Marine Policy 39 (2013) 289–295

Contents lists available at SciVerse ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

Marine conservation science and governance in North–West Europe: Conservation planning and international law and policy

Kristian Metcalfe *, Thomas Roberts, Robert J. Smith, Stuart R. Harrop **

Durrell Institute of Conservation and Ecology, University of Kent, Canterbury, Kent, CT2 7NR, United Kingdom

ARTICLE INFO

Article history:
Received 12 October 2012
Received in revised form
4 December 2012
Accepted 5 December 2012

Keywords:
CBD
Birds Directive
Habitats Directive
Natura 2000
OSPAR
Marine protected areas
Systematic conservation planning

ABSTRACT

Member States of the European Union are increasingly designating marine protected areas (MPAs) to meet globally agreed marine protection targets and regional commitments. A number of studies have examined the impact of the associated European policy on the representation of species and habitats but there is no comprehensive review of their combined impact on marine conservation in Europe. Here a systematic conservation planning framework is used to conduct such a review and compare the existing legislation to three elements of best practice, which are designed to identify MPA networks that achieve conservation goals whilst increasing the likelihood of implementation. In particular, this review investigates the extent to which legislation: (i) translates broad policy goals into explicit targets; (ii) incorporates socio-economic data into the planning process; and (iii) requires a social assessment. Whilst this legislation has widespread political support and has underpinned the rapid expansion of MPA networks, this review shows it largely fails to incorporate these key components from systematic conservation planning. Therefore, if European approaches to marine conservation are to fulfil their goal of halting marine biodiversity loss, it is essential they link existing policy frameworks with transparent strategies that account for local conditions and support implementation.

1. Introduction

There is international agreement on the need for increased protection of the world's oceans because of rapid declines in the health of many marine ecosystems [1]. However, protected area (PA) coverage in the marine realm is relatively low, with only 1.17% of the ocean's surface designated as marine protected areas (MPAs), in contrast to 12.7% of terrestrial areas [2,3]. In response, many governments have agreed to establish or expand existing MPA networks within their marine jurisdictions to meet globally agreed marine protection targets [4,5], such as the Convention on Biological Diversity's (CBD) '*Aichi Target*', which recommends that by 2020, 10% of marine and coastal areas should be covered by MPAs [6,7]. This interest in establishing MPAs is also reflected in the European Union (EU), where MPAs are increasingly seen as important spatial management tools to address a broad array of management goals, such as biodiversity conservation and sustainable fisheries [8].

However, implementing a network of MPAs in Europe is likely to be challenging because approaches that govern marine conservation are often developed at both the European and national level [9]. Consequently, recent work has called for research to address knowledge gaps about the factors influencing the success of European MPAs [10]. Thus, whilst many commentators have examined the impact of European law and policy on the representation of species and habitats [11–14], and there is a growing body of evidence on the effectiveness of MPAs in Europe [10], there is no comprehensive review of the combined impacts of marine conservation policy in Europe. This paper addresses this gap by: (i) reviewing the extensive body of marine conservation planning legislation in Northern Europe, defined as the North East Atlantic (Fig. 1); and, (ii) identifying problems with the existing approaches used to guide the selection and designation of MPAs. This involves highlighting several key components of best practice from conservation planning science and proposing how existing measures should be adapted to include such elements.

2. The current consensus on best practice in conservation planning

It is generally agreed in the scientific literature that the best approach for designing PA networks is systematic conservation planning [15]. This approach is designed to identify priority areas for conservation that ensure the representation and persistence of biodiversity, whilst minimising impacts on stakeholders and increasing the likelihood of implementation [16,17]. Systematic

* Corresponding author. Tel.: +44 1227 764552.
** Corresponding author. Tel.: +44 1227 827074.
E-mail addresses: km375@kent.ac.uk (K. Metcalfe), S.R.Harrop@Kent.ac.uk (S.R. Harrop).

0308-597X/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.marpol.2012.12.002

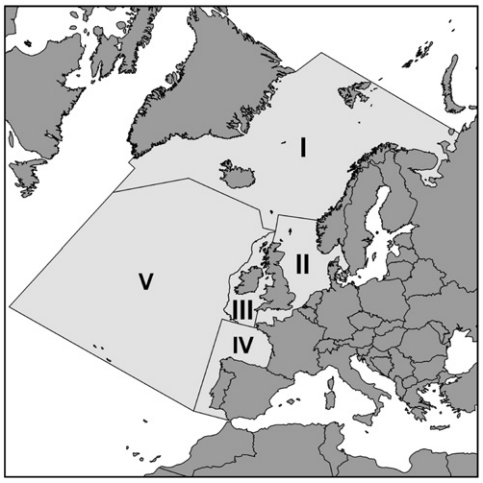

Fig. 1. North East Atlantic as defined by the OSPAR Commission. Regions are defined as follows: (I) Arctic Waters; (II) Greater North Sea; (III) Celtic Seas; (IV) Bay of Biscay and Iberian Coast; and (V) Wider Atlantic.

conservation planning is a process that combines a short-term conservation assessment, which identifies priority areas for conservation management, together with a long-term implementation framework that is used to achieve conservation action [16]. This approach has been widely used in both the terrestrial and marine realms and this is partly because it avoids being overly prescriptive. However, there are three key aspects that underpin the success and flexibility of this approach and these are described in the following sub-sections.

