



Implementation challenges of area-based management tools (ABMTs) for biodiversity beyond national jurisdiction (BBNJ)

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ABSTRACT

Area-based management tools (ABMTs), including marine protected areas (MPAs) are widely recognized as a key mechanism for conserving and restoring biodiversity. The developing international legally-binding instrument (ILBI) on biodiversity beyond national jurisdiction (BBNJ) is considering a range of approaches to ABMTs. While the process is still in early stages, this paper looks ahead to anticipate implementation challenges for ABMTs, given previous experiences with regional fisheries management organizations (RFMOs) and high seas MPAs. Drawing on the implementation of MPAs under the OSPAR Convention and the Convention on the Conservation of Antarctic Living Marine Resources (CCAMLR), key suggestions revolve around: (1) improving the evidence basis for protecting BBNJ, (2) designing effective compliance and enforcement mechanisms, and (3) engaging adequately with relevant stakeholders. In addition to the case studies, which are primarily marine pollution and fishing-oriented, considerations related to mitigating the effects of deep sea mining and the harvesting of marine genetic resources are also touched upon.

1. Introduction

1.1. Overview of ABNJ process and introduction to ABMTs including MPAs

Following more than a decade of informal discussions and efforts, both within and beyond the United Nations (UN), in June 2015 the UN General Assembly adopted a Resolution¹ on the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (ABNJ). This action put into motion a process that will soon shift from preparatory to formal negotiations on an international legally binding instrument (ILBI), which will buttress the 1982 UN Convention on the Law of the Sea (UNCLOS) and allow it to better address marine management and conservation challenges of the 21st century. Four Preparatory Committee (PrepCom) meetings were held between April

2016 and July 2017, aimed at providing substantive and procedural recommendations for an ILBI to the General Assembly, and the formal negotiations are beginning in September 2018. The key items to be addressed under the ILBI include: (1) marine genetic resources (MGRs), (2) area-based management tools (ABMTs), including marine protected areas (MPAs), (3) environmental impact assessments, and (4) capacity building and technology transfer.

ABMTs can be defined as spatial closures that offer a degree of protection greater than the surrounding area “due to more stringent regulation of one or more of all human activities, for one or more purposes” [1]. In addition to MPAs, these include Emission Control Areas/Special Areas and Particularly Sensitive Sea Areas² (PSSAs), seasonal or year-round area fisheries closures, and Areas of Particular Environmental Interest³ (APEIs). Compared with MPAs, which offer a

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¹ United Nations General Assembly Resolution on the Development of an International Legally Binding Instrument under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (A/Res/69/292), 19 June 2015.

² Emission Control Areas/Special Areas and PSSAs are under the International Maritime Organization's (IMO) International Convention for the Prevention of Pollution from Ships (MARPOL).

³ APEIs are under the International Seabed Authority.

degree of long-term in situ conservation, ABMTs may be more adaptive/tailored to particular sectors, but also potentially shorter-term measures [1].

MPAs⁴ are widely regarded as a key tool for biodiversity conservation, but are not infallible, particularly in remote areas that pose challenges for surveillance, or are inadequately planned and supported.⁵ There are currently 12 high seas MPAs (HSMPAs), which were designated under two regional management bodies: two in the Southern Ocean, under the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), and ten in the North-East Atlantic, under the jurisdiction of the OSPAR Convention⁶ and the North-East Atlantic Fisheries Commission (NEAFC). Table 1 provides further details on these HSMPAs and outlines the complexity and fragmentation of their current governance and management.

Note that some of these areas are under consideration to be included within the extended continental shelf (ECS) of some States, and thus they may not be considered ABNJ in the future. In addition, the regimes governing fishing in the water column and on the bottom differ among themselves, and from the regime governing the seabed and subsoil. That is not to say that it is impossible to harmonize overlapping regimes, but it is complex and there are gaps where some sites are not currently fully protected. For example, Hatton Bank and Hatton-Rockall Basin are currently considered ABNJ but may become part of the UK's ECS. Portions of these sites are monitored within NEAFC as closures for bottom trawling, yet the water column above remains unprotected. Moving forward with a regime for ABMTs and MPAs on the high seas, standardizing a more uniform approach to protecting both the water column and underlying bottom would improve the effectiveness of both monitoring and biodiversity conservation objectives. Piecemeal approaches to governance are complex and render monitoring and enforcement difficult. Regional approaches have played an important role to date [4] and there are many positive aspects to be built on in the new ILBI, as discussed below within the context of OSPAR and CCAMLR.

While many marine management-related instruments already exist, both within and beyond national jurisdiction, the marine environment and marine biodiversity continue to deteriorate, and there is no formal regime for designating MPAs on the high seas. The 1982 UN Convention on the Law of the Sea (UNCLOS) contains provisions on conserving living resources within exclusive economic zones (EEZs⁷) (Article 61), and on the high seas⁸ (Part VII, Section 2), the Convention lacks

⁴ A widely accepted, international definition of an MPA is provided by the IUCN (International Union for Conservation of Nature) as: “a clearly defined geographic space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values” [2].

⁵ Agardy et al. [3] categorize five types of MPA shortcomings: (i) MPAs that are too small or poorly designed to be ecologically sufficient; (ii) inappropriately planned or managed MPAs; (iii) MPAs that fail due to degradation of unprotected ecosystems surrounding them; (iv) MPAs that do more harm than good, by displacing effort elsewhere; and (v) MPAs that create a dangerous illusion of protection when none is occurring.

⁶ The 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic, which replaced (1) the 1972 Oslo Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft, and (2) the 1974 Paris Convention for the Prevention of Marine Pollution from Land-Based Sources.

⁷ EEZs comprise coastal nation state jurisdiction in the oceans, out to 200 nautical miles (nm) from the baseline (normally the low-water mark). States can extend their EEZs further in cases where their continental shelf extends past 200 nm, subject to review by the Commission on the Limits of the Continental Shelf. States maintain sovereign rights within the EEZ, for both exploration/exploitation and conservation/management of marine living and non-living resources, both in the water column and on the seabed and under its subsoil.

