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Securing effective and equitable coverage of Marine Protected Areas: The UK's progress towards achieving Convention on Biological Diversity commitments and lessons learned for the way forward

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Abstract

1. Current international agreements call for protecting 10% of marine and coastal waters by 2020, with the intention of increasing that target to 30% by 2030. With 24% of its territorial waters protected, the UK falls short of the new expected target.

2. As well as quantitative targets, qualitative criteria have been internationally agreed for protected area designation, including minimum coverage values and characteristics that encompass 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.

3. The legal framework supporting protected area designations at sea is summarized and explained for UK territorial waters. Efforts to date to achieve current marine protected area (MPA) targets are reviewed, with emphasis on how well the existing protected area portfolio captures the qualitative criteria. Examples are given of other effective conservation measures complementary to formalized MPAs, especially with regard to achieving and promoting qualitative criteria for biodiversity conservation, including appropriate recognition of and support for areas conserved by indigenous people, local communities and private entities.

4. A precis on the governance of MPAs and other effective conservation measures in the UK and its overseas territories is presented. Whilst the UK has made exceptional progress with quantitative MPA coverage, it is still not clear whether designated areas offer effective protection. A UK-level strategy is in place to address this, and at site level, Lyme Bay MPA illustrates the benefits of addressing qualitative criteria. Illustrated by the UK example, an urgent call is made for ongoing and future marine *in situ* area-based conservation efforts to substantiate quantitative and qualitative considerations, and to ensure that MPA networks are ultimately fit for purpose.

Key words: Aichi Biodiversity Target 11, UN Sustainable Development Goals, Other Effective Conservation Measures, Area Based Management Tools

1 Introduction

For many States, marine and coastal living resources are essential for national development, as they play an important role in food security, poverty eradication, and job creation (e.g. tourism); interactions highlighted by the 2015 Sustainable Development Goals (Stafford-Smith et al., 2017). However, the effort required to protect these resources should not be underestimated. In 1992 the United Nations Conference on Environment and Development (UNCED) – the Rio Earth Summit – adopted Agenda 21 on the conservation and management of resources for development. Chapter 17 of the Agenda specifically addresses the protection of the oceans and the protection and rational use and development of their living resources (UN, 1992a). Another significant outcome of the Rio Earth Summit was the opening for signature of the Convention on Biological Diversity (CBD), which eventually entered into force in December 1993, now with 168 signatories and ratified by 196 Parties (CBD, 2017). The CBD provides a formal basis for global governance of biodiversity; its potentially far-reaching objectives are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources taking into account all rights over those resources.

Protected areas are considered an effective method of managing human activities and natural resources (Christie et al., 2017; Laffoley et al., 2019; OECD, 2017). The CBD defines protected areas as “a geographically defined area, which is designated or regulated and managed to achieve specific

conservation objectives". Within the marine realm, the CBD maintains that marine and coastal protected areas are an essential tool for the conservation and sustainable use of marine and coastal biodiversity[1], and that a national framework of marine and coastal protected areas should include a range of levels of protection, encompassing both areas that allow sustainable uses and those that prohibit extractive uses (i.e. 'no-take' areas) (CBD, 2004). Since their recognition and recommendation, many marine protected areas (MPAs) have been implemented by numerous authorities with different remits and varying degrees of success in achieving their objectives, and often with insufficient resources for governance. Many areas that are intended to protect marine biodiversity overlap, having been designated at different times and under different legal instruments.

Both in Europe and in the United Kingdom (UK), MPAs include a range of areas where human activities are restricted to protect living, non-living, and/or cultural values. Thus, MPAs are seen as a means, consistent with international law, for instituting protective conservation, restoration or precautionary measures related to specific areas or sites and related to specific species, habitats or ecological processes (Olsen et al., 2013). Progress towards establishing coherent networks of MPAs at various scales has been driven at the global and regional international level but implemented at the national level. Conservation targets and processes adopted by the 2002 World Summit on Sustainable Development, the G8 Group of Nations in 2003, and by the CBD in 2004, envisaged established and representative networks of MPAs covering at least 10% of coastal and marine areas by 2012. Subsequently, however, given the slow progress towards this target observed by 2010 (Herkenrath & Harrison, 2011), the CBD adopted an updated Strategic Plan for Biodiversity 2011-2020 (CBD, 2010a), which now includes Aichi Biodiversity Target 11, calling for 10% of coastal and marine areas to be conserved by 2020 (see following section).

The UK is developing a MPA network in line with CBD agreements. This paper considers recent commitments and actions in response to the initial adoption of MPA-related targets. It presents an evaluation of the UK process to establish MPAs as part of an ecosystem approach to the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way, with the aim of providing general lessons for other Parties.

2 Legal frameworks

The CBD is a legally binding treaty with three main goals: (i) conservation of biodiversity, (ii) sustainable use of biodiversity, and (iii) fair and equitable sharing of benefits arising from the use of genetic resources (UN, 1992b). In 1995 the Conference of the Parties (CBD COP) adopted the Jakarta Mandate on the Conservation and Sustainable Use of Marine and Coastal Biological Diversity

[1] The definition of MPAs by CBD COP 7 (2004) Decision VII/5 can be found in a footnote of para. 10 that welcomes the report of the Ad Hoc Expert Group on Marine and Coastal Protected Areas, and reads as follows: "—'Marine and coastal protected area' means any defined area within or adjacent to the marine environment, together with its overlying waters and associated flora, fauna and historical and cultural features, which has been reserved by legislation or other effective means, including custom, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection that is surroundings."

(CBD, 1995) containing basic principles and thematic areas. Its work programme was adopted at the COP meeting in Bratislava in 1998 (CBD, 1998). In 2004, the CBD COP defined the term 'protected area' and agreed that marine and coastal protected areas are essential tools and approaches in the conservation and sustainable use of marine and coastal biodiversity[2] (CBD, 2004).

CBD decisions related to conservation and sustainable use of marine biodiversity adopted subsequently include:

- Criteria adopted at CBD COP9 (CBD, 2008) for the identification of Ecologically or Biologically Significant Marine Areas (EBSAs) (Decision IX/20, Annex I) and guidance concerning the development of representative networks of MPAs (Decision IX/20, Annex II).

