VALUING THE RECREATIONAL BENEFITS OF WETLAND ADAPTATION TO CLIMATE CHANGE: A TRADE-OFF BETWEEN SPECIES’ ABUNDANCE AND DIVERSITY.

According to experts, climate change will further exacerbate wetland deterioration, especially in the Mediterranean region. On the one side, it will accelerate the decline in flora and fauna populations and species. On the other one, it will also promote biotic homogenization, resulting in a loss of species’ diversity. In this context, different adaptation policies can be designed: those orientated to recovering species’ abundance and those aimed at restoring biological diversity. Aware that knowledge about visitors’ preferences is crucial to better inform the planning of wetlands and secure their public use and conservation, this paper assesses the recreational benefits of different adaptation options through a choice experiment study carried out in S’Albufera wetland (Mallorca). Results show that visitors display positive preferences for an increase in both species’ abundance and diversity, although they assign a higher value to the latter, thus suggesting a higher acceptability of policies pursuing wetlands’ differentiation. This finding acquires special relevance not only for wetland adaptation but also for tourism planning, given the growing competition among wetlands to attract visitors and the increasing tourists’ demand for high environmental quality and unique experiences. Therefore, promoting wetlands’ differentiation policies could be a good destination strategy to gain competitive advantage.

Keywords: climate change, wetland adaptation, species’ diversity, species’ abundance, recreational benefits, choice experiment.

JEL classification: D6, Q51, Q54, Q57.

1. Introduction

Wetlands –including marshes, fens, peatlands or coastal areas– are not only among the richest ecosystems in biodiversity, but also among the most fragile environments (Russi et al. 2013). Anthropogenic stresses on wetlands, especially in terms of land use conversion and unsustainable water use, are responsible for their continuous degradation (Seilheimer et al. 2009). According to experts, climate change (CC) will further exacerbate wetland deterioration mainly by intensifying current alterations in water quantity and quality, given humid lands’ dependence on water (Cross et al. 2012; Erwin 2009).

This is especially true for wetlands located in the Mediterranean region, as it represents a global warming hotspot where a particularly severe increase in temperatures and a decrease in precipitation...
rates are forecasted (Giorgi and Lionello 2008). In this framework, further degradation of humid lands is expected to intensify current negative impacts on wetland-dependent species. On the one side, it will accelerate population declines in most flora and fauna as well as extinction of species, both resulting in an impoverishment in biological abundance (Amezaga et al. 2002; Cuttelod et al. 2008). On the other one, it will also promote biotic homogenization, that is, the process by which many ‘specialist’ species relying on one or few habitats are substituted by few ‘generalist’ ones occupying a wider habitat range and hence being more adaptable to human-induced pressures (Araújo et al. 2011; Lougheed et al. 2008; Mediterranean Wetlands - Outlook 2012). This substitution pattern will result not only in a quantitative but also, and even more importantly, in a qualitative loss in species diversity which is forecasted to reduce the original heterogeneity of wetlands, thus accentuating the current process of homogenization among Mediterranean humid lands.

In this context, welfare losses are expected especially for recreationists, who increasingly appraise wetlands for their biological abundance and diversity (Millennium Ecosystem Assessment 2005). Action is therefore needed to avoid or minimize these welfare losses in the face of CC and hence ensure wetland sustainability. In other words, the design of CC adaptation policies oriented to securing public use and conservation should be of high priority for wetland managers. In this sense, and by strengthening efforts on current management practices, decision-makers can opt for different strategies to counteract the abovementioned CC impacts on wetland-dependent species. Indeed, they can pursue to recover species’ abundance, thus taking action to avoid a quantitative loss of species, regardless of the species’ type. Also, they can seek to preserve original wetlands’ heterogeneity, thus acting against biotic homogenization by undertaking measures to avoid the quantitative loss of many ‘specialist’ species. Although both strategies contribute to the goals of conservation and public use, the latter type of policy has been argued to be more desirable from an ecological point of view. Indeed, it contributes to achieve more complex and healthy, hence more resilient, ecosystems (Norberg et al. 2008; Robledano et al. 2010). In addition, it allows promoting wetlands’ differentiation which could represent a good destination strategy to gain competitive advantage, given the growing competition among wetlands to attract visitors as well as the increasing demand for high environmental quality and unique experiences (Secretariat of the Ramsar Convention on Wetlands & World Tourism Organization (UNWTO) 2012). In this context, adaptation policies should be not only desirable and feasible but also socially accepted. Thus, knowledge about the economic value that users assign to species’ diversity and abundance in wetlands is crucial to maximize visitors’ wellbeing and guarantee an efficient intervention.

