xx**) that can inform the design of basic sampling regimes. As the number of fishery and biodiversity outcomes reflected in the suite of objectives of an OECM increases, the likelihood that they can all be monitored with comparable accuracy and precision drops off quickly. Consequently, compromises would have to be made taking into account, *inter alia*:

- The fishery and biodiversity features of most importance to judging performance of the OECM at delivering conservation outcomes (status of threatened species, vulnerable ecosystems , general biodiversity community metrics, etc as well as main target species, particularly in multispecies fisheries)

- The availability of information on status and trends of these features in the "background" outside the OECM. It would impossible to attribute either positive or negative trends on any biological features specifically to the OECM, unless there was information about the status and trends on the same features in otherwise comparable areas where the OECM was not in place (**Section 6.4**). Consequently, if the features were not being monitored outside the OECM, allocation of resources for MER would have to be invested on much large sampling scales than solely the OECM area.
- The fact that, as with all monitoring, the optimal design should account for the variance inherent in the properties being monitored and the size of the difference that the sampling results is expected to detect. As a rule of thumb, for the tests of achievement of the objectives to be robust, the sampling density must be high enough that the signal-to-noise ratio in the accuracy and particularly the precision of sampling has to be about half the size of the difference to be detected. This necessary "power" of the MER may present multiple dilemmas for the design of the programme. For the expected differences in the management outcomes due to the performance of the OECM to be larger than the sampling noise, it may be necessary to have the OECM benefits accrue for several years or even decades before such differences become statistically significant. In such cases, the support within the sector for an OECM with provisions considered restrictive may diminish as impatience with the lack of demonstrable benefits grows. Potential partial solutions could include: (i) an intensification of sampling, which would require expanded resources for MER, (ii) sampling fewer biodiversity and fishery variables with more targeted effort, which would reduce the robustness of the evaluation, or simply (iii) more patience from all perspectives for reliable evidence on the performance of the OECM.

Managers may modify the fishery and conservation provisions within the OECM for many reasons. However, for the modifications to be considered as "adaptive responses", they need to be well informed by reliable or sustained feedback from the MER program.

Regardless of the sampling design, it is possible that evidence will emerge of increasingly rapid changes in the fishery or biodiversity features, or that information comes available from outside the MER monitoring program, that some anthropogenic or natural pressure on the OECM is changing, intensifying the concern for some biodiversity values. In such cases additional MER efforts targeted at the unexpectedly changing pressures and at the biodiversity features most likely to be threatened by such changes may be warranted may be warranted, even if just to isolate that change from the potential fishery-based pressure. However, these should not come at the cost of abandoning the monitoring program, or weakening it to the point that it would lose the power to measure the OECM performance.

In order to optimize sampling frequency, monitoring should be responsive to change in individual indicators and their trends that are likely to differ for r or K selected species (**Zhou, 1996; Nelson and Ward, 1981; Field et al., 2005; Wolfe et al., 1987**), adopt a risk assessment and ranking approach to scale MER responses (**Bottrill et al., 2008; Barrington et al., 2014**) and cease the monitoring if objectives are shown to be unobtainable or achieved (**Gerber et al., 2005, Chades et al., 2008; Pannell and Glenn, 2000**).

For institutional delivery, the spatial and temporal sampling scheme needs to account for cost and practicality and to provide timely information on deleterious change to allow the responsive implementation of adaptive management interventions.

This builds on the foundations of well-defined MER objectives and agreements between managers and scientists that define the requirement for detecting change (**Mapstone, 1995**) and the importance of identifying thresholds about "state" or "pressure" that act as triggers for management action (**Caddy and Mahon, 1995; Morrison, 2008; Nie and Schultz, 2012; McClanahan et al., 2011**).

### 7.5 EVALUATION OF EFFECTIVENESS AND EFFICIENCY

The purpose of an optimal MER is to assess correctly the performance of the OECM and its special measures, in relation to the biodiversity values of relevance, inside the OECM itself as well as more in the surrounding fishery and local ecosystem (cf. **Section 7.1**). The effectiveness of the fishery management system is reflected by the extent to which the management targets are reached. Its efficiency relates to the ability of the system to use the most cost-effective strategy possible to reach those objectives. Many factors may affect these properties but the effectiveness and efficiency of the MER itself –a key instrument within the management plan is an important one.

The MER effectiveness relates to its ability to reach its own objectives (cf. **Section 7.1**) and targets (cf. **Section 7.3.1**); the quality of the assessments (cf. **Sections 7.3** and **7.4**) including their relevance and timeliness. It depends *inter alia* on accuracy of its data-collection system and the quality of the assessments. The MER efficiency relates to its benefit/cost ratio and the ways the means available are used to reach its assigned objectives at the least possible cost. The ratio may be optimized increasing the benefits (optimizing sampling and assessments) and reducing the costs (improving methodology and processes; optimizing the frequency with which the information needs to be updated).

Effectiveness and efficiency of an OECM should be assessed at two levels: (1) at the local level, inside the OECM, where the performance of maintaining or restoring biodiversity values need to be assessed to confirm the "status" of OECM; and (2) at the level of the entire fishery (and/or local ecosystem) where the performance on the biodiversity values of concern, resulting from both the OECM and the other fishery measures applying around it he entire fishery system needs to be assessed and improved if needed, for adaptive management.

The overall performance of the management system in terms of effectiveness and efficiency may be determined via assessments of the interaction between pressure (P), state (S) and management (M) trends. Four theoretical cases are illustrated in **Figure 3** (from left to right columns):

1. The state declines markedly, and its changes are well correlated with those of the pressure, indicating that the MER might have identified the right cause-effect relationship. The management response is rapid, strong and accompanied by a decrease in the "pressure" with a resultant improvement in state. Following recovery, the management response is progressively relaxed. The system appears reactive and adaptive (adjusting response to state and pressure) and both effective (in achieving the objective) and efficient (fine-tuning the management response as the state and pressure evolved).
2. The state is above the safe limit. The pressure is low and seems to decrease in response to management response. The response reacts to these small oscillations in state and pressure, implementing management actions that may come at high cost and are maintained despite their little effect on ether state or pressure. The system appears effective but the over-reaction and lack of adaptation result in high cost for the sector and the management and indicate low efficiency.
3. The state decreases rapidly while the pressure increases, indicating that the correct pressure and status indicators have been identified (the correlation seems evident). Nonetheless, there is no management response. The system appears non-reactive and therefore is ineffective. Due to the low costs for management responses, this can be considered efficient in the short term although in reality it is likely inefficient in the long term considering the likely costs if inaction to the sector.
4. In this last case, both pressure and state are low and practically trendless, implying that the cause-effect relationship between the two is not evident. Nonetheless, a large input is on-going in

management response with oscillations in strength (and cost) without any visible impact on either state or pressure. The system is ineffective. In the absence of changes, the large ongoing investment in a management response indicates an inefficient use of resources.

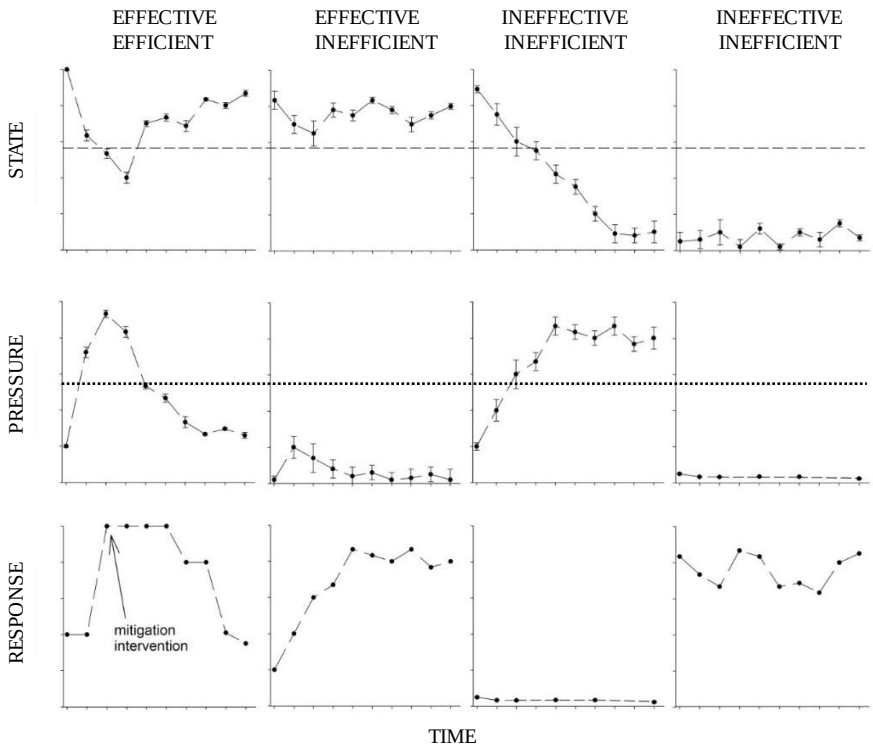


**Figure 3. Management performance: Four possible time-series scenarios of Pressure, State and management Response, considering both effectiveness and efficiency. The thresholds related to the safe value for *in-situ* biodiversity (dashed line) and the upper tolerable limit for the pressure (dotted line) are shown.**

The effectiveness of the MER is fundamental for that of the fishery management system e.g., in ensuring: (i) the quality of the data and information sampling system; (ii) the quality of the assessments in the identification of the key P, S and R, variables and indicators and of the cause-effect relationships between them as well as in the interpretation of the observations and translation of conclusions into operational options for decision.

The efficiency of the MER within its limited budget requires optimizing: (i) The cost of the observation system, sampling scheme, technology used, data processing, and information management; and (ii) The frequency at which assessments and reports are updated. This second point depends theoretically on how the variables observed by the MER change (type, frequency and amplitude of change; signal/noise ratio, etc.), which unfortunately is highly variable-specific. Pragmatically, report frequency will be related to the frequency of the management plan revisions (annual or multi-annual) for which MER conclusions are needed (see **Section 7.6**).

### 7.6 REPORTING ON OECMS IN THE FISHERY CONTEXT

Reports written by the MER programme for the fishery managers should summarize the implementation and provide the information needed to show; (i) how far the objectives assigned to the MER were reached;

(ii) how the "state" of the various biodiversity values of concern, in the OECM and the fishery, have evolved under current "pressures" and management response. Such reports should show whether the fishery, biodiversity conservation and social objectives assigned for the OECM (within those assigned to the entire fishery) have been achieved? If not, why? And what are the options available to correct the situation. This information might constitute a subset of the report on the performance of the whole fishery management system but should also be able to inform an eventual report to the CBD on the OECM performance and implementation of biodiversity Targets.

The MER reports are intended for consideration by the management authority. Complemented as needed by other analyses, e.g., on specific social and economic issues, they should inform decision-making and facilitate the adaptation of the management plan of the fishery and the OECM, instituting an effective adaptive management system. The frequency of the reports (and the updating of information and assessments) should be related to that of the revisions of the management plan which can be annual or, increasingly, multi-annual –for reasons related to management costs and sector operations stability. The reports for the auditing institutions may be more comprehensive than those destinated to the regular information of the management authority or even the public (e.g., on the fishery management website.

Communicating to the wider audience the content of the MER report that can be made publicly available is considered good practice.

The reports to the CBD (for matters related to Target 11 and successor targets in SDGs, etc.) and to WCPA (for registration in the database of OECMs), will be sent by the State Party to the CBD, not any other sectoral agency. The exact structure and information content of this report might be further specified in some CBD guidance with advice from WCMC and WCPA.

### 7.7 AUDITING

Creating a process or an institution in charge of auditing the processes and performance of fisheries management is an increasing practice, in well managed fisheries as wells as in RFMOs, improving transparency, independence in oversight, and possibly consistency in the long-term, facilitating also the oversight task of the government. Alternatively, auditing might be outsourced to a third party, to ensure the independence of the process from internal pressure.

The content of the regular (annual or multi-annual) management-related reports could be transmitted by the managing authority to the auditor to ensure a continuous and flow of updated information on the fishery management system (at fishery or sector level), the performance of the management plan, the functioning and performance of the MER and of the OECMs.

More comprehensive reports might be elaborated by the MER, at fixed intervals, for the formal review of the performance of the management (including MER) systems itself, and the "state" of the fishery resources and in-situ biodiversity values. This review might be undertaken by an Audit Committee established in the fishery policy framework, that would usually include external (independent) members, including the Chair, to ensure impartiality. It could also be undertaken by a third party. Such an Audit function can be aligned to renewal process for the management plan of the OECM. The frequency and timing could be selected to match that of the multi-annual fisheries plans and other strategic conservation processes or other strategic conservation schedules.

The Audit report, or at least the parts not considered highly confidential, should be communicated through verbal and written audits are then available for distribution to other fishery management and conservation initiatives, such as those associated with other commercial developments, research and community education.

### 7.8 DATA AND INFORMATION MANAGEMENT AND COMMUNICATION

A fundamental process of the fishery managers is to store and make accessible, information that contributes to adaptive management of the fishery and the OECM. A well-designed system for the orderly management of the full 'lifecycle' of data is essential, as is the effective management of related information that supports the MER program (e.g. metadata, experimental designs, Standard Operating Procedures, audit reports etc.). Long-term monitoring is by nature multi-decadal, and therefore careful consideration of the standards (e.g. formats, software, languages) and rules (e.g. for access and changes in data work-flows) adopted for information management needs to be considered so the MER program can consistently access past information and update and archive knowledge through time.

A major challenge for MER programs is to get decision-makers to respond to feedback provided by MER program results (**Griffiths, 2004; Jacobson et al., 2011; Cvitanovic et al., 2013, 2015**). Accordingly, OECM managers needs to develop ways of transferring knowledge from monitoring into operational practice, to facilitate early delivery of adaptive management. Adaptive action based on the results from MER is most likely when the MER program: (i) results from a direct demand of the managing authority and is funded by it; (ii) is integrated in a formal fishery management plan in which adaptive management and reporting on performance evaluation and related auditing are included; (iii) if the protocols for data collection and assessment have been rigorously applied and any change has been documented and justified; (iv) if fishery stakeholders and the biodiversity conservation community have been involved in the planning and delivery of the MER and convinced by the results; (v) if these stakeholders also participate in the subsequent adjustments to the management and MER plans. These functions benefit from clear and transparent planning and communication across the levels from policy makers to on-ground operational staff.

## 8. RE-EVALUATION OF THE OECM

In any well-managed fishery, there is need to do periodic assessments of the degree to which the Management Plan and the measures comprising it are delivering the expected outcomes, as reflected in the objectives of the Plan. In the case of FMPs that include OECMs, the relevant part of such periodic evaluations would be to see if the exploited stocks are healthy or improving if depleted, and that expected biodiversity outcomes are being realized – taking ecological lags into account. The characteristics of such evaluations are covered in **Section 7** focussing on the evaluation of the expected biodiversity benefits. Such evaluations do not have to cover biodiversity values not explicitly included in the objectives of the OECM. They will be generally undertaken with a periodicity agreed in the FMP, in line with the population traits and fisheries circumstances and their conclusions may trigger re-evaluations of the OECM as follows:

- Trigger 1: The performance on both sets of objectives is adequate: As long as these periodic assessments conclude that both stocks and biodiversity outcomes are progressing satisfactorily, there would be no need for a specific re-evaluation of whether or not the area meets the OECM criteria. However, if the periodic assessments show that the expected biodiversity outcomes are not occurring at a reasonable rate – or continue to decline – a re-evaluation of the area-based measure and the OECM decision would be needed.
- Trigger 2: The performance on fishery sustainability is inadequate. If the periodic assessments show the area-based measure is not producing the expected outcomes for fishery sustainability (including stock status, social or economic outcomes of the fishery), that information goes to the fishery managers and stock assessors as a fisheries management problem. Those managers and assessors decide what is necessary for improving the sustainability of the fishery, and propose appropriate changes in the FMP. If the proposed changes are substantial, with likely significant

consequences for the biodiversity conservation objectives, a re-evaluation of the OECM decision is required.

