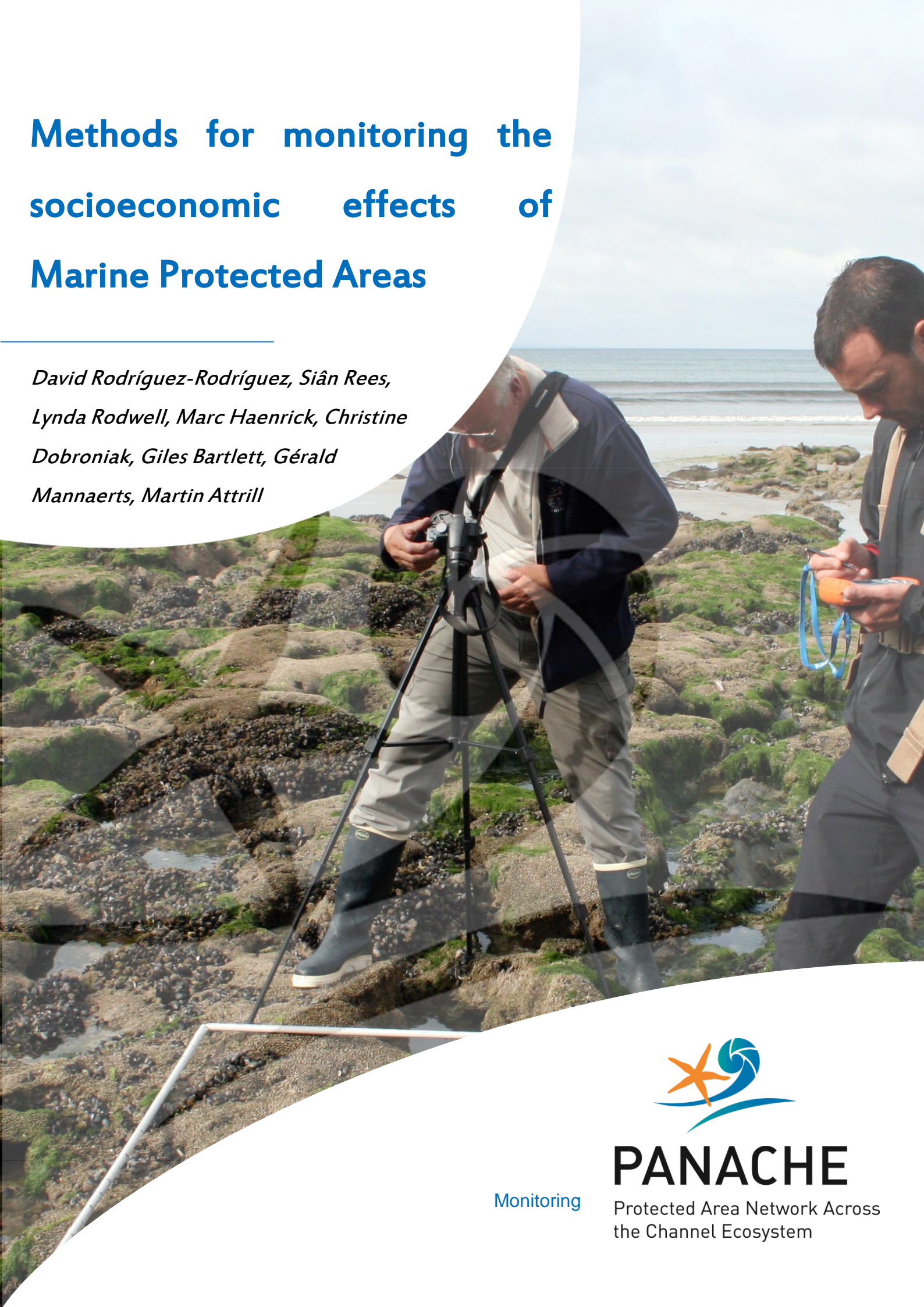


Methods for monitoring the socioeconomic effects of Marine Protected Areas

*David Rodríguez-Rodríguez, Siân Rees,
Lynda Rodwell, Marc Haenrick, Christine
Dobroniak, Giles Bartlett, Gérald
Mannaerts, Martin Attrill*



PANACHE

Protected Area Network Across
the Channel Ecosystem

Monitoring

Methods for monitoring the socioeconomic effects of MPAs

Monitoring

Prepared on behalf of / Etabli par



by / par

Author(s) / Auteur(s) : David Rodríguez-Rodríguez, Siân Rees, Lynda Rodwell, Marc Haenrick, Christine Dobroniak, Giles Bartlett, Gérald Mannaerts, Martin Attrill

Contact : David Rodríguez-Rodríguez
david.rodriguez-rodriguez@plymouth.ac.uk

In the frame of / dans le cadre de



Work Package 2

Work quotation: Rodríguez-Rodríguez, D., Rees, S., Rodwell, L., Haenrick, M., Dobroniak, C., Bartlett, G., Mannaerts, G., Attrill, M., 2014. Methods for monitoring the socioeconomic effects of MPAs. Report prepared on behalf of Grand Port Maritime de Dunkerque, Marine Institute and WWF for the Protected Area Network Across the Channel Ecosystem (PANACHE) project. . INTERREG programme France (Channel) England funded project 74 pp.

Cover photo: C. Lefevre / Agence des aires marines protégées

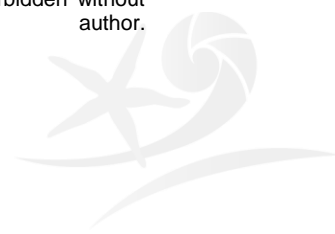


European Regional Development Fund
The European Union, investing in your future



Fonds européen de développement régional
L'union Européenne investit dans votre avenir

This publication is supported by the European Union (ERDF European Regional Development Fund), within the INTERREG IVA France (Channel) – England European cross-border co-operation programme under the Objective 4.2. “Ensure a sustainable environmental development of the common space” - Specific Objective 10 “Ensure a balanced management of the environment and raise awareness about environmental issues”. Its content is under the full responsibility of the author(s) and does not necessarily reflect the opinion of the European Union. Any reproduction of this publication done without author’s consent, either in full or in part, is unlawful. The reproduction for a non commercial aim, particularly educative, is allowed without written authorization, only if sources are quoted. The reproduction for a commercial aim, particularly for sale, is forbidden without preliminary written authorization of the author.



Methods for monitoring the socioeconomic effects of MPAs

Techniques pour le suivi socioéconomique des AMPs

ABSTRACT

Recent legal and policy developments prompt us to assess social, economic and cultural effects of (MPAs) on local communities and marine and coastal stakeholders accurately and cost-effectively. In this report, we present a new marine protected area (MPA) socioeconomic assessment framework based on a mixed methods research design in 3 phases. In Phase 1, we conducted a literature review to identify a set of potentially relevant socioeconomic variables and stakeholder categories relevant in Europe. In Phase 2, we conducted an online survey among the main marine and coastal organisations in the UK and France to gather their perceptions of MPAs and their rating of potential socioeconomic variables for measuring MPAs' socioeconomic effects. In Phase 3 we used publicly available official statistics on those variables (or proxies) in a Multiple-Paired-Before-After-Control-Impact analysis to assess the socioeconomic effects of 6 case study MPAs in the PANACHE project area. A set of 14 socioeconomic variables for which data were available was identified. Of these, five variables were categorised as 'priority 1' and nine variables as 'priority 2' for stakeholders. Eight of them were community-scale variables, whereas 6 of them were sectorial variables related to fishing. Mixed Factorial ANOVA or descriptive statistics were used. No evidence of community-scale effects from our sample of stakeholders or MPAs was found, whereas effects were apparent on most fishing-related variables and also stated by some of the stakeholders surveyed. Our findings suggest that future socioeconomic assessments should focus on MPA effects on specific stakeholders rather than on the broader community. However, results should be handled with care due to the non-random selection of our sample of organisations and MPAs, the low sample sizes of some variables (e.g. fishing-related ones) and the likely masking effect of delayed management of some of the selected MPAs. Further studies should help to generalise our findings and the applicability of the framework.

KEYWORDS: Socioeconomic assessment, marine protected area, English Channel, mixed method, IMPASEM.

RÉSUMÉ

Les récentes évolutions juridiques et politiques nous incitent à évaluer les effets sociaux, économiques et culturels des AMP sur les communautés locales et les parties prenantes sur le littoral et en mer de façon précise et efficiente. Dans ce rapport, nous présentons un nouveau cadre d'évaluation socioéconomique des aires marines protégées (AMP) basé sur un modèle de recherche au moyen de techniques mixtes en trois phases. Au cours de la Phase 1, nous avons conduit une analyse bibliographique afin d'identifier un ensemble de variables socioéconomiques pouvant être pertinentes et les catégories de parties prenantes concernées en Europe. Lors de la Phase 2, nous avons mené une enquête en ligne auprès des principaux organismes maritimes et du littoral au Royaume-Uni et en France pour recueillir leurs perceptions des AMP et leur évaluation des variables socioéconomiques potentielles permettant de mesurer les effets socioéconomiques des AMP. Pour la Phase 3, nous avons utilisé les statistiques officielles accessibles au public sur ces variables (ou indicateurs) dans le cadre d'une analyse de type Avant/Après-contrôle/impact par paires multiple pour évaluer les effets socioéconomiques de six AMP faisant l'objet d'une étude de cas dans la zone du projet PANACHE. Un ensemble de 14 variables socioéconomiques pour lesquelles des données étaient disponibles a été identifié. Parmi elles, cinq variables ont été classées sous la « priorité 1 » et neuf variables sous la « priorité 2 » pour les parties prenantes. Huit d'entre elles sont des variables à l'échelle des communes, tandis que six sont des variables sectorielles liées à la pêche. Des statistiques descriptives ou l'ANOVA à plusieurs facteurs ont été utilisées. Aucun élément probant n'a permis de conclure à des effets à l'échelle des communes à partir de notre échantillon de parties prenantes ou d'AMP, alors que les effets étaient visibles sur la plupart des variables liées à la pêche et également déclarés par certaines des parties prenantes interrogées. Nos résultats suggèrent que les futures évaluations socioéconomiques devraient se concentrer sur les effets des AMP sur des parties prenantes spécifiques plutôt que sur la communauté au sens large du terme. Cependant, les résultats doivent être traités avec précaution en raison de la sélection non aléatoire de notre échantillon d'organismes et d'AMP, des petites tailles d'échantillons de certaines variables (par exemple celles liées à la pêche) et de l'effet de masquage probable dû au retard de gestion de certaines AMP sélectionnées. D'autres études devraient permettre de généraliser nos conclusions et l'applicabilité du cadre.

MOTS-CLÉS : Evaluation socioéconomique, aire marine protégée, Manche, méthode mixte, IMPASEM



Contents

Executive summary.....	1
Rationale.....	5
I. Introduction.....	5
1.1 Need for socioeconomic monitoring of MPAs.....	5
1.2 Existing studies on MPA socioeconomic assessment.....	6
1.2.1 Global MPA socioeconomic studies.....	6
1.2.2 MPA socioeconomic studies in the Channel.....	7
II. Overview of existing MPA socioeconomic monitoring methods.....	8
2.1 Existing methods.....	8
2.1.1. Project appraisal and evaluation techniques.....	9
2.1.2. Bio-economic models.....	10
2.1.3. Indicator systems.....	11
2.1.4. Social surveys.....	12
III. Research question, methodology and design.....	13
3.1 Phase 1: Literature review.....	16
3.1.1. Data collection.....	16
3.2 Phase 2: Stakeholder survey.....	16
3.2.1. Research sub-questions.....	17
3.2.2. Data collection.....	17
3.2.3. Data analysis.....	18
3.3 Phase 3: MPBACI design.....	20
3.3.1. Research hypothesis.....	21
3.3.2. Data collection.....	21
3.3.3. Data analysis.....	24
IV. Results & discussion.....	25
4.1 Literature review.....	25
4.1.1. Variable identification.....	25
4.1.2. Stakeholder category identification.....	26
4.2 Stakeholder survey.....	27



4.2.1. Survey completion figures	27
4.2.2. Stakeholder selection	28
4.2.3. MPA stakeholder self-classification (Q3 & Q4)	32
4.2.4. Main MPA effects perceived by stakeholders (Q5)	36
4.2.5. Variable prioritisation: Identifying the most important socioeconomic factors for marine and coastal stakeholders (Q6 & Q7)	39
4.2.6. Perceived temporal scale of the ecological, social, economic and cultural effects of MPAs (Q8).....	44
4.2.7. Perceived spatial scale of the ecological, social, economic and cultural effects of MPAs (Q9).....	45
4.2.8. Perceived intensity of MPA effects on local communities and economies (Q10)	46
4.3 MPBACI design	47
4.4 Limitations of the study.....	52
V. Conclusions and recommendations	53
5.1 Conclusions	53
5.2 Recommendations	54
Acknowledgements.....	55
VI. References	56
Appendix	68
Appendix 1: Questions of the stakeholder survey.....	68
Appendix 2: Criteria used in the expert discrimination survey	70
Appendix 3: Main characteristics of the MPAs assessed in Phase 3 of the study.....	71
Appendix 4: Assessment of the technique	73



Executive summary

In addition to their reported ecological effects, marine protected areas (MPAs) may have important social, economic and cultural effects on local communities and marine and coastal stakeholders. Recent legal and policy developments prompt us to assess those effects accurately and cost-effectively in order to maximise benefits and minimise costs of MPA designation. A diversity of methods exists to assess the socioeconomic effect of MPAs: project appraisal and evaluation methods, bio-economic models, indicator systems and social surveys being among the main methods that can be used.

Here we present a new framework to assess the socioeconomic effects of MPAs: the Integrated MPA Socio-Economic Monitoring (IMPASEM). The IMPASEM 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 IMPASEM followed a mixed-methods approach in 3 phases. In Phase 1, a group of relevant marine and coastal stakeholder categories in the UK and France as well as a set of socioeconomic variables likely to be influenced by the designation of MPAs in Europe were selected through a literature review. A qualitative methodology (stakeholder survey) was then followed whereby we selected a reduced set of variables that were identified as being the most important for the main marine and coastal stakeholder organisations in the UK and France (Phase 2). A quantitative methodology (Multiple-Paired-Before-After-Control-Impact research design, Phase 3) was then used on a set of multiple-use MPAs in the PANACHE project area. From this we were able to assess the effect of these MPAs on some of the variables that were the most important to stakeholders and validate the results from Phase 2 to produce more robust evidence.

In **Phase 1**, a set of 64 potentially relevant socioeconomic variables in a European context were identified along with a comprehensive list of 20 relevant marine and coastal stakeholder categories from a literature review. A set of 90 national or regional umbrella organisations (47 British and 43 French associations, federations, unions, boards, councils or ministries) representing the interests of a number of individuals or smaller member organisations in both countries was subsequently identified.

In **Phase 2**, an online survey was used in order to assess the organisational perceptions on multiple-use MPAs and to identify the most important socioeconomic variables by the stakeholders to monitor the socioeconomic effects of MPAs to be used in Phase 3. Questions were posed regarding the perceived influence of multiple-use MPAs on stakeholder organisations and to elicit the organisational perspectives on the broad social, economic, cultural and economic effects of multiple-use MPA designation as well as on multiple-use MPAs' spatial and temporal effects. The results show that the main perceived beneficiaries of multiple-use MPA designation are environmental



NGOs, research centres, MPA managers and statutory nature conservation bodies as MPAs fits within their ongoing campaigns and organisational remit or provide broader opportunities for research. In contrast, fishers' organisations and most industrial and recreational organisations stated that they were negatively affected by the designation of MPAs, mainly as a result of new restrictions, greater bureaucracy and higher incurred costs for their activities. Catering and accommodation businesses stated they were not affected by or interested in multiple-use MPAs.

On average, stakeholders perceived multiple-use MPAs' ecological effects as 'largely positive' even though 30% of the respondents did not perceive any ecological benefit from multiple-use MPAs. The social, economic and cultural effects of multiple-use MPAs are perceived as 'moderately positive'.

A majority of stakeholders perceived that the biggest environmental, social, economic and cultural effects from the designation of multiple-use MPAs are felt permanently and in a wide geographical range (>10km), although a substantial proportion (31.2% and 38.6% on average, respectively) could not reply to these questions. This suggests a notable social 'expectation' in the performance of MPAs that may not be substantiated by scientific evidence. Further research and enhanced communication could help to set up more realistic societal expectations towards multiple-use MPAs.

Stakeholders were also asked whether they perceived any increase or decrease in the intensity of some socio-economic variables following multiple-use MPA designation. Five variables were perceived to potentially increase slightly following the designation of MPAs (from 3-6% in the 10-year period since designation): 'research', 'environmental performance by citizens, businesses and towns', 'number of green businesses', 'tourism' and 'economic activities'.

Finally, the stakeholders were asked to rate the set of 64 socioeconomic variables identified from the literature review according to their importance for assessing the effects of multiple-use MPAs on local communities and economies. The most important social variables for the stakeholders, according to their decreasing coefficients of variation, were: 'Environmental outreach of local populations', 'Visitors' satisfaction' and 'Number of research projects undertaken'. The most important economic variables were: 'Fishing effort', 'Human activities developed' and 'Composition of fleets'.

There were statistically significant intra-stakeholder category differences in how individual organisations rated the importance of the set of socioeconomic variables amongst 'Scientists', 'Recreational associations', 'Environmental associations' and the 'Fishing industry'.

In **Phase 3**, the effect of a convenient sample of 6 French, multiple-use MPAs in the PANACHE project area on 14 socio-economic variables for which official, consistent time series of data were available was geo-statistically analysed using a Multiple-Paired-Before-After-Control-Impact (MPBACI) semi-experimental research design. Eight of these variables were analysed at the community scale (scale of *commune*) whereas 6 were sectorial variables related to fishing. The



statistical analysis of the data does not allow us to support our quantitative research hypothesis ('the designation of multiple-use MPAs has social and economic effects at the community level'), as no variable showed a statistically significant effect at the community scale. Communities inside those MPAs experienced no changes in most of the eight community scale variables compared to communities located outside the MPAs. Only the 'number of hotel rooms' showed a substantial difference, although this is probably a specific result of the MPA analysed and may have been caused by factors other than the designation of the MPA. Regulations related to multiple-use MPA designation do not seem to have had an effect that is intense or broad enough to reflect statistically significant differences at the community scale for the selected MPAs. The fact that all the MPAs analysed are multiple-use MPAs rather than highly restrictive marine reserves may have influenced the 'low intensity' of their socioeconomic effects. Additionally, the facts that just one of the MPAs considered has a management plan and that only two of them have active management in place are likely to have played a role in 'masking' the socioeconomic effect of these MPAs and thus contributed to the non-significant differences shown at the scale of commune.

The sectorial analysis of the fishing activity in those MPAs suggests some possible MPA effects, however. At two ports located within the two managed MPAs (Dunkerque and Douarnenez) the following variables decreased substantially after the designation of the Banc des Flandres Specially Protected Area and Iroise marine nature park, respectively: 'number of fishers on coastal boats', 'average length of fishing boats', and 'total power of coastal fishing boats'. In contrast, those variables increased slightly or moderately in the control port of Brest in the same period. These results should be interpreted with caution due to the low number of cases analysed and might be due to specific or wider management actions at the three ports considered. Conversely, the 'volume of landings' and 'value of landings' have increased at those ports inside MPAs substantially more than in the control port. This might reflect increased landing activity by external boats in those ports and/or enhanced performance or quota increases by the coastal and/or offshore fleets linked to those home ports. Further analysis is required at the individual port level to accurately separate any MPA effects from specific or wider fisheries management measures and other local economic drivers that may have influenced these variables.

The **general results** from both main parts of the study (Phases 2 & 3) suggest that there are no community scale effects of multiple-use MPAs in the UK and France. However, socioeconomic effects on environmental NGOs, the fishing sector and other stakeholders are apparent and/or perceived. It would be needed to conduct further research that considers a higher number of randomly selected MPAs from diverse locations and management regimes to confirm the results of this study.

However, based on our findings, we recommend streamlining future MPA socioeconomic assessments by focusing on specific stakeholder organisations rather than on the community as a whole. The self-classification of stakeholders shown here can help to inform and streamline public participation in MPA-related socioeconomic processes. Based on these results a



'tiered approach' to stakeholders' involvement based on each organisation's stated degree of interest or influence by MPAs may be most efficient.

The high stakeholder intra-category variability in the rating of important socioeconomic variables suggests that as broad a number of organisations as feasible should be included in such marine socioeconomic processes in the UK and France to ensure proper representation. Additionally, MPA socioeconomic programmes in the UK and France can benefit from considering the most highly rated variables by the stakeholders shown here in order to incorporate a socially meaningful and participative approach to MPA management, monitoring and assessment.

The IMPASEM is an attempt to implement MPA socioeconomic monitoring more soundly and meaningfully. It overcomes some of the drawbacks of existing assessment methods: representation (ensured by a wide stakeholder participation), objectivity (enhanced by structured questionnaires with closed-ended questions), cost-effectiveness (enhanced through online survey techniques and use of secondary, publicly available data), and accurate attribution of MPA's effects (maximised by a sound, spatial-temporal MPBACI design). Its characteristics make the IMPASEM a promising powerful tool that could be applied in different contexts and to different sorts of sustainability assessments involving protected areas or other spatially-defined entities.

The main limitation for the use of the IMPASEM was the compilation of consistent time series of socioeconomic data. The compilation and disclosure of long-term series of multi-purpose socioeconomic data should be encouraged, especially in the UK, where a diversity of information exists, but it comes mainly from one-off studies at different spatial or temporal scales. Additionally, the implementation of the MPBACI phase of the IMPASEM required relatively complex statistical and GIS skills.

