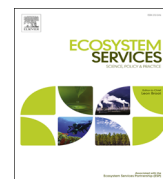




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# Looking below the surface: The cultural ecosystem service values of UK marine protected areas (MPAs)



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## ABSTRACT

Recreational users appreciate the UK marine environment for its cultural ecosystem services (CES) and their use and non-use values. UK Governments are currently establishing a network of marine protected areas (MPAs) informed by ecological data and socio-economic evidence. Evidence on CES values is needed, but only limited data have been available. We present a case study from the UK National Ecosystem Assessment (NEA) follow-on phase that elicited divers' and anglers' willingness to pay (WTP) for potential MPAs. The case study is an innovative combination of a travel-cost based choice experiment and an attribute-based contingent valuation method. Our study design allowed us to understand the marine users' preferences from both a *user* and a *stewardship* perspective. Following the UK NEA's place-based CES framework, we characterised marine CES as environmental spaces that might be protected, with features including the underwater seascape, and iconic and non-iconic species. Our survey highlighted the importance of CES to divers and anglers. A wide variety of marine spaces influenced user-WTP, while stewardship-WTP was most influenced by management restrictions, species protection, and attitudes towards marine conservation. An understanding of key stakeholders' CES values can inform a more holistic and sustainable approach to marine management, especially for decisions involving trade-offs between marine protection and opportunity costs of the blue economy.

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## 1. Introduction

The UK National Ecosystem Assessment (NEA) defined cultural ecosystem services (CES) as environmental settings or spaces that enhance human wellbeing through activities, capacities, identities and experiences (Church et al., 2014, 2011). One of the key aspirations of the ecosystem services (ES) research community is to improve environmental decision making by providing information on the benefits of nature conservation (Chan et al., 2012a; Daily et al., 2009). CES are often omitted from cost–benefit analysis and impact assessments because data on CES benefits are unavailable, and there are considerable methodological challenges to measuring them (Chan et al., 2012a; Church et al., 2011; Ruiz-Frau et al., 2013). Omitting CES from impact assessments underestimates the social and economic value of nature to people (Chan et al., 2012a). In this paper, we present evidence that makes a strong appeal to include CES despite these measurement challenges. We show how conser-

vation features important for a national network of marine protected areas (MPAs) can be translated into CES benefits and be valued using stated preference surveys, thus better accounting for CES in decision-making.

This interdisciplinary research project, which was part of the second phase of the UK NEA,<sup>1</sup> had three objectives: (i) to add to the evidence base on marine CES values, (ii) to improve understanding about marine use and non-use values, and (iii) to provide evidence that can be used in MPA decision-making in the UK. To achieve these objectives, we developed a stated preference valuation method that linked a travel-cost choice experiment (CE) with an attribute-based contingent valuation method (CVM). The CE elicited direct and indirect use values for recreational visits to marine sites. The CVM elicited non-use and option values for protecting marine sites. Attribute-based CVM has been applied in only a few studies (Christie and Azevedo, 2009; Holmes and Boyle, 2004; Moore et al., 2011) and the combination with a travel-cost CE is a novel approach to valuing ES. This paper is also the first to base the monetary valuation of CES on the place-based CES framework developed by the UK NEA (Church et al., 2014). In this

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<sup>1</sup> See URL: <http://uknea.unep-wcmc.org> and URL: [www.lwec.org.uk/sharedvalues](http://www.lwec.org.uk/sharedvalues).

paper we report monetary values for divers' and anglers' marine site preferences based on CES. The total value of recreation in and designation of proposed UK MPAs is reported elsewhere (Kenter et al., 2013).

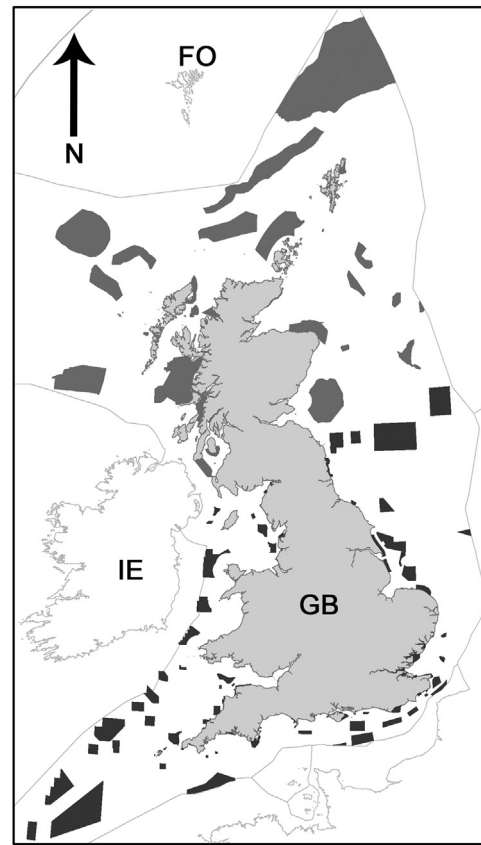
### 1.1. Threats to marine ecosystem services provision