Unfortunately, adaptation research on CC impacts in Mediterranean wetlands has mainly focused on the issue of loss of abundance rather than diversity. Most of papers have dealt with adaptation aimed at strengthening flood control measures (El-Raey 1997; Nicholls and Hoozemans 1996; Snoussi et al. 2008) and water management (Ayache et al. 2009; Jeppesen et al. 2011) to respectively counteract two primary CC induced problems in the region: sea level rise and water scarcity (Carbognin et al. 2010; García-Ruiz et al. 2011). This way, adaptation has mainly addressed the CC intensified loss of species from a quantitative perspective, thus neglecting the problem of a joint quantitative and qualitative impoverishment in species diversity. Also, adaptation literature has paid little attention to the analysis of social acceptance of policies, thus overlooking efficiency issues in their design.

To better inform wetland planning, this paper analyses users’ preferences for two types of adaptation policies: those oriented to a quantitative recovery of species and populations and those pursuing a qualitative restoration of biological diversity. By assuming policies aimed at preserving original wetlands’ heterogeneity are more desirable, the hypothesis that visitors assign a higher value to ‘specialist’ species-abundant rather than to ‘generalist’ species-abundant wetlands is tested for. Support in favor of this hypothesis is provided in Lundhede et al. (2012) and Lundhede et al. (2013), who outline people tend to support conservation actions targeted at native instead of immigrating species under CC, while
the reverse is found in Bardsley and Edwards-Jones (2007). To test for our hypothesis, preferences of visitors to S'Albufera wetland (Mallorca), an outstandingly vulnerable site to CC stresses (Candela et al. 2009), are examined through a choice experiment (CE).

The structure of the paper is as follows. Next section describes S'Albufera wetland case study. Then, the methodology and statistical model employed for data analysis are highlighted. The following section outlines the main steps of the CE design. Afterwards, sample descriptive statistics and model results are reported. A conclusion section ends the paper.

2. Case study description

S'Albufera is the largest wetland in the Balearic Islands, with 1646.38 Ha protected by law. It is placed at the coastal plain of an extensive catchment area in the North East of Mallorca and it is nourished by surface runoff waters, precipitations, underground springs and sea water (Parc Natural de S'Albufera de Mallorca 2005). The prevalently freshwater nature of this wetland makes it different from most Mediterranean coastal humid lands,¹ at the time it supports diverse and abundant flora and fauna species of international importance (Sato and Riddiford 2008). Bird species are its major natural asset. In this sense, there is a community of 'specialist' species that find in S'Albufera their ideal habitat, including both sedentary and migratory birds that regularly move to this site for breeding during spring or stopping over during winter. Additionally, there is an increasing presence of 'generalist' bird species that are not exclusively found in S'Albufera but start to appear both as occasional migrants and as sedentary new species due to the increasing salinization process of this wetland.

Salinization, which is one of the major threats for freshwater habitats and species (Jin 2008), results from the insufficient freshwater availability caused by the unsustainable water extraction and consumption derived from intensive agriculture, urbanization and tourism (Espais de Natura Balear - Conselleria de Medi Ambient 2008). Further declines in freshwater volumes are projected under CC due to increased temperatures and decreased precipitations forecasted for the Mediterranean region and leading to a growing probability of droughts and extreme events (Candela et al. 2009). This, coupled with increased sea water intrusion, is anticipated to elevate the concentration of salt in waters with repercussions over the flora and fauna species. The most serious consequences are expected on 'specialist' bird species, whose projected decline will generate a qualitative loss in the site's biological diversity.