Finally, MPA management improvements such as more homogeneous designation schemes that avoid multiplicity of designation categories (and possibly conflicting management objectives) on the same site or the promotion of active MPA management since designation would be desirable, especially in France. This should allow for more effective conservation and for clearer discrimination of MPA's ecological, social, economic and cultural effects.



Rationale

The INTERREG IVA France (Channel)-England PANACHE project (PANACHE, 2014) aims at the better understanding and management of the set of marine protected areas (MPAs) in the English Channel (*La Manche*) by joint actions between French and English organisations. This report was completed as a result of the second phase of the project's Work Package 2 which is concerned with the development and trial of innovative monitoring techniques for MPAs.

As a result of recent requirements to assess the effects of protected areas on local communities (CBD, 2008) and to ascertain the socioeconomic effects of designating MPAs (UK Government, 2009), adequate methods are to be developed and tested. This report shows the mainstream methods that can be used for monitoring the socioeconomic effects of MPAs and trials a new method for assessing the effects of recently established MPAs on local societies and economies in an objective and cost-effective manner.

This research is the result of a collaborative effort between three project partners: the Marine Institute of Plymouth University (England, leading partner), the Grand Maritime Port de Dunkerque (France) and WWF-UK (England).

I. Introduction

1.1 Need for socioeconomic monitoring of MPAs

Protected areas (PAs) are increasingly recognised as socio-ecological systems (Armsworth et al., 2007). PA designation has a wide array of benefits for human populations in terms of direct economic benefits such as increased employment and tourism revenues, peace promotion, international cooperation, protection of traditional culture and enhanced ecosystem service supply (Dudley et al., 2013). Complementarily, the designation of PAs may also have diverse impacts on local populations arising from PA designation, management and opportunity costs, enhanced ecosystem disservices, restrictions in access to resources, alienation or displacement (Kettunen et al., 2013; De Santo, 2013). Driven by overarching European policy, current systematic conservation planning in the UK and France requires an ecosystem approach that takes into account not only nature but also the human activities that take place in an area (OSPAR & HELCOM, 2003).

PA monitoring establishes the basis for assessing the status of protected features, detecting possible effects of protection measures, and identifying and preventing existing pressures and threats (Davies et al., 2001; Chape et al., 2008). PA monitoring should provide the basis for adaptive and effective management (Hockings et al., 2006). As such, it is becoming increasingly important to



assess and address the broad social and economic implications of MPA designation from the early planning stages (Commonwealth of Australia, 2005; Hull et al., 2010) to ensure that benefits and costs from that process are equitably distributed across society (CBD, 2008; Schreckenberg et al., 2010; Toropova et al., 2010). The socioeconomic effects of MPAs result from the reallocation of access rights to coastal and marine resources resulting in a shift from marine and coastal areas providing private benefits to providing broader public benefits (Badalamenti et al., 2000; Commonwealth of Australia, 2005; Kumar & Kumar, 2008; Toropova 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 (West et al., 2006; Hull et al., 2010), than for more distant stakeholders in more socio-economically diversified contexts.

The socioeconomic impact of MPAs is a recent concern. Very few studies had addressed this issue before the new millennium (Badalamenti et al., 2000). However, policy and legislative requirements to assess the impact of MPAs on local communities (CBD, 2008; UK Government, 2009) and a current interest in identifying and assessing services provided by marine and coastal ecosystems (Beaumont et al., 2007; Austen & Malcom, 2011) have bolstered the development of marine socioeconomic assessments (JNCC, 2012). Schreckenberg et al. (2010) identified over 30 different methods and techniques as well as nearly 200 parameters that could be used as indicators of MPA socioeconomic performance. However, only some of these methods and techniques are considered useful for managers, decision-makers, local communities or 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, simple, cost-effective and robust technique to monitor and assess such effects for management, decision-making and reporting purposes (Schreckenberg et al., 2010), as well as for the establishment of long-term, comprehensive metrics of success (Sala et al., 2013). The Convention on Biological Diversity's requirement to protect 10% of the world's coasts and oceans by 2020 (CBD, 2010) will certainly have important consequences for local and regional societies and economies, thus making it necessary to assess what these consequences might be to maximise the positive ones and, conversely, minimise or offset the negative impacts to gain evidence and support for achieving that target (Sala et al., 2013).

1.2 Existing studies on MPA socioeconomic assessment

1.2.1 Global MPA socioeconomic studies

Although the first socioeconomic effects of MPAs started to be explored over a decade ago (Badalamenti et al., 2000), only very recently have the wider effects of MPAs on local societies and economies started to be systematically assessed through tools such as socioeconomic impact assessments (SIA; Commonwealth of Australia, 2005; Fleming & Jones, 2012; Schreckenberg et al.,



2010). Hull et al. (2010) provided a review of 9 MPA socioeconomic case studies using different socioeconomic assessment methods, ranging from spatial tools like Marxan to bio-economic models, cost-benefit or survey-based tools, excluding formal environmental impact assessment tools.

A socioeconomic impact assessment (IA) was carried out by the Department for Environment, Food and Rural Affairs (DEFRA) to appraise the social and economic impacts of the establishment of a network of Marine Conservation Zones (MCZs) in England and Wales (JNCC, 2013). This IA used project appraisal methods to estimate the costs of such a network of MPAs on marine industry, risk management, national defense, archaeology, ports & harbours, recreation and governmental MPA management, surveillance and enforcement costs (Natural England, 2012). The potential benefits arising from increasing tourism or enhanced ecosystem services from that network were not estimated in economic terms but just stated in a narrative form leading to some criticism of the IA process as failing to provide a balanced approach to fully appraise the costs and benefits of MPAs (Atkins et al., 2012; Rees et al., 2014).

Other studies have focused exclusively on the social benefits accruing from the establishment of such network using an indicator-based ecosystem service approach (Fletcher et al., 2012; Hussain et al., 2010). Most of the existing socioeconomic impact assessment has focused on one or a few stakeholder groups, mainly related to fisheries (Commonwealth of Australia, 2005; INDECO, 2005; Hull et al., 2010; Mangi et al., 2011) and tourism (Rees et al., 2010b; Sala et al., 2013), with few studies being broader in scope (Badalamenti et al., 2000; Natural England, 2012). Despite the fact that there is a variety of methods and techniques to assess the social (Schreckenberget al., 2010) and economic effects of MPAs, socioeconomic information systems are still mostly experimental when it comes to assessing nature conservation and management initiatives (INDECO, 2005).

[1.2.2 MPA socioeconomic studies in the Channel](#)

Buléon & Shurmer-Smith (2008) produced a bilingual, French-English atlas on the social, economic, cultural and environmental aspects of the Channel as well as a more recent online version (Buléon & Shurmer-Smith, 2014). Additionally, a series of socioeconomic maps including energy, recreation, fishing and other human activities in the Channel was recently produced in the framework of the CAMIS project (Turbout, 2013). Dauvin (2012) showed the main economic activities taking place in both basins of the Channel. However, neither of these studies assessed MPAs socioeconomic specifically. Specific socioeconomic assessments are included in the management planning of Natura 2000 sites, although these assessments do not evaluate the effects of marine protection on stakeholders but rather the effects of stakeholders on protected habitats and species following the requirements in the Habitats Directive (EU, 1992). These plans provide a baseline evaluation of the socioeconomic activities in these sites as well as management guidance aimed at their sustainable development (Gouvernement Français, 2014a).



Two UK regional MCZ projects were conducted between 2008 and 2011 looking at the specific effects of a new network of MPAs: Balanced Seas, in the south-east, and Finding Sanctuary in the south-west, although their scope was bigger than the Channel area (JNCC, 2013). Some other scientific studies have addressed the socioeconomic effects of MPAs in the Channel area, although most of them were restricted to the Lyme Bay and Torbay area (Rees et al., 2010a,b; Mangi et al., 2011; Fleming & Jones, 2012; Rees et al., 2013a), or the Natura 2000 sites with management plans in place. A DEFRA and Natural England funded project was conducted to monitor both the ecological change and the socioeconomic impacts of this MPA over a 4 year period following the implementation of a Statutory Instrument: The Lyme Bay Designated Area (Fishing Restrictions) Order 2008 which closed a 206 km² area of Lyme Bay reef habitat to bottom towed fishing gear (Mangi et al., 2012). An extensive stakeholder consultation was used to collate and collect primary and secondary quantitative and qualitative information. Primary data were collected mainly through questionnaires, individual and small group interviews, and stakeholder workshops. The secondary data that were collated includes commercial fisheries data such as the wet weight and value of landings, sightings of vessels using the Lyme Bay area, and enforcement costs from the Marine Management Organisation (MMO) and Devon and Severn IFCA (Inshore Fisheries and Conservation Authority).

Finally, it is worth mentioning a number of international research projects that have looked at cross-Channel governance from an integrated socioeconomic-environmental perspective (CAMIS, 2013; PEGASEAS, 2014). Additionally, the VALMER project (VALMER, 2014) currently tries to assess marine ecosystem services provided by 6 case study MPAs, 4 of which are in the Channel area, to support informed marine planning and management.

II. Overview of existing MPA socioeconomic monitoring methods

2.1 Existing methods¹

No standard method exists to assess the social (Schreckenberg et al., 2010) or economic effect of MPAs. We identified four broad categories of complementary methods for the analysis of the socioeconomic effects of MPAs:

¹ We followed a nested classification of 'methodology', 'method', 'technique' and 'tool' to show an increasing level of detail in carrying out a socioeconomic assessment.

2.1.1. Project appraisal and evaluation techniques

This method uses a range of economic valuation techniques to ascertain the overall balance and distribution of a project's effects on communities. They are generally used in environmental impact assessment studies and in the assessment of marine conservation policies, such as the MCZ impact assessment (Natural England, 2012). Cost-benefit analysis, cost-effectiveness analysis, social return on investment, and multi-criteria analysis are all well-developed techniques belonging to this category.

a) Cost-benefit analysis (CBA)

CBA is a technique broadly used by public administrations in public policy analysis (Azqueta et al., 2007). In some countries such as the UK it is compulsory to undertake CBA for appraising public projects (HMT, 2011). This technique tries to formalise the selection of a project's alternative that maximises economic returns (financial CBA) or social welfare (social CBA; this approach has been little used due to measurement difficulties) also considering option 0 (not doing the project) as one of the alternatives. CBA has been used to estimate the benefits of a number of community-managed MPAs in the Pacific (Pascal, 2011).

Economic returns are calculated by identifying the economic benefits and costs of the intended project's actions. However, social wellbeing from MPAs (including many ecosystem services provided by them) is hard to measure due to the difficulty in defining and 'putting a price' (and sometimes a weight when integrating values) on intangible social and environmental assets such as health or biodiversity. Moreover, it does not consider ethical values related to the right of existence of other living beings.

b) Cost-effectiveness analysis (CEA)

CEA is used when the decision to implement a project or public policy has been made (therefore, Option 0 is not considered) and the objective is to carry it out in the most cost-effective manner. Thus, benefit calculation is not needed, as benefits have been taken for granted beforehand (for instance, due to a legal mandate) and the analysis is just restricted to the cost-effectiveness of the different alternatives to carry out the project. This simplifies calculations under the assumptions that no other use of these funds could have been more socially profitable (Azqueta et al., 2007). CEA has been used as a structured decision-support system for coral reef management in the Maldives (Westmacott & Rijsberman, 2000).

c) Social return on investment (SROI)

SROI evolved from social CBA in order to take account of socially desirable project or policy outcomes to achieve wellbeing (NEF, 2013a). These outcomes are ascertained through direct stakeholder engagement and then translated into monetary terms. SROI has been used to assess the



environmental, social and economic value of a marine exhibition in New Zealand compared to the investment in developing the exhibition (Allpress et al., 2014).

SROI aims to provide a more realistic and complete picture of the true effects of a project or policy on communities by including into the equation issues that are not only valuable for experts or decision-makers, but to potentially affected people. In this sense, SROI is more inclusive than CBA or CEA in the sense that it considers the three dimensions of sustainability: social, economic and environmental, and the long-term perspective on gains and losses in its analysis more specifically. It is also a more participative technique as it integrates the input from members of the community and not only from 'experts'. However, concerns regarding the representativeness of selected community members exist. Additionally, complexity and subjectivity regarding the assignment of prices and weights to intangible costs and benefits remain.

d) Multi-criteria analysis (MCA)

MCA compares alternatives to a project or public policy against a set of monetary and non-monetary (e.g., time, social agreement, etc.) criteria. It considers all potential stakeholders affected by the project, classifies them according to their importance and consults them to determine the criteria against which the intervention should be appraised and the weight to be given to each criterion. Heck et al. (2011a) used this technique to identify stakeholders' expectations towards a proposed MPA in Canada.

Performance is assessed through indicators that are subsequently harmonized to a common scale in order to create a global score for each project or policy option. Results are 'best' and 'worst' options for each stakeholder group. The overall 'best' (most acceptable) option is obtained by a negotiating process among stakeholders. It is thus useful for integrating intangibles (e.g., cultural benefits of MPAs) and opposing stakeholder views into the valuation equation. However, it does not necessarily come up with the most effective, efficient or equitable possible solution (NEF, 2013b), given that selected options are likely to be consensus solutions whereby all participating stakeholder groups try to maximize their gains and offset their losses. In this sense, good representativeness is crucial to the social relevance of the agreed option.

2.1.2. Bio-economic models

Bio-economic models present a mathematical and formal representation of the interactions between biological and economic processes that affect MPAs (Garcia et al., 2013). These models have been widely used in marine management and conservation. They integrate a number of biological (e.g. population trends, dispersal abilities, etc.) and economic variables (e.g. fishing effort, MPA size, location, etc.) to assess the best environmental and economic solution to MPA design &/or management in time. They can be used to assist MPA creation (Sanchez & Wilen,



2001), to assess the ecological and economic effects of different fishery management scenarios (Yamazaki et al., 2014), or to propose economic alternatives to traditional exploitation of marine resources (Sala et al., 2013).

Bio-economic models allow assessing the direct effects of a proposal on specific sectors as well as its 'flow-on' effects (*i.e.*, indirect effects on production and induced effects on consumption) on other sectors of the economy by applying suitable multipliers (Commonwealth of Australia, 2005). One obvious advantage of such models is the prospective information they convey to decision-makers under a range of possible scenarios. The accuracy of such models will, however, be highly determined by the variables considered in the model and the quality of the data used (Sala et al., 2013). Additionally, understandability of procedures and results from these models by end-users can be an issue.

2.1.3. Indicator systems

An indicator is a variable that estimates and easily portrays information about a complex parameter that cannot be measured directly (ten Brink, 2006). A good indicator must be: clearly defined, relevant, created transparently, credible, sensible to changes, cost-effective and easy to convey to non-specialists (ten Brink, 2006).

This method is widely used in sustainability assessments for a number of reasons. The fact that indicator systems are usually based on secondary data saves time and costs, especially when compared with research-intensive methods like bio-economic models, iterative participatory techniques such as the SROI or the MCA, or intensive survey techniques such as the 'Contingency valuation' technique. Nevertheless, techniques using primary data from social surveys can also be translated into (mainly qualitative) indicators. Schreckenberget al. (2010) provide a comprehensive review of methodologies using mostly household-scale indicators for the rapid social assessment of conservation initiatives that can generally be applied to MPAs.

Unlike most of the methods and techniques mentioned above, the development and use of these systems do not require specific economic training. This method requires, however, relevant experience for the meaningful selection and interpretation of a set of social and economic variables meeting most of the aforementioned requirements to be assessed at the appropriate temporal and spatial scales. It should also involve the identification of relevant valuation thresholds. Variable and threshold selection can be made by the researcher (from his experience or often from a literature review; e.g., Pugh, 2008) or by stakeholders, following a participatory process (Heck et al., 2011b). Some comprehensive sets of social and economic indicators in marine and coastal areas have been produced: Pomeroy et al. (2004), INDECO (2005), Pugh (2008), Böhnke-Henrichs et al. (2013). The translation of numerical results from indicators to symbols (colours, arrows or faces) makes it easy for anyone to understand the current state of the measured variables as well as their



trend (when repeated measures along time have been taken). Furthermore, indicators can be integrated into indexes aggregating information for communication and decision-making purposes and facilitating understanding by non-specialists (ten Brink, 2006). The socioeconomic monitoring of MPAs is often based on dashboards of indicators used individually (Garcia et al., 2013). An example of this is the MPA indicator dashboard being currently developed by the French Agence des Aires Marine Protégées (AAMP, 2012).

Indicators have also been broadly used for assessing the social and economic benefits accruing from marine biodiversity following an 'ecosystem service' approach, where the benefits that people obtain from ecosystems (MA, 2005) are estimated either in physical units and/or in monetary terms (Beaumont et al., 2008; Hussain et al., 2010). This approach is currently quite popular and seems to be gaining momentum in different social and policy contexts (IPBES, 2014). Nevertheless, much work still needs to be done to properly define and identify ecosystem services, to ensure more precise integrated valuations of the whole range of ecosystem services and to provide a more balanced approach that adequately includes ecosystem disservices (Dunn, 2010) also provided by MPAs.

Some limitations of indicator methods when applied to MPAs relate to the difficulty of attributing effects, data collection and availability, understandability by and salience to end-users, and the difficulty of producing a synthetic MPA evaluation (Schreckenberget al., 2010; Garcia et al., 2013).

2.1.4. Social surveys

A number of recent studies have explored the social perceptions on the effects of MPAs on local welfare and livelihoods by a variety of techniques that included interviewing affected persons within the community (Jentoft et al., 2012; Pita et al., 2013; Rees et al., 2013a,b). These studies provide a valuable and necessary insight into the perceptions of local societies about different social and economic aspects of MPAs that can hardly be obtained otherwise. However, most of these studies have targeted mainly fishers: Mangi et al. (2011), Pita et al. (2013), Horta e Costa et al. (2013), Perez de Oliveira (2013), Rees et al. (2013b). Although fishers are clearly a primary stakeholder group when planning, designating and managing MPAs (Badalamenti et al., 2000), the role of some other important marine and coastal stakeholders needs also to be considered in assessment and decision-making processes (Mangi et al., 2011).

As social surveys rely largely on primary data collected mainly from face-to-face interviews, they are relatively expensive and time-consuming. Even 'remote' survey methods such as online questionnaires or phone surveys can entail substantial expenses in terms of time and costs (Commowwealth of Australia, 2005) as well as bring about low response rates (Petchenik & Watermolen, 2011). Further concerns about these methods refer to the representativeness of the interviewed groups (such as the fishers' example mentioned above), persons or organisations, often failing short of mainstream statistical procedures in terms of numbers and randomness, as well as to the accuracy and reliability of the responses given, that may be biased by external



events, personal prejudices or vested interests among interviewed persons (Azqueta et al., 2007), or even vary sharply for the same person over short periods of time (Mangi et al., 2011).

III. Research question, methodology and design

The Integrated MPA Socio-Economic Monitoring System (IMPASEM) developed here was intended as an innovative, cost-effective, participative and sound MPA socioeconomic monitoring and assessment framework. Grounded on qualitative methods such as social surveys and indicator systems, it also applies a quantitative Before-After-Control-Impact geo-statistical design to rigorously assess the socioeconomic effects of MPAs.

By developing the IMPASEM, we tried to answer the following central research question (Creswell, 2013): 'Do multiple-use MPAs have a socioeconomic effect on local communities?'

Qualitative and quantitative methodologies were used to answer the central research question through a mixed methods research design (Gray, 2014) in 3 phases (Figure 1): 1) Literature review, 2) Stakeholder survey, and 3) Multiple-Paired-Before-After-Control-Impact (MPBACI) semi-experimental research design. 'Mixed methods' have been defined as 'the collection or analysis of both quantitative and qualitative data in a single study in which the data are collected concurrently or sequentially, are given a priority, and involve the integration of data at one or more stages on the process of research' (Creswell et al., 2003:212).



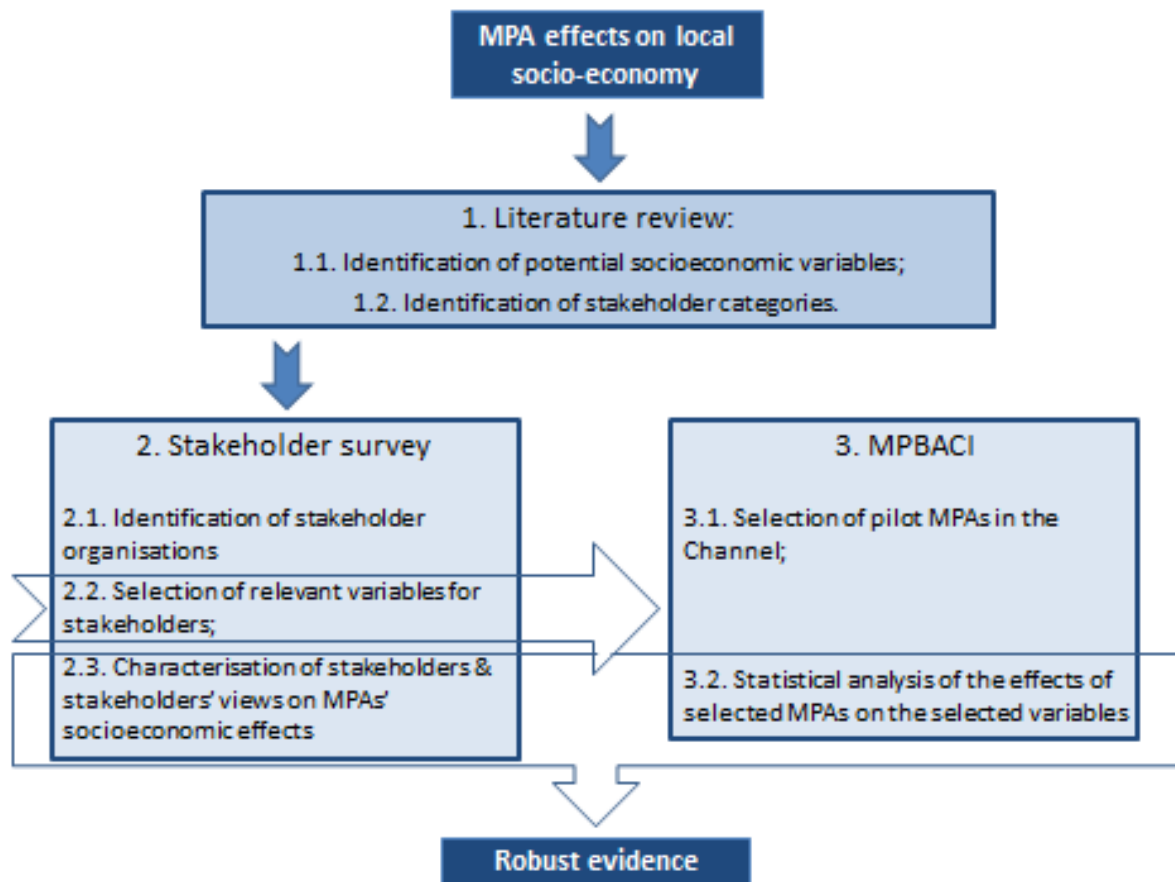


Figure 1. Outline of the mixed methods study design undertaken to develop the IMPASEM showing the main research phases followed in chronological order and the main objectives within each phase.