2.1. Compile a list of broad-goals and set quantitative targets

Systematic conservation planning involves translating the broad-goals of the planning process into explicit and measurable objectives. This generally involves: (i) compiling a list of conservation features, such as important species, habitats and ecological processes, based on legislation or expert opinion, and (ii) setting quantitative targets for the minimum amount of each feature intended for protection [18,19]. There has been substantial debate about target-based conservation planning but there are two broad reasons why it is generally seen as best practice [19]. First, it allows policy makers to measure how well existing PA networks meet these targets and makes it less likely that conservation features with high economic value are underrepresented [18]. Second, it provides a clear purpose for conservation decisions, lending them accountability and scientific defensibility and so makes them less open to direct or unconscious political interference [18,20]. This transparency helps build stakeholder support and also provides a platform for discussing trade-offs between different groups.

2.2. Incorporate socio-economic data

Another advantage of setting targets is that it allows the incorporation of socio-economic data into the planning process without compromising conservation goals, as the process is based on meeting targets for every feature, even when there is no alternative but to select costly areas. In contrast, priority setting without targets creates an incentive to avoid areas that are deemed too costly to protect, regardless of their conservation value [15]. Including socio-economic data facilitates the development of conservation plans that: (i) minimise impacts on stakeholders, and so reduce conflict between conservationists and resource users [21,22]; (ii) are more cost effective to implement and manage [23,24]; (iii) can influence policy by highlighting trade-offs between achieving higher levels of a feature target and the increase in cost to obtain it [23], and; (iv) account for conservation opportunity and constraint data and so increase the likelihood of implementation [25]. There are a number of types of conservation costs that can be included in the planning process, such as: acquisition, management, opportunity, transaction and damage [23], although opportunity costs (the foregone revenues to stakeholders) are commonly used to influence the location of MPAs [26].

2.3. Conduct a social assessment

Much of the early literature on systematic conservation planning focused on analysing biological data, but it is now widely accepted that it is vital to also conduct a social assessment [16], which involves incorporating socio-economic, social and policy-based information in the planning process [27]. Thus, in order to facilitate the translation of priority areas and goals into conservation action it is essential to undertake a well-resourced social assessment that gathers the relevant non-biological data [28]. This must involve identifying and working with the relevant stakeholders and implementing agencies to develop a better understanding of impacts, such as the opportunities and constraints associated with each type of conservation intervention [17,28]. This information can then be used to inform the conservation assessment, by setting targets that reflect both biological, social, and economic requirements and adjusting costs to preferentially select areas where stakeholder support is most likely [17,28,29]. However, it should be recognised that the designation of some priority areas will never have full stakeholder support. Thus, this information should also be used to minimise conflict and inform the implementation strategy by identifying how priority areas should be managed in ways that foster support and fit within existing policy frameworks [17,29].

3. International and European marine conservation law and policy

There are a number of ‘peripheral’ legal obligations and non-binding provisions that influence biodiversity conservation in Europe [30,31], which include the following: Convention on Wetlands of International Importance (Ramsar); Convention on the Conservation of European Wildlife and Natural Habitats (Bern); Convention on the Conservation of Migratory Species of Wild Animals (Bonn); World Summit on Sustainable Development (WSSD); the Protected Areas Programme of the World Conservation Union [32]; and the Marine Strategy Framework Directive [31]. However, the main policy instruments that govern the conservation of marine biodiversity and the selection and designation of MPAs in Northern Europe are: (i) the Convention on Biological Diversity; (ii) the European Birds and Habitats Directives; and (iii) the Convention for the Protection of the Marine Environment of the North East Atlantic, which are summarised and compared to best practice in the following sub-sections.

3.1. Convention on Biological Diversity

3.1.1. Marine policy relevance

The EU’s Member States are Contacting Parties to the Convention on Biological Diversity (CBD), which states in Article 8(a) that: “each contracting party shall as far as possible and as appropriate establish a system of protected areas or areas where special measures need to be taken to conserve biological

diversity" [33]. Such PAs are defined in Article 2 as: "a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives" [33]. The establishment of a representative global network of MPAs was initially proposed at the 7th Conference of the Parties (COP) to the CBD [5] where it was agreed that the goal of the Programme of Work on Protected Areas, and on Marine and Coastal Biological Diversity should be: "the establishment and maintenance of marine and coastal protected areas that are effectively managed, ecologically based and contribute to a global network of marine and coastal protected areas, building upon national and regional systems, including a range of levels of protection, where human activities are managed, particularly through national legislation, regional programmes and policies, traditional and cultural practices and international agreements, to maintain the structure and functioning of the full range of marine and coastal ecosystems" [34,35], echoing commitments made at the WSSD and 5th World Parks Congress [36,37].

This goal was further reinforced with the formulation of the 20 time-bound Aichi targets that were negotiated within the CBD's new Strategic Plan for Biodiversity at the 10th COP [38]. In the context of MPAs, Aichi Target 11 urges that: "by 2020, at least 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" [38].

