

Implications of ‘other effective area-based conservation measures’ for marine conservation

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Abstract

Implications of ‘other effective area-based conservation measures’ for marine conservation

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After nearly a decade of discussion, the Parties to the Convention on Biological Diversity (CBD) adopted an official definition and criterion for ‘other effective area-based conservation measures’ (OECMs). OECMs allow area-based management initiatives that are not considered to be protected areas to be counted as conserved areas and consequently contribute towards global biodiversity conservation goals like Aichi Target 11. However, there is a question of how this designation will be interpreted, applied, and monitored. In an effort to help answer some of these questions with regards to the marine realm, this paper assesses this recent definition and criterion against a number case studies from fisheries, cultural, industrial, and other categories of area-based initiatives in addition to existing databases. This broad range of examples shows great promise for OECMs, but also highlights precautions that must be considered. Ultimately, this research aims to help illuminate innovative practices for marine conservation and contribute to the achievement of the global marine conservation targets in a meaningful way.

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1. Introduction

The conservation of biodiversity or biological diversity established itself as a need in the late twentieth century [1]. After various studies and global assessments, there became an international understanding that biodiversity is essential for ecosystems functions and services, and consequently loss of biodiversity could have drastic consequences. This concern surrounding biodiversity loss amounted to the signing of the Convention on Biological Diversity (CBD) at the 1992 Rio de Janeiro Earth Summit.

The convention set forth three main goals: 1) the conservation of biological diversity; 2) the sustainable use of its components; and 3) the fair and equitable sharing of the benefits from the use of genetic resources.

Soon after the signing, Parties began trying to implement this agreement. In the marine realm, marine protected areas (MPAs) were advised to meet the conservation of marine biological diversity [2]. It should be noted that ‘marine protected area’ is an umbrella term that more specific marine area-based conservation measures can fall under (e.g., marine reserve, marine sanctuary, marine monument). However, the principal guiding definition for an MPA comes from the International Union for Conservation of Nature (IUCN) definition for a protected area [3]:

“A protected area is 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”

The CBD has also adopted this definition of protected area [4].

MPA designation became increasingly popular with various international global commitments in the twenty-first century. Beginning with eight Millennium Development Goals (MDGs) following the Millennium Summit of the United Nations in 2000, Goal 7 was to ‘ensure environmental sustainability’. More specifically Target 7.B aimed to ‘Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss’. While there was no set target for protected areas under this goal, by the 2007 MDGs report MPAs were used as evidence to show progress towards this goal [5]. However, the report stated that despite increases in protected area, biodiversity was decreasing on a global scale.

This recognition that biodiversity was in decline led to more specific biodiversity goals [6–8]. In 2010, at the tenth meeting of the Conference of the Parties (COP10) in Nagoya, Japan, Parties revised and updated the Strategic Plan for Biodiversity. Twenty biodiversity goals, collectively referred to as the Aichi Targets, were agreed upon (UNEP/CBD/COP/DEC/X/2).

Specifically, Aichi Target 11 called for:

“By 2020, at least 17 per cent of terrestrial and inland water areas and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of

protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascape (decision x/2).”

Later in 2015, when the United Nations (UN) General Assembly came together to create the 2030 Sustainable Development Agenda, this target was also adopted as Sustainable Development Goal (SDG) 14.5: *by 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on best available scientific information.*

Overall, these global conservation goals did spur results. Between 2002 and 2012, nearly 10 million km² of new MPAs were established representing a ~360% increase in conserved marine area [9]. However, with this rapid growth came critiques over the effectiveness of MPAs. These critiques can be categorized into three themes: 1) placement, governance, and management; 2) social ecological value and cost; and 3) political expediency [10].

Many MPAs are placed in politically convenient locations rather than biologically significant and scientifically backed areas [11,12]. For example, Klein et al (2015) found that 97.4% of fish, mammal, and invertebrate marine species (N=17,348) have less than 10% of their ranges represented in current MPA coverage. Some authors have claim that many MPAs are too small to offer adequate protection [13]. Often MPAs are poorly managed, monitored and enforced and thus, simply “paper parks” [14–16]. Some authors have also criticized MPAs for their cost. For example, the establishment cost for a single MPA can be as high as USD\$34,800,000 (Papahanamokuakea Marine National Monument) [17].

While MPAs continued to be the dominant discourse surrounding marine conservation in the 2010s, another discourse was occurring. This was in regards to ‘other effect area-based conservation measures’ or OECMs. OECMs were first mentioned in 2010 when Aichi Target 11 was conceived:

*“By 2020, at least 17 percent of terrestrial and inland water, and 10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas **and other effective area-based conservation measures**, and integrated into the wider landscapes and seascapes (emphasis added) (Decision X/2).”*

The OECM clause was a last minute addition to acknowledge the contribution that many areas which are not legally designated as protected areas can contribute to effective conservation despite operating under different management types [18]. However, in reality, this clause caused considerable confusion largely due to the fact that there were no official guidelines to assess what could or could not be considered to be an OECM at the time. Some in the conservation community argued that OECMs should only be areas whose intent aligns with the IUCN definition of the protected area—mainly that the area’s primary objective is long term conservation [19]. Conversely, others argued that areas whose primary objective is not conservation, but have strong co-benefits for biodiversity, could be labelled as an OECM and thus included in the national and global accounting for progress towards Aichi Target 11. This led to nearly a decade long deliberation involving an IUCN task force, expert group meetings,

and CBD hosted workshops. The results of these activities manifested themselves in July 2018 as a draft definition, criterion, and recommendations for OECMs presented at the twenty-second meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA 22) in July 2018 (CBD/SBSTTA/REC/22/5) and were finally adopted at COP14 this past November (CBD/COP/DEC/14/8).