In Phase 1, a group of relevant marine and coastal stakeholder categories in the UK and France as well as a set of socioeconomic variables likely to be influenced by the designation of MPAs in Europe were selected through a literature review. A qualitative methodology (stakeholder survey) was then followed whereby we selected a reduced set of variables that were identified as being the most important for the main marine and coastal stakeholder organisations in the UK and France (Phase 2). A quantitative methodology (Multiple-Paired-Before-After-Control-Impact research design, Phase 3) was then used on a set of multiple-use MPAs in the PANACHE project area (Figure 2). From this we were able to assess the effect of these MPAs on some of the variables that were the most important to stakeholders and validate the results from Phase 2 to produce more robust evidence (Reed, 2008).

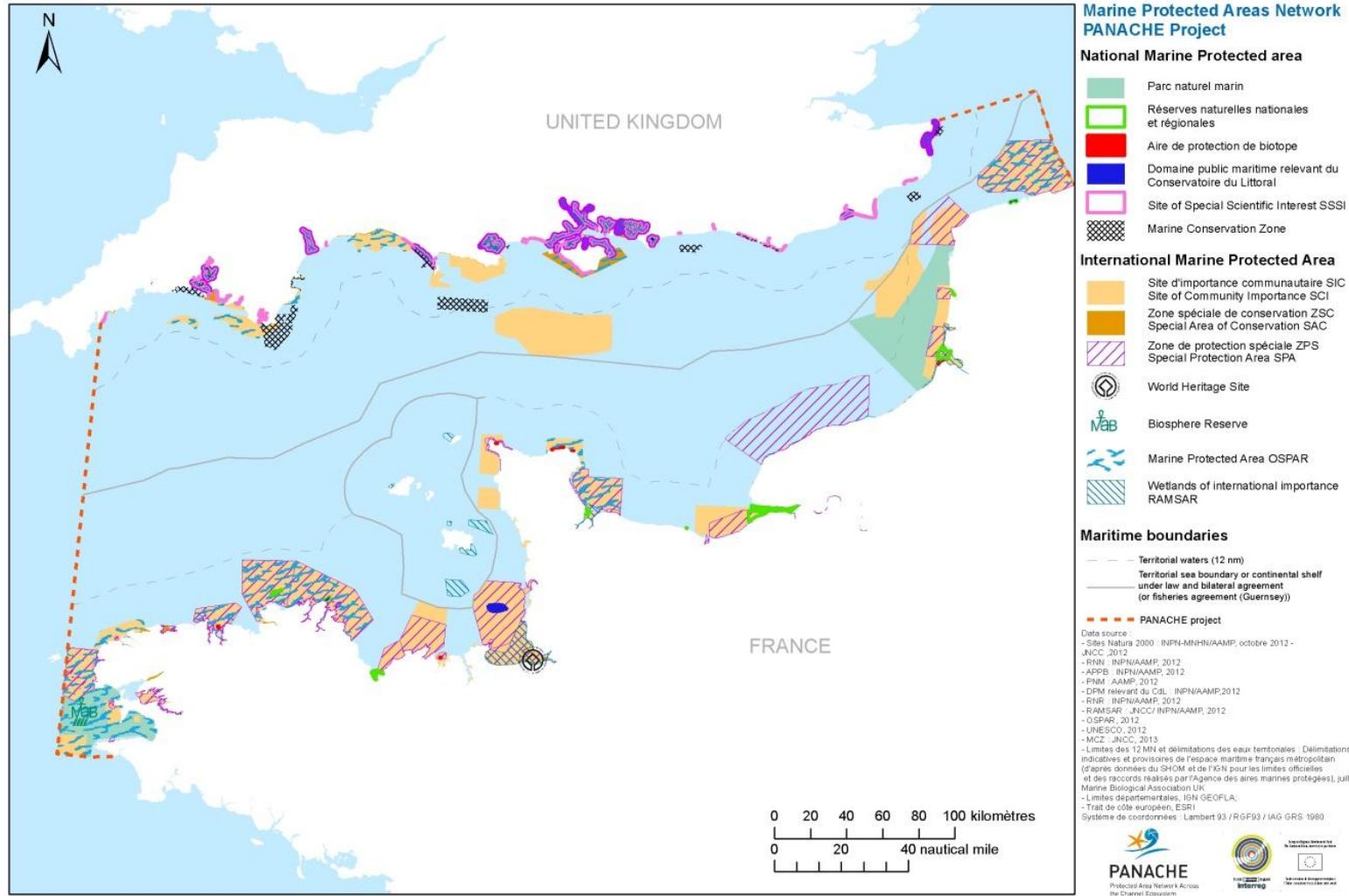


Figure 2. MPAs in the PANACHE project area by designation category



3.1 Phase 1: Literature review

In this first phase, we identified a set of variables of potential interest for assessing the socioeconomic effects of MPAs at a local scale. We also identified a number of relevant marine and coastal stakeholder categories in Europe.

3.1.1. Data collection

Our literature review included peer-reviewed journal articles, published technical documents and official websites. The main sources of information found and used were (in chronological order): Badalamenti et al. (2000); Roberts et al. (2003); Commonwealth of Australia (2005); EUROSTAT (2005); INDECO (2005); West et al. (2006); Pugh (2008); Hull et al. (2010); Schreckenberg et al. (2010); DEFRA (2011); Heck et al. (2011a,b); Mangi et al. (2011); Marine Management Organisation (2011); JNCC (2013); Kettunen & ten Brink (2013); Rees et al. (2013b) & C-SCOPE (2013).

In order to show a balanced approach to socioeconomic MPA effects, we classified all the variables identified from these publications as 'positive' (33%), 'negative' (30%) or 'neutral' (37%) (Schreckenberg et al., 2010) from a subjective *a priori* perspective. This approach helped to reduce reporting biases towards the assessment of socioeconomic 'benefits' (Hussain et al., 2010; Kettunen & ten Brink, 2013; Sala et al., 2013) or 'costs' of MPA designation (Balmford et al., 2004; JNCC, 2012; De Santo, 2013).

We also identified a set of 20 stakeholder categories that could be affected by the designation of new MPAs in Europe. We attempted to provide a balanced representation of the interests at stake and the effects resulting from MPA designation and enforcement, both positive and negative. We initially identified 10 categories of stakeholders as being potentially negatively affected by MPAs and 10 categories of stakeholders as being potentially positively affected by MPAs from a subjective *a priori* perspective. We valued the degree of confidence in our *a priori* stakeholder classification by applying a confidence rating to the stakeholder's 'stance', where '3' represents evidence from peer-reviewed literature, '2' represents evidence from grey literature and '1' represents expert opinion. We also attempted to make this set of categories as comprehensive and discriminant as possible, thus disaggregating some broad categories (such as the fishing sector) into smaller sub-categories according to existing evidence (Heck et al., 2011a; Mangi et al., 2011; Rees et al., 2013a).

3.2 Phase 2: Stakeholder survey

In this second phase of the study, we selected and surveyed multiple national or regional organisations representative of the main socioeconomic activities related to the use of the sea and the

coast in the UK and France to garner a comprehensive social perspective on MPA designation.

3.2.1. [Research sub-questions](#)

In addition to responding to the central research question of the study ('Do MPAs have a socioeconomic effect of local communities?'), the qualitative part of the study sought to answer the following research sub-questions:

- 1) What are the types of stakeholders most affected by the designation of MPAs?
- 2) What are the views of stakeholders on the main effects of MPAs?
- 3) What factors are considered most important for stakeholders to assess the social and economic effects of MPA designation?
- 4) What are the perceived temporal and spatial scales of the effects of MPA designation?
- 5) What is the perceived intensity of the effects of MPA designation on local communities and economies?

3.2.2. [Data collection](#)

We followed a purposive sampling data collection method (Gray, 2014) to identify individual national or regional (intra-national) organisations in the UK and France belonging to the stakeholder categories previously identified in Phase 1. Purposive samples are selected by the surveyor on the grounds that the cases selected maximise the information provided about the studied phenomenon (Gray, 2014; Fleming & Jones, 2012). For practical reasons, we selected a maximum of three relevant organizations from each stakeholder category from each of the countries. The following steps were followed:

- 1) Using literature, the internet, previous experiences (JNCC, 2013) and our own experience to identify a set of 90 national or regional umbrella organisations (47 British and 43 French associations, federations, unions, boards, councils or ministries) representing the interests of a number of members or smaller member organisations in both countries were identified.
- 2) An online survey was applied to address the Phase 2 sub-questions. A structured questionnaire was created in both English and French to ensure response consistency using Survey Monkey software (Appendix 1).
- 3) A representative of each of the selected umbrella organisations who dealt with marine policy, socioeconomic or conservation issues was contacted by telephone or email. They were explained the aim of the survey and respondents were explicitly asked to represent the views or policies of their organisations rather than their personal views when responding to the survey in order to maximise organisational representation (Brugha & Varvasovszky, 2000).

4) We obtained due ethical permission to carry out the survey, piloted it prior to its administration and amended it accordingly. We administered it between August the 30th and October the 6th 2013. Two reminders were sent to non-respondents after each stated deadline. The 10 survey questions asked are included in Appendix 1.

Not every organisation that replied to the survey completed it. The response rate therefore varies between questions and declines as the survey progresses. This diminishing response rate is common in web-based surveys (Fan & Yan, 2010). For questions 3 & 4 (Q3 & Q4), we also included those organisations that did not fill in the survey but replied to our invitation email and said they did not feel affected by either MPAs or offshore MPAs, or that the topic was not relevant to them.

For the online survey, a 'marine and coastal protected area' (MCPA) was defined as: 'Marine and coastal protected area stretching up to 12 nautical miles (22km) seaward from the coast, whatever its designation category (Special Areas of Conservation, Special Protection Areas, Sites of Special Scientific Interest, Marine Conservation Zones, Ramsar sites, etc). Assuming medium level of regulation (*i.e.*, most human activities are permitted -though regulated- whereas some others are restricted or forbidden)'. The term 'MCPA' was preferred to the more widely used term of 'MPA' to facilitate all the stakeholders to focus on MPAs potentially close to land rather than think of distant, offshore MPAs, which could have distorted their replies. 'Indicator' was defined as: 'Indicators are used to measure the status and trends of economic, social and environmental activities'. The term was used in the survey instead of the more appropriate term of 'variable' because it was considered less technical and more easily understood by every respondent.

We intended to follow a 'dual stakeholder approach' for the analysis of data and divide stakeholders' replies into a 'bottom-up' and a 'top-down' or 'expert' approach. The distinction criterion was the degree of expertise of respondents in marine socioeconomics in order to properly identify 'experts' from the top-down categories: decision-makers, managers and scientists. We tried to do so by adding a brief, preliminary emailed 'expert discrimination survey' to the main survey stating the criteria the respondent to the survey should meet to be classified as an 'expert'. These criteria related to the respondent's: a) background, b) expertise, and c) publication record. The criteria proposed to consider someone an expert are shown in the Appendix 2.

[3.2.3. Data analysis](#)

Question 2 (Q2; 'Number of members of the organisation') could not be analysed due to the different understanding of the question by the stakeholders. Some interpreted it correctly as the number of people represented by the umbrella organisation, whereas others interpreted it as the number of organisations represented or even as the number of staff working in the organisation.

For Q3 ('To which degree is your organisation affected by the designation and enforcement of marine and coastal protected areas?') & Q4 ('To which degree is your organisation affected by the designation and enforcement of offshore marine protected areas?'), an empirical classification of stakeholders based on their perceptions of MPAs' effects on their organisations was made. We considered those organisations that emailed us back declining our invitation to fill in the survey saying they did not feel affected by or interested in MPAs as 'neutral' stakeholders.

For Q5 ('The designation of marine and coastal protected areas is...'), in order to calculate mean and standard deviation values of the main MPA effects, the qualitative response options were coded into an ordinal scale of equal intervals were: 'Very negative' = -2; 'Negative' = -1; 'Neutral' = 0; 'Positive' = 1; 'Very positive' = 2. Then, the continuous range of mean values of the variables (ecological, social, economic and cultural) was later split into ordinal categories of equal intervals for communication purposes using quartiles: 0-0.50 (slightly positive), 0.51-1 (moderately positive), 1.01-1.50 (largely positive) and 1.51-2 (very positive).

For Q6 ('How would your organisation rate the importance of the following indicators for assessing the effects of marine and coastal protected areas on local communities?') & Q7 ('How would your organisation rate the importance of the following indicators for assessing the effects of marine and coastal protected areas on local economies?'), in order to select the socioeconomic variables with a higher degree of consensus among stakeholders, Likert-type responses were also coded into an ordinal scale of equal intervals: 'Not important/not considered' = 0; 'Slight importance' = 1; 'Moderate importance' = 2; 'High importance' = 3; and 'Very high importance' = 4). We then selected the variables that had smaller coefficient of variation (*i.e.*, higher arithmetic mean and smaller standard deviation) than the mean coefficient of variation of the whole set of variables and classified them as 'priority 1' variables. The coefficient of variation is the ratio between the standard deviation and the mean. It is regarded as a robust estimate of inter-observer precision or degree of agreement and is widely used for that purpose (Euser et al., 2008) in fields like fishing (Campana, 2001) or medicine (Chun et al., 2010). It may even be considered the preferred measure of relative dispersion of data in moderately non-normal distributions, although other less developed measures appear to perform best in purely non-normal distributions (Bonnet, 2006). We considered our stakeholder sample as the entire population for standard deviation calculation purposes. Thus, we classified the variables identified in Phase 1 as 'priority 1' (those with the highest degree of consensus as stated above) and 'priority 2' (the rest).

Low response rate and consistency at replying to the 'expert discrimination survey' due mainly to restraints in terms of respondents' time and degree of fulfilment of the 'expert' criteria prevented us from finally following the 'dual stakeholder approach' stated above. So we produced a 'mixed balanced approach' that showed which of the selected variables the whole set of stakeholders valued most. The integration of top-down and bottom-up approaches is likely to lead to a more effective management and governance of MPAs (Jones et al., 2011; Rees et al., 2013b). Given that as many



'top-down organisations' ($n_1 = 6$) as 'bottom-up organisations' ($n_2 = 19$) could not be identified and their relevance for researching, designating and managing MPAs (Jones et al., 2011; Brugha & Varvasovszky, 2000), we weighted the replies by top-down organisations 19:6 to match the number of responses by social and economic stakeholders (bottom-up approach) and provide a more balanced picture between both approaches when selecting the most relevant socioeconomic variables as suggested by Reed (2008), Heck et al. (2011a), Jones et al. (2011), and Fleming & Jones (2012).

We also analysed the degree of consistency in the responses by the stakeholder organisations included in the same stakeholder category at rating the importance of social and economic variables (independent variable: 'organisation'; dependent variable: 'rating of the importance of the set of socioeconomic variables'). For this, we also compared both 'Fishing industry' categories, given their predicted different responses to MPAs (Pita et al., 2013). After checking the non-normality of data, we used Kruskal-Wallis tests of analysis of variance, splitting our file for pairwise comparisons.

For Q5 ('The designation of marine and coastal protected areas is...'), Q8 ('For how long will the biggest effects from the designation and enforcement of a marine and coastal protected area generally be felt?'), Q9 ('To what extent are the effects of the designation and enforcement of a marine and coastal protected area generally felt?') and Q10 ('What local effect would your organization expect in a 10 year period since the designation and enforcement of a marine and coastal protected area on the indicators listed below?'), descriptive statistics were produced.

Finally, for Q10 ('What local effect would your organization expect in a 10 year period since the designation and enforcement of a marine and coastal protected area on the indicators listed below?') the ordinal response categories were coded into numerical responses according to the following scale: 'Substantial decrease (over 10%)' = -2; 'Decrease (between 3%-10%)' = -1; 'No effect (less than 3% increase or decrease)' = 0; 'Increase (between 3%-10%)' = 1; and 'Substantial increase (over 10%)' = 2. The relative coefficient of variation (the standard deviation divided by the absolute value of the mean) was calculated to rank the variables according to the perceived effects of the designation of MPAs on local communities and economies by the stakeholder organisations. For communication purposes, the range of continuous mean values of the perceived intensity of the MPA effects was split into equal intervals using quartiles: 0-0.50 / 0-(-0.50) (no effect: 0-3% increase / decrease); 0.51-1 (slight increase: 3-6%); 1.01-1.50 (moderate increase: 6-10%); and 1.51-2 (large increase: >10%).

Collected responses were analysed using Microsoft Excel and SPSS version 21.

3.3 Phase 3: MPBACI design

In this third phase of the study we followed a Multiple Paired Before-After-Control-Impact (MPBACI) semi-experimental research design to objectively determine whether MPAs had had an effect on the variables that were most valued by the stakeholders. BACI is the most common

research design for monitoring environmental impacts (Addison, 2011). MPBACI allows a comparison of data series ('paired' BACI) before and after an impact occurs (in this case, the designation of the MPA) at the potentially impacted site and at one or different ('multiple' BACI) control sites. We looked for published official statistics for each of those variables for two periods (before and after designation) for a number of MPAs in the Channel area meeting a number of selection criteria to increase the internal validity of the results. The attribution of socioeconomic effects to MPAs is one of the main and most common caveats of most existing PA socioeconomic evaluation techniques (Schreckenberget al., 2010).

3.3.1. Research hypothesis

We set up the following two-tailed quantitative research hypothesis to reply to our central research question ('Do multiple-use MPAs have a socioeconomic effect on local communities?'): 'the designation of multiple-use MPAs has social and economic effects at the community level'.

3.3.2. Data collection

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

Criterion	Discriminating factor	Importance
It needs to have a coastal part to which most of the possible socioeconomic effects relate	Data availability	Essential
Its designation date should be close to that of the assessment to retrieve before-after data	Data availability	Essential
It cannot overlap with other MPAs designated previously which could confound the intended effects	Attribution	Essential
It must be surrounded by unprotected coast in order to select adequate control sites	Attribution	Essential
It should not include estuaries, harbours, marinas, or big cities acting as confounding variables	Attribution	Desirable
It should have a minimal size to warrant an effect	Attribution	Desirable
It should have an international designation to increase the interest and exportability of the outcomes	Broad interest	Desirable

Table 1. Selection criteria for pilot MPAs on which to test the quantitative phase of the study

We used only secondary data in the form of official statistics for ease of access, objectivity, consistency, cost-effectiveness and comparability over time (Pugh, 2008; Gray, 2014). These statistics were sought from scientific or managerial organisations' websites in the UK and France. These included: the Office for National Statistics (UK), Data for Neighbourhoods and Regeneration (UK), the Marine Management Organization (UK), the Environment Agency (UK), Natural England (UK), the Joint Nature Conservation Committee (UK), English Heritage (UK), CEFAS (UK), the Institut National de la Statistique et des Études Économiques (France), l'Observatoire National de la Mer et du Littoral (France), the Ministère de l'Écologie, du Développement Durable et de l'Énergie (France), the Agence des Aires Marines Protégées (France), the Association des Directeurs et Responsables des Halles à Marée de France (France) and IFREMER (France).

The variables that were retrieved and analysed are shown in Table 2. Limitations in data availability forced us to widen the analysis not only to the most highly rated variables by the stakeholders but to the whole set of pre-identified variables after Phase 1.