3.1.2. Critique

In terms of developing a list of broad-goals and translating these into targets, the Programme of Work on Protected Areas states Contracting Parties should aim to achieve 10% protection of their coastal and marine areas by 2020, and this should involve developing feature-specific targets that reflect their national and regional priorities [34]. These targets act as an important foundation [39] but this programme has neither prescribed any subsidiary legal requirements to the generality of Article 8(a), nor established any explicit goals or targets defining what these systems should aim to achieve [40]. Moreover, whilst the Aichi Targets address marine protection in substantially more detail, they have been criticised because these targets: (i) do not resolve how Contracting Parties and regions such as the EU will work together to achieve these goals; and (ii) are not legally binding since the CBD merely 'urges' Contracting Parties to fulfil them [7,41].

With regards to incorporating socio-economic data, the Programme of Work on Protected Areas states that Contracting Parties should: "use relevant socio-economic data required to develop effective planning processes" to substantially improve site-based protected area planning and management [35]. However, this is only a 'suggested' activity as Contracting Parties are only: "encouraged to pay due regard to the social, economic and environmental costs and benefits of various options" [35]. Thus, there are no clear requirements to incorporate these data into the planning process. In fact a greater emphasis is placed on collecting data on: (i) the socio-economic value of marine ecosystems, and the cost of their continuing decline; and (ii) the establishment and maintenance cost of managing protected areas [34,35].

In contrast, the Programme of Work on Protected Areas does clearly state that to improve site-based PA planning and management that "all protected areas" should be developed using: "participatory and science-based site planning processes that incorporate clear biodiversity objectives, targets, management strategies and monitoring programmes, drawing upon existing methodologies and a long-term management plan with active stakeholder involvement" [35]. Whilst this implies some aspects of best practice from conservation planning science, and clearly highlights that PA design and management should involve collaboration with relevant stakeholders, once again there is no requirement to incorporate this into national policies that govern PA selection and designation [35].

Nonetheless, despite its voluntary nature the EU has declared its commitment to integrate the CBD's Strategic Plan for Biodiversity and its time-bound Aichi targets into: "all relevant EU sectors and policies and to implement them, including through the future EU Biodiversity Strategy" [42]. However, the EU Biodiversity Strategy, a policy document developed to support these objectives, only refers to MPAs as a tool for supporting sustainable fisheries, and makes no explicit reference to achieving Aichi Target 11 [43].

3.2. European Birds and Habitats Directives

3.2.1. Marine policy relevance

The European Birds and Habitats Directives are two of the EU's principal and most comprehensive instruments of conservation strategy that are legally binding on Member States. The Birds Directive (Council Directive 79/409/EEC), though primarily concerned with avian conservation, requires the designation of Special Protection Areas (SPAs) to: "maintain endangered, vulnerable, and migratory species of conservation concern across their natural range" [44]. The principal goal of the Habitats Directive (Council Directive 92/43/EEC) is the conservation of natural habitats and of wild fauna and flora [45], and requires the designation of Special Areas of Conservation (SACs) defined as the most appropriate areas to: "maintain or restore, natural habitats, plant and animal species of conservation concern to a favourable conservation status across their natural range" [45].

The selection of SACs is described in Annex III of the Habitats Directive and is based exclusively on scientific criteria, such as: (i) the degree of representativity, ecological quality and area for habitat types; and (ii) the size, density of populations, and the degree of their isolation for species [45–47]. In contrast, there are no agreed EU criteria for the selection and designation of SPAs. Although many countries use the criteria based on the Ramsar 1% flyway population [48]. In combination these sites form the Natura 2000 network, which is described as an ecologically coherent community wide-network of PAs covering terrestrial and marine ecosystems [45,46], and each EU state must contribute to Natura 2000 "in proportion to the representation within its territory of the natural habitat types and the habitats of the species detailed in the Directive's Annexes" [45].

3.2.2. Critique

Although the EU Birds and Habitats Directives contain a list of conservation features that are considered appropriate subjects for conservation interventions[1], and were established with extensive national and political input, they have not been re-evaluated since 2007 [48]. This has resulted in several problems, as it fails to take into account: (i) how species and habitat conservation status has changed with the expansion of the EU [49]; (ii) new data on the

[1] The EC Birds Directive requires the designation of SPAs for rare and/or threatened species (192 species or sub-species as listed in Annex I of the Directive), together with sites which that are important for regularly occurring migratory species. The EC Habitats Directive includes measures for the strict protection of species listed in Annex IV, and requires the designation of SACs that will make a contribution to conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended in the consolidated version 1.1 of the Habitats Directive in 2007).

importance of marine species and habitats [47,50,51]; and (iii) changing risks from climate change and other factors [52,53]. In addition, there is no formal agreement or coordinated attempt to establish which other biodiversity features should be represented [8,11], particularly areas that are important for marine ecosystem functioning such as spawning and aggregation sites. This may neglect areas that support key ecological processes that are difficult to define spatially such as migratory routes [54], arguably failing to implement Bonn Convention obligations. In addition, the Habitats Directives has been criticised as ill-suited for marine conservation because it was originally designed for terrestrial use and then initially only applied to inshore areas [48,54].

Moreover, compared to the detail that prescribes what should be protected, there has been little consideration of targets specifying how much of each feature should be conserved. Thus, existing approaches for designating SPAs and SACs are at the discretion of Member States, and have varied substantially as a result [40,46,47]. Selection has almost always focused on the properties of individual sites, such as the presence of target species and habitats [55]. The only mention of targets in the Habitats Directive relates only to whether a nominated site should be proposed as a SAC, so that sites containing 60% of a feature should automatically be proposed, whereas sites containing 20% of a feature need further assessment before being considered for proposal [56]. However, these figures have often been misunderstood to mean that between 20% and 60% of a species population or habitat area should be protected [47,48]. Thus, although the Directives oblige Member States to ensure each site achieves 'favourable conservation status', they provide no guidance on how much of each feature should be conserved in a PA network. This makes it difficult to determine: (i) how close the marine component of Natura 2000 is to being complete; (ii) what protection shortfalls need to be resolved through conservation planning; and (iii) how well this network will perform in the future [11,13,40].