- Commitment by Parties at CBD COP10 (CBD, 2010b) to long-term conservation, management and sustainable use of marine resources and coastal habitats, effective management of MPAs, and safeguarding of marine and coastal biodiversity, marine ecosystem services, sustainable livelihoods and recognition of the need to adapt to climate change. More specifically, §36 of Decision X/29 set in process the organization of regional workshops to describe EBSAs through the adopted scientific criteria.

- The Strategic Plan for Biodiversity 2011-2020 and Aichi Biodiversity Targets (including Target 6 (sustainable fisheries) and Target 11 (protected areas) directly related to marine and coastal biodiversity adopted by CBD COP10 (CBD, 2010b).

The Aichi Biodiversity Targets agreed at CBD COP10 in Nagoya provide the building blocks to deliver on the overarching framework of the Strategic Plan. Aichi Target 11 states that by 2020 at least 17% of terrestrial and inland water and 10% 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. However, it is critical to consider all 20 Aichi Targets together as they rarely stand alone. Public awareness, economic incentives and policy mainstreaming are fundamental to biodiversity protection. Consideration should therefore also be given to linkages such as with Aichi Target 3 on incentives/subsidies, Target 8 on pollution, Target 10 on ecosystems vulnerable to climate change, and Target 14 on essential ecosystem services. It is imperative to properly address marine and coastal areas holistically in order to achieve the Aichi Targets (e.g. recognizing impacts of land-based pollution, declining fisheries, impact of alien species on wild fish stocks, and strengthening marine and coastal ecosystem resilience).

Aichi Target 11 aligns closely with Sustainable Development Goal 14 (SDG 14) of the UN General Assembly 2030 Agenda. Target 14.5 of SDG 14 specifies that by 2020 at least 10% of coastal and marine areas should be conserved and used sustainably in accordance with national and

[2] International obligations are also set by the Berne, Bonn and Ramsar Conventions.

international law and based on best scientific information[3]. There are arguments (Diz et al., 2017; Rees et al., 2017) which propose that SDG target 14.5 lacks the same level of ambition as Aichi Target 11 due to the absence of the qualifiers described above (i.e. ecologically representative and well-connected MPAs). Nevertheless, the basis for integrating the qualifiers of Aichi Target 11 into the implementation of SDG target 14.5 can be found in the 2016 CBD Decision on mainstreaming, in which Parties are urged to mainstream biodiversity into the implementation of all relevant SDGs (CBD, 2016b, para. 14). In this context, it is important to recall the jurisdictional scope of the CBD within and beyond areas of national jurisdiction. As per Article 4(a), in areas within national jurisdiction, the CBD applies to components of biodiversity as well as to processes and activities. In areas beyond national jurisdiction (ABNJ), the CBD only applies to processes and activities, but the biodiversity components are not left unprotected, since States are required to cooperate directly or through competent international organizations for the conservation and sustainable use of biodiversity in ABNJ (CBD, Art. 5). Furthermore, decisions adopted by the CBD provide guidance on the implementation of the Convention and other related instruments, such as the UN Convention on the Law of the Sea (UNCLOS), especially with regards to the obligation of UNCLOS Parties to protect important marine habitats (UNCLOS, Art. 194(5)) (Diz, 2017). Even though in general, CBD COP decisions (including decision X/2, which adopted the Aichi Biodiversity Targets) and UNGA resolutions (including resolution 70/1, which adopted the 2030 Agenda for Sustainable Development and its SDGs) are not legally binding, they are part of the corpus of international law and their negotiation by consensus contributes to their universal acceptance (Diz, 2017; see also Boyle and Chinkin, 2007). Thus, their normative value should not be underestimated, especially when analysed in the context of the CBD and UNCLOS obligations on *in situ* conservation (CBD, Art. 8) and protection and preservation of the marine environment (UNCLOS, Arts. 192 and 194(5)).

At a national level, in addition to obligations under global Conventions, the UK is a Contracting Party to the OSPAR Convention[4], with a commitment to establishing an ecologically coherent and well-managed network of MPAs for the North-East Atlantic (Johnson et al., 2014). In common with other European States, the UK has obligations under European Union Directives as well as national country-specific legislation. The Natura 2000 network includes legally binding marine components of the Birds Directive[5] and Habitats Directive[6]. The former requires designation of Special Protection Areas (SPAs) for birds. For the latter, Sites of Community Importance are identified for particular species and habitats (as listed in Annexes I and II of the Directive) before being designated as Special Areas of Conservation (SACs) with appropriate conservation measures. This system focuses specifically on physical features, with some controversy concerning which features qualify as priority habitats (for example, deep-sea hydrothermal vents are integrated into the Natura 2000 network on

[3] SDG indicator 14.5.1: Coverage of protected areas in relation to marine areas https://unstats.un.org/sdgs/metadata/files/Metadata-14-05-01.pdf [13 November 2018]

[4] OSPAR is the mechanism by which 15 Governments & the EU cooperate to protect the marine environment of the North-East Atlantic https://www.ospar.org [13 November 2018]

[5] Directive 79/409/EEC of 2 April 1979 on the Conservation of Wild Birds http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31979L0409&from=EN [13 November 2018]

[6] Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043&from=en [13 November 2018]

a voluntary basis). Subsequent framework Directives – the Water Framework Directive[7] and Marine Strategy Framework Directive[8] – set out MPAs as one of the Programmes of Measures that may contribute to the achievement of Good Environmental Status across European seas (MSFD Art. 13.4). The Maritime Spatial Planning Directive[9] should also incorporate MPAs within a spatial vision reflecting legal obligations and societal choices[10]. Fisheries measures are also relevant, such as the EC's prohibition of deep-sea fishing with bottom trawls below 800 m from the water surface (EC, 2016).

In the UK, biodiversity policy is a devolved matter, thus each of the four countries (England, Northern Ireland, Scotland and Wales) has separate strategies and implementation actions coordinated by a UK Biodiversity Group. According to the UK's response to CBD Notification 2017-084 (JNCC, 2017), the UK's devolved administrations follow a number of key principles and selection processes (see Table 1). UK national MPA coverage comprises sites designated under European Directives (SPAs and SACs), marine components of Sites of Special Scientific Interest and Ramsar Sites, Marine Conservation Zones (MCZs) designated under the UK's Marine and Coastal Access Act (MCAA) 2009, and Nature Conservation MPAs designated under the MCAA 2009, the Marine (Scotland) Act 2010 and the Marine Act (Northern Ireland) 2013[11]. For inshore waters (from the coast to 12 nm offshore) statutory advice is provided by Natural England (English waters), the Department of Agriculture, Environment and Rural Affairs for Northern (Irish inshore waters), Scottish Natural Heritage (Scottish waters), and Natural Resources Wales (Welsh waters). The Joint Nature Conservation Committee (JNCC) is responsible for the identification of MPAs in UK offshore waters (from 12 nm to 200 nm or the limit of the continental shelf). Cross-border cooperation is also required for transboundary MPAs that straddle international borders. The JNCC also supports UK Overseas Territories in their efforts to identify MPAs. The UK Overseas Territories are custodians to the fifth largest marine estate in the world, attracting an obligation to protect and conserve these fragile environments. They hold biodiversity of global significance, from vast penguin colonies in the South Atlantic Ocean to tropical coral reefs in the Caribbean Sea. Some of the species and habitats present are found nowhere else on earth.