Variable or proxy	Scale	Data source	Data period	Reference
Number of unemployed people between 15-64 years old (DEFM cat A a 31 dec 2010)	Commune	INSEE	2001-11	http://www.insee.fr/fr/themes/detail.asp?reg_id=99&ref_id=base-cc-chomage
Population density	Commune	ONML	2006; 2009	http://www.onml.fr/outil-de-cartographie/donnees-statistiques/
Number of new establishments created	Commune	INSEE	2006-2012	http://www.insee.fr/fr/themes/detail.asp?reg_id=99&ref_id=base-cc-demo-entreprises
Number of new construction establishments created	Commune	INSEE	2009-12	http://www.insee.fr/fr/themes/detail.asp?reg_id=99&ref_id=base-cc-demo-entreprises
Number of new establishments of services created	Commune	INSEE	2009-12	http://www.insee.fr/fr/themes/detail.asp?reg_id=99&ref_id=base-cc-demo-entreprises
Distribution of income by household and consumption unity (median)	Commune	INSEE	2001-11	http://www.insee.fr/fr/bases-de-donnees/default.asp?page=statistiques-locales/revenu-niveau-vie.htm

Number of hotel rooms	Commune	INSEE	2009; 2013	http://www.insee.fr/fr/themes/detail.asp?reg_id=99&ref_id=base-cc-tourisme
Number of coastal fishing boats*	Port	IFREMER	2003; 2005-2011	http://sih.ifremer.fr/Publications/Syntheses/Synthese-par-quartier-region-et-facade/Mer-du-Nord-Manche-Atlantique
Variable or proxy	Scale	Data source	Data period	Reference
Number of fishers on coastal fishing boats	Port	IFREMER	2003; 2005-2011	http://sih.ifremer.fr/Publications/Syntheses/Synthese-par-quartier-region-et-facade/Mer-du-Nord-Manche-Atlantique
Mean length of fishing boats	Port	IFREMER	2003; 2005-2011	http://sih.ifremer.fr/Publications/Syntheses/Synthese-par-quartier-region-et-facade/Mer-du-Nord-Manche-Atlantique
Total power of coastal fishing boats	Port	IFREMER	2003; 2005-2011	http://sih.ifremer.fr/Publications/Syntheses/Synthese-par-quartier-region-et-facade/Mer-du-Nord-Manche-Atlantique
Auction value of marine landings ; Volume of landings	Port	Association des Directeurs et Responsables des Halles à Marée de France	2005-12	http://www.criees-france.com/index.php?id_site=1&id_page=6

Table 2. Variables considered in and data sources for the quantitative phase of the study.

INSEE: Institute National de la Statistique et des Etudes Economiques; ONML: Observatoire National de la mer et du Littoral.

(*) IFREMER defines 'coastal fishing boat' as 'boats doing more than 75% of their activity within 12 nm'.

In order to ensure a proper scale of analysis, availability and comparability of data over time, standard Lower Layer Super Output Areas (LSOAs) for the UK and Communes for France were chosen as our basic spatial scale of analysis. LSOAs are the basic statistical units in the UK. They integrate into broader spatial scales: Middle Layer Super Output Areas (MSOAs) which, in turn, fit into local authority boundaries (ONS, 2014). Communes are the finest-scale administrative and electoral divisions in France (Gouvernement Français, 2014b). For the purposes of this study, we will refer to LSOAs and communes as spatial units (SUs).

Both SUs' GIS layers (ONS, 2011; Gouvernement Français, 2012) were overlapped with another GIS layer showing the PANACHE project area and the intersected MPA network within the

project area (Figure 6). We included in the analysis all the SUs whose coastlines are totally or partially protected by the previously identified MPAs (census sampling).

Whenever possible, two control SUs alongside the coast were used thus applying a MPBACI design where the 'impact' represents 'MPA designation' and subsequent protection (Addison, 2011). Control SUs were ideally selected as the SUs closest to but outside each MPA boundaries up to 10km from the MPA boundary. We compared baseline data of some variables from MPA and control SUs prior to the designation of the MPA against data for those variables after MPA regulations had come into force (Hull et al., 2010). The use of controls is highly encouraged to facilitate attribution of socioeconomic effects to MPAs (Sala et al., 2013, Addison, 2011, Schreckenberget al., 2010). Additionally, sectorial data on fishing activity were collected from individual ports.

As many years before and after each MPA designation as available were considered for analysis. We considered data from the year the MPA was designated as 'post-designation' if the MPA was designated in the first half of the year (till the 30th of June) and 'pre-designation' if the MPA was designated in the second half of the year (from the 1st of July). It was assumed that legal designation of MPAs confers a higher degree of protection to protected features than unprotected areas, even if some (and sometimes substantial) delays in active management occur, leading to temporal paper parks (Rand et al., 2012). For Natura 2000 sites, we generally considered as 'designation date' the date when the site was included in the list of Sites of Community Importance by the EU (and thus designated as an SCI), as from that date Member States must take appropriate measures to ensure that habitats and species for which those sites were designated are properly maintained. These measures include the appropriate assessment and licencing of activities posing potential threats to the protected species or habitats (EU, 2000). Moreover, some stakeholder's behaviours and procedures are likely to start changing just after or even before the legal designation of sites to anticipate restrictions in access or use of resources gradually (e.g. fishers and the industry), minimise legal restrictions (Fleming & Jones, 2012), prevent possible sanctions, and/or benefit from new opportunities (e.g. tourism).

3.3.3. [Data analysis](#)

General linear models (mixed factorial ANOVA) were used to appropriately account for intra-subjects (time) and inter-subjects (location) differences in the independent variables considered, the subjects being the selected SUs. The effects of two independent variables were assessed: 'time' (with two levels: mean annual values of the dependent variable before and after designation) and 'location' (with three levels: SUs inside, partially inside and outside the MPA) against our set of dependent variables.

We tested the statistical null hypothesis that 'there are no significant differences in the mean values of the assessed variables between SUs inside and outside MPAs before and after designation'. The Shapiro-Wilkin test was used to test for normality. Variables that did not follow a



normal distribution were normalised by using a Log10 transformation. In the case when this did not result in a normal distribution of the variables ('unemployment'), outliers corresponding to communes including big cities (Grande-Synthe, Dunkerque, Dieppe and Brest) were removed and normality was achieved. Data were analysed using SPSS v21 software. For small numbers of SUs or ports (n<5), descriptive statistics were used to explore the possible effects of MPAs.

IV. Results & discussion

4.1 Literature review

4.1.1. Variable identification

We identified a set of 64 potentially useful social (32) and economic (32) variables from the literature review (Table 3).

Social variables	Effect	Economic variables	Effect
Population	n	Employment rate	n
Population density	n	Employment rate by economic sector/activity	n
Population age distribution	n	Employment rate by age	n
Youth migration	n	Employment rate by gender	n
Number of households	n	Type of employment (contracted, freelance, cooperative...)	n
Household size	n	Number of local residents working for the MCPA	+
Life expectancy of local population	n	Number of enterprises	n
Local populations' health	+	Number of enterprises by economic sector	n
Education level of local population	n	Net added value by economic sectors/activities	n
Existence of basic services (public transport, schools & hospitals)	-	Number of enterprises with environmental management systems	+
Cultural heritage (number of classified material features)	+	Number of ecotourism enterprises	+
Environmental education of local populations	+	Number of environmental NGOs	+
Environmental outreach of local populations	+	Number of social NGOs	n

Number of regulation breaches by year	-	Total public expenditure	+
Type of regulation breach by year	-	Management costs of the MCPA	-
Number of sanctions imposed from regulation breaches by year	-	Economic displacement	-
Amount of sanctions imposed from regulation breaches by year	-	Local councils' income	n
Percentage/volume of by-catches	+	Local population's income per person	n
Percentage/volume of discards	+	House prices	-
Social variables	Effect	Economic variables	Effect
Number of research projects undertaken	+	Number of holiday homes	n
Number of research publications	+	Value of landings of biological marine products	-
Origin of visitors	+	Volume of landings of biological marine products	-
Visitors' satisfaction	+	Maritime traffic intensity	-
Accessibility from land and sea (infrastructures)	-	Value of aquaculture production	-
Local electoral results	n	Volume of aquaculture production	-
Waste production per person	+	Number of visitors	+
Electricity consumption per person	+	Number of visitors by places/features visited	+
Water consumption per person	+	Visitors' expenditure	+
Carbon emissions per person	n	Use fees (access, resource extraction...)	-
Percentage of renewable energy used	n	Human activities developed	-
Use of private transportation	n	Fishing effort (number of boats; distance)	-
Area of coastal built-up land	-	Composition of fleets (sizes; gears)	-

Table 3. List of the social and economic variables identified from the literature review and their subjective a priori classification into negatively affected by MPA designation (-), positively affected (+) or not affected (n)

4.1.2. Stakeholder category identification

We identified 20 stakeholder categories from the literature review (Table 4).

Positively affected	Evidence confidence	Negatively affected	Evidence confidence
Scientists	1	Towed fishing industry	3 ^a
Decision-makers	1	Mariculture industry	1
MPA managers	1	Energy industry	1
Static fishing industry	3 ^b	Aggregate industry	1

Environmental associations	3 ^c	Shipping industry	1
Business associations (hotels & restaurants)	3 ^d	Submarine cable industry	1
Cultural associations	1	Military	1
Local residents (Local councils)	3 ^e	Recreational associations	3 ^f
Tour operators	3 ^g	Housing industry	1
Visitors associations (tourism boards)	3 ^h	Landowners	1

Table 4. Stakeholder categories identified from the literature review, their a priori stance on MPAs and the degree of confidence in the preliminary classification of the categories (where '3' represents peer-reviewed evidence –including references justifying the placement of categories-, '2' represents evidence from grey literature, and '1' represents expert opinion).

^a(Pita et al., 2013); ^b(Mangi et al., 2011); ^c(Fleming & Jones, 2012); ^d(Salado et al., 2013); ^e(Wheeler et al., 2012); ^f(Jones, 2012); ^g(Rees et al., 2010b); ^h(Salado et al., 2013).

4.2 Stakeholder survey

4.2.1. Survey completion figures

The response rate ranged between 40% (36 organisations) and 25.6% (23 organisations), depending on the questions. These response rates are consistent with previous studies showing response rates to web-based surveys ranging from 39.7% to 62.2% (Archer, 2008), although response rates as low as 2% (Petchenik & Watermolen, 2011) and high as 79% (Monroe & Adams, 2012) have been reported. Response rates were higher for the UK, with 20 organisations (42.5% of the UK sample) responding partially to the survey and 11 organisations among them (23.4% of the UK sample) responding to the whole survey. In France, 11 French organisations responded partially to the survey (25.6% of the French sample) and 7 among them responded to the whole survey (16.3% of the French sample).

The mean time to reply to the whole survey was 40.9 minutes, 29.2 minutes on average for the UK organisations and 52.6 minutes for the French organisations. The relative length of the survey is likely to have reduced the response rate (Fan & Yan, 2010). The mean number of days to respond to the whole survey since contacted was 14.8 for the UK organisations and 7.7 for the French organisations, whereas the French organisations filled in the complete survey in one day on average versus 4.1 days on average for the UK organisations.

4.2.2. [Stakeholder selection](#)

The stakeholder categories identified and the surveyed organisations relevant to MPAs in the UK and France are shown in Table 5.



Stakeholder category	Organisations (The UK)	Organisations (France)
Scientists (TD; +)	Plymouth Marine Laboratory(p); Centre for Environment, Fisheries and Aquaculture Science (t); Marine Institute (Plymouth University) (t)	Institut Français de Recherche pour l'Exploitation de la Mer (p); Université du Littoral Côte d'Opale ; Museum National d'Histoire Naturelle (t)
Decision-makers (TD; +)	Richard Benyon (Parliamentary under Secretary of State for Natural Environment, Water and Rural Affairs); Barry Gardiner MP (Shadow Natural Environment and Fisheries Minister); Department for Environment, Food and Rural Affairs (t)	Frederick Cuvillier (Ministre de l'Écologie, du Développement Durable et de l'Énergie)
MPA managers (TD; +)	Marine Management Organisation (p); Natural England (t); Southern Inshore Fisheries and Conservation Authority (t)	Agence des Aires Marines Protégées; Comité Régional des Pêches Maritimes de Basse-Normandie (p); Conservatoire du Littoral
Static fishing industry (BU; +)	South Coast Fishermen's Council; New Under Ten Fishermens Association (t)	Comité National des Pêches Maritimes et des Elevages Marins (p)
Towed fishing industry (BU; -)	South West Fish Producers Organisation; National Federation of Fishermen's Organizations (p)	Comité National des Pêches Maritimes et des Elevages Marins (p)
Mariculture industry (BU; -)	Shellfish Association of Great Britain	Comité National de la Conchyliculture; Syndicat Français de l'Aquaculture Marine et Nouvelle
Energy industry (BU; -)	Energy UK (t); Renewable UK; Oil & Gas UK	EDF; La Compagnie du Vent; France Énergies Marines

Aggregate industry (BU; -)	British Marine Aggregate Producer's Association (t); British Aggregates Association	GSM-Italcementi Group; CEMEX; Union Nationale des Industries de Carrières et Matériaux de Construction
Stakeholder category	Organisations (The UK)	Organisations (France)
Shipping industry (BU; -)	British Chamber of Shipping; British Ports Association	Fédération des Industries Nautiques; Les Armateurs de France (t) ; Ports de France
Submarine cable industry (BU; -)	SubSea Cables UK	Association des Amis des Câbles Sous-Marins
Military (BU; -)	Ministry of Defence	Ministère de Défense
Recreational associations (BU; -)	Angling Trust(p); Royal Yachting Association; British SubAqua Club	Union des Plaisanciers Français (t) ; Fédération Française d'Études et des Sports Sous-Marins (t) ; Fédération Nationale des Pêcheurs Plaisanciers et Sportifs (t)
Environmental associations (BU; +)	Royal Society for the Protection of Birds (t); World Wildlife Fund-UK (t); The Wildlife Trusts(t)	France Nature Environnement; Greenpeace-France (t); Fondation Nicolas Hulot (p)
Business associations (hotels & restaurants) (BU; +)	British Hospitality Association; British Chamber of Commerce; Local Enterprise Partnerships	Syndicat National des Hôteliers, Restaurateurs, Cafetiers et Traiteurs; Les Gens de Mer

Housing industry (BU; -)	Home Builders Federation; National Federation of Builders (t); Construction Products Association	Fédération Française du Batiment; Association des Industries de Produits de Construction
Cultural associations (BU; +)	English Heritage; Nautical Archaeology Society	Fédération Patrimoine Environnement
Stakeholder category	Organisations (The UK)	Organisations (France)
Landowners (BU; -)	The Crown Estate (t); National Trust; Country Land & Business Association Limited	Union National de la Propriété Immobilière; Fédération Nationale de la Propriété Privée Rurale
Local residents (Local councils) (BU; +)	Plymouth Local Council; Portsmouth Local Council; Swansea Local Council	Ville de Dunkerque; Ville de Brest (p); Ville de Marseille (t)
Tour operators (BU; +)	ABTA-The Travel Association (t); Association of Independent Tour Operators	Syndicat des Entreprises du Tour Operating
Visitors associations (tourism boards) (BU; +)	Visit Britain (p); Visit England (t)	France Guide-AGISM (t); French Tourist Office

Table 5. Stakeholder categories relevant in the UK and France, approach: Bottom-up (BU) or Top-down (TD); subjective a priori stance towards marine protected areas: positive (+) or negative (-) organisations contacted, and organisations that responded to the survey totally (t) or partially (p)

We obtained partial or total responses from a total of 15 of the 20 identified stakeholder categories (75%). However, some of the non-responding categories, like the military, represent important figures in terms of annual turnover and employment in the UK (Pugh, 2008).

4.2.3. MPA stakeholder self-classification (Q3 & Q4)

Thirty-six organisations responded to this part of the survey, which makes a response rate of 40%. Some organisations responded by email declining to participate in the survey because they did not feel affected by or interested in MPAs and were included as 'neutral'. The classification of the stakeholders according to their stated organisational views on the effects of MPAs is shown in Table 6.

Organisational view	Very affected	Somehow affected
Positive	Royal Society for the Protection of Birds; Wildlife Trusts; Southern Inshore and Fisheries Conservation Authority; Greenpeace-France; Fondation Nicolas Hulot; Ville de Marseille	Marine Institute (Plymouth University); World Wildlife Fund-UK; VisitEngland; Natural England; Centre for Environment, Fisheries and Aquaculture Science; Department for Environment, Food and Rural Affairs; Museum National d'Histoire Naturelle; Fédération Nationale des Pêcheurs Plaisanciers et Sportifs; FranceGuide; Ville de Brest; Institut Français de Recherche pour l'Exploitation de la Mer; Marine Management Organisation
Negative	National Federation of Fishermen's Organisations; Union des Plaisanciers Français	New Under Ten Fishermens Association; British Marine Aggregate Producer's Association; National Federation of Builders; Angling Trust; Fédération Française d'Études et des Sports Sous-Marins; Armateurs de France; Comité National des Pêches Maritimes et des Elevages Marins

Neutral	ABTA-The Travel Association; British Chamber of Commerce*; Crown Estate; Energy-UK; Syndicat National des Hôteliers, Restaurateurs, Cafetiers et Traiteurs*; Fédération Française du Batiment* ; VisitBritain; Construction Products Association*; Plymouth Marine Laboratory
----------------	---

Table 6. Classification of marine and coastal stakeholder organisations in the UK and France according to their own perception on how marine and coastal protected areas affect them.

() show organisations that declined to participate stating that the topic did not concern them*

There are some stakeholders that feel positively affected by the designation of coastal, multiple-use MPAs: Environmental organisations, research centres, local councils, MPA managers and statutory nature conservation bodies. The environmental organisations stated the need to conserve marine biodiversity and that the topic of MPAs falls within their remit and current campaigns. Research centres stated MPAs provide opportunities to undertake research and that some of that research may be used to support MPA designation and management. MPA managers and statutory nature conservation bodies identified designating and managing MPAs as part of their core duties, whereas the Ville de Marseille is included in the management and administration body of local MPAs.

In contrast, fishers' organisations, the industry (shipping and aggregate) and recreational organisations perceive multiple-use MPA effects mostly negatively. Fishers' organisations identified new restrictions imposed on their traditional activities and little or no support for diversification or displacement as their main concerns. Fishers' relevance and opposition to MPAs is well known in diverse settings (Mangi et al., 2011; Pita et al., 2011). Our results point, however, towards existing evidence on the different perceptions on MPAs by towed-gear fishers (represented mostly by the National Federation of Fishermen's Organisations), strongly negatively affected by MPAs, and static-gear fishers (New Under Ten Fishermens Association), somehow negatively affected by MPAs, as suggested by Fleming & Jones (2012) and Pita et al. (2013).

The aggregate industry perceived greater developmental uncertainty and costs associated to harder environmental impact assessment procedures. Recreational organisations mentioned restrictions in scuba diving, angling, navigating and mooring as negatively affecting their activities, although there are similar recreational organisations, like recreational boaters, stating different effects of MPAs: The Union des Plaisanciers Français stated they were very negatively affected, whereas the Fédération Nationale des Pêcheurs Plaisanciers et Sportifs, stated they were somehow positively affected. The Union des Plaisanciers Français mentioned safety at sea as a result of navigating and mooring restrictions within MPAs as negatively affecting them.

Tourism boards and visitors' organisations perceive MPAs as either positively affecting them due to the tourism potential of MPAs (Visit England) or to existing collaboration with MPA managing agencies (France Guide), or as not affecting them (ABTA-The Travel Association, Visit Britain). However, potential negative impacts related to shifts in cruise or ferry routes as a result of new MPAs being designated were mentioned. The housing industry was also divided in opinion. They either felt negatively affected due to increased planning costs (National Federation of Builders) or not affected by multiple-use MPAs (Fédération Française du Batiment, Construction Products Association).

Catering and accommodation businesses, landowners, the energy industry, one research organisation and two construction organisations did not feel affected by or interested in the designation of MPAs. Some of these results were surprising given the societal expectations (Heck et al., 2011a; Rees et al., 2013a) and the scientific emphasis put on tourism and recreation when advocating for MPAs (Rees et al., 2010b; Sala et al., 2013).

The picture looks similar for offshore multiple-use MPAs although there is, understandably, a higher number of respondents not perceiving their organisations as being affected by the designation of these MPAs (Table 7).

Organisational view	Very affected	Somehow affected
Positive	Royal Society for the Protection of Birds; Wildlife Trusts; Southern Inshore and Fisheries Conservation Authority; Greenpeace-France	Marine Institute (Plymouth University); World Wildlife Fund-UK; Natural England; Centre for Environment, Fisheries and Aquaculture Science; Department for Environment, Food and Rural Affairs; Museum National d'Histoire Naturelle; Marine Management Organisation; Institut Français de Recherche pour l'Exploitation de la Mer; Fondation Nicolas Hulot
Negative	National Federation of Fishermen's Organizations; Union des Plaisanciers Français	New Under Ten Fishermens Association; British Marine Aggregate Producer's Association; Angling Trust; Comité National des Pêches Maritimes et des Elevages Marins

Neutral	ABTA-The Travel Association; British Chamber of Commerce*; Crown Estate; Energy-UK; Syndicat National des Hôteliers, Restaurateurs, Cafetiers et Traiteurs*; Fédération Française du Batiment*; VisitBritain; Construction Products Association*; Plymouth Marine Laboratory; Ville de Marseill ; Ville de Brest; VisitEngland; Fédération Nationale des Pêcheurs Plaisanciers et Sportifs; France Guide; Fédération Francaise d'Études et des Sports Sous-Marins; Armateurs de France; National Federation of Builders
----------------	---

Table 7. Classification of marine and coastal stakeholder organisations in the UK and France according to their own perception on how offshore marine protected areas affect them.

() show organisations that declined to participate as they stated the topic did not concern them*

Again, the most positively affected stakeholders are environmental organisations and some MPA managers like the Southern IFCA (even if they only manage inshore MPAs) with some research organisations, statutory nature conservation bodies, and other environmental organisations and MPA managers perceiving their organisations to be somehow positively affected. The stated reasons were similar to the ones stated for inshore MPAs. Natural England does not have statutory responsibilities for these sites but felt positively affected in the sense that MPAs provide benefits to the society as a whole.