Article 2 of the Habitats Directive does, however, state that conservation measures shall take account of: "economic, social and cultural requirements and regional and local characteristics"[45], although their inclusion is often limited because European guidelines require that Member States should 'only' employ scientific and ecological criteria in the selection and designation of sites [47,51]. The guidelines do require Member States to identify how different stakeholders interact with the species and habitats targeted for protection. However, this is primarily concerned with environmental impact assessments and identifying the negative impacts of activities, rather than documenting where stakeholders may support conservation [47]. Furthermore, the level of stakeholder participation is often restricted to what has been described as 'consultative' [57], so whilst stakeholders are encouraged to be involved in implementation and management, they lack powers to influence where a site is designated or how specific features are protected [29,58]. This is in line with other approaches to conservation planning in Europe which specifies that socio-economic data and stakeholder involvement should not guide the selection of PAs [46].

This has given rise to problems in some Member States, such as: (i) disagreements about the scope of stakeholders influence over designated areas; (ii) increased conflict at various stages of the planning and implementation process, particularly the designation of site boundaries; and (iii) a lack of local acceptance, and confusion surrounding the protection statuses (i.e., overlap among national, EU and IUCN statuses) of existing and new PAs [11,50,55,59,60]. Therefore, given limited conservation resources, the present approach to identifying PAs has often generated unwanted economic impacts and increased social tensions rather than foster support for conservation [50,60].

3.3. Convention for the protection of the marine environment of the North East Atlantic

3.3.1. Marine policy relevance

The Convention for the protection of the marine environment of the North East Atlantic (OSPAR) is designed to regulate marine activities across a number of EU Member States marine jurisdictions (Fig. 1). This includes territorial waters, exclusive economic zones (EEZs) and areas beyond national jurisdiction [61], and can be interpreted as legally binding for the Governments of the 15 contracting parties and EU Member States through the effect of the EU being a direct signatory [54].

The convention's primary emphasis was on anti-dumping and pollution measures [61], but it now includes explicit references to marine conservation planning, which include obligations in Article 2(1)(a) to: "conserve marine ecosystems and, when practicable, restore marine areas" [61]. In addition, OSPAR has issued several relevant binding and non-binding provisions with regard to MPAs through its Biological Diversity and Ecosystems Strategy, which are directed at: (i) "conserving species, habitats and ecological processes which have been adversely affected by human activities"; and (ii) "protection of areas that best represent the range of species habitats and ecological processes" in the OSPAR maritime area [62]. Furthermore, to complement existing European measures OSPAR has developed a number of strategies for Contracting Parties to implement a joint network of "well-managed" MPAs, that together with the Natura 2000 network is "ecologically coherent" [62–64]. In addition, though some differences exist in their text and geographical scope, OSPAR also operates a joint programme of work on MPAs with HELCOM, which is the Convention on the Protection of the Marine Environment of the Baltic Sea Area [64,65].

3.3.2. Critique

In order to address gaps in existing European measures, OSPAR has developed a list of conservation features in need of protection[2] [66] but this has primarily focused on offshore habitats and species, as existing efforts have generally been directed at protecting inshore territorial waters [51,54]. This list seeks to complement, but not duplicate work under other international and European agreements [67], and forms part of the criteria in the guidelines used to reinforce the identification and selection of OSPAR MPAs [63,68]. However, even though OSPAR provides a framework for identifying suitable sites, there are no explicit or legally binding targets for what this network should aim to achieve [68]. Although, OSPAR does encourage Contracting Parties to develop a network that is consistent with existing international obligations, such as the CBD target that: "at least 10% of each of the world's marine and coastal ecological regions" should be conserved [62,69]. OSPAR also recommends that Contracting Parties should determine the proportion of each biodiversity feature to be included within this joint network using the best available data [68], which is likely to be difficult given that: (i) there is no formal guidance on how to develop quantitative targets; (ii) data on many of the listed species, if available, are often mapped at too coarse a spatial and temporal scale; and (iii) there has been no coordinated attempt by EU Member States to develop a research agenda to address these data gaps [66,68,70].

Moreover, given that EU Member States have different capacity levels and priorities [49], they have often interpreted the

[2] OSPAR has produced three documents since it was first ratified that identifies threatened and or declining species and habitats in the OSPAR maritime area that should be represented in MPAs; the latest version includes 16 habitats and 42 species (comprised of 5 invertebrates, 9 birds, 22 fish, 2 reptiles and 4 mammals).

Convention's broad-goals differently. This is because Member States have their own framework for the organisation of environmental policy [9], and so consequently, targets for features may be influenced by social and political acceptability. Such trends are already evident in European terrestrial conservation strategies, where protected areas are commonly placed at high elevations and in areas of low population density and economic potential [13,71]. Furthermore, given that the OSPAR selection criteria do not account for what is already conserved under Natura 2000, it is unlikely that the ecological goals of this 'joint network' will be met [63]. This is especially because the majority of existing OSPAR MPAs are SACs and SPAs, so that 144 of the 159 OSPAR MPAs overlap with these existing Natura 2000 sites. Thus, the current network is failing to fulfil its goal of conserving offshore areas, as most Natura 2000 sites are located in inshore territorial waters[3] or are simply extensions of terrestrial sites [53,70,72].

In addition, even though OSPAR explicitly states that conservation measures should consider: "social and economic implications"[61], the guidelines for the identification and selection of MPAs make no reference of how to account for socio-economic data when identifying MPAs [63,68]. Though, in contrast to other European measures, OSPAR has developed guidance on how to incorporate relevant stakeholders, experts and organisations into the planning process [73]. However, this guidance was only developed to ensure that Contracting Parties are aware of: (i) approaches to communicating with different types of stakeholders; and (ii) the benefits and challenges of stakeholder participation. Moreover, it also states that the selection and designation of sites is often a lengthy process and that stakeholder engagement should be assessed on a case by case basis [73]. This further emphasises, as with other European measures, that stakeholder consultation about the nature of designated or proposed sites is often disregarded at the value of other stages in the planning process [74].

4. Discussion

4.1. Successes in current European law and policy

Whilst developing PAs in Europe has proven difficult, the European legislation described in Section 3 has significant political buy-in and widespread support [60]. This is highlighted by the rapid expansion of PA networks such as Natura 2000 [43], which currently contains more than 26,000 sites covering 17.5% of the EU territory [48]. The EU also has the clear expertise and legal authority to effectively implement a network of transnational MPAs, which is demonstrated by the Habitats Directive being the first international instrument to address the protection of all habitats within the region [54].

Moreover, this European legislation has provided the first coherent framework for conservation planning at a national level in a number of countries, so there would probably be far less interest in designating PAs in Europe without such obligations [40]. It is also likely that EU legislation has resulted in far better representation of important biodiversity features than could have been achieved by individual Member States acting alone. In addition, the broad goals identified in the legislation described in Section 3 mean there is a great deal of scope for Member States to tailor their actions to local conditions. For example, the Marine and Coastal Access Act was developed by the UK government in response to their OSPAR commitments [75,76]. This Act resulted in the Marine Conservation Zone (MCZ) project which represents the first such attempt in Europe to adopt principles of best practice from conservation planning. Thus, the initial recommendations for priority areas that form the basis of the UKs first comprehensive MPA network are based on achieving explicit quantitative targets, and involved significant stakeholder participation [29,76,77].

However, it should be noted that the UK Government were not required to adopt this approach and voluntarily used aspects of best practice to underpin the MCZ project. Thus, current legislation makes it more likely that Member States will adopt less systematic approaches and so produce MPA networks that fail to conserve marine biodiversity adequately or reduce negative impacts on stakeholders [78,79].

4.2. Adopting key components of best practice from conservation planning

European legislation is currently failing to benefit from the lessons learnt in systematic conservation planning but there are opportunities for its application. This is because current measures adopt some aspects of best practice, such as compiling a list of important species and habitats of conservation concern. However, these aspects are not used as part of a coherent framework and are generally not applied in a transparent manner. Thus, there is an obvious need for change but any suggested amendments must account for the current legislative frameworks. This is why amending the OSPAR legislation is probably most appropriate because it focuses on developing a network of MPAs, which is in contrast to the site-by-site approach of the Birds and Habitats Directives [40]. In addition, such a role would be possible given that OSPAR's text and actions are legally binding on Member States through the effect of the EU being a signatory [54].

4.3. Adopting a more coordinated approach to conservation planning in Europe

One of the key issues with existing approaches to marine conservation planning in Europe is the lack of quantitative targets or framework to develop them. This has inevitably led to a lack of consistency between individual Member States and a failure to measure progress and adapt strategies based on changes in data and socio-economic conditions. Moreover, recent research has shown that if Europe was to adopt a target-based approach then Member States would require less money if they adopted a coordinated approach, rather than identifying priorities in isolation [80]. Therefore, a more transparent and coordinated strategy within Europe would allow the development of more sophisticated planning that accounts for socio-economic data, resulting in increased representation of biodiversity and cost-efficiency [80,81]. Such a target-based approach could be particularly important in the EU, as it would allow better consideration of the trade-offs involved in exploiting and developing 'shared' marine resources and conserving biodiversity.

5. Conclusion

Marine conservation planning in Europe is often seen as a balancing act between socio-economic and political interests and the need to improve the status of the marine environment [51]. Despite this trade-off, existing approaches have resulted in the

[3] In 2010, the OSPAR MPA network consisted of 159 sites (144 of which overlap with existing Natura 2000 sites) collectively covering 147,322 km^2, corresponding to 1.06% of the OSPAR maritime area. As the vast majority of sites have been designated in territorial waters overall coverage of coastal waters by OSPAR MPAs is 13.5%. In contrast, coverage of offshore areas i.e., exclusive economic zones is 0.57%. In addition, no MPA has yet been established in areas beyond national jurisdiction, which comprises 40% of the OSPAR maritime area.

rapid expansion of PA networks across Member States, underlining the EU's ability to implement a network of transnational MPAs. However, existing legislation neglects several key components of best practice from conservation planning, which is likely to prevent the achievement of the EU's broad conservation goals. Moreover, given that every Member State is committed to developing MPA networks, policy makers and practitioners should see these shortcomings as critically important. This is because a failure to adopt best practice will result in wasted resources, increased stakeholder conflict and lost opportunities [82]. Therefore, if European approaches to marine conservation are to fulfil their original goals, it is essential that they link existing EU objectives with implementation strategies that account for local conditions and facilitate appropriate conservation action.

Acknowledgements

This work was funded by the European Union under the Interreg IVA Programme that was co-financed by the European Regional Development Fund, as part of the Channel Integrated Approach for Marine Resource Management (CHARM) Phase III Project.

References

[1] Lubchenco J, Palumbi SR, Gaines SD, Andelman S. Plugging a hole in the ocean: the emerging science of marine reserves. Ecol. Appl. 2003;13:S3–S7.
[2] CBD. Convention on Biological Diversity. Global Biodiversity Outlook 3. Montréal, Canada. 2010. 〈http://gbo3.cbd.int/〉.
[3] Fox HE, Soltanoff CS, Mascia MB, Haisfield KM, Lombana AV, Pyke CR, et al. Explaining global patterns and trends in marine protected area (MPA) development. Mar. Pol. 2012;36:1131–1138.
[4] Wood LJ, Fish L, Laughren J, Pauly D. Assessing progress towards global marine protection targets: shortfalls in information and action. Oryx 2008;42: 340–351.
[5] Wood LJ. Global marine protection targets: how S.M.A.R.T are they? Environ. Manage. 2011;47:525–535.
[6] CBD. Report of the 10th meeting of the conference of the parties to the Convention on Biological Diversity. Nagoya, Japan. 2011. 〈http://www.cbd.int/doc/meetings/cop/cop-10/official/cop-10-27-en.pdf〉.
[7] Harrop SR. Living in harmony with nature? outcomes of the 2010 Nagoya conference of the Convention on Biological Diversity J. Environ. Law 2011;23:117–128.
[8] Smith RJ, Eastwood PD, Ota Y, Rogers SI. Developing best practice for using Marxan to locate marine protected areas in European waters. ICES J. Mar. Sci. 2009;66:188–194.
[9] Haslett JR, Berry PM, Bela G, Jongman RHG, Pataki G, Samways MJ, et al. Changing conservation strategies in Europe: a framework integrating ecosystem services and dynamics. Biodivers. Conserv. 2010;19:2963–2977.
[10] Fenberg PB, Caselle JE, Claudet J, Clemence M, Gaines SD, Antonio Garcia-Charton J, et al. The science of European marine reserves: status, efficacy, and future needs. Mar. Pol. 2012;36:1012–1021.
[11] Dimitrakopoulos PG, Memtsas D, Troumbis AY. Questioning the effectiveness of the Natura 2000 Special Areas of Conservation strategy: the case of Crete. Global Ecol. Biogeogr. 2004;13:199–207.
[12] Jackson SF, Kershaw M, Gaston KJ. The performance of procedures for selecting conservation areas: waterbirds in the UK. Biol. Conserv. 2004;118: 261–270.
[13] Maiorano L, Falcucci A, Garton EO, Boitani L. Contribution of the Natura 2000 network to biodiversity conservation in Italy. Conserv. Biol. 2007;21: 1433–1444.
[14] Sundblad G, Bergström U, Sandström A. Ecological coherence of marine protected area networks: a spatial assessment using species distribution models. J. Appl. Ecol. 2011;48:112–120.
[15] Margules CR, Pressey RL. Systematic conservation planning. Nature 2000;405: 243–253.
[16] Knight AT, Cowling RM, Campbell BM. An operational model for implementing conservation action. Conserv. Biol. 2006;20:408–419.
[17] Knight AT, Driver A, Cowling RM, Maze K, Desmet PG, T Lombard A, et al. Designing systematic conservation assessments that promote effective implementation: best practice from South Africa. Conserv. Biol. 2006;20: 739–750.
[18] Pressey RL, Cowling RM, Rouget M. Formulating conservation targets for biodiversity pattern and process in the Cape Floristic Region, South Africa. Biol. Conserv. 2003;112:99–127.
[19] Carwardine J, Klein CJ, Wilson KA, Pressey RL, Possingham HP. Hitting the target and missing the point: target based conservation planning in context. Conserv. Lett. 2009;2:3–10.
[20] Cowling RM, Pressey RL, Sims-Castley R, le Roux A, Baard E, Burgers CJ, et al. The expert or the algorithm? Comparison of priority conservation areas in the Cape Floristic Region identified by park managers and reserve selection software Biol. Conserv. 2003;112:147–167.
[21] Klein CJ, Chan A, Kircher L, Cundiff AJ, Gardner N, Hrovat Y, et al. Striking a balance between biodiversity conservation and socioeconomic viability in the design of marine protected areas. Conserv. Biol. 2008;22:691–700.
[22] Klein CJ, Steinback C, Scholz AJ, Possingham HP. Effectiveness of marine reserve networks in representing biodiversity and minimizing impact to fishermen: a comparison of two approaches used in California. Conserv. Lett. 2008;1:44–51.
[23] Naidoo R, Balmford A, Ferraro PJ, Polasky S, Ricketts TH, Rouget M. Integrating economic costs into conservation planning. Trends Ecol. Evol. 2006;21: 681–687.
[24] Carwardine J, Wilson KA, Watts M, Etter A, Klein CJ, Possingham HP. Avoiding costly conservation mistakes: the importance of defining actions and costs in spatial priority setting. PloS One 2008;3:e2586, http://dx.doi.org/10.1371/journalpone.0002586.
[25] Nhancale B, Smith R. The influence of planning unit characteristics on the efficiency and spatial pattern of systematic conservation planning assessments. Biodivers. Conserv. 2011;20:1821–1835.
[26] Ban NC, Klein CJ. Spatial socioeconomic data as a cost in systematic marine conservation planning. Conserv. Lett. 2009;2:206–215.
[27] Cowling RM, Knight AT, Privett SDJ, Sharma G. Invest in opportunity, not inventory of hotspots. Conserv. Biol. 2010;24:633–635.
[28] Cowling RM, Wilhelm-Rechmann A. Social assessment as a key to conservation success. Oryx 2007;41:135–136.
[29] Jones PJS. Marine protected areas in the UK: challenges in combining top-down and bottom-up approaches to governance. Environ. Conserv. 2012: 1–11.
[30] EC. Towards a strategy to protect and conserve the marine environment. European Commission, Brussels. 2002. 〈http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2002:0539:FIN:EN:PDF〉.
[31] EC. Council Directive 2008/56/EC establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive). Off. J. L. 2008;164(19).
[32] IUCN. Protected areas, benefits beyond boundaries. International Union for Conservation of Nature and Natural Resources (IUCN).Gland, Switzerland. 2000.
[33] CBD. Convention on Biological Diversity. United Nations Treaty Series. 1992. 〈http://www.cbd.int/doc/legal/cbd-un-en.pdf〉.
[34] CBD. COP 7 (DecisionVII/5 Marine and Coastal Biological Diversity) Convention on Biological Diversity. Kuala Lumpur, Malaysia. 2004. 〈http://www.cbd.int/decision/cop/?id=7742〉.
[35] CBD. COP 7 (DecisionVII/28 Protected Areas) Convention on Biological Diversity. Kuala Lumpur, Malaysia. 2004. 〈http://www.cbd.int/decision/cop/?id=7765〉.
[36] United Nations. Plan of implementation of the world summit on sustainable development. 2002. 〈http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf〉.
[37] IUCN. Recommendation 5.22: building a global system of marine and coastal protected areas. Fifth IUCN world parks congress, Durban, South Africa. IUCN, Gland, Switzerland. 2003.
[38] CBD. COP 10 (Decision X/2 strategic plan for biodiversity 2011–2020) Convention on Biological Diversity. Nagoya, Japan. 2010.
[39] Metcalfe K, Delavenne J, Garcia C, Foveau A, Dauvin JC, Coggan RA, et al. Impacts of data quality on the setting of conservation planning targets using the species-area relationship. Diversity and Distributions. 2013; 19(1):1-13.
[40] Gaston KJ, Jackson SE, Nagy A, Cantu-Salazar L, Johnson M. Protected areas in Europe: principle and practice. Ann. N.Y. Acad. Sci. 2008;1134: 97–119.
[41] Harrop SR, Pritchard DJ. A hard instrument goes soft: the implications of the Convention on Biological Diversity's current trajectory. Global Environ. Change 2011;21:474–480.
[42] EC. Council conclusions on Convention on Biological Diversity: outcome of and follow-up to the Nagoya conference. 3061st Environment Council meeting Brussels. 2010.
[43] EC. Our life insurance, our natural capital: an EU biodiversity strategy to 2020. Brussels: European Commission; 2011.
[44] EC. Council Directive 79/409/EEC on the conservation of wild birds. Off. J. L 1979;103:1.
[45] EC. Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. Off. J. L 1992;206:0007–0050.
[46] EC. Commission working document on Natura 2000. European Commission, Brussels. 2002. 〈http://ec.europa.eu/environment/nature/info/pubs/docs/nat2000/2002_faq_en.pdf〉.
[47] EC. Guidelines for the establishment of the Natura 2000 network in the marine environment. Application of the Habitats and Birds Directives. European Commission, Brussels. 2007. 〈http://ec.europa.eu/environment/nature/natura2000/marine/docs/marine_guidelines.pdf〉.
[48] Evans D. Building the European Union's Natura 2000 network. Nat. Conserv. 2012;1:11–26.

[49] Cogalniceanu D, Cogalniceanu GC. An enlarged European Union challenges priority settings in conservation. Biodivers. Conserv. 2010;19:1471–1483.
[50] Apostolopoulou E, Pantis JD. Conceptual gaps in the national strategy for the implementation of the European Natura 2000 conservation policy in Greece. Biol. Conserv. 2009;142:221–237.
[51] van Haastrecht EK, Toonen HM. Science–policy interactions in MPA site selection in the Dutch part of the North Sea. Environ. Manage. 2011;47: 656–670.
[52] Harrop SR. Conservation regulation: a backward step for biodiversity? Biodivers. Conserv. 1999;8:679–707.
[53] Giakoumi S, Katsanevakis S, Vassilopoulou V, Panayotidis P, Kavadas S, Issaris Y, et al. Could European marine conservation policy benefit from systematic conservation planning? Aquat. Conserv.: Mar. Freshwater Ecosyst. 2012 doi 10.1002?aqc.2273.
[54] De Santo EM, Jones PJS. Offshore marine conservation policies in the North East Atlantic: emerging tensions and opportunities. Mar. Pol. 2007;31: 336–347.
[55] Ioja CI, Patroescu M, Rozylowicz L, Popescu VD, Verghelet M, Zotta MI, et al. The efficacy of Romania's protected areas network in conserving biodiversity. Biol. Conserv. 2010;143:2468–2476.
[56] EC. Criteria for assessing national lists of pSCI at biogeographic level. Habitats Committee. 1997.
[57] Borrini-Feyerabend G. Collaborative management of protected areas. In: Stolton S, Dudley N, editors. Partnership for protection: new strategies for planning and management for protected areas. London: Earthscan Publications Ltd; 1999.
[58] Jones PJS. Marine nature reserves in Britain: past lessons, current status and future issues. Mar. Pol. 1999;23:375–396.
[59] Roberts T, Jones PJS. Shellfishing, eider ducks, and nature conservation on the wash: questions raised by a fractured partnership. Soc. Nat. Resour. 2009;22:538–553.
[60] Grodzinska-Jurczak M, Cent J. Expansion of nature conservation areas: problems with Natura 2000 implementation in Poland? Environ. Manage. 2011;47:11–27.
[61] OSPAR. Convention for the protection of the marine environment of the North–East Atlantic. OSPAR Commission. 1992.
[62] OSPAR. The North–East Atlantic Environment strategy. Strategy of the OSPAR Commission for the Protection of the marine environment of the North–East Atlantic 2010–2020. OSPAR Commission (OSPAR Reference Number: 2010-3). 2010.
[63] OSPAR. Guidelines for the identification and selection of marine protected areas in the OSPAR maritime area. OSPAR Commission (Reference Number: 2003-17). 2003.
[64] OSPAR. Joint HELCOM/OSPAR work programme on marine protected areas. First joint managerial meeting of the Helsinki and OSPAR Commissions, Agenda Item 6, Annex 7. 2003.
[65] Ardron JA. The challenge of assessing whether the OSPAR network of marine protected areas is ecologically coherent. Hydrobiologia 2008;606:45–53.
[66] OSPAR. OSPAR list of threatened and/or declining species and habitats. OSPAR Commission. (Reference Number: 2008-6). 2008.
[67] OSPAR. Case reports for the OSPAR list of threatened and/or declining species and habitats. OSPAR Commission. Biodiversity Series No. 358. 2008.
[68] OSPAR. Guidance on developing an ecologically coherent network of OSPAR marine protected areas. OSPAR Commission (Reference Number: 2006-3). 2006.
[69] CBD. Decisions adopted by the conference of the parties to the Convention on Biological Diversity at its eighth meeting (DecisionVIII/15, Annex IV). Convention on Biological Diversity. Curitiba, Brazil 2006.
[70] OSPAR. 2006 Report on the status of the OSPAR network of marine protected areas. OSPAR Commission Biodiversity Series, 319. 2007.
[71] Oldfield TEE, Smith RJ, Harrop SR, Leader-Williams N. A gap analysis of terrestrial protected areas in England and its implications for conservation policy. Biol. Conserv. 2004;120:303–309.
[72] OSPAR. 2009/2010 Status report on the OSPAR network of marine protected areas. OSPAR Commission. Biodiversity Series. 2010.
[73] OSPAR. Guidance for good practice for communicating with stakeholder on the establishment and management of marine protected areas. OSPAR Commission (Reference Number: 2008-2). 2008.
[74] Dimitrakopoulos PG, Jones N, Iosifides T, Florokapi I, Lasda O, Paliouras F, et al. Local attitudes on protected areas: evidence from three Natura 2000 wetland sites in Greece. J. Environ. Manage. 2010;91:1847–1854.
[75] MCAA. Marine and Coastal Access Act 2009. London: The Stationery Office; 2009 Chapter 23.
[76] JNCC, Natural England. Marine Conservation Zone Project. Ecological Network Guidance. Joint Nature Conservation Committee and Natural England. 2010. 〈http://www.jncc.gov.uk/pdf/100608_ENG_v10.pdf〉.
[77] Jones PJS. Equity, justice and power issues raised by no-take marine protected area proposals. Mar. Pol. 2009;33:759–765.
[78] Rabaut M, Degraer S, Schrijvers J, Derous S, Bogaert D, Maes F, et al. Policy analysis of the 'MPA-process' in temperate continental shelf areas. Aquat. Conserv.—Mar. Freshwater Ecosys. 2009;19:596–608.
[79] Stewart RR, Noyce T, Possingham HP. Opportunity cost of ad hoc marine reserve design decisions: an example from South Australia. Mar. Ecol.—Prog. Ser. 2003;253:25–38.
[80] Kark S, Levin N, Grantham HS, Possingham HP. Between-country collaboration and consideration of costs increase conservation planning efficiency in the Mediterranean Basin. PNAS 2009;106:15368–15373.
[81] Bladt J, Strange N, Abildtrup J, Svenning J-C, Skov F. Conservation efficiency of geopolitical coordination in the EU. J. Nat. Conserv. 2009;17:72–86.
[82] Agardy T, di Sciara GN, Christie P. Mind the gap: addressing the shortcomings of marine protected areas through large scale marine spatial planning. Mar. Pol. 2011;35:226–232.