- Trigger 3: Change in the environmental context of and within the OECM. It has been argued in previous sections of this Background Paper that effectiveness of OECMs may be influenced by changes in their ecological and environmental context. Any changes of this nature, suspected or expected to affect the OECM biodiversity outcomes, should trigger a re-evaluation.
- Trigger 4: Interactions from other economic sectors. The entry or termination of activities by other economic sectors (or other fisheries) in the area in which the OECM operates may constitute a trigger for re-evaluation of an OECM if there is enough evidence that this change could have consequences for the biodiversity features expected to benefit from the OECM.

In general, any acquisition of new type information (from the monitoring system or other sources) and/or change in the method of evaluation, including new modelling, may affect the initial assessments on the biodiversity values at risk and call for a re-evaluation of the OECM and revision of its objectives and measures (adaptive management).

For practical reasons and costs, the assessments of the biodiversity values must be limited to those key outcomes assessed at risk in the concerned fishery (or fishery sector). However, re-evaluations could be triggered also by biodiversity features not considered of concern at the time of the initial evaluation (or in past re-evaluations) if their state in the fishing area and the OECM, or their national or international status (e.g. in the IUCN Red List or CITES Appendices) has changed in ways that would change their priority for conservation.

### 8.1 THE INDIVIDUAL TRIGGERS AND POSSIBLE RESPONSES

All of the triggering factors mentioned above have intrinsic variations, and fisheries management has already learned many lessons about trying to chase typical levels of variance in biological parameters like recruitment and somatic growth, environmental parameters such as temperature and salinity profiles, and market fluctuations. These lessons have led to many jurisdictions adopting multi-annual fishing plans and harvest strategies that are robust to the range of uncertainties inherent in the data used in their development, and they apply also to the Triggers of OECM re-evaluations.

Revisiting OECM evaluations every time there is a tweak in the management plan, some minor environmental fluctuation, or a minor change in some other pressure (e.g. one new aquaculture facility in an area where several were in place when the initial evaluation was conducted) would be likely to result in very high operational overhead with little added benefit, and numerous false alarms and misses from changes to the OECM provisions that were responses to situations that might even have passed before the management response could be implemented. This section will discuss the nature of considerations that might cause each trigger to be prominent enough to warrant attention.

#### *8.1.1 The OECM-based periodic assessments.*

Part of responsible management of fisheries within an area evaluated as an OECM is monitoring and assessing the biodiversity properties expected to benefit from the area-based measures (See **Section 7**). The ease with which improvements or further decline in the biodiversity features expected to benefit from the OECM and its measures can be detected in such periodic assessments will be highly variable, depending on the biodiversity property. Some biological or ecological processes or features have inherently long life-histories or high inertia, such that improvements will accrue slowly. In other cases, properties can be highly variable so that reliably detecting a signal from a noisy background requires substantial information.

Whenever possible the evaluation tasks in **Section 7** should focus on indicators or biodiversity metrics that are likely to be responsive to management, so both expected improvements and particularly failure of the measure to stop or substantially reduce further decline the relevant biodiversity features can be detected rapidly. Making the management adaptive to the feedback from the metric(s) is facilitated by pre-agreement on a necessary benchmark (or reference value, or threshold) for improvement in the chosen metric(s) to be evidence of success and a benchmark for decline in the metric that would be evidence of possible failure (**Butterworth and Punt, 2003**). Consistent with the Precautionary Approach, these benchmarks should be set at levels where there is still some scope and time for management responses before the biodiversity features have entered a state of serious or irreversible harm (**FAO, 1996**). In cases when the threshold for possible failure is exceeded, a full review of the OECM is warranted. In cases when the benchmarks for success are not being reached in a timely manner, a less intensive review should be conducted to see if the cause for the slower-than-desired progress could be identified and addressed. Based on the outcome of that review, a deeper re-evaluation of some or all parts of the interactions between the OECM, the fishery and the biodiversity may be necessary to see if expectations were unrealistic or if the OECM and/or the measures therein are not sufficiently effective and should be revised if the area is to remain considered as an OECM.

For the targeted stocks, many jurisdictions have adopted Harvest Control Rules (HCRs), formal management Strategies, or other rule-based approaches to evaluating sustainability of harvests. These approaches typically include benchmarks for stock status that are taken as evidence that the stock status has declined to a point where a change in exploitation rate is required to maintain/restore sustainability (**FAO, 1996**). Consequently, as a minimum, the effectiveness of the OECMs should be reviewed, to ensure that their effectiveness has not been decreased by the changes in the FMP. How this targeted evaluation of the OECM should be conducted will be highly context-specific but have to take into account both the role of the OECM in the overall FMP before it was modified, and the likely role of the measure in the altered FMP. It would also have to take into account likely changes in the activities of the fishery in response to the changes in the FMP (possibly changes in timing, location, gear uses, or levels of effort in the fishery), that could have consequences for the effectiveness of the area-based measure in delivering the expected biodiversity benefits.

For either the biodiversity features expected to benefit from an OECM, or for the Target species of the fishery covered by the FMP, sometimes new types of information on the species, stocks or ecosystem come available. These would be assumed to be taken up in the periodic reviews of OECMs. If they simply add more information to the respective assessments, possibly changing (hopefully reducing) the uncertainty of the stock and biodiversity metric but not significantly changing the historical trajectories of the metrics, then no further action would be necessary. If however, the perception of historical and/ or present status of the target species or the biodiversity features expected to benefit from the OECM was changed substantially by the new information, then further actions would be needed. If the status and trend of the target species changed substantially, a full revaluation of the FMP, including the area-based measure would usually be necessary, and after any changes to management measures found necessary to accommodate the new perception of the harvested stock had been made, then the OECM evaluation would have to be repeated with the new management plan and its area-based measures. If the new information changed the perception of the status and trend of the biodiversity feature expected to benefit, depending on the nature of the change it could be necessary to re-evaluate:

a. The conservation potential of the measure (**Section 6.3.3**) if the biodiversity feature was associated with the area to a greater or lesser degree;

b. the potential effectiveness of the area-based measure (**Section 6.3.4**) if the biodiversity feature was found to be influenced by fisheries or other pressures to greater or lesser degrees; or

c. much of the basis for the previous conclusion on being an OECM, if the dynamics of the biodiversity feature were thought to possibly be different than assumed during the initial OECM evaluation.

### *8.1.2 The changes to the fishery*

The behaviour of a fishery can change for many reasons other than changes imposed by an FMP, e.g., in response to changes in markets, technology, opportunities in alternative fisheries and other factors. Any of those changes could affect where, when, how and how much a fishery operated, and any of those changes in the fishery could alter the effectiveness of the area-based measures to deliver the expected biodiversity outcomes. Any time a fishery shows such changes in operations, it would be necessary to see if the consequences include changing the way the fishery operated within the OECM or around it if this could affect its performance. If the changes mean that fishery fishes less in the area but in the same general time window and uses the same gears, re-evaluating the OECM would not usually be a priority (although it may be appropriate to evaluate new areas as OECMs as well, if the fishery is greatly reduced). However, if the fishery increases operations in or around the OECM, changes the timing of fishing there, or uses a new gear, effectiveness of the OECM at delivering the expected biodiversity benefits would have to be reviewed. Effectiveness could actually be improved, for example if the new gears had lower impact on the biodiversity features. However, many kinds of changes in fishery operations might reduce effectiveness of the area-based measure, and a review should be thorough enough to confirm the measure is still effective or to either guide adaptation of the area or of the measures inside it to re-establish effective conservation outcomes, or else withdraw identification of the area as an OECM.

### *8.1.3 The environmental / ecosystem changes (including climate change)*

Three is increasing evidence that ecosystem changes, particularly in physical and chemical oceanographic conditions, can driver further changes in dynamics of individual populations and more integrative ecosystem properties. Although consensus is emerging that fisheries management should adjust harvest strategies to accommodate such ecosystem changes (**Hughes et al., 2013**). However, the changes may show characteristics of alternating regimes, each relatively stable for some time before returning to the previous regime. They may be fairly abrupt but long-lasting changes in ecosystem state or incremental, directional change in ecosystem features. Climate change is making such ecosystem scale changes more common (**IPCC 2014**) and attracting a great deal more research interest in both explaining and predicting such changes, and in making harvest strategies either robust or responsive to such ecosystem changes (**Baumgartner et al. 1992, Jiao 2009**). Although there is consensus that, under these conditions, management can at least become increasingly inefficient, and may fail, at maintaining sustainability of fisheries relative to both target stocks and ecosystem impacts, there is no consensus yet on how to determine when such adaptations in management would be required, and the nature of the changes that would be needed to maintain sustainability. Some jurisdictions have adopted practices for responding to environmental and ecosystem changes, and as experience in those jurisdictions accumulates, it may be possible to develop evidence-based guidance on when to undertake reviews of OECM decisions in response to changes in the larger environment or ecosystem.

For the short term, however, such reviews should at least be undertaken whenever the fisheries management plan is altered to accommodate changing stock dynamics (from the fishery assessments and, at least ,be given consideration when a periodic evaluation of the expected biodiversity benefits (**Section 8.2.1**) is indicating the that area-based measures are not being as effective as expected. How far such re-evaluations have to go depends on the extent of ecosystem changes and the impacts of those changes on the relevant biodiversity features.

### *8.1.4 Changes in activity of other economic sectors*

This type of change in conditions under which the OECM operated are most directly relevant to **Section 6.3.7** on Integration. As noted in **Section 6.3.3**, however, even the potential for conservation benefits from an OECM has to be preceded by at least a qualitative assessment of all potential anthropogenic threats to the biodiversity features of concern. Major changes in activity of any other sector should at least trigger re-visiting the threat assessment. If the industry change reduces the potential threat of other sectors, there can be low priority assigned to re-evaluating the OECM, since area-based fishery measures satisfactorily delivering the expected biodiversity benefits with a given level of pressure on the biodiversity feature from another sector, it is likely to still be performing satisfactorily with the pressure reduced. The reduction in the pressure may be used to justify revisiting the evaluation of other areas that had failed to be accepted as OECMs because of questionable biodiversity benefits, but that is another issue.

If some other industry increases its activity, the revisit of the threat assessment could well move the other sector from not being a major concern to being a consideration on the OECM evaluation. An efficient next step would be for the relevant fisheries authorities to contact the management authority for the other sector, and coordinate efforts of the two agencies to assess the level of threat that the other sector now poses to biodiversity features in the area, as well as possible mitigation options, as per **Section 6.3.7**. The results of that assessment would then be brought into a re-evaluation of at least the effectiveness of the OECM in delivering the expected biodiversity outcomes (**Section 6.3.4**), and could require revisiting the potential for conservation benefits (**Section 6.2.3**) and several other of the OECM features.

Standards applied in the re-evaluation should not be lower than used in the initial OECM evaluation, and it could be appropriate to make them higher and more precautionary, if the impacts of the new activity on biodiversity are highly uncertain.

## 8.2 REPORTING ON RE-EVALUATION OUTCOMES

Whenever such re-evaluations are conducted, the reporting and archiving of information specified in **Section 6.4.2f** should be updated as appropriate. This is the case even if a decision is made that none of the decisions of the past OECM evaluations need to be changed, in order to both update the baseline information for future evaluations and to demonstrate due diligence in OECM review and reporting. If the decision is that OECM status should change for the area, jurisdictions make require more action than merely reporting the outcome of the re-evaluation. Such additional actions have not yet been specified, but make be part of the post 2020 program for the CBD.

The standard documentation for to be used for the submission of a proposal to the General Fisheries Commission for the Mediterranean (GFCM) for the establishment of a Fisheries Restricted Areas (FRAs)[22] in the Mediterranean and Black Sea, under the GFCM jurisdiction[23] may be taken as an example for an OECM submission, adapting it to the fact that an OECM is not an ordinary ABFM but has important secondary objectives related to biodiversity conservation. The required information might therefore include:

- Executive summary.

[22] A generic name for a range of area-based fishery management measures (ABFMs)

[23] 2017_Form_FRA-Submission_adopted_by_SAC16-rev.docx (http://www.fao.org/gfcm/data/maps/fras/fr/)

- Identification of the OECM: Name; Geographical location; Ecosystem within which the OECM is inserted (e.g., seascape, ecoregion, LME).; Reference fishery management plan.
- Site description: Creation date; Map; Coordinates; Dimension (medium to small, usually); Depth range; Zoning (inside and outside; buffer zone); Physical and oceanographic properties (relief; bottom; currents). Large ones may include mud flats, mangroves, dynamic dunes, hot vents, sea mounts, estuaries, lagoons; Stocks (resident and migrating); Habitats and biodiversity values (e.g., habitats, vulnerable ecosystems, emblematic species; protected, endangered and threatened (PET) species;
- Role of the OECM: primary role/objectives (e.g., Essential Fish Habitat (EFH): nursery, spawning or feeding area, migration corridor). Secondary role/objectives (specific biodiversity impact or expected outcomes). Stocks and fisheries concerned; Expected outcomes, e.g., rebuilding, optimization, habitat restoration; Scientific reference site; Element of ecolabelling. Clear evidence needs to be provided.
- Governance: type of governance; competent authority(ies) (e.g., national fishery Department; Municipality; Indigenous community; RFMO); scientific support; Participatory/empowerment processes; Spatial framework (MSP, ICM)?
- Supported fisheries: Target species; Main gears; Small or large scale; Recreational; Subsistence; Economic and social importance;
- Management measures: Inside and around the OECM. Integration into a fishery management plan (reference); Restrictions on gears and practices; Monitoring & Evaluation (M&E); Recurrent assessment; Oversight institution and process.
- Expected development (short-medium-term) in fisheries; Other foreseeable developments;
- Other known threats: e.g., noise, pollution, climate change, maritime traffic, littoral erosion; Demography; Poverty;
- Regional importance of the site: part of a seascape? Representativeness (e.g., VMEs)? Role in connectivity (8) Rationale for the establishment of the area (bioecological, socioeconomic, scientific, ecosystem services, connectivity and complementarity with MPAs; (9) any other relevant information (e.g., part of an EBSA).

The documentation may have a "static" part, changing very little (e.g., location and dimensions), and a dynamic part (e.g., management measures; conclusions of regular assessments)

### 8.3 REVISION OF THE OECM STATUS OF AN ABFM

The conclusion of each recurrent evaluation of the performance of an OECM through its monitoring and evaluation programme might be that the area, and/or the measures implemented in it, are no longer producing the expected outcomes that justified its initial identification as OECM. The failure to deliver might stem from factors internal to the OECM (e.g. inadequate initial assessment; non-compliance with its regulations), or factors external to it (in the fishery sector, in other economic sectors, or in the background environmental conditions, any of which could change the effectiveness of the ABMs in the OECM. If those changes could be addressed by correcting the measures applying in the OECM, to re-establish its performance, the OECM could possibly be maintained and the fishery management plan revised as appropriate to correct deficiencies. However, if the failure could only be addressed by deeply modifying the OECM, such as by changing its boundaries and total area, or introducing new measures to implement in the original area, the OECM a deeper evaluation might be needed which might require a

temporary removal from the OECM list for as long as needed to complete the analyses of how the new areas or measures were expected to perform producing a rationale for the new OECM. However, in a moderately well-organized government and a fisheries Ministry with reasonable resources, there may be not be any lapse in the OECM "status" if evaluation team is able to also rapidly suggest a doable solution and the governance process can have the necessary consultations and implement the revisions within the reporting cycle.

If that OECM was reported to CBD and WCPA and registered in the database, this modification should be duly reported to these institutions with its rationale. The same would apply, under the same conditions, if the decision was to remove the OECM from the reported list.

In cases when the failing OECM would straddle the EEZs of two (or more) States, and OECMs were jointly identified, and reported to CBD and WCPA, the same mechanism would be needed to decide on their modifications or removal from the database. Because removal may affect the broader conservation programmes of the States concerned within their EEZ, each State concerned may then decide on measures needed to mitigate the removal of the shared OECM independently, or may choose to continue to collaborate to develop a new suite of measures that each would agree to apply, such that the positive biodiversity outcomes of the shared total area would be restored.