On the contrary, fishers' organisations (especially those using towed gears) and the aggregate industry perceived they are either very negatively or somehow negatively affected by offshore MPAs. The reasons for this are also similar to the ones stated for coastal MPAs in Q3. Inshore fishers stated that they might be affected by the relocation of bigger boats displaced from offshore waters. The opinions of recreational boaters were divided: the Union des Plaisanciers Françaises perceived they are very negatively affected by offshore MPAs on the grounds of navigation restrictions and worsened safety at sea, whereas the Fédération Nationale des Pêcheurs Plaisanciers et Sportifs (representing recreational boat fishers) stated they were unaffected.

This preliminary classification of marine and coastal stakeholders can help to inform and streamline public participation processes related to the planning, designation and management of

MPAs, as suggested by Pomeroy & Douvère (2008). Based on these results we propose to follow a 'tiered approach' in stakeholder involvement effort that entails: 1) to engage, together with the stakeholders with statutory responsibilities in planning, designating or managing MPAs, those stakeholders feeling 'very affected' by MPAs in direct negotiations related to MPA planning, designation and management processes; 2) to involve the stakeholders feeling 'somehow affected' in these processes through proper consultation and; 3) to communicate on these processes to 'neutral' stakeholders. However, this classification is unlikely to remain the same over a large period of time as policies, contexts, participants' expertise, organisational interests, remits, stances and leverage evolve (Brugha & Varvasovszky, 2000).

4.2.4. Main MPA effects perceived by stakeholders (Q5)

Thirty organisations replied to this question, which makes a response rate of 33.3%. The stakeholders' ratings of the degree to which MPAs have ecological, social, cultural and economic effects are shown in Table 8.

Organisation	Ecological	Social	Economic	Cultural	Mean	sd
Royal Society for the Protection of Birds	2	1	1	1	1.25	0.43
The Wildlife trusts	1	2	2	2	1.75	0.43
New Under Ten Fishermen's Association	0	-1	-1	-1	-0.75	0.43
Marine Institute (Plymouth University)	2	0	2	-1	0.75	1.30
World Wildlife Fund-UK	2	2	2	2	2.00	0.00
VisitEngland	2	2	1	2	1.75	0.43
Southern Inshore Fisheries and Conservation Authority	2	2	2	2	2.00	0.00
ABTA-The Travel Association	1	1	1	1	1.00	0.00
Natural England	1	1	0	0	0.50	0.50
British Marine Aggregate Producers Association	0	0	0	0	0.00	0.00
National Federation of Builders	0	0	0	0	0.00	0.00
The Crown Estate	2	0	0	0	0.50	0.87
National Federation of Fishermen's Organisations	0	-1	-1	-1	-0.75	0.43
Angling Trust	2	1	0	1	1.00	0.71

Organisation	Ecological	Social	Economic	Cultural	Mean	sd
Energy UK	0	0	0	0	0.00	0.00
Centre for Environment, Fisheries and Aquaculture Science	1	1	0	0	0.50	0.50
Department for Environment, Food and Rural Affairs	2	1	1	1	1.25	0.43
VisitBritain	0	0	0	0	0.00	0.00
Greenpeace-France	2	2	2	2	2.00	0.00
Muséum National d'Histoire Naturelle	1	1	1	1	1.00	0.00
Fédération Française d'Études et des Sports Sous-Marins	2	1	1	0	1.00	0.71
Ville de Marseille	2	2	2	2	2.00	0.00
Fédération Nationale des Pêcheurs Plaisanciers et Sportifs	0	-1	0	1	0.00	0.71
Armateurs de France	1	0	0	0	0.25	0.43
Union des Plaisanciers Français	1	0	-1	0	0.00	0.71
FranceGuide-AGISM	1	1	1	1	1.00	0.00
Fondation Nicolas Hulot	0	1	1	1	0.75	0.43
Comité National des Pêches Maritimes et des Elevages Marins	0	0	0	0	0.00	0.00
Institut Français de Recherche pour l'Exploitation de la Mer	1	1	1	0	0.75	0.43
Ville de Brest	2	1	1	1	1.25	0.43
Mean ± sd	1.10±0.83	0.70±0.90	0.63±0.91	0.60±0.92	0.76	0.34

Table 8. UK and French stakeholder's perceptions of the degree to which MPAs have an ecological, social, economic and cultural effect on a scale from -2 points (very negative) to +2 points (very positive). sd: Standard deviation

On average, the ecological effects of MPAs are perceived as 'largely positive', whereas their social, economic and cultural effects are perceived as 'moderately positive', although in these cases the variability of the responses is higher (Figure 3). Nevertheless, the fact that 22 organisations that are potentially in favour of MPAs and only 8 organisations that are potentially against them

(from a subjective, *a priori* perspective) replied to this part of the survey may have biased the results positively. These results are, however, in agreement with other studies in non-EU settings (Heck et al., 2011a), suggesting a broader pattern of positive societal perceptions on MPA main effects by similar stakeholder groups, at least in industrialised countries. Rees et al. (2013a) also found similar results for their whole stakeholder sample in Lyme Bay, although they reported substantially lower perception of social benefits from the MPA.

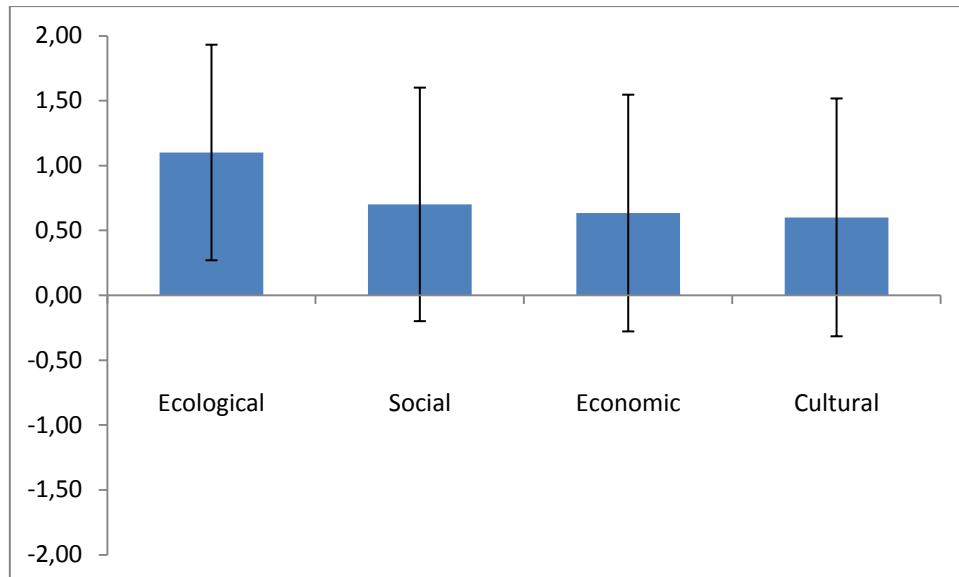


Figure 3. Mean and standard deviation values representing the main effects of MPAs as perceived by the UK and French stakeholders on a -2 point (very negative) to +2 point (very positive) scale

The most optimistic stakeholders about the main effects of MPAs (mean valuation = 2 ± 0.00) were two environmental organisations (World Wildlife Fund-UK & Greenpeace-France), one management organisation (Southern IFCA) and one local council (Ville de Marseille). Other stakeholders that perceived very positive main effects of MPAs overall (mean valuation $> 1.5 \pm 0.43$) were another environmental organisation (The Wildlife Trusts) and one tourism board (Visit England).

No stakeholder stated any 'Very negative' value for any of the assessed main effects of MPAs. Just the two fishers' organisations perceived the MPAs overall main effects as negative (moderately negative). For most of the industry (Energy UK, British Marine Aggregate Producer's Association and National Federation of Builders) and for some recreational organisations (Union des Plaisanciers Françaises and Fédération Nationale des Pêcheurs Plaisanciers et Sportifs), the overall main effects of MPAs are stated as being neutral.

These results are likely to be influenced by the frequency of use of MPAs and the degree of livelihood dependency on the MPA of the stakeholders: Potentially higher for fishers', recreational and industrial organisations than for NGOs, local councils or managerial agencies (Heck et al., 2011a). This fact may have led to some protest responses by these groups.

In contrast to previous studies where stakeholders have unanimously stated the environmental importance of MPAs (Heck et al., 2011a), 30% of the stakeholders did not perceive any ecological benefit from multiple-use MPAs. Though contrasting with the foreseen enhancement of marine and coastal ecosystem services by MPA designation (Rees et al., 2014) the perceptions of these 'sceptical' stakeholders align with quantitative scientific studies showing no discernible ecological effects of multiple-use MPAs when compared to unprotected areas (Rife et al., 2013; Guidetti et al., 2014). Among these 'sceptical' stakeholders, no industrial or fisher stakeholder perceived that MPAs have any positive ecological effects. The Fédération Nationale des Pêcheurs Plaisanciers et Sportifs, VisitBritain and Fondation Nicolas Hulot did not perceive any ecological benefits from MPAs either. However, in the case of the Fondation Nicolas Hulot, they think this is due to the lack of active management measures in place, something still common in many French MPAs.

The ecological, social and economic perceptions of recreational organisations and fishers' organisations (with the exception of the NFFO, representing mostly towed gear fishers) are substantially more negative than those of individual anglers, divers, charter boat operators and static gear fishers shown by Rees et al. (2013a) in Lyme Bay Site-Closed Area. Their findings suggest a more positive recreational perception in Lyme Bay, possibly as a result of a lengthy designation process (Fleming & Jones, 2012) leading to wider research (Rees et al., 2010a,b; Mangi et al., 2011; Rees et al., 2013a) and societal dissemination of the MPA values.

[4.2.5. Variable prioritisation: Identifying the most important socioeconomic factors for marine and coastal stakeholders \(Q6 & Q7\)](#)

We obtained 25 responses that ranked the proposed socioeconomic variables, which makes a response rate of 27.8%. Table 9 shows the consensus on the set of social and economic variables among the stakeholders.

Social variables	Mean	sd	CV	Priority
Environmental outreach of local populations	1.89	1.02	53.86	1
Visitors' satisfaction	1.97	1.18	59.82	1
Number of research projects undertaken	1.95	1.28	65.54	1
Number of regulation breaches by year	1.84	1.23	66.52	1
Environmental education of local populations	1.71	1.17	68.27	1
Number of sanctions imposed from regulation breaches by year	1.84	1.27	68.81	1
Social variables	Mean	sd	CV	Priority
Number of research publications	1.82	1.25	69.03	1
Type of regulation breach by year	1.89	1.31	69.33	1
Amount of sanctions imposed from regulation breaches by year	1.71	1.23	72.11	1
Origin of visitors	1.47	1.12	75.85	1

Local populations' health	1.32	1.00	76.21	1
Accessibility from land and sea (infrastructures)	1.79	1.40	78.15	1
Percentage/volume of discards	1.79	1.40	78.15	1
Area of coastal built-up land	1.66	1.34	81.01	1
Cultural heritage (number of classified material features)	1.53	1.25	81.96	1
Population	1.39	1.16	83.13	1
Percentage/volume of by-catches	1.63	1.48	90.50	2
Waste production per person	1.08	1.01	93.61	2
Electricity consumption per person	0.84	0.81	96.42	2
Water consumption per person	0.95	0.92	96.70	2
Population density	1.26	1.25	98.95	2
Carbon emissions per person	0.92	0.96	103.84	2
Existence of basic services (public transport, schools & hospitals)	1.03	1.09	106.00	2
Use of private transportation	0.97	1.04	106.65	2
Education level of local population	1.14	1.21	106.75	2
Percentage of renewable energy used	0.97	1.06	109.22	2
Life expectancy of local population	0.95	1.05	110.83	2
Youth migration	0.97	1.09	111.73	2
Population age distribution	0.97	1.09	111.73	2
Local electoral results	0.62	0.82	131.45	2
Household size	0.76	1.04	135.89	2
Number of households	0.82	1.12	137.35	2
Mean	1.36	1.14	84.28	
Economic variables	Mean	sd	CV	Priority
Fishing effort (number of boats; distance)	2.84	1.39	48.78	1
Human activities developed	2.50	1.23	49.20	1
Composition of fleets (sizes; gears)	2.82	1.41	50.13	1
Maritime traffic intensity	2.16	1.09	50.46	1
Value of landings of biological marine products	2.42	1.29	53.29	1
Value of aquaculture production	2.32	1.30	56.13	1
Number of ecotourism enterprises	1.95	1.19	61.16	1
Management costs of the MCPA	2.08	1.44	69.25	1
Economic variables	Mean	sd	CV	Priority
Number of local residents working for the MCPA	1.87	1.30	69.64	1
Volume of landings of biological marine products	2.11	1.50	71.28	1
Economic displacement	2.00	1.45	72.70	1
"Use" fees (access, resource extraction...)	2.08	1.53	73.52	1

Visitors' expenditure	2.05	1.52	74.09	1
Volume of aquaculture production	2.00	1.49	74.43	2
Employment rate by economic sector/activity	1.89	1.43	75.41	2
Net added value by economic sectors/activities	1.79	1.36	76.02	2
Number of visitors by places/features visited	1.95	1.54	78.98	2
Number of visitors	1.84	1.48	80.25	2
Number of holiday homes	1.24	1.06	85.87	2
Employment rate	1.47	1.27	86.31	2
Number of environmental NGOs	1.29	1.19	92.29	2
Employment rate by gender	1.13	1.06	93.28	2
Total public expenditure	1.37	1.29	93.98	2
Type of employment (contracted, freelance, cooperative...)	1.11	1.07	96.89	2
Number of enterprises by economic sector	1.47	1.43	96.89	2
Local councils' income	1.13	1.10	97.59	2
House prices	1.08	1.06	98.32	2
Local population's income per person	1.21	1.20	98.76	2
Number of enterprises with environmental management systems	1.32	1.34	101.82	2
Employment rate by age	0.95	0.97	102.59	2
Number of social NGOs	1.13	1.22	107.61	2
Number of enterprises	1.03	1.16	112.85	2
Mean	1.74	1.29	74.40	

Table 9. Importance of socioeconomic variables rated by the stakeholders. Mean values (on a 0 to 4 point scale), standard deviation values (sd) and coefficients of variation (CV)

The most highly rated 'social' variables refer to local populations' engagement with the MPA, tourism and research. Participatory MPA governance is regarded not only as a desirable management procedure (Jones et al., 2011) but also as an important factor for MPA conservation success (Hoelting et al., 2013). The most highly rated 'economic' variables are linked to fishing, shipping and aquaculture activities. Surprisingly, given the current economic crisis affecting most European countries, employment and income-related variables are chiefly moderately rated, with most of them classified as 'priority 2' variables. Other studies have also noted that these variables tend to be neglected or downplayed in marine spatial planning and management studies to date (Rees et al., 2013a; Jacobsen et al., 2014).

This participatory classification of socioeconomic variables can help to inform the development of MPA monitoring and management programmes and systems in Europe from an ecosystem-based perspective, as advocated elsewhere (Heck et al., 2011a,b; Cárcamo et al., 2014).

Table 10 shows the variables or proxies for which statistical data were available for use in Phase 3 of

the study.

Variables	Type	Variable or proxy used in Phase 3
Population density	Social	Population density
Fishing effort (number of boats; distance)	Economic	Number of coastal fishing boats; Total power of coastal fishing boats
Composition of fleets (sizes; gears)	Economic	Average length of fishing boats
Value of landings of biological marine products	Economic	Auction value of marine landings
Volume of landings of biological marine products	Economic	Volume of landings
Employment rate by economic sector/activity	Economic	Number of fishers on coastal fishing boats
Number of visitors	Economic	Number of hotel rooms ; Number of camping places
Employment rate	Economic	Number of unemployed people between 15-64 years old
Number of enterprises by economic sector	Economic	Number of new construction establishments created; Number of new establishments of services created
Local population's income per person	Economic	Distribution of income by household and consumption unit
Number of enterprises	Economic	Number of new establishments created

Table 10. Variables from Phase 2 or proxies used in Phase 3 of the study

The degree of consistency in the responses by different stakeholder organisations included in the same stakeholder categories was low. Statistically significant differences in the organisational importance of the set of socioeconomic variables were found for 'Scientists' ($X^2_{(2)}=33.884$; $p<0.000$), 'Recreational associations' ($X^2_{(3)}=144.932$; $p<0.000$), 'Environmental associations' ($X^2_{(3)}=108.998$; $p<0.000$) and the 'Fishing industry' ($X^2_{(1)}=7.693$; $p=0.006$). Statistically significant pairwise comparisons are shown in Table 11.

Stakeholder category	Direction of the difference	Statistic value and p-value
Scientists	CEFAS > MNHN	$X^2_{(1)}=23.99$; $p<0.000$
	MI > MNHN	$X^2_{(1)}=29.16$; $p<0.000$

Recreational associations	AT < FFESSM	$X^2_{(1)}=38.09; p<0.000$
	AT < FNPPSF	$X^2_{(1)}=91.40; p<0.000$
	AT < UPF	$X^2_{(1)}=71.55; p<0.000$
	FFESSM < FNPPSF	$X^2_{(1)}=59.02; p<0.000$
	FNPPSF > UPF	$X^2_{(1)}=52.01; p<0.000$
Environmental associations	RSPB > WT	$X^2_{(1)}=36.53; p<0.000$
	RSPB < WWF-UK	$X^2_{(1)}=18.91; p<0.000$
	RSPB < Greenpeace-FR	$X^2_{(1)}=21.71; p<0.000$
	WT < WWF-UK	$X^2_{(1)}=81.81; p<0.000$
	WT < Greenpeace-FR	$X^2_{(1)}=87.02; p<0.000$
Fishing industry	NUFTA > NFFO	$X^2_{(1)}=7.69; p=0.006$

Table 11. Pairwise comparisons between stakeholder organisations included in the same categories that showed statistically significant differences (at $p<0.05$) in their ratings of the importance of socioeconomic variables related to MPAs

Note: CEFAS: Centre for Environment, Fisheries and Aquaculture Science; MHNH: Museum National d'Histoire Naturelle; MI: Marine Institute (Plymouth University); AT: Angling Trust; FFESSM: Fédération Française d'Études et des Sports Sous-Marins; FNPPSF: Fédération Nationale des Pêcheurs Plaisanciers et Sportifs; UPF: Union des Plaisanciers Françaises; RSPB: Royal Society for the Protection of Birds; WT: Wildlife Trusts; WWF-UK: World Wildlife Fund-UK; Greenpeace-FR: Greenpeace-France; NUFTA: New Under Ten Fishermen's Association; NFFO: National Federation of Fishermen's Organizations

There is a high intra-category variability in the responses from different organisations, which suggests substantially different organisational views on which socioeconomic variables are considered important to monitor the effects of multiple-use MPAs. For instance, both the Centre for Environment, Fisheries & Aquaculture Science and the Marine Institute of Plymouth University rated the whole set of socioeconomic variables significantly higher than the Museum National d' Histoire Naturelle (Direction of the difference, Table 11). This intra-category difference could be due to different institutional remits or to different organisational expectations towards the socioeconomic performance of MPAs.

Thus, classifying organisations into 'intuitive' or 'traditional' categories for MPA socioeconomic assessments, whereas of some conceptual use, is likely to be of little practical use due to a diversity of interests, views and backgrounds between organisations (Duggan et al., 2013). Not only different organisations but also different individuals representing these organisations are likely to have their own views, characteristics and interests, thus introducing a degree of intrinsic uncertainty in any stakeholder analysis (Pomeroy & Douvère, 2008). This finding also suggests that MPA socioeconomic participation processes in the UK and France should count on a variety of organisations belonging to the same 'intuitive' or 'traditional' stakeholder category to properly account for the diversity of perspectives and interests on the socioeconomic effects of MPAs. Some authors have warned of the increasing difficulty and costs of reaching consensus as the number of actors involved in participatory processes rises (Brandt & Svendsen, 2013). Resorting to some sort of stakeholder prioritisation, such

as the stakeholder self-classification proposed above, could help to find a compromise solution that best deals with representation and efficiency trade-offs.

4.2.6. Perceived temporal scale of the ecological, social, economic and cultural effects of MPAs (Q8)

Twenty-five organisations replied to this question, which makes a response rate of 27.8%. A majority of stakeholders perceived that the biggest effects from the designation of MPAs are either long-term or permanent although a remarkable percentage (25% to 37.5%) did not specify a time scale (Figure 4).

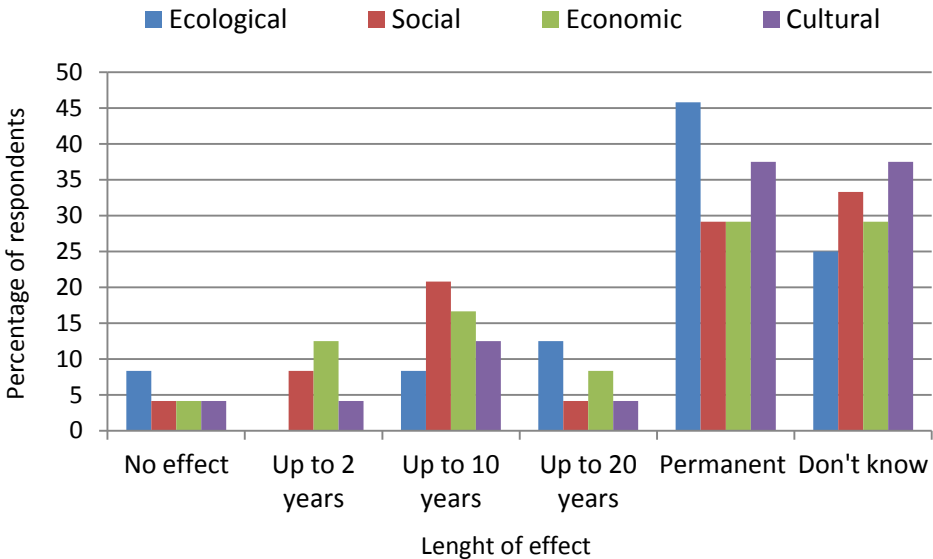


Figure 4. Stakeholders’ perception of the temporal length of the main effects of MPAs (in percentage)

Over 58% of respondents stated that there are long-term or permanent ecological effects of multiple-use MPAs. This finding contrasts with recent studies which have shown that multiple-use MPAs or MPA zones are not ecologically different from surrounding fished areas and that only well-enforced, no-take MPAs ensure significant ecological effects (Rife et al., 2013; Guidetti et al., 2014). One tour operator (ABTA-The Travel Association) and a recreational association (Fédération Nationale des Pêcheurs Plaisanciers et Sportifs) stated that (multiple-use) MPAs had no ecological effects. These replies are likely to be the result of little familiarity with the topic of MPAs (Reed, 2008) rather than of expertise on the subject or, in the case of the Fédération Nationale des Pêcheurs Plaisanciers et Sportifs, of protest responses due to organisational opposition to the assessed topic (Azqueta et al., 2007).

Around 60% of respondents thought multiple-use MPA designation has social (62.5%), economic (66.7%) and cultural effects (58.3%). One third of respondents (33.3%) stated that the biggest social effects of multiple-use MPAs are either long-term (up to 20 years) or permanent, although nearly the same proportion (29.2%) perceived short or medium-term (up to 10 years) social effects. The biggest

perceived economic effects of MPAs show similar figures, with a slightly higher percentage of respondents stating that there are long-term or permanent economic effects (37.5%). Finally, most respondents (41.7%) stated that the biggest cultural effects of MPAs are either permanent or long-term in contrast to 16.7% who stated short or medium-term (up to 10 years) biggest cultural effects.

These figures show, on the one hand, high uncertainty in the organisational replies to the main temporal ecological, social, economic and cultural effects of multiple-use MPAs. On the other hand, they also show a moderately high degree of stakeholder 'confidence' in or 'expectation' towards the overall temporal performance of multiple-use MPAs. The actual time range of the effects of protection is likely to be highly site and feature-specific (Tillin et al., 2010) and strongly dependent on MPA type and enforcement (Guidetti et al., 2014). Other studies have also shown high stakeholder expectations towards MPAs not sufficiently justified by scientific evidence (Rees et al., 2013a; Cárcamo et al., 2014). Both conclusions suggest the need for further research and improved communication to generate sounder societal knowledge in order to avoid over-expectations and misinterpretations about the actual effects of MPAs at different temporal scales.

[4.2.7. Perceived spatial scale of the ecological, social, economic and cultural effects of MPAs \(Q9\)](#)

Twenty-five organisations replied to this question, which makes a response rate of 27.8%. The majority of respondents perceived long-range spatial effects of MPAs (over 10 km) from their boundaries for the four variables analysed, although a substantial proportion (29.2% to 45.8%) did not specify a spatial scale question (Figure 5).

These results also show a notable degree of 'confidence' or 'expectation' towards the spatial effects of multiple-use MPAs by the UK and French stakeholders. These spatial effects are likely to be influenced by the characteristics of the site, such as its size, location or the types of features protected, by the degree of regulation enforcement and by the pressure exerted on their ecosystem services inside (Guidetti et al., 2014) and in their boundaries (Kellner et al., 2007), as some of the respondents pointed out.

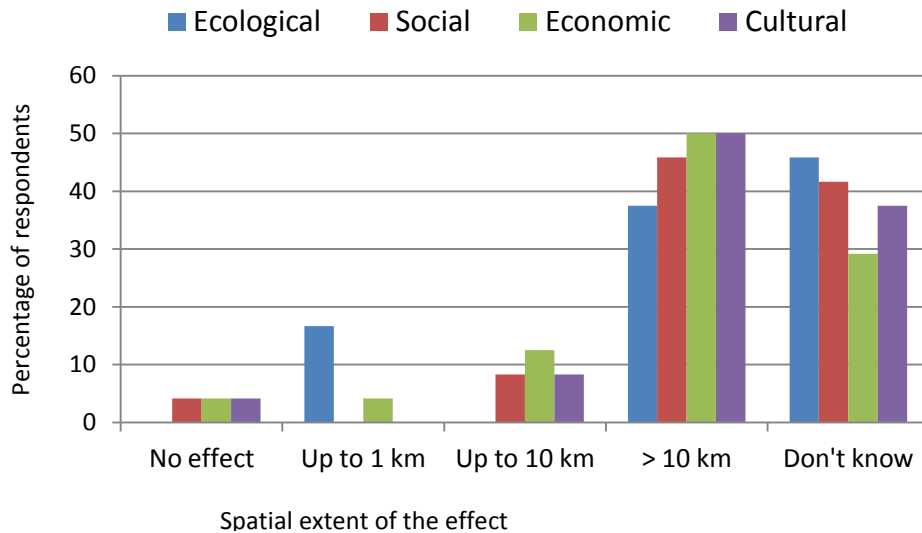


Figure 5. Stakeholders' perception of the spatial extent of the main effects of MPAs (in percentage)

It is noteworthy that the stakeholders perceiving long-range social, economic and cultural MPA effects are mostly stakeholders 'very affected by/interested in' MPAs that may overestimate the spatial effects of MPAs: fishers' organisations, environmental organisations and the Southern Inshore Fisheries and Conservation Authority, with the only exceptions of DEFRA and the Fédération Nationale des Pêcheurs Plaisanciers et Sportifs (that only perceived long-range social and economic effects). Again, further research and enhanced communication with stakeholders would be needed to have a more accurate societal picture of the socioeconomic spatial effects of MPAs under a range of circumstances and scales.

4.2.8. Perceived intensity of MPA effects on local communities and economies (Q10)

Twenty-three organisations replied to this question, which makes a response rate of 25.6%. Most of the assessed socioeconomic variables are not perceived to increase or decrease substantially. However, 5 variables (with mean score over 0.5) are thought to increase slightly (by 3-6%) within 10 years since the designation of MPAs: 'research', 'environmental performance by citizens, businesses and towns', 'number of green businesses', 'tourism' and 'economic activities' (Table 12). These variables coincide mostly (or as proxies) with the most highly valued variables by the stakeholders. Only one variable ('economic costs and losses') shows a negative mean value. Its interpretation is tricky as it implies a double negative meaning: decrease in economic costs and losses (*i.e.*, increased economic gains), which might have confused some of the respondents.

Variable	Mean	sd	CV
Research	0.74	0.67	91.13
Environmental performance by citizens, businesses & towns	0.61	0.64	105.46
Number of green businesses	0.70	0.75	107.53
Tourism	0.68	0.92	135.48
Population's health	0.39	0.57	145.72
Education & outreach of local populations	0.39	0.57	145.72
Economic activities	0.52	0.93	177.56
Number of NGOs*	0.26	0.53	202.76
Basic services to populations	0.30	0.62	204.04
Employment	0.39	0.87	222.78
Income to the area	0.39	0.87	222.78
Regulation breaches	0.43	0.97	223.16
Expenditure in the area	0.35	0.81	233.85
Number of enterprises	0.30	0.91	297.61
Designated cultural features	0.17	0.70	403.11
Population	0.13	0.54	410.96
Fishing activity	0.17	1.01	578.79
Local electoral results	0.09	0.50	578.79
Aquaculture production	0.05	0.82	1813.84
Economic costs & losses	-0.04	0.81	1854.72

Table 12. Perceived intensity of the effects of MPAs on socioeconomic variables on a -2 point (substantial decrease) to +2 point (substantial increase) scale for the mean, ordered by decreasing degree of agreement (shown by the coefficient of variation). sd: Standard deviation. CV: Relative coefficient of variation.

4.3 MPBACI design

We identified 6 suitable multiple-use MPAs in France on which to test our research hypotheses (Figure 6). The main characteristics of these MPAs are provided in the Appendix 3. They amount to 47 communes. No MPAs meeting the essential selection criteria and for which consistent data series were available at the LSOA scale could be found in the UK.

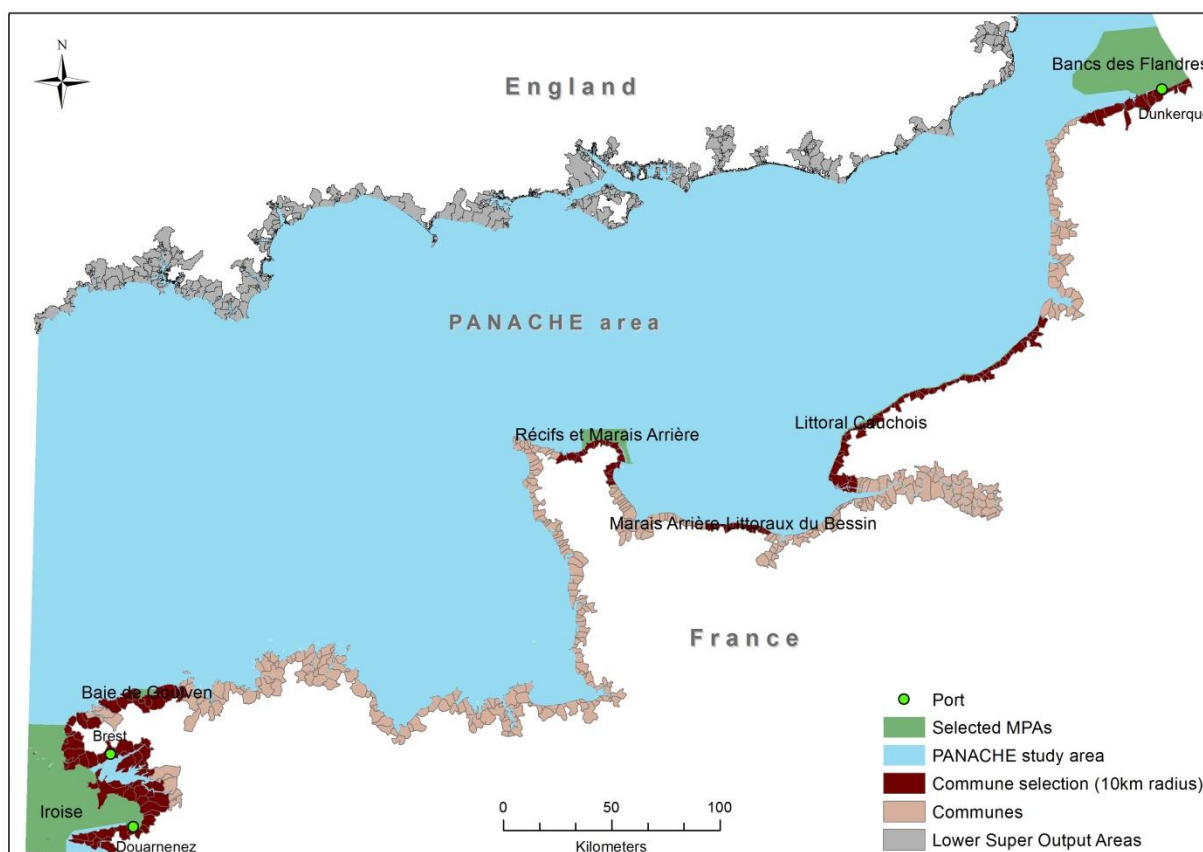


Figure 6. Study area, selected MPAs, spatial units along the English and French coasts and spatial units within a 10 km radius from the boundaries of selected MPAs

We found data to analyse 14 socioeconomic variables or proxies. Of these, 5 were considered as ‘priority 1’ for stakeholders and 9 as ‘priority 2’. Eight of them were community-scale variables whereas 6 of them were sectorial variables related to fishing (Table 13).

Variable or proxy	Type	Priority for stakeholders	Number of MPAs	Number of communes	Statistic and significance level
Number of unemployed people	Economy	2	6	47 (43 after deleting outliers)	$F_{(2,40)} = 1.001$; p-value=0.377
Population density	Social	2	1	11	$F_{(1,9)} = 1.413$; p-value=0.265
Number of new establishments created	Economy	2	2	15	$F_{(2,12)} = 1.028$; p-value=0.387

Variable or proxy	Type	Priority for stakeholders	Number of MPAs	Number of communes	Statistic and significance level
Number of new construction establishments created	Economy	2	1 (Banc des Flandres)	4	Mean increase before-after (%) Inside = 46.42 Partially = 183.33 Outside = 111.11
Number of new establishments of services created	Economy	2	1 (Banc des Flandres)	4	Mean increase before-after (%) Inside = 23.46 Partially = -15.69 Outside = 12.12
Income (median)	Economy	2	6	47	$F_{(2,44)}=0.077$; p-value=0.926
Number of hotel rooms	Economy	2	1	4	Mean increase before-after (%) Inside = 33.08 Partially = 1.19 Outside = -20.31
Number of camping places	Economy	2	1	4	Mean increase before-after (%) Inside = -6.16 Partially = 0 Outside = -6.53
Number of coastal fishing boats (f) [#]	Economy	1	5	11 ports	$F_{(2,8)} = 1.471$; p-value=0.286
Number of fishers on coastal fishing boats (f)	Economy	2	2	3 (ports: Dunkerque, Douarnenez & Brest)	Mean increase before-after (%) Inside = -19.38 Outside = 6.09
Average length of fishing boats (f)	Economy	1	2	3 (ports: Dunkerque, Douarnenez & Brest)	Mean increase before-after (%) Inside = -10.90 Outside = 0.53
Total power of coastal fishing boats (f)	Economy	1	2	3 (ports: Dunkerque, Douarnenez & Brest)	Mean increase before-after (%) Inside = -32.21 Outside = 11.27



Variable or proxy	Type	Priority for stakeholders	Number of MPAs	Number of communes	Statistic and significance level
Volume of landings (f)	Economy	1	2	3 (ports: Dunkerque, Douarnenez & Brest)	Mean increase before-after (%) Inside = 27.97 Outside = 15.80
Value of landings (f)	Economy	1	2	3 (ports: Dunkerque, Douarnenez & Brest)	Mean increase before-after (%) Inside = 45.75 Outside = 8.38

Table 12. Summary of statistical results of Phase 3 of the study

All data analysed using Multiple Factorial ANOVA met the sphericity assumption

(f): Sectorial variables related to fishing

#Coastal fishing boats: Boats having done more than 75% of their fishing activity within 12 nm from the coast

The statistical analysis of the data does not allow us to support our central research question ('Do multiple-use MPAs have a socioeconomic effect on local communities?') or our quantitative research hypothesis that 'the designation of multiple-use MPAs has social and economic effects at the community level' for the MPAs considered, as no variable showed a statistically significant effect at the scale of commune. Only the 'number of hotel rooms' has increased inside and decreased outside neighbouring communes in the same MPA after designation. However, caution should be considered when interpreting these results due to the low number of cases analysed, the likely specificity of this result and the possibility that the increased number of hotel rooms in the commune of Dunkerque responds to drivers other than the designation of Banc des Flandres as an MPA. This result could be further clarified through ground truthing (e.g., interviews with local businesses and visitors to possibly elicit any MPA effects).

Regulations related to multiple-use MPA designation do not seem to have had an effect that is intense or broad enough to reflect statistically significant differences in the variables analysed at the community level for the selected MPAs. The fact that all the MPAs analysed are multiple-use MPAs rather than highly restrictive marine reserves may have influenced the 'low intensity' of their socioeconomic effects, as shown for MPAs' ecological effects (Rife et al., 2013; Guidetti et al., 2014). In the French context it should be further noted that there is usually a noticeable delay of some years between the dates when MPAs are officially designated and the dates when actual management takes place. In fact only one of the seven MPAs included in the assessment (*parc naturel marine d'Iroise*) had a management plan and only two MPAs (Iroise and Banc des Flandres) had some management structures in place at the time of this assessment. This 'delayed management' is likely to have played

a role in 'masking' the socioeconomic effect of these MPAs and thus contributed to the non-significant differences shown at the scale of commune.

These results are in agreement with the stakeholders' perceptions (Phase 2) of the low intensity of the effects of multiple-use MPAs on some common socioeconomic variables: 'Employment', 'Income', 'Number of enterprises' and 'population', thus advocating the exploration of the use of social surveys as cost-effective methods for some complex and integrated aspects of PA assessments, as suggested previously (Rodríguez-Rodríguez & Martínez-Vega, 2013). However, stakeholders responded assuming medium level of regulation and thus enforcement of these MPAs which was not the case for most of our sample. Only 'fishing activity' (not perceived to vary in intensity) shows a large quantitative increase when assessed through the volume and value of landings, although this may be a specific result of the ports considered and would require further study.

Interestingly, these quantitative results (Phase 3) contradict some of the results from the qualitative part of the study (Phase 2) that showed that stakeholders perceived long-range temporal and spatial social and economic effects of multiple-use (enforced) MPAs by most stakeholders. Heck & Dearden (2011a) advocated the use of stakeholders' expectations to define MPA performance indicators and as guides for MPA management. However sensible this statement is, our findings suggest that some of these expectations may not be realistic achievements of MPAs, which may result in stakeholders' and managers' frustration and repeated poor valuation of MPAs' performance. Evidence-based studies like this one should help to establish reasonable social and economic expectations, objectives and monitoring of MPAs. Nevertheless, it is possible that if our sample of MPAs had been actively managed and enforced since designation, the results of expectations and actual effects might align more closely.

In terms of the sectorial analysis of the fishing sector, there seems to be an opposite effect between ports inside (Dunkerque and Duarnenez) and outside MPAs (Brest) in the 'number of fishers on coastal boats', the 'average length of fishing boats', and the 'total power of coastal fishing boats'. These three variables decreased substantially after the designation of the two MPAs: *Zone de Protection Spéciale de Banc des Flandres* and *parc naturel marine d'Iroise* in the ports inside these MPAs. These results should be interpreted with caution due to the low number of cases analysed, as results might well be due to specific or wider management actions taken at the three ports considered rather than the effect of regulations or of actions taken by the MPAs' administrations. Changes in fishers' behaviour as a result of new protection regulations being established might have also influenced these results. Thus, these results require further ground truthing.

Conversely and unexpectedly, the volume and value of landings have increased substantially more in the two ports inside MPAs than in the port outside MPAs (by nearly a two-fold and six-fold increase respectively) in similar periods. Changes in the value of landings are logically linked to changes in the volume of landings, as well as to market prices. Shifts in the volume of landings might reflect increased landings by 'foreign' boats not having those ports as home ports and/or enhanced performance (or quota increase) by the coastal and/or offshore fleets having those

ports as home ports in that period. Again, further analysis is required at the individual port level to accurately separate any MPA effects from specific or wider fisheries management measures and local economic drivers that may influence the volume and value of landings.

4.4 Limitations of the study

The main limitation of the study was data availability. The integrated nature of the study design was notably hampered for this reason. Consistent, long-term time-series of socioeconomic data could not be found in the UK, and time-series for a limited number variables were found in France. The lack of social variables was especially remarkable, as only one social variable could be retrieved for use in Phase 3 of the study, making the social quantitative analysis scarce.

Another important caveat refers to different MPA overlapping categories designated at different times that made it very difficult to find suitable MPAs to perform the Phase 3 of the study in the PANACHE project area in terms of attributing effects from designation. These designation category overlaps may also pose some practical challenges regarding MPA management effectiveness and coherence, as suggested previously (Rodríguez-Rodríguez et al., in press).

Although the sampling units selected in the stakeholder survey (Phase 2) could be deemed representative of a broad range of smaller organisations and individuals, the non-random nature of the selection of our sample does not allow us to generalise our findings to the whole studied countries, let alone other countries, especially in different socioeconomic contexts. Our results suggest additional caution even when assuming representation by organisations belonging to the same intuitive stakeholder category. Similarly, the non-random selection of our MPA sample (Phase 3) does not allow us to generalise our findings to other settings, nor event to all French MPAs in the Channel. Thus, these results should only be interpreted concerning the selected MPAs.

Some improvements to the surveys used could be made. The relative length, complexity &/or ambiguity of some of the questions in the stakeholder survey are likely to have put some stakeholders off and reduced the response rate. Moreover, a very low response rate and high inconsistency in the profiles of the respondents to the 'expert discrimination survey' (Phase 2) was obtained. Additional time to respond to this survey, high staff turnover and the somehow sensitive character of this survey are likely to have influenced this survey's success. As a result, it was not possible to determine the degree of expertise of the respondents to our survey.

Finally, the implementation of the MPBACI part of the IMPASEM (Phase 3) required relatively complex statistical and GIS skills.

V. Conclusions and recommendations

5.1 Conclusions

Our quantitative and qualitative results suggest a negative reply to our central research question: ‘Do multiple-use MPAs have a socioeconomic effect on local communities?’ On the one hand, the designation of the selected multiple-use MPAs on the French side of the PANACHE project area does not seem to have had quantitative community-scale socioeconomic effects. We found, thus, no evidence to support our quantitative research hypothesis that ‘the designation of multiple-use MPAs has social and economic effects at the community level’. However, this finding does not mean that multiple-use MPAs may not have some broad socioeconomic effects in other settings, on other variables, or under different management conditions, as suggested before (West et al., 2006). Moreover, the lack of active management of most of the selected sample of MPAs is likely to have ‘disguised’ their socioeconomic effects and ‘diluted’ their statistical differences. On the other hand, from a qualitative standpoint, multiple-use MPAs are perceived to have effects on a number of socioeconomic sectors in the UK and France, especially on environmental organisations and fishers’ organisations, but not on others. A range of stakeholder organisations and categories stated they were not affected by/interested in the designation of multiple-use MPAs.

