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Assessing the socioeconomic effects of multiple-use MPAs in a European setting: A national stakeholders' perspective

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ABSTRACT

The designation of marine protected areas (MPAs) may have intense social and economic effects on human communities. Driven by overarching global and European policies and national legislations, 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. Here, we identified a set of 64 socioeconomic variables potentially relevant for marine and coastal stakeholders in a European context and a comprehensive set of 20 marine and coastal stakeholder categories. Ninety national organisations in the UK and France belonging to those categories and potentially affected by/interested in the designation of multiple-use MPAs were identified and surveyed. Results show that environmental NGOs, research centres, local councils, managing agencies and statutory nature conservation bodies perceived that they are positively affected by these MPAs, whereas fishers' organisations, shipping and aggregate industrial organisations and recreational organisations perceived to be chiefly negatively affected by MPAs. On average, the ecological effects of multiple-use MPAs are perceived as 'largely positive', though 30% of respondents did not perceive any positive ecological effects from these MPAs. The social, economic and cultural effects of such MPAs are perceived as 'moderately positive'. Most respondents perceived broad range (>10 km) and permanent ecological, social, economic and cultural effects from multiple-use MPA designation suggesting high societal expectations towards these areas. However, only five variables were perceived to vary in intensity after the designation of multiple-use MPAs: 'research', 'environmental performance by citizens, businesses and towns', 'number of green businesses', 'tourism' and 'economic activities'. The most important 'social' variables for stakeholder organisations referred to local populations' engagement with the MPA, tourism and research. The most important 'economic' variables were linked to fishing, shipping and aquaculture activities. These variables highlight relevant topics to be considered in MPA planning, designation and management processes, especially in the UK and France. There were statistically significant

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differences in the ratings of socioeconomic variables between many organisations belonging to the same intuitive stakeholder categories, suggesting the importance of including as wide a range of stakeholder organisations as feasible in MPA socioeconomic-related processes. Our methods and findings can help to inform and streamline ongoing and future participatory MPA planning, management and monitoring processes in Europe and in other regions with similar socioeconomic characteristics.

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1. Introduction

Protected areas (PAs) are increasingly recognised as socio-ecological systems (Armsworth et al., 2007). In addition to their reported ecological benefits (Geldmann et al., 2013; Halpern, 2003), PA designation can bring about a wide array of benefits to 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, 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 global (CBD, 2008), European (EU, 2008; OSPAR and HELCOM, 2003) and national (AAMP, 2012; UK Government, 2009) policy and legislation, 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. 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 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).

Ongoing national marine conservation processes in the UK (JNCC, 2013) and France (AAMP, 2012) have resulted in the designation of numerous new MPAs (AAMP, 2012; DEFRA, 2013) in three of the five OSPAR maritime regions (OSPAR, 2014) and in three of the four marine regions in the Marine Strategy Framework Directive (EU, 2008). Such processes have resulted in notable increases in the amount of coastal and marine area protected in areas like the English Channel in recent years (Rodríguez-Rodríguez et al., 2015). Ambitious marine conservation strategies in both countries aim to create a coherent, representative and well managed MPA network comprising of up to 20% of the French territorial waters (AAMP, 2012) and, potentially, up to 27.1% of the English marine area (Jones, 2012), far exceeding international targets in terms of area (CBD, 2010) and thus broadening potential socioeconomic implications. These developments have made the assessment of national stakeholders' views and expectations a timely and useful exercise to inform such processes. The importance of stakeholders' inclusion for the success of marine conservation

initiatives is widely acknowledged (Hoelting et al., 2013; Pomeroy and Douvère, 2008). Moreover, stakeholders are considered an essential part of an ecosystem approach to MPAs that integrates a diversity of views and interests in the planning and managing of these areas (Cárcamo et al., 2014; Fleming and Jones, 2012).

Multiple-use MPAs, largely corresponding to IUCN management categories II–VII (Dudley, 2008), are by far the most numerous type of MPAs globally (Toropova et al., 2010), in Europe (European Commission, 2014) as well as in the UK and France (Jones, 2012; Rodríguez-Rodríguez et al., 2015). They include, among other designation categories, Natura 2000 sites (Specially Protected Areas and Special Areas of Conservation), Marine Conservation Zones (MCZs) and marine nature parks (AAMP, 2012; Jones, 2012; Rodríguez-Rodríguez et al., 2015).

In the UK, an official participative appraisal of the socioeconomic impacts of the designation of an entirely new network of multiple-use MPAs (MCZs) was carried out through four regional projects covering the English and Welsh waters (JNCC, 2012). However, criticism was made to its unbalanced treatment of the network's foreseen costs and benefits (Atkins et al., 2012; Rees et al., 2014). The study of the social and economic effects of MPA designation is often polarised, with different studies reporting either benefits (Hussain et al., 2010; Rees et al., 2014), or costs (Balmford et al., 2004; (de) Santo, 2013). When research portrays a more balanced picture of the socioeconomic effects of MPAs, evidence remains fragmented with studies looking at individual MPA effects on local stakeholders (Fleming and Jones, 2012; Mangi et al., 2011; Rees et al., 2013a) or at the effects of different MPAs on specific stakeholders, mainly fishers (Pita et al., 2013; Rees et al., 2013b).

Thus, there is a need for a balanced, broad-scale approach to assessing socioeconomic effects of new MPAs and MPA networks among a wide range of stakeholders to inform current and oncoming marine conservation processes and policies globally (CBD, 2008) and in Europe (EU, 2008; OSPAR and HELCOM, 2003). Additionally, ascertaining stakeholders' views and expectations on MPAs may help to identify new research, management, monitoring and assessment needs and communication gaps (Heck et al., 2011). Therefore, the objectives of this study were to: (1) identify a comprehensive set of marine and coastal stakeholder categories relevant in a European context; (2) identify the most relevant national organisations in the UK and France belonging to those stakeholder categories; (3) assess their organisational perceptions on the designation of multiple-use MPAs; and (4) elicit the most important socioeconomic variables for stakeholders in order to monitor and assess the effects of MPA designation.

2. Methods

2.1. Data collection

A set of variables of potential interest for assessing the socioeconomic effects of European MPAs at a local scale was identified from an initial literature review that included peer-reviewed journal articles, published technical documents and official websites. The main references used in our literature review can be found in the supplementary material. 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%) from a subjective *a priori* perspective, thus reducing reporting biases towards the assessment of socioeconomic ‘benefits’ or ‘costs’ of MPA designation (Schreckenberg et al., 2010).

From the literature review, a number of stakeholder categories that could be affected by the designation of new MPAs in Europe were also identified. We attempted to make this set comprehensive and a balanced representation of the interests at stake and the effects resulting from MPA designation and enforcement by categorising ‘bottom-up’ and ‘top-down’ categories that were either positively or negatively involved with MPAs from a subjective *a priori* perspective. We also aimed to make this set of categories as discriminant as possible, thus disaggregating some broad categories such as the fishing sector into smaller sub-categories by gear types according to their reported differential impact from marine conservation measures (Mangi et al., 2011; Pita et al., 2013).

Using literature, the internet, previous experiences (JNCC, 2013) and our own experience, we identified individual national or regional (intra-national) umbrella organisations in the UK and France belonging to the identified stakeholder categories following a purposive sampling data collection method (Gray, 2014). We aimed to select each of these organisations on the basis of their broadest national representation of the interests of a number of individuals (local councils, ministries) or smaller organisations (national associations, federations, unions, boards, etc.) in each country. A variety of organisations by stakeholder category and country was sought to increase the representation of the responses. For practical reasons, we selected a maximum of three relevant organisations from each stakeholder category from each of the countries. A representative of each of the selected organisations who dealt with marine policy, socioeconomic or conservation issues was contacted by email or, in the cases when an email response could not be obtained, by telephone. The aim of the survey was explained and the respondents were explicitly asked to represent the views or policies of their organisations when replying to the survey to maximise representation (Brugha and Varvasovszky, 2000).

Using Survey Monkey software, a ten-question, online structured questionnaire in English and French was created to ensure response consistency. The whole survey and the definition of the terms used can be consulted in the supplementary material. We piloted the survey prior to its administration and administered it between August the 30th and October the 6th 2013. Two reminders were sent to

non-respondents after each stated deadline. For the survey, the term ‘marine and coastal protected area’ was preferred to the more widely used term of ‘MPA’ to facilitate all the stakeholders to focus on inshore MPAs rather than think of distant, offshore MPAs which were included expressly in question 4 of the survey, in the supplementary material. ‘Marine and coastal protected area’ was defined as an MPA ‘stretching up to 12 nautical miles (22 km) 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.)’. Multiple-use MPAs assuming medium level of regulation (i.e., most human activities are permitted – though regulated – whereas some others are restricted or forbidden) were asked about for being the most common type of MPA in Europe (European Commission, 2014).

2.2. Data analysis

2.2.1. Analysis of organisational perceptions

An empirical classification of stakeholders based on their organisational perceptions of multiple-use MPAs’ effects on their organisations was made. Respondents were given the option to explain why they felt affected by or interested in MPA designation through open-ended responses. We considered those organisations that replied declining our invitation to fill in the survey saying they did not feel affected by or interested in MPAs as ‘neutral’ stakeholders.

Descriptive statistics were produced to analyse perceptions on the ecological, social, economic and cultural effects of multiple-use MPAs’. In order to calculate mean and standard deviation values of the main MPA effects (question 5 of the survey, in the supplementary material), the qualitative response options were coded to an ordinal scale of equal intervals: ‘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 effects) 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). Percentages were computed for assessing the perceived spatial and temporal scales of MPA effects (questions 6 and 7 of the survey, in the supplementary material).

For analysing the perceived intensity of the socioeconomic effects of MPAs (question 8 of the survey in the supplementary material), the ordinal response categories were coded to numerical responses according to the following scale: ‘Substantial decrease (over 10%)’ = –2; ‘decrease (between 3% and 10%)’ = –1; ‘no effect (less than 3% increase or decrease)’ = 0; ‘increase (between 3% and 10%)’ = 1; and ‘substantial increase (over 10%)’ = 2. The relative coefficient of variation (i.e. the standard deviation divided by the absolute value of the mean) was calculated to rank the variables according to the responses 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%).

2.2.2. Identification of the most important socioeconomic variables for organisations

Likert-type responses were coded to 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 ordered the variables by their importance according to their increasing coefficients of variation. The variables that had smaller coefficient of variation than the mean coefficient of variation of the whole set of variables identified in the literature review were classified as ‘priority 1’ variables. The remaining variables were classified as ‘priority 2’ variables. The coefficient of variation is regarded as a robust estimate of inter-observer precision and is widely used for that purpose even in non-normal distributions of data (Bonett, 2006). Our stakeholder sample was considered as the entire population for standard deviation calculation purposes.

We produced a ‘mixed stakeholder approach’ by integrating ‘top-down’ and ‘bottom-up’ responses. Mixed approaches are likely to lead to a more effective management and governance of MPAs (Jones et al., 2011; Rees et al., 2013b). We considered ‘top-down’ stakeholders those organisations especially relevant for influencing MPA designation and management: decision-makers, scientists and MPA managers (Jones, 2012). Given that ‘top-down organisations’ were under-represented in our sample (6 top-down vs 19 bottom-up organisations), we weighted their replies (Brugha and Varvasovszky, 2000) by replicating the responses by MPA managers, researchers and decision-makers (top-down approach) 3 times each (4 times in the case of Natural England) to match the number of responses by social and economic stakeholders (bottom-up approach) and present an equitable picture between both approaches when selecting the most relevant socioeconomic variables, as suggested by Fleming and Jones (2012), Gaymer et al. (2014), Jones et al. (2011) and Reed (2008).

We also analysed the degree of consistency of the ratings of the social and economic variables by stakeholder organisations included in the same traditional stakeholder categories (independent variable: ‘organisation’; dependent variable: ‘ratings of the set of socioeconomic variables’). For this, we also compared both ‘fishing industry’ categories, given their predicted different responses to MPAs (Mangi et al., 2011; Pita et al., 2013). We checked the normality of data using Shapiro–Wilk tests. Then, we used non-parametric Kruskal–Wallis tests to determine differences in variable ratings within stakeholder categories. We later split our file for pairwise comparisons to elicit which organisations replied differently.

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

3. Results

3.1. Stakeholder categories & organisations

A set of 20 stakeholder categories and 90 organisations (47 British and 43 French associations, federations, unions,

boards, councils or ministries) were identified (supplementary material).

3.2. Stakeholders’ perceptions on multiple-use MPAs

3.2.1. Survey response rate

We obtained partial or total responses from 15 of the 20 identified stakeholder categories (75%). The organisational response rate ranged between 40% (36 organisations) and decreased to 25.6% (23 organisations) to the end of the survey. The mean time to reply to the whole survey was 40.9 min.

The number of members of each organisation could not be analysed due to the different understandings of the question. Some respondents 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.