⁸ The High Seas is defined as the area beyond national jurisdiction, in which States exhibit the freedom of the seas (these include: navigation, overflight, laying of submarine cables and pipelines, construction of artificial islands and

mechanisms for establishing MPAs. While the 1992 UN Convention on Biological Diversity (CBD) does provide such a mechanism, it is not applicable beyond national jurisdiction (however, there is some debate on the CBD's jurisdictional scope in ABNJ⁹). This is of particular importance with respect to the CBD's targets for biodiversity conservation. In 2010 the 10th Conference of Parties (COP) to the Convention adopted the Aichi Biodiversity Targets, which stipulate: “By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes” (Target 11). Without the authority to designate a network of HSMPAs, the CBD is not currently being applied beyond 200 nm (or States' ECS).

Consequently, the only tools available for restricting access to areas on the high seas currently fall within the purview of regional fisheries management organizations (RFMOs), environmental protection conventions with authority in ABNJ, such as OSPAR, and global bodies operating throughout the high seas, e.g. the International Seabed Authority (ISA) and the International Maritime Organization (IMO) through the MARPOL Convention (although some aspects of the CBD marine portfolio (e.g. Ecologically or Biologically Significant Areas) include consideration of ABNJ). The IMO can designate (1) Special Areas, which require particular mandatory methods for pollution prevention, and (2) Particularly Sensitive Sea Areas (PSSAs) to protect areas of special ecological, socio-economic, or scientific importance that are vulnerable to damage by maritime activities. The criteria for identifying PSSAs and Special Areas are not mutually exclusive, consequently PSSAs may be identified within a Special Area, and vice-versa. To date, no PSSAs have been declared in ABNJ, however two Special Areas (one in the Antarctic area and one in the Mediterranean Sea) do both include some ABNJ [5]. The ISA can designate Preservation Reference Zones, in which mining is prohibited in order to maintain representative and stable biota to aid comparison with mined areas. The ISA has established Preservation Reference Zones in the Clarion Clipperton Zone in the North Central Pacific, as well as a network of nine Areas of Particular Environmental Interest (APEIs), aimed at protecting different habitat types in the region at a large scale (each is approximately 160,000 km²). In APEIs and exploration is prohibited for at least five years, and these sites can be seen as providing a precautionary approach [6] and serving a biodiversity offsetting function [7].

In addition to this fragmented approach to ocean governance in ABNJ, another threat to successful high seas conservation is the underlying “freedom of the seas” paradigm espoused in the UN Convention on the Law of the Sea, which inevitably leads to a tragedy of the commons scenario. An ILBI may not be able to solve the freedom of the seas issue, wherein some States support implementing MPAs in

(footnote continued)

other installations permitted under international law, fishing, and scientific research). The High Seas refers only to the water column, the seabed and ocean floor beyond the Continental Shelf is referred to as The Area.

⁹ Article 4 of the CBD on Jurisdictional Scope stipulates that the provisions of the Convention apply, in relation to each Contracting Party (a) in the case of components of biological diversity, in areas within the limits of its national jurisdiction, and (b) 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. Consequently, while the CBD does not provide a specific mechanism for States to enact MPAs on the high seas, it can be inferred that the Convention poses some obligations on States not to undertake activities in ABNJ that could harm biodiversity. Regardless, the international community at times talks about the CBD Aichi Biodiversity Targets as though they have authority to protect the global oceans, rather than just national jurisdictions.

Table 1
 HSMMPAs to date (as of July 2018) MPA size data from MPAtlas.org, OSPAR MPA restrictions/protections from [20].

Year	Name	Location	Size (km ²)	Restrictions/Protections		
				Water column	Bottom trawling	Seabed & subsoil
2009	South Orkney Islands Southern Shelf MPA (CCAMLR)	Southern Ocean. Claimed by the UK and Argentina are frozen under the Antarctic Treaty System (ATS)	93,819	100% no-take		Governed under ATS
2016	Ross Sea Protected Area (CCAMLR)	Southern Ocean, adjacent to Antarctica	1117,000 Protection Zone 110,000 Special Research Zone Krill Research Zone	100% no-take Limited research fishing for krill and toothfish		Governed under ATS
2012	Charlie Gibbs North HSMPA (OSPAR)	Partly situated within an area that may become part of Iceland's Extended Continental Shelf (ECS) ABNJ	178,651	Controlled research fishing for krill permitted Water column is protected collectively by all OSPAR Contracting Parties (CPs) Long line pelagic fishing is regulated.	Bottom trawling and fishing with static gear, including bottom set gillnets and longlines, has been prohibited since 2004	Governed under UNCLOS, Iceland may eventually govern portion within ECS
2010	Charlie Gibbs South MPA (OSPAR)	ABNJ	145,420	Long line pelagic fishing is regulated. Seabed, subsoil, and water column are protected collectively by all OSPAR CPs		Governed collectively by all OSPAR CPs
2010	Milne Seamount Complex MPA (OSPAR)	ABNJ	20,913	Seabed, subsoil, and water column are protected collectively by all OSPAR CPs		
2010	Alair Seamount HSMPA (OSPAR)	Currently ABNJ, may become part of Portugal's ECS	4409	Upon invitation from Portugal, OSPAR is collectively protecting water column	Overlap with NEAFC closures	Portugal intends to protect seabed and subsoil
2010	Mid-Atlantic Ridge North of the Azores HSMPA (OSPAR)		93,416			
2010	Antialair Seamount HSMPA (OSPAR)		2208			
2010	Josephine Seamount HSMPA (OSPAR)		19,370		Under jurisdiction of multiple RFMOs	
2006	Rainbow Hydrothermal Vent Field (nominated)		22	Water column currently unprotected		Seabed and subsoil are protected by Portugal
2012	Hatton Bank SAC (nominated)	Currently ABNJ, may become part of UK's ECS	15,722		Overlap with NEAFC closure	Seabed and subsoil are protected by UK
2014	Hatton-Rockall Basin (nominated)		1,256		Overlap with NEAFC closure	

ABNJ, but others may be unwilling to accept said designations or be bound by them [8]. On the enormous scale of the high seas, it is difficult to instill the self-organized management of common pool resources recommended by e.g. Ostrom [9] and others, even with regional management approaches such as RFMOs, as the living resources are highly mobile and there is significant illegal poaching. Increased surveillance, both within MPAs and throughout the high seas, including new technologies discussed in more detail below, may be the only way to halt the tragedy of the commons in on the high seas, however the legal framework and financing mechanisms for implementing policing on such a large scale remain undefined.