Thus, our joint results point into the direction of focusing the socioeconomic analysis of the effects of multiple-use MPAs just on relevant affected or interested stakeholders rather than on the community as a whole. Further studies using randomly selected MPAs under different management regimes should help to confirm our findings.

The IMPASEM has the potential to work soundly and cost-effectively to assess the effects of spatial entities like MPAs in a participatory manner under few conditions, namely consistent geo-referenced and statistical data availability, and single MPA designation categories on each site. Given these restrictions, it can be applied in contexts with consistent time series of socioeconomic data (e.g. France) and where new, non-overlapping MPA networks are being designated (e.g. the MCZs in the UK). Overlaps with international MPA designation categories designated at different dates that do not entail specific management or regulations (e.g. OSPAR sites) could be accepted as they are unlikely to influence the ecological status or the socio-economy of the area. This should facilitate broader applicability of the framework.

The IMPASEM overcomes a number of drawbacks of current mainstream socioeconomic assessment methods: representation (ensured by a wide stakeholder participation), objectivity (enhanced by structured questionnaires with closed-ended questions), cost-effectiveness (enhanced through online survey techniques and use of secondary, publicly available data), and accurate attribution of MPA’s effects (maximised by a sound, spatial-temporal MPBACI design). Its characteristics

make it especially useful in the terrestrial environment, where most socioeconomic statistics are normally compiled.

The fact that important data limitation occurs in two of the wealthiest countries in the EU, and thus globally, highlights the importance of efficient allocation of resources for the consistent compilation and sharing of time series of multi-purpose socioeconomic data that are made available to the public after proper validation.

5.2 Recommendations

- Socioeconomic analyses of the effects of multiple-use MPAs in the UK and France are likely to be most efficient by focusing just on relevant stakeholders rather than on the community as a whole.
- The stakeholders' self-classification shown here can help to streamline oncoming participatory processes related to the socio-economy of MPAs in the UK and France.
- As wide a range of stakeholder organisations as feasible (also different organisations belonging to the same intuitive guild or stakeholder category) should be incorporated in participatory MPA socioeconomic processes in the UK and France for these processes to claim relevant social representation.
- The selection of priority 1 variables provides a useful basis for a meaningful and participatory approach to MPA monitoring and management in the UK and France.
- Further research and more evidence-based, targeted communication should help to shape more realistic societal expectations and managerial targets about MPAs' socioeconomic and ecological performance under different socioeconomic contexts and management regimes.
- The IMPASEM should be tested on a higher number of randomly selected MPAs from diverse locations and management regimes to confirm the specific results of this study and the applicability of the framework. These tests should also help to clarify the actual effect of 'management' or 'enforcement' on the socioeconomic effects of MPAs at a community scale.
- The compilation, sharing and public disclosure of consistent long-term series of multi-purpose socioeconomic data should be encouraged, especially in the UK, where a diversity of information exists, but it comes mainly from one-off studies at different spatial or temporal scales.

- It would be desirable that MPAs in the Channel had more homogeneous designation schemes that avoided multiplicity of designation categories on the same site and that all MPAs had active management since designation, especially in France. This should allow for more effective conservation and for clearer discrimination of MPA's ecological, social, economic and cultural effects.
- Techniques that, accounting for little extra survey time and effort, allow for the proper discrimination of real 'experts' from other respondents to surveys with a variable degree of expertise on the assessed topic should be further explored to promote good practice when resorting to studies involving experts.

Acknowledgements

We would like to thank all the individuals and institutions who replied to our survey.

We would also like to acknowledge the statistical advice by Stephen Mangi (CEFAS) and Den McGowan (Plymouth University) and the work of some people and institutions at providing non-published socioeconomic statistics: Devon and Severn IFCA, the Marine Management Organisation and CEFAS.

This study was funded by the European Regional Development Fund (INTERREG).



VI. References

AAMP. Agence des Aires Marines Protégées, 2012b. *Suivi et évaluation des aires marines protégées*. Available online from: <http://www.aires-marines.fr/Evaluer/Suivre-et-evaluer-les-AMP> [Accessed 16/07/2014]

Addison, P., 2011. *A global review of long-term Marine Protected Area monitoring programmes: The application of a good framework to marine biological monitoring. A report prepared for the Joint Nature Conservation Committee*. JNCC. Peterborough, UK. Available online from: http://jncc.defra.gov.uk/pdf/jncc455_Vol1_Vol2%20combined_web.pdf [Accessed 16/07/2014]

Allpress, J.A., Rohani, M. & Meares, C., 2014. *Measuring the value created by Auckland Museum's Moana - My Ocean Exhibition: A Social Return on Investment (SROI) analysis*. Auckland Council technical report, TR2014/014. Available online from: <http://www.aucklandcouncil.govt.nz/SiteCollectionDocuments/aboutcouncil/planspoliciespublications/technicalpublications/tr2014014sroianalysismoanaaucklandmuseumrpt.pdf> [Accessed 14/07/2014]

Archer, T. M., 2008. Response rates to expect from Web-based surveys and what to do about it. *Journal of Extension*, vol. 46, n° 3, Article 3RIB3. Available online from: <http://www.joe.org/joe/2008june/rb3.php>

Armsworth, P.R., Chan, K.M.A., Daily, G.C., Ehrlich, P.R., Kremen, C., Ricketts, T.H. & Sanjayan, M.A., 2007. Ecosystem-service science and the way forward for conservation. *Conservation Biology*, vol. 21, p. 1383-1384.

Atkins, J. Burdon, D & Elliott, M., 2012. *Summary of the Marine Conservation Zone Impact Assessment Review*. University of Hull. Available online from: http://www.mseproject.net/downloadable/cat_view/2-resources/25-impact-assessment/11-benefits-of-mpas/12-mczs [Accessed 16/07/2014]

Austen, M., & Malcom, S.J. (coord.), 2011. *UK National Ecosystem Assessment. Understanding nature's value to society. Technical report. Chapter 12: Marine*. UNEP-WCMC, Cambridge, UK. Available online from: <http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx> [Accessed 29/07/2014]

Azqueta, D., Alviar, M., Domínguez, L. & O'Ryan, R., 2007. *Introducción a la economía ambiental*. Segunda Edición, McGraw-Hill/Interamericana de España, Aravaca, Spain.

Badalamenti, F., Ramos, A.A., Voultziadou, E., Sanchez-Lizaso, J.L., D'Anna, G., Pipitone, C., Mas, J., Ruiz-Fernandez, J.A., Whitmarsh, D., and Riggio, S., 2000. Cultural and socio-economic impacts of Mediterranean marine protected areas. *Environmental Conservation*, vol. 27, n° 2, p. 110-125.

Balmford, A., Gravestock, P., Hockley, N., McClean, C.J., & Roberts, C.M., 2004. The worldwide costs of marine protected areas. *PNAS*, vol. 101, n° 26, p. 9694-9697.

Beaumont, N.J., Austen, M.C., Mangi, S.C. & Townsend, M., 2008. Economic valuation for the conservation of marine biodiversity. *Marine Pollution Bulletin*, vol. 56, p. 386-396.

Beaumont N.J., Austen, M.C., Atkins, J.P., Burdon, D., Degraer, S., Dentinho, T.P., Deros, S., Holm, P., Horton, T., van Ierland, E., Marboe, A.H., Starkey, D.J., Townsend, J. & Zarzycki, T., 2007. Identification, definition and quantification of goods and services provided by marine biodiversity: implications for the ecosystem approach. *Marine Pollution Bulletin*, vol. 54, p. 253-265.

Böhnke-Henrichs, A., Baulcomb, C., Koss, R., Hussain, S.S., & de Groot, R.S., 2013. Typology and indicators of ecosystem services for marine spatial planning and management. *Journal of Environmental Management*, vol.130, p. 135-145.

Bonett, D.G., 2006. Confidence interval for a coefficient of quartile variation. *Computational Statistics & Data Analysis*, vol. 50, p. 2953-2957.

Brandt, U.S. & Svendsen, G.T. 2013. Is local participation always optimal for sustainable action? The costs of consensus-building in Local Agenda 21. *Journal of Environmental Management*, vol. 129, p. 266-273.

Brink (ten), B., 2006. *Indicators as communication tools: an evolution towards composite indicators*. ALTER-Net. Available online from: http://unstats.un.org/unsd/envaccounting/seeaLES/egm/ALTERNet_bk.pdf [Accessed 16/07/2014]

Brugha, R. & Varvasovszky, Z., 2000. Stakeholder analysis: A review. *Health Policy and Planning*, vol. 15, n° 3, p. 239-246.

Buléon, P. & Shurmer-Smith, J.L. (ed.), 2008. *Espace Manche: un monde en Europe/ Channel Spaces: A world within Europe*. University of Caen, Caen, France.

Buléon, P. & Shurmer-Smith, J.L., 2014. *Cross-Channel Atlas*. University of Caen Basse-Normandie. Available online from: <http://atlas-transmanche.certic.unicaen.fr/en/> [Accessed 10/09/2014]

CAMIS. Channel Arc Manche Integrated Strategy. 2013. *The CAMIS Project. In brief*. Available online from: <http://www.arcmanche.com/en/the-camis-project/in-brief/> [Accessed 10/04/2014]

Campana, S.E., 2001. Accuracy, precision and quality control in age determination, including a review of the use and abuse of age validation methods. *Journal of Fish Biology*, vol. 59, p. 197-242.

Cárcamo, P.F., Garay-Flühmann, R., Squeo, F.A. & Gaymer, C.F., 2014. Using stakeholders' perspective of ecosystem services and biodiversity features to plan a marine protected area. *Environmental Science & Policy*, vol. 40, p. 116-131.

CBD. Convention on Biological Diversity., 2010. *COP 10. Decision X/2. Strategic Plan for Biodiversity 2011-2020*. Available online from: <http://www.cbd.int/decision/cop/default.shtml?id=12268> [Accessed 16/07/2014]

CBD. Convention on Biological Diversity., 2008. *COP 9 Decision IX/18 (19), Bonn 19-30 May 2008*. Available online from: <http://www.cbd.int/decision/cop/default.shtml?id=11661> [Accessed 15/07/2014]

Chape, S., Spalding, M., & Jenkins, M.D. (ed.), 2008. *The World's Protected Areas: Status, Values and Prospects in the 21st Century*. UNEP World Conservation Monitoring Centre, University of California Press, Berkeley, USA.

Chun, K.A., Manley, G.T., Stiver, S.I., Aiken, A.H., Phan, N., Wang, V., Meeker, M., Cheng, S-C., Gean, A.D. & Wintermark, M., 2010. Interobserver Variability in the Assessment of CT Imaging Features of Traumatic Brain Injury. *Journal of Neurotrauma*, vol. 27, n° 2, p. 325-330.

Commonwealth of Australia. 2005. *Socio-economic Impact Assessment Toolkit. A guide to assessing the socio-economic impacts of Marine Protected Areas in Australia*. Australian Government & Natural heritage Trust, Canberra, Australia. Available online from: <http://www.environment.gov.au/system/files/resources/27b104ce-ff21-43d8-9a7f-2c51cbe821bd/files/nrsmmpa-seia.pdf> [Accessed 06/06/2014]

Creswell, J.W., 2013. *Qualitative inquiry & Research design*. Choosing among five approaches. Third Edition, SAGE, Thousand Oaks, USA.

C-SCOPE project. Combining Sea and Coastal Planning in Europe. 2013. *Project Activities. Coastal Management Tools. Indicators*. Available online from: <http://www.cscope.eu/en/project-activities/coastal-management-tools/indicators/> [Accessed 02/07/2014]

Dauvin, J.C., 2012. Are the eastern and western basins of the English Channel two separate ecosystems? *Marine pollution Bulletin*, vol. 64, p. 463-471.

Davies, J., Baxter, J., Bradley, M., Connor, D., Khan, J., Murray, E., Sanderson, W., Turnbull, C. & Vincent, M., 2001. *Marine Monitoring Handbook*. March 2001. Joint Nature Conservation Committee. Available online from: <http://jncc.defra.gov.uk/MarineMonitoringHandbook> [Accessed 16/07/2014]

DEFRA. Department of Environment, Food and Rural Affairs., 2011. *Science and Research Projects. Lyme Bay - A Case-study: Measuring the effects of benthic species and assessing potential - MB0101*. Available online from: <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=16366&FromSearch=Y&Publisher=1&SearchText=Lyme%20Bay&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description> [Accessed 16/07/2014]

Dudley, N., Stolton, S. & Kettunen, M., 2013. Protected areas: their values and benefits. In Kettunen, M. & ten Brink, P. (ed.), *Social and economic benefits of protected areas. An Assessment Guide*, p. 11-32. Routledge, Oxon, UK, and New York, USA.

Duggan, D.E.; Farnsworth, K.D. and Kraak, S.B.M. 2013. Identifying functional stakeholder clusters to maximise communication for the ecosystem approach to fisheries management. *Marine Policy*, vol. 42, p. 56-67.

Dunn, R.R., 2010. Global Mapping of Ecosystem Disservices: The Unspoken Reality that Nature Sometimes Kills us. *Biotropica*, vol 42, n° 5, p. 555-557.

EU. European Union., 1992. *Habitats Directive (amended version)*. Available online from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1992L0043:20070101:EN:PDF> [Accessed 16/07/2014]

EU. European Union., 2000. *Managing Natura 2000 Sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE*. Office for Official Publications of the European Communities. Luxembourg. Available online from: http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf [Accessed 10/09/2014]

EUROSTAT., 2005. *Sustainable Development Indicators to monitor the implementation of the EU Sustainable Development Strategy*. Available online from: [http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/files/SEC\(2005\)161%20SDI%20COMMUNICATION%20EN.PDF](http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/files/SEC(2005)161%20SDI%20COMMUNICATION%20EN.PDF) [Accessed 02/07/2014]

Euser, A.M., Dekker, F.W. & le Cessie, S., 2008. A practical approach to Bland-Altman plots and variation coefficients for log transformed variables. *Journal of Clinical Epidemiology*, vol. 61, n° 10, p. 978-82.

Fan, W. & Yan, Z., 2010. Factors affecting response rates of the web survey: A systematic review. *Computers in Human Behavior*, vol. 26, p. 132-139.

Fleming, D.M. & Jones, P.J.S., 2012. Challenges to achieving greater and fairer stakeholder involvement in marine spatial planning as illustrated by the Lyme Bay scallop dredging closure. *Marine Policy*, vol. 36, n° 2, p. 370-377.

Fletcher, S., Rees, S., Gall, S., Jackson, E., Friedrich, L. and Rodwell, L., 2012. *Securing the benefits of the Marine Conservation Zone Network. A report to The Wildlife Trusts by the Centre for Marine and Coastal Policy Research, Plymouth University.* Available online from: http://www.bbowt.org.uk/sites/default/files/files/Securing_The_Benefits.pdf [Accessed 06/06/2014]

Garcia, S.M., Gascuel, D. & Hénichart, L.-M., 2013. *Marine protected areas in fisheries management. Synthesis on the state of the art.* Sub-Regional Fisheries Commission (SRFC), Dakar, Senegal.

Gouvernement Français., 2014a. *Eau et Biodiversité. Natura 2000. Orientations de gestion.* Available online from: <http://www.developpement-durable.gouv.fr/Les-documents-d-objectifs.html> [Accessed 10/09/2014]

Gouvernement Français., 2014b. *Vie publique. Réperes. Découverte des institutions. Les collectivités territoriales. Qu'est-ce qu'une commune?* Available online from: <http://www.vie-publique.fr/decouverte-institutions/institutions/collectivites-territoriales/categories-collectivites-territoriales/qu-est-ce-qu-commune.html> [Accessed 04/07/2014]

Gouvernement Français., 2012. *GEOFLA. Communes au 1er janvier 2012 Métropole.* Available online from: <http://www.data.gouv.fr/dataset/geofla-communes> [Accessed 16/07/2014]

Gray, D.E., 2014. *Doing research in the real world.* Third Edition, SAGE Publications, London, UK.

Guidetti P, Baiata P, Ballesteros E, Di Franco A, Hereu B, Macpherson, E., Micheli, F., Pais, A., Panzalis, P., Rosenberg, A.A., Zabala, M. & Sala, E., 2014. Large-Scale Assessment of Mediterranean Marine Protected Areas Effects on Fish Assemblages. *PLoS ONE*, vol. 9, n° 4, e91841. doi:10.1371/journal.pone.0091841

Heck, N., Dearden, P. & McDonald, A., 2011a. Stakeholders' expectations towards a proposed marine protected area: A multi-criteria analysis of MPA performance criteria. *Ocean & Coastal Management*, vol. 54, p. 687-695.

Heck, N., Dearden, P. & McDonald, A., 2011b. Stakeholder evaluation priorities for demonstrating marine protected area effectiveness at the Pacific Rim National Park Reserve, Canada. *Coastal Management*, vol. 40, n° 1, p. 55-72.

Hockings, M., Stolton, S., Leverington, F., Dudley, N. & Courrau, J., 2006. *Evaluating effectiveness. A framework for assessing management effectiveness of protected areas*. 2.^a Ed. Gland, Switzerland & Cambridge, UK: IUCN.

Hoelting, K.R., Hard, C.H., Christie, P. & Pollnac, R.B., 2013. Factors affecting support for Puget Sound Marine Protected Areas. *Fisheries Research*, vol. 144, p. 48-59

Horta e Costa, B., Batista, M.I., Gonçalves, L., Erzini, K., Caselle, J.E., Cabral, H.N. & Gonçalves, E.J., 2013. Fishers' behaviour in response to the implementation of a marine protected area. *PlosONE*, vol. 8, n° 6, e65057.

HMT. Her Majesty Treasury., 2011. *The Green Book. Appraisal and Evaluation in Central Government*. Available online from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf [Accessed 14/07/2014]

Hull, S.C., Frost, N.J., Saunders, J.E., Rupp-Armstrong, S., Hime, S., Tinch, R., Claydon, J. & Jones, P., 2010. *Determining how and what to take into account in the planning of marine protected area networks – socio-economic data*. DEFRA. MB0104 Project. Marine Biodiversity R&D Programme. Available online from: <http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16371> [Accessed 02/07/2014]

Hussain, S.S., Winrow-Giffin, A., Moran, D., Robinson, L.A., Fofana, A., Paramor, O.A.L., & Frid, C.L.J., 2010. An Ex Ante Ecological Economic Assessment of the Benefits Arising from Marine Protected Areas Designation in the UK. *Ecological Economics*, vol. 69, p. 828–838.

INDECO project. Development of Indicators of Environmental Performance of the Common Fisheries Policy., 2005. *A review of the indicators for ecosystem structure and functioning*. Available online from: <http://www.ieep.eu/assets/233/INDECOD08socioeconomicindicators.pdf> [Accessed 16/07/2014]

IPBES. Intergovernmental Platform on Biodiversity & Ecosystem Services., 2014. *Work programme*. Available online from: <http://www.ipbes.net/work-programme.html> [Accessed 02/07/2014]

Jacobsen, K.I., Lester, S.E. & Halpern, B.S., 2014. A global synthesis of the economic multiplier effects of marine sectors. *Marine Policy*, vol. 44, p. 273-278.



Jentoft, S., Pascual-Fernandez, J.J, de la Cruz, R., Gonzalez-Ramallal, M. & Chuenpagdee, R., 2012. What stakeholders think about marine protected areas: Case studies from Spain. *Human Ecology*, vol. 40, p. 185-197.

JNCC. The Joint Nature Conservation Committee., 2012. *Marine. Marine Protected Areas. Marine Conservation Zones. MCZ Project. MCZ Advice Package. The regional MCZ project Impact Assessment materials*. Available online from: <http://jncc.defra.gov.uk/page-6231> [Accessed 04/07/2014]

JNCC. The Joint Nature Conservation Committee. Marine., 2013. *Marine. Marine Protected Areas. Marine Conservation Zones. The Marine Conservation Zone Project*. Available online from: <http://jncc.defra.gov.uk/page-2409> [Accessed 16/12/2013]

Jones, P.J.S., Qiu, W. & De Santo, E.M., 2011. *Governing MPAs: getting the balance right*. Technical Report to Marine and Coastal Ecosystems Branch, United Nations Environment Programme, Nairobi, Kenya. Available online from: <http://www.unep.org/ecosystemmanagement/Portals/7/governing-mpas-final-technical-report-web-res.pdf> [Accessed 16/07/2014]

Kellner, J.B., Tetreault, I., Gaines, S.D., & Nisbet, R.M., 2007. Fishing the line near marine reserves in single and multispecies fisheries. *Ecological Applications*, vol. 17, p. 1039–1054.

Kettunen, M. & ten Brink, P. (ed.), 2013. *Social and economic benefits of protected areas. An Assessment Guide*, Routledge. Oxon, UK, and New York, USA.

Kettunen, M., ten Brink, P. & Bassi, S., 2013. General principles for estimating the socio-economic value of benefits provided by protected areas. *In* Kettunen, M. & ten Brink, P. (ed.), *Social and economic benefits of protected areas. An Assessment Guide*. p: 33-53. Routledge, Oxon, UK, and New York, USA.

Kumar, M. & Kumar, P., 2008. Valuation of the ecosystem services: a psycho-cultural perspective. *Ecological Economics*, vol. 64, n° 4, p. 808-819

MA. Millennium Ecosystem Assessment., 2005. *Ecosystems and human well-being: General synthesis*. Island Press, Washington DC, USA. Available online from: <http://www.unep.org/maweb/documents/document.356.aspx.pdf> [Accessed 16/07/2014]

Mangi, S.C., Rodwell, L.D & Hattam, C., 2011. Assessing the impacts of establishing MPAs on fishermen and fish merchants: The case of Lyme Bay, UK. *AMBIO*, vol. 40, p. 457-468.