3.2.2. Perceived degree of the effect of multiple-use MPAs on organisations

The classification of the stakeholders according to their stated organisational views on the effects of inshore, multiple-use MPAs can be consulted in the supplementary material. There are some stakeholders that felt positively affected by the designation of inshore, multiple-use MPAs: environmental NGOs, research centres, local councils, MPA managers and statutory nature conservation bodies. The environmental NGOs stated the need to conserve marine biodiversity and that the topic of MPAs falls within their remit and current campaigns. Research centres stated that 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 forms part of the management body of local MPAs.

In contrast, fishers’ organisations, the industry (shipping and aggregate) and recreational organisations perceived 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. The aggregate industry perceived greater developmental uncertainty and costs associated with more stringent 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 Françaises* 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 Françaises* mentioned safety at sea as a result of navigating and mooring restrictions within MPAs as negatively affecting them. Tourism boards and visitors’ organisations perceived 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 MPAs (*Fédération Française du Batiment*, Construction Products Association). Additionally, catering and accommodation businesses, landowners, the energy industry and one research organisation did not feel affected by or interested in the designation of inshore multiple-use MPAs.

The picture looks similar for offshore multiple-use MPAs although there are, understandably, a higher number of

respondents not perceiving their organisations as being affected by the designation of these MPAs (supplementary material). Static-gear fishers mentioned increased competition and displacement by the relocation of bigger boats resulting from the designation of offshore MPAs.

3.2.3. Main effects of multiple-use MPAs perceived by organisations

The ratings of the main effects of inshore, multiple-use MPAs perceived by the stakeholder organisations are shown in Table 1.

Table 1 – UK and French organisations' rating of the main effects of inshore, multiple-use marine protected areas on a scale from –2 points (very negative) to +2 points (very positive).

Organisation	Category	Ecological	Social	Economic	Cultural	Mean	sd
Royal Society for the Protection of Birds	Environmental association	2	1	1	1	1.25	0.43
The Wildlife trusts	Environmental association	1	2	2	2	1.75	0.43
New Under Ten Fishermen's Association	Static fishing industry	0	–1	–1	–1	–0.75	0.43
Marine Institute (Plymouth University)	Scientific organisation	2	0	2	–1	0.75	1.30
World Wildlife Fund-UK	Environmental association	2	2	2	2	2.00	0.00
VisitEngland	Visitors association	2	2	1	2	1.75	0.43
Southern Inshore Fisheries and Conservation Authority	MPA manager	2	2	2	2	2.00	0.00
ABTA-The Travel Association	Tour operator	1	1	1	1	1.00	0.00
Natural England	MPA manager	1	1	0	0	0.50	0.50
British Marine Aggregate Producers Association	Aggregate industry	0	0	0	0	0.00	0.00
National Federation of Builders	Housing industry	0	0	0	0	0.00	0.00
The Crown Estate	Landowner	2	0	0	0	0.50	0.87
National Federation of Fishermen's Organisations	Towed fishing industry	0	–1	–1	–1	–0.75	0.43
Angling Trust	Recreational association	2	1	0	1	1.00	0.71
Energy UK	Energy industry	0	0	0	0	0.00	0.00
Centre for Environment, Fisheries and Aquaculture Science	Scientific organisation	1	1	0	0	0.50	0.50
Department for Environment, Food and Rural Affairs	Decision-maker	2	1	1	1	1.25	0.43
VisitBritain	Visitors association	0	0	0	0	0.00	0.00
Greenpeace-France	Environmental association	2	2	2	2	2.00	0.00
Muséum National d'Histoire Naturelle	Scientific organisation	1	1	1	1	1.00	0.00
Fédération Française d'Études et des Sports Sous-Marins	Recreational association	2	1	1	0	1.00	0.71
Ville de Marseille	Local residents	2	2	2	2	2.00	0.00
Fédération Nationale des Pêcheurs Plaisanciers et Sportifs	Recreational association	0	–1	0	1	0.00	0.71
Armateurs de France	Shipping industry	1	0	0	0	0.25	0.43
Union des Plaisanciers Français	Recreational association	1	0	–1	0	0.00	0.71
FranceGuide-AGISM	Visitors association	1	1	1	1	1.00	0.00
Fondation Nicolas Hulot	Environmental association	0	1	1	1	0.75	0.43
Comité National des Pêches Maritimes et des Elevages Marins	Fishing industry	0	0	0	0	0.00	0.00
Institut Français de Recherche pour l'Exploitation de la Mer	Scientific organisation	1	1	1	0	0.75	0.43
Ville de Brest	Local residents	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

sd, standard deviation.

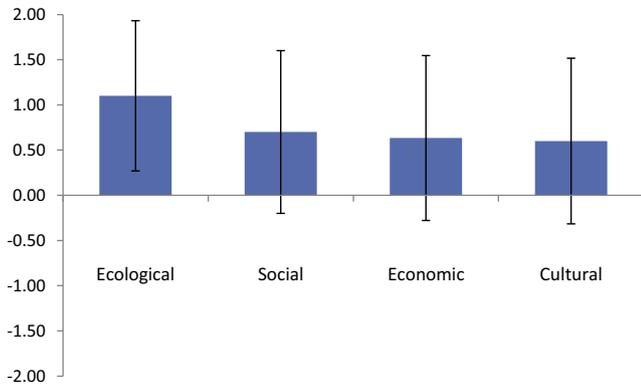


Fig. 1 – Mean and standard deviation values representing the main effects of multiple-use marine protected areas as perceived by the UK and French stakeholders on a –2 point (very negative) to +2 point (very positive) scale.

The aggregated perception of all the respondents on the main effects of inshore, multiple-use MPAs is shown in Fig. 1.

3.2.4. *Organisational perception on the spatial and temporal extent of the effects of multiple-use MPAs*

The majority of respondents (37.5–50%) perceived long-range spatial effects of inshore, multiple-use MPAs (felt over 10 km from their boundaries) for the four variables analysed, although a substantial proportion (29.2–45.8%) did not specify a spatial scale (Fig. 2).

A majority of stakeholders perceived that the biggest effects from the designation of inshore, multiple-use MPAs are permanent (29.2–45.8% depending on the variable) although a remarkable percentage (25–37.5%) did not specify a time scale (Fig. 3).

3.2.5. *Organisational perception of the intensity of the effects of multiple-use MPAs on local communities and economies*

The stakeholders’ ratings of the degree to which inshore, multiple-use MPAs have local ecological, social, economic and cultural effects are shown in Table 2. 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%)

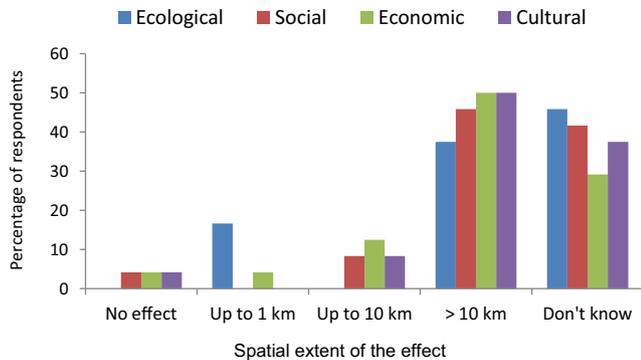


Fig. 2 – Stakeholders’ perception of the spatial extent of the main effects of inshore, multiple-use marine protected areas (in percentage).

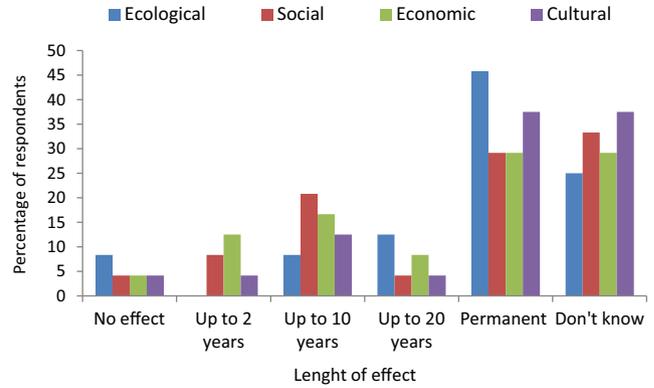


Fig. 3 – Stakeholders’ perception of the temporal length of the main effects of inshore, multiple-use marine protected areas (in percentage).

Table 2 – Perceived intensity of the effects of inshore, multiple-use marine protected areas 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 their coefficients of variation).

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

sd: Standard deviation. cv: Relative coefficient of variation.

within 10 years since the designation of inshore, multiple-use MPAs: ‘research’, ‘environmental performance by citizens, businesses and towns’, ‘number of green businesses’, ‘tourism’ and ‘economic activities’.

3.3. *Socioeconomic variables most important for stakeholders to assess the effects of multiple-use MPAs on local communities*

Table 3 shows the set of social and economic variables most important by the stakeholders ordered by increasing coefficients of variation.

Table 3 – Importance of socioeconomic variables for assessing the effects of inshore, multiple-use marine protected areas on local communities by the stakeholders. Mean values (on a 0 to 4-point scale), standard deviation values (sd), coefficients of variation (cv).

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
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
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

Table 3 (Continued)

Economic variables	Mean	sd	cv	Priority
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 4 – 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 marine protected areas.

Stakeholder category	Direction of the difference	Statistic value	p-value
Scientists	CEFAS > MNHN	$X^2_{(1)} = 23.99$	<0.000
	MI > MNHN	$X^2_{(1)} = 29.16$	<0.000
Recreational associations	AT < FFESSM	$X^2_{(1)} = 38.09$	<0.000
	AT < FNPPSF	$X^2_{(1)} = 91.40$	<0.000
	AT < UPF	$X^2_{(1)} = 71.55$	<0.000
	FFESSM < FNPPSF	$X^2_{(1)} = 59.02$	<0.000
	FNPPSF > UPF	$X^2_{(1)} = 52.01$	<0.000
Environmental associations	RSPB > WT	$X^2_{(1)} = 36.53$	<0.000
	RSPB < WWF-UK	$X^2_{(1)} = 18.91$	<0.000
	RSPB < Greenpeace-FR	$X^2_{(1)} = 21.71$	<0.000
	WT < WWF-UK	$X^2_{(1)} = 81.81$	<0.000
	WT < Greenpeace-FR	$X^2_{(1)} = 87.02$	<0.000
Fishing industry	NUFTA > NFFO	$X^2_{(1)} = 7.69$	0.006

Note: CEFAS, Centre for Environment, Fisheries and Aquaculture Science; MNHN, *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 Français*; 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.

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' ($X^2_{(2)} = 33.88$; $p < 0.000$), 'recreational associations' ($X^2_{(3)} = 144.93$; $p < 0.000$), 'environmental associations' ($X^2_{(3)} = 108.99$; $p < 0.000$) and the 'fishing industry' ($X^2_{(1)} = 7.69$; $p = 0.006$). Statistically significant pairwise comparisons are shown in Table 4.

4. Discussion

4.1. Perceived degree of effects of multiple-use MPAs on organisations

Environmental NGOs, research centres and MPA managers' support for MPAs was expected. Similarly, fishers' relevance for and opposition to MPAs is well known (Jones, 2012; Mangi et al., 2011). Our results point, however, towards existing evidence on the different perceptions on multiple-use 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 Fishermen's Association), somehow negatively

affected by MPAs, as suggested by Fleming and Jones (2012) and Pita et al. (2013). Also, the perceptions by recreational users align largely with recent participatory experiences from MPA designation processes in parts of the UK, where recreational users mostly opposed new MPAs as a result of perceived new restrictions to their activities (Jones, 2012). In contrast, catering and accommodation businesses and some tourism boards and tour operators did not perceive MPAs as affecting them. This was surprising given the societal expectations (Heck et al., 2011; Rees et al., 2013a) and the scientific emphasis put on tourism and recreation when advocating for MPAs (Rees et al., 2010; Sala et al., 2013), and may show a lack of awareness on the potential benefits of these areas for tourism businesses. However, the unspecific nature of the activities regulated, restricted and forbidden in the generic multiple-use MPA asked about might have made it difficult for some respondents to figure out how this sort of MPA may affect their organisations, as regulations are frequently highly site-specific. Site management has been shown fundamental for stakeholders in some MPA participatory processes in the UK and Canada (Gaymer et al., 2014). Therefore, specifying the planned, real or hypothetical management regime of the MPA(s) being asked about should result in more accurate responses and meaningful findings for management and decision-making.

This preliminary self-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 and Douvere \(2008\)](#). Based on these results we suggest using a tiered approach to stakeholder involvement in MPA planning, designation and management processes. This approach would imply: engaging organisations with statutory responsibilities in planning, designating or managing MPAs and organisations stating to be ‘very affected by/interested in’ MPAs in continuous negotiations for the best common outcomes from those processes; regularly consulting organisations perceiving to be ‘somehow affected or interested’ on the key aspects of such processes; and punctually informing ‘neutral’ organisations of the main objectives, milestones and expected outcomes of these processes, chiefly at the beginning and at the end. This tiered approach to stakeholder prioritisation can be applied in different settings, with likely modifications of the survey technique according to the means available: online, by email, by phone or face to face. It can also be applied to different scales, from individual MPAs to MPA networks, and types of stakeholders, including businesses, organisations or communities. This tiered approach is likely to result in lower time and financial costs from participation by devoting more effort to the organisations that require it most. However, the classification shown here is unlikely to remain the same over long periods of time as policies, contexts, participants’ expertise, organisational interests, remits, stances and leverage evolve ([Brugha and Varvasovszky, 2000](#)). Thus, results from surveys like this one would be most meaningful for planners, managers and decision-makers if updated at regular intervals, especially when new national or regional MPA designation processes emerge (e.g. the MCZ process in the UK), as social and organisational circumstances and priorities may have changed. Also, different organisational responses are expected on no-take MPAs rather than multiple-use MPAs, as the Welsh case showed ([Welsh Government, 2013](#)).

4.2. Main effects of multiple-use MPAs perceived by organisations

On average, the ecological effects of inshore, multiple-use 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. Nevertheless, the fact that 22 organisations that are potentially in favour of MPAs and only 8 organisations that are potentially against them replied to this part of the survey may have biased the results positively. These results are, however, in agreement with other studies in non-European settings ([Heck et al., 2011](#); [Cárcamo et al., 2014](#)), suggesting a broader pattern of positive societal expectations on the main effects of multiple-use MPAs by similar stakeholder groups. [Rees et al. \(2013b\)](#) also found similar results for their whole stakeholder sample in Lyme Bay (UK), although they reported substantially lower perception of social benefits from the MPA.

No stakeholder stated any ‘very negative’ perception for any of the assessed main effects of multiple-use MPAs and

only the two fishers’ organisations perceived these MPAs main effects as negative overall (moderately negative). For most of the industrial sector (Energy UK, British Marine Aggregate Producer’s Association and National Federation of Builders) and for some recreational organisations (*Union des Plaisanciers Français* and *Fédération Nationale des Pêcheurs Plaisanciers et Sportifs*), the overall main effects of multiple-use MPAs were 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., 2011](#)).

In contrast to previous studies where stakeholders have unanimously stated the environmental importance of multiple-use MPAs ([Heck et al., 2011](#)) 30% of the organisations in the UK and France did not perceive any ecological benefit from this type of MPAs, although it is possible that some of these responses may have been protest responses from ‘very negatively affected’ organisations. Among these stakeholders, no industrial or fisher stakeholder perceived that multiple-use MPAs have any positive ecological effects. The *Fédération Nationale des Pêcheurs Plaisanciers et Sportifs* (recreational association), VisitBritain (visitors association) and *Fondation Nicolas Hulot* (environmental association) did not perceive any ecological benefits from multiple-use MPAs either. However, in the case of the *Fondation Nicolas Hulot*, they think this lack of effect is due to the lack of active management measures in place, something still common in many French MPAs ([Rodríguez-Rodríguez et al., 2015](#)). These stakeholders’ perceptions align with current quantitative scientific studies showing no discernible ecological effects of multiple-use MPAs or MPA zones when compared to unprotected areas ([Guidetti et al., 2014](#); [Rife et al., 2013](#)). However, the likely relevant socioeconomic effects of different levels of MPA protection through enforcement were not explicitly considered in our survey.

4.3. Organisational perception on the spatial and temporal extent of the effects of multiple-use MPAs

The majority of respondents perceived long-range spatial effects of inshore, multiple-use MPAs (over 10 km from their boundaries) for the four variables analysed. It is noteworthy that the stakeholders perceiving long-range social, economic and cultural MPA effects are mostly stakeholders ‘very affected by/interested in’ MPA designation and subsequent enforcement. These stakeholders may overestimate the spatial effects of MPAs: fishers’ organisations, environmental NGOs 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.

Over 58% of respondents stated that there are long-term or permanent ecological effects of multiple-use MPA designation. 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 or MPA zones ensure significant ecological effects ([Guidetti et al., 2014](#); [Rife et al.,](#)

2013). One tour operator (ABTA-The Travel Association) and a recreational association (*Fédération Nationale des Pêcheurs Plaisanciers et Sportifs*) stated that 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.

These figures show, on the one hand, high uncertainty in the organisational replies to the main spatial and temporal effects of multiple-use MPAs on ecological, social, economic and cultural aspects. On the other hand, they also show a moderately high degree of stakeholders' 'confidence' or 'expectation' towards the overall spatial and temporal performance of multiple-use MPAs. 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 respondents pointed out. Likewise, 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 suggested high stakeholder expectations towards multiple-use MPAs not sufficiently justified by scientific evidence (Cárcamo et al., 2014; Rees et al., 2013a). Both considerations advocate 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 multiple-use MPAs at different spatial and temporal scales.

4.4. Organisational perception of the intensity of the effects of multiple-use MPAs on local communities and economies

The variables perceived to vary in intensity coincide mostly (or as proxies) with the most important variables by the stakeholders. Only one variable ('economic costs and losses') shows a negative mean value. Its interpretation is however 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.

4.5. Socioeconomic variables most important for stakeholders to assess the effects of multiple-use MPAs on local communities

The most important '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 important 'economic' variables are linked to fishing, shipping and aquaculture activities. The ecological (Gaines et al., 2010) and social (Pomeroy et al., 2006) importance of fishing activities in MPAs is well acknowledged. 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 (Jacobsen et al., 2014; Rees et al., 2013a).

This participatory ranking of socioeconomic variables can help to inform the development of MPA monitoring and management programmes and systems in Europe and other similar regions from an ecosystem-based perspective, as advocated elsewhere (Cárcamo et al., 2014; Heck et al., 2011). Nevertheless, the results of the survey are likely to be highly organisation-dependent, as shown earlier. Also, the fact that the responses of top-down organisations were weighted may have introduced a source of bias in the overall results of the survey. Even though the designation of Natura 2000 sites does not require a socioeconomic appraisal (Jones, 2012), it would be advisable to carry out such appraisals from a participatory ecosystem approach to nature conservation that considered the needs and perceptions of bottom-up stakeholders. This approach would, consequently, help to reduce opposition to the designation of these areas among some societal sectors (Grodzinska-Jurczak and Cent, 2011). Such socioeconomic appraisals can provide highly relevant information to managers, planners and decision-makers when incorporated in systematic marine conservation planning processes (Giakoumi et al., 2012).

There was high intra-categorical organisational variability in the ratings of the socioeconomic variables, which highlights 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*. This intra-categorical difference could be due to different institutional remits or to different organisational expectations towards the socioeconomic performance of such 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, remits 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 and Douvère, 2008). This finding also advocates 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 categories to properly account for the diversity of organisational perspectives and interests on the socioeconomics 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 and Svendsen, 2013). Resorting to some sort of stakeholder prioritisation, such as the stakeholder self-classification proposed above, could help to find a

solution that best deals with representation and efficiency trade-offs.

5. Conclusions

Inshore, multiple-use MPAs are perceived to have effects on a number of socioeconomic sectors in the UK and France, especially on environmental NGOs and fishers' organisations. Some stakeholders' expectations on the diversity, extent and length of the effects of such MPAs seem to exceed existing evidence, whereas for some others (especially for some tourism-related organisations) perceived socioeconomic benefits from those MPAs fall shorter than suggested in the literature (Rees et al., 2010; Sala et al., 2013). Further research and more evidence-based, targeted communication should help to shape more realistic societal expectations and managerial objectives on multiple-use MPAs' socioeconomic and ecological performance under different socioeconomic contexts and management regimes. In addition to the use of the aggregated results, the analysis of individual organisational responses to the survey can provide highly relevant information for MPA managers, planners and decision-makers on engagement, environmental education and outreach, and/or negotiation needs with key stakeholders. Organisational perceptions on no-take MPAs remain to be studied further.

The selection of priority 1 variables shown here can provide a useful basis for a meaningful and participatory ecosystem approach to socioeconomic MPA planning, designation, management and monitoring in the UK and France. These results can also guide such processes elsewhere, although the highly diverse and specific socioeconomic, governance, cultural and ecological coastal and marine contexts (Gaymer et al., 2014) advocate reproducing or adapting the variable selection procedure used here in other settings in order to obtain more tailored findings for management and decision-making. It should be noted that as wide a range of stakeholder organisations as feasible should be incorporated in such participatory socioeconomic processes for these processes to claim relevant societal representation. The stakeholder self-classification procedure shown here can be used by MPA managers and decision-makers as a quick and cost-effective 'scoping phase' to make such participatory processes more efficient and identify organisational concerns and trade-offs.

Our methods and findings can help to inform and streamline ongoing MPA designation processes globally and especially in Europe, such as the designation of new marine Natura 2000 sites Europe-wide (European Commission, 2014; Spanish Government, 2014), the second and third tranches of MCZ designation in the UK (DEFRA, 2014) or the recent and progressive designation of multiple-use MPAs under different designation categories in different countries: France (AAMP, 2012), Wales (Welsh Government, 2013), or Scotland (Scottish Government, 2014).

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.envsci.2014.12.020>.

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