Druel and Gjerde [10] outline a few approaches the ILBI could take with regard to the process for ABMTs and MPAs that are worth keeping in mind when examining the current progress towards HSMPAs, and considering what design/direction to take: (i) it could set out a process for designating an effectively managed, biogeographically representative and connected network of sites, requiring States and global and regional organizations to cooperate; (ii) it could take a largely regional approach, giving a mandate to States and relevant regional organizations to identify and submit MPA proposals to an international authority for approval, with management responsibility remaining at the regional level; (iii) a global scientific body could be tasked with developing proposals for MPAs in line with existing processes (i.e. regional approaches, existing RFMOs), or (iv) a broader framework for integrated spatial planning and management could be initiated, aimed at coordinating efforts between States and regional and sectoral organizations, requiring a coordinated process for both MPAs and other area-based (and non-area-based) management measures. Whatever model is chosen, as the ILBI negotiations unfold, we have a unique opportunity to build on past experience while resolving issues with UNCLOS, including overcoming governance fragmentation [11].

This paper examines the potential for ABMTs, in particular MPAs, on the high seas, focusing on implementation challenges they are likely to face. Drawing on the previous experiences of CCAMLR and OSPAR HSMPAs, as well as regional approaches to designing networks of MPAs closer to shore (e.g. the UK Marine Conservation Zone (MCZ) process), three key aspects are examined in more detail below: (1) improving the evidence basis for protecting biodiversity beyond national jurisdiction (BBNJ), (2) designing effective compliance and enforcement mechanisms, and (3) engaging adequately with relevant stakeholders.

1.2. CCAMLR MPAs

The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) is part of the Antarctic Treaty System (ATS) and governs marine resource conservation in the Southern Ocean surrounding Antarctica, approximately 10% of the Earth's ocean area [12]. Under the ATS, claims on Antarctica and its surrounding waters are “frozen”, thus the marine area encompassed by CCAMLR is considered ABNJ (although it does extend north in places, beyond the ATS area, which is limited to 60 degrees South latitude). There are currently 25 State Members¹⁰ to the Convention.

CCAMLR does not have a formal definition of an MPA, but rather refers to the idea as “a marine area that provides protection for all or part of the natural resource it contains. Within an MPA certain activities are limited, or entirely prohibited, to meet specific conservation, habitat protection, ecosystem monitoring or fisheries management objectives” [12]. In defining MPAs, CCAMLR distinguishes between no-take areas, in which no fishing is allowed, and multi-purpose areas which may allow some fishing, research, or other human activities.

¹⁰ CCAMLR Members as of July 2018: Argentina, Australia, Belgium, Brazil, Chile, China, EU, France, Germany, India, Italy, Japan, Republic of Korea, Namibia, New Zealand, Norway, Poland, Russian Federation, South Africa, Spain, Sweden, Ukraine, UK, USA, and Uruguay.

MPAs are included within CCAMLR's approach to marine spatial protection as a tool among others, such as fishing limits and gear restrictions. The 1991 Madrid Protocol to the AT provides for the creation of two types of protected areas, Antarctic Specially Protected Areas (ASPAs) and Antarctic Specially Managed Areas (ASMAs). There are currently 10 ASPAs which are marine or partly marine, and three partly marine ASMAs [13].

Following years of dialogue on the need for MPAs, in 2011 CCAMLR adopted a legally-binding Conservation Measure on establishing CCAMLR MPAs [14]. This measure calls for CCAMLR MPAs to be established based on the “best available scientific evidence” and aimed at achieving the following objectives: (i) to protect representative examples of marine ecosystems, biodiversity and habitats at an appropriate scale to maintain their viability and integrity in the long term; (ii) to protect key ecosystem processes, habitats and species, including populations and life-history stages; (iii) to establish scientific reference areas for monitoring natural variability and long-term change or for monitoring the effects of harvesting and other human activities on Antarctic marine living resources and on the ecosystems of which they form part; (iv) to protect areas vulnerable to impact by human activities, including unique, rare, or highly biodiverse habitats and features; (v) to protect features critical to the function of local ecosystems; and (vi) to protect areas to maintain resilience or the ability to adapt to the effects of climate change [14]. Several MPA proposals have been put forward, however most have been unsuccessful due to some States' political agendas and fishing interests in the Southern Ocean.

In 2009, CCAMLR established the world's first High Seas MPA around the South Orkney Islands. It is entirely no-take, and was accepted by CCAMLR members without significant conflict, due to there being no impact on fisheries within the area set aside, however it appears that a nearby biologically rich area was left out so as not to interfere with the krill fishing industry, which calls into question the functional importance of this MPA [15]. Further, it has been cited as example of going after “low hanging fruit” [15]. The indentation in the north-western portion of the MPA was removed to placate States with an interest in crab fishing in the area, which has not been realized on a commercial scale [16,17]. Nevertheless, it set a precedent in a region with a history of political tension, where there have been concerns about MPAs in the CCAMLR area serving as a potential ocean grab, aimed at extending sovereign claims to Antarctic territory [15]; States have been arguing about this point, and whether CCAMLR even allows for the establishment of MPAs (prior to the adoption of the 2011 Conservation Measure).