CC will also be responsible of increasing stresses over migratory bird species –especially spring ones– by growingly shifting their migration timing (Tingley et al. 2009). The projected rise in temperatures at their origin place is expected to stimulate their advanced departure, such that they will arrive earlier to S'Albufera for resting and breeding. In this context, they might not find the optimal nesting conditions, such as peak food availability, thus being forced to abandon the site. As a result of this, the abundance of both 'specialist' and 'generalist' migratory bird species in S'Albufera is expected to decline.

Both qualitative and quantitative drops in bird species under CC are expected to generate welfare losses especially for visitors, whose number has steadily grown since the declaration of S'Albufera as a Natural Park in 1988 (Espais de Natura Balear – Conselleria de Medi Ambient 2008), attracted by a wide range of recreational activities (contemplation of nature, sport, bird watching…). Over these last 15 years, water management interventions have been implemented to control for seawater intrusion and to favor the diffusion of freshwater throughout the channels of the park, as the best way to recover ‘specialist’

¹ [http://www.medwetlands-obs.org/node/33 accessed in December 2013]
species. Additionally, managers have undertaken policies oriented to the creation of optimal nesting and breeding conditions to attract migratory bird species to S’Albufera, regardless of whether ‘specialist’ or ‘generalist’, to increment the attractiveness of the wetland. Vegetation diversity management –through the use of cattle and horses– has also been carried out to maintain landscape heterogeneity and to restore the environmental conditions in sensitive areas, such as the riverbank wood and the dune system.

3. Methodology

Measuring visitors’ welfare changes associated with global warming requires the use of stated preference (SP) methods. Indeed, they allow valuing non-market goods when individuals face scenarios they have not previously experienced yet, as happens when it comes to CC impacts. In this context, choice experiments (CE) represent appropriate methods when multiple environmental changes are simultaneously considered and their impact on utility is to be assessed (Hanley et al. 2001). They consist of the combination of different attributes’ levels to create hypothetical alternatives which are grouped into choice sets and presented to respondents. From each choice set, individuals are asked to select their most preferred option and, through statistical analysis of responses, preferences can be inferred. In case a price is included in the alternatives, the monetized value individuals assign to each attribute can be obtained (Hanley et al. 1998).

3.1. Statistical modelling

Preference analysis in a CE study is performed through the use of statistical models relying on the random utility theory (RUT) (Manski 1977). Thus, a decision-maker facing different alternatives, each providing a given level of utility, selects his most preferred one in the choice card. $U_{nj}$ represents the utility an individual $n$ obtains from alternative $j$. Because $U_{nj}$ is only partly observed by the researcher, it depends on a deterministic ($V_{nj}$) and a stochastic ($\varepsilon_{nj}$) component:

$$U_{nj} = V_{nj}(x_{nj}, x_{costnj}, \beta) + \varepsilon_{nj} \quad (1)$$

Where $x_{nj}$ are non-monetary attributes, $x_{costnj}$ is the price associated with the combination of attributes’ levels, $\beta$ are attributes’ parameters and $\varepsilon_{nj}$ represents the error term capturing all the unobserved factors affecting individuals’ choice. As $U_{nj}$ is partly observed by the analyst, only probabilistic statements can be made about individuals’ choices. To calculate the probability that the alternative $j$ is elicited, assumptions on the distribution of $\varepsilon_{nj}$ are required. The most common one is the error is independently and identically distributed (iid), which allows for the identification of the conditional logit (CL) model (McFadden 1974). By assuming utility is linear-in-parameters, the logit probability function can be expressed as:

$$L_{nj} = \frac{exp(V_{nj})}{\sum_{k \in C} exp(V_{nk})} \quad (2)$$

However, the CL model displays some limitations. One of the most stringent ones is the assumption of preference homogeneity (Train 2009). To deal with individual-specific taste heterogeneity, the random parameter logit (RPL) model is increasingly employed also for its flexibility to approximate any random

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2 The iid property implies that the error associated with one alternative’s utility provides no information on the error of another alternative’s utility. Under this assumption, the independence from irrelevant alternatives (IIA) property holds and this involves that the relative probability of choice of two options is independent of the presence or absence of other alternatives.
utility model (McFadden and Train 2000). The formulation of the utility that individual $n$ obtains from alternative $j$ under RPL is:

$$U_{nj} = V_{nj}(x_{nj}, x_{-nj}, \beta_n) + \varepsilon_{nj}$$  \hspace{1cm} (3)