## 9. SELECTED GOVERNANCE ISSUES

A very large body of literature exist on the governance and management of fisheries (for example in **Cochrane and Garcia, 2009; Grafton et al 2009**) and of protected areas (**Jones, 2014; Feral and Salvat, 2014; Fox et al., 2014)** as well as on issues of governance emerging between the two arenas (**Garcia, Rice and Charles, 2014; Weigel et al., 2014**). The purpose of this section is, therefore, to address only the governance-related issues directly mentioned (or implicit) in the CBD COP Decision 14/8 and specific to OECMs.

The OECM is a particular Area-based Measure (ABM) in that (i) it addresses issues and contribute emerges in the environmental arena (CBD) but (ii) is to be implemented in economic sectors and coastal communities with sustainable use (*sensu lato*) as primary objectives and in-situ biodiversity conservation as additional objectives or unplanned /unexpected positive outcome, and (iii) is reported back to the environmental arena, to CBD, WCMC and in the WDPA. Moreover, OECMs may have existed for a long time, as ABFMs, before being identified/upgraded to meet OECMs standards.

In the CBD COP Decision, Governance is addressed in many different places, in the definition of OECMs, the Guiding principles, the criteria and more specifically in Annexes. Annex I of the CBD COP Decision, provides voluntary guidance on the integration of OECMs into wider landscapes and seascapes and their mainstreaming in economic sectors, *inter alia* to contribute to SDGs. Annex II to the Decision provides voluntary guidance on governance models for protected areas, addressing issues like governance diversity, effectiveness and equity. The elements referred therein are important but not new either to fisheries management or biodiversity conservation. They refer directly to "good governance" principles that have emerged in the mid-1990s in sustainable development at the United Nations Level (cf. **Graham, Amos, Plumtre, 2003.**

Many aspects of governance, that have emerged in various parts of Decision 14/8 have been addressed in **Section 5**: (1) The need for an OECM to be governed and managed; (2) Cultural, spiritual and other locally relevant issues; (3) Effectiveness; (4) Implementation flexibility; (5) Legitimate authorities; (6) Free and Prior Inform Consent (FPIC) and self-identification (of indigenous people); and (7) Sustained and long-term in-situ conservation objectives and outcomes. These will not be mentioned again in this section.

### 9.1 THE GOVERNANCE FRAMEWORK

In order to be properly put in place and managed, OECMs, as with any other management instruments, need to be inserted in a functional policy, legal and governance framework[24]. As the CBD COP Guidance indicates, the OECMs need to be governed and managed…by legitimate authorities. Several questions arise: (i) What elements should that framework include? (ii) What additional legal and institutional foundations might be needed to proceed with OECMs? (iii) Which authority is legitimate (e.g., in internal waters, EEZ, straddling OECMs and High Sea OECMs (cross-jurisdictional issues ? (iv) How to deal with cross-sectoral issues in a fishery management area-based instrument, if two or more sectors with significantly different operations and impacts create overlapping ABMs intended to produce similar or different biodiversity benefits in overlapping but different boundaries, and possible at different depth (in the open ocean)? (v) What processes are needed, at national or sub-national levels, in federal and States waters, to identify, assess, submit, integrate, decide to report or not to CBD and WCPA[25], evaluate and report on performance, etc.

### 9.2 EQUITABLE GOVERNANCE

The expression "equitable governance" is used in the Decision 14/8 (Annex II) as a synonym of "good governance" (Annex II,B) and is characterized in the Decision by, *inter alia*; (i) full and effective participation of stakeholders within their mandates; (ii) recognition of customary tenure and governance systems; (iii) transparency and accountability; (iv) conflict resolution; (v) equitable sharing of economic and social benefits and costs, including compensation, based on criteria agreed among rights holders and stakeholders; (vi) impartial and effective implementation of the rule of law; (vii) monitoring of governance issues and well-being of people concerned; (viii) free, prior and informed consent; (ix) use of scientific and local knowledges.

The concept of *equity* is specifically addressed in Decision 14/8 (Annex II) from three interconnected angles: (1) Recognition; (2) procedural equity and (3) distributional equity. Recognition is the necessary starting point for achieving (2) and (3). It may be achieved through acknowledgement of the diversity and respect due to the rights, identities, values, knowledge systems and institutions of rights-holders, other stakeholders and communities affected by decisions. Procedural equity might be achieved through inclusiveness of the governance cycle from data-collection to assessment, elaboration of advice, decision-making, management implementation and performance evaluation. It requires effective participation and empowerment of the people directly involved by the action needed and its consequences. Distributional equity requires that short- and long-term costs and benefits resulting from the introduction or enhancement of OECMs in fisheries management plans be transparently assessed and equitably shared among different actors.

The voluntary guidance provided by CBD COP refers to "*equitable governance*" to be achieved through appropriate procedures and mechanisms for the full and effective participation of stakeholders (ensuring gender equality) in full respect of their rights and recognition of their responsibilities, and in coordination with other stakeholders. While the Decision text refers specifically to *indigenous people and local communities*, the concepts would probably apply also to all types of communities (e.g., including

[24] In cases of self-identification of OECMs, Decision 14/8, Annex III Criterion B2b, the OECM itslef might not be inserted in a legal policy framework, but the right to self-governance by the group doing the self-identiifcation is.

[25] The **IUCN-WCPA (2018)** guidelines indicate that *the governance authority has the right to withhold or give its consent to an area being recognised as an OECM, assuming it meets the OECM criteria*

municipalities and fishing associations) to which use rights and fishery management responsibilities may have been recognized/devolved by the State. Annex II contains also a list of actions to be considered to give effect to good/equitable governance. It can be noted in that regard that CBD COP (Paragraph 5) *Encourages* Parties and *invites* other Governments, relevant organizations, in collaboration with indigenous peoples and local communities, to apply the scientific and technical advice on OECMs contained in annex III, while also taking into account, where appropriate, the 2016 report of the United Nations Special Rapporteur on the rights of indigenous peoples on the theme "indigenous peoples and conservation"[26] and the 2017 report of the United Nations Special Rapporteur on human rights and the environment[27].

Effective engagement of rights-holders and stakeholders requires action to (i) Identify relevant rights-holders and stakeholders; (ii) Develop/ foster their communities of practice and networks; (iii) Build their common understanding of objectives and expected outcomes; and (iv) Improve management skills (CBD COP Decision, Annex IV, paragraph C2).

In a fishery environment, good governance is to be applied to the whole fishery management (not only to the OECM) and is reflected in the management plan within which the OECM is used. Relevant FAO Guidance is available in the FAO Guidelines on fisheries management and on the Ecosystem Approach to Fisheries (EAF), particularly in the guidelines on its human dimensions (**De Yong, Charles and Hjort, 2008**)

### 9.3 INTEGRATION

Various aspects of "integration" of OECMs are mentioned in Decision 14/8 (Annex 1) and have implications for fisheries: (1) within a fishery, in the fishery management plans; (2) within the sector, considering connectivity of different OECMs established for different purposes, to optimize costs and benefits across the sector; (3) across economic sectors, particularly in densely used spaces, reducing conflict, increasing cross-connectivity between fishery-OECMs and other OECMs. This issue is beyond the mandate of fishery authorities and may be dealt with within national or regional spatial frameworks (MSP, ICM, landscapes, seascapes, ecoregions); (4) into poverty eradication and development strategies, an issue that has fishery-specific dimensions (impacts of OECMs on fishing communities' livelihoods) and broader dimensions (e.g., in the rural and urban sectors).

Many degrees of "integration" are possible, between simple exchange of information and unified decision-making and implementation, with increasing potential benefits and also of interaction costs (Garcia, Rice et al., 2014). Case by case determination of the optimal integration level may be a challenge, depending on scale. Integration of an OECM within a fishery management plan presents the fewest challenges but costs and benefits in the short- and long-term will need to be assessed or at least identified, and there should be some process for addressing any inequities in how they are distributed . Integration of OECMs across fisheries in an ecosystem raises cross-fisheries issues, that can be addressed within the Ministry in charge. Integration of OECMs with MPAs e.g., at national level, calls for inter-ministerial collaboration. Integration within a large marine ecosystem, an ecoregion or a marine landscape requires a higher, cross-sectoral level of coordination and decision-making. Integration across jurisdictional boundaries is posed additional challenges, requiring specific institutions and, to be fully effective, must be agreed on allocation of resources, benefits and costs between parties involved. The existence of an RFMO is a greatly facilitating factor and framework in this case as UNCLOS and the UNFSA impose clauses

[26] Report of the Special Rapporteur of the Human Rights Council on the rights of indigenous peoples, Victoria Tauli-Corpuz (A/71/229).

[27] Report of the Special Rapporteur of the Human Rights Council on the issues of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment, John Knox (A/HRC/34/49).

of sustainability, protection of associated and dependent species, of the environment, and a principle of compatibility of management measures between jurisdictions and across the entire life-cycle distribution area.

In general, integration across space and within the ecosystem would benefit from an ecosystem approach as adopted in fisheries (EAF) with related issues of critical or essential fish habitats, vulnerable ecosystems, connectivity and functional ecological networks. Decision 14/8 indicates that this requires *integration of the values, impacts and dependencies of the biodiversity and ecosystem functions and services* …into the sector. This is already done, conceptually, through the adoption of EAF at the FAO level but needs to progress further in requiring and implementing best practices at fishery, national and international levels.

Integration of "fishery" OECMs in seascapes or ecoregions (or landscapes in inland waters) requires the existence of such a spatial cross-sectoral governance framework at national or regional levels. From solely a conservation biology perspective, seascape has been defined as *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/Pages/Seascapes-program.aspx). However, as is the case with "landscape" in the terrestrial realm, the general usage the term includes far more than just the protected areas in the area of reference. The OECMs established in fisheries may be integrated in such protected area-based seascapes when they have been established and EAF provides a pathway for integration of fisheries with the broader seascape.

A good integration may be achieved through well-informed OECM design, appropriate additional measures, and effective management and enforcement (**Annex 1, §2**). In theory, integration should be demonstrated by high levels of compliance and measurable connectivity and biodiversity outcomes, and made easier if there was compatibility between the expected outcomes of both biodiversity conservation and fishery management. In practice, this will always be very difficult in a changing environment and because of the multiple factors affecting effectiveness of single OECMs or any other specific fishery measure applied in a particular fishery (**Garcia, Rice and Charles, 2014**). Corridors as well as passive transportation and active migration pathways are important, particularly in fluid and dynamic seas and large lakes environments (See **Section 5**).

Integration of OECMs within sectors would result in effective sectoral mainstreaming. It requires consideration of biodiversity al all steps of data collection, assessment, elaboration of advice and implementation as well as performance assessments. It required definition of additional objectives for each sector beyond their core objectives of sector optimization. The objective of integrating biodiversity and fishery concerns should be made explicit in OECMs (Decision 14/8. Annex III C1d), as efforts are made to deliver the biodiversity objectives despite some the added costs imposed to also achieve the fishery objectives (e.g., greater travel time, exclusion from areas of high catch rates of the target species).

Integration of OECMs across sectors could result in increased effectiveness in delivery of biodiversity outcomes by each sector, any time multiple commercial sectors were active in the same area, or even in different areas that were necessary for completion of the full life history of a species high priority for biodiversity conservation. Slow progress in both spatial integration and the collective mainstreaming of biodiversity among sectors result *inter alia* from a complex set of factors such as (i) formal separation of mandates within a government; (ii) insufficient coordination and collaboration at inter-ministerial level; (iii) competition for budgets between agencies and Ministries; (iv) insufficient participation of stakeholders (lip-service), or differential access or priority of stakeholders in different sectors (partisanship or playing constituencies off against each other) .

Integration into poverty eradication and development

The CBD COP Decision does not provide guidance on that issue. The need for biodiversity-conscious development strategies is a global anthem since at least UNCED (1992). The Ecosystem Approach to Fisheries deals with both management and development but in practice has been considered more for management than for development. In addition, practical implementation has been progressing only slowly and at unequal pace between countries and regions.

Poverty eradication is also an issue beyond the narrow sectoral remit of fishery authorities although, in many places, fisheries may play an important role in programs to address poverty. In all cases, care should be taken, in the development of OECMs, to take into account the livelihoods of economically-vulnerable communities, and where necessary put in place programmes to alleviate the consequences for them.

For all these aspects of integration the guidance provided in CBD COP Decision 14/8, Annex I (Section IIb) relates both to protected areas and OECMs, which may be confusing. Nonetheless, a translation contained therein in terms of action within a fishery authority mandate would be to:

- Include the concept of integration into the vision, goals and targets of fisheries policies at national and regional scale, where appropriate;
- Review the status and trends in the biodiversity impacted by fishing and identify detrimental impacts of fishing (or risks of them) across target and non-target species, Essential Fish Habitats (EFHs), VMEs etc. with the view to reduce/mitigate/restore or compensate for them, in line UNCLOS, UNFSA, CBD and the Biodiversity Impact Mitigation hierarchy;
- Identify and prioritize potential OECMs to be used in fisheries to reduce detrimental ecological impacts, and develop strategies to mitigate such impacts and undertake active restoration programmes. This typically involves significant work to assess the actual or potential contribution to connectivity and biodiversity conservation, duly noting, however, that a lot of groundwork has already been conducted in the conservation arena on these aspects from which the OECM work can draw.
- Prioritize and implement measures within identified OECMs, to maintain or enhance their contribution on the long term, or to create new OECMs for the purpose of enhancing the contribution that fisheries can make to conservation of biodiversity within seascapes. Key potential enhancements can include increased network connectivity, including through (i) creation of new OECMs in the sector for that purpose, if appropriate; (ii) identification of opportunities for additional MPAs and in OECMs; (iii) addition or adaptation of measures within existing OECMs; (iv) accounting for indigenous and community conserved areas: All these measures can serve as stepping stones between habitats, or areas important for different life history functions, the creation of conservation corridors to connect key habitats, the creation of buffer zones to mitigate the impacts of various sectors, and more generally the promotion of sectoral practices that reduce and mitigate their impacts on biodiversity.

### 9.4 MAINSTREAMING

The meaning of “mainstreaming” goes well beyond that of “integration”.

For capture fisheries (referred to as the “fisheries sector”), mainstreaming may be defined as *the progressive, interactive process of recognizing the values of biodiverse natural systems in the development and management… 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, Garcia and Rice, 2018).** OECMs are particularly relevant instruments of “mainstreaming” as

they emerge in the environmental governance arena of CBD but need to (and can only be) implemented by the economic sectors generating impacts on biodiversity, implying a good level of buy-in in order to be effective. In addition, the identification, establishment and recurrent assessment of OECMs may require a good level of cooperation between fishery and conservation science, enhancing the level of convergence and co-evolution of the two governance streams (**Garcia, Rice and Charles, 2014**).

### 9.5 NOTE ON THE LEGAL FRAMEWORK

The CBD is an international convention under which the Conference of the Parties (COP) has been established. It is implemented by Contracting Parties, with respect to the marine environment, consistently with the rights and obligations of States under the Law of the Sea (Article 22.2). As per Article 4(b) of the Convention, Parties are to apply the provisions of this Convention, in the case of processes and activities, regardless of where their effects occur, carried out under its jurisdiction or control, within the area of its national jurisdiction or beyond the limits of national jurisdiction. Indeed, Decision 18/4, paragraph 5a encourages Parties and invites other governments to …Identify OECMs *and their diverse options within their jurisdiction*.

The FAO is a specialized and agency of the United Nations operating under a Constitution with the exclusive responsibility on fisheries within that system, in all areas (marine or continental) and all jurisdictions. It advises its Members in all fishery matters such as data collection, research, policy, development and management, globally (through COFI), regionally (through its regional fishery bodies) or nationally in specific programmes and projects, but has no decisional power. The Decisions of the Council on Fisheries (COFI) are not mandatory and the guidance provided by COFI, e.g., in the CCRF and related technical or international guidelines and Plans of Action, are advisory and voluntarily applied by FAO parties. The international legal instruments adopted in FAO and endorsed by enough States, such as the 1993 Compliance Agreement and the 1999 Port Sates Measures Agreement (PSMA) to fight against IUU, become mandatory.