More recently, and following several attempts and revised proposals, the Ross Sea region MPA was established in 2016. Following negotiations and compromise the final MPA was reduced in area by 40%, and approximately 72% of its 1.55 million km² is closed to fishing [15]. In addition to no-take areas (General Protection Zones), it includes a Special Research Zone and a Krill Research Zone, both of which allow limited fishing. Two additional important compromises in the designation of this area included the opening of Patagonian toothfish fishing areas outside of the MPA that had previously been closed (i.e. displacing the fishery outside of the MPA), and reducing the proposed time-frame for the MPA from 50 to 35 years, with provisions for periodic review/revision [15].

1.3. OSPAR MPAs

The OSPAR Convention¹¹ is a regional environmental agreement covering the North-East Atlantic, encompassing five regions: Arctic Waters, the North Sea, Celtic Seas, the Bay of Biscay and Iberian Coast,

¹¹ OSPAR Parties include the EU plus Belgium, Denmark, Finland France, Germany, Iceland, Ireland, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the U.K.

and the Wider Atlantic (the Arctic and wider Atlantic regions include ABNJ). With roots in pollution prevention, the Convention has expanded its remit to include other environmental issues, but it does not address fishing or maritime transport, nor does it have competence over mineral extraction in the Wider Atlantic. Rather, the OSPAR Commission cooperates with the relevant bodies for these issues, the North-East Atlantic Fisheries Commission (NEAFC), the IMO, and the ISA. It is worth noting that OSPAR Maritime Area and NEAFC Regulatory Area overlap geographically (with the exception of some areas in the Barents Sea under Russian jurisdiction, which are not covered by OSPAR¹²). There is also some institutional overlap with respect to both OSPAR and NEAFC's efforts to protect marine ecosystems in ABNJ; both have proceeded with adopting measures to protect vulnerable marine ecosystems, including in the Wider Atlantic subregion. However, while OSPAR uses the term MPAs (defined below), NEAFC refers to “closed areas”, as these spaces are closed only to bottom-fishing, on the basis of having been identified as Vulnerable Marine Ecosystems in accordance with FAO guidelines [18].

OSPAR broadly defines MPAs as “areas for which protective, conservation, restorative or precautionary measures have been instituted for the purpose of protecting or conserving species, habitats, ecosystems or ecological processes of the marine environment” [19]. The momentum towards designating a network of MPAs within the OSPAR area began in 1998, with the adoption of the Sintra Ministerial Statement, which committed the Commission to promote the establishment of a network of MPAs “to ensure the sustainable use, protection and conservation of marine biological diversity and its ecosystems.” This process has continued, with shifting targets (i.e. the initial 2010 deadline for a network was moved forward to 2012–2016). The aims of the OSPAR MPA Network are threefold: (1) to protect, conserve and restore species, habitats and ecological processes which have been adversely affected by human activities; (2) to prevent degradation of, and damage to, species, habitats and ecological processes, following the precautionary principle; and (3) to protect and conserve areas that best represent the range of species, habitats and ecological processes in the maritime area [20]. As they currently stand, the network targets are: (1) by 2012, to be ecologically coherent, to include sites representative of all biogeographic regions in the OSPAR Maritime Area, and to be consistent with the CBD target for effectively conserved marine and coastal ecological regions; and (2) by 2016, to be well-managed (i.e. coherent management measures have been set up and are being implemented for such MPAs that have been designated up to 2010) [20].

As of October 2016, the OSPAR MPA Network included 448 MPAs, 7 of which are located beyond national jurisdiction (see Table 1). The entire network covers 806,472 km², or 5.9% of the OSPAR Maritime Areas [20]. Proportionately, the greatest MPA coverage is within the subregion comprising the Greater North Sea, and the lowest is in the Arctic Waters subregion (see Table 2). The Wider Atlantic is the largest OSPAR region, 8.3% of which is now within MPAs. However, despite this significant progress, the OSPAR MPA network is not yet considered to be ecologically coherent [21].

As mentioned above, NEAFC has also established closed areas in the high seas portion of the North-East Atlantic. This process has run in parallel with the OSPAR MPA network, and in 2008 a Memorandum of Understanding (MOU¹³) was adopted to address the institutional overlap between OSPAR and NEAFC, emphasizing the complimentary yet separate competencies and responsibilities of the two organizations (environmental protection in the case of OSPAR and fisheries management for NEAFC). NEAFC began closing areas on a precautionary

¹² With the exception of Russia, NEAFC and OSPAR have the same membership.

¹³ For a full listing of OSPAR MOUs with other organizations, see: <https://www.ospar.org/about/international-cooperation/memoranda-of-understanding> (accessed 4/26/18).

Table 2
OSPAR MPA coverage by region (adapted from [20]).

OSPAR Region	Total Area of Region (km ²)	Area in MPAs (km ²)
I. Arctic Waters	5,529,716	107,109 (1.9%)
II. Greater North Sea	766,624	112,968 (14.7%)
III. Celtic Seas	366,459	27,795 (7.6%)
IV. Bay of Biscay and Iberian Coast	539,153	32,076 (5.9%)
V. Wider Atlantic (beyond national jurisdiction)	6,346,159	526,525 (8.3%)
TOTAL	13,548,111	806,472 (5.9%)

basis in 2004, and the process has run somewhat in parallel, but without coordination between the two institutions, resulting in only partially overlapping MPAs [15,22]. The effort toward coordination begun in 2008 (referred to as the “Madeira Process”) continued with subsequent meetings in 2010 and 2012 and has resulted in an initial Collective Arrangement between OSPAR and NEAFC in 2014 [23,24]. It does not yet include the ISA or IMO (despite efforts to do so), but it is hoped that these and other relevant organizations will participate in the future, so as to include all human uses in the North-East Atlantic. The Collective Arrangement intends to facilitate cooperation and coordination between OSPAR and NEAFC, including sharing information and avoiding undermining one another's conservation and management measures [23]. The organizations observe one another's meetings, provide written notifications, and maintain a joint overview of areas that are subject to special measures, including having joint meetings to discuss issues relevant to these areas [23]. The ISA has participated in formal meetings under the Collective Agreement, despite not yet being a formal participant, and there is some potential for both the ISA and IMO and perhaps other international organizations to join.

