Editorial: Working Towards a Blue Future: Promoting Sustainability, Environmental Protection and Marine Management: Examples from the UK Government Blue Belt Programme and Current International Initiatives

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Editorial on the Research Topic

Working Towards a Blue Future: Promoting Sustainability, Environmental Protection and Marine Management: Examples from the UK Government Blue Belt Programme and Current International Initiatives

INTRODUCTION

World-wide, the oceans are experiencing unprecedented rates of change associated with human activities. Overexploitation of species, degradation of habitats, biodiversity loss, a growing human population and changes in sea and land use are fundamentally altering the structure and function of marine ecosystems (Scheffer et al., 2001; Lubchenco et al., 2003; Jennings and Brander, 2010; Este et al., 2011; Díaz et al., 2019; Halpern et al., 2019). Effective and sustainable marine conservation and management strategies are urgently needed to halt the continued degradation of the world's oceanic and coastal environments (Devillers et al., 2015; Lubchenco and Grorud-Colvert, 2015; Ban et al., 2017; Roberts et al., 2017; Alvarez-Fenandez et al., 2020; Laffoley et al., 2020). International conventions and policies, most notably the Convention of Biological Diversity and the United Nations Sustainable Development Goal 14, called for at least 10% of the world's oceans to be protected by 2020 [Convention on Biological Diversity - Aichi biodiversity targets, 2010; United Nations Educational Scientific Cultural Organisation (UNESCO), 2017]. At present, an estimated 7.7% of the world's oceans are designated as Marine Protected Areas (MPAs) (The United Nations World Database of Protected Areas, 2021), with discussions to determine the type and extent of marine protection required post- 2020 currently underway (Campbell and Gray, 2019; Gownaris et al., 2019).

Across the globe there are aspirations of reversing biodiversity loss through the protection of 30% of the world oceans by 2030 and a vision of living in harmony with nature by 2050. (The United Kingdom Government, 2018; Convention of Biological Diversity, 2019; The International Union for Conservation Nature, 2021) The declaration of the United Nations Decade of the Ocean Science for Sustainable Development encompassing 2021-2030 [United Nations Educational Scientific Cultural Organisation (UNESCO), 2017] has been developed to provide a common framework to unify and enable countries to undertake the ocean science necessary to sustainably manage oceans on a global scale and to ensure that connections between science, policy and societal needs are at the heart of the process (The United Nations decade of ocean science for sustainable development, 2020). One of the proposed mechanisms for achieving such ocean management is the designation of large-scale highly protected MPAs (Dudley et al., 2010; Leverington et al., 2010; Edgar et al., 2014; Watson et al., 2014). Highly protected MPAs can be a powerful conservation tool if appropriately managed from the point of designation (Lubchenco and Grorud-Colvert, 2015; Gownaris et al., 2019; Schratzberger et al., 2019; Alvarez-Fenandez et al., 2020). To effectively designate and sustainably manage such large areas of ocean and sea that can encompass a myriad of habitats and species, it is crucial that we understand the structure, function and resilience of the ecosystems therein. Such decisions involve many sources of evidence and require consideration of a complex interplay of social, political, legal, cultural, economic, and environmental concerns (Schratzberger et al., 2019). The wide range of competing interests means that, to be effective, decision-makers need to be presented with this evidence in a timely and accessible manner so it can be used to inform the development of future management and policy strategies.

UK GOVERNMENT BLUE BELT PROGRAMME

In 2016, the UK Government established its Blue Belt Programme[1], a broad initiative to develop and enhance marine management, protection and conservation across a number of its Overseas Territories. The Blue Belt Programme has focused on seven territories, including British Antarctic Territory, British Indian Ocean Territory, Pitcairn Islands, St Helena, Ascension Island and Tristan da Cunha, and South Georgia and the South Sandwich Islands.

This Programme has contributed to the delivery of the UK Government's commitment to provide protection of over four million km^2 of marine environment across the UK Overseas Territories (UKOTs). This has been achieved through the provision of ongoing support for existing strategies of marine protection within British Indian Ocean Territory, South Georgia and the South Sandwich Islands and within British Antarctic Territory and through assisting in the development of new marine management and protection strategies within Pitcairn,

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[1]https://www.gov.uk/government/publications/the-blue-belt-programme

St Helena, Ascension Island and Tristan da Cunha Exclusive Economic Zones (EEZs).

High-level objectives of the Blue Belt Programme have been to:

1. Improve scientific understanding of the marine systems throughout the seven UKOTs;
2. Develop and implement evidence based, tailored marine management and protection strategies where these were not already developed and
3. Ensure that any management measures both ongoing and developed within the Blue Belt Programme are sustainable into the future.

CONTENT

The Blue Belt programme is delivered by the UKOTs in partnership with the Center for Environment, Fisheries and Aquaculture Science (Cefas) and the Marine Management Organization (MMO), in addition to collaborators and experts from around the world to generate additional knowledge to ensure that existing and newly developed marine protection strategies are well-designed, and that valuable marine areas and zones are effectively managed and monitored.

The geographic scope of this Frontiers in Marine Science Research Topic demonstrates the amount of work currently being undertaken in partnership with many UKOTs as they seek to protect and sustainably manage their marine estates. Included are studies encompassing UKOTs within the Blue Belt Programme (South Georgia and the South Sandwich Islands, Tristan da Cunha, St Helena, Ascension Island, Pitcairn Island and the British Indian Ocean Territory), as well as Monserrat. It brings together 22 papers that focus broadly on four key themes that demonstrate the importance of scientific data collection and how it has been utilized to deliver policy relevant evidence and advice for UKOT decision makers.