The CBD COP decisions are cross-sectoral and apply to the whole biodiversity. As such, they apply also to fishery resources and ecosystems in which fisheries operate, as long as they do not contradict UNCLOS fundamental provisions. CBD Parties can implement the decisions they have taken in COP in all the situations in which they have authority, at national level but also in the international institutions of which they are also members, like at FAO. The converse is also true, and, for example, CBD Parties would normally not contradict, in CBD COP decisions, the decisions they have adopted at FAO or within a RFMO. This is the mechanism that facilitated, for example, the translation of the CBD Ecosystem Approach in FAO into the Ecosystem Approach to Fisheries (EAF) and leads COFI members to talk about how to implement Target 6 and 11. Through this institutional "bridge" FAO members that are also CBD Parties[28] may endorse in COFI the concept of OECMs adopted at CBD COP, facilitating its translation in the global fishery sector. Through the same mechanism, CBD Parties that are parties to an international convention establishing a RFMO have the authority to propose and eventually decide to establish OECMs as fishery management tool, expanding to the High Sea the application of an instrument initially developed in the CBD. This opportunity is reinforced by the fact that if CBD Parties have translated the CBD COP Decision into their national law, that law will be expected to be complied with by all the vessels flying their flag in whatever area they operate, as part of the flag State responsibility.

Notwithstanding, nothing impedes national, regional or international fishery actors (e.g., in RFMOs, FAO, ISA, IMO) to develop and adopt guiding documents for the use of OECMs within their sector of

[28] The CBD COP and FAO have practically the same members.

competence, in line with the CBD definition and inspired by the related guidance. The exact content of these guiding documents, in the end, will depend on what States, individually, or Parties to these conventions, jointly, may decide.

### 9.6 GOVERNANCE PROCESS

The governance processes are likely to be context-specific, depending on: (i) the country (or RFMO) concerned; (ii) the political system in place, assuming, however a democratic one; (iii) the overall degree of devolution of decision-making power within the political system (iv) the implementation capacity available; etc. A possible scenario for the process leading from the CBD COP Decision on OECMs to national implementation in the fishery sector could be (as an illustrative example):

1. The CBD COP Decision is brought to the attention of all sector-based Ministries at the Inter-Ministerial Council which may decide that the decision is endorsed nationally Line Ministers are instructed to start implementation in their sectors and report. In countries where governance authority is partitioned, such as between provincial/state and federal jurisdictions, and where Indigenous Peoples or other distinct communities have recognized mandates in various aspects of governance, etc., these instructions to Line Ministers may be accompanied by required consultations with other levels of government to convey the CBD Decision and encourage, support, and where appropriate coordinate implementation within their respective areas of responsibility. For the other steps listed here, appropriate coordination and sharing of duties is assumed to be undertaken, even in cases when only the federal government is referenced.
2. A nation-wide effort might be done to review the status, trends, hotspots and priorities for biodiversity, current challenges to achievement of existing conservation objectives, such as problems of fragmentation and connectivity, identification of possible sectors responsible for various impacts on biodiversity, and development of a national or regional spatial planning system to serve as reference framework.
3. At the same time (for fast response and delivery), the Fishery Department (or the RFMOs) undertakes a comprehensive cataloguing of all the ABFMs in operation in the area under its competence, with their time/space/gear restrictions. Regardless of the progress on MSP and other spatially integrated management frameworks, other Departments (or other international institutions) competent for managing human activities that may impact marine biodiversity, would likely be undertaking similar cataloguing of their area-based conservation measures.
4. A pre-screening or rapid run through the first three steps of **section 6.4.2** is undertaken either as the inventory is being developed, or as soon as it is available, to establish a list of possible candidate-OECMs to be assessed, based on the CBD COP decision, the generic guidance available (IUCN WCPA, 2019) and the guidance for fisheries as it becomes available.
5. A deeper assessment is conducted on candidate-OECMs, applying Steps 4 and 5 in Section 6.4.2as described in steps, a list of proposed-OECMs may be established that meet all the criteria. Evidence is assembled that demonstrates empirically or projects convincingly a significant biodiversity conservation outcome. The direct participation of the sectoral actors in the assessment is essential (to obtain useful knowledge and increase probability of buy-in;
6. The OECMs are adopted or not in the different fisheries concerned- If adopted, and if they already existed, they should already be integrated in the fishery management plan. The FMP may need be updated in case the boundaries of the old ABFM have been adjusted and the measures inside it complemented to meet the OECM standard. The specific objectives of the OECM with regard to biodiversity values may need to become more explicit and specified. The name given to these

areas is a decision of the management authority or the State. In some countries/areas/fisheries, the sector may agree to establish/improve and ABFM for larger biodiversity benefits but may not accept to see it called an OECM. The same happens already with MPAs.

7. The recognized OECMs identified in fisheries and other economic sectors are fully documented, and may or may not be formally reported by the State, including to the WCPA through UNEP-WCMC as per **Section 6.4.2 (Step 6)** and foreseen in the COP Decision 14/8. Again, whether this is done or not is a national prerogative and the IUCN WCPA draft guidelines indicate that*, assuming an area meets the OECM criteria, the governance authority has the right to withhold or give its consent to the area being recognised as an OECM* **(IUCN-WCPA, 2019: Box 1***).*

The rationale for States progressing through the process with all OECMs identified in a single operation has to do with efficiencies of scale and the imminence of the reporting deadline for Target 11 (in 2020). However, for reasons of limited resources, lack of experience in conducting extensive reviews of marine biodiversity information as well as fisheries information, or very large EEZs with diverse characteristics, a "pilot" or partitioned approach may be taken, selecting one or few fisheries in which OECMs might be more likely found/used, or particularly information-rich parts of their EEZs, to initiate the whole process, developing progressively the capacity and skills needed to proceed developing a more complete network of OECMs connected with the network of MPAs.

In the case of shared or straddling resources or habitats, agreements will be needed to undertake a similar process. Scientific collaboration is usually easy to organize. Effective trans-boundary management is complicated by issues of use rights, sovereignty, often more levels of approval for any decisions, and other factors. Even when formal sharing agreements for fisheries harvests are in place, if the adjacent countries are not in the same stage of commitment to or progress on OECMs. Governance may remain split between parties involved, potentially reducing efficiency.

In a RFMO, the Parties to that body may decide to identify OECMs. The same process as above could be followed involving scientific working groups in charge of the identification and assessment of biodiversity outcomes. The Scientific and Management Committees would check the validity and comprehensiveness of the proposals (e.g., against an agreed template). The RFMO (i.e. the Member States) would adopt the OECMs and decide to report them or not to the WCPA database.

In devolved or recognized decentralized governance systems e.g., in TURFs, MMA and LMMAs, and more generally for areas under community-based management, the same type of process may be undertaken under the responsibility of the authority formally "in charge". The evidence needed may be provided by the State science capacity, by decentralized research institutions (e.g., prefectural research in Japan), locally and privately recruited consultants (in Chilean TURFs), cooperation with Universities; and, of course, with full harnessing of local and traditional knowledge regarding both the ecology and socio-economy of the system around the OECM. The importance of self-identification of OECMs by Indigenous groups and other special rights-holders in acknowledged in Decision 14/8 (**Criterion 2B2**), and in such cases it is the decision of the groups entitled to self-identification to both decide in an ABFM is an OECM, and whether to report it to WCMC

### 9.7 SPATIAL MANAGEMENT ISSUES

The CBD COP Guidance refers in many places to the need to ensure connectivity of OECMs with other protected areas inside ecosystem networks. The interactions between fishery-OECMs, with other sectoral-OECMs (e.g., in the navigation, oil and gas extraction, or mining sectors) may also be relevant for their effectiveness and need be considered, at a higher level of governance than that of the fishery sector

(e.g., the Ministry of Environment or Planning) for cross-sectoral coherence across space and scales. National or subnational frameworks such as ICAM or MSP might be useful in that respect.

MSP and Integrated Coastal Management (ICM) are mentioned in Decision 14/8 Annex IV, in relation to other sectoral area-based management approaches such as IMO Particularly Sensitive Sea Areas (PSSAs) or ISA Areas of Particular Environmental Interest (APEI). The CBD Ecologically and Biologically Significant Areas (EBSAs)[29] and IUCN Key Biodiversity Areas (KBAs) and Important Marine Mammals Areas (IMMAs) are also areas that might be considered as sources of relevant information on biodiversity and connectivity.

Marine spatial planning (MSP) allocates the spatial and temporal distribution of human activities in the marine realm and is advocated as an essential tool in ecosystem-based management. Given the increasing competition and demand for space in the aquatic environment, there is a substantial need for States to organize the management of marine waters more coherently and holistically though MSP initiatives (**Douvere, 2008; Ehler and Douvere, 2010**). Area-based fishery management measures (ABFMs) that might meet the OECM criteria already or with some adaptation exist in fisheries, are integrated in fisheries plans (FMPs) in the most advanced systems, and as such could significantly help meeting marine development planning and conservation goals and objectives (**Diz et al. 2018**). Although OECMs may be identified or created for individual fisheries, States should take measures to ensure that the management efforts are coordinated across fisheries that take place within their EEZs, including on transboundary stocks and ecosystems.

If designed and planned through an MSP process, these formally established, spatially-defined fishery management measures could be integrated across competing sectors in order to reduce overlap between areas and conflicts between sectoral conservation measure that might affect the OECMs capacity to: (i) fulfil the conservation objectives of the CBD; and (ii) help stakeholders in achieving a balance between the competing uses of the marine environment. Integration of OECMs identification and management between fisheries, sectors, and ensuring coordination across networks of MPAs and OECMS are important and should be a central responsibility of the State. This includes establishing the necessary legal and policy framework, targets, incentives, and processes for implementing MSP initiatives. Importantly, economic sectors (and fisheries) should be encouraged and assisted in establishing OECMs in a way that ensures the maximum possible benefits for the least possible cost to the public and private sectors. OECMs should also not be double counted towards global goals such as Target 11 or SDG 14. Although overlap may allow for greater connectivity between areas, it also requires greater coordination and care to ensure overlap is complementary and beneficial to all sides. Fishing activity will only continue to increase the demand for ocean space in the future, thus developing OECMs within a MSP framework is an important and holistic consideration.

The CBD COP Decision 14/8 and the Background document refer also in many places to the need to integrate OECMs within landscapes and seascapes, but one could also refer, in the same spirit, to ecoregions and Large Marine Ecosystems (LMEs). All these space-based frameworks are potentially useful to increase coherence and facilitate implementation of biodiversity conservation at cross-sectoral and large ecosystem levels.

The use of thematic mapping is not a new suggestion for fisheries and was indeed advocated 3 decades ago as a *prerequisite for intelligent management and development of fisheries* (cf. **Caddy and Garcia,**

[29] EBSAs are not mentioned specifically in CDB COP Decision as they are not intended as management instruments, but the biodiversity information they provide makes them an element to be considered also in marine spatial analysis and eventual planning under the relevant jurisdictions.

**1986)** and widely applied for descriptions of life-cycles, critical and essential habitats, spatial analyses, modelling, and for cross-sectoral analyses. In fisheries management, jurisdictional spatial dimensions have always been central, to policy and legal frameworks (e.g., UNCLOS and the UNFAS). However, within these spaces, management remained resource-based with spatial issues being implicit at best. These issues became more explicit with the adoption of EAF in the early 2001, increased considerations about the role of MPAs in fisheries, and will now likely improve through the identification of OECMs and their potential role in ecological networks.

**REFERENCES**

Still unedited


Amoroso, R.O.; Pitcher, R.; Rijnsdorp, A.D.; McConnaughey, R.A.; Parmae, A.M.; Suuronen, P.; Eigaard, O.R. et al., 2018. Bottom trawl fishing footprints on the world's continental shelves, PNAS (pre-publication): 8 p. www.pnas.org/cgi/doi/10.1073/pnas.1802379115. Supplementary data at: www.pnas.org/lookup/suppl/doi:10.1073/pnas.1802379115/-/DCSupplemental.

Ayers, A.L., Kittinger, J. N., Vaughan, and Mehana B. 2018. Whose right to manage? Distribution of property rights affects equity and power dynamics in comanagement Ecology and Society 23: Article Number 37.

Azmi, K. Other effective area-based conservation measures for achieving Aichi biodiversity Target 11 in marine and coastal areas (in non-fisheries marine sectors. 2018. Document CBD/MCB/EM/2018/1/INF/3. Prepared by Azmi, K. https://www.cbd.int/meetings/PAEM-2018-01: 23 p.

Barange, M.; Bahri, T. ; Beveridge, M.C.; 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. FAO Fisheries and Aquaculture Technical Paper, 627: 627 p

Barrington, D.J., Ghadouani, A., Sinang, S.C., Ivey, G.N., 2014. Development of a new risk-based framework to guide investment in water quality monitoring. Environmental Monitoring and Assessment 186, 2455–2464. doi:10.1007/s10661-013-3552-1

Baumgartner, T.R., Soutar, A. & Ferreirabartrina, V. 1992. Reconstruction of the history of Pacific sardine and Northern anchovy populations over the past 2 millennia from sediments of the Santa-Barbara basin, California. California Cooperative Oceanic Fisheries Investigations Reports, 33: 24-40

Baumgartner, T.R.; Soutar, A. and Ferreirabartrina, V. 1992. Reconstruction of the history of Pacific sardine and Northern anchovy populations over the past 2 millennia from sediments of the Santa-Barabara basin, California. California Cooperative Oceanic Fisheries Investigations Reports, 33: 24-40

BBOP. 2012c. *Glossary with updates.* Business and Biodiversity Offsets Programme (BBOP). Forest Trends, Washington, DC. Available from http://bbop.forest-trends.org/guidelines/Updated_Glossary.

Berkes, F. 1999. Traditional ecological knowledge and resources management. Philadelphia and London. Taylor and Francis

Blanchard, J.L.. Jennings, S., Holmes, R., Harle, J., Merino, G., Allen, J., and Barange, M. 2012. Potential consequences of climate change for primary production and fish production in large marine ecosystemsPhilos. Trans. R. Soc. B Biol. Sci., 367 (1605) 2979-2989

Botsford, L. W.; Brumbaugh, D. R.; Grimes, C.; Kellner, J. B.; Largier, J.; O'Farrell, M. R.; Ralston, S.; Soulanille, E. and Wespestad, V. 2009. Connectivity, sustainability, and yield: bridging the gap between conventional fisheries management and marine protected areas. Rev. Fish. Biol. Fisheries, 19: 69–95. DOI 10.1007/s11160-008-9092-z

Bottrill, M.C., Joseph, L.N., Carwardine, J., Bode, M., Cook, C., Game, E.T., Grantham, H., Kark, S., Linke, S., McDonald-Madden, E., Pressey, R.L., Walker, S., Wilson, K.A., Possingham, H.P., 2008. Is conservation triage just smart decision making? Trends in Ecology & Evolution 23, 649–654. doi:10.1016/j.tree.2008.07.007

Bruckner, T., Petschel-Held, G., Leimbach, M. & Toth, F.L., 2003. Methodological aspects of the tolerable windows approach. Climate change, 56: 73–89. http:// dx.doi.org/10.1023/A:1021388429866

Butterworth, D. S., and Punt, A. E. 2003. The role of harvest control laws, risk and uncertainty and the precautionary approach in ecosystem-based management pp 311-319 in Sinclair, M. and Valdimarsson G. (eds) Responsible fisheries in the marine ecosystem. FAO Rome.

Caddy, J.F. and S. Garcia. 1986 Fisheries thematic mapping. A prerequisite for intelligent management and development of fisheries. Océanographie Tropicale. 21(1): 31-52

Caddy, J.F., Mahon, R., 1995. Reference points for fisheries management, FAO fisheries technical paper. FAO, Rome.

Cadrin, S. X. & Dickey-Collas, M. 2015. Stock assessment methods for sustainable fisheries. ICES Journal of Marine Science, 72: 1–6.