[7] Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy http://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF [13 November 2018]

[8] Directive 2008/56/EC Marine Strategy Framework Directive of 17 June, OJL 164/19 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:PDF [13 November 2018]

[9] Directive 2014/89/EU of 23 July on establishing a framework for maritime spatial planning http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0089&from=EN [13 November 2018]

[10] At the time of writing, it is too early to speculate on likely changes that may come about as and when the UK leaves the EU.

[11] Collectively known as the UK Marine Acts.

Table 1. Principles derived from OSPAR guidance followed by UK administrations in their MPA network development (JNCC, 2017).

Principles	Explanation
Features	The network should represent a range of habitats and species for which MPAs are considered appropriate – with a greater proportion of particularly threatened and/or declining features
Representativity	The network should include areas that best represent the range of habitats and species
Connectivity	The network should comprise MPAs that are well-distributed and take into account linkages between marine systems
Resilience	The network should include more than one example of a feature in individual MPAs and ensure they are of sufficient size to deliver conservation benefits
Management	The network should ensure the protection of marine habitats and species for which an MPA has been identified

3 Reaching 10%

3.1 Global efforts

Impetus for designating MPAs in recent years has been exponential but coverage is uneven and ecologically unrepresentative, not least because the current lack of comprehensive legal mechanisms means that protection is very limited in ABNJ. Thomas et al. (2014) present an analysis of the World Database on Protected Areas that calculated MPA coverage of 12,300,000 km^2 or 3.41% of the world's ocean, of which 0.59% of the global ocean area (2,163,661 km^2 within 1,124 areas) is protected in no-take areas. An update made available for the CBD COP in December 2016 recorded an increase to 5.10% global ocean coverage, of which 1.23% represents no-take zones. This increase represents a combination of efforts to create new sites and expansion of existing sites in national waters, together with a recent trend to delineate very large MPAs in relatively remote areas. Examples of the latter include British and French Overseas Territories, Canada's Beaufort Sea and three large MPAs declared by Mexico. A recent and spectacular declaration by the Convention for the Conservation of Antarctic Marine Living resources (CCAMLR) was the establishment of the world's largest MPA in the Ross Sea (entry into force, 1 December 2017) that covers 1.55 million km^2, of which 1.12 million km^2 or 72%, is fully protected (no-take area), albeit with an arbitrary expiration date. This site increased global ocean percentage cover from 5.10% to 5.55%. As of September 2018, there are over 15,300 MPAs across the globe, collectively covering 26,945,395 km^2 (7.44%) of the ocean surface, of which 2.26% is no-take areas (www.protectedplanet.net [13 November 2018]).

There are concerns that there is an over-reliance on the coverage of recently created large-scale MPAs (LSMPAs) (i.e. >100,000 km^2) to achieve the overall 10% coverage target (Jones & De Santo, 2016), with a suspicion that some parts of LSMPAs incorporate areas not as important for biodiversity or areas where no overlapping economic interest exists (Devilliers et al., 2015; Diz,

2017). Some 70% of the total global MPA coverage is made up of the 20 largest MPAs (www.protectedplanet.net). This leads to questions of whether these vast remote MPAs, as exemplified by those in UK Overseas Territories, are effective (i.e. can they be enforced given their scale and remoteness?), representative (i.e. can a small number of vast MPAs cover a diversity of different habitat types in 62 marine provinces?), connected (i.e. can ecological processes such as fish migrations and larval dispersal bridge the gaps between MPAs consisting mostly (in terms of area) of vast remote MPAs?), and equitable (i.e. are people affected by vast remote MPAs bearing an unfair burden of the costs, especially where these MPAs are no-take and local people are heavily reliant on marine resource?). Proponents for LSMPAs have highlighted their advantages; for example, Ban, Adams, Pressey & Hicks (2011) note the cost of enforcing large reserves is less than enforcing many small ones. There is no *a priori* reason why a single LSMPA could not extend across all depth ranges, and thus represent a range of local species' distributions. Similarly, LSMPAs may contain enough of some species' life cycle stages so that connectivity between MPAs is not so important for those species. UNEP-MAP RAC-SPA (2015) noted possibilities to harness remote sensing technology (e.g. drones, vessel AIS data) to support monitoring and enforcement of large transboundary MPAs, while Roberts et al. (2017) highlight their potential for enhanced resilience to climate change. O'Leary et al. (2018) balance reservations against distinct advantages and benefits of LSMPAs. Equity is perhaps the most pressing issue. A clear rationale has to be provided for no-take zones that balances the conservation of biodiversity with an appraisal of current management measures for sustainable use of natural resources. As well as meeting this target through LSMPAs in more pristine remote ocean areas, it is also important for the target to be met by smaller MPAs in more 'metropolitan' seas near population centres where people rely on the sea for their food and livelihoods. This is more likely to enable the benefits of effective protection (e.g. spillover/export of fish, increased coastal defence value of habitats) to flow to dependent local communities (Jones & De Santo, 2016).

Obtaining comprehensive and up to date quantitative statistics of this nature is complicated by different approaches to measuring (i.e. different systems, such as the World Database on Protected Areas (WDPA) and MPAtlas) and lack of inclusion of non-State sanctioned sites in the official statistics. To this end, the recently published IUCN MPA Standard (IUCN WCPA, 2018) is a helpful tool for determining an accurate and accepted figure, clearly denoting what activity is and is not allowed in an internationally recognised MPA. It highlights a major shortcoming in the WDPA, which does not adequately scrutinise the levels of protection of MPAs. For example, industrial fishing is not compatible with the IUCN Standard, but is allowed as an activity in many MPAs listed in the WDPA.