Mangi SC, Gall SC, Hattam C, Rees S, Rodwell LD., 2012. *Lyme Bay – a case-study: measuring recovery of benthic species; assessing potential “spillover” effects and socio-economic changes; 3 years after the closure. Report 2: Assessing the socio-economic impacts resulting from the closure restrictions in Lyme Bay.* Report to the Department of Environment, Food and Rural Affairs from the University of Plymouth-led consortium, Plymouth: University of Plymouth Enterprise Ltd. 96 pages. Available online from: <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=16366&FromSearch=Y&Publisher=1&SearchText=Lyme%20Bay&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description> [Accessed 14/07/2104]

Marine Management Organisation., 2011. *Maximising the socio-economic benefits of marine planning for English coastal communities.* Available online from: <http://www.marinemanagement.org.uk/marineplanning/key/se.htm> [Accessed 02/07/2014]

Monroe, M.C. & Adams, D.C., 2012. Increasing Response Rates to Web-Based Surveys. *Journal of Extension*, vol. 50, n° 6, 6T0T7. http://www.joe.org/joe/2012december/pdf/JOE_v50_6tt7.pdf

Natural England., 2012. *Regional MCZ project Impact Assessment materials (MCZ024).* Available online from: <http://publications.naturalengland.org.uk/publication/2071071> [Accessed 02/07/2014]

NEF. New Economics Foundation., 2013a. *Economics in policy-making 4. Social CBA and SROI.* New Economics Foundation, London, UK. Available online from: http://b.3cdn.net/nefoundation/ff182a6ba487095ac6_yrm6bx9o6.pdf [Accessed 16/07/2014]

NEF. New Economics Foundation., 2013b. *Economics in policy-making 6. Multi-criteria analysis.* New Economics Foundation, London, UK. Available online from: http://b.3cdn.net/nefoundation/ff182a6ba487095ac6_yrm6bx9o6.pdf [Accessed 16/07/2014]

ONS. Office for National Statistics., 2011. *Open Geography. Lower Super Output Area.* Available online from: <https://geoportal.statistics.gov.uk/geoportal/catalog/main/home.page> [Accessed 24/04/2014]

ONS. Office for National Statistics., 2014. *Neighbourhood Statistics. Super Output Areas explained.* Available online from: <http://www.neighbourhood.statistics.gov.uk/dissemination/Info.do?m=0&s=1405511623717&enc=1&page=nessgeography/superoutputareasexplained/output-areas-explained.htm&njs=true&nsc=false&nsvg=false&nswid=1366> [Accessed 16/07/2014]

OSPAR & HELCOM.,2003. *Statement on the Ecosystem Approach to the Management of Human Activities. Towards an Ecosystem Approach to the Management of Human Activities. First Joint Ministerial Meeting of the Helsinki and OSPAR Commissions (JMM)*

Bremen: 25 - 26 June 2003. Available online from:
http://www.ospar.org/content/content.asp?menu=00430109150000_000000_000000 [Accessed 16/07/2014]

PANACHE. Protected Area Network Across the Channel Ecosystem., 2014. *Home*. Available online from: http://www.panache.eu.com/home_panache [Accessed 15/07/2014]

Pascal, N., 2011. *Cost-benefit analysis of community-based marine protected areas: 5 case studies in Vanuatu*. CRISP Study Report. Available online from:
http://cmsdata.iucn.org/downloads/nicolas_pascal_2011_cba_mma_spc.pdf [Accessed 14/07/2014]

PEGASEAS. Promoting Effective Governance of the Channel Ecosystem. 2014. *Home*. Available online from: <http://www.pegaseas.eu/> [Accessed 10/04/2014]

Perez de Oliveira, L., 2013. Fishers as advocates of marine protected areas: a case study from Galicia (NW Spain). *Marine Policy*, vol. 41, p. 95-102.

Petchenik, J., & Watermolen, D. J., 2011. A cautionary note on using the Internet to survey recent hunter education graduates. *Human Dimensions of Wildlife* 16, n° 3, p. 216-218.

Pita, C., Pierce, G.J., Theodossiou, I. & Mcpherson, K., 2011. An overview of commercial fishers' attitudes towards marine protected areas. *Hydrobiologia*, vol. 670, p. 289-306.

Pita, C., Theodossiou, I. & Pierce, G.J., 2013. The perceptions of Scottish inshore fishers about marine protected areas. *Marine Policy*, vol. 37, p. 254-263.

Pomeory, R., Parks, J.E. & Watson, L.M., 2004. *How is your MPA doing? A Guidebook of natural and social indicators for evaluating marine protected area management effectiveness*. IUCN, Gland, Switzerland and Cambridge, UK.

Pomeroy, R. & Douvère, F., 2008. The engagement of stakeholders in the marine spatial planning process. *Marine Policy*, vol. 32, p. 816-822.

Pugh, D., 2008. *Socio-economic indicators of marine-related activities in the UK economy*. The Crown Estate. Available online from:
http://www.thecrownestate.co.uk/media/207045/socio_economic_uk_marine.pdf [Accessed 27/05/2014]

Rand, M., Spalding, M. & Sanjayan, M., 2012. Paper Parks Re-Examined: Building a Future for “MPAs-in-Waiting”. *MPA News*, vol.13, n° 4, p. 1-4.

Reed, M.S., 2008. Stakeholder participation for environmental management: A literature review. *Biological Conservation*, vol. 141, p. 2417-2431.

Rees, S.E., Fletcher, S., Gall, S.C., Friedrich, L.A., Jackson, E.L., Rodwell, L.D., 2014. Securing the benefits: Linking ecology with marine planning policy to examine the potential of a network of Marine Protected Areas to support human wellbeing, *Marine Policy*, vol. 44, p. 335-341.

Rees, S.E., Attrill, M.J., Austen, M.C., Mangi, S.C. & Rodwell, L.D., 2013a. A thematic cost-benefit analysis of a marine protected area. *Journal of Environmental Management*, vol.114, p. 476-485.

Rees, S.E., Rodwell, L.D., Searle, S. & Bell, A., 2013b. Identifying the issues and options for managing the social impacts of marine protected areas on a small fishing community. *Fisheries Research*, vol. 146, p. 51-58.

Rees, S.E., Attrill, M.J., Austen, M.C., Mangi, S.C., Richards, J.P. & Rodwell, L.D., 2010a. Is there a win-win scenario for marine nature conservation? A case study of Lyme Bay, England. *Ocean & Coastal Management*, vol. 53, p. 135-145.

Rees, S.E., Rodwell, L.D., Attrill, M.J., Austen, M.C. & Mangi, S.C., 2010b. The value of marine biodiversity to the leisure and recreation industry and its application to marine spatial planning. *Marine Policy*, vol. 34, p. 868-875.

Rife, A.N., Aburto-Oropeza, O., Hastings, P.A., Erisman, B., Ballantyne, F., Wielgus, J., Sala, E. & Gerber, L., 2013. Long-term effectiveness of a multi-use marine protected area on reef fish assemblages and fisheries landings. *Journal of Environmental Management*, vol. 117, p. 276-283.

Roberts, C.M., Andelman, S., Branch, G., Bustamante, R.H., Castilla, J.C., Dugan, J., Halpern, B.S., Lafferty, K.D., Leslie, H., Lubchenco, J., McArdle, D., Possingham, H.P., Ruckelshaus, M. & Warner, R.R., 2003. Ecological criteria for evaluating candidate sites for marine reserves. *Ecological Applications*, vol.13, n° 1, S:199-214.

Rodríguez-Rodríguez, D. & Martínez-Vega, J., 2013. Results of the implementation of the System for the Integrated Assessment of Protected Areas (SIAPA) to the protected areas of the Autonomous Region of Madrid (Spain). *Ecological Indicators*, vol. 34, p. 210-220.

Rodríguez-Rodríguez, D., Rees, S., Mannaerts, G., Sciberras, M., Pirie, C., Black, G., Aulert, C., Sheehan, E.V., Carrier, S. & Attrill, M.J. In press. Status of the marine protected area network across the English Channel (La Manche): Cross-country similarities and differences in MPA designation, management and monitoring. *Marine Policy*.

Sala, E., Costello, C., Dougherty, D., Heal, G., Kelleher, K., Murray, J.H., Rosenberg, A.A. & Sumaila, R., 2013. A General Business Model for Marine Reserves. *PLoS ONE*, vol. 8, n° 4, e58799. doi:10.1371/journal.pone.0058799

Salado, .R., Footitt, A., Goodbody, R., Elding, C., Morris, R. & Blyth-Skyrme, R., 2013. *Value of Marine Protected Areas on recreation and tourism services. Methodology report prepared for Defra*. Loddon, Norfolk, UK. Available online from: <http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=18546> [Accessed 26/09/014]

Sanchirico, J.N. & Wilen, J.E., 2001. A bioeconomic model of marine reserve creation. *Journal of Environmental Economics and Management*, vol. 42, p. 257-276.

(de) Santo, E.M., 2013. Missing marine protected area (MPA) targets: how the push for quantity over quality undermines sustainability and social justice. *Journal of Environmental Management*, vol. 124, p. 137-146.

Schreckenber, K., Camargo, I., Withnall, K., Corrigan, C., Franks, P., Roe, D., Scherl, L.M. & Richardson, V., 2010. *Social assessment of conservation initiatives. A review of rapid methodologies*. Natural Resource Issues No. 22, IIED, London, UK.

Tillin, H.M., Hull, S.C. & Tyler-Walters, H., 2010. *Development of a Sensitivity Matrix (pressures-MCZ/MPA features)*. Report to the Department of Environment, Food and Rural Affairs. Defra Contract No. MB0102. ABPmer and Marine Life Information Network (MarLIN) Task 3, Report No. 22. Available online from: <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16368> [Accessed 03/07/2014]

Tropova, C., Meliane, I., Laffoley, D., Matthews, E. & Spalding, M. (ed.), 2010. *Global Ocean Protection: Present Status and Future Possibilities*. Agence des aires marines protégées: Brest, France; IUCN WCPA: Gland, Switzerland, Washington, DC and New York, USA; UNEP-WCMC: Cambridge, UK; TNC: Arlington, USA; UNU: Tokyo, Japan; WCS: New York, USA.

Turbout, F., Bahe, S., Buleon, P., Costa, S., Shurmer-Smith, L., Shurmer-Smith, P. & Thenail, B. 2013.

Focusing on the Channel. Collection of maps. CAMIS. University of Caen Lower Normandy, France.

UK Government., 2009. *Marine and Coastal Access Act*. Available online from: <http://www.legislation.gov.uk/ukpga/2009/23/contents> [Accessed 15/07/2014]

VALMER. Valuing Ecosystem Services in the Western Channel. 2014. *Home*. Available online from: <http://www.valmer.eu/> [Accessed 10/09/2014]

West, P., Igoe, J. & Brockington, D., 2006. Parks and peoples: The social impact of protected areas. *Annual Review of Anthropology*, vol. 35, p. 251-277.

Westmacott, S. & Rijsberman, F., 2000. Cost-Effectiveness Analysis of Coral Reef Management and Protection: A Case Study of the Republic of the Maldives. In Gustavson, K., Huber, R.M. & Ruitenbeek, J. (ed.), *Integrated coastal zone management of coral reefs: Decision support modelling*, p: 67-82, World Bank. Available online from: http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2000/05/13/000094946_0005030530_2187/Rendered/PDF/multi_page.pdf [Accessed 14/07/2014]

Wheeler, B.W., White, M., Stalh-Timmins, W. & Depledge, M.H., 2012. Does living by the coast improve health and wellbeing? *Health & Place*, 18: 1198-1201.

Yamazaki, S., Grafton, Q.R., Kompas, T. & Jennings, S., 2014. Biomass management targets and the conservation and economic benefits of marine reserves. *Fish & Fisheries*, vol. 15, n° 2, p. 196-208.

Appendix

Appendix 1: Questions of the stakeholder survey

Q1) 'Name of the organisation';

Q2) 'Number of members of the organisation';

Q3) 'To which degree is your organisation affected by the designation and enforcement of marine and coastal protected areas?' Five response options according to a Likert-type scale were given: 'Very negatively affected'-'Somehow negatively affected'-'Not affected'-'Somehow positively affected'-'Very positively affected'. Please, explain briefly in which way your organization is affected by and/or interested in the designation of MCPAs.

Q4) 'To which degree is your organisation affected by the designation and enforcement of offshore marine protected areas?' Five response options according to a Likert-type scale were given: 'Very negatively affected'-'Somehow negatively affected'-'Not affected'-'Somehow positively affected'-'Very positively affected'. Please, explain briefly in which way your organization is affected by and/or interested in the designation of MCPAs.

Q5) 'The designation of marine and coastal protected areas is: Ecologically-Socially-Economically-Culturally'. Five response options according to a Likert-type scale were given for each category: 'Very negative'-'Negative'-'Neutral'-'Positive'-'Very positive'. Because...

Q6) 'How would your organisation rate the importance of the following indicators for assessing the effects of marine and coastal protected areas on local communities?' They were asked to rank the complete list of 32 social variables identified from the literature review according to the following response options: 'Not important/Not considered'-'Slight importance'-'Moderate importance'-'High importance'-'Very high importance';

Q7) 'How would your organisation rate the importance of the following indicators for assessing the effects of marine and coastal protected areas on local economies?' They were asked to rank the complete list of 32 economic variables identified from the literature review according to the following response options: 'Not important/Not considered'-'Slight importance'-'Moderate importance'-'High importance'-'Very high importance';

Q8) 'For how long will the biggest effects from the designation and enforcement of a marine and coastal protected area generally be felt...? Ecologically-Socially-Economically-Culturally'. Six response options were given for each category: 'No effect'-'Up to 2 years since designation'-'Up to 10 years since designation'-'Up to 20 years since designation'-'Permanent effect'-'Don't know';

Q9) 'To what extent are the effects of the designation and enforcement of a marine and coastal protected area generally felt...? Ecologically-Socially-Economically-Culturally'. Six

response options were given for each category: 'No effect'-'Limited to the MCPA limits'-'Up to 1km around the MCPA limits'-'Up to 10km around the MCPA limits'-'More than 10km around the MCPA limits'-'Don't know'.

Q10) 'What local effect would your organization expect in a 10 year period since the designation and enforcement of a marine and coastal protected area on the indicators listed below?' Five response options were given: 'Substantial decrease (over 10%)'-'Decrease (between 3% and 10%)'-'No effect (less than 3% increase or decrease)'-'Increase (between 3% and 10%)'-'Substantial increase (over 10%)'.



Appendix 2: Criteria used in the expert discrimination survey

We considered an expert someone who:

a) Had a relevant 3-year or higher degree in a topic related to marine socioeconomics (economy, environmental science, geography, etc.): AND

b) Had worked under part (min. 0.5 FTE) or full-time contract developing theoretical breakthroughs or performing regular managerial responsibilities on marine socioeconomics continuously for at least two years in the last 30 months, or for at least three years in the last four years: AND/OR

c) Had published at least two-peer reviewed outputs (papers, books or book chapters) on marine socioeconomics in the last two years as a first or second author, or more than five publications on that subject in the last five years among the first three authors.



Appendix 3: Main characteristics of the MPAs assessed in Phase 3 of the study

MPA name	Designation category (& date)	Size ²	Management structure in place (& date)	Management plan (& date)	Conservation features ³	Number of communes
Banc des Flandres	SPA (01/2010); SCI (02/2010); OSPAR (12/2012)	116 632	Yes (06/2010)	No	1110 (Habs.); 1351, 1364, 1365 (Spp.)	4
Littoral Cauchois	SCI (12/2004); OSPAR (12/2012)	3,616	No	No	1110, 1140, 1170, 1220, 1230, 4020, 7110, 7120, 7220, 8330, 9180 (Habs.); 1349, 1351, 1364, 1365 (Spp.)	10
Marais Arriere- Littoraux du Bessin	SCI (12/2004)	55	No	No	1140, 1210, 1330, 2110, 2120, 2130, 2160, 2190, 3140, 3150, 6430, 7210, 7230 (Habs.); 1016 (Spp.)	5
Iroise	PNM (09/2007)	168 889	Yes (12/2007)	Yes (11/2010) ⁴		11
Recifs et Marais Arriere-littoraux du Cap Lévi à la Pointe de Saire	SCI (12/2004)	14 688	No	No	1110, 1140, 1170, 1210, 1220, 1230, 1310, 1330, 2110, 2120, 2130, 4030, 6510, 7230, 91E0, 9130 (Habs.); 1349, 1351, 1364, 1365, 1166, 1304, 1324 (Spp.)	8
Baie de Goulven	SPA (03/2006)	2,136	No	No	A034, A038, A046, A048, A050, A052, A053, A130, A137, A138, A140, A141, A142, A143,	9

² In hectares. Clipped to the PANACHE project area.

³ Codes according to the 92/43/EEC & 2009/147/EC Directives. Habs.: Habitats ; Spp.: Species.

Source: <http://inpn.mnhn.fr/accueil/index> [Accessed 03/07/2014]

⁴ Source: <http://www.parc-marin-iroise.fr/Le-Parc/Historique-du-Parc/Les-dates-clefs> [Accessed 18/09/2014]

A144, A149, A151, A156, A157, A160, A161,
A162, A164, A169, A182, A294 (Spp.)



Appendix 4: Assessment of the technique

- 1) At what level can this technique be used?

The quantitative part of the study can be used at any geographic scale for which consistent and reliable statistics at the local (municipality) level are collected. The qualitative part can be used anywhere.

- 2) Can the technique be transferred to different MPA sites?

The quantitative part of the study needs two requirements to be met: a) consistent time series of available socioeconomic data compiled at local level; b) An incipient or ongoing process of designation of a network of MPAs that ensures the comparison of recent data and avoids confusion arising from overlaps between different MPA designation categories. It may be difficult that both requirements are met at once. The qualitative part of the study can be adapted to different situations and contexts.

- 3) How does this technique and the data fit with/inform existing MPA monitoring programmes in the UK and France?

The methods shown here will help clarify MPA socioeconomic monitoring priorities, scales, stakeholders and variables in both countries and elsewhere.

- 4) What are the current similarities/differences between how the technique is used in the UK and France?

In principle, the MPBACI method can be used in any country meeting the requirements stated in e.2. However, lack of suitable data at the scale of LSOA prevented us from using the quantitative part of the study in the UK.

- 5) What are the current similarities/differences between how the data is analysed in the UK and France?

Data would be analysed equally in either case, if they were available in both cases.

- 6) How has this study aligned those differences?

- 7) From this collaborative study please make recommendations as to how this technique and the data collected be used by MPA managers at English and French MPA sites?

The results from the quantitative part of this study make it advisable to use a different technique (qualitative) that may deliver more meaningful management results from the collaboration with specific (affected &/or interested) stakeholders.

8) How much has this study cost?

The direct cost of developing and testing the two methodologies shown in this study (in staff time) has been approximately 14,400 £.

9) How is this technique cost effective for monitoring MPAs?

The implementation of this technique is fairly cost-effective, as it relies solely on published secondary data for the quantitative part and on online surveys for the qualitative part.

10) How was information and expertise exchanged between partners?

The MI led the whole study, compiled the data and analysed the results. The GMPD provided and helped to find a number of data regarding socioeconomic statistics for some French MPAs. WWF-UK provided help with the piloting and filling in of the survey.

11) How has this collaboration built capacity within your organisation for monitoring MPAs?

It has broadened our collaboration experience and made us realise the kind of socioeconomic monitoring that MPA managers are doing and the type of data they need and can be produced.

12) How can this collaboration be developed in the future?

Closer and wider collaboration throughout the whole study process could help enhance outcomes and overcome difficulties.

13) Please can you make suggestions as to how your technique and the results of your study can be used to give a greater overall indication of how MPAs are impacting humans and biodiversity?

The results of this study suggest that MPAs do not seem to have broad socioeconomic effects at the community level and that ongoing and future MPA socioeconomic monitoring and assessment processes could benefit from such activities focusing just on key stakeholder groups. However, it would be advisable to confirm the results of the quantitative part of the study on a broader, randomly-selected sample of MPAs.



PANACHE

Protected Area Network Across
the Channel Ecosystem

PANACHE is a project in collaboration between France and Britain. It aims at a **better protection** of the Channel marine environment through the **networking** of existing marine protected areas.

The project's five objectives:

- Assess the existing marine protected areas network for its ecological coherence.
- Mutualise knowledge on monitoring techniques, share positive experiences.
- Build greater coherence and foster dialogue for a better management of marine protected areas.
- Increase general awareness of marine protected areas: build common ownership and stewardship, through engagement in joint citizen science programmes.
- Develop a public GIS database.

France and Great Britain are facing similar challenges to protect the marine biodiversity in their shared marine territory: PANACHE aims at providing a **common, coherent and efficient reaction**.

PANACHE est un projet franco-britannique, visant à une **meilleure protection** de l'environnement marin de la Manche par la **mise en réseau** des aires marines protégées existantes.

Les cinq objectifs du projet :

- Étudier la cohérence écologique du réseau des aires marines protégées.
- Mutualiser les acquis en matière de suivi de ces espaces, partager les expériences positives.
- Consolider la cohérence et encourager la concertation pour une meilleure gestion des aires marines protégées.
- Accroître la sensibilisation générale aux aires marines protégées : instaurer un sentiment d'appartenance et des attentes communes en développant des programmes de sciences participatives.
- Instaurer une base de données SIG publique.

France et Royaume-Uni sont confrontés à des défis analogues pour protéger la biodiversité marine de l'espace marin qu'ils partagent : PANACHE vise à apporter **une réponse commune, cohérente et efficace**.

- www.panache.eu.com -

Financed by / financé par



PANACHE Project partners / Partenaires du projet PANACHE