Now that an official framework exist for OECMs, there is great need for guidance in helping Parties interpret and apply them if they are to be meaningful tools. In support of the ultimate development of guidance, the objective of this paper is highlight and postulate major considerations for OECMs. We investigate the future of the OECMs reporting process, then broadly comment on the scope of OECMs by presenting a typology for OECMs. Lastly, we discuss the implications of various OECM designation, data available for making such a designation, and recommendations as well as cautions for doing so in the future. Ultimately, this paper hopes to illuminate innovative practices for marine conservation that may help the global community achieve the global conservation targets in a meaningful way via the recent adoption of the OECMs concept.

2. Framework

2.1 Criteria and definition of OECMs

In November 2018, the Parties to the CBD formally adopted the following definition of OECM (CBD/COP/DEC/14/8):

“A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values;”

Additionally, the CBD Parties adopted guiding principles, four criteria, and several sub-criteria, to assist with OECM identification (Table 1).

Table 1. Criteria for identification of other effective area-based conservation measures (Source: CBD/COP/DEC/14/8)

Criterion A: Area is not currently recognized as a protected area	
Not a protected area	<input type="checkbox"/> The area is not currently recognized or reported as a protected area or part of a protected area; it may have been established for another function.
Criterion B: Area is governed and managed	
Geographically defined space	<input type="checkbox"/> Size and area are described, including in three dimensions where necessary. <input type="checkbox"/> Boundaries are geographically delineated.

Legitimate governance authorities	<ul style="list-style-type: none"> <input type="checkbox"/> Governance has legitimate authority - and is appropriate for achieving <i>in situ</i> conservation of biodiversity within the area; <input type="checkbox"/> Governance by indigenous peoples and local communities is self-identified in accordance with national legislation and applicable international obligations; <input type="checkbox"/> Governance reflects the equity considerations adopted in the Convention. <input type="checkbox"/> Governance may be by a single authority and/or organization or through collaboration among relevant authorities and provides the ability to address threats collectively.
Managed	<ul style="list-style-type: none"> <input type="checkbox"/> Managed in ways that achieve positive and sustained outcomes for the conservation of biological diversity. <input type="checkbox"/> Relevant authorities and stakeholders are identified and involved in management. <input type="checkbox"/> A management system is in place that contributes to sustaining the <i>in situ</i> conservation of biodiversity. <input type="checkbox"/> 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.
Criterion C: Achieves sustained and effective contribution to <i>in situ</i> conservation of biodiversity	
Effective	<ul style="list-style-type: none"> <input type="checkbox"/> The area achieves, or is expected to achieve, positive and sustained outcomes for the <i>in situ</i> conservation of biodiversity. <input type="checkbox"/> Threats, existing or reasonably anticipated ones are addressed effectively by preventing, significantly reducing or eliminating them, and by restoring degraded ecosystems. <input type="checkbox"/> Mechanisms, such as policy frameworks and regulations, are in place to recognize and respond to new threats. <input type="checkbox"/> To the extent relevant and possible, management inside and outside the other effective area-based conservation measure is integrated.
Sustained over long term	<ul style="list-style-type: none"> <input type="checkbox"/> The other effective area-based conservation measures are in place for the long term or are likely to be. <input type="checkbox"/> “Sustained” pertains to the continuity of governance and management and “long term” pertains to the biodiversity outcome.
<i>In situ</i> conservation of biological diversity	<ul style="list-style-type: none"> <input type="checkbox"/> Recognition of other effective area-based conservation measures 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).
Information and monitoring	<ul style="list-style-type: none"> <input type="checkbox"/> Identification of other effective area-based conservation measures 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. <input type="checkbox"/> A monitoring system informs management on the effectiveness of measures with respect to biodiversity, including the health of ecosystems. <input type="checkbox"/> Processes should be in place to evaluate the effectiveness of governance and management, including with respect to equity. <input type="checkbox"/> General data of the area such as boundaries, aim and governance are available information.
Criterion D: Associated ecosystem functions and services and cultural, spiritual, socio-economic and other locally relevant values	
Ecosystem functions and services	<ul style="list-style-type: none"> <input type="checkbox"/> Ecosystem functions and services are supported, including those of importance to indigenous peoples and local communities, for other effective area-based conservation measures 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. <input type="checkbox"/> Management to enhance one particular ecosystem function or service does not impact negatively on the sites overall biological diversity.
Cultural, spiritual, socio-economic and other locally relevant values	<ul style="list-style-type: none"> <input type="checkbox"/> Governance and management measures identify, respect and uphold the cultural, spiritual, socioeconomic, and other locally relevant values of the area, where such values exist. <input type="checkbox"/> Governance and management measures respect and uphold the knowledge, practices and institutions that are fundamental for the <i>in situ</i> conservation of biodiversity.