Furthermore, since Aichi Target 11 includes a defined percentage but Target 6 does not, there has been an overemphasis on achieving this target first – purely from a coverage perspective – to the neglect or detriment of other Aichi Targets, specifically Target 6. Weakening the underlying interpretation of Target 11 to include fisheries management measures has created an exaggerated value for biodiversity conservation. For example, temporal fisheries closures aimed at rebuilding fish stocks, measures to protect a single species, or a ban on the use of certain habitat-damaging or non-selective gear types are most appropriately reported under Target 6. However, there are cases

whereby such measures have been recorded against Target 11. They may be effective tools in helping to ensure that fisheries are managed sustainably without necessarily achieving the *in situ* conservation of biodiversity (Johnny Briggs, pers. comm., October 2018). Efforts have been made to address this by FAO through adding questions on the ecosystem approach to fisheries to the biennial questionnaire that informs the SOFIA report presented to COFI (Freedman, Garcia & Rice, 2018).

Perhaps even more critically, the 10% coverage target has been contested by scientists as not being scientifically robust (e.g. O'Leary et al., 2016), with the culmination of the 2014 World Parks Congress recommendation to designate ecologically representative and well-connected systems of MPAs or other measures that include strictly protected areas (with no extracting activities) amounting to at least 30% of each marine habitat (IUCN, 2014, 2016; O'Leary et al., 2016) (Table 2).

Table 2. Global MPA targets.

	Target	Deadline	Applicable protection
CBD Aichi Target 11 During COP CBD10 held in Japan, the 193 signatory countries adopted a revised and updated Strategic Plan for Biodiversity, including the Aichi Biodiversity Targets	>10%	2020	"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."
Sustainable Development Goal 14 In 2015, member states of the UN adopted a series of 17 Sustainable Development Goals (SDGs)which came into force in 2016. SDG14 is to "Conserve and sustainably use the oceans, seas and marine resources for sustainable development."	>10%	2020	Target 14.5: "By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information."
IUCN World Conservation Congress 2016	>30%	20130	"A clearly defined geographical 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."

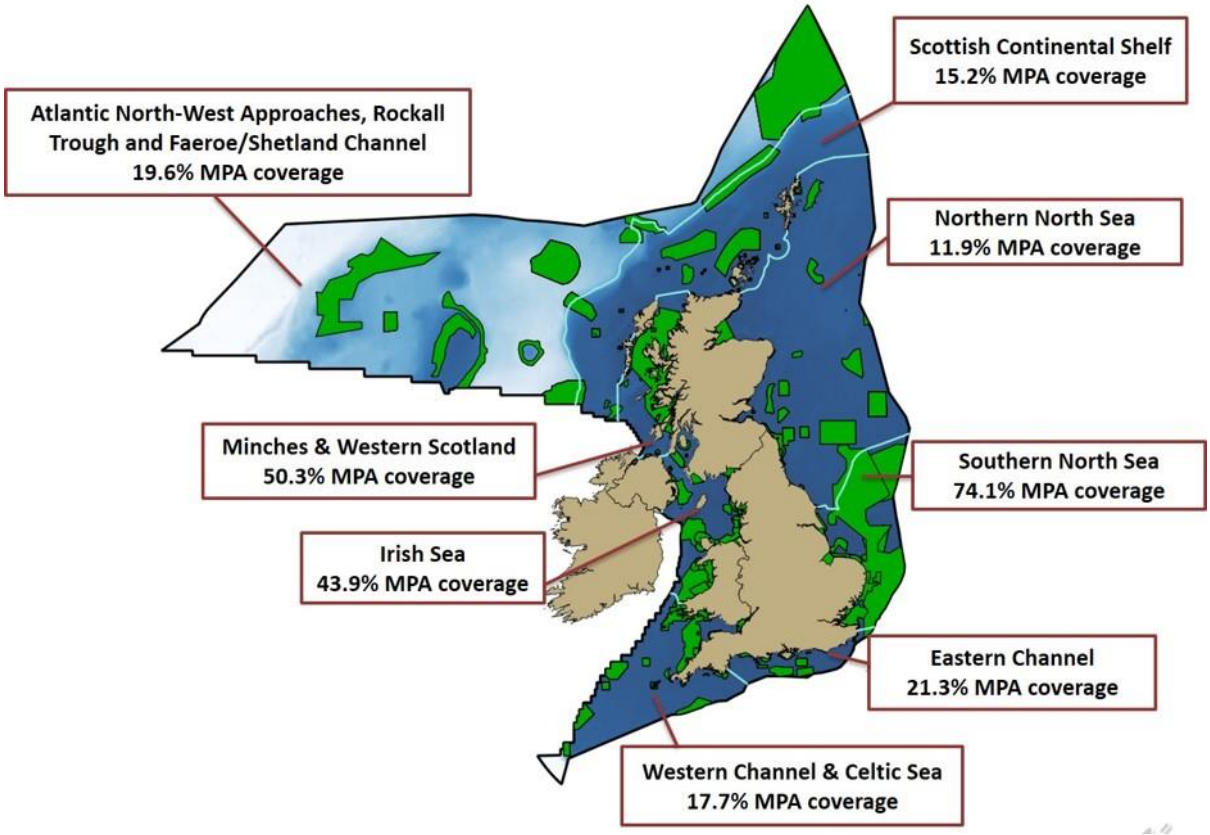
3.2 UK efforts

As of 2017, approximately 24% of UK waters are protected within MPAs (excluding the Isle of Man and Channel Islands); this includes 296 MPAs covering an area of 206,000 km^2, although bottom trawling is permitted in many of these areas and only three areas (namely Lundy, Flamborough Head and Lamlash Bay; collectively <20 km^2) are regarded as highly protected, strict no-take areas (JNCC FOI/EIR 201104[12]). A map of current UK MPAs can be found on the JNCC website[13] including site information centres for individual offshore MPAs (). JNCC (2017) set out different approaches to selection of MPAs and details of various research projects undertaken to practically apply selection

[12] http://jncc.defra.gov.uk/pdf/EIR_201104.pdf [13 November 2018]
[13] http://jncc.defra.gov.uk/marineprotectedareas [13 November 2018]

processes. There are 209 SPAs and SACs with marine components in UK waters. Fifty-six MCZs have been established over two designation tranches, covering over 20,000 km^2, and 30 Nature Conservation Marine Protected Areas. A third and final tranche of MCZs is to be consulted on in 2018 with designation expected within 12 months of the consultation date. As with the first and second tranches of MCZs, the UK Government proposes to select sites for the third tranche (in English waters) which achieve an appropriate balance between ecological benefits and the social and economic costs associated with designation, and which are supported by adequate evidence. Most of the site options are drawn from the remaining recommendations of stakeholder-led regional projects (in 2011 these recommended a total of 127 sites) that were considered as a first step, with some new site options developed by JNCC and Natural England to fill ecological gaps in the network (e.g. Ridgeway, Cornthwaite, Wright & Davies, 2014). In addition, the EC Habitats Committee will be considering the adoption of five harbour porpoise sites as Sites of Community Interest (SCIs), which were given UK Ministerial clearance and were submitted to the European Commission for approval to designate on 30 January 2017. Approval will allow the UK to designate them as SACs[14].