Canada Department of Fisheries and Oceans, 2016. Operational Expert for identifying 'other effective area-based conservation measures' in Canada's marine environment. Canada Department of Fisheries and Oceans: Ottawa, Canada. 9 pp. Accessed January 17, 2017 at: http://www.dfo-mpo.gc.ca/oceans/documents/publications/oeabcm-amcepz/2016_11_24_OEABCM-marine-guidance-for-public-audience_Version-1b.pdf

Canales, C.M., Hurtado, C., & Techeira, C. 2017. Implementing a model for data-poor fisheries based on steepness of the stock-recruitment relationship, natural mortality and local perception of population depletion. The case of the kelp *Lessonia berteroana* on coasts of north-central Chile. Fisheries Research 198: 31–42.

CBD. 2010. Strategic Plan on Biodiversity 2011-2020. https://www.cbd.int/sp

CBD. 2012. Decision on Protected Areas (XI/24).

CBD. 2016. Progress Towards the Achievement of Aichi Biodiversity Targets 11 and 12 (Decision XIII/2).

CBD. 2018a. Report of the Technical Expert Workshop on Protected Areas and Other Effective Area-based Conservation Measures for Achieving Aichi Biodiversity Target 11. Montreal, Canada, 6-9 February 2018. Document CBD/PA/EM/2018/1/2. https://www.cbd.int/meetings/PAEM-2018-01: 21 p.

CBD. 2018b. Report of the Expert Workshop on marine protected areas and other effective area-based conservation measures for achieving Aichi Biodiversity Target 11 in marine and coastal areas. Montreal, Canada, 6-9 February 2018. CBD/MCB/EM/2018/1/3. https://www.cbd.int/meetings/MCB-EM-2018-01: 30 p.

CBD. 2018c. Decisions adopted by the Conference of the Parties to the Convention on Biological Diversity. Decision 14/8 on protected areas and other effective area-based conservation measures. Cop 14. Sharm Sharm El-Sheikh, Egypt, 17-29 November 2018. Document CBD/COP/DEC/14/8. https://www.cbd.int/decisions/cop/?m=cop-14

Chadès, I., McDonald-Madden, E., McCarthy, M.A., Wintle, B., Linkie, M., Possingham, H.P., 2008. When to Stop Managing or Surveying Cryptic Threatened Species. Proceedings of the National Academy of Sciences of the United States of America 105, 13936–13940.

Christie, P. & Lewis, N. 2016 Perspective: report on the think tank on human dimensions of large scale MPAs. MPAnews 17: 5–6.

Cochrane, K., De Young, C., Soto, D., and Bahri, T. (Eds.), 2009. Climate Change Implications for Fisheries and Aquaculture. Overview of Current Scientific Knowledge, FAO Fisheries , pp. 7-106

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.

Coll, M.; Libralato, S.; Tudela, S.; Palomera, I.; Pranovi, F. 2008. Ecosystem Overfishing in the Ocean. PLoS ONE, 3(12): e3881. https://doi.org/10.1371/journal.pone.0003881

Collie, J.S., Botsford, L.W., Hastings, A., Kaplan, I.C., Largier, J.L et al. 2014. Ecosystem models for fisheries management: finding the sweet spot. Fish and Fisheries, DOI: 10.1111/faf.12093: 25 p.

Cormier, R, Elliot, M, and Rice, J.C.. 2019. Putting on a bow-tie to sort out who does what and why in the complex arena of marine policy and management. Science of the Total Environment. 648: 293-305.

Cvitanovic, C., Hobday, A.J., van Kerkhoff, L., Wilson, S.K., Dobbs, K., Marshall, N.A., 2015. Improving knowledge exchange among scientists and decision-makers to facilitate the adaptive governance of marine resources: A review of knowledge and research needs. Ocean & Coastal Management 112, 25–35. doi:10.1016/j.ocecoaman.2015.05.002

Cvitanovic, C., Wilson, S.K., Fulton, C.J., Almany, G.R., Anderson, P., Babcock, R.C., Ban, N.C., Beeden, R.J., Beger, M., Cinner, J., Dobbs, K., Evans, L.S., Farnham, A., Friedman, K.J., Gale, K., Gladstone, W., Grafton, Q., Graham, N. a. J., Gudge, S., Harrison, P.L., Holmes, T.H., Johnstone, N., Jones, G.P., Jordan, A., Kendrick, A.J., Klein, C.J., Little, L.R., Malcolm, H.A., Morris, D., Possingham, H.P., Prescott, J., Pressey, R.L., Skilleter, G.A., Simpson, C., Waples, K., Wilson, D., Williamson, D.H., 2013. Critical research needs for managing coral reef marine protected areas: Perspectives of academics and managers. Journal of Environmental Management 114, 84–91. doi:10.1016/j.jenvman.2012.10.051

Day, J., N. Dudley, M. Hockings, G. Holmes, D. Laffoley, S. Stolton, and S. Wells, 2012. *Guidelines for applying the IUCN Protected Area Management Categories to Marine Protected Areas*. IUCN: Gland, Switzerland.

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.

DFO. 2016. Guidance on identifying "other effective area-based conservation measures" in Canadian coastal and marine waters. Canadian Science Advisory Secretariat. National Capital Region. Science Advisory Report 2016/002: 13 p. Retrieved from: http://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2016/2016_002-eng.html.

DFO. Undated. Operational guidance for identifying "other effective area-based conservation measures" in Canada's marine environment: 8 p.

Diz, D., Johnson, D., Riddell, M., Rees, S., Battle, J., Gjerde, K., Hennige, 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.

Donohue, I., Hillebrand, H., Montoya, J.M, Petchey, O.L., Pimm, S.L., Fowler, M.S., Healy, K., Jackson, A.L. et al., 2016. Navigating the complexity of ecological stability. Ecology letters, 19: 1172-1185

Douvere, F. 2008. The importance of marine spatial planning in advancing ecosystem-based sea use management. *Marine policy*, *32*(5), 762-771.

Dudley, N. (Editor), 2008. Guidelines for Applying Protected Area Management Categories. IUCN: Gland, Switzerland. 86 p.

Eddy, T.D., Gardner, J.P.A., Pérez-Matus, A., 2010. Applying fishers' ecological knowledge to construct past and future lobster stocks in the Juan Fernández Archipelago, Chile, PLoS ONE. Public Library of Science, p. e13670.

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.

Enrichetti, F.; Bava, S.; Betti, F.; Lanteri, L. & Bo, M. 2019. Artisanal fishing impact on deep coralligenous animal forests: a Mediterranean case study of marine vulnerability. Ocean and Coastal Management. In press. OCMA_2018_825

Fancy, S.G., Gross, J.E., Carter, S.L., 2008. Monitoring the condition of natural resources in US national parks. Environ Monit Assess 151, 161–174. doi:10.1007/s10661-008-0257-y

FAO. 1995. Code of Conduct for Responsible Fisheries. Rome. FAO: 41 p.

FAO. 1996. Precautionary approach to fisheries. 1. Guidelines on the precautionary approach to capture fisheries and species introductions. FAO Fisheries Technical Paper, 350/1. 52 pp.

FAO. 1996a. Integration of fisheries into coastal areas management. FAO, Rome. Technical Guidelines for Responsible Fisheries, 3:17 p.

FAO. 1996b. Precautionary approach to capture fisheries and species introductions. Rome. FAO Technical Guidelines for Responsible Fisheries, 2: 60 p.

FAO. 1997. Fisheries management. FAO Technical Guidelines for responsible fisheries, 4: 82 p.

FAO. 2000. Fisheries management. 1. Conservation and management of sharks. FAO Technical Guidelines for responsible fisheries, 4, Suppl. 1: 37 p.

FAO. 2003. Fisheries management. 2. The ecosystem approach to fisheries. FAO Technical Guidelines for Responsible Fisheries, 4 (suppl. 2): 112 p.

FAO. 2003a. Strategy for Improving Information on Status and Trends in Capture fisheries. FAO. Rome: 10 p.

FAO. 2005. Ethical issues in fisheries. Prepared by Įrnason, W.; Bartley, D.; Garcia, S.; Haraldsson, R.H.; Sveinbjörnsson, D.; and Watanabe, H. FAO Ethics Series., 4: 30 p.

FAO. 2009a. Fisheries management. 2. The ecosystem approach to fisheries. 2.1. Best practices in ecosystem modelling for informing an ecosystem approach to fisheries. FAO. Rome. FAO Technical Guidelines for Responsible Fisheries, 4, Suppl 2, Add. 1: 78 p.

FAO. 2009b. International guidelines for the management of deep-sea fisheries in the high seas. Rome, FAO: 73 p.

FAO. 2009c. Fisheries management. 2. The ecosystem approach to fisheries. 2.2 The human dimensions of the ecosystem approach to fisheries. FAO. Rome. FAO Technical Guidelines for Responsible Fisheries, 4, Suppl 2, Add. 2: 88 p.

FAO. 2009d. Information and knowledge sharing. FAO Technical Guidelines for Responsible Fisheries. Rome. FAO: 97 p.

FAO. 2011. Fisheries management. 4. Marine protected areas and fisheries. FAO Technical Guidelines for Responsible Fisheries, 4, Suppl. 4: 199 p.

FAO. 2015. Voluntary guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication. Rome. FAO: 27p.

Féral, F. & Salvat, B. 2014. Gouvernance, enjeux et mondialisation des grandes aires marine protégées. Paris. L'Harmattan: 217 p.

Field, S.A., O'Connor, P.J., Tyre, A.J., Possingham, H.P., 2007. Making monitoring meaningful. Austral Ecology 32, 485–491. doi:10.1111/j.1442-9993.2007.01715.x.

Field, S.A., Tyre, A.J., Jonzen, N., Rhodes, J.R., Possingham, H.P., 2004. Minimizing the cost of environmental management decisions by optimizing statistical thresholds. Ecology Letters 7, 669–675. doi:10.1111/j.1461-0248.2004.00625.x

Field, S.A., Tyre, A.J., Possingham, H.P., 2005. Optimizing allocation of monitoring effort under economic and observational constraints. Journal of Wildlife Management 69, 473–482. doi:10.2193/0022-541X(2005)069[0473:OAOMEU]2.0.CO;2

Fischer, J.; Jorgensen, J.; Josupeit, H.; Kalikoski, D. & Lucas, C.M., eds. 2015. Fishers' knowledge and the ecosystem approach to fisheries: applications, experiences and lessons in Latin America. Rome, FAO. FAO Fisheries and Aquaculture Technical Paper, 591: 278 p. Available at: http://www.fao.org/3/a-i4664e/index.html

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

Fowles, B., 2007. Shifting baselines, shifting perspectives: The methodological challenges associated with creating historical baselines of finfish in the Ningaloo Marine Park, History, Political Science and International Relations. University of Western Australia, Perth, Western Australia, p. 71.

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, DOI: 10.1080/08920753.2014.904178

Frank, K.T., Petrie, B. & Shackell N.L. 2007. The ups and downs of trophic control in continental shelf ecosystems. Trends in Ecology and Evolution 22:236−242

Fraschetti, S., Pipitone, C., Mazaris, A. D.; et al. 2018. Light and Shade in Marine Conservation Across European and Contiguous Seas Frontiers in Marine Science 5 UNSP 420

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

Fuller, S. 2018. Cross-cutting issues and key messages related to the achievement of Target 11 through the use of marine protected areas and other effective area-based conservation measures. Document CBD/MCB/EM/2018/1/INF/1. htpps://www.cbd.int/meeetings/PAEM-2018-01*: 63 p.*

Fulton, E. A., Smith, A. D. M. &Punt, A. E. 2005. Which ecological indicators can robustly detect effects of fishing? e ICES Journal of Marine Science, 62: 540-551.

Fulton, E.A., Link, J.S., Kaplan, J.C., Savina-Rolland, M., Johnson, P., Ainsworth, C., Horne, P., Gorton, P., Gamble, R.J., Smith, A.D.M. and Smith, D.C. 2011 Lessons in modelling and management of marine ecosystems: the Atlantis experience. Progress in Oceanography, 12: 171-188

Fulton, E.A., Punt, A.B, Dichmont, C.M., Gorton, R., Sporcic, M., Dowling, M., Little, R., Haddon, M., Klaer, N. & Smith, D.C. 2016. Developing risk equivalent data-rich and data-limited harvest strategies. Fisheries Research 183: 574–587

Fulton, E.A.; Bax, N. J.; Bustamante, R. H.; Dambacher, J. M.; Dichmont, C.; Dunstan, P. K.; Heyes, K. R. et. al. 2015. 2015. Modelling marine protected areas: insights and hurdles. Phil. Trans. R. Soc. B 370: 20140278. http://dx.doi.org/10.1098/rstb.2014.0278

Garcia, S.M. & Charles, A.T. 2008. Fishery systems and linkages: implications for science and management. Oceans and coastal Management, 51(7): 505-427. Doi 10.1016/j.oceacoaman.2008.05.0001.

Garcia, S.M. & Rice, J. 2019. Scientific assessment of progress towards Aichi biodiversity Target 6 on sustainable fisheries. CBD Technical Series, 87. Secretariat of the Convention on Biological Diversity: 101 pages

Garcia, S.M. ; Rice, J. & Charles, A. 2014. Governance of marine fisheries and biodiversity conservation: the integration challenge: pp. 37-52 *in Governance of marine fisheries and biodiversity conservation. Interaction and coevolution.* Garcia, S.M.; Rice, J. and Charles, A. (Eds). Wiley Blackwell, Chichester (U.K.): 511 p.

Garcia, S.M.; Rey-Vallette, H. & Bodiguel, C. 2009. Chapter 12. Which indicators for what management? The challenge of connecting offer and demand of indicators. *In* Cochrane, K. and Garcia, S.M. (Eds). *A fishery managers' handbook*. FAO and Wiley-Blackwell: 303-332

Gerber, L.R., Beger, M., McCarthy, M.A., Possingham, H.P., 2005. A theory for optimal monitoring of marine reserves. Ecology Letters 8, 829–837. doi:10.1111/j.1461-0248.2005.00784.x

Goulletquer, P.; Gros, P.; Boeuf, G. & Weber, J. (Coord.). 2013. Biodiversité en environnement marin. Versailles (France). Editions Quae: 207 p.

Grafton, Q.R., Hilborn, R., Squires, D., Tait, M., and Williams, M. (Eds). 2009. Handbook of Marine Fisheries Conservation and Management. Oxford University Press: 770 p.

Grafton, R. Q. and Little, L. R. 2017. Risks, resilience, and natural resource management: lessons from selected findings. Natural Resource Modeling 30: 91-111.

Graham, J.; Amos, B. & Plumptre, T. 2003. Principles for Good Governance in the 21st Century. Ottawa. Institute of Governance. Policy Brief, 15: 9p. unpan1.un.org/intradoc/groups/public/documents/UNPAN/UNPAN011842.pdf

Griffiths, R.A., 2004. Mismatches between conservation science and practice. Trends in Ecology & Evolution 19, 564–565. doi:10.1016/j.tree.2004.09.008

Griggs, D., Stafford-Smith, M., Gaffney, O., Rockström, J., Öhman, M.C., Shyamsundar, P., Steffen, W., Glaser, G., Kanie, N. & Noble, I., 2013. Policy: sustainable development goals for people and planet. Nature, 495, 305–307. http://dx. doi.org/10.1038/495305a

Hajer, M., Nilsson, M., Raworth, K., Bakker, P., Berkhout, F., De Boer, Y., Rockström, J., Ludwig, K. & Kok, M., 2015. Beyond cockpit-ism: four insights to enhance the transformative potential of the Sustainable Development Goals. Sustainability, 72(2): 1651-1660. https://doi.org/10.3390/su7021651

Hall, S. J. 2009. Chapter 8 - Area and time restrictions: 196-219. *in*: Cochrane, K.L. and S. M. Garcia (Eds.) *A fishery's manager guidebook*. Chichester (UK) and Rome (Italy). Wiley-Blackwell and FAO. 2nd Edition: 518 p.

Halpern, B.S., Frazier, M., Potapenko, J., et al. 2015. Spatial and temporal changes in cumulative human impacts on the world's ocean Nature Communications. 6: Article Number:7615.