The marine environment provides many ES including fish, climate regulation, water circulation, habitats, nutrient cycling, resilience and resistance, waste absorption, detoxification of pollutants, primary production, medicinal and biotechnological products, storm protection, a wide variety of marine spaces for recreational activities such as angling, diving and snorkelling, and generates substantial cultural benefits (Austen et al., 2008; Beaumont et al., 2007; UNEP, 2006). Currently, the long-term provision of marine ES is threatened by human activities including industrial fishing, raw material extraction, oil and gas exploration, shipping and terrestrial source pollution (Barbier et al., 2011; Benn et al., 2010). Most marine activities are concentrated around coastlines because of the ease of coastal access and the limitations of accessing deeper parts of the ocean further offshore. The environmental impacts of these activities in shallow water makes them a marine conservation focal point (Halpern et al., 2008). Three important questions for decision makers are: (1) To what extent are marine ES being affected? (2) What are the benefits of protecting marine areas? (3) Could these benefits outweigh the opportunity costs of marine conservation on the marine economy (TEEB, 2012; UK NEA, 2011)?

### 1.2. Marine policy context

The Convention on Biological Diversity (CBD) signatories agreed to protect at least 10% of marine habitats by 2020 (CBD, 2010; UNEP, 2012). In 2010, only 1.6% of the oceans were protected (UNEP, 2012). Currently, the UK and Scottish, Welsh and Northern Irish devolved governments are designating conservation areas to protect marine biodiversity in response to both CBD targets and the EU Marine Strategy Framework Directive 2020. The UK Marine & Coastal Access Act and the Marine Scotland Act empower governmental bodies to designate an ecologically coherent network of MPAs in UK waters, with the aim of progressing towards “clean, healthy, safe, productive and biologically diverse oceans and seas” (DEFRA, 2002). The MPA network comprises different types of MPAs including Ramsar sites, sites of special scientific interest (SSSIs), special areas of conservation (SACs), special protection areas (SPAs) and two new main types of MPA: Marine Conservation Zones (MCZs) and Scottish MPAs (Fig. 1).

Biological and geological conservation targets and social and economic factors are taken into account when considering potential MCZ and Scottish MPA sites. In England, stakeholders have recommended 127 MCZs, 27 of which were designated in November 2013<sup>2</sup> with some further sites likely to be designated in 2015. In Scotland, 33 MPAs were proposed for designation (The Scottish Government, 2014). Wales and Northern Ireland have yet to decide how they will contribute to the UK MPA network. In 2012, there was a public outcry over the Welsh government's proposal to establish highly protected marine conservation zones. The Welsh government withdrew its plans as a result of the consultation responses, which were “expressing highly divergent and strongly held views” (Welsh Government, 2012). One of the main reasons for the public upset was the exclusion of all extractive, damaging, and disturbing activities in these areas without consideration of the socio-economic implications for local communities and businesses (Kenter et al., 2013; Welsh Government, 2012). The experience clearly illustrates the importance of socio-



**Fig. 1.** The British network of recommended MPAs. In black the English recommended marine conservation zones and in grey the Scottish potential MPAs (*status quo* at the time of research in December 2012). Boundaries show the limits of Exclusive Economic Zones (max. 200 nm offshore). GB=Great Britain, FO=Faroe Islands, and IE=Republic of Ireland.

economic evidence, including CES values, for decision making. While cost data on marine management is relatively easy to obtain, data on the non-market benefits of marine conservation in the UK are scarce (cf. Austen et al., 2011; Beaumont et al., 2006, 2008; McVittie and Moran, 2010; Radford et al., 2009; Rees et al., 2010; Ruiz-Frau et al., 2013). A recent report by Fletcher et al. (2012) specifically identified the ES provided by the UK marine habitats and species of conservation importance and highlighted the lack of information on CES values associated with these marine features.

### 1.3. Valuing cultural ecosystem services

There are many potential marine CES benefits to the general public and specific communities associated with history, heritage and identity in relation to the sea. This paper focuses on the use and non-use benefits to two key recreational user groups of potential future MPAs (i.e. divers and anglers). Most economic valuations of marine CES have been based on market related values of leisure and recreation. For example, leisure and tourism revenues including users' expenditures on access fees, equipment, fuel, accommodation costs, etc. For the UK marine environment, these values amounted to £11.77 billion per annum in 2002 (Beaumont et al., 2006, 2008). Using market related values mixes ES values with infrastructure and human labour values, and fails to take account of the total economic value (TEV; Fig. 2) of the recreational activities (Toivonen et al., 2004). TEV includes both use and non-use values. To recreational users of MPAs, use value includes the actual use value (the value of recreating in an area) and option value (the value of maintaining a site's availability for potential use in the future; Pascual et al., 2010,

<sup>2</sup> See Joint Nature Conservation Committee (JNCC), *Marine Conservation Zones*; URL: <http://jncc.defra.gov.uk/page-4525> (last access May 2014).

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