Figure 1. Location and coverage of MPAs in UK waters (source: JNCC).



[14] See http://jncc.defra.gov.uk/page-7369 [13 November 2018]

In 2015, the UK Government also committed to establishing a 'Blue Belt' across its 14 Overseas Territories. By 2020 this initiative will have designated over 4 million km^2 of ocean. Previously declared MPAs comprise:

- British Indian Ocean Territory (BIOT; 640,000 km^2 designated in 2010).
- South Georgia & the South Sandwich Islands (SGSSI; 1 million km^2 designated in 2013).
- The UK-led, internationally agreed MPA on the Southern Shelf of the South Orkney Islands, through the Convention of Antarctic Marine Living Resources (British Antarctic Territory 94,000 km^2 in 2009).

Newly announced MPAs are:

- A full no-take MPA within the Pitcairn Islands exclusive economic zone, established in 2016 (840,000 km^2).
- A sustainable use MPA declared by St Helena in 2016 across its entire maritime area (445,000 km^2).
- Ascension Island Government has agreed an evidence-based, no-take MPA, covering at least half of its 445,000 km^2 maritime zone by 2019.
- Tristan da Cunha is developing a regime for protecting the waters across its maritime zone of 750,000 km^2 to be designated in 2020.

UK Government funding will support the scientific assessment, implementation, management, monitoring and surveillance of the existing and developing large-scale MPAs. It will also facilitate access to technical expertise, practical surveillance and technology solutions to help ensure that the existing and newly announced MPAs are backed up by robust data, legislation and enforcement. This will include autonomous underwater and surface vehicles, remotely operated vehicles, and optical and acoustic sensor systems. Critically, it will also provide support to UK Overseas Territories which have indicated that they wish to further develop their marine economies, or who are not in a position to consider large-scale marine protection measures at this stage, to make improvements to their marine environments through a range of other projects. To help deliver this ambitious programme of work, UK Government has approached the Centre for Environment, Fisheries and Aquaculture Science (Cefas), the JNCC and the Marine Management Organisation (MMO) to support the development and delivery of appropriate marine management strategies across the Overseas Territories. Success will require continuity of funding, currently set to expire in 2020. The SGSSI designation has also been questioned by international experts, who reviewed the designation against the IUCN Standard, as krill fishing is permitted in 98% of the area.

4 Recognizing qualitative commitments

The text of Aichi Target 11 comprises both quantitative targets (i.e. percentage coverage values) and qualitative elements (i.e. feature representativity and connectivity) that define how Aichi Target 11 may be achieved (Table 3).

Table 3. The quantitative targets and qualitative elements that define how Aichi Target 11 may be achieved. Adapted from Jonas & Lucas (2011).

Quantitative targets	17% terrestrial
	10% coastal and marine
Means of conservation	Protected areas
	Other effective area-based conservation measures
Qualitative elements	Ecologically representative
	Areas of particular importance for biodiversity and ecosystem services
	Management equity and effectiveness
	Well-connected
	Integration into wider landscape and seascape

In 2012, CBD Parties were invited to undertake major efforts to achieve all elements of Aichi Biodiversity Target 11 (CBD, 2012). The Fourth Global Biodiversity Outlook in 2014 reported varying levels of progress for the different elements of Aichi Target 11 and this was subsequently updated in a report to the CBD Subsidiary Body on Technical and Technological Advice (CBD, 2016a) in 2016. In terms of the quantitative targets, as explained earlier, there has been rapid progress in the global drive to meet the goal for the 10% area coverage of coastal and marine areas via the designation of MPAs. The qualitative aspects of Aichi Target 11 are, at present, less well described. Essentially, these broaden the scope of the quantitative target in support of the ecological premise that there is a high level of functional and spatial connectivity within marine ecosystems (Agardy et al., 2003; Agardy, Notarbartolo di Sciara & Christie, 2011; Carr et al., 2003; NRC, 2001), and that area-based targets alone may not be adequate to safeguard the important ecosystem processes and services that marine ecosystems underpin (Spalding et al., 2016). These qualitative elements of Aichi Target 11 form a more holistic perspective of MPA design and function by considering contextual setting and also provide the means to be systematic in an approach to planning for marine biodiversity conservation (Margules & Pressey, 2000). For example, in its most fundamental role the qualitative element 'well-connected' defined in Aichi Target 11 may work to underpin sustainability by increasing the resilience of the system to the loss of functional processes or regime shifts (Folke et al., 2004), essentially spreading risk across the seascape (Rees et al., 2017). For deep-sea ecosystems, large precautionary MPAs, such as Charlie Gibbs Fracture Zone MPA (see Johnson et al., 2018a), may support resilience to climate change impacts.

'Representativity' refers to the inclusion of the full range of ecosystems, habitats, biotic diversity, ecological processes, and environmental gradients (e.g. depth, wave exposure) within the MPA network. The objective in applying this criterion to MPA networks is to ensure representative

coverage of all biodiversity and biogeographic regions by the network (Foster et al., 2014). The key premise behind representativity is that the full range of biodiversity is protected worldwide. This includes the species, genes and higher taxa, as well as evolutionary patterns, distinct communities and ecological processes that sustain global biodiversity (Spalding et al., 2007). Representativity (and replication) of species and habitats within an MPA network aims to underpin ecological resilience and to spread risk (of permanent loss, regime shifts) spatially across the seascape. At a global level, there is a need to improve understanding of marine biogeography in support of ecological representativity, particularly for ABNJ (O'Hara, Rowden & Bax, 2011), and to decide what functions representativity and connectivity should deliver (e.g. propagule stock function, ensuring the potential for restoration). In light of the recent trend in the designation of large MPAs, there is also a need to understand how and if these extensive sites contribute to ecologically representative and well-connected networks (Rees et al., 2017).