Harding, R., Traynor, D., 2003. Informing ESD: State of Environmental Reporting, in: Drovers, S., Wild River, S. (Eds.), Managing Australia's Environment. Federation Press, Leichhardt, New South Wales, pp. 181–226.

Harding, R., Traynor, D., 2003. Informing ESD: State of Environmental Reporting, in: Drovers, S., Wild River, S. (Eds.), Managing Australia's Environment. Federation Press, Leichhardt, New South Wales, pp. 181–226.

Hassan, R.; Scholes, R. and Ash, N. (Eds). 2005. Millennium Ecosystem Assessment: Ecosystems and human wellbeing, Volume 1, Current State and Trends. Island Press, Washington

Hatry, H.P. 2006. Performance measurement: Getting results, second edition. Washington DC: The Urban Institute Press.

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. 2018. Are MPAs effective? ICES Journal of Marine Science (2018), 75(3): 1160–1162. doi:10.1093/icesjms/fsx068.

Hobday, A.J., 2011. Sliding baselines and shuffling species: implications of climate change for marine conservation. Marine Ecology 32, 392-403.

Hockings, M., 1998. Evaluating management of protected areas: integrating planning and evaluation. Environmental management 22, 337–345.

Hoeksema, B.W., van der Land, J., van der Meij, S.E.T., van Ofwegen, L.P., Reijnen, B.T., van Soest, R.W.M., de Voogd, N.J., 2011. Unforeseen importance of historical collections as baselines to determine biotic change of coral reefs: the Saba Bank case. Marine Ecology 32, 135-141.

Hughes,T.P., Carpenter, S., Rockström, J,: Scheffer, M. & Walker, B. 2013. Multiscale regime shifts and planetary boundaries. Trends n ecology and evolution 28: 389-395.

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 Afr. J. Sci. 110 (9/10). http://dx.doi.org/10.1590/sajs.2014/a0080.

ICES. 2001. Report of the Study Group on Further Development of the Precautionary Approach to Fisheries Management. ICES Document CM 2001/ACFM: 11. 28 pp.

ICES. 2002. Report of the Study Group on Further Development of the Precautionary Approach to Fisheries Management. ICES Document CM 2002/ACFM: 10. 67 pp.

IPCC 2014: Adaptation to Climate Change. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

IPCC in press. Special Report on the Ocean and Cryosphere. To appear 08/2019

IUCN WCPA, 2018. (Draft) Guidelines for recognising and reporting other effective Area-based Conservation Measures. Version 1. Gland. IUCN. Document CBD/PA/EM/2018/1/INF/1IUCN. Technical Expert Workshop on Other Effective Area-Based Conservation Measures for Achieving Aichi Biodiversity Target 11. 6 - 9 February 2018 - Montreal, Canada. https://www.cbd.int/meetings/PAEM-2018-01: 42 p.

Jacobson, C., Carter, R.W., Hockings, M., Kelman, J., 2011. Maximizing conservation evaluation utilization. Evaluation 17, 53–71. doi:10.1177/1356389010389903

Jameson, D.A., 1986. Sampling intensity for monitoring of environmental systems. Applied Mathematics and Computation 18, 71–76.

Jennings S, et al. (1999) Fishing effects in northeast Atlantic shelf seas: Patterns in fishing effort, diversity and community structure. III. International trawling effort in the North Sea: An analysis of spatial and temporal trends. Fish Res 40:125–134.

Jiao, Y. 2009. Regime shift in marine ecosystems and implications for fisheries management, a review. Reviews in Fish Biology and Fisheries 19: 177-191

Jonas H. and K. MacKinnon (Editors), 2016. *Co-Chairs' Report of the First Meeting of International Experts of the Task Force on Other Effective Area-based Conservation Measures*. : IUCN-WCPA: Gland, Switzerland. https://www.iucn.org/theme/protected-areas/wcpa/what-we-do/oecms

Jonas H. and K. MacKinnon (Editors), 2017. *Using Case Studies to Enhance Guidance on Other Effective Area-based Conservation Measures: Report of Third Meeting of the IUCN-WCPA Task Force on Other Effective Area-based Conservation Measures*. IUCN-WCPA: Gland, Switzerland. https://www.iucn.org/theme/protected-areas/wcpa/what-we-do/oecms

Jonas H. and MacKinnon, K. (Editors), 2016. Advancing Guidance on Other Effective Area-based Conservation Measures: Report of the Second Meeting of the IUCN-WCPA Task Force on Other Effective Area-based Conservation Measures. Bundesamt für Naturschutz: Bonn https://www.bfn.de/fileadmin/BfN/ina/Dokumente/Tagungsdoku/2016/Task_Force_on_OECMs_Rp2016.pdf

Jonas, H., V. Barbuto, H.C. Jonas, A. Kothari, and F. Nelson, 2014. New steps of change: looking beyond protected areas to consider other effective area-based conservation measures. *PARKS,* 20 (2): 111-128.

Jonas, H.; Barbuto, V.; Jonas, H.C.; Kothari, A. & Nelson, F. 2014. New steps of change: looking beyond protected areas to consider other effective area-based conservation measures. *PARKS* **20** (2): 111-128.

Jonas, H.D.; MacKinnon, K.; Dudley, N.; Hockings, M.; Jessen, S.; Laffoley, D.; MacKinnon, D. et al. 2018. Editorial essay: other effective area-based conservation measures: from Aichi Target 11 to the post 2020 biodiversity framework. PARKS, 24 (Special Issue): 9-16

Jones, P.J.S. 2014. Governing marine protected areas. Resilience through diversity. New-York, Earthscan Routledge: 240 p.

Kerr, S. 2019. Should we be conserving and managing marine ecosystems in 3D? The latest thinking on vertical zoning. The Skimmer, February 2019. https://meam.openchannels.org/news/skimmer-marine-ecosystems-and-management/should-we-be-conserving-and-managing-marine-ecosystems

Laffoley, D., N. Dudley, H. Jonas, D. MacKinnon, K. MacKinnon, M. Hockings, and S. Woodley, 2017. An introduction to 'other effective area-based conservation measures' under Aichi Target 11 of the Convention on Biological Diversity: origin, interpretation and some emerging ocean issues. Journal of Aquatic Conservation, 27 (Supplement 1): 130-137

Laffoley, Dan; Dudley, Nigel; Jonas, Harry; et al. 2017. An introduction to "other effective area-based conservation measures' under Aichi Target 11 of the Convention on Biological Diversity: Origin, interpretation and emerging ocean issues Aquatic Conservation-Marine and Freshwater Ecosystems 27 – Supp. 1: 130-137.

Leadley, P.W.; Krug, C.B.; Alkemade, R.; Pereira, H.M.; Sumaila, U. R.; Walpole, M.; Marques, A. et al. 2014. Progress towards the Aichi Biodiversity Targets: An Assessment of Biodiversity Trends, Policy Scenarios and Key Actions. Technical Series, 78. Secretariat of the Convention on Biological Diversity, Montreal, Canada.

Libralato, S.; Coll, M.; Tudela, S.; Palomera, I. & Pranovi, F. 2008. Novel index for quantification of ecosystem effects of fishing as removal of secondary production. Mar. Ecol .Prog .Ser,. 355: 107–129, doi: 10.3354/meps07224

Lindenmayer, D., Gibbons, P., 2012. Biodiversity Monitoring in Australia. CSIRO Publishing, Melbourne.

Lindenmayer, D.B., Likens, G.E., 2010. The science and application of ecological monitoring. Biological Conservation 143, 1317–1328. doi:10.1016/j.biocon.2010.02.013

Link, J.S. 2010. Ecosystem-based fisheries management. Confronting trade-offs. Cambridge. Cambridge University Press: 207 p.

Lopoukhine, N. & Dias, B. F. 2012. Editorial: What does Target 11 really mean? *PARKS* **18** 925 (1): 5-8.

Lotze, H.K., Worm, B., 2009. Historical baselines for large marine animals. Trends in Ecology and Evolution 24, 254-262.

MacKenzie, B.R., Myers, R.A., 2007. The development of the northern European fishery for north Atlantic bluefin tuna Thunnus thynnus during 1900-1950. Fisheries Research 87, 229-239.

MacKenzie, B.R., Schiedek, D., 2007. Long-term sea surface temperature baselines - time series, spatial covariation and implications for biological processes. Journal of Marine Systems 68, 405-420.

MacKinnon, D.; Lemieux, C.J.; Beazley, K.; Woodley, S.; Helie, R.; Perron, J.; Elliott, J.; et al. 2015. Canada and Aichi Biodiversity Target 11: understanding 'other effective area-based conservation measures' in the context of the broader target. Biodiversity and Conservation, **24** (14): 3559-3581. Doi 10.1007/s10531-015-930 1018-1

Mackinson, S., Heymans, J. J., & Raid, T. 2010. Can simple be useful and reliable? Using ecological indicators to represent and compare the states of marine ecosystems. – ICES Journal of Marine Science, 67: 717–731.

Mapstone, B.D., 1995. Scalable Decision Rules for Environmental Impact Studies: Effect Size, Type I, and Type II Errors. Ecological Applications 5, 401. doi:10.2307/1942031

McClanahan, T.R., Graham, N.A.J., MacNeil, M.A., Muthiga, N.A., Cinner, J.E., Bruggemann, J.H., Wilson, S.K., 2011. Critical thresholds and tangible targets for ecosystem-based management of coral reef fisheries. Proceedings of the National Academy of Sciences 108, 17230–17233. doi:10.1073/pnas.1106861108

McClatchie, S.; Hendy, I. L.; Thompson, A. R. and Watson, W.. 2017. - Collapse and recovery of forage fish populations prior to commercial exploitation. Geophysical Research Letters, 44:. http://dx.doi.org/10.1002/2016GL071751

Meiklejohn, K.; Ament, R. & Tabor, G. 2010. Habitat Corridors & Landscape Connectivity: Clarifying the Terminology. Center for large landscapes conservation. A project of the wild foundation. Boseman. Center for large landscapes conservation. https://www.researchgate.net/publication/242196426_Habitat_Corridors_Landscape_Connectivity_Clarifying_the_Terminology/download: 6 p.

Montoya, J.M., Donohue, I. & Pimm, S.L. 2018. Planetary Boundaries for Biodiversity: Implausible Science, Pernicious Policies. Trends in Ecology and Evolution, 33: 71–73.

Morrisey, D.J., Underwood, A.J., Howitt, L., Stark, J.S., 1992. Temporal variation in soft-sediment benthos. Journal of Experimental Marine Biology and Ecology 164, 233–245. doi:10.1016/0022-0981(92)90177-C

Morrison, L.W., 2008. The Use of Control Charts to Interpret Environmental Monitoring Data. Natural Areas Journal 28, 66–73. doi:10.3375/0885-8608(2008)28[66:TUOCCT]2.0.CO;2

Murawski, S. 2000. Definitions of overfishing from an ecosystem perspective. ICES Journal of Marine Science, 57: 649-658

Muxika, I., Borja, Á., Bald, J., 2007. Using historical data, expert judgement and multivariate analysis in assessing reference conditions and benthic ecological status, according to the European Water Framework Directive. Marine Pollution Bulletin 55, 16-29.

Nash, K.L., Cvitanovic, C., Fulton, E.A., Halpern, B.S., Milner-Gulland, E.J., Watson, R.A. & Blanchard, J.L. 2017. Planetary boundaries for a blue planet. Nature Ecology & Evolution 1: 1625–1634.

Nelson, J.D., Ward, R.C., 1981. Statistical considerations and sampling techniques for ground-water quality monitoring. Ground Water 19, 617–625.

Newman. S.J.; Brown, J.I.; Fairclough, D.V.; Wise, B.S.; Bellchambers, L.M-; Molony, B.W.; Lenanton, R.C.J.; et al. 2018. A risk assessment and prioritization approach to the selection of indicator species for the assessment of multi-species, multi-gear, multi-sector fishery resources. Marine Policy, 88: 11-22

Nie, M.A., Schultz, C.A., 2012. Decision-Making Triggers in Adaptive Management. Conservation Biology 26, 1137–1144. doi:10.1111/j.1523-1739.2012.01915.x

Noss, R., 1990. Indicators for monitoring biodiversity: A hierarchical approach. Conservation Biology 4, 355–364.

OECD, 1993. OECD core set of indicators for environmental performance reviews, Environmental Monographs (83). Organisation for Economic Co-operation and Development, Paris, France.

OED, 2004. Monitoring and Evaluation. Some tools, methods and approaches. The International Bank for Reconstruction and Development, The World Bank. 1818 H Street, N.W. Washington, D.C. 20433, U.S.A.

Ojaveer, H., MacKenzie, B.R., 2007. Historical development of fisheries in northern Europe--Reconstructing chronology of interactions between nature and man. Fisheries Research 87, 102-105.

Pannell, D.J., Glenn, N.A., 2000. A framework for the economic evaluation and selection of sustainability indicators in agriculture. Ecological economics 33, 135–149.

Pauly, D., 1995. Anecdotes and the shifting baseline syndrome of fisheries. Trends in Ecology and Evolution 10, 430.

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, xxx(xxx): 12 p. https://doi.org/10.1016/j.marpol.2019.01.005.

Piet, G., Culhane, F.,; Jongbloed, R., et al. 2019. An integrated risk-based assessment of the North Sea to guide ecosystem-based management Science of the Total Environment. 654: 694-704

Piroddi, C.; Coll, M.; Liquete, C.; Macias, D.; Greer, K.; Buszowski, J.: Steenbeek, J.; Danovaro, R. and Christensen, V. 2017. Historical changes of the Mediterranean Sea ecosystem: modelling the role and impact of primary productivity and fisheries changes over time. Nature Scientific Reports, Scientific Reports | 7:44491 | DOI: 10.1038/srep44491: 18 p.

Pitcher, C.R., Burridge, C.Y., Wassenberg, T.J., Hill, B.J. & Poiner, I.R. 2009. A large scale BACI experiment to test the effects of prawn trawling on seabed biota in a closed area of the Great Barrier Reef Marine Park, Australia. Fisheries Research, 99, 168–183.

Plagąnyi, E. E. 2007. Models for an ecosystem approach to fisheries. FAO. Rome. FAO Fisheries Technical Paper, 477:108 p.

Preston, B.L., Dow, K. & Berkhout, F. 2013. The Climate Adaptation Frontier. Sustainability 2013, 5, 1011-1035.

Rees, S.E.; Foster, N.L.; Langmead, O.; Pittman, S. & Johnson, D.E. 2018. Defining the qualitative elements of Aichi Biodiversity Target 11 with regard to the marine and coastal environment. Document CBD/MCB/EM/2018/1/INF2. Expert Workshop on marine protected areas and other effective area-based conservation measures in coastal and marine areas (6-9/02/2018; Montreal, Canada). https://www.cbd.int/meetings/PAEM-2018-01

Rice, J.; Garcia, S.M: & Kaiser, M. 2018. Other effective area-based conservation measures (OEABCMs) used in marine fisheries: a working paper. Document CBD/MCB/EM/2018/1/INF/4. Expert Workshop on marine protected areas and other effective area-based conservation measures in coastal and marine areas (6-9/02/2018; Montreal, Canada): 70 p. https://www.cbd.int/meetings/PAEM-2018-01

Rice, J.C. and Houston, K. 2011. Representativity and networks of Marine Protected Areas. Aquatic Conservation: Marine and Freshwater Ecosystems, 21: 649–657

Rockström, J, J., Steffen, W.i., Noone, K., et al., 2009. Planetary Boundaries: Exploring the safe operating space for humanity. Ecology and Society, 14: Article N° 32

Rosenberg, A.A.//Bolster, W.J.//Alexander, K.E.//Leavenworth, W.B.//Cooper, A.B.//McKenzie, M.G. 2005. The history of ocean resources: modeling cod biomass using historical records. *Frontiers in Ecology and the Environment*, 3(2) . 78-84

Rudnick, D.A.; Ryan, S.J.; Beier, P.; Cushman, S.A.; Dieffenbach, F.; Epps, C.W; Gerber, L.R. et al. 2012. The Role of Landscape Connectivity in Planning and Implementing Conservation and Restoration Priorities. Ecological Society of America Issues in Ecology, 16: 21 p. https://www.esa.org/esa/wp-content/uploads/2013/03/issuesinecology16.pdf

Schwerdtner Máñez, K., Ferse, S.C.A., 2010. The history of Makassan trepang fishing and trade, PLoS ONE. Public Library of Science, p. e11346.