Where $\beta_n$ is now individual-specific. The RPL assumes that the sources of taste heterogeneity are unobserved and hence unknown, such that a random density function is employed to describe heterogeneity in the $\beta$ coefficients. The $\beta$ distribution is defined by some parameters $\Omega$ which correspond to the population's mean and standard deviation. For an RPL model the density function is specified to be continuous and it can follow any distribution.

The probability of choice of the $j$ alternative within a set of $C$ options can be calculated by integrating the standard logit probabilities $L$ over the $\beta$ density function:

$$P_{nj} = \int \frac{\exp(V_{nj}/\beta_n)}{\sum_{k=1}^{C} \exp(V_{nk}/\beta_n)} f(\beta_n | \Omega) \, d\beta$$  \hspace{1cm} (4)

Estimation in RPL models must be approximated through simulation methods because the expression for the probability of choice in (4) does not have a closed-form. Various simulation methods are available to obtain the draws, the Halton sequence representing one of the most commonly employed approaches (Bhat 2001). By including the simulated probabilities into the log-likelihood function, the simulated log likelihood (SLL) is obtained. The maximum simulated likelihood estimator is the value of $\Omega$ that maximizes the SLL function.

Once the $\Omega$ parameters are estimated, the value that individuals assign to a change in a given non-monetary attribute $x_m$ can be calculated by means of the willingness to pay (WTP) formula presented in Hanemann (1984):

$$WTP = - \frac{1}{\beta_c} \ln \left[ \frac{\sum_{k=1}^{C} \exp(V_{nk}^1)}{\sum_{k=1}^{C} \exp(V_{nk}^0)} \right]$$  \hspace{1cm} (5)

where $\beta_c$ is the marginal utility of income, and $V_{nk}^1$ and $V_{nk}^0$ are, respectively, the utility levels after and before the change in the attribute of interest, $x_m$.

4. Choice experiment design

The first step in the development of a CE study consisted in the identification of the relevant management attributes and attribute levels. They were selected after consultation with park managers and experts, taking into account current policy interventions and recognizing that management efforts should be strengthened to avoid welfare losses related to CC. Agreement was reached on the fact that CC will mainly provoke a reduction in the ‘specialist’ and ‘generalist’ bird species of S’Albufera. Thus, two environmental management attributes were considered: the change in the number of ‘specialist’ bird species to reflect the effects of CC-induced salinization and the change in the number of ‘generalist’ migratory bird species to capture the impacts of CC-intensified shifts in migration timing. Based on the results of previous visitors’ satisfaction surveys, other two non-environmental attributes were considered to be relevant for recreationists when evaluating management programs: the waiting time for a seat in an observation cabin –as a proxy for the degree of congestion at the site– and the number of rest-stop benches to reflect park services. A payment was also included, consisting in an entrance fee adult visitors would be charged each time they accessed the park. The appropriateness of the selected
attributes and levels was tested in focus group sessions with park visitors in the last weeks of March 2013. Table 1 describes the different attributes and their levels.

Table 1. Description of the attributes and their levels

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Specialist’ bird species</td>
<td>Change in the number of ‘specialist’ bird species (with respect to current level)</td>
<td>+5, 0, -10</td>
</tr>
<tr>
<td>‘Generalist’ migratory bird species</td>
<td>Change in the number of ‘generalist’ migratory bird species (with respect to current level)</td>
<td>+5, 0, -10</td>
</tr>
<tr>
<td>Waiting time</td>
<td>Waiting time for a seat in an observation cabin</td>
<td>About 3 minutes, About 7 minutes, About 15 minutes, Triple current number, Double current number, Keep current number</td>
</tr>
<tr>
<td>Rest-stop benches</td>
<td>Number of rest-stop benches throughout the park</td>
<td>Triple current number, Double current number, Keep current number</td>
</tr>
<tr>
<td>Entrance Fee</td>
<td>Entrance fee per adult visitor and trip (in euros) (BAU level: 0 euros)</td>
<td>4, 8, 12, 16, 20, 24</td>
</tr>
</tbody>
</table>

Attribute levels resulting from high (a), moderate (b) or no increase (c) in management efforts.