The UK Joint Administrations Statement[15] sets out the commitment to a UK-wide ecologically coherent network of MPAs. In terms of ecological representativity and connectedness there has been significant progress. In waters surrounding England and the offshore waters of Wales and Northern Ireland all broad-scale habitats are represented and replicated, but there is a lack of protection of broad-scale sediment habitats in the English Channel and Irish Sea regions, and lack of protection for Features of Conservation Interest (FOCI) across all regions (Carr, Cornthwaite, Wright & Davies, 2016). Cunningham, Chaniotis, Gillham & James (2015) assessed the adequacy of the Scottish MPA network as part of an ongoing six-yearly review in Scotland's seas. Their analysis, based upon a five-stage set of guidelines considering representation, replication, linkages, geographic range and variation, and resilience as applied to seabed habitats, low or limited mobility species, mobile species, large scale features, and broader representativity was positive albeit with a focus on selected species and features. MPA ecological coherence is also under consideration by the Northern Ireland Marine Task Force (Barnard, Burdon, Strong & Atkins, 2014). Regional approaches to assessments of representatively and connectedness of MPA networks at broader scales, including The Celtic Seas (Foster et al., 2017) and OSPAR (Johnson et al., 2014), note significant progress towards the 10% spatial target but with gaps at increasing spatial scales in terms of qualitative targets.

5 EBSAs and other effective conservation measures

To help Parties and competent international organizations establish networks of MPAs in addition to other appropriate conservation and management measures, the CBD has put significant effort into describing areas that meet the EBSA criteria. The EBSA process has successfully integrated data and encouraged collaboration amongst acknowledged stakeholders in the natural environment (Johnson et al., 2018b). How much attention the international community or certain sectors of industry are currently giving to EBSA descriptions is debatable, but EBSAs have gained an impressive level of

[15] Source: www.gov.scot/Topics/marine/marine-environment/mpanetwork/engagement/UKMPANetworkStatement [13 November 2018]

international attention that should prompt the identification of areas where measures such as MPAs and other effective conservation measures (OECMs) are suitable.

OECMs differ from EBSAs and protected areas in the fact that their primary purpose may not be necessarily a conservation objective, but *in situ* conservation is nonetheless delivered by their existence (IUCN WCPA, 2017). This lack of specificity means that such elements can, in theory, take many forms, as long as their ultimate outcome complements the ambitions set out by Aichi Target 11, especially the qualitative aspects that go beyond the numerical target and that cannot be ignored in assessing progress (i.e. ecological and socio-economic considerations, such as safeguarding vulnerable habitats, augmenting connectivity between MPAs, or improving food security). However, whether the coverage of OECMs should indeed contribute towards the attainment of the 10% Aichi Target 11 is still a matter of considerable debate (Lopoukhine & Ferreira de Souza Dias, 2012), and if so, how might MPA network design be optimized to ensure that OECMs contribute synergistically to aspects of ecological coherence and *vice versa*[16] (Rees et al., 2018).

Specific sector-based examples of potential OECMs include the International Seabed Authority's (ISA) Areas of Particular Environmental Interest (APEIs), the Food and Agriculture Organization's (FAO) Vulnerable Marine Ecosystems (VMEs), and the International Maritime Organization's (IMO) Particularly Sensitive Sea Areas (PSSAs). Numerous community-based marine conservation and sustainability projects around the world, collectively referred to as Locally Managed Marine Areas (LMMAs) (Diz et al., 2017), also have the potential to complement MPAs. Other, less obvious contenders for OECM status might be exclusion zones associated with offshore renewable energy developments or military and cultural exclusion zones (e.g. dedicated burial-at-sea areas), where public access and any other resource exploitation activity are severely restricted.

Incidental, voluntary or self-regulating protection, that may or may not be permanent and/or long-term, of sector-specific resources in the presence of other potentially impactful activities makes the recognition of certain other OECM candidates controversial, especially in inshore waters where competition for overlapping resources is greatest. In contrast, in ABNJ where very few MPAs have yet been designated the adoption of potential OECMs (e.g. VMEs, PSSAs or APEIs) is likely useful and pragmatic. These area-based management tools recognize and highlight areas significant for biodiversity and ecosystem services, and protect them from recognized and specific impacts in the absence of any other measures, albeit limited to a single sector and often time-limited. In the specific case of EBSAs in ABNJ, which can provide essential information for the establishment of OECMs, until the UN have negotiated a new legally binding instrument on the basis of General Assembly Resolution 69/292 (UNGA, 2015), the role of the CBD in ABNJ is limited. Also, OECMs are unable to exclude potentially damaging activities from sectors that are not accountable to the implementing authority (e.g. hydrocarbon prospecting in fishery-defined VMEs). Nonetheless, poor data availability from ABNJ favours a pragmatic, precautionary, multi-criteria and biogeographic based approach for MPA network planning, and OECMs provide a useful starting point. CBD expert workshops held in February 2018 (in response to paragraph 10(b) of CBD COP Decision XIII/2) sought

[16] CBD COP14 will seek to adopt a definition and criteria for an OECM based on recommendations put forward by an IUCN Task Force.

to provide scientific and technical advice on definition, management approaches and identification of OECMs and their role in achieving Aichi Target 11. Discussion points included the need to assess OECMs on a case by case basis to evaluate their potential to enhance the viability of MPA networks and promote greater network connectivity.

At the national level within the UK, examples of potential OECMs illustrate some complex considerations. Consideration has been given to voluntary marine reserves, fisheries activity restriction areas, areas of military activity, safety exclusion zones around marine infrastructure and shipping routes. For example, sea areas, known as 'boxes', closed to particular fishing activities during particular months of the year, are aimed at protecting the spawning and nursery grounds of particular fish or shellfish stocks. These boxes were evaluated by the European Commission's Scientific, Technical and Economic Committee for Fisheries (STECF) in 2007 (SGMOS, 2007) in relation to whether they may constitute MPAs or OECMs. Whilst the conclusions of this analysis did not propose that such boxes represent MPAs, some could be considered as OECMs. However, most area closures are too spatially or seasonally restricted to be considered as effective beyond the narrow objective to protect a particular target stock on a seasonal basis.

The Western European PSSA, an extensive area encompassing the Atlantic coasts of Spain, France, Belgium, Ireland and the United Kingdom, was adopted by IMO in 2004. The designation of the PSSA – a reaction to the sinking of the single-hull oil tanker *Prestige* in 2002 that spilled 64,000 tonnes of crude oil – was controversial from its inception. Detjen (2005) provides a detailed analysis of the process, noting some views that the area concerned does not comprise a single coherent ecosystem and its environment is not known to be vulnerable; the coastline concerned has suffered and recovered from many oil spills. The IMO PSSA Guidelines define a PSSA as an area of the marine environment that needs special protection through action by the IMO because of its significance for recognized ecological, socio-economic, or scientific attributes where such attributes may be vulnerable to damage by international shipping activities (IMO, 2017). At the time of designation of a PSSA, an associated protective measure (APM), which meets the requirements of the appropriate legal instrument establishing such a measure, must have been approved or adopted by IMO to prevent, reduce or eliminate the threat or identified vulnerability. In this case, the APM was specifically about controlling the passage of single-hull tankers carrying heavy oil (the original PSSA proposal contained an absolute ban of single-hull tankers over 600 dwt carrying heavy grades of oil, but this was withdrawn during discussions at IMO). Such vessels are required to report with a 48-hour notice period, serving to heighten awareness of potential impact and pollution prevention response. This PSSA, however, has no conservation objectives, its main objective is to prevent pollution rather than *in situ* conservation of biodiversity and thus is unlikely to count as an OECM (see Diz et al., 2017).

6 Governance

In a portfolio that complements efforts to establish MPAs, the CBD has made efforts to increase technical capacity, highlight specific threats to marine biodiversity such as noise, marine debris and ocean acidification, and make best use of traditional knowledge relating to marine species. Specific

challenges for implementing global commitments to the CBD Aichi biodiversity targets on marine and coastal biodiversity include capacity disparity (institutional, managerial, technical, scientific, human resources and financial resources) and weak governance (sectoral conflicts, lack of coordination among different government agencies and different levels of governments, and limited participation of indigenous and local communities). Recognizing these challenges, the Sustainable Ocean Initiative (SOI) was established by the CBD (Secretariat and COP Presidency) to address the need for capacity building to protect marine biodiversity. The intention of the SOI is to share experiences, expertise, ideas and vision; to be open to new ideas, diverse approaches, different sectoral concerns and different ecological, socio-cultural and economic contexts; and to be innovative in creating new partnerships, strengthening existing collaborations, inviting partners and mobilizing necessary technical expertise and financial resources.

The United Nations Environmental Programme (UNEP) has sponsored a project to help build capacity for the effective and equitable governance of MPAs (Jones, 2014). This is focused on how different approaches to governance can be combined to better address the impacts of human activities on species, habitats and ecosystems in MPAs, and thereby promote effectiveness. It also addresses how the costs and benefits of such protective measures can be more fairly distributed amongst MPA users, as well as providing for their recognition and participation in decision-making, thereby promoting equity. This project focuses on how 36 incentives from five categories – economic, communication, knowledge, legal and participation – can be integrated to combine top-down, bottom-up and market-based approaches to more effectively steer human behaviour to reduce use impacts (Jones, 2014). It draws on 34 case studies from 19 countries around the world and provides practical guidance (Jones, Murray & Vestergaard, in prep.) to MPA managers and related policy makers, including examples of particular combinations of incentives to address particular conflicts.

OSPAR guidance for the development and management of its MPA network has evolved as the network has become more comprehensive. A self-assessment scorecard (OSPAR Agreement 2007-5) combined expert judgement scores from a series of questions on design, adequacy and delivery. Approaches to MPA effectiveness were later reviewed by a technical OSPAR workshop that further explored the concept of management effectiveness, how to assess it, and how it relates to ecological coherence (OSPAR, 2014). Rees et al. (2018) set out a series of focus points that recognize direct links between the flow of ecosystem services and human well-being. This includes advocating the 'social-ecological' benefits of representative networks of MPAs and a rationale to increase the size and number of MPAs with high protection levels by formalizing procedures to track the performance of MPA management measures against socio-economic outcomes. Ultimately integration of MPA networks in the wider seascape should be part of marine spatial planning processes involving stakeholders, establishing trade-offs when determining different spatial allocations and promoting appropriate financial investments.

In the UK, a 'whole site approach' for MPA management, underpinning a potential for natural capital-led economic growth, has been realized in Lyme Bay. In July 2008, the UK Government closed a 206 km^2 area of the Bay by way of 'The Lyme Bay Designated Area (Fishing Restrictions) Order' (2008) to bottom towed fishing gear to aid the recovery of the benthos following damage

caused by bottom towed fishing gear. The Order was specific to bottom towed fishing gear and the area remains open to fishers using static gears such as pots and nets, and to recreational users. From the outset, the closure was highly contentious and impacted heavily on sectors of the local fishing community (Fleming & Jones, 2012; Hattam, Mangi, Gall & Rodwell, 2014; Mangi, Rodwell & Hattam, 2011; Rees et al., 2010a). Evidence-based research results were used to instigate discussions with local stakeholders and ease local tensions in the years following the closure (Mangi et al., 2011; Rees et al., 2013; Rees, Rodwell, Attrill, Austen & Mangi, 2010b; Sheehan et al., 2013; Sheehan, Stevens, Gall, Cousens & Attrill, 2013). Ecological monitoring studies, results of which have been shared with the local fishing community, demonstrate that there have been positive responses: 'recovery' for species richness, total abundance and assemblage composition for seven out of 13 indicator taxa (Sheehan, Stevens, Gall, Cousens & Attrill, 2013).

The closure in Lyme Bay has also had profound effects within the social and economic system, as the removal of bottom towed fishing gear in the Lyme Bay MPA has allowed a redistribution of equity. Alternative commercial fishing activities have proliferated within the closed area (Mangi et al., 2011), and recreation participants and providers have increased their use of the MPA (Rees et al., 2015). In 2011, a non-governmental organization (NGO), the Blue Marine Foundation, formed a proactive working group for the Lyme Bay MPA (now called the Lyme Bay Consultative Committee), which led to the implementation of more specific MPA management measures, including a Voluntary Code of Conduct and experimental fishing areas to determine sustainable harvesting of the resource. Wider partnership activities by the Lyme Bay Consultative Committee include development of real-time monitoring and marketing technologies, investment in post-harvest icing infrastructure, and knowledge-sharing and training activities. In addition to providing supporting technologies, these partnership activities have enabled participation of fishers in decisions that affect them and may, thus, have enhanced voluntary compliance to MPA management measures and built trust among Lyme Bay stakeholders.

