Estuarine, Coastal and Shelf Science 207 (2018) 303–311

Contents lists available at ScienceDirect

Estuarine, Coastal and Shelf Science

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

Navigating future uncertainty in marine protected area governance: Lessons from the Scottish MPA network

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ARTICLE INFO

Keywords:
Climate change
Delphi technique
MPA management
Marine protected area network
Scotland

ABSTRACT

As international pressure for marine protection has increased, Scotland has increased spatial protection through the development of a Marine Protected Area (MPA) network. Few MPA networks to date have included specific considerations of climate change in the design, monitoring or management of the network. The Scottish MPA network followed a feature-led approach to identify a series of MPAs across the Scottish marine area and incorporated the diverse views of many different stakeholders. This feature led approach has led to wide ranging opinions and understandings regarding the success of the MPA network. Translating ideas of success into a policy approach whilst also considering how climate change may affect these ideas of success is a complex challenge. This paper presents the results of a Delphi process that aimed to facilitate clear communication between academics, policy makers and stakeholders in order to identify specific climate change considerations applicable to the Scottish MPA network. This study engaged a group of academic and non-academic stakeholders to discuss potential options that could be translated into an operational process for management of the MPA network. The results of Delphi process discussion are presented with the output of a management matrix tool, which could aid in future decisions for MPA management under scenarios of climate change.

1. Introduction

Marine ecosystems are facing a diverse range of threats, including climate change, prompting international efforts to safeguard marine biodiversity through the use of spatial management measures (Allison et al., 1998; Lubchenco et al., 2003; Chuenpagdee et al., 2013). Marine Protected Areas (MPAs) have been implemented as a conservation tool throughout the world, but their usefulness and effectiveness is strongly challenged by climate change (Harley et al., 2006; Andrello et al., 2015). Whilst MPAs cannot explicitly protect against climate change related disturbances (e.g. ocean acidification), MPAs can assist in sustaining biodiversity and ecosystem processes at regional and local scales (Levy and Ban, 2013). The reduction of other anthropogenic threats (e.g. overfishing) can minimise the synergistic impact of other stressors which may exacerbate detrimental changes to ecosystem health (Harley and Rogers-Bennett, 2004; Harley et al., 2006; Levy and Ban, 2013). The reduction of additional stressors could also contribute to increased ecosystem resilience in the face of climatic stress (see Bernhardt and Leslie, 2013). However, few MPA programmes have directly considered climate change in the design, management or monitoring of an MPA network (Hopkins et al., 2016a). Considering elements of design, management and monitoring that could enable an MPA network to perform effectively under scenarios of climate change, could also improve networks more generally.

Under international obligations, EU, UK and national targets (e.g. CBD, OSPAR), Scotland has developed an MPA network intended to protect marine biodiversity and contribute to the vision of a clean, healthy and productive marine environment (Scottish Government, 2011a). The implementation of the Scottish MPA network has been a complex process requiring the consideration of stakeholder values and perceptions, scientific evidence and political factors (Hopkins et al., 2016b). There is a need to facilitate clear communication between academics, policy makers and stakeholders to progress MPA policy delivery and ensure decisions are jointly formed and therefore acceptable to multiple parties (Pollnac et al., 2010).

The Scottish Nature Conservation MPA network consists of 30 MPAs designated in 2014: 17 MPAs under the Marine (Scotland) Act 2010 in Scottish territorial waters and 13 MPAs under the Marine and Coastal Access Act 2009. Scottish Natural Heritage (SNH) and the Joint Nature Conservation Committee (JNCC) submitted formal advice to parliament following a series of stakeholder workshops. The Scottish MPA network (including other types of protected area designation) covers

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https://doi.org/10.1016/j.ecss.2018.04.020
Received 31 October 2017; Received in revised form 22 March 2018; Accepted 18 April 2018
Available online 25 April 2018
0272-7714/

approximately 20% of the Scottish sea area. The Scottish MPA network is intended to contribute to an OSPAR ecologically coherent network and is part of the Scottish Government's three pillar approach to conservation, which includes spatial protection, wider seas measures and species-specific protection and management measures (Scottish Government, 2011a). Together, the three-pillar approach is intended to contribute to the achievement of Good Environmental Status (GES) under the Marine Strategy Framework Directive (MSFD). Therefore, it is important to assess the contribution that the MPA network makes towards protecting marine biodiversity and the delivery of GES. Furthermore, with increasing pressure from climate change on marine biodiversity, an effective MPA network will be crucial in providing climate change resilience. We define resilience here as the ability of an ecosystem to experience disturbance without substantial biological change (Holling, 1973), a change that could result in an alternative state and loss of ecosystem function (Côté and Darling, 2010).

The Scottish MPA network was developed using a feature-based approach to site selection, whereby MPA sites were selected based on the "locations of habitats or species which are important, rare, threatened and/or representative of the range of features in the UK marine area" (Scottish Government, 2011b) termed Priority Marine Features (PMFs) (see Howson et al., 2012). It will be important to assess whether such a feature led approach is effective for selecting MPA sites that will remain resilient under climate change scenarios. Each Scottish MPA also has a Conservation Objective of either "conserve" or "recover" tying MPA management measures to the feature for which each site was designated. These objectives are vague and therefore difficult to measure under climate change scenarios where it may become unfeasible to achieve such an objective (Cliquet et al., 2009).

The aim of this study was to facilitate the identification of high level management options for Scottish MPA network in the context of potential climate change scenarios prior to the development of site specific management options. There are few examples of high level MPA decision making, for example, under what circumstances should a new MPA be designated, or an MPA that is no longer effective or successful, de-designated. This study aimed to explore these options in the context of climate change, answering the following research questions:

Are there differences in the perceptions of MPA success between different stakeholder groups?

How can we effectively protect marine ecosystems under climate change scenarios?

What are feasible options for including climate change specific management and monitoring strategies?

2. Materials and methods

A Delphi method was devised in this study to elicit perceptions and options for climate change management scenarios. The Delphi method is becoming more frequently applied to conservation and biodiversity management issues due to their complex nature, involving a range of stakeholders and trade-offs (Hess and King, 2002; O'Neill et al., 2008; Gobbi et al., 2012). The Delphi method is a flexible methodology suitable for complex policy problems, particularly where there is significant uncertainty, lack of historical precedent and especially in situations where information is limited or conflicting (Mukherjee et al., 2015). Questions are posed and responses to those questions exchanged usually anonymously with other participations via a process facilitator and is an effective way for a group to deal with a complex issue either reaching consensus or identifying convergence of opinion (Linstone and Turoff, 2002; Hsu and Sandford, 2007). The benefit of the reflective deliberation of the Delphi method may also be the development of more creative solutions by groups of people (Reed, 2008). The Delphi method employed here did not seek consensus, seeking instead an improvement in understanding and clarification of the issue, therefore sharing similarities with Policy Delphi. As Rowe and Wright (2011) suggest, the most interesting and important issues often emerge where consensus is not evident.

MPA processes involve a complex range of stakeholders from various economic, social and environmental interest groups. As such, the panel was carefully selected to apply their knowledge and experience to the study issue and to reflect the diversity of stakeholders involved in the MPA process. Following Glass et al. (2013) a stakeholder map was created to identify a matrix of organisations and stakeholder interest groups related to the Scottish MPA process. Potential participants were selected if they met one or more of the following criteria: active role in the Scottish MPA process, relevant experience in other UK MPA processes, member of a representative body, and academically relevant research to MPAs and/or marine climate change. The size of the panel is not a critical feature of the Delphi method as participants are purposefully rather than randomly selected and reliable results can be obtained by choosing participants using strict inclusion criteria (Akins et al., 2005).

2.1. Progression through rounds

The Delphi study began in January 2014 and consisted of two emailed questionnaires and a final focus group round that concluded the participant input process in September 2014. The focus group provided the participants with an opportunity for face to face interaction, encouraging motivation to remain engaged in the process. The participants had an adequate history of communication through the Scottish MPA process stakeholder workshops. Additionally, the use of the focus group further complemented the Delphi technique by emphasising the synergy of a group for producing ideas over and above individual contributions (Krueger and Casey, 2009). Results presented in this paper reflect final outcomes from the Delphi method, following the three rounds (Fig. 1.). Round One and Two identified potential management options and discussed the feasibility of these options. Recognising the feature-based approach to designation of the Scottish MPAs, the participants of the focus group were presented with a series of feature-based scenarios whereby the abundance or presence of a feature changed, to explore which possible management options were available and under which circumstances these were acceptable and feasible. The scenarios focused on the high level management options suggested by participants in previous rounds, rather than specific management relating to activities (e.g. types of gear restriction).

2.2. Composition of the panel

Upon acceptance respondents from similar organisations nominated one person to speak on behalf of the interest group and this person became the point of contact (Participants 1, 2 and 10). Reasons given for the collective input included the already heavy investment of relevant organisations involved in the on-going MPA designation process and reshuffling of employees within the relevant organisations to different policy areas. Six participants completed the Round One questionnaire and four participants responded to the Round Two questionnaire (Participants 1 and 8 did not complete). Whilst, this resulted in a low panel number for Round Two and a loss of two perspectives (policy maker and practitioner/professional), the information provided by the remaining four panellists was detailed and illustrated in-depth thinking concerning the feedback (from Round One) and resultant questions. Additionally, there was some overlap in the remaining participants with the non-respondents in terms of experience and background (i.e. a practitioner/professional and policy maker responded to Round Two). To counter-act the lower response rate of Round Two further action was taken: i) renewed efforts were made to contact the participants to encourage them to respond to the questionnaire and subsequent round; ii) additional potential participants from the stakeholder map having experience and knowledge in the research topic were invited to participate in the Delphi focus group. Subsequently, Participant 8 confirmed their acceptance of the invitation to attend the