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Abstract: Understanding the cultural variation in public preference for marine species is a necessary pre-requisite if conservation objectives are to include societal preferences in addition to scientific considerations. We report the results of a contingent study undertaken at three case-study sites: Azores islands (Portugal), Gulf of Gdansk (Poland) and Isles of Scilly (UK). The study considered species richness of five specific marine taxa (mammals, birds, fish, invertebrates and algae) as proxies of marine biodiversity and the aim of analysis was to estimate from a multi-site perspective public's willingness to pay (WTP) to avoid increased levels of species loss (reduction of species richness) for different marine taxa. Results, based on 1502 face-to-face interviews, showed that income, education and environmental awareness of the respondents were significant predictors of WTP for marine species conservation. Results also indicated that respondents in each of the European locations had different preferences for marine taxa. In the Azores, although mammals and fish were valued highly, small differences occurred in the WTP among different taxa. Respondents in the Isles of Scilly put a relatively low value on fish while algae and marine mammals were highly valued. In Gdansk, respondents defined a clear order of preference for marine mammals> fish> birds> invertebrates and algae. These findings suggested that cultural differences may be important drivers of valuation and undermines the commonly held premise that charismatic/likeable taxa consistently have a disproportionately strong influence on WTP for biodiversity conservation. We conclude that conservation policy must take account of cultural diversity alongside biological diversity.

*Highlights

Research Highlights

> We report the results of a Contingent Valuation Study undertaken in 3 European countries

> The study assessed the Willingness to Pay (WTP) of respondents to avoid loss in the number of marine species in 5 marine taxa

> We examine how WTP varies with increased levels of species loss in 5 taxa in each of the three countries

> Different European locations have different preferences for marine taxa

> Cultural differences may be important drivers of valuation

Different cultures, different values: the role of cultural variation in public's willingness to pay for marine species conservation

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ABSTRACT

Understanding the cultural variation in public preference for marine species is a necessary pre-requisite if conservation objectives are to include societal preferences in addition to scientific considerations. We report the results of a contingent study undertaken at three case-study sites: Azores islands (Portugal), Gulf of Gdansk (Poland) and Isles of Scilly (UK). The study considered species richness of five specific marine taxa (mammals, birds, fish, invertebrates and algae) as proxies of marine biodiversity and the aim of analysis was to estimate from a multi-site perspective public's willingness to pay (WTP) to avoid increased levels of species loss (reduction of species richness) for different marine taxa. Results, based on 1502 face-to-face interviews, showed that income, education and environmental awareness of the respondents were significant predictors of WTP for marine species conservation. Results also indicated that respondents in each of the European locations had different preferences for marine taxa. In the Azores, although mammals and fish were valued highly, small differences occurred in the WTP among different taxa. Respondents in the Isles of Scilly put a relatively low value on fish while algae and marine mammals were highly valued. In Gdansk, respondents defined a clear order of preference for marine mammals> fish> birds> invertebrates and algae. These findings suggested that cultural differences may be important drivers of valuation and undermines the commonly held premise that charismatic/likeable taxa consistently have a disproportionately strong influence on WTP for biodiversity conservation. We conclude that conservation policy must take account of cultural diversity alongside biological diversity.

Key Words: Marine biodiversity; multi-site study; contingent valuation; willingness to pay; biodiversity loss; payment card.

1. INTRODUCTION

Oceans and seas account for more than half of the territory of the EU 27 member states (EEA Report, 2010) yet there remains a general lack of awareness among scientists, legislators and the general public about the role and status of biological diversity in Europe's marine systems. It is estimated that between 11% to 33% of the species remain to be described especially in the species-rich groups such as the smaller invertebrates (Costello & Wilson, 2011). Additionally, our understanding of the consequences of biodiversity loss on the provision of ecosystem services (e.g. food supply, water purification, climate regulation, erosion control) is limited (Bracken et al., 2008; Worm et al., 2006). In contrast, ongoing erosion of marine biodiversity in Europe and worldwide is exceedingly well documented (Coll et al., 2010; Clausen and York, 2008; Myers and Worm, 2003; Worm et al., 2006). Habitat degradation, over-harvesting, pollution and climate change are reducing species populations and causing shifts in communities' composition and diversity (Coll et al., 2010).

Understanding and conserving marine biodiversity is one of the most pressing challenges of the next decades and a strategic subject in the EU political arena. Policy makers need to prioritize conservation goals in a manner that is objective and cost-effective. Since declines in species and habitats are largely the result of socio-economic and political forces, human preferences and values should be considered in this process (White et al., 2001). Such information is needed to ensure that conservation measures succeed both ecologically and socially (Dalton, 2005; Clausen and York, 2008). Despite the assertion that conservation science is synthetic and multidisciplinary (Fazey et al., 2005) there remain a shortage of studies that are truly cross disciplinary. In addition, there is a strong taxonomic bias in conservation research towards large vertebrates, especially mammals and birds (Bonnet at al., 2002; Clark and May, 2002; Fazey et al., 2005; Seddon et al., 2005; Wilson et al., 2007) and few studies of communities or ecosystems. Taxonomic bias is also reflected in public willingness to pay (WTP) towards species conservation (White et. al. 1997, 2001, Metrick and Weitzman, 1996; Loomis and White, 1996). Martín-López et al. (2009) examined the allocation of funds for species conservation in Spain and demonstrated that those species that were favoured by the public as well by scientific research were more likely to obtain adequate funding as compared to less preferred species. Public opinion and scientific research together perpetuate a feedback loop towards a few charismatic species which may threaten wider conservation goals.

In recent decades, environmental economists have improved our understanding of public preferences and values for complex goods such as biodiversity. Economic valuation techniques such as contingent valuation are becoming increasingly important in policy-related research as a supplement to biological information, and have helped to define objectives and priorities in conservation (White et al., 2001). Economic analysis can make a valuable contribution to conservation science by (i) offering alternatives whereby the value of biodiversity and public preferences can be accounted for in policy planning, (ii) identifying the main beneficiaries of conservation and (iii) providing evidence of the social demand for biodiversity protection; reinforcing, thereby, scientific support for conservation.

A recent meta-analysis revealed that 65% of economic valuation studies have been focussed in the U.S. while only 15% occurred in Europe (Martín-López et al., 2008). Despite the lack of European focus on this issue, recent European legislation requires the adoption of an ecosystem-based approach to the management of marine systems in which humans are regarded as a key system component (Mee et. al, 2010). Social, economic and cultural factors may influence how individuals perceive and value species (Martín-López et al., 2007). These factors vary considerably across the EU, which is constituted of 27 independent nation states with a diverse range of ecosystems, languages and cultures. This biological and social diversity has the potential to further complicate both the application of practical conservation measures across the EU, and also the interpretation and application of valuation studies that typically are carried out in only one location and/or ecosystem. These cultural differences become particularly important in marine ecosystems, which because of their open access nature, have the potential to be both impacted and valued by citizens of different nation states (e.g. fishers, tourists and traders).