Ecology and Status of Key Fisheries Species

Sustainable management of fish and invertebrates requires detailed knowledge of the distribution, abundance and ecology of both target and non-target species. In the Tristan da Cunha EEZ, Campanella et al. use acoustics to detect and quantify major fish aggregations at seamounts, whilst Bell et al. and Heyworth et al. investigate the life-history traits and regional connectivity of the bluenose fish populations caught at those seamounts. In St Helena waters, Wright et al. apply both conventional and novel tagging methods to investigate patterns in the behavior of yellow-fin tuna, that will inform regional management of this economically valuable species. An economic study undertaken by Muench et al. to assess the viability of existing fisheries during the creation of a large scale MPA in the Ascension Island EEZ provides valuable insights into the potential socio-economic impacts that MPA design and management practices could have if not considered during the design and designation phase of MPA planning and management. In addition, a study by Townhill et al. utilizes climate projection models under different

emission scenarios to assess potential changes in the distribution of commercially important fish stocks in the vicinity of Ascension Island, St Helena and Tristan da Cunha under different climate scenarios, providing important information on how climate change may affect the livelihoods of small Island communities.

Integrated and Adaptive Marine Management

Robust monitoring of ocean health is vital for the development of an integrated and adaptive approach to marine management. This is often challenging in small communities with limited capacity and weak or non-existent environmental baselines. The two studies undertaken by Painting, Haigh, et al. and Painting, Nelson, et al. demonstrate the importance of monitoring and how baseline data can be used to develop assessment levels for coastal pollutants. McGoran et al. discuss the value of understanding potential sources of pollution, such as plastics and the extent and impacts of this pollution on marine systems, including the deep sea. Mynott et al. show how the collection of scientific data and evidence can be used to develop novel tools for conducting ecological risk assessments relating to anthropogenic activities in data poor environments. Duffy et al. discuss how long-term monitoring can inform the development of conservation objectives that result in the continued sustainable use of resources and minimize potential socio-economic impacts on local communities.

Stakeholder conflict is a common issue during the development and implementation of management strategies. Dosell et al. stress the importance of stakeholder engagement in data collection and as part of the decision-making process and highlight the importance of inclusivity in user conflict resolution and the development of evidence informed management and policy strategies. While Hardman et al. emphasize the importance of establishing multi-actor and multi-sector partnerships to aid stakeholder participation, offer technical expertise and to mobilize finance. Governance structures are essential to balance and trade-off competing objectives, resolve conflicts and develop integrated and adaptive management systems that enable managers and decision makers to coordinate planning and management across a range of sectors.

Investigating Vulnerable Marine Ecosystems

In order to conserve and protect vulnerable marine species, it is first necessary to understand how they interact with key habitats, where these habitats are located, and how susceptible they are to human activities. Downie et al. and Hogg et al. demonstrate that work to map the location of vulnerable habitats is essential during the MPA design and designation process to ensure that MPAs are placed in the correct location, therefore affording vulnerable marine ecosystems the level of protection they require. These articles also show the importance of baseline information during the management effectiveness assessment step of the MPA management cycle. Archer-Rand et al. and Bridges et al. illustrate how the modeling and mapping of tropical and cold water corals has provided information that has contributed to the designation of highly protected marine zones and the management of potentially damaging activities.

Dickens et al., Martin et al., Meeuwig et al., and Thompson et al. discuss how the mapping of oceanic features and the collection of sightings data of vulnerable marine species and land-based marine predators can be used to inform marine spatial protection and conservation strategies. Much of the research presented here has already directly informed management and policy decisions in the UKOTs, highlighting the value of targeted operational research delivered in a timely and accessible manner.

Marine Protection and Enforcement

The designation of large scale ($>100,000$ km^2) MPAs is rapidly increasing on a global scale. How effective these large scale MPAs are at achieving their conservation objectives depends on the level of compliance with management measures. Collins et al. conclude that to improve compliance and therefore the potential for any management objectives to be met it is first necessary to understand both the social and economic drivers of non-compliance. Their article also considers how applicable the development and implementation of educational and incentive-based programmes are as an alternative to costly enforcement activities.

SUMMARY

The articles contained in this issue represent the outcomes of policy-driven, applied research, developed to fill the most critical knowledge and evidence gaps in the marine decision-making process. The outcomes of this work have already had demonstrable impact upon major policy decisions within the UKOTs, including the designation of large MPAs, the safeguarding of fisheries resources, the protection of vulnerable ecosystems, and the sustainable use of the marine environment. The articles highlight many of the challenges that have been overcome while working in remote locations with varying levels of infrastructure and governance. They demonstrate the importance of communication and what can be achieved through partnership working between Government agencies, non-governmental organizations, academic partners, and local stakeholders.

We, the authors, are proud to have worked alongside our UKOT colleagues to deliver co-created science that has been crucial to evidence-based decisions made during our journey toward sustainable ocean governance. Many of the UKOTs are remote communities that depend heavily on their marine environments and have limited means for economic diversification. Their willingness to consider their economic goals alongside those of global marine protection cannot be underestimated and they should be wholeheartedly congratulated on their commitment to building a sustainable future for our oceans.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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