The second step of the process consisted in generating the experimental design required to combine the attributes’ levels and create the alternatives and choice sets. A D-efficient Bayesian design was used, which finally resulted in 18 profile combinations. Three options were considered for each choice set: two combinations showing improvements in at least one attribute, as a result of a moderate or high increase in management efforts; and a third fixed alternative representing the business-as-usual (BAU) scenario that would occur in 10 years under CC if management efforts were not strengthened. Choice situations were blocked to reduce the number of choice sets to 6 per individual. As a result of this, three questionnaires’ versions were obtained and they were randomly distributed across respondents.

The questionnaire was divided into 5 sections. The first one was aimed to identify the respondents’ profile, with specific questions designed for Mallorcan residents and tourists. The following section was focused on the features of the recreationists’ behavior in S’Albufera. The third block described the environmental problem and the possible solutions park managers could adopt to counteract CC impacts. Next block was devoted to the choice of alternatives. Follow up questions were also included to identify possible protest answers within the sample. The questionnaire concluded with some questions about the individual’s socio-demographic profile.

Data were collected through face-to-face individual interviews addressed to the visitors’ population of S’Albufera of 18 years of age or older. Individuals were randomly drawn within some pre-defined strata, discriminating users according to their place of origin. Trained interviewers were hired to undertake the surveying process, conducted between the 15th of April and the 30th of June 2013 –the peak visitation season for the park–. From a total population of 23172 individuals, a sample of 322 participants was selected by considering a confidence interval of 95% and a sample error of 5.47%. By taking the number of intercepted but non-participating visitors into account (488), the rate of response accounted for 39.75%.

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3 D-efficient designs were created in Ngene.
4 An example of choice set is shown in the Appendix.
5. Results

5.1. Descriptive statistics

Analysis of sample data showed that visitors to S’Albufera match the profile of nature-based recreationists identified by Arnegger et al. (2010), Luo and Deng (2008), Shrestha et al. (2007) and others. In fact, visitors were mainly non-residents (86.91%), were mostly motivated to travel to Mallorca for nature enjoyment (45.17%) and displayed longer average length of stay at the destination (10.21 days) than that of the average traveler to the island over the same period (6 days). As nature-based recreationists, S’Albufera visitors tended to be mid-life (53 years old), displayed a high education level (50.17% finalized university or post-graduate studies) and belonged to the upper middle class (monthly average net household income was between 3000 and 4000 euros). They also showed repeat visitation rates to the park (63.16% of residents yearly visited S’Albufera an average of 2.33 times and 55.91% of non-residents had visited the park an average of 4 times over the last 5 years) and to other humid lands, especially within their region (with a mean of 25 visits per year). Most of users went to S’Albufera to ‘contemplate and enjoy nature’ (41.95%), while 30.54% engaged in a more specific activity like ‘bird-watching’.

Visitors were also found to generally travel in small groups (53.35%) and were sensitive towards the environment: 38.93% of them were members of environmental groups, 24.50% belonged to a birding organization, 46.31% were engaged in some sport/leisure group, 52.35% regularly consumed organic food, 97.99% separated waste for recycling and 37.25% collaborated with some non-governmental organizations.

5.2. Choice experiment results

After invalid and protest questionnaires were eliminated, 298 surveys were taken into account for the estimation. They provided a total of 1788 observations as each individual faced 6 choice cards. CE responses were initially modelled by means of a CL, but the rejection of the IIA property suggested the use of a more flexible model such as the RPL. Individuals’ utility function was specified by considering both main and interaction effects. The environmental attributes reflecting the change in the number of ‘specialist’ and ‘generalist’ migratory bird species entered the utility function as continuous variables with both a linear and a quadratic specification to test whether they had non-linear effects on utility. Additionally, an interaction term between ‘specialist’ and ‘generalist’ migratory bird species attributes was included to check whether the expected benefits obtained from a marginal increase in one bird category depended on the level of the other one. Concerning non-environmental attributes, resting places and waiting time were entered as dummy variables. To verify the existence of substitutability/complementarity relations between congestion and the environmental attributes, interaction terms between these latter and waiting time were also included. Finally, the price attribute was continuously codified.