2.2 Current accounting methods towards global conservation goals

The CBD relies on the World Conservation Monitoring Centre's (WCMC) World Database of Protected Areas (WDPA) to track progress on national commitments to Aichi Target 11 (UNEP-WCMC 2017). The CBD has recommended that OECMs also be reported to the WDPA; however, presently, not reporting method exists.

As of January 2019, countries have reported approximately 14,841 MPAs worldwide to the WDPA, which represents 7.59% of protected oceans (UNEP-WCMC, IUCN and NGS 2019). However, many conservationists claim that far less of the ocean is actually protected given the number of MPAs that allow extractive uses or that are not well managed or enforced. Costello and Ballantine (2015), for example, reported that 94% of MPAs allow fishing and argue only strict no-take marine reserves should be used to track progress towards the conservation goals. Similarly, Sala et al. (2018) claims that if ill managed and extractive MPAs are excluded, only 3.6% of oceans and coastal areas are actually protected.

Currently, the WDPA requires that a standard set of data be submitted for each MPA (i.e. name, location, area, year designated, GIS data, etc.). There are two main entities that can enter data into the WDPA: 1) national governments; and 2) the sub-national governance authorities managing protected areas. The latter happens when the governance authority is a private actor, indigenous or local community, and the protected area is not recognized or reported on by the government. In some cases, national governments do not have the capacity to provide data to the WDPA, in which case they may nominate another organization to do so (e.g., a non-governmental organization (NGO)). For data from non-government data-providers, there is a verification process where relevant experts confirm that the site meets the IUCN definition of a protected area and that the data are accurate.

Not all protected areas in the WDPA are counted towards Aichi Target 11 accounting. Sites with no designation, meaning sites with no official governing body, or sites that the WDPA staff have reason to believe do not meet the IUCN definition of a protected area are not counted towards Aichi Target 11. Once an area is accepted into the database, UNEP-WCMC aims to update the data every five years by contacting the original providers of the data (UNEP-WCMC 2017).

It should be noted from this review of the data requirements that to be considered a PA in the WDPA and counted toward global conservation goals, no ecological data are required nor is management effectiveness assessed. Thus, we do not truly know what we are protecting and if what we are trying to protect is working.

3. Materials and methods

To understand and derive the implications of OECMs, we started with a literature review of the CBD history of OECMs using CBD official documents and inputs to CBD meetings and workshops. Then, literature searches and web engine searches were conducted to identify marine area-based management measures and marine spatial planning initiatives. From this, a number of examples were compiled into a list of case studies to be further scrutinized. The case studies were then separated into categories based on the primary purpose of the measure (fisheries, tourism, government use, etc.) and a more extensive literature review was completed to see if

the case had available data to support the OECM Criteria. For each case, the following questions were tested: *Is the case in question currently recognized as a protected area? Does the case in question have well-defined boundaries? Is some authority in charge of the case in question? Is there any evidence to show that there is significant biodiversity present at the case in question? Is there any evidence to show that there are significant ecosystem services at the case in question?*

In the case that no evidence was available, we investigated the feasibility of using existing tools and methods that could potentially provide evidence. This allowed us to identify major data needs for OECMs. Lastly, we highlight existing databases that could be assessed for OECMs and streamlined with the WDPA.

4. Results

4.1 Opportunities for OECM designation

OECMs are intended to promote biodiversity via three overarching ways through whatever measures are in place within the area: 1) by limiting access to an area; 2) by limiting use of marine resources; and/or 3) by containing artificial structures that enhance biodiversity. Conceptually, OECMs are valuable as they have the potential to illuminate and recognize more organizations and arrangements that contribute toward in-situ conservation and contribute to better ecological representation and connectivity associated with biodiversity [18]. Furthermore, given that the goal for global conserved area will increase to 30 percent by 2030 (IUCN World Conservation Congress Motion 053), OECMs will be a key player in reaching such a target [20,21].

Our assessment illuminated 4 categories of OECMs: fisheries, cultural, industrial, and ‘other’ (see below). These categories were determined based on the primary objective of the marine spatial area. Overall, data was lacking the most to support Criteria C (area achieves sustained and positive in situ conservation of biodiversity) and Criteria D (area’s associated ecosystem functions and cultural values areas are supported). In regards to Criteria C, information on monitoring systems in place, biodiversity attributes documented, and cultural and spiritual values considered was scarce for the majority of case studies. For Criteria D, it was difficult finding information that showed ecosystem services and functions were supported without compromising biodiversity. It was also difficult to judge whether the management authority for the areas upheld values for local communities and indigenous peoples as well as biodiversity. Generally, data supporting sub-criterion that involved indigenous peoples or local communities was often unavailable (Table 2). Some data was unavailable to meet sub-criteria across all case studies. This includes the *integration of management inside and outside of OECM* and the requirement that *processes are in place to evaluate management and equity* (Table 2). Similarly, there was a sub-criteria (‘*sustained*’ pertains to the continuity of governance and management and ‘*long-term*’ pertains to the biodiversity outcome) that received blanks across all case studies. This is due to the debate that exists over the applied meaning of these terms (Table 2).