The unique management in Lyme Bay that required the cessation of fishing using bottom-towed gear within the area has demonstrated that the reefs have the capacity for self-repair and self-renewal, particularly in areas that were not previously considered as reef habitat (Sheehan, Stevens, Gall, Cousens & Attrill, 2013). The 'whole site approach' to management has also led to increased catches of shellfish and new business enterprises (e.g. diver-caught scallops). Further management and support measures, such as installing chiller units in ports for maintaining fresh catches and the development of 'Reserve Seafood' to sell sustainably sourced fish and shellfish at a premium, agreed through the Consultative Committee have been successful in improving the well-being for those fishermen directly involved in the project.

There are, however, concerns about the dependence on funding and support from the Blue Marine Foundation, as the involvement of this NGO cannot be guaranteed in the future. Also, the The Lyme Bay Designated Area (Fishing Restrictions) Order might be revoked – as is being considered by one of the Inshore Fisheries and Conservation Authorities (IFCAs) – to enable a zoned approach to bottom towed fishing gear in parts of what is currently a closed area, thus undermining the 'whole site approach' (Singer & Jones, in press).

7 Future outlook

The CBD has made concerted efforts to support and encourage States to designate MPAs. Aichi Target 11 and SDG 14.5 both provide a focus for collective efforts. However, global coverage of MPAs is likely to fall short of expected targets. As time is fast approaching to review international agreements, post Aichi 2020 Targets should recognise calls for significantly more than 10% MPA coverage by 2030 and revisit what is truly sustainable.

Transformation and exploitation of the marine environment since the 1850s provides a strong rationale as to why a significant percentage of MPAs have to be highly protected. For example, historical records demonstrate clearly that as fishing intensity has increased, profound changes have resulted in marine food webs. Significant protection is required to reverse the decline in vulnerable species and restore their populations. Leadership and political will is now needed more than ever to reverse marine biodiversity loss and ensure MPAs are nested within sustainable seas (Jones, 2014). O'Leary & Roberts (2018) highlight ecological connectivity across ocean depths is needed, and Voss et al (2017) suggest an ecological economic optimization approach to biological resource management, recognizing that sustaining the ocean's living resources has important dimensions beyond food security, such as cultural values.

All such aspirations reflect that prevalent conservation objectives that simply maintain existing ecological status of MPAs are insufficient, as they lack the ambition to build up and recover representative marine ecosystems. However, it is also important to be clear on what constitutes an 'effective' conservation measure. Hilborn (2018) argues that MPAs only really address regulated fishing impacts, which they then displace elsewhere (see also Vaughan (2017) for a perspective from English waters). He advocates expanded fisheries management rather than more no-take areas. In our view both effective MPAs and expanded fisheries management measures are needed. Indeed, EBSAs identify areas where fisheries management, or MPAs, or other measures may be needed to secure biodiversity assets. Furthermore, IUCN WCPA's work on applying IUCN's Global Conservation Standards to MPAs provides clear elements and criteria on a management continuum from the wider ocean, through multiple-use areas to no-take areas, all of which must be managed sustainably (IUCN WCPA, 2018).

Political impetus is critical for MPAs regardless of size or objective (O'Leary et al., 2018). Meaningful progress also requires proper implementation of Aichi Target 11, with its focus from quantity to quality of MPAs – after all, targets only represent steps towards an end. This contention has been captured in the so-called Malta Declaration (put forward at the 2017 EU Our Oceans Conference), in which six influential academic commentators state that "…the term MPA is now being used so loosely that it no longer connotes meaningful protection. The signatories assert that MPAs that are just lines on a map without any implemented conservation regulation or management plan should not count and should not be accepted in national or global tallies until they are truly protected."

A five-point action plan is advocated as follows:

1. Introduce simplified categories of MPA (e.g. strongly protected (no commercial fishing), fully protected (no extractive use)).

2. Apply protection across the entirety of each MPA, or within practical zonation schemes, and target protection of the whole ecosystem.

3. Create sustainable fishing plans for MPAs using the Ecosystem Approach to Fisheries Management.

4. Ensure sustainable financing of MPAs with management plans.

5. Monitor, enforce and report on MPA management measures to ensure compliance.

There is a danger that governments are over-claiming and under-protecting their marine assets. Several national MPA portfolios, such as that of the UK, significantly exceed the 10% target but the level of protection afforded is debatable. Other efforts to strengthen the conservation and sustainable use of marine biodiversity must be considered, including giving more attention to qualitative aspects of the targets and recognizing the value of OECMs. Implementation of management measures and site condition monitoring to assess progress towards achieving conservation objectives are key. At the same time, more thought could be given to reversing the 'burden of proof' required before human activities are minimised and their impacts contained, particularly in areas of significant biodiversity.

Thus, whilst the UK has made exceptional progress with quantitative MPA coverage (and promises ambitious further progress still[17]), it is imperative to substantiate that these areas offer effective protection. The UK has applied OSPAR Commission questions to evaluate progress towards being well-managed, namely whether management is documented, measures are implemented, monitoring is in place and how well the network is moving towards conservation objectives (OSPAR, 2017, 34). In 2016, whilst shortcomings were acknowledged, partial progress in all four areas was significant and endorsed by a repeat evaluation in 2018. Detailed monitoring strategies have been produced by the JNCC and Marine Scotland (in partnership with the JNCC and Scottish Natural Heritage) to help address this as part of a cost efficient and integrative approach. Furthermore, the UK has recognized the value of an effective stakeholder process as part of establishing MPA networks, and has made significant efforts to be open and transparent (e.g. House of Commons Environmental Audit Committee, 2017; which was critical of the UK Government's communications strategy for both UK and UKOTs MPAs).

In evidence presented to the CBD Aichi Target 11 review expert meeting (February 2018), UK delegates emphasised lessons learned including the importance of well-targeted, meaningful and regular engagement with sea users; transparency concerning levels of evidence underpinning identification of MPAs; and benefits of including MPA monitoring as part of a wider data collection policy.

[17] GOV.UK press release 24 September 2018: "Gove calls for 30 per cent of world's oceans to be protected by 2030". https://www.gov.uk/government/news/gove-calls-for-30-per-cent-of-worlds-oceans-to-be-protected-by-2030 [13 November 2018]

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