Seavy, N.E., Reynolds, M.H., 2007. Is statistical power to detect trends a good assessment of population monitoring? Biological Conservation 140, 187–191. doi:10.1016/j.biocon.2007.08.007

Shackell, N. L., Bundy, A., Nye, J. A., et al., 2012. Common large-scale responses to climate and fishing across Northwest Atlantic ecosystems. ICES Journal of Marine Science, 69: 151-162.

Shankar, A., Basurto, X.,, Ferse, S., Glaser, M., Campbell, L., Cinner, J.E., Dalton, T., Jenkins, L.D., Miller, M.L., Pollnac, R., Vaccaro, I., and Christie, P. 2018. Marine resource management and conservation in the Anthropocene. Environmental Conservation 45: 192–202.

Shin, Y-J., Bundy, A., Shannon, L. J., Simier, M., Coll, M., Fulton, E. A., Link, J. S., Jouffre, D., Ojaveer, H., Mackinson, S., Heymans, J. J., and Raid, T. 2010. Can simple be useful and reliable? Using ecological indicators to represent and compare the states of marine ecosystems. – ICES Journal of Marine Science, 67: 717–731

Simpson, C., Beger, M., Colman, J., Friedman, K., Hill, A., Kendrick, A., Waples, K., Whiting, S., Wilson, S., 2015. Prioritisation of conservation research and monitoring for Western Australian protected areas and threatened species. Conservation Science W. Aust. 9, 227–237.

Smith, A. D. M., Fulton, E. J., Hobday, A. J., Smith, D. C., & Shoulder, P. 2007. Scientific tools to support the practical implementation of ecosystem-based fisheries management. ICES Journal of Marine Science, 64: 633–639. Https://doi.org/10.1093/icesjms/fsm041

Steffen, W., Richardson, K., Rockström, J. et al.,2015. Planetary boundaries: Guiding human development on a changing planet. Science, 345: 734-747.

ten Kate, K. and Crowe, M.L.A. 2014a. Biodiversity Offsets: Policy options for governments. An input paper for the IUCN Technical Study Group on Biodiversity Offsets. Gland, Switzerland: IUCN: 91pp.

Thomas, I., Murfitt, P., 2011. Environmental management: processes and practices for Australia, 2nd ed. ed. Federation Press, Annandale, N.S.W.

Tittensor, D.P., Mora, C., Jetz, W., Lotze, H.K., Ricard, D., Berghe, E.V., Worm, B., 2010. Global patterns and predictors of marine biodiversity across taxa. Nature 466, 1098-1101.

Trenkel, V.M.; Rochet, M-J.; Mesnil, B. 2007. From model-based prescriptive advice to indicator-based interactive advice. In: Fisheries management strategies. ICES Journal of Marine Science, 64(4): 768-774

Underwood, A.J., 1992. Beyond BACI: the detection of environmental impacts on populations in the real, but variable, world. Journal of Experimental Marine Biology and Ecology 161, 145–178.

UNEP and IOC/UNESCO 2009. An Assessment of Assessments. Findings of a Group of Experts. Regional and Supra-Regional Summaries and Annexes. ISBN 978-92-807-29764. 3 volumes.

United Nations. Report of the International Workshop on Methodologies regarding Free, Prior and Informed Consent and Indigenous Peoples. Permanent Forum on Indigenous Issues. Economic and Social Council. Fourth session. New York, 16-27 May 2005. Document E/C.19/2005/3: 25 p

Ward, R.C., Loftis, J.C., Nielsen, K.S., Anderson, R.D., 1979. Statistical evaluation of sampling frequencies in monitoring networks. Journal (Water Pollution Control Federation) 2292–2300.

Weigel, J.Y.// Mannle, K.O.//Bennet, N.J.// Carter, E.// Westlund, L.// Burgener, V.// et al. 2014. Marine protected areas and fisheries: bridging the divide. Aquatic conservation: Marine and freshwater ecosystems, 24(Suppl. 2): 192-215

Weisshuhn, P.; Mueller, F.; and Wiggering, H. 2018. Ecosystem Vulnerability Review: Proposal of an Interdisciplinary Ecosystem Assessment Approach Environmental Management 61: 904-915.

Werner, E.E. & Gilliam, J.F. 1984. The ontogenetic niche and species interactions in size-structured populations. Annu. Rev. Ecol. Syst., 15: 393–425.

Wolfe, D., Champ, M., Flemer, D., Mearns, A., 1987. Long-Term Biological Data Sets - Their Role in Research, Monitoring, and Management of Estuarine and Coastal Marine Systems. Estuaries 10, 181–193. doi:10.2307/1351847

## ANNEX 1 – TYPOLOGY OF AREA-BASED FISHERY MANAGEMENT MEASURES[30]

### 1. INTRODUCTION

An area-based fisheries management measure (ABFM) is a formally established, spatially-defined fishery management and/or conservation measure, implemented to achieve one or more intended fishery outcomes. These outcomes are commonly related to sustainable use of the target species of the fishery, such as the protection of vulnerable life-stages or critical habitats or to allocation of space and resources among fishing communities or sub-sectors. However, increasingly the intended outcomes can include protection or reduction of impact on biodiversity components, habitats, or ecosystem structure and function, such as closures of Vulnerable Marine Ecosystem (VMEs) or exclusion of small-mesh fisheries within the foraging range of seabird colonies. Moreover, many of the measures that are intended primarily to deliver outcomes related to the target species also deliver additional biodiversity

[30] This typology is extracted and summarized from **Rice, Garcia & Kaiser (2018)**

conservation outcomes relevant to Target 11. These area-based measures have an implicit or explicit time dimension (from permanent, to temporary, seasonal or real time).

## 2. OBJECTIVES OF ABFMS

In order of priority, ABFMs usually aim at : (i) Optimizing the exploitation of the target species, e.g. protecting juveniles, recruits, or spawners; (ii) Allocating space and resources to categories of users, e.g. small-scale, large scale fisheries or recreational fisheries; national or foreign fleets; (iii) Broader conservation, e.g. protecting vulnerable or threatened species and habitats critical for fishery sustainability and ecosystem services needed for it.

## 3. PERFORMANCE FACTORS OF ABFMS

ABFMs are used in lieu or as a complement to more conventional fishery management measures such as input/output controls and economic incentives. In general terms, their performance depends on: (i) The overall state of the environment and its intrinsic oscillations, including climate change (that may affect the distribution or survival of the life cycle to be protected; (ii) The adequacy of its parameters (e.g. size, location, history, state, and general environment); (iii) Their intended purpose(s) when adopted (i.e. their objectives, whether explicit or implicit), and what fishery issues they are intended to address; (iv) Fishery governance, particularly community involvement, access rules, additional management measures, inside and outside it, and enforcement; and (v) Overall fishing pressure,

## 4. TYPOLOGY OF ABFMS

ABFMs have three main dimensions of constraint: (1) Time: areas are closed to fishing permanently (reserves) or temporarily (seasonal, rotational, in real-time); (2) Space: closing the entire EEZ or all or part of a fishing ground within the EEZ; (3) Fishing activities: limitations may apply to all fishing or only to some gears, or some socio-economic categories. Measures affecting dimensions 1, 2 and 3, together with additional technical measures within the areas, can be used to achieve the purposes listed **Section 3.2**. The realm of possible ABFMs is illustrated in **Figure 1** and examples are given in **Table 1**.

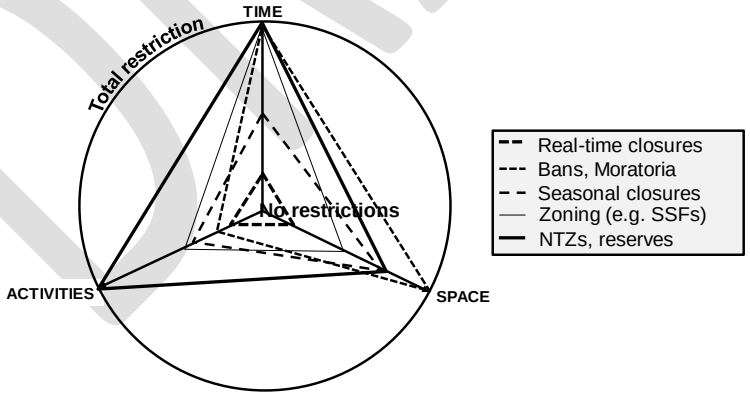


**Figure 1: Different types of area-based fishery management measures (ABFM) according to the degree of restriction of time, space and types of activities (Redrawn from Garcia et al., 2013). The three axes range from zero restriction (at the centre) to total restriction (on the circle). All these types may be implemented for different purposes (see text)**

The degree of restriction in the three main dimensions leads to a large range of ABFMs when combined with the different potential purposes and contextual parameters related, for example, to the

oceanographic characteristics (e.g., depth rage; inshore, coastal, or offshore; neritic or oceanic; benthic or pelagic), jurisdiction (e.g., national jurisdiction, shared with neighbouring States, straddling between jurisdictions, or in the High Sea), types of governance, etc. Therefore, in the following sections, some main ABFMs are described, identifying various examples that vary considerably in: (i) the degree to which the dimensions are restrained, and (ii) their range of intended purposes. Because of their multiple dimensions, ABFMs cannot be easily "boxed" into simple homogenous categories that could be reliably expected to deliver intended outcomes.

**Table 1. Constraints in space, time and fishing activities in various ABFMs. The characteristics of these and other areas is clarified below.**

| | DIMENSIONS CONSTRAINED | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Duration | | | | Space | | | | Gears | |
| | Permanent | Temporary | Seasonal | Real time | High Sea | EEZ | Fish. ground | Area | All | Some |
| Total gear ban | ■ | | | | ■ | ■ | ■ | | ■ | ■ |
| Vulnerable Marine Ecosystem (VME) | ■ | | | | ■ | | | ■ | ■ | ■ |
| Reserve; sanctuary | ■ | | | | | | | ■ | ■ | ■ |
| Zoning | ■ | | | | | ■ | | | | ■ |
| Territorial use right in fisheries (TURF) | ■ | | | | | | | ■ | | ■ |
| Fishery restricted area (FRA) | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ |
| Benthic Protected Area (BPA) | ■ | | | | ■ | | | | | ■ |
| Ring fencing | ■ | | | | | ■ | ■ | | | ■ |
| Moratorium | ■ | | | | ■ | ■ | ■ | | | ■ |
| Marine Managed Area (MMA) | | ■ | | | | | | ■ | | ■ |
| Locally Managed Marine Area (LMMA) | | ■ | | | | | | ■ | | ■ |
| Community Conserved Area (CCA) | ■ | ■ | | | | | | ■ | | ■ |
| Rotational closure | | ■ | | | | ■ | | ■ | | ■ |
| Closed season | | | ■ | | ■ | ■ | ■ | ■ | | ■ |
| Real-time incentives, closures, (RTI, RTC) | | | | ■ | | | | ■ | | ■ |
| Move-on rule | | | | ■ | ■ | ■ | ■ | ■ | | ■ |

Some more details on these ABFMs are provided below.

Fishing zones are often also established inside an EEZ to allocate the available space, and the resources therein, exclusively to types of fishing or fleets or to socio-economic groups, excluding others. The purpose may relate to equity, avoidance of people and gear conflict, and reduction of the risk of dangerous collisions. They are important for the orderly development of the sectors but have little direct impact on sustainability or conservation although formal space allocation may stimulate local stewardship.

Rebuilding closures or moratoria may be used only when key target species are badly depleted or collapsed and other measures have not succeeded in limiting catches and rebuilding biomass. They may be closed *sine die* or until rebuilding has been completed (e.g. in a rebuilding moratorium).

TAC-related closures are used when the Total Allowable Catch (TAC) for a season or fishing year have been exhausted for the target species (or for a quota-protected bycatch species) and the fishery is closed for

the entire fleet for the rest of the year. They commonly reopen when the next fishing season or year starts.

Total closures for ecosystem management can also be implemented by fishing authorities for protection of some spatial ecosystem feature. These fishery "reserves" are often similar, in their intent, to MPAs (which, however, are cross-sectoral). Like MPAs, their effectiveness depends on the state of the resources before the measure, enforcement of special measures insider the area and, if resources move in and out of the closed area, on effectiveness of management outside the area.

Vulnerable Marine Ecosystems (VMEs) are areas closed to all or some fishing gear (particularly bottom-contacting gear) to protect vulnerable biogenic habitats (such as corals and sponge reefs). Guidance has been elaborated by FAO to qualify the significance of adverse impacts and is available on the FAO and other VME-dedicated websites[31] (**FAO, 2008, 2009; Thompson et al., 2016**).

Benthic Protected Areas (BPAs) were voluntarily established, in 2006, by the Southern Indian Ocean Deepwater Fishers Association (SIODFA), closing 11 areas (covering 309,000 $km^2$ of deep-sea benthic habitat) to their own vessels. Two more areas were announced in 2013. A process of formalization and recognition of BPAs at international level has started in the Southern Indian Ocean Fisheries Agreement (SIOFA, http://www.siofa.org).

Ring-Fencing is a voluntary agreement adopted in South Africa by the hake trawl industry in 2008 (**Augustyn et al., 2018**) to freeze the spatial expansion of the fishery. The "fenced" area is integrated with the national Vessel Monitoring Systems (VMS). Compliance is controlled by the South African Deep-Sea Trawling Industry Association (SADSTIA) and is now part of the fishing permit conditions. Another example might be the decision by the GFCM, in 2005, to prohibit the use of towed dredges and trawls below 1000 meters in the entire Mediterranean Sea, to protect little known deep-sea sensitive habitats **(Thompson et al., 2016: 107, 111**). In 2016, the whole area was recognized as a Fisheries Restricted Area (FRA) (see below). A similar, but unilateral, regulation (EU 2016/2336) adopted in 2016 by the European Parliament and Council, prohibits trawling at depths greater than 800 meters to (i) the Union fishing vessels and third-country fishing vessels in the E.U. waters of the North Sea, north-western and south-western European waters as well as in the E.U. waters of ICES zone IIa; and (ii) by E,U. fishing vessels in international waters of CECAF areas 34.1.1, 34.1.2 and 34.2.

Fisheries Restricted Areas (FRAs) have been proposed and formally adopted in GFCM since 2006, as multi-purpose spatial management tool 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 national or international waters, therefore following criteria in accordance to (but broader in scope than) those established for VMEs in the FAO deep-sea fisheries guidelines.

[31] http://www.fao.org/in-action/vulnerable-marine-ecosystems/vme-database/en/vme.html
http://www.fao.org/in-action/vulnerable-marine-ecosystems/en/
http://www.ices.dk/marine-data/data-portals/Pages/vulnerable-marine-ecosystems.aspx
https://www.nafo.int/Fisheries/VME
https://www.ccamlr.org/en/science/vulnerable-marine-ecosystems-vmes

Rotational closures involve temporary inter-annual and usually recurrent closures and re-opening of areas to specific fisheries or gears. In the long-term, all areas are fished on some pre-established multi-year schedule. They are often used, for example in some fisheries for sedentary benthic species such as bivalves or precious corals, when efficient harvesting can take most of the stock in a local area (and the local depletion rate cannot be really controlled), and renewal of the stock takes several years. The length of the closed and open periods and the relative size of the open and closed areas are context-specific.

Seasonal closed areas are common in fisheries management. Fishing is restricted only part of the year and often in part of the fishing area. These ABFMs close areas to a specific fishery or fishing gear for a period of time. The area and the time are usually the same every year, based on average time-space distribution of the element to be protected (e.g. juveniles or spawners of the target species; concentration of protected species). With short-lived animals, however, as in tropical penaeid shrimp fisheries, the closures might cover the entire EEZ (becoming a "closed season" more than a "closed area") and the exact dates might be fixed every year, based on pre-recruitment surveys. Seasonal closures may apply to the total stock range or a part of it (e.g., on concentration of spawners or juveniles). Seasonal closures might also be established for economic reasons (e.g., to avoid landing gluts and decreased prices in periods of high abundance) or social reasons (e.g., to reduce conflicts).