4.1.1 Types of OECMs

a. Fisheries-based OECMs

With regard to fisheries, now more than ever, there is concern to protect and preserve fisheries given their economic, ecological, and sociological importance [22]. In 2015, 33.1 per cent of the world's marine fisheries stocks were classified as overfished [23]. Thus, OECMs may be another tool used to promote long term sustainable fisheries management while simultaneously promoting in-situ conservation. OECMs could also be used to streamline other Aichi Targets that do not emphasize quantitative goals [18] such as Aichi Target 6, which states:

“By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.”

Thus, some area-based fisheries management (ABFM) initiatives could contribute to both Aichi Targets 11 and 6. ABFM initiatives are a formally established, spatially-defined fishery management and/or conservation measure, implemented to achieve one or more intended outcomes. They have typically been implemented with the objective to sustainably use or even protect a target species, but now there is a trend to use ABFM simultaneously as an economic, social, and ecological tool [24]. Rice, Garcia, and Kaiser (2018) outline a number of ABFM measures that have the potential to be OECMs under Aichi 11. These include:

- Vulnerable Marine Ecosystems (VMEs)
- Fishery Restricted Areas (FRAs)
- Fisheries Closures
- Territorial Use Rights Fisheries (TURFs)
- Locally Managed Marine Areas (LMMAs)
- Marine Managed Areas (MMAs)
- Marine Areas for Responsible Fishing (MARFs)
- No-take zones (NTZs)
- Benthic Protected Areas (BPAs)
- Ring-fencing
- Marine Refuges (MRs)

It should be noted that ABFM initiatives like TURFs and LMMAs (sometimes used interchangeably in literature) can encompass many different types of fisheries areas based on country context [24–26]. For example, TURFs in Chile are known as *Áreas de Manejo y Explotación de Recursos Bentónicos (AMERB)*, whereas in Fiji they are known as ‘qoliqoli’. In both of these examples, customary community fishing rights are recognized by the national

government and the community is left to enforce and manage these rights. It should also be noted that MPAs can be a type of ABFM when fisheries plans are used to support a conservation objective. However, for our purposes here, we are only examining ABFM where sustainable use of fisheries is the primary objective of the area.

The specific measures and rules that govern each ABFM type vary drastically, but can be categorized according to three main dimensions: 1) time; 2) space; and 3) fishing activities. ABFM initiatives are usually enacted in defined time frames that can be seasonal, short-term, or indefinite. Spaces are also well-defined, but can be dynamic and layered. These defined spaces usually coincide with fishing activities which limit the users, gear type, or harvest amount [27].

In recent years, research, initiatives, and policies have emerged highlighting the nexus between biodiversity conservation and fisheries sustainability [28]. For example in 1991, Chile established a national TURF policy which gave the government the authority to assign exclusive access rights to artisanal fisher organizations for the sustainable harvesting of benthic resources [29]. As of 2015, there are over 800 TURFs throughout coastal Chile. Recent research shows that some TURFs are also being managed for biodiversity benefits and promote environmental stewardship [30,31]. For example, Gelcich et al. (2012) showed significantly higher species richness, biomass, and density in TURFs compared to open-access areas. However, it is unclear if TURFs have monitoring systems or plans for threat adaptation in place (Table 2).

Another type of ABFM, fishing restricted areas (FRAs), have shown promise for OECMs. Petza et al. (2019), evaluated over 500 FRAs in the Aegean Sea and concluded that 22 FRAs, making up 2014 km², were at least effectively contributing towards marine biodiversity conservation. The authors also used CBD OECM definition and criteria, but it was unclear what extent spiritual or cultural values were considered (Table 2).

While we have shown some ABFM may be considered as OECMs; however, there is not yet clear guidance on how to identify which ABFM measures are appropriate for Target 11 reporting [27].

b. Cultural-based OECMs

In recent years, more recognition has been given to preserving cultural resources, evidenced by international conventions such as the United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention concerning the Protection of World Cultural and Natural Heritage in 1972 and Convention on the Protection of the Underwater Cultural Heritage (CPUCH) in 2001. Similar to the IUCN's mandate for in-situ biological conservation, UNESCO stresses in-situ conservation of cultural resources. Thus, there exist areas that have spiritual or cultural significance (e.g., war graves, shrines, and historic areas), which are managed for the protection of these values but, by consequence, biodiversity may also be benefiting due to these measures. For example, underwater marine archaeological sites or wrecks can have strong co-benefits of biodiversity due to an 'artificial reef effect' [35,36]. An artificial reef is a man-made structure which has been submerged in the natural environment usually in order to promote marine life [37]. Artificial reefs provide substrate for colonization for microorganisms or larvae and structure for fish habitat [38]. They have shown to have greater densities and biomass, and

provide higher catch rates, compared to surrounding soft bottom areas, and in several cases in relation to adjacent natural reefs [39,40].