The likelihood-ratio (LR) test was used to identify the model best fitting the data, shown in Equation (6):

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5 Data provided by the Agència del Turisme de les Illes Balears for the II trimester of 2013 [http://www.caib.es/sacmicrofront/archivopub.do?ctrl=MCRSRT652154103&id=154103 accessed in December 2013].
\[ V_{nj} = \beta_1 x_{\text{specialist$_n$}} + \beta_2 x_{\text{generalist$_n$}} + \beta_3 x_{\text{waiting$_n$}} + \beta_4 x_{\text{bench$_{double}$$_n$}} + \beta_5 x_{\text{bench$_{triple}$$_n$}} + \beta_6 x_{\text{cost$_n$}} + \beta_7 x_{\text{specialist$_n$} \cdot x_{\text{specialist$_n$}}} + \beta_8 x_{\text{generalist$_n$}} \cdot x_{\text{generalist$_n$}} + \beta_9 x_{\text{specialist$_n$} \cdot x_{\text{generalist$_n$}} \cdot x_{\text{waiting$_n$}}} \]  

Table 2 shows RPL model results estimated by means of Matlab 7.12. Normal distributions were considered for all the coefficients of attributes entering linearly the utility function, except for the cost parameter, which was assigned a lognormal distribution. Results illustrated that only marginal utility of income was random. Due to the presence of non-fixed estimated parameters, model optimization was achieved by means of a Halton sequence with 100 draws.

<table>
<thead>
<tr>
<th>MAIN EFFECTS</th>
<th>coefficient</th>
<th>p-value</th>
<th>st. error</th>
<th>st. deviat.</th>
<th>p-value</th>
<th>st. error</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Specialist' bird species</td>
<td>2.1130***</td>
<td>0.0000</td>
<td>0.2861</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'Generalist' migratory bird species</td>
<td>1.2454***</td>
<td>0.0000</td>
<td>0.2364</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waiting time</td>
<td>0.4547***</td>
<td>0.0012</td>
<td>0.1394</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rest-stop benches (double)</td>
<td>0.5837***</td>
<td>0.0001</td>
<td>0.1497</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rest-stop benches (triple)</td>
<td>0.2764</td>
<td>0.1123</td>
<td>0.1735</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost $^b$</td>
<td>1.3711***</td>
<td>0.0000</td>
<td>0.0645</td>
<td>0.7177***</td>
<td>0.0000</td>
<td>0.0425</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INTERACTIONS</th>
<th>coefficient</th>
<th>p-value</th>
<th>st. error</th>
<th>st. deviat.</th>
<th>p-value</th>
<th>st. error</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Specialist' bird species (squared)</td>
<td>-0.7799***</td>
<td>0.0048</td>
<td>0.2744</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'Generalist’ migratory bird species (squared)</td>
<td>-0.7579***</td>
<td>0.0031</td>
<td>0.2545</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'Specialist' * 'Generalist' migratory bird species</td>
<td>-0.2898*</td>
<td>0.0801</td>
<td>0.1650</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>'Specialist' * Waiting time</td>
<td>-0.6836***</td>
<td>0.0001</td>
<td>0.1672</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Log-likelihood: -1050.6006
Observations: 1788
N: 298

$^a$Note: *** 1% significance level; ** 5% significance level; * 10% significance level;
$^b$Reported estimated parameters are those of the normal distribution associated with the lognormal one. Mean and standard deviation of the lognormal distribution are, respectively, 5.0936 and 4.1547

Concerning main effects, the sign of the estimated coefficients for the environmental attributes indicated that visitors displayed positive preferences for a marginal increase in the number of both ‘specialist’ and ‘generalist’ migratory bird species. However, the coefficient of ‘specialist’ bird species was almost double in magnitude. On the other side, they showed preferences for lower congestion levels (with respect to the current one), even though they seemed to be insensitive to the magnitude of congestion reduction. Regarding rest-stop benches, they displayed higher preferences for doubling than for tripling the number of resting places. Due to the use of a lognormal distribution for the estimated parameter of cost, the price coefficient was positive, according to expectations, and significant.

