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Spatially explicit economic assessment of cultural ecosystem services: Non-extractive recreational uses of the coastal environment related to marine biodiversity

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ABSTRACT

The adoption of comprehensive marine spatial plans (MSP) requires that all aspects of value associated with marine biodiversity are considered in their development. Therefore, a holistic approach to MSP needs to include the ecological, social and economic aspects related to the range of goods and services provided by marine biodiversity. In temperate coastal areas however, extractive uses of marine biodiversity (i.e., fisheries) tend to receive more consideration than other non-extractive uses such as certain forms of recreation. This is primarily due to its economic and social importance and a lack of information on non-extractive uses of marine biodiversity. This study presents an assessment of the economic importance and spatial distribution of non-extractive uses of marine biodiversity (diving, kayaking, wildlife watching from boats and seabird watching) in the coastal temperate area of Wales and its application to MSP. The assessment of the economic importance and spatial distribution of these uses was ascertained through questionnaires with relevant users. Results indicated that the economic importance of non-extractive recreational uses of marine biodiversity in Wales is comparable to that of commercial fisheries for the same region. Spatially there was a significant degree of overlap among areas used by the different recreational groups studied here and the distribution of uses could be linked to different aspects of marine biodiversity, such as the presence of particular habitats in the case of divers. The integration of spatially explicit socioeconomic data for a range of different uses of marine biodiversity enables policy makers to gain useful insight into the potential consequences of implementing a spatial management regime, as certain uses can be sometimes overlooked but are still essential if we are to consider the impact of spatial planning on all economically relevant activities. Such data provide a balanced overview of the value of marine biodiversity to different sectors of society and contributes to the process of developing comprehensive marine spatial plans.

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Introduction

Marine biodiversity provides society with a wide range of goods and services that are essential for the maintenance of our social and economic wellbeing [1]. The benefits provided by marine biodiversity, in terms of ecosystem goods and services, can be divided into four main categories: provisioning services, regulating services, cultural services and supporting services [2].

Over the past decade, the economic assessment of the services provided by ecosystems has become increasingly important in a policy context [3–8]. Although some of the approaches used in the assessment of the economic importance of biodiversity have been controversial [9], in the absence of monetary valuation some biodiversity services might be overlooked during decision making. This may lead to inappropriate decisions that in some instances may result in the degradation of the marine environment and the services it provides.

Cultural services, defined as the non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences [2], are among those provided by marine biodiversity. Thus far however, studies on the assessment of the economic importance of cultural services have mainly focused on iconic marine habitats (e.g., coral reefs) and species (e.g., whales) [10–14]. Activities such as whale-watching or scuba-diving on coral reefs attract high numbers of visitors and generate significant economic revenues both at a local and national scale [15]. In contrast, the importance

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of economic inputs derived from cultural services in temperate systems has received less attention perhaps as a consequence of a lower prevalence of iconic species and habitats (but see [7,16]).

Highlighting the economic importance of non-extractive uses associated with marine biodiversity in temperate areas can have benefits in promoting conservation as these uses are more easily regulated and their effects are less likely to contribute to biodiversity degradation than industrial scale activities (e.g., fishing and aggregate extraction), which generally makes them more compatible with conservation objectives. Furthermore, the assessment of the economic inputs of the services provided by marine biodiversity facilitates their incorporation into management plans, particularly if the geographic distribution of these services can be integrated into marine spatial planning (i.e., such as the implementation of marine protected areas) [17]. Such information can be used to facilitate stakeholder engagement and can help in conflict resolution when designing networks of marine protected areas from which some activities may be excluded or more strictly regulated.

The aim of this paper was to provide a measure of the importance of the economic inputs of marine biodiversity in temperate coastal areas in terms of the provision of recreational services and to highlight the significance of mapping the distribution of these services to inform comprehensive spatial management. This study concentrates on the assessment of the economic importance and geographic distribution of four non-extractive recreational uses of the marine environment for which marine biodiversity may have an important role. Recreational scuba-divers, sea-kayakers, customers of wildlife viewing boat trips and seabird watchers were surveyed in Wales (United Kingdom) in order to define the characteristics of their activities and to obtain information on their economic significance. As this study builds on a previous assessment of the economic value of provisioning services (fisheries) in the same area [18], a comparison of the relative importance and overlap of these activities is possible. The results of this study provide policy-makers and managers with a more objective means of assessing the relative importance of different activities that occur in the marine environment in the context of marine management plans.

Material and methods

Study area

The present study focused on Wales, United Kingdom (UK). The coastal area of Wales encompasses 1300 km of coastline and it is a popular tourist destination (Fig. 1). In 2007, Wales hosted a total of 8.85 million UK domestic trips, of which approximately 48% occurred at seaside destinations [19], it was estimated that domestic tourists spent approximately £742.6 million at Welsh seaside destinations.

Survey design

The present study provides a measure of the economic importance of those non-extractive recreational activities that are dependent to some degree on marine biodiversity and which do not impinge on its integrity if adequately managed. The assessment of the economic importance and geographic distribution of diving, kayaking, wildlife viewing cruises and seabird watching was undertaken using questionnaire surveys. Two different approaches were adopted to survey the various user groups. Divers, kayakers and seabird watchers were surveyed using an on-line questionnaire [20]. This survey method was chosen due to the impracticality of intercepting a representative sample of such a wide-spread population using face-to-face questionnaires. The survey was promoted through

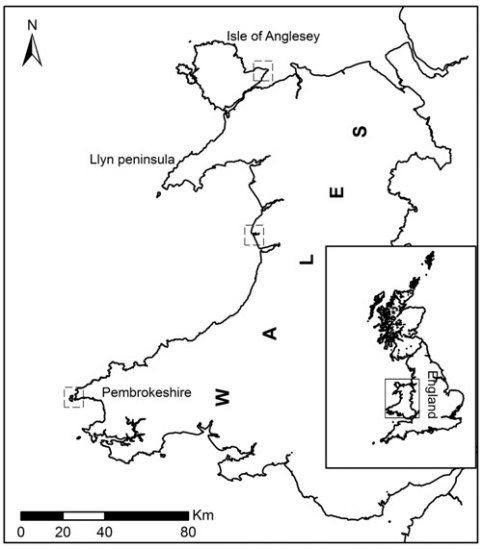

Fig. 1. Overview map of the study area. Dashed squares indicate interview locations with wildlife viewing trips customers.

diving, kayaking and birding clubs and associations in Wales and England. Additionally, in order to reach those users who might not have belonged to any clubs or associations, flyers and posters promoting the study were distributed among watersports retailers throughout Wales and England. Press releases were also published in several relevant magazines and fora in both paper and electronic formats (e.g., [21–23]).

Customers of wildlife viewing trips were surveyed by means of face-to-face questionnaires. Twenty-one boat operators were identified along the Welsh coastline. Due to logistical limitations it was not possible to carry out a meaningful number of questionnaires at each of the 21 boat operators sites. Therefore, in order to obtain a good geographical survey coverage, the coast of Wales was divided into three areas, namely North, Mid and West Wales, where three locations were selected to undertake questionnaires (Fig. 1).

The information sought through the questionnaires focused on the characteristics of the user's trip, the expenditure incurred, the reasons for choosing a particular activity area and demographic information. The spatial distribution of activities was also assessed (Section 2.4).

In order to obtain the total revenues produced through the activities included in the study it was necessary to estimate the average expenditure per person per day for each of the activities and to scale the results to the population level. The average spend per person per day for each activity was calculated using information collected for the expenditure incurred on food and drink, accommodation, travel costs and the total duration of the activity visit. Additionally, boat-use related expenditures, air tank refills and equipment hire were included for divers. Equipment rental was included for kayakers and in the case of wildlife-cruise customers the cost of the boat ride was also included in the calculations. Estimates for the total number of activity days in Wales for each user-group were ascertained as outlined in Section 2.3.

Estimation of total number of activity days

Scuba diving

No previous information existed on the number of diving activity days in Wales. The estimation of diving activity days was undertaken as follows. First, in 2007 the Watersports and Leisure participation survey, a survey carried out each year by the

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