As a case example, Garcia and Barreiros (2018) demonstrated the biodiversity co-benefits of Underwater Archaeological Parks (UAP) in the Azore Islands of Portugal. The Azores are a remote oceanic archipelago composed of nine islands known for their rich biodiversity [42]. In 2005, the Regional Government of the Azores classified the Bay of Angra of Terceira Island as an UAP. The Bay has at least 70 documented shipwrecks and more than 15 archaeological sites. The motivation of the designation was to protect the Bay from threats, such as construction, dredging, salvage, and fishing. Garcia and Barreiros (2018) found higher biodiversity and biomass inside the UAP compared to areas outside the UAP. However, it is unclear what local management is doing to monitor and mitigate threats as well what community values exist (Table 2).

OECMs have the potential to recognize living cultural areas. One of the strong arguments for OECMs is their ability to recognize communities and indigenous groups that have contributed to biological conservation for centuries [43]. It has been estimated that 80 per cent of the world's biodiversity and 95 per cent of the world's cultural diversity is found on indigenous lands, which make up 20 per cent of the Earth's surface [44]. However, many of these areas, sometimes called Indigenous Communities Conserved Areas (ICCAs), Indigenous Protected and Conserved Areas (IPCAs), or Sacred Natural Sites (SNSs) have not been officially recognized as protected area. However, similar to LMMAs, many indigenous groups may not want to be involved in a governmental reporting process given the historical cultural traumas associated with the group and government.

In some cases, indigenous groups are claiming their own PAs, which are later accepted by the State. In British Columbia, Canada, there has been an emergence of 'tribal parks' which is land reclaimed and exclusively managed by First Nations groups for long-term and sustainable use [45,46]. Many of these Tribal Parks are located in British Columbia which is known to have unique biodiversity [47]. However, more data on biodiversity would need to be collected as our analysis shows this is not available yet (Table 2). The government of Canada has shown that it is considering accepting these areas help achieve its national and international protected areas targets and contribute to the spirit and practice of reconciliation in Canada [48,49].

c. Industrial-based OECM

In recent years, "Blue Economy" (i.e., marine based industrial development) initiatives have increased [50]. These often include offshore developments, such as oil rigs, renewable energy structures, or tourism initiatives. Some marine development initiatives may promote biodiversity as these industrial areas can restrict access or use to an area and provide structure that might enhance biodiversity. For example, Hammar, Perry, and Gullström (2016) analyzed the conservation benefits of offshore wind turbines in Northern Europe. In areas around wind turbines, access and use of the area is often restricted. Consequently, there may be some benefit to marine life. They concluded that offshore wind areas "can have positive impacts on seabed habitats and benthos, epifaunal benthos, fish, seals and possibly porpoises". However, there is some question of the impact of offshore wind turbines may have on marine bird populations so

more research is likely needed [52] (Table 2). Similarly, pearl farms in French Polynesia were found to have a positive effect on reef fish abundance [53]. Pearl farming is French Polynesia's second largest industry and accounted for half of all exports in 2015 [54]. Thus, this industry may have the great potential to promote biodiversity on a large national scale. Additionally, there is research emerging that suggests seaweed farms enrich biodiversity and mitigate climate change [55–57]. This could be promising for China, Japan, North Korea, and the Philippines as they are top cultivated seaweed producing countries [23].

Perhaps more notably, tourism has been highlighted as a tool for conservation via the CBD Guidelines on Biodiversity and Tourism Development [58]. This can include private dive or recreation areas or Hotel Managed Marine Protected Areas (HMMPAs). For example, there is a known HMMPA on Hon Ong (Whale Island) in Viet Nam which is owned by the local resort. The resort boasts pristine diving, excellent beaches, and a plethora of watersports. In the early 2000s, as a response to the declining fish populations and coral cover, the owner of the resort created protected areas by leasing areas from Provincial Authorities for some parts of the island. Guards were hired to patrol areas and ensure compliance. Studies showed that this HMMPA had significantly higher fish densities, richness, average size, and number of fishes compared with two unprotected control sites [59]. Given the sheer amount of private coastal resorts in existence that benefit from and maintain biodiversity, potential is high that these areas could be contributing towards biodiversity conservation and deemed OECMs. However, as in the case of Hong Ong, it will need to be made clear if the management in place is supporting the cultural values and ecosystem services of the local community in addition to equity (Table 2).

d. Other types of OECMs

Marine spatial planning (MSP) is now commonplace in the twenty-first century [60]. Many nations have designated marine spatial plans for calculated allocation of their EEZ. Some components of a marine spatial plan may have potential for OECM designation. For example, in the Falklands Islands' marine spatial plan, a coastal buffer encompasses all of its inshore waters. Within this coastal buffer area there are 31 key biodiversity area (KBAs), important cultural coastal areas, no large-scale activities, and a permanent large-scale fishing ban in place [61]. Furthermore, there is already established protocol that assesses and adapts to risks and threats. Notably, this case study meets more OECM criteria than any other in our assessment (Table 2).