Looking at the estimated coefficients for the quadratic terms, the benefits of a marginal increment in the number of both types of species increased at decreasing rates, showing individuals’ utility function was concave with respect to the number of ‘specialist’ and ‘generalist’ migratory bird species. That is, it is possible to identify a specific number (maximum) of both types of species for which their part-worth

$^6$As the cost parameter displays restricted sign domain, a lognormal distribution was used.

$^7$A Wald test was performed to check for the significance of two separate dummies for different waiting time reductions (from 15 to either 7 or 3 minutes) but it failed to reject the null hypothesis of parameters’ equality.
utility is maximized. The negative sign of the coefficient of the interaction between both environmental attributes showed visitors perceived them as substitutes, thus assigning a higher value to ‘specialist’ bird species when the number of ‘generalist’ migratory ones is lower, and vice versa. Congestion was also found to affect the part-worth utility of ‘specialist’ but not of ‘generalist’ migratory species: the negative coefficient of the interaction between ‘specialist’ and waiting time suggested that visitors valued more ‘specialist’ bird species when congestion was high.

By adapting Equation (5) to the utility specification of Equation (6), we calculated individuals’ willingness to pay (WTP) for a change in each attribute from the BAU to a policy-on situation, achieved with a moderate increase in management efforts. The values of the interacting attributes were set equal to the BAU levels. Equation (7) shows the WTP for a change in $x_{specialist_{nj}}$:

$$WTP = -\frac{1}{\beta_0}(\beta_1(x_{specialist_{nj}}^1 - x_{specialist_{nj}}^0) + \beta_7((x_{specialist_{nj}}^1 \cdot x_{specialist_{nj}}^1) - (x_{specialist_{nj}}^0 \cdot x_{specialist_{nj}}^0)) + \beta_9((x_{specialist_{nj}}^1 \cdot x_{generalist_{nj}}^0) - (x_{specialist_{nj}}^0 \cdot x_{generalist_{nj}}^0)) + \beta_{10}((x_{specialist_{nj}}^1 \cdot x_{waitingtime_{nj}}^0) - (x_{specialist_{nj}}^0 \cdot x_{waitingtime_{nj}}^0)))$$

where the superscript $^1$ and $^0$ indicate, respectively, the attribute level under moderate effort and the BAU scenario.

Given the randomness of the price parameter, a distribution of WTP values for each attribute was obtained. Table 3, which reports the value of the mean and the standard deviation of these distributions, shows that, on average, individuals would be willing to pay for each of the proposed improvements.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Average WTP values per person and trip</th>
<th>Standard deviation of the distribution in parenthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Specialist’ bird species</td>
<td>10.72€ (9.20)</td>
<td></td>
</tr>
<tr>
<td>‘Generalist’ migratory bird species</td>
<td>7.73€ (6.63)</td>
<td></td>
</tr>
<tr>
<td>Waiting time reduction</td>
<td>3.83€ (3.29)</td>
<td></td>
</tr>
<tr>
<td>Rest-stop benches (double)</td>
<td>1.97€ (1.69)</td>
<td></td>
</tr>
</tbody>
</table>

By means of a bootstrapping procedure with 1000 replications, significant differences were found between the per trip mean WTP for ‘specialist’ (10.72 euros) and that for ‘generalist’ migratory bird species (7.73 euros). These findings are summarized in figure 1.
According to the previous results, it would be suitable to safeguard the heterogeneous character of S’Albufera under CC. To this aim, any intervention oriented to maintain or increment the number of ‘specialist’ bird species requires to take into account that the policy benefits depend on different factors: the number of ‘specialist’ and ‘generalist’ migratory bird species and the level of congestion. Table 4 analyzes the sensitivity of the mean WTP for a given increase in ‘specialist’ species to different congestion and species scenarios.