Real-Time Closures (RTCs) are area-based measures advocated in dynamic fishery management that changes in space and time, implemented in near real-time in response to shifting oceanic and fisheries conditions (**Maxwell et al., 2015**). The approach suits better to mobile and variable resources, the distribution and structure of which is too weakly predictable for the establishment of static closures. Three types of RTCs have been identified (**Dunn et al., 2016**): (1) Grid-based closures involve the overlaying of a grid on an area of interest and closing fishing in individual grid cells where bycatch has exceeded a threshold level.; (2) Move-on rules are also triggered by a threshold and fishermen must move a set distance away from the point of significant encounter of a species or habitat of concern. They have been widely implemented with real-time closures lasting days to weeks over distances as short as 2–10 km; (3) Oceanographic closures are 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. Other RTCs have ben described such as Real-Time Incentives (RTIs, **Kraak et al., 2012**), Real-Time Spatial Management (RTSM, **Hobday et al., 2014; Lewison et al., 2015; Maxwell et al., 2015; Little et al., 2015; Dunn et al., 2016; Eliasen and Bichel 2016**) or Real-Time Ocean Management (RTOM, **Dunn et al.,2016**), differing in the degree to which the systems are "real-time" and the extent to which fishers are involved in designing and operating the management tools (**Little et al., 2015**).

Refugia are defined in fisheries as "*spatially and geographically defined, marine or coastal areas in which specific management measures are applied to sustain important species [fisheries resources] during critical stages of their life cycle, for their sustainable use*" (**Paterson et al., 2013**). Under this definition, refugia are aimed at target resources and fisheries sustainability. Refugia have been established at national and regional levels in the South China Sea (**Pernetta et al., 2007; Paterson et al., 2013**). In Mexico, however, zonas de refugio" have been defined for both fisheries and conservation purposes.

Community-based closed areas tend to aim both at fisheries and biodiversity conservation. Only part of the fishable territory is closed, and not always to all fishing activities. Some areas within them may be no-

take zones. These closures are usually established in the long-term but may be opened and closed either regularly or in exceptional conditions. The term "community" is taken here in a broad sense including Indigenous People communities, traditional communities, but also municipalities or other competent associative institutions (e.g. cooperatives, unions). The management responsibility may be shared with the central government (e.g. under co-management) or devolved to the "community". Areas in that category include: Marine Managed Areas[32] (MMAs) and Locally-Managed Marine Areas[33] (LMMAs) (**Govan et al., 2008; 2009**) used in the Asia-Pacific area, Marine areas for responsible fishing (MARF) established in Costa Rica[34]; community fishery MPAs abundantly used in Japan (**Matsuda et al., 2010; Yagi et al., 2010**).

Territorial Use Rights in Fisheries (TURFs) (**Christy, 1982**) have no generally agreed definition. TURFs intends to remove the condition of common property of the resources in a territory, allocating use and management rights explicitly to its owner, which can be an individual, a private enterprise (**Costello and Kaffine, 2017**), a cooperative, association or community. A TURF may relate to the surface, the bottom, or to the entire water column within an area. Its size depends on local conditions and its performance depends on its size relative to the distribution area of the resources to be managed. It may enclose only part of the resource and its performance depends on management in neighbouring areas. The rights allocated to the TURF "owner" vary between countries and resources concerned. The length of tenure should allow a satisfactory return on investments for the "owners". A community-owned TURF may be held in perpetuity. TURFS have been abundantly in Chile since 1991[35] (**Gonzalez et al., 2006; Gelcich and Donlan, 2015**). Established initially to reduce conflicts , TURFs are being developed combining harvest and management rights and NTZs (reserves) within TURFs, with the full involvement of the communities concerned, to enhance their broad biodiversity benefits (**Gelcich and Donlan, 2015**).

**REFERENCES**


Augustyn et al., 2018 : TO BE INSERTED

Christy 1982) Christy, F, Jr. 1982. Territorial use rigths in marine fisheries: definitions and conditions. FAO Fish. Tech. Pap., 227: 9p.Costello & Kaffine, 2017

Costello, C. & Kaffine, D. 2017. Private Conservation In Turf-Managed Fisheries. Natural Resource Modeling 30: 32-51.

Dunn et al., 2016 Dunn, D. C., Maxwell, S. M., Boustany, A. M. and 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


[32] NOAA National Marine Protected Areas Center. http://www.expertglossary.com/definition/marine-managed-area (accessed: January 28, 2018).

[33] LMMAs have local names (e.g.: ra'hui; tabu area; kapu zone; sasizen, bau zone, tambu zone) and may also be referred to as traditional reserves, community-protected areas, traditional or community-based MPAs, cultural marine conservation districts, no-take areas, multiple use MPAs, customary areas, marine sanctuaries; village-managed reserves etc. (**Parks and Salaski, 2001**).

[34] Decree N° 35502-MAG of 2008, from the President of the Republic and the Minister of Agriculture and Cattle-raising of Costa Rica.

[35] Locally called "Áreas de Manejo y Explotación de Recursos bentónicos" (AMERBs) or Management and Exploitation Areas for Benthic Resources (MEABR, in English).

Eliasen and Bichel 2016: TO BE INSERTED

FAO, 2008, 2009; FAO. 2009. International Guidelines for the Management of Deep-sea Fisheries in the High Seas. Rome, FAO: 73p

Garcia et al., 2013 Garcia, S.M., Boncoeur, J. and Gascuel, D. 2013. Les aires marines protégées et la péche: bioécologie, socioéconomie et gouvernance. Presses Universitaires de Perpignan (France): 432 p.

Gelcich S. and Donlan, C.J. 2015. Incentivizing biodiversity conservation in artisanal fishing communities through territorial user rights and business model innovation. Conservation Biology, Volume 00, No. 0, 1–10 DOI: 10.1111/cobi.12477

Gonzalez et a.., 2006 Gonzalez, J.; Stotz, W.; Garrido, J.; Orensanz, J.M. et.al. 2006. The chilean turf system : how is it performing in the case of the loco fishery ? Bulletin of Marine science, 78(3): 499-527

Govan et al., 2008 Govan, H., Aalbersberg, W., Tawake, A. and Parks, J. 2008. Locally-Managed Marine Areas: A guide for practitioners. The Locally-Managed Marine Area Network: 70 p.

Govan, H. et al. 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/WorldFish-Reefbase/CRISP: 95p + 5 annexes

Hobday AJ, et al. (2014) Dynamic ocean management: Integrating scientific and technological capacity with law, policy and management. Stanford Environ Law J., 33(2):125–165.

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

Lewison et al., 2015; Lewison R, et al. (2015) Dynamic ocean management: Identifying the critical ingredients of dynamic approaches to ocean resource management. Bioscience 65(5): 486–498.

Little, A.S.; Needle CL, Hilborn R, Holland DS, Marshall CT (2015) Real-time spatial management approaches to reduce bycatch and discards: Experiences from Europe and the United States. Fish Fish 16(4):576–602.

Matsuda, H., Makino, M, Tomiyama, M., et al. 2010. Fishery management in Japan. Ecological Research 25: 899-907.

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

Parks, J. E. and Salafsky, N. (Eds). 2001. Fish for the future? A collaborative test of locally managed marine areas as a biodiversity conservation and fisheries management tool in the Indo-Pacific region: Report on the initiation of a learning portfolio. World Resources Institute and Foundations of Success: 70 p. Available at: http://www.lmmanetwork.org/pdfs/fish_for_the_future.pdf

Paterson, C. J.; Pernetta, J. C.; Siraraksophon, S.; Kato, Y.; Barut, N.C.; Saikliang, P.; Vibol, O.; et al. 2013. Fisheries refugia: a novel approach to integrating fisheries and habitat management in the context of small-scale fishing pressure. Ocean & Coastal Management, 85: 214-229

Pernetta, J.C.; Paterson, C.J. & Siriraksophon, S. 2007. Fisheries refugia and marine protected areas: can theu help sustain the contribution of fisheries towards food security in Southeast Asia? SEAFDEC. Fisheries for the people: 1-9

Rice, J.; Garcia, S.M: & Kaiser, M. 2018. Other effective area-based conservation measures (OEABCMs) used in marine fisheries: a working paper. Document CBD/MCB/EM/2018/1/INF/4. Expert Workshop on marine protected areas and other effective area-based conservation measures in coastal and marine areas (6-9/02/2018; Montreal, Canada): 70 p. https://www.cbd.int/meetings/PAEM-2018-01

Thompson, A.; Sanders, J.; Tandstad, M.; Carocci, F. & Fuller, J. 2016. Vulnerable marine ecosystems. Processes and practices in the high seas. Rome, FAO. FAO Fisheries and Aquaculture Technical Paper, 595: 200 p. http://www.fao.org/in-action/vulnerable-marine-ecosystems/background/deep-sea-guidelines/en/

Yagi, N.; Takada, Y. & Kurokura, H. 2010. Coastal marine protected areas in Japan and their institutional characteristics. Paper Presented at the IIFET, Montpellier. 2010.

**ANNEX 2 – SOURCES OF GUIDANCE ON DATA COLLECTION, ASSESSMENT METHODOLOGY, MONITORING AND EVALUATION**

Temporary place-holder: The experts at the meeting will consider the need for such an annex and eventually provide the references of available guidance they consider most appropriate.

**Guidance on the CBD EBSA process and the experience of fisheries with VMES, there is also guidance available on identification of areas important to life histories of species or important for specific ecosystem services.**

***Guidance on EBSAs***

***Guidance on VMEs***


FAO. 2009. International guidelines for the management of deep-sea fisheries in the high seas. Rome,

FAO. 2011. Report of the FAO workshop on the implementation of the FAO International Guidelines for the management of deep-sea fisheries in the high seas - challenges and way forward. Pusan, Republic of Korea:10-12 May 2010. FAO Fisheries and Aquaculture Report, 948: 27p.FAO: 73 p.

FAO. 2013. *Workshop for the Development of a Global Database for Vulnerable Marine Ecosystems (VMEs)*. FAO Fisheries and Aquaculture Report. No. 1018. Rome. 41 pp.

Thompson, A.; Sanders, J.; Tandstad, M.Carocci, F. & Fuller, J. 2016.Vulnerable marine ecosystems. Processes and practices in the high seas. Rome, FAO. FAO Fisheries and Aquaculture Technical Paper, 595: 200 p.


***Guidance about Integration***


Ervin, J.; Mulongoy, K.J..; Lawrence, K.; Game, E.; Sheppard, D.; Bridgewater, P.; Bennet, G.; Gidda, S.B.; Bos. 2010. Making protected areas relevant: A guide to integrating protected areas into wider landscapes, seascapes and sectorla plans and strategies. Mnetrelal, Canada. CNB. Technical Series, 44: 94 p.

Henoque, Y. & Denis J.. 1002. Steps and tools towards integrated coastal areas managementm Methodological Guide Volume II. Paris. UNESCO. Manuals and Guides, 42: 64 p.


***Guidance on Governance, planning, management***


DeCaro, D. A.; Chaffin, B. C.; Schlager, E.; Garmestani, A.S. & Ruhl., J. B. 2017. Legal and institutional foundations of adaptive environmental governance. Ecology and Society 22(1):32. https://doi.org/10.5751/ES-09036-220132

FAO. 2009. Information and knowledge sharing. FAO Technical Guidelines for Responsible Fisheries, 12: 97 p.

FAO. 2013. Implementing improved tenure governance in fisheries. A technical guide to support the implementation of the Voluntary guidelines on the responsible governance of tenure of land, fisheries and forests in the context of national food security. Rome. FAO: 71 p.

FAO. 2016. People's Manual on the Guidelines on Governance of Land, Fisheries and Forests. A guide for promotion, implementation, monitoring and evaluation. Rome. FAO: 50 p.

Govan, H., Aalbersberg, W., Tawake, A. and Parks, J. 2008. Locally-Managed Marine Areas: A guide for practitioners. The Locally-Managed Marine Area Network: 70 p. Available at www.LMMAnetwork.org

Salm, R.V.//Clark, J.R./ Siirila, E.2000. Marine and Coastal Protected Areas. A guide for planning and management. Gland, Switzerland; Washington DC. IUCN. : 371 p.

UNEP. 2011: Taking Steps toward Marine and Coastal Ecosystem-Based Management - An Introductory Guide. By Agardy, T.; Davis, J.; Sherwood, K. & Vestergaard, O. UNEP Regional Seas Reports and Studies, 189: 68 p.

Wilkinson, C.; Green, A.; Almany, J. & Dionne, S. 2003. A practical guide on how monitoring can support effective management of MPAs. Townsville, Australia, and Gland, Switzerland: 67 p.

***Guidance on determining areas important for specific ecosystem services is less mature than guidance on biodiversity features but is progressing through IPBES and many sectoral agencies***

Smith, S; Rowcroft, P.; Everard, M.; Couldrick, L.; Reed, M.; Rogers, H.; Quick, T.; Eves, C. and White, C. 2013. Payments for ecosystem services: a best practices guide. Defra, London: 85 p.

Syrbe, R-U- & Walz, U. Spatial indicators for the assessment of ecosystem services: Providing, benefiting and connecting areas and landscape metrics. Ecological Indicators, 21: 80-88. https://doi.org/10.1016/j.ecolind.2012.02.013

Daily, G.C. & Matson, P.A. 2008. Ecosystem services: From theory to implementation. PNAS, 105 (28): 9455-9456. Https://doi.org/10.1073/pnas.0804960105

***Selected assessment methods for various aspects of biodiversity***

Campbell, M.L & Hewitt, C.L. 2006. A hierarchical framework to aid biodiversity assessment for coastal zone management and marine protected area selection. Ocean & Coastal Management, 49 (3-4): 133-146

Fletcher, R.; Chesson, J.; Fisher, M.; Sainsbury, K.; Hundloe, T.; Smith. T. and B. Whitworth, B. 2002. National ESD reporting framework for Australian fisheries: the 'how to' guide for wild capture fisheries. Fisheries Research and Development Corporation Project 2000/145. Canberra, Australia: 120 p.

Hayek, L.A.C. & Buzas, M.A. 2010. Surveying natural populations: quantitative tools for assessing Ocean & Coastal Management

Hoggard, D.D.; Abeyasekera, S.; Arthur, R.I.; Beddington, J.R.; Burn, R.W.; Halls, A.S.; Kirkwood, G.P. et al. 2006. Stock assessment for fishery management. A framework guide to the stock assessment tools of the Fisheries Management Science Programme. Rome. FAO. FAO Fisheries Technical Paper, 487: 261 p. + CD.

Mikkelsen, P.M. & Cracraft, J. 2001. Marine biodiversity and the need for systematic inventories. Bulletin of Marine Science, 69(2): 525-534

Salas, F.; Marcos, C; Neto J; .Patrício; ; Pérez-Ruzafa A. Marques, J.C. 2006. User-friendly guide for using benthic ecological indicators in coastal and marine quality assessment. Ocean & Coastal Management, 49 (5–6) : 308-331

Teixeira, H.; Berg, T.; Uusitalo, L.; Fürhaupter, K.; Heiskanen, A-S.; Mazik, K.; Lynam, C.P. et al. 2016. A Catalogue of Marine Biodiversity Indicators. Front. Mar. Sci., 04 November 2016 | https://doi.org/10.3389/fmars.2016.00207

FAO. 1999. Indicators for sustainable development of marine capture fisheries. Rome. FAO. FAO Technical Guidelines for Responsible fisheries, 8: 68 p.

FAO. 2011. Fisheries management. 4. Marine protected areas and fisheries. FAO Technical Guidelines for Responsible Fisheries, 4, Suppl. 4: 199 p.

FAO. 2008. Fisheries management. 2. The ecosystem approach to fisheries. 2.1 Best practices in ecosystem modelling for informing an ecosystem approach to fisheries. FAO Technical Guidelines for Responsible Fisheries, 4, suppl.2, Add. 1: 78 p.

.