Given the breadth and variety among marine spatial initiatives, "other" OECM types likely exist. There are a number of areas in existence that are restricted for other reasons and by consequence may have a strong biodiversity co-benefit. Military training areas (MTAs) which are very restrictive to outside use and extremely well enforced have the potential to make a significant formal contribution to biodiversity conservation [62]. For example, the Shoalwater Bay Training Area in Australia is a MTA located on the coast and is part of the Great Barrier Reef World Heritage Area. The area is actively managed for environmental protections and studies have shown its biodiverse habitat and important species [63–66]. There have already been some research that suggests Shoalwater Bay MTA would make a good candidate for an OECM [67]. Yet, again there is a question if biodiversity attributes and ecosystem services and functions have been officially collected for this area (Table 2).

Additionally, there has been an emergence of ‘peace parks’ in recent decades. Peace parks describe an area that uses environmental cooperation in multi-jurisdictional disputed areas to help resolve political and territorial conflicts [68]. While most peace parks have been terrestrial areas, their use is beginning to be documented in the marine realm [69]. These areas may be good candidates for OECMs if management and biodiversity of the area is clear.

Table 2. Summary of select OECM case studies. A check indicates that data supports the corresponding criteria whereas a question indicates that more data is needed to verify. Blanks represent areas that are not relevant to the corresponding case study.

OECM Criteria	Australian MTA	Bay of Angra UAP	B.C. Tribal Parks	Chilean TURFs	FRAs of Aegean Sea	HMMPA Hon Orog.	Northern European Wind Farms	Falkland Islands Coastal Buffer
A. Area is not currently recognized as a protected area								
The area is not currently recognized or reported as a protected area or part of a protected area; it may have been established for another function.	✓	✓	✓	✓	✓	✓	✓	✓
B. Area is governed and managed								
Size and area are described, including in three dimensions where necessary.	✓	✓	✓	✓	✓	✓	✓	✓
Boundaries are geographically delineated.	✓	✓	✓	✓	✓	✓	✓	✓
Governance has legitimate authority - and is appropriate for achieving in situ conservation of biodiversity within the area;	✓	✓	✓	✓	✓	✓	✓	✓
Governance by indigenous peoples and local communities is self-identified in accordance with national legislation and applicable international obligations	-	-	✓	✓	-	-	-	?
Governance reflects the equity considerations adopted in the Convention.	✓	✓	✓	✓	✓	?	✓	✓
Governance may be by a single authority and/or organization or through collaboration among relevant authorities and provides the ability to address threats collectively.	✓	✓	✓	✓	✓	✓	✓	✓
Managed in ways that achieve positive and sustained outcomes for the conservation of biological diversity.	✓	✓	?	✓	✓	✓	?	✓
Relevant authorities and stakeholders are identified and involved in management.	-	?	✓	✓	✓	✓	?	✓
A management system is in place that contributes to sustaining the in situ conservation of biodiversity.	✓	✓	?	✓	✓	✓	?	✓
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.	✓	✓	?	✓	✓	✓	?	✓
C. [Area] Achieves sustained and effective contribution to in situ conservation of biodiversity								
The area achieves, or is expected to achieve, positive and sustained outcomes for the in situ conservation of biodiversity.	✓	✓	✓	✓	✓	✓	✓	✓
Threats, existing or reasonably anticipated ones are addressed effectively by preventing, significantly reducing or eliminating them, and by restoring degraded ecosystems.	✓	✓	?	?	✓	✓	?	✓
Mechanisms, such as policy frameworks and regulations, are in place to recognize and respond to new threats.	✓	?	?	?	✓	✓	?	✓
To the extent relevant and possible, management inside and outside the other effective area-based conservation measure is integrated	?	?	?	?	?	?	?	?
The other effective area-based conservation measures are in place for the long term or are likely to be. "Sustained" pertains to the continuity of governance and management and "long term" pertains to the biodiversity outcome	✓	✓	✓	✓	?	✓	✓	✓
Recognition of other effective area-based conservation measures 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).	-	-	-	-	-	-	-	-
Identification of other effective area-based conservation measures 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.	?	?	?	?	?	?	?	✓
A monitoring system informs management on the effectiveness of measures with respect to biodiversity, including the health of ecosystems.	?	?	?	?	✓	✓	?	✓
Processes should be in place to evaluate the effectiveness of governance and management, including with respect to equity	?	?	?	?	?	?	?	?
General data of the area such as boundaries, aim and governance are available information	✓	✓	✓	✓	✓	✓	✓	✓
D. [Area's] Associated ecosystem functions and services and cultural, spiritual, socio-economic and other locally relevant values [are supported]								
Ecosystem functions and services are supported, including those of importance to indigenous peoples and local communities, for other effective area-based conservation measures 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.	?	?	✓	✓	?	?	?	?
Management to enhance one particular ecosystem function or service does not impact negatively on the sites overall biological diversity	?	✓	✓	✓	✓	✓	?	?
Governance and management measures identify, respect and uphold the cultural, spiritual, socioeconomic, and other locally relevant values of the area, where such values exist.	?	?	✓	✓	?	?	?	?
Governance and management measures respect and uphold the knowledge, practices and institutions that are fundamental for the in situ conservation of biodiversity.	?	?	?	✓	✓	?	?	✓

4.2 Streamlining other Existing Databases

While the WDPA is the official record keeping system used for tracking progress towards Aichi Target 11 and SDG 14, other existing databases that compile area-based marine initiatives exist. These other databases have not been integrated with the WDPA due to the requirements of the protected area definition. However, these other databases could be streamlined or incorporated to the WDPA, if their components meet the OECM criteria. We highlight the following examples: the United States De Facto MPA Database; the FAO Vulnerable Marine Ecosystem Database; and the UNESCO MAB Biosphere Reserves Directory. By examining other databases that may be able to be included in the WDPA via the OECM framework, a more accurate baseline of what areas and how much area is being conserved can be established.

DeFacto Marine Protected Areas in U.S. Waters

Similar to the OECM concept, the United States identified De Facto Marine Protected Areas (DFMPAs) as early as 2005. The National Oceanic and Atmospheric Association (NOAA) termed a DFMPA as, “areas of the ocean where access and/or use are restricted for reasons other than conservation, although they may provide conservation benefits” [70]. NOAA compiled all DFMPAs into a database that is accessible online. These areas include safety, security and danger zones, restricted areas, prohibited lightering areas, some anchorage grounds, and traffic separation schemes. Each entry lists the area type and shows the area polygon. It is reported that there are 1,234 DFMPAs in the U.S. waters covering nearly 3 percent or 340,530 km² of the exclusive economic zone (EEZ). Of that, nearly 1,500 km² is said to be completely subject to no access. The United States is not party to the CBD, so it does not have an Aichi commitment, but it is part of the UN General Assembly and therefore committed to SDG 14.5.

Vulnerable Marine Ecosystems Database

According to Rice et al. (2018) and Diz et al. (2018), some Vulnerable Marine Ecosystems (VMEs) should be considered as OECMs. VMEs are groups of species, communities or habitats that may be vulnerable to impacts from fishing activities on the high seas. VMEs have been identified following criteria from the FAO Deep Sea Fisheries Guidelines [71]. Consequently, most VMEs exist in the areas beyond national jurisdiction (ABNJ) and have defined fishing restrictions. For instance, the Edora Bank fishing grounds is an area of approximately 5878km² managed by the North East Atlantic Fisheries Commission. The area has been closed to fishing since 2013. Thus, like FRAs described in ABFM above, some VME entries in the database may be able to be considered OECMs.

Biosphere Reserves

Launched in 1971, UNESCO’s Man and the Biosphere (MAB) reserves are areas comprising terrestrial, marine and coastal ecosystems. Each MAB reserve promotes solutions

reconciling the conservation of biodiversity with its sustainable use. MAB reserves are nominated by national governments and remain under the sovereign jurisdiction of the states where they are located. There are 686 biosphere reserves in 122 countries, including 20 transboundary sites that are internationally recognized. These sites are cataloged online in the UNESCO MAB Biosphere Reserves Directory. MAB reserves have three interrelated zones that aim to fulfil complementary and mutually reinforcing functions: 1) core area(s) which comprises a strictly protected ecosystem that contributes to the conservation of landscapes, ecosystems, species and genetic variation; 2) a buffer zone that surrounds or adjoins the core areas, and is used for activities compatible with sound ecological practices that can reinforce scientific research, monitoring, training and education; and 3) a transition area that is part of the reserve where the greatest activity is allowed, fostering economic and human development that is socio-culturally and ecologically sustainable. Currently, biosphere reserves are not counted as protected areas because their buffer zones do not meet the IUCN definition of a protected area. For example, the Boloma Bijagós Biosphere Reserve is an archipelago of 88 islands located on the coast of Guinea-Bissau in western Africa and approximately 10278 km². Given the biospheres reserve mandate for sustainable use and environmental protection, they have great potential for OECM designation.

5. Discussion

Although there is great potential for OECMs, there are some critical points that need to be addressed in the near future if OECMs are to be meaningful and successful. First, despite the adoption of the CBD's OECM framework, the global community needs proper guidelines that inform the step-by-step process CBD Parties need to go through to assess their EEZ's for OECMs and report them to WDPA. Similar to PAs, OECMs will face challenges when being reported, monitored and accounted for as countries try to meet the Aichi Target 11 global conservation goals by 2020.

While number-based goals are easier to measure, their use has been cautioned [15]. Thus, OECM reporting should require strong evidence of their ability to maintain or increase biodiversity and management effectiveness to ensure quality data. Unfortunately, the minimum data attributes required for MPAs to be submitted to the WDPA do not currently include a requirement for submission of biodiversity or management effectiveness information, fueling doubts that the global community is protecting the oceans effectively. This is of course done to make the reporting process more inclusive, but by consequence many PAs are inefficient. Therefore, the data requirements to meet the newly adopted criteria for including OECMs in the Aichi Target 11 accounting have the potential to make OECMs more legitimate than many MPAs. Ultimately, the WDPA will have to strike a balance between the data requirements for MPA and OECM submissions. If the data requirements are minimal, submissions could include "paper OECMs," but if the required data are too high, areas managed in low financial and managerial resource contexts will be excluded and not recognized. As we showed in our analysis, biodiversity and ecosystem services data lacked the most throughout all are case

studies. This data gap could be filled through the use of biodiversity surveys or ecosystem services assessments.

Similar to need for clear data requirements, vague terms found within the OECM definition and criteria will need to be clarified. Such ambiguity in terms has already caused conflict in fisheries OECMs realm. In 2016, Fisheries and Oceans Canada (DFO) assessed 1000 fisheries closures in Canadian waters and determined that 51 fisheries closures could be considered OECMs based on DFO's self-defined criteria that was developed following IUCN recommendations. Ultimately, this allowed DFO to count an additional 275,000 km² or 4.78% of protected marine territory. Thus, with the combination of MPAs and the identification of OECMs, Canada's national total reported marine protected territory rose from the currently reported 0.96% to 7.76% between 2016-2017 [72,73]. While it is commendable that Canada took the first steps to systematically apply the OECM concept to its entire EEZ, there was some pushback against the DFO's efforts [74]. One of the biggest points of contingency was the fact that these fisheries closures are only in place for 25 years. This begged the question of what the true intent of "*sustained long-term outcomes*" meant in the OECM definition. In the CBD documentation, "*sustained*" pertains to the continuity of governance and management and "*long-term*" pertains to the biodiversity outcome. However, there is no universally accepted definition for "*long-term*," as temporal restrictions appear to be arbitrary. Conservationists often argue that conservation initiatives should be implemented indefinitely, pointing out that if the conservation of an area cannot be guaranteed in perpetuity, it should not be counted towards global conservation goals, especially when conservation goals are expected to continue to rise. Efforts must be made to improve this lack of clarity in order to minimize disputes that will only slow OECM designation and progress towards goals. For example, if "*long-term*" can be described as 'over timescales of human generations' [75] and one generation is approximately 30 years [76], then 'long term' could be considered to last for at least 60 years.

The WDPA and partner organizations should compile data from other existing databases, particularly those related to national fisheries regulations and international conventions for conservation as we have demonstrated their potential. This would provide a clearer picture of existing initiatives that are providing co-benefits for biodiversity. The conservation areas of many conventions are already included in the WDPA and accounted towards Aichi Target 11 (e.g., Ramsar Sites). Inclusion of these other databases in the WDPA can help develop an accurate representation of area-based conservation initiatives and measures that can be added to and used as a baseline in the post-2020 era.

Special guidelines or protocol should be developed for cultural OECM designation. One of the strong arguments for OECMs is their ability to recognize communities and indigenous groups that have contributed to biological conservation for centuries (Jonas et al. 2017). However many of these communities have experienced cultural or historical trauma associated with the State [77,78]. Thus, the custodians of these areas may not want recognition by Parties. Governments will need to work with the people of ICCAs, IPCAs and SNSs delicately. The tenure rights will need to be guaranteed to the community which may be exceptionally difficult in areas where the community is not recognized on the national level.

Similarly, special guidelines should be developed for industrial OECMs given they will likely be points of contention in the future. For example, oil platforms have shown to have high

biodiversity [79,80]. Yet, given the known impacts that oil spills from platforms can have on marine life, as well as damage to the seabed, counting them as contributing towards global conservation goals that champion sustainability may be inappropriate. Further research would need to be completed to assess the risks and trade-offs of industrial OECMs. There also must be incentive for getting industries interested in going through the OECM designation process. For instance, if a government recognizes the importance of pearl farms to their national biodiversity commitments, perhaps they will offer more support or protection for the industry in the future especially to threats such as ocean acidification or sea-level rise [81].

6. Conclusion

Arguments surrounding semantics will keep the OECM concept stuck in high-level intergovernmental arenas and from being applied on the ground. Our review shows that the scope for OECMs is quite broad, but clear and guidelines will be needed across a variety of OECM types.

The science of biological conservation has developed greatly since its traditional beginnings. Now, the field is interdisciplinary and becoming more diverse [82,83]. Ultimately, OECMs have the great potential to contribute toward these modern conservation practices, but also the potential to be simply another definition. OECMs reported in the future should keep with the spirit of the definition of PA so that only meaningful areas with meaningful protection of marine biodiversity are counted against the Aichi 11 Targets.

Additionally, as OECM accounting become more widespread, it is important to not lose sight of previously existing conservation measures. The inclusion of OECMs in Aichi Target 11 and SDG 14 is intended to complement MPAs, not replace them. The question that will be immediately asked when we reach Aichi Target 11 and SDG 14 in 2020 will be: Is this 10% really doing anything? It will be critical to rebuttal this question—especially as goals for conservation will be argued to be increased. Regardless, of what term is used to call areas of the marine and coastal environment “conserved” it should be meaningful and of quality. Otherwise, both the SDGs and Aichi Targets will simply become paper commitments. Thus, recommend that specific guidelines and a step-by-step process be clearly developed so that Parties will be able to assess OECMs. We hope the analysis presented here will aid in the creation of such protocol and convey a range of areas that Parties may be able to assess soon—both for the sake of mitigating biodiversity loss and achieving global goals.

7. References

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