Table 4. Mean WTP for given changes in ‘specialist’ avian species under different levels of species and congestion

| SCENARIO                          | WTP (€)  
|-----------------------------------|---------
| **Minus 10 ‘generalist’ migratory bird species** | **10.72** | **14.11** |
| **Current ‘generalist’ migratory bird species** | **9.75** | **12.65** |
| **Plus 5 ‘generalist’ migratory bird species** | **9.26** | **11.92** |
| **Reduced congestion**                      |         |
| **Minus 10 ‘generalist’ migratory bird species** | **8.42** | **10.66** |
| **Current ‘generalist’ migratory bird species** | **7.44** | **9.19** |
| **Plus 5 ‘generalist’ migratory bird species** | **6.96** | **8.46** |

Variations in the number of ‘specialist’ and ‘generalist’ migratory species are considered with respect to current levels.

Results of this sensitivity analysis show that, regardless of the scenario, visitors valued more than double an increase in ‘specialist’ species from minus 10 to current than from current to plus 5, due to the concavity of the utility function with respect to this variable. According to the previously mentioned idea of substitutability between ‘specialist’ and ‘generalist’ migratory species, WTP for an increment in ‘specialist’ species was found to significantly decrease with increasing ‘generalist’ migratory bird species. For each extra ‘generalist’ migratory species, WTP for one additional ‘specialist’ species was 0.01 euros lower. Furthermore, results indicate that the value of a change in ‘specialist’ bird species was significantly higher under current congestion with respect to a reduced congestion scenario. WTP for one additional ‘specialist’ species was 0.23 euros higher under current congestion, supporting the idea that visitors appreciated more ‘specialist’ species under high congestion.

To inform policy-makers about the optimal degree of conservation efforts, the number of ‘specialist’ species maximizing the part-worth utility under different scenarios was identified (table 5). Overall, maximums indicated that an increase in ‘specialist’ species with respect to the current level would be required to maximize visitors’ welfare under CC, such that an adaptation policy oriented just to maintain the present number of this avian group would be sub-optimal. The required increment in the number of ‘specialist’ species varied according to the scenario considered: visitors demanded a lower increase in the number of ‘specialist’ species (1 less) in a scenario of higher availability of ‘generalist’ migratory species (5 more). Similarly, visitors would require a lower increase in ‘specialist’ species (5 less) under a reduced congestion scenario.

Table 5. Partworth utility maximizing values of ‘specialist’ species under different scenarios

<table>
<thead>
<tr>
<th>SCENARIO</th>
<th>Current congestion</th>
<th>Reduced congestion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minus 10 ‘generalist’ migratory bird species</strong></td>
<td>+ 16</td>
<td>+ 11</td>
</tr>
<tr>
<td><strong>Current ‘generalist’ migratory bird species</strong></td>
<td>+ 14</td>
<td>+ 9</td>
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<tr>
<td><strong>Plus 5 ‘generalist’ migratory bird species</strong></td>
<td>+ 13</td>
<td>+ 8</td>
</tr>
</tbody>
</table>

Maximum values are calculated with respect to the current level of ‘specialist’ bird species.

Variations in the number of ‘generalist’ migratory species are considered with respect to current levels.
6. Conclusions

By using a sample of recreationists to S’Albufera Natural Park (Mallorca), this paper measures the economic value that visitors assign to a set of wetlands’ attributes. This welfare-based analysis provides information on the weight of each attribute in visitors' utility, thus allowing policy makers to prioritize actions to efficiently adapt to CC. Our findings demonstrate that managers should be encouraged to implement policies to maintain, and if it is feasible, to increment the number of ‘specialist’ bird species that find in S’Albufera their ideal habitat, including both sedentary birds and migratory species that regularly move to this site for breeding during spring or stopping over during winter.

These results arise in a process of wetlands’ homogenization, especially experienced in the Mediterranean region, through which many ‘specialist’ species are substituted by few ‘generalist’ ones, more adaptable to human-induced pressures on humid lands. Experts consider that this substitution pattern will be mostly exacerbated under CC (Erwin 2009) and will not only quantitatively but also, and even more importantly, qualitatively affect wetland-dependent species, thus leading to a reduