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IMPASEA: A methodological framework to monitor and assess the socioeconomic effects of marine protected areas. An English Channel case study

D. Rodríguez-Rodríguez [a,*], S.E. Rees [a], L.D. Rodwell [a], M.J. Attrill [a,b]

[a] Centre for Marine and Coastal Policy Research, Marine Institute, Plymouth University, Drake Circus, Plymouth, Devon PL4 8AA, UK
[b] Marine Biology and Ecology Research Centre, Marine Institute, Plymouth University, Drake Circus, Plymouth, Devon PL4 8AA, UK

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ABSTRACT

Marine protected areas (MPAs) are increasingly regarded as socio-ecological systems. In addition to their reported ecological effects, MPAs may have important social, economic and cultural effects on local communities and marine and coastal stakeholders. Those effects should be considered within an ecosystem approach to MPA planning, designation and management. Here we present a new framework to monitor and assess the socioeconomic effects of MPAs saliently and soundly: the Integrated MPA Socio-Economic Assessment (IMPASEA). The IMPASEA considers and analyses those factors deemed most important for marine and coastal stakeholders in a spatially referenced, sound and cost-effective manner. The development of the IMPASEA followed a mixed-methods research design in 3 phases: literature review, stakeholder survey and geo-statistical analysis using a Multiple-Paired-Before-After-Control-Impact design (MPBACI). The framework was tested on a set of 6 multiple-use MPAs on the French side of the English Channel. Of the eight socioeconomic variables analysed at the scale of '*commune*' in the geo-statistical phase, only one variable ('number of hotel rooms') might have been affected by the designation of MPAs. Factors such as MPA designation category and management status are likely to have contributed to the non-significant differences shown at the scale of *commune* for the selected MPAs. In contrast, most of the six variables related to fishing showed differences between ports inside and outside MPAs, although these results need further ground truthing to discriminate attribution of effects. The characteristics of the IMPASEA make it a sound monitoring and assessment framework that could be applied in different contexts and to different types of sustainability assessments involving protected areas or other spatially-defined entities under certain conditions: existence of consistent time series of fine-scale socioeconomic data and avoidance of overlap of designation categories over single spaces.

1. Introduction

Ongoing efforts to meet international marine protected area (MPA) coverage targets in seas and oceans are resulting in a rapidly increasing amount of marine area being protected worldwide, currently at 3.4% (UNEP-WCMC, 2014). In addition to their reported ecological effects (Edgar et al., 2014; Selig and Bruno, 2010), MPAs may have important social, economic and cultural effects on local communities and marine and coastal stakeholders (Rodríguez-Rodríguez et al., 2015a; Santo, 2013). An ecosystem approach (Shepherd, 2008) to MPA planning, designation and management needs to identify and assess the range of implications for local communities and economies arising from such processes in order to facilitate sustainable development in these increasingly common, spatially defined socio-ecological systems (Armsworth et al., 2007).

The ecosystem approach is defined as 'the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way' (CBD, 2000). It embeds the three overriding principles of sustainable development: environmental conservation, social equity and economic profitability at ecologically recognisable scales (Shepherd, 2008). Even though ecologically MPAs are often included within broader seascapes and/or coastal landscapes, they represent an adequate and easily recognisable scale for the implementation of the

* Corresponding author. Tel.: +44 1752584899.
E-mail addresses: david.rodriguez-rodriguez@plymouth.ac.uk, davidrgrg@yahoo.es (D. Rodríguez-Rodríguez), sian.rees@plymouth.ac.uk (S.E. Rees), lynda.rodwell@plymouth.ac.uk (L.D. Rodwell), m.attrill@plymouth.ac.uk (M.J. Attrill).

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ecosystem approach: they have clear boundaries; biodiversity, culture and ecosystem service conservation mandates; and specific regulations and management that are likely to influence a range of local stakeholders (Dudley, 2008).

The socioeconomic effects of MPAs result from the reallocation of access rights to coastal and marine resources (Bennett and Dearden, 2014) resulting in a shift from marine and coastal areas providing private benefits to these areas providing broader public benefits in terms of enhanced biodiversity conservation and ecosystem service supply (Hussain et al., 2010). These effects are likely to be wider and more significant on some sectors of the community (Rees et al., 2010a), such as local stakeholders (Mangi et al., 2011) and economically-dependent communities, especially in developing countries (Hull et al., 2010; West et al., 2006), than for more distant stakeholders in more socio-economically diversified contexts (Rodríguez-Rodríguez et al., 2015a).

The Convention on Biological Diversity's target to protect 10% of the world's coasts and oceans by 2020 (CBD, 2010) is expected to have important consequences for local and regional coastal communities (Santo, 2013). Furthermore, ongoing MPA network designation processes in several countries are likely to exceed that protection figure (Jones, 2012; Rodríguez-Rodríguez et al., 2015b; Santo, 2013), which may entail even broader and more intense social and economic consequences for those communities. Therefore, it is necessary to appraise what these consequences could be in order to maximise the positive ones and minimise or offset the negative impacts, if possible ahead of designation.

The effects of MPA designation on local societies and economies have recently started to be assessed in a range of settings to ensure that benefits and costs from those processes are equitably distributed across society (Commonwealth of Australia, 2005; Hull et al., 2010; JNCC, 2013; Natural England, 2012; Schreckenberg et al., 2010). There are, however, a number of caveats about existing socioeconomic assessments. Some studies have only dealt with the socioeconomic costs (Balmford et al., 2004; Natural England, 2012; Santo, 2013) or benefits (Fletcher et al., 2012; Hussain et al., 2010; Sala et al., 2013) accruing from the establishment of MPAs. Additionally, most of the existing socioeconomic impact assessment research has focused on one or few stakeholder groups, mainly fishers (Commonwealth of Australia, 2005; Hull et al., 2010; INDECO, 2005; Mangi et al., 2011; Rees et al., 2013) and recreation and leisure stakeholders (Rees et al., 2010b; Sala et al., 2013), with few studies being broader in scope (Natural England, 2012). Moreover, many of the indicators used for socioeconomic assessments are qualitative (Schreckenberg et al., 2010), which may pose some problems regarding accuracy (Azqueta et al., 2007) and precision (Mangi et al., 2011). Finally, only some of these methods and techniques are considered useful for managers, decision-makers, local communities and NGOs as end users as they are often based on different approaches, assumptions and resources (Schreckenberg et al., 2010). Thus there is a need for a consistent, balanced, simple, cost-effective and robust technique to monitor and assess socioeconomic effects of MPAs meaningfully for management, decision-making and reporting purposes (Schreckenberg et al., 2010). The objective of this study was to develop and test a framework for the socioeconomic monitoring and assessment of MPAs that meets as many as those requirements as possible in order to answer the following research question: 'Do MPAs have a socioeconomic effect on local communities?'

2. Methods

2.1. Development of the socioeconomic monitoring and assessment framework

The framework was developed within the Protected Areas Network Across the Channel Ecosystem project (PANACHE, 2014). Qualitative and quantitative methodologies were used to answer our research question through a mixed methods research design (Gray, 2014) in 3 phases: (1) literature review, (2) stakeholder survey, and (3) geo-statistical analysis following a Multiple-Paired-Before-After-Control-Impact (MPBACI) semi-experimental research design.

2.1.1. Phase 1: literature review

In phase 1, a group of marine and coastal stakeholder categories relevant to the European context as well as a set of socioeconomic variables likely to be influenced by the designation of MPAs in industrialised settings were selected through a purposive review of the literature (Appendix A). We used Google and Google Scholar engines to look for relevant scientific articles, grey literature and websites using the following search terms: 'Marine protected area' & 'impact'; or 'effect'; or 'society'; or 'social'; or 'economy'; or 'economic'; or 'socioeconomic'; or 'stakeholder'. To reduce reporting biases towards social benefits or costs of MPA designation (Schreckenberg et al., 2010), we attempted to identify a balanced representation of variables and stakeholder categories according to the interests at stake and the effects resulting from MPA designation, both positive and negative, based on previous research (DEFRA, 2011; Natural England, 2012).

2.1.2. Phase 2: stakeholder survey

We followed a purposive sampling data collection method (Gray, 2014) to identify individual national or regional (intra-national) umbrella organisations in the UK and France belonging to the stakeholder categories identified in phase 1: national associations, federations, unions, ministries, boards, etc. A maximum of three organisations per category and country was selected. The selection of relevant stakeholder organisations was made based on the literature review, previous MPA appraisal experiences (JNCC, 2013) and our own MPA research experience. Representatives from those organisations were surveyed using an online, structured questionnaire in order to select a reduced set of variables ('priority 1' variables vs 'priority 2' variables) for the main marine and coastal stakeholder organisations in the UK and France (Rodríguez-Rodríguez et al., 2015a).

2.1.3. Phase 3: geo-statistical analysis

A quantitative methodology following a Multiple-Paired-Before-After-Control-Impact research design (MPBACI; Addison, 2011) was then used to assess the effect of a set of multiple-use MPAs on the most important socioeconomic variables to stakeholders. Rife et al. (2013) recognise that analysing data from multiple sample units from within and (nearby) outside MPAs before and after the designation of MPAs is the optimal design to evaluate the efficacy of an MPA. Secondary data in the form of official statistics (Appendix B) were used for ease of access, objectivity, consistency, cost-effectiveness and comparability over time (Gray, 2014; Pugh, 2008). Proxies were used for some variables for which official statistics could not be retrieved.

A number of 'essential' criteria for selecting adequate MPAs to test our framework were proposed in order to maximise the internal validity of results as well as data availability (Table 1). An additional set of 'desirable' MPA selection criteria was also proposed in order to increase accuracy and broaden the interest of the results.

In order to ensure a proper scale of analysis, availability and comparability of data over time, standard Lower Layer Super Output Areas (LSOAs; ONS, 2014) for the UK and *communes* for France (Gouvernement Français, 2014) were chosen as our basic 'community' spatial scales of analysis. For the purposes of this study, we will refer to LSOAs and *communes* as spatial units (SUs). Both SUs represent the finest geographic scales for which official