2. Improving the evidence basis for protecting BBNJ

ABMTs and MPAs are not an antidote to all environmental threats, especially external and/or exogenic pressures such as climate change. Johnson et al. [1] estimate that nearly all¹⁴ high seas ABMTs and MPAs in the North-East Atlantic are likely to experience climate change impacts in the next 20–50 years. Even for endogenic threats originating within the area, spatial approaches are not always the best approach, especially for highly mobile/migratory species [25]. ABMTs and MPAs can be effective tools for fisheries management, but are often implemented when other approaches have failed, rather than as part of a suite of tools. In addition, RFMOs have generally been slow to follow the advice of their science advisory bodies with respect to closures, either ignoring recommendations or implementing closures that do not fully meet the scientific advice [26]. There are two key concerns worth unpacking with regard to how science will inform the implementation of ABMTs and MPAs in ABNJ: the structure and function of scientific advisory committees, and the standards of evidence used.

2.1. Science advisory committees and evidence-based decision-making

The relationship between science advice and political decision-making is increasingly important, and affected by several factors, ranging from the complexity of the issue itself, to the background/knowledge of the expert and/or their employer, as well as the political context of the issue itself and any bias/agendas on either side of the science-policy interface [27–30]. Other factors also influence how well science advisors inform decision-makers, including whether the latter are even receptive to the information and/or understand it appropriately, i.e. whether it is pitched at the right level and accessible.

¹⁴ Excluding areas designated to protect hydrothermal vents.

Science advisors themselves are often put in a difficult position, especially when the information they are assessing is incomplete and/or mixed with policy/politics [31], i.e. it may have implications that make it impossible for advisors to be truly neutral in their recommendations [32]. In addition, successful science-based policy requires the inclusion of perspectives beyond science alone, such as resource managers and interest groups [33], and thus some transparency and public participation is necessary; this issue is further explored below.

Examining CCAMLR and OSPAR as possible models, the structure and function of science advice in these cases is complex. As is often the case in marine science advisory panels, both of these approaches are primarily focused on natural science, i.e. they lack a wider range of expertise, with participation from social scientists (i.e. economists, political scientists, geographers, and sociologists), who could provide a wider breadth perspectives on human uses of the oceans that are necessary for designing effective conservation measures [27]. CCAMLR has a Scientific Committee that takes into account research from individual CCAMLR Members, and it also has several programs of its own that collect data relevant to environmental management. These Working Groups focus on: (i) ecosystem monitoring and management; (ii) fish stock assessment; (iii) statistics, assessments, and modelling; (iv) incidental mortality associated with fishing; and (v) acoustics, survey and analysis methods. The first three meet annually, the last two met at the Scientific Committee's request. The Scientific Committee itself is currently comprised of one member from each of the 25 CCAMLR Member States.¹⁵

Regarding science advice for decision-making in the North-East Atlantic, ICES¹⁶ provides scientific advice to both OSPAR and NEAFC, as well as their government members. OSPAR and ICES have a MOU (initiated in 1995 and updated and renewed in 2006), indicating inter alia that the two organizations have a Coordinated Environmental Monitoring Programme (CEMP) under the OSPAR Joint Assessment and Monitoring Programme (JAMP), wherein ICES serves as the data center, and OSPAR cooperates with ICES on appraising data submitted by Contracting Parties. The two organizations are also invited to send observers to one another's meetings and to share documents and reports. However it is worth noting that this MOU predates the bulk of the MPA related activity in the North-East Atlantic, and it may therefore require updating in light of the developing ILBI. In addition to this advice, OSPAR also manages its own Committees that compile data on: biological diversity and ecosystems, environmental impacts of human activities, hazardous substances and eutrophication, offshore industry, and radioactive substances. According to the MOU, the Committee findings form the basis for consultations between the Secretariats of OSPAR and ICES. The consultations address scientific information and advice to be provided, and data activities to be undertaken, in the following calendar year. Again, while these cooperative efforts bode well for regional approaches to inform the development of an ILBI, additional science needs to be included, encompassing human uses, motivations, and governance considerations.

In addition to the structure of science advice, it is also worth reflecting on the scientific basis for designating ABMTs and MPAs in ABNJ, as two approaches with different criteria have developed in the same timeframe, over the past decade. The Vulnerable Marine

Ecosystem (VME) concept underpins the designation of closures under Regional Fisheries Management Organizations (RFMOs), including NEAFC and CCAMLR, and aims to protect groups of species, communities or habitats that may be vulnerable to impacts from fishing impacts. The UN Convention on Biological Diversity (CBD) is also contributing to the scientific basis for protecting areas, identifying Ecologically and Biologically Significant Areas (EBSAs) that may contribute to spatially-based approaches to protecting marine ecosystems [34]. This approach has been informing national networks of MPAs within EEZs, as well as UN Regional Environmental Programmes, including the Mediterranean Action Plan (which includes high seas areas).

As set out in the report of the Preparatory Committee [35], the suggested criteria for identifying areas include several that overlap with EBSA criteria, as well as a few additions. EBSA criteria included in this list include: uniqueness; rarity; special importance for the life history stages of species; importance for threatened, endangered, or declining species and/or habitats; vulnerability, fragility, sensitivity¹⁷; biological productivity; biological diversity; and naturalness. Additional criteria include: representativeness; dependency; connectivity; ecological processes; and economic and social factors. It will be interesting to see how economic and social factors are included in a scientific assessment based on ecological criteria, and what factors are included.

The additional criteria beyond EBSAs have potential to protect ecosystems from new and developing threats to these areas and ecosystems, including deep sea mining for minerals and the extraction of marine genetic resources. This would work particularly well if the international community would agree to integrate a more formal and explicit operationalization of the precautionary principle¹⁸ into the criteria for MPAs in ABNJ; the Preparatory Committee report [35] does refer to it, among several other principles for possible inclusion in the ILBI. Implementing a truly precautionary approach to managing anthropogenic activities in ABNJ is critical for protecting not only vulnerable and rare species and ecosystems, but also preserving those yet to be discovered. All too often, the precautionary principle has been misinterpreted in environmental contexts, such that damage must occur before it kicks in, particularly in offshore marine contexts [36].

3. Designing effective management and compliance/enforcement mechanisms

Assessing environmental regime effectiveness is complex and multidimensional [37], however two key aspects include compliance (e.g. actor behavior) and results (e.g. environmental improvement), which may be independent of one another, but both are necessary [38]. Compliance can take many forms along a spectrum, from spontaneous compliance on one end, to induced on the other, to facilitated regime-enabled compliance in the middle – and, as is the case with many environmental issues, whether and how compliance is achieved also depends upon the ease of overcoming both individual and social/institutional barriers [39]. International organizations can help facilitate compliance, and if protecting ABNJ were a new issue area, it might be appropriate to suggest how a new organization could be designed to help the regime achieve its objectives.

While it can be argued there is little appetite in the international community for creating an entirely new international organization to govern the high seas [8], existing relevant bodies are already heavily taxed with their respective areas of work, i.e. the aforementioned

¹⁵ As of July 2018, only 23 out of 25 Members have representatives on the Scientific Committee, with Brazil and India the exceptions. For a current listing of Scientific Committee representatives, see: <https://www.ccamlr.org/en/science/scientific-committee-representatives> (accessed 7/26/18).

¹⁶ The International Council for the Exploration of the Sea (ICES) is an international organization that develops science and provides advice to support the sustainable use of the oceans. It brings together over 5000 scientists to provides advice to its 20 member countries: Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Russian Federation, Spain, Sweden, the UK and the USA.

¹⁷ NB: the EBSA criteria for vulnerability, fragility and sensitivity also includes slow recovery, not listed here.

¹⁸ The Precautionary Principle, codified in the 1992 Rio Declaration, states that “where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation” (Principle 15).

RFMOs and Regional Seas Conventions, the IMO, ISA, and the branch of the UN that oversees UNCLOS (the Division for Ocean Affairs and the Law of the Sea (DOALOS)). If it is decided that a new overarching mechanism is to be implemented for protecting BBNJ, it could be structured on a Convention model, and follow the approach of the Convention on Biological Diversity, with close linkages to advisory commissions (i.e., legal, scientific, technical), and a decision-making body (e.g. a Conference of Parties (COP) mechanism). Alternatively, as noted earlier [10], a broader framework approach for integrating spatial planning and management could be less taxing on the international community, if it harnesses existing momentum and regional/sectoral approaches. However that would require said momentum to continue without the top-down pressure provided by a Convention and COP mechanism.

While international organizations can help with encouraging compliance and with monitoring how well an environmental agreement is working (depending on the resources at their disposal), compromises are often made as well, in order to keep States at the table. This point is particularly important with respect to the politics of managing marine living resources, for instance the pace at which RFMOs act to implement evidence-based closures and/or a precautionary approach when under political pressure [40], and how the International Whaling Commission has struggled with scientific uncertainty and continues to allow Japan, Iceland, and Norway to whale under reservation to the Convention and/or through scientific whaling loopholes, despite a whaling moratorium and tremendous international pressure [41]. The alternative, that nations may leave the organization and harvest resources at will, is unacceptable.

In addition, how can we counteract the freedom of the seas? Conservation measures in ABNJ are not automatically binding on third states without their consent – as mentioned earlier, MOUs and agreements facilitated cooperation between RFMOs and regional environmental agreements. The same is true for non-parties to these instruments who are active in the region. Therefore, if a new unified mechanism is not created, a myriad of bilateral agreements will be necessary. Cooperation between NEAFC and OSPAR already exists in the water column, and between OSPAR and the ISA on the seabed, but this will need to be harmonized throughout the oceans, and in many places there are gaps and weakly implemented/monitored regions. However, in the Sargasso Sea region off the east coast of the US, the Sargasso Sea Alliance Initiative has demonstrated the voluntary will between the Bermuda government and a range of scientists, international organizations, and private donors, to collaborate on research and conservation in the high seas. This partnership has led to the Sargasso Sea being described as an EBSA under the CBD [42] and it has potential to be designated a HSMMPA.

Focusing on measures currently in place, and drawing on the cases examined earlier, two key points relevant to implementing MPAs in ABNJ are important to consider: how/whether these sites are designated with clear management plans, and how/what technology exists to help enforce them.

3.1. Management plans

The most glaring omission in the cases outlined above is a general lack of management plans. Inshore OSPAR MPAs (i.e. within national jurisdiction) are better protected than the high seas sites, as many of these are also part of the Natura 2000 network and monitored under domestic legislation implementing the EU Habitats and Birds Directives. Even where OSPAR management plans do not yet exist, Member States are required to implement measures in the interim, under the EU Directives. According to a 2016 survey of OSPAR Contracting Parties [20] there is a lot of uncertainty surrounding whether and how well conservation measures are working in OSPAR MPAs. These data are qualified by poor response rates (ranging from 20% to 27% on each question), however they show that among the

majority of self-reporting Contracting Parties, MPA measures are only “partially” being implemented (54%), and monitoring is only “partially” taking place (46%).

The CCAMLR South Orkney Islands MPA was also designated without a management plan or research and monitoring plans; it relies on research and monitoring undertaken via Conservation Measure 91–03 from 2009 and a 2014 MPA Report.¹⁹ The latter sets out the MPA's objectives and summarizes research and monitoring in the region, as well as assesses the effects of fishing activities on biodiversity in the MPA. The UK submitted a draft research and monitoring plan to CCAMLR in 2014, but it has not yet received consensus support from other members [16]. In contrast, Ross Sea MPA proposals (2012–2015) included a brief management plan, and there is currently a research and monitoring plan under review, proposed in the fall of 2017.

Unfortunately, it is not unusual for MPAs to be designated without clear management plans in place, this is not just an issue for high seas management. For example, during the design and implementation of a network of Marine Conservation Zones (MCZs) throughout its EEZ, the UK proceeded with designating sites without having management measures in place or even on the table for stakeholders to examine [43]. However, a post-facto approach to management makes it difficult for those involved in deciding where and how much to protect without knowing what activities will be restricted. While securing sites first and then designing management measures later allows for some flexibility, it can also lead to sites not being adequately protected. In the UK MCZ example, none of the sites implemented to date are completely no-take, off-limits to resource extraction. If the parties involved in selecting sites for the network had known this would be the case from the start, it may have affected their decision-making with respect to site locations and boundaries/sizes [27,43].

This is an important issue that needs to be decided prior to the development of a regime for MPAs and ABMTs in ABNJ: should we select areas first and then design management measures later? Or should possible restrictions and management measures be part of the decision for where/what to conserve? It is not an easy decision, and many would argue that the first approach is preferable, allowing compromise later. However, both the EU and the Least Developed Countries (LDCs) coalition have expressed support for including management plans in ABMT proposals at the PrepCom meetings. A compromise could involve implementing emergency short-term moratorium measures, such as was done with the Darwin Mounds area of cold water coral on the UK continental shelf, i.e. an emergency closure under the Common Fisheries Policy which was then replaced by permanent measures under the Habitats Directive [36,44]. A temporary moratorium can also test out a management strategy, before it is implemented more stringently. It would be prudent for the ILBI to have such a precautionary measure built into it, if it is not possible to simultaneously designate MPAs and draft management plans.

3.2. New technologies

Currently the high seas are surveyed with the use of satellite technology and boat and plane patrols. RFMOs work closely with member governments to compile data and monitor ships, and in regions like the North-East Atlantic, where there is geographic overlap between NEAFC and OSPAR, this approach is effective for policing both agreements. However, OSPAR on its own lacks enforcement mechanisms, neither for Contracting Parties nor for third States [45].

Monitoring fishing vessels occurs both collaboratively, using Vessel Monitoring System (VMS) and Automatic Identification System (AIS) satellite tracking on board ships, and non-collaboratively, via optical or

¹⁹ Conservation Measure 91–03 (2009), see: <https://www.ccamlr.org/en/measure-91-03-2009> and an MPA Report (2014) from CAMLR XXXIII (see: <https://www.ccamlr.org/en/sc-camlr-xxxiii/bg/19>) (both accessed 7/23/18).

radar satellites. There is need for both approaches due to widespread illegal, unregulated, and unreported (IUU) fishing, as well as linkages between IUU fishing and organized crime and drugs. In addition to these traditional approaches, there are new technologies being developed, including using drones both in the air and under water, artificial intelligence, on-board cameras (not a new approach, but hopefully improved), and even smartphones [46].

Recently, new surveillance technology has been an important consideration when designating large, remote MPAs. The “Eyes in the Sky” satellite-based approach, supported by the Bertarelli Foundation, Pew Environment Group, and a UK satellite company, was launched with the designation of a large MPA surrounding the UK Pitcairn Islands overseas territory. This technology is part of a larger Project Eyes on the Seas, that merges four sources of information: (i) data from AIS and VMS; (ii) satellite imagery, including synthetic aperture radar, optical imaging, and thermal imaging; (iii) data from RFMOs, including vessel histories, fishing boundaries, marine reserve boundaries, and other information; and (iv) automation, including alerts to users when anomalies are detected (such as a vessel entering an EEZ or a no-take MPA, or when an AIS system is suddenly turned off) [46].

AIS data is also being used by a partnership between Oceana, SkyTruth, and Google, called “Global Fishing Watch”, which was launched to monitor fishing vessel activity within another large, remote MPA, the Phoenix Islands Protected Area in Kiribati. A third new satellite program, “DigitalGlobe”, still under development, will use the company’s own satellites to provide visual evidence of infractions, to aid prosecution efforts in remote waters [47]. As evidenced by these examples, the technological surveillance playing field is developing quickly, and may be beneficial for monitoring and enforcing MPAs in ABNJ, provided the legal requirements and pathways for prosecution are clear. Capacity building and technology transfer are also important factors to ensure developing countries are able to monitor, control, and survey their EEZs [48].

4. Engaging adequately with relevant stakeholders

One final issue that warrants consideration for implementing MPAs and ABMTs in ABNJ, is the degree to which stakeholders are engaged in the process. This is an important topic in environmental management, with an extensive scholarship that points to a lack of public engagement often leading to policy failure [49–51]. Best practices include starting the process of public engagement as early as possible, with clear objectives from the outset, excellent facilitation, underpinned by strong and interdisciplinary science (i.e. both natural and social), and the process must also be institutionalized, i.e. embedded in policy [49]. Rights to participation and decision-making have been enshrined in the 2001 Aarhus Convention on Access to Information, Public Participation in Decision-making, and Access to Justice in Environmental Matters, but this Convention is fairly weak legally. Additionally, it falls within the auspices of the UN Economic Commission for Europe (UNECE), and its membership is limited to European countries and some of the former Soviet bloc.

In MPAs, the challenge often comes down to ensuring all relevant sectors and participants are not just informed about where an MPA will be designated, but actively involved in the decision-making about what and where to protect. To date, this approach has been implemented within EEZs, but as MPAs move further offshore, it is important to consider how to best harness stakeholder engagement and awareness, in order to legitimize the process and also help ensure its efficacy vis-à-vis biodiversity conservation objectives.

4.1. Transparency and participation build legitimacy

The Preparatory Committee report [35] includes a list of general principles and approaches that may be included in the text of the ILBI, including *inter alia* relevant stakeholder engagement; public

participation; and transparency and availability of information – all factors in line with the aforementioned Aarhus Convention and which are widely regarded as critical to successful environmental governance. However, if these principles are operationalized in the ILBI, it will be important to follow-through and ensure that high seas MPAs learn lessons from experiences with similar aims.

One recent example of MPA planning with a strong focus on stakeholder participation is the aforementioned UK MCZ process that unfolded in 2009–2011 and is still ongoing with respect to actual site designations. This process, modeled largely on an earlier regional MPA network approach in Californian state waters, aimed to create a stakeholder-driven network of MCZs throughout the UK’s EEZ, including no-take Reference Areas. Both the Californian and UK processes involved extensive partnership and collaboration with a range of stakeholders, who were directly involved in site selection proposals. Unfortunately, due to political and economic considerations, as well as problems with interpreting the scientific evidence underpinning the sites, the UK MCZ network has not yet been completed (and does not include any of the recommended Reference Areas, or no-take zones), and consequently a great deal of public trust and social capital has been lost [43]. Unpacking stakeholder perceptions of the process, a few problems are obvious in hindsight, namely a lack of clear objectives for how these sites would be managed (i.e. having a sense of management plans and what activities would be restricted), a lack of transparency in the process (i.e. decisions were taken behind closed doors), and a lack of communication and access to information throughout (i.e. updates to the stakeholder community were limited and their expectations were not managed appropriately) [43].

While MPAs in ABNJ are “out of sight, out of mind” to most of the public, there is an opportunity to harness public concern for common resources – not just marine living resources, but also the minerals and precious metals that will be mined in The Area, as well as marine genetic resources. It will be important to ensure that the regime for the latter (marine genetic resources) is in line with the CBD Nagoya Protocol on Access and Benefit Sharing²⁰ (ABS); whether and how these provisions will be implemented in ABNJ has not been determined. However, if the contentious sessions on ABS within the CBD COPs are anything to go by, it will be challenging for the new regime to determine how to share common resources equitably across the world.

The ISA and RFMOs in general have faced critiques with respect to transparency and participation. As it currently stands, their meetings are not very visible and do not garner the same amount of media and NGO engagement as the CBD or other global forums. With respect to accountability for deep-sea mining, managed by the ISA, a recent analysis [52] recommends six areas of good transparency practice that the ISA will need to better operationalize in order to improve their accountability: (i) access to information; (ii) reporting; (iii) quality assurance; (iv) compliance information; (v) public participation; and (vi) ability to review/appeal decisions. For RFMOs, a recent survey-based comparative analysis of 11 organizations examined a range of questions falling within three categories: (i) access to full, up-to-date and accurate information; (ii) public participation in decision-making; and (iii) access to outcomes [53]. This study concluded that with respect to transparency, no single RFMO is doing particularly well or failing spectacularly, rather most have some room for improvement. However, this analysis focused on the organizations themselves and was based on a self-reporting survey; future research on RFMO transparency should compare these outcomes with perceptions of the scientific community, users, and other stakeholders, and assess what improvements are needed from the other side.

As a new regime for protecting BBNJ develops, and as ABMTs and MPAs are debated and designated, it will be critical for the RFMOs and

²⁰ The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (2010).

other organizations to be more accessible and transparent, as well as make information readily available to a broad audience beyond users. These areas and the resources they contain, both unique and rare biological and ecological features, as well as mineral resources, belong to the Common Heritage of Mankind, in the last true frontier on the planet.

5. Conclusions and recommendations

It is critical to learn from regional experiences to date with implementing ABMTs and MPAs in ABNJ as we develop a new ILBI. Building on RFMO and regional environmental protection experiences and utilizing existing networks of states and non-state actors will be critical, but we must be careful not to grandfather in or replicate existing flaws. Four key recommendations can be drawn from examples with CCAMLR, OSPAR, and regional MPA network planning discussed in this paper:

- (1) High Seas MPAs should be stronger than existing RFMO closures, include both the water column and seabed, and include sites that are completely off-limits to human use.
- (2) Clearer pathways for science advice in the process should be identified, ensuring the evidence-base for closures is sound, adequate, and precautionary in nature. In addition, social science must be included in the science advisory process from the start.
- (3) Consideration of management plans should be included in ABMT and MPA planning from the start, including clear monitoring and enforcement plans, linked to new technologies, and with greater transparency. In cases where this is not possible, emergency closure measures should be an interim option.
- (4) Equitable and transparent stakeholder engagement and participation should be implemented in the design and designation of ABMTs and MPAs, including a wide range of user communities as well as the scientific community and general public.

Lessons learned from the cases examined above include the necessity of avoiding a network of “paper parks” on the high seas. In the North-East Atlantic, geographical overlap between an RFMO and the regional environmental OSPAR Convention is beneficial, encouraging efficient management and surveillance, as well as adequate precaution in the decisions regarding where and what to protect. However, such geographic overlap is the exception rather than the rule on the high seas.

Given the currently fragmented approach to ocean governance, it will be important to decide early on in the ILBI process whether we should rely solely upon existing regional approaches to ocean management, or create a new global scientific body to harmonize MPA implementation. While it is tempting to choose the latter option, this would only work if carefully designed to be politically highly influential, which opens up several interesting questions about the architecture of science-policy advice when governing areas of the planet with high degrees of scientific uncertainty and enforcement challenges. Nevertheless, it is still important to build on regional lessons and improve on them, as a stepping stone towards global marine governance. Clearly, there will be a lot of “learning by doing” over the coming years, but there are also many lessons to be drawn from experiences with ocean governance to date, that will hopefully inform the ongoing process.

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