Understanding the relationship between social, economic and cultural diversity and perceived value attributed to marine biodiversity would provide valuable policy-related information to bridge the gap between scientific research and the management of marine ecosystems. Most of the previous studies have been geographically specific which contrasts with the present study that aimed to estimate from a multi-site perspective public's WTP to avoid the loss of marine species using the contingent valuation method. A similar survey and study design were applied in the Azores Islands (Portugal), the Isles of Scilly (UK) and in the Gulf of Gdansk region (Poland) (Fig. 1). The aim of the study was to compare between these contrasting countries the marginal values associated with increased levels of species loss (reduction of species richness) for different marine taxa. The coverage of taxa was broad and included less charismatic taxa, such as algae, fish and marine invertebrates, and more charismatic groups (marine mammals and birds). When valuing species preservation it is likely that substantial non-use values (i.e. not related with the consumption or use of species) are included in the public's WTP. We also tested for differences in the WTP between residents and visitors and between case-study locations. To our knowledge this is the first time these issues have been tested in the context of marine ecosystems at this geographical scale

2. METHODOLOGY

2.1. Setting the scene: Contingent markets and Marine Biodiversity

The total economic value (hereafter referred as TEV) associated with species is composed of use and non-use values which are not traded in any market. The concept of TEV has evolved in the literature as a framework to capture the whole set of various benefits supplied by environmental goods (Bené and Doyane, 2008) and distinguishes between use and non-use values highlighting that there is an additional value of species apart from its direct or indirect use. While direct use values, such as recreation or fisheries, involve some human interaction with species and are associated with the traditional economic concept of value, the non-use components (such as existence and bequest values) arise essentially from ethical positions and hence pose challenges to their quantification on a monetary scale. In such circumstances, environmental economists have developed techniques which enable individuals to reveal values by setting up hypothetical markets in which individuals are asked to state their WTP to protect one or more species or to achieve improvements in their conservation status.

The contingent valuation method (CVM) (and more recently Choice Experiments[1] developed for a multi-attribute approach) has been widely used in the context of species valuation (Richardson and Loomis, 2009). This method offers flexibility in its application because it allows for the evaluation of bequest and existence values (Arrow et al., 1993). CVM enables integration of all benefits associated with species preservation into the decision making process and economic analysis allowing a better alignment between public expectations and political initiatives. Yet, the strength of the CVM is in a way its own weakness. As CVM values are built on hypothetical

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[1] Despite the growing interest in valuation literature in Choice Experiments (CE) method and its potential to reduce some of the biases of CVM, it may not be the best option in every case. One of the main issues surrounding CE is the choice-task complexity and the cognitive burden of the respondent. This may be especially true when respondents are asked to value changes in complex and unfamiliar environmental goods (Hoyos, 2010) such as marine biodiversity. For this reason a payment card CV method was used over CE or referendum dichotomous choice surveys.

transactions they are prone to several biases. These include hypothetical bias, information bias, strategic bias, and embedding effects (Venkatachalam, 2004). While such biases call for caution in the application and interpretation of the results, they do not render this method invalid (Bishop and Heberlein, 1990) or operationally irrelevant (Tisdell and Wilson, 2004).

CVM is survey based technique to estimate societal preferences and values. Developing surveys that enable the average citizen to understand and value the consequent welfare implications of changes in biodiversity necessitate the identification of appropriate language in which complex biological concepts can be meaningfully conveyed to members of the public (Christie et al., 2006). To do this, important caveats must be kept in mind. First, the economic valuation of biodiversity does not pursue total value assessment of biodiversity and empirical assessments often consider changes in components of biodiversity at different scales: genetic, species, ecosystem and functional diversity. For this reason, it is not possible to value biodiversity in its entirety, but rather changes in components of biodiversity can be valued.

2.1.1. Valuation scenarios

The valuation scenarios considered marine biodiversity in terms of species richness (number of species within an area) for five separate taxa: marine mammals, sea birds, fish, invertebrates and algae. Species richness is a useful proxy of biodiversity because it is a straightforward concept that is likely to be understood by the general public, and also provides a measurement that can be easily compared between case studies. We assessed the WTP expressed by members of the general public to prevent a decline in these five taxa from their current level of species richness. To test for scope sensitivity (observing changes in the WTP estimates as the quantity or quality of the good is made larger or smaller (Jin et al., 2010)) we used a spilt sample design. Respondents were randomly assigned to one of two groups, and were asked to express a value to avoid either a 10% or a 25% reduction in species richness for each taxon. In each case study, the changes in species richness were considered to occur at a regional scale (Table 1).

2.1.2. Target Population

Changes in marine biodiversity can affect the welfare of many people, including those that live far away from the site concerned, as people may derive satisfaction out of knowing that species exist without receiving benefit from them directly (i.e. existence value of species) and/or that they will be preserved for future generations (i.e. bequest value) (Nijkamp et al., 2008). Despite this, there is consistent evidence that WTP responses are more reliable when obtained from on-site users compared with non-users (Whitehead et al., 1995) and that the validity of such estimates improved with direct knowledge of the good being valued (Paradiso and Trisorio, 2001). The literature also suggests that visitors have higher WTP than local people, as visitors are likely to include a large recreational component in their total value and are likely to be more knowledgeable about the species (Loomis and White, 1996). Given these insights, we interviewed residents and visitors at each case-study site as both constituted the primary population affected by the loss of marine biodiversity.

2.1.3. Survey structure

The CV questionnaire was discussed by an expert group within the EU network of Excellence: Marine Biodiversity and Ecosystem Function (www.marbef.org). Comments from these experts served to refine the valuation scenarios, the instrument survey and the sampling strategy before the pilot study was conducted. A series of pilot surveys were conducted in each case study area. These pilot studies enabled further evaluation of the acceptability of the payment method and the plausibility of the valuation scenarios. To obtain accurate estimates of the benefits and to minimize common biases several recommendations available for CVM surveys were followed (e.g. Mitchell and Carson, 1989; NOAA panel guidelines among others). A summary of these precautions are illustrated in Table 2.

The questionnaire comprised 28 questions designed to elicit respondents' knowledge about marine biodiversity, details of their visit (if relevant), respondents' general behaviour and attitudes towards the conservation of marine biodiversity, the economic valuation exercise and socio-demographic information. Long questionnaires can be problematic because of potential respondent fatigue and loss of interest (Martín-Lopéz et al., 2007). To mitigate this problem, photomontages were used to depict representative organisms of each marine taxon being valued. Each marine taxon was individually presented on an A4 colour photomontage including 20 photos of species (each photo representing one individual per species). The species included in each photomontage were representative of the local marine biodiversity (specific to each case study site) and a wide range of species was included to avoid a bias incurred from including only large, beautiful or valuable fauna (Fig.2). Photomontages were pre-tested and care was taken in order to present consistent visual information across each photomontage and across case study sites.

The survey questionnaire started with a multiple-choice question that included formal definitions of the ecological terms ‘ecosystem’, ‘species richness’ and ‘marine biodiversity’. Respondents were asked to choose the correct definition of marine biodiversity (adopted from CBD definition of biodiversity) from amongst alternatives (including “don’t know”). This had the purpose of obtaining an initial indicator of respondents’ knowledge on biodiversity and to encourage further discussion if the respondent had any doubts or misconceptions on this subject.

The CV survey also included questions about respondents' general pro-environmental behaviour and attitudes towards marine biodiversity conservation. The possible alternative responses ranged between considering biodiversity conservation as (i) a priority for governments; (ii) important but not a priority, (iii) not important and (iv) don't know. Some of these questions might serve as variables in the valuation function of WTP, helping to understand the stated preferences of the respondents for marine species preservation. Before the valuation exercise respondents were informed about the number of species currently present in each marine taxon (specific to each location), as well the number of species hypothetically that would be lost from each taxon under a scenario of a 10% or 25% reduction in species (Table 1). Due to the uncertainty about the consequences of species loss on ecosystem dynamics in the context of marine environment (Bracken et al., 2008; Hooper et al., 2005; Solan et al., 2004; Worm et al., 2006), no background information on the potential consequences of species declines was conveyed to the respondents.

Each respondent was asked five independent valuation questions, one each for marine mammals, seabirds, fish, marine invertebrates and algae. To mitigate question-order bias (Mitchell and Carson, 1989) the order of the five taxa was randomised for each questionnaire and respondents could change their answers throughout the exercise. The WTP question for each taxon was framed as follows: *First let's consider [taxon]. What would be the maximum amount you would be willing to pay, in a once only payment to such a conservation trust, in order to avoid a decline in the number of [taxon] by 10%?*

The valuation exercise included explicit warnings about budget constraints and substitutes that were designed to mitigate positive hypothetical bias as well as some debriefing questions including reasons why respondents were or were not WTP for marine species conservation. For zero bidders, follow up questions distinguished respondents between genuine zero bidders (i.e. those respondents that cannot afford to pay or for whom welfare is unaffected by the good being valued) and protest responses. Protest responses differ from genuine zeros, they are a "protest" against some feature of the simulated market (e.g. payment vehicle) (Mitchell and Carson, 1989). Protesters, if identified, are usually dropped from further analysis (Adams *et al.*, 2008; Mitchell and Carson, 1989; Ressurreição et al., 2011; Spash *et al*., 2009). Debriefing questions also allow exploration of the motivations underlying positive WTP responses. The role of use and non-use values in stated WTP was examined by presenting respondents with several statements describing potential reasons for valuing marine biodiversity conservation. These statements correspond to different components of the TEV of species: direct, indirect, existence, option and bequest values. Respondents could tick one or more alternatives or use their own words to justify their answers.

A payment card was adopted as the elicitation format in all locations. This method displays a range of values including zero on a card and respondents circle the highest amount they would be willing to pay. We opted for this format because it (i) reduces item non-responses more common in open-ended valuation questions (Cameron and Huppert, 1989; Veisten et al., 2004), (ii) it eases the cognitive burden on respondents and (iii) it obtains more information per respondent than dichotomous choice (Hung et al., 2007). This is particularly relevant when the valuation scenarios involve changes in complex and unfamiliar goods that could potentially exacerbate the tendency for yea saying when using a referendum dichotomous choice survey. The downside of payment cards are anchoring and range effects (Mitchell and Carson, 1989) i.e. answers can be influenced by the amounts presented on the card. To mitigate these effects the bid values displayed on the card were based on the results of a pilot study carried out in each case study (Azores islands n=64, Gulf of Gdansk n=30 and Isles of Scilly n=35). As the monetary currency and its purchasing power varied between case studies the payment cards were expressed in local currencies [UK –pounds sterling (£), Azores – Euro(€), Poland-Zlotys (Zł)] and the ranges of the bids used in the payment cards differed. Pilot tests also selected the payment vehicle used in the survey as a 'once only' payment to a conservation trust fund.

2.2. Case studies and study design

The CV survey was undertaken in the summer of 2007 using face-to-face interviews as recommended by the NOAA panel (Arrow et al., 1993). Three case studies located in three different European countries were used in the study: Azores islands (Portugal), Gulf of Gdansk (Poland) and Isles of Scilly (UK). Brief descriptions of each case study site are provided in Appendix A. We aimed to target approximately 500 respondents at each study site, evenly distributed among visitors and residents and between the two levels of species loss specified in the spilt sample design.

A total number of 1502 questionnaires were completed split into subsamples as follows: residents 10% species loss (n=383), visitors 10% species loss (n=374), residents 25% species loss (n=366) and visitors 25% species loss (n=379). The interviews were conducted by trained interviewers. Sample points included mainly public places such as streets, market places, recreational areas, ports and airports. Respondents were randomly selected to cover a representative range of residents and visitors. The sampling procedure was restricted to citizens 18 years or older and allowed self-nomination as household head.

To maximize the response rate and respondent attention when answering questions, the interviews were preferentially performed when respondents were apparently relaxed, unoccupied or waiting for transportation. All respondents were approached politely and informed about the purpose of the survey along with the affiliation of the surveyors. In order to mitigate social desirability response effect[2] associated with in-person interviews all responses were anonymous and confidential (Loureiro and Lotade, 2005).

2.3. Data analysis

Potential differences in the demographics of respondents surveyed for the two versions of the level of loss (10% or 25% loss of species) were tested in each case study site using an independent samples t-test.

The modelling approach extended that of Ressurreição et al. (2011) to multiple locations. We combined the data from the three case study sites, weighting each location equally and estimated the mean effect of demographics, location and the interaction between location and taxa WTP. For a complete list of model variables see

[2] Social desirability bias is phenomenon likely to occur when using in person interviews (Loureiro and Lotade, 2005; Nielsen, 2011). In the presence of the interviewer, the respondent may feel compel to give answers that are socially acceptable or that he thinks the interviewer would like to hear.

Table 3. This analysis allowed the valuation of taxa to vary between locations but constrained the effect of socio-demographic variables to be the same at all locations.

As described in Ressurreição et al. (2011) the model was fitted to the interval log(WTP) values using the maximum likelihood approach of Cameron & Huppert (1989) implemented in the survival package in R. We then selected the best supported simplified version of this global model using a difference in AIC >2 to indicate a better supported model (Burnham and Anderson, 2002). During model selection, variables that were levels of the same factor were removed or retained together. So, for example, all occupations could be removed but not a single occupation. After excluding protest responses and questionnaires with incomplete or inconsistent answers 1015 responses were included in the analysis.

All the demographic variables, with the exception of occupation, were included as continuous variables. Log income was included as a linear term and the other demographic continuous variables as linear and quadratic terms allowing a curvilinear relationship between these variables and the dependent variable. Hence we assume that log(WTP) is a smooth continuous function of the demographic data while, for model parsimony, restricting the parameter numbers. For the ordinal variables age data were included as mid-points and education levels from 1 (basic) to 4 (postgraduate). Individual bids and incomes were adjusted to 2008 USA purchasing power using World Bank purchasing power parity (PPP) figures for private consumption. Visitors were adjusted by the PPP of their home country while residents were adjusted for the PPP where the survey took place.

Again following Ressurreição et al. (2011) unbiased estimates of sample mean WTP were calculated on the monetary scale using Duan smearing. Confidence intervals for subgroup means were calculated using the modified Cox method described in Olsson (2005).

3. RESULTS

3.1. Socio-Demographic Profile of the respondents

The sampled population was aged between 18 and 75 with an average age of 39.5 (visitors 41.2; residents 36.7) (Table 4). The level of education and household size were comparable in all case studies. Across all studies the size of the household varied between 1 and 4 individuals, with a mean of 2.4 individuals per household (visitors 2.4; residents 2.4: t-test P=0.585). The level of education profile revealed that 20% of the respondents were educated to the elementary level (level 1), 38% obtained a high school diploma (level 2), 29% were undergraduate (level 3) and 13% had postgraduate level education (level 4). Visitors had a higher level of education than residents in all case studies (visitors 2.6; residents 2.2: P<0.001). Approximately 50% of those individuals interviewed were male and respondents had an average income of $2718 per month per household (visitors $3208; residents $2226: P<0.001). The sample population in Isles of Scilly had the highest income level ($3726) while Gdansk had the lowest ($1482). Furthermore, in each of the case studies visitors had higher income levels than residents.

3.2. Respondents' views on marine biodiversity conservation

In total 55% of respondents declared that marine biodiversity conservation should be a priority for governments at a national and global level. Further 41% declared that the conservation of marine biodiversity should be an important issue in the political agenda, while only 4% stated that this subject was not important to them. Contrary to results reported in other studies (Christie at. al, 2006) 77% of respondents chose the correct definition of marine biodiversity from among the available options (Azores 73%; Isles of Scilly 75%; Gdansk 82%).

3.3. Motivations underlying WTP responses

The motivations underlying WTP responses were analysed using the reasons cited by respondents for contributing or not to marine species conservation. Of the 1502 respondents 67% were willing to pay to avoid species loss whereas 33% refused. A summary of these motivations is presented in Table 5. Based on the debriefing questions 21% of the refusals were considered protest responses and 12% genuine zero bidders. The examination of protest responses revealed that the majority of the refusals (211 responses) were based on the belief that species conservation is the responsibility of the government rather than the individual. The remainder of the protest responses reflected disagreements with particular elements of the valuation process (Table 5). Gdansk had the highest proportion of non-WTP for marine species preservation, as well as the highest number of protest responses and people stating that they could not afford to pay. The Azores and the Isles of Scilly had similar numbers of both positive WTP responses and refusals. The lowest percentage of protest responses was reported in the Azores. Preserving species for the benefit of future generations was the most frequently cited reason for wanting to pay to preserve marine biodiversity followed closely by direct use values such as food supply and recreational options (Table 5).

3.4. The bid curve for marine species conservation

T-test did not reveal any significant differences between the profiles of respondents by level of loss in each case study site (Azores: Age P=0.488; Household P=0.260; Income P=0.858; Education P=0.478; Scilly: Age P=0.138; Household P=0.781; Income P=0.689; Education P=0.612; Gdansk: Age P=0.128; Household P=0.855; Income P=0.821; Education P=0.287). Accordingly, it was possible to evaluate the effect of the degree of loss on WTP.

The best supported model of WTP in terms of AIC is presented in Table 6. Compared to the global model this model reduced AIC by 7 and removed variables for level of biodiversity loss, campaigning for an environmental issue, membership of an environmental group and the linear term for household number. The interaction terms (testing differences in preference for marine taxa by location) are relative to the

Azores location and to Algae, which implicitly has a coefficient of zero[3]. The regression results showed that, on average, mammals and fish are valued higher in the Azores compared to birds, algae and invertebrates, which are valued similarly. People interviewed in the Isles of Scilly put a relatively low value on fish while marine mammals and algae are highly valued. Among the Polish respondents there is strong public support for marine mammals, followed by fish, birds and ultimately invertebrates and algae. There is clear evidence that in different locations marine taxa are valued differently, suggesting that cultural differences may be important determinants of demand for marine species conservation (Table 6).

Log Income had a positive and highly significant effect on log WTP: wealthier households were WTP more than lower income households for marine species conservation. From the remaining socio-demographic characteristics household size, education and age were significant predictors of WTP. As the number of household members increased the WTP decreased. This result is common (Gürlük, 2006; Jones et al., 2008) and consistent with a higher level of household expenses as the household size increases. The lower levels of education (1:3) had a similar effect on WTP while education to level 4 substantially increased the WTP. The combined effect of the linear and quadratic age coefficients mean a peak WTP around 40 years of age and a decline either side. Based on these results, the profile of the respondent who is most willing to

[3] The interpretation of preferences for marine taxa by location can be made clear by summing the four taxa plus the coefficients for location plus the coefficients for the respective interaction terms rather than just looking to the raw interaction regression coefficients (Table 6).

pay to prevent marine species loss is a highly educated, middle-aged respondent with a high income level and a small household size. From the nine professional occupations tested as possible explanatory variables of WTP, two were significant predictors of WTP at 5% level: respondents that were "fishermen" and "tourist operators" had a significantly higher WTP compared with other professional occupations (Table 6). These findings are not surprising given that a decrease in marine species richness may have a direct impact on these people's livelihoods.

Respondents seemed to be indifferent to the percentage of species loss, which was not included in the best supported model (Table 6). Several reasons can be suggested to explain this finding, which are further considered in the Discussion. Regression analysis highlighted significant differences between the WTP of residents and visitors. Although there is evidence that visitors' incomes and education were higher than those of residents in all case studies, when comparing residents and visitors with the same socio-demographic profile, residents were more likely to attach higher values to prevent species loss (Table 6).

The questionnaire also explored views on marine biodiversity conservation. As expected those respondents that did not regard biodiversity conservation as a priority were less likely to pay for marine species preservation. Of the behaviours associated with environmental awareness or commitment tested in our study, all had a positive and significant effect on WTP except for "actively campaigned about an environmental issue" and "membership of a conservation group", thus not included in the AIC model (Table 6).

3.5. The WTP values for hypothetical scenarios of loss in marine species

The mean WTP point and interval estimates, broken down by residents and visitors, are presented in Table 7. The WTP values are presented in USD ($) and normalised against US purchasing power. Overall, the results of this contingent valuation study indicated that the visitors and residents in each case study site attached positive and significant values to the conservation of marine species. Although econometric evidence suggested that residents are more likely to attach higher values to prevent species loss than visitors, WTP values allocated by visitors are also significant. In absolute terms, respondents in the Azores case study allocate the highest values to avoid marine species loss at the regional level; while respondents in the Gulf of Gdansk region allocate the lowest ones. Nevertheless, it is interesting to note that once the WTP bids from the Isles of Scilly had been adjusted for PPPs and controlled for differences in demographics between the sample populations, these WTP bids were lower than elsewhere.

4. DISCUSSION

Most previous valuation studies in marine systems have tended to focus on single and charismatic species (Bosetti and Pearce, 2003; Giraud et al., 2002; Langford et al., 1998; Samples et al., 1986; White et al., 1997) and as such provide little insight into the value of marine biodiversity at a broader scale. Furthermore, previous studies have been geographically specific which contrasts strongly with the present study which examined the valuation of key taxon groups across a range of contrasting sites in Europe (NE Atlantic). In this study, the coverage of taxa was broad and the valuation of less charismatic taxa, such as algae, fish and marine invertebrates, were addressed together with more charismatic groups (marine mammals and birds).

In contrast to previous findings that public knowledge of biodiversity is virtually non-existent (Christie et al., 2006), the survey results suggested that respondents in the three case studies sites are generally aware of, and interested in marine biodiversity issues. In this survey the vast majority (77%) of respondents chose the correct definition of marine biodiversity from among the available options. We acknowledge that choosing the right definition among a defined set of options is a simplified exercise and does not imply full understanding of the concept of biodiversity or the welfare trade-offs involved; nevertheless it is an encouraging finding that society is aware that biodiversity is much more than simple measures of species richness. Our results are comparable with those obtained by the Gallup Organization on attitudes of Europeans towards the issue of biodiversity (Eurobarometer, 2010) which found that about two-thirds of EU citizens were familiar with the term biodiversity and the majority of the EU citizens were able to define the meaning of biodiversity loss in their own words and to mention several aspects of biodiversity loss, when the term biodiversity was explained to them. Taken together these results show that awareness of EU citizens about issues related to biodiversity is increasing. In parallel with this finding a high level of importance in the political agenda for marine biodiversity conservation was desired by 96% of the respondents, and the majority interviewed (67%) were willing to pay to avoid a loss in marine species. Preserving species for the benefit of future generations is the most frequently cited reason for wanting to pay. This result portrays a societal ethical principle and substantiates the relevance of non-use values in the valuation of complex environmental amenities such as biodiversity. Once again, this result is comparable with that obtain by the Gallup Organization (Eurobarometer, 2010) that found that "respondents saw the conservation of biodiversity, first and foremost, as moral obligation".

Differences in the economic preferences of visitors and residents to a location have been reported elsewhere. A higher allocation of funds by visitors for the preservation of species is reported in several studies (Loomis and Larson, 1994; Martin-Lopez et al., 2008; Richardson and Loomis, 2009) since visitors are likely to be more knowledgeable about the species in question and are likely to have a large recreational component in their total value (Loomis and White, 1996). In our study, residents were willing to forego a greater proportion of their household income to preserve species at the regional level. In this case the degree of attachment to the study site is possibly the main driver of valuation of marine species, rather than income or education. This provides significant insights into the social acceptability process of local communities towards conservation measures for managers and also highlights the importance of closer involvement of residents in marine conservation management.

Economically consistent measures of WTP are expected to adjust with the scale of the change in the good (Smith and Osborne, 1996). It has been argued that respondents in CV surveys asked to value complex environmental amenities, will state WTP independently of the scope of the project. Such insensitivity would be at odds with rational choice and could therefore imply that CV studies are not a theoretically valid method for biodiversity valuation (Veisten et al., 2004). The results show that the level of loss of species richness did not have a significant effect on WTP. This scope insensitivity may be affected by cognitive limitations, but also by 'warm glow' (charitable behaviour) (Kahneman et al., 1993) or fixed expenses constraints (respondents identify an amount from their budget that they feel that they can afford to spend on the good in question which is invariant with the amount of the good offered) (Chilton and Hutchinson, 2003). A common statement from many respondents was that "losing one species could be as bad as losing several". Poor understanding about the welfare implications of such biodiversity loss among members of the public is understandable given that there is limited science about the ecological consequences of marginal biodiversity loss (Hooper et al., 2005; Worm et al., 2006). From a scientific perspective, several aspects regarding the relationship between marine biodiversity and ecosystem functions still require further clarification. Within communities some species play a more vital role than others in maintaining community interaction and ecosystem structure or function, while other species may be removable or replaceable in a community with little or no effect on ecosystem structure or function (Tisdell et al., 2006). Ecological uncertainty may contribute to ambiguity in appreciation of welfare trade-offs by the general public increasing the probability of insensitivity to the scope of the change. Further, as claimed by Urama and Hodge (2006) "rational choice may be fundamental to human consumption decisions but it does not offer sufficient explanation for all forms of decisions even in street markets." Finally, although tests for scope sensitivity have traditionally relied on split sample designs (Carson and Mitchell, 1993; Loomis et al., 1993) more recent studies have tested scope sensitivity within sample design (see Chilton and Hutchinson, 2003). Testing a similar questionnaire within the same sample would offer a basis for future research.

To provide useful and reliable information to policy makers it seems also important to gain a better understanding of how citizens of different European countries perceive and value marine biodiversity. Our results show that overall the respondents attached positive and significant values to the conservation of marine species. Respondents in the Azores case study allocate the highest values to avoid marine species loss at the regional level. It seems logical as the number of species that would be loss under a hypothetical scenario of 10% or 25% decline in species richness is greater for the Azores compared with the other two case study sites. The present results also demonstrate that different European locations have different preferences for marine taxa. In the Azores, although mammals and fish were valued more highly than birds, invertebrates and algae; small differences occurred in the willingness to pay for different taxa. On the other hand, respondents in the Isles of Scilly put a relatively low value on fish while algae and marine mammals are highly valued. People interviewed in the Gulf of Gdansk region define a clear order of preference for marine mammals, followed by fish, then birds and ultimately invertebrates and algae.

These findings suggested that the valuation of components of marine biodiversity may be context dependent and driven by the specific maritime culture of each location. In the Azores positioned in the central Atlantic with narrow shelves of the islands there is an intimate and frequent contact between respondents and marine mammals, making whale watching in the Azores a more significant activity than bird watching. Furthermore, both scuba diving and fisheries (recreational and professional) are activities with high economic and cultural relevance at the regional level where the integrity and diversity of fish populations plays an important role. The surprising high value attributed to algae in the Isles of Scilly may be correlated with the presence of kelp beds which provide a three dimensional habitat for many species of fish and invertebrates and also gave rise to the kelp burning industry for the extraction of sodium carbonate and iodine which comprised an important part of the Scilly's economy from the mid 17^{th} to 19^{th} century. The Isles of Scilly are also a stronghold for grey seals (*Halichoerus grypus*) and several species of whales and dolphins are seen regularly in island waters. Finally the strong public support towards marine mammals in the Gulf of Gdansk region may be underlined by the frequent conservation campaigns lead by the Marine Station of the University of Gdansk and environmental NGOs raising public awareness for the species' condition and the threats they face. Furthermore, recreational fishing and diving are also activities with high cultural and economic relevance in this region, possibly driving the significant public support for fish. Despite of the ecological importance of baseline taxa such as algae and invertebrates, the lack tradition of shellfish consumption in the Gulf of Gdansk region and the occasional episodes of toxic algal blooms along with the temporary deposits of algae mass on the beaches may explain the more pronounced differences in public support for different marine taxa reported for the Gulf of Gdansk region. These results suggested that cultural differences may be important drivers of valuation of marine species conservation and throw doubts on the commonly held premise that charismatic/likeable taxa have a disproportionately strong influence on the willingness to pay.

This study provided important new insights into human preferences for aspects of biodiversity. Even though marine mammals are highly valued in all case studies, the disparities in the valuations between taxa are less pronounced than those typically reported in the CVM literature. Moreover, taxa that are generally not considered charismatic fauna such as fish (Richardson and Loomis, 2009) and algae are highly valued as well. There is consistent evidence to suggest that we might have reached a pivotal moment in Europe where the public understanding and awareness of biological diversity has reached a point that bypasses the excessive influence of anthropomorphic factors (such attractiveness or likeability of species to humans) and more emphasis is given to a holistic perspective regardless of taxa. Biodiversity encompasses a wide range of species, along with the interaction between them and the surrounding environment. The conservation of species requires the conservation of this interaction, which often goes unvalued. Valuation of single and charismatic species as they could exist in isolation is, therefore, limited in perspective and it would be more meaningful to ask people how much they would be prepared to pay to conserve a community, habitat or ecosystem (Tisdell et al., 2006).

Despite Europe's recent legislation (e.g. Marine strategy framework directive, adopted in 2008) to apply an ecosystem-based approach to managing the seas around the member states, biodiversity in Europe's seas and oceans faces an unprecedented range of pressure. Effective policies for management must be not only scientifically valid and economically feasible but also culturally adaptable i.e. consistent with prevailing social beliefs and values (Stankey and Shindler, 2005). Key gaps in knowledge remain about the status and ecological role of Europe's seas and oceans and in our understanding of the relationship between social, economic and cultural diversity in the perceived value attribute to marine biodiversity among member states. Widening the scope of scientific research towards the community/ecosystem scale and towards less studied taxa would be an important step forward to achieve this goal. Moreover, more cooperation and network research as well as interdisciplinary work are also necessary to provide contributions towards the definition of meaningful and coordinated policies between member states, and more importantly, to shed some light on the complex relationship between biodiversity changes, ecosystem services and human well-being. We find clear evidence that there is social demand for the conservation of marine biodiversity but also variation in valuation and preference across Europe. This finding suggests that conservation policy must take account of cultural diversity alongside biological diversity.

ACKNOWLEDGMENTS

The authors would like to attribute this paper in memory of our co-author, friend and collaborator Gareth Edwards-Jones who died on 14th August 2011 aged 49. The lead author is the last of a six PhD students jointly supervised by Gareth with MJK. Gareth's interdisciplinary approach, his generosity and enthusiasm will be greatly missed.

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APPENDIX A: Brief descriptions of each case study site

The Azores archipelago (Portugal) is composed of nine volcanic islands and several small islets, scattered along 600km of the northern part of the Mid Atlantic Ridge. The

Azores archipelago is of considerable conservation and marine biological interest due to its isolated position in the middle of the north eastern Atlantic and its relatively young geological age (Santos et al, 1995). As such, the Azores provides a diverse range of habitats for numerous marine taxa such as sea mammals (24 spp), fish (520 spp), birds (56 spp), algae (368 spp) and invertebrates (1700 sp) (Gonçalves pers. Comm.[4], 2007; Porteiro pers. comm.[4], 2007; Clarke (2006); Neto et. al. (2006); Gonçalves pers. Comm[4]., 2007).

The Isles of Scilly (UK) are a biodiversity hotspot (Hiscock and Breckels, 2007) the habitats and ecosystems are pristine (Warwick *et al.*, 1977). The islands also have a high number of Nationally Important Marine Feature (NIMF) species, and are therefore an important area for conservation (Hiscock and Breckels, 2007). The distinct nature of this site is reflected in the associated environmental legislation. The area is designated, a Special Area of Conservation (SAC), a Special Protection Area (SPA), and Ramsar protected site and provides habitat for many marine taxa such as marine mammals (9spp), fish (42 spp), birds (13 spp), algae (287spp) and invertebrates (916 spp).

The Gulf of Gdansk (Poland) is situated in the south-east of the Baltic Sea and is enclosed by the shores of Gdansk Pomerania in Poland, and Kaliningrad Oblast in

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[4] The personal communications were given by marine experts in the University of the Azores.

The species list for the Azores is not yet complete, and new species are being discovered in the region on a regular basis.

Russia. The gulf has a mix of brackish and marine waters due to its position in the Baltic Sea and associated riverine discharges. The maximum depth is 118 m, and the average surface water salinity is 8.28 PSU. The total surface area of the Gulf of Gdansk is 4296 km^2 and its volume is 236 km^3. There are sandy, stony and muddy bottom biotopes that create habitats for marine and freshwater taxa such as marine mammals (4 spp.), fish (60 spp.), birds (125 spp.), invertebrates (88 spp.) and algae (42 spp.)(Kruk-Dowgiałło and Szaniawska, 2008; http://www.iopan.gda.pl/projects/puckbay).

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Tables Titles

Table 1: The number of species currently present in each marine taxon (specific to each location) and the number of species that would be lost from each taxon under a scenario of a 10% or 25% reduction in species

Table 2: Guidelines for conducting CV surveys followed in this study

Table 3: Definition of variables used in the regression

Table 4: Socio-demographic profile of respondents detailed by case study site and broken down by residents and visitors

Table 5: Motivations underlying WTP responses

Table 6: The factors influencing the willingness to pay responses to avoid two levels of species loss of five marine taxa

Table 7: Respondents' willingness to pay (WTP) point and interval estimates for scenarios of species loss

Figures

Fig.1: Location of case study sites

Fig. 2: Photomontage presented for fish

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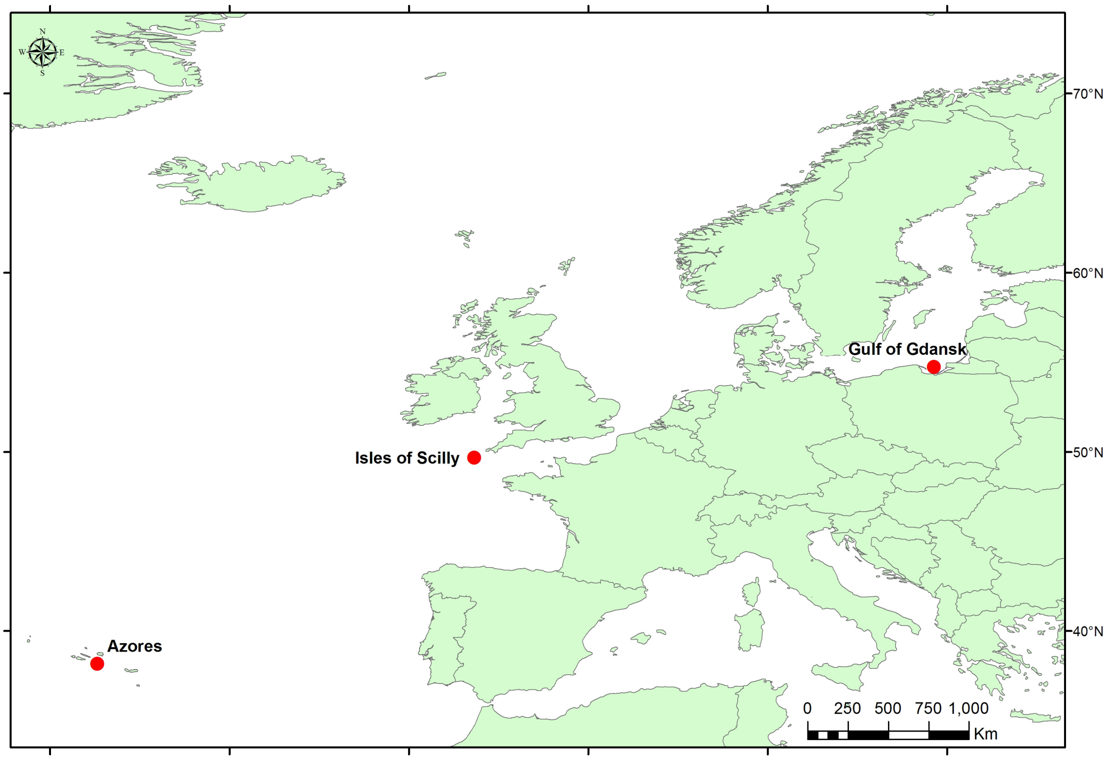
Figure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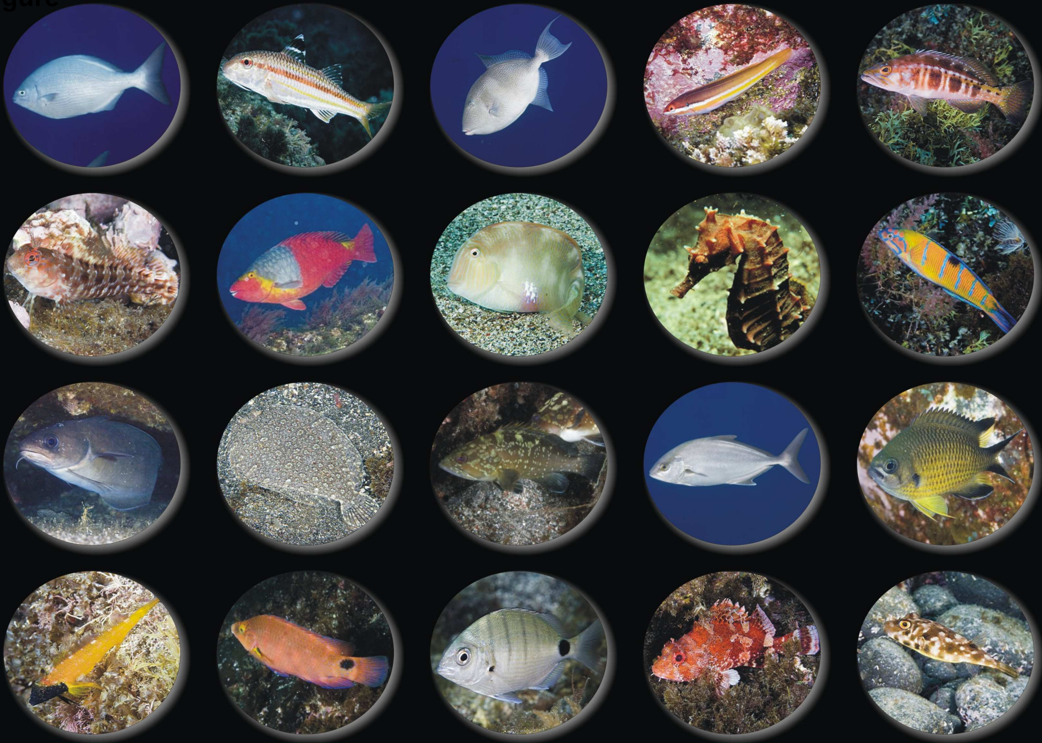

LETTER RESPONDING TO THE REVIEWS

Editor's comments: Thanks for your new version, which has been improved. I only have the last minor comments that should still be addressed:

MINOR SUGGESTIONS:

1) Editor's comments: Title change: I agree with the change but the acronym WTP should be spell out for following journal's format.

Author's comments: The spelled-out form of the acronym WTP (wilingness to pay) is now used in the title of the manuscript. The revised title is reproduced below:

"Different cultures, different values: the role of cultural variation in public's willingness to pay for marine species conservation"

2) Editor's comments: Acknowledgements: Please add reviewers.

Author's comments: The time, careful reading and comments of the editor and anonymous reviewers are now acknowledged in the manuscript.

3) Editor's comments: Abstract: You mention the differences between locations in WTP, but you don't mention any of the variables that explained a significant proportion of variance (e.g. income). I believe that this should be added because this can also be related to geographical differences in socio-economic features, and to reinforce such main result.

Author's comments: We have rewritten the abstract in order to add information on significant predictors of WTP for marine species conservation such as income, education and environmental awareness of the respondents. The relevant sentence is reproduced below:

"Results, based on 1502 face-to-face interviews, showed that income, education and environmental awareness of the respondents were significant predictors of WTP for marine species conservation. Results also indicated that respondents in each of the European locations had different preferences for marine taxa*"*

Table

Table 1: The number of species currently present in each marine taxon (specific to each location) and the number of species that would be lost from each taxon under a scenario of a 10% or 25% reduction in species

Marine Taxon	Current level[(a)]	10% Decline in S.R.[(b)]	25% Decline of S.R.[(b)]
Azores (Portugal)			
Fish	520 sp	52 sp	130 sp
Marine Mammals	24 sp	2 sp	6 sp
Algae	368 sp	37 sp	92 sp
Sea birds	56 sp	6 sp	14 sp
Invertebrates	1700 sp	170 sp	425 sp
Isles of Scilly (UK)			
Fish	42 sp	4 sp	11 sp
Marine Mammals	9 sp	1 sp	2 sp
Algae	287 sp	29 sp	72 sp
Sea birds	13 sp	1 sp	3 sp
Invertebrates	916 sp	92 sp	229 sp
Gulf of Gdansk (Poland)			
Fish	60 sp	6 sp	15 sp
Marine Mammals	4 sp	Not assessed[(c)]	1 sp
Algae	42 sp	4 sp	10 sp
Sea birds	125 sp	13 sp	31 sp
Invertebrates	88 sp	9 sp	22 sp

[(a)] The sources of the number of species currently present in each marine taxon (specific to each location) are given in the Appendix A.
[(b)] S.R. = Species Richness
[(c)] In Gdansk the hypothetical scenario of 10% of loss in the species of marine mammals was not assessed since there is only 4 species in the current level.

Table 2: Guidelines for conducting CV surveys followed in this study
Survey mode
Face-to-face interviews were used
This method allows for the presentation of complex valuation scenarios using support material (such as visual aids) arousing interest and awareness
The interviews were performed by trained interviewers to clarify respondents' doubts, thereby minimizing non-response rates and improving the quality of the data
Pre-testing
Questionnaire wording clear and pre-tested
Pre-testing of the photomontages and consistency of the visual information provided across photomontages and case study sites
Bids displayed on the payment card where based on the results of an open-ended pilot survey
Responses
Confidentiality and anonymity of the information provided and respondents encourage to give honest responses
Follow up questions to test for consistency of responses
No limits of time imposed and allowance to change previous responses
Order of the valuation questions randomised
Respondents reminded of their budget constraint and of alternative expenditures possibilities
Collection of supplementary information to hep the interpretation of the valuation responses
Elicitation Format
WTP rather WTA to gain conservative values

Table 3: Definition of variables used in the regression	
Variable name	**Description**
Scenario: mammals (€)	WTP to prevent a decline in the number of species of mammals
Scenario: birds (€)	WTP to prevent a decline in the number of species of birds
Scenario: fish (€)	WTP to prevent a decline in the number of species of fish
Scenario: inverts (€)	WTP to prevent a decline in the number of species of inverts
Gdansk	Case study Gdansk
Scilly	Case study Isles of Scilly
Log PPP Monthly Income (€)	Continuous variable included as a linear term - The midpoint of income brackets adjusted to 2008 USA purchasing power
Occupation	Factor with levels: Fisherman, Public employee, Private employee, Self employed, Student, Retired, Unemployed, Homemaker, Tourist operator
Household	Continuous variable included as a linear and quadratic term - number of household members
Age	Continuous variable included as a linear and quadratic term - the midpoint of age brackets
Resident (1,0)	Binary variable = (1) If respondent is a resident; (0) otherwise
Biodiversity not Priority	Attitudes towards biodiversity conservation
Biodiversity not Important	Attitudes towards biodiversity conservation
No opinion	Attitudes towards biodiversity conservation
Education	Continuous variable included as a linear and quadratic term - educational levels from 1(basic) to 4 (postgraduate)
Read/ TV env. conservation (1,0)	Binary variable = (1) If respondent reads or watches TV about environment conservation; (0) otherwise
Recycling of household goods (1,0)	Binary variable = (1) If respondent recycles household waste; (0) otherwise
Subscribe a magazine (1,0)	Binary variable = (1) If respondent subscribes a magazine concerned with environmental issues; (0) otherwise
Products env. friendly (1,0)	Binary variable = (1) If respondent selects preferentially green products; (0) otherwise
Donations for charities (1,0)	Binary variable = (1) If respondent has given or raisin money for environmental charities; (0) otherwise
Birds*Gdansk (example)	Interaction term testing differences in preference for specific marine taxa by location

Table 4: Socio-demographic profile of respondents detailed by case study site and broken down by residents and visitors

	Age		Education		Household		Income	
Case Study Site	**Mean**	**Std. deviation**	**Mean**	**Std. deviation**	**Mean**	**Std. deviation**	**Mean**	**Std. deviation**
Azores (Total Sample)	38,6	13,4	2,2	0,9	2,9	1,3	$3.125	$2.135
Visitors (n=255)	39,5	13,7	2,6	0,9	2,8	1,3	$3.755	$2.106
Residents (n=252)	37,7	13,1	1,9	0,8	3,1	1,3	$2.488	$1.971
IOS (Total Sample) [(a)]	42,7	16,1	2,3	1,0	2,3	1,3	$3.726	$2.357
Visitors (n=217)	48,8	15,4	2,4	1,1	2,4	1,2	$4.437	$2.449
Residents (n=200)	35,6	13,5	2,2	0,9	2,3	1,4	$2.970	$2.017
Gdansk (Total Sample)	36,4	14,2	2,5	0,9	3,6	1,5	$1.482	$948
Visitors (n=244)	36,2	12,8	2,7	0,8	3,6	1,4	$1.544	$1.038
Residents (n=268)	36,6	15,4	2,4	0,9	3,5	1,6	$1.425	$855
Total Sample	39,5	14,9	2,4	1,0	2,4	1,3	$2.718	$2.108
Visitors (n=716)	41,2	14,9	2,6	1,0	2,4	1,2	$3.208	$2.294
Residents (n=720)	36,7	14,0	2,2	0,9	2,4	1,3	$2.226	$1.781

[(a)] In Isles of Scillies case study, 66 respondents were not willing to provide some of the socio-demographic details. For this reason they were excluded from the analysis.

Table 5: Motivations underlying WTP responses				
	Azores	**Isles of Scilly**	**Gdansk**	**Total Sample**
WTP	392 (77%)	363 (75%)	254 (50%)	1008 (67%)
Not WTP	115 (23%)	120 (25%)	258 (50%)	494 (33%)
Total	n=507	n=483	n=512	n=1502
Protest responses (Total) [(a)]	**66 (13%)**	**93 (19%)**	**161 (31%)**	**321 (21%)**
Government's responsibility	46	38	127	211
Insufficient information	2	6	27	35
Refusal to put a price on MB	8	23	4	35
Objection towards the valuation question	5	1	3	9
Other reasons	5	26	0	31
Genuine Zero Bidders (Total) [(a)]	**49 (10%)**	**27 (6%)**	**97 (19%)**	**173 (12%)**
Can't afford to pay	20	15	54	89
Society has more important problems	23	4	23	50
Insufficient benefit of such a payment	6	8	20	34
Positive WTP (Total) [(b)]	**392 (77%)**	**363 (75%)**	**254 (50%)**	**1008 (67%)**
The marine biodiversity of this region provide an option for leisure/recreation, food provision and it is important for the local economy ***(Direct use value)***	257	254	200	711
The marine biodiversity of this region is precious and it benefits the human well being (water quality, erosion control, coastal protection, etc) ***(Indirect Use Value)***	177	152	156	485
I enjoy knowing that marine biodiversity exists in this region even if I never see or use it ***(Existence value)***	237	230	58	525
The marine biodiversity of this region has the right to exist even if it does not appear important to human well being today ***(Option value)***	270	239	68	577
I enjoy knowing that the future generations will be able to enjoy marine biodiversity of this region ***(Bequest value)***	301	301	168	770
Other (please specify)	3	7	0	10

[(a)] Respondents could only tick one option as their primary reason for not be WTP for marine species conservation

[(b)] Respondents could tick one or more reasons to justify their positive WTP for marine species conservation

Table 6 : The factors influencing the WTP responses to avoid two levels of species loss of five marine taxa

Dependent variable: WTP to prevent a decline in all marine species

Number of observations: 5075			**X^2 =** 1504.94		
Log-likelihood model: -24140			**D.F:** 43		
Log-likelihood (intercept only): -24893			**p<0.0001**		
AIC: 48377			**scale=** 1.88		

Variables Labels	Parameter estimates	Standard error	z	p	Sig.
Intercept	-6.106	0.476	-12.835	p<0.0001	***
Scenario: mammals (€)	0.253	0.147	1.725	0.085	*
Scenario: birds (€)	0.072	0.147	0.492	0.623	n.s.
Scenario: fish (€)	0.260	0.147	1.773	0.076	*
Scenario: inverts (€)	0.028	0.147	0.189	0.850	n.s.
Gdansk	-0.340	0.157	-2.161	0.031	**
Scilly	0.011	0.156	0.072	0.942	n.s.
Log PPP Monthly Income (€)	0.975	0.046	21.132	p<0.0001	***
Fisherman	1.301	0.297	4.375	p<0.0001	***
Public Employee	-0.281	0.184	-1.531	0.126	n.s.
Private Employee	0.100	0.182	0.549	0.583	n.s.
Self Employed	-0.283	0.190	-1.488	0.137	n.s.
Student	0.126	0.205	0.615	0.539	n.s.
Retired	-0.171	0.218	-0.782	0.434	n.s.
Unemployed	0.365	0.247	1.476	0.140	n.s.
Homemaker	0.517	0.280	1.842	0.066	*
Tourist Operator	0.596	0.232	2.569	0.010	**
Household - Quadratic term	-0.012	0.003	-4.467	p<0.0001	***
Age - linear term	0.039	0.014	2.838	0.005	***
Age - Quadratic term	0.000	0.000	-2.531	0.011	**
Resident/visitor condition (1,0)	0.316	0.062	5.132	p<0.0001	***
Biodiversity not Priority	-0.888	0.066	-13.469	p<0.0001	***
Biodiversity not Important	-3.136	0.396	-7.921	p<0.0001	***
No opinion	-1.837	0.280	-6.556	p<0.0001	***
Education - Linear Term	-0.376	0.156	-2.407	0.016	**
Education - Quadratic Term	0.088	0.031	2.871	0.004	***
Read/ TV env. conservation (1,0)	0.553	0.087	6.389	p<0.0001	***
Recycling of household goods (1,0)	0.237	0.073	3.254	0.001	***
Subscribe a magazine (1,0)	0.176	0.085	2.067	0.039	**
Products env. friendly (1,0)	0.392	0.062	6.357	p<0.0001	***
Donations for charities (1,0)	0.258	0.077	3.339	0.001	***
Interaction factor: Birds*Gdansk	0.466	0.212	2.197	0.028	**
Interaction factor: Fish*Gdansk	0.572	0.211	2.710	0.007	***
Interaction factor: Inverts*Gdansk	-0.004	0.214	-0.021	0.983	n.s.
Interaction factor: Mammals*Gdansk	1.048	0.238	4.394	0.000	***
Interaction factor: Birds*Scilly	-0.243	0.207	-1.173	0.241	n.s.
Interaction factor: Fish*Scilly	-0.460	0.207	-2.224	0.026	**
Interaction factor: Inverts*Scilly	-0.272	0.207	-1.316	0.188	n.s.
Interaction factor: Mammals*Scilly	-0.322	0.207	-1.557	0.119	n.s.

Log(scale)	0.630	0.011	55.837	p<0.0001	***

p<0,01 (***); p<0,05(**); p<0,1 (*); n.s.: Non significant

Table 7: Respondents' willingness to pay (WTP) point and interval estimates for scenarios of marine species loss

Location	Taxa	Sample Group	Mean	95% CI	% WTP to monthly Income
Azores	mammals	Residents	$90	[$73 - $111]	3.62%
Scilly	mammals	Residents	$70	[$58 - $84]	2.36%
Gdansk	mammals	Residents	$58	[$43 - $79]	4.07%
Azores	birds	Residents	$75	[$61 - $93]	3.01%
Scilly	birds	Residents	$63	[$52 - $76]	2.12%
Gdansk	birds	Residents	$35	[$28 - $44]	2.46%
Azores	fish	Residents	$91	[$73 - $112]	3.66%
Scilly	fish	Residents	$61	[$51 - $74]	2.05%
Gdansk	fish	Residents	$47	[$38 - $59]	3.30%
Azores	inverts	Residents	$72	[$58 - $89]	2.89%
Scilly	inverts	Residents	$59	[$49 - $71]	1.99%
Gdansk	inverts	Residents	$21	[$17 - $26]	1.47%
Azores	algae	Residents	$70	[$57 - $86]	2.81%
Scilly	algae	Residents	$75	[$62 -$90]	2.53%
Gdansk	algae	Residents	$20	[$16 - $26]	1.40%
Azores	mammals	Visitors	$101	[$117 - $136]	2.69%
Scilly	mammals	Visitors	$62	[$73 - $85]	1.40%
Gdansk	mammals	Visitors	$50	[$69 - $94]	3.24%
Azores	birds	Visitors	$84	[$98 - $114]	2.24%
Scilly	birds	Visitors	$56	[$66 - $77]	1.26%
Gdansk	birds	Visitors	$24	[$29 - $36]	1.55%
Azores	fish	Visitors	$101	[$118 - $137]	2.69%
Scilly	fish	Visitors	$54	[$64 - $75]	1.22%
Gdansk	fish	Visitors	$32	[$39 - $49]	2.07%
Azores	inverts	Visitors	$80	[$93 - $109]	2.13%
Scilly	inverts	Visitors	$52	[$61 - $72]	1.17%
Gdansk	inverts	Visitors	$14	[$18 - $22]	0.91%
Azores	algae	Visitors	$78	[$91 - $106]	2.08%
Scilly	algae	Visitors	$66	[$78 - $92]	1.50%
Gdansk	algae	Visitors	$14	[$17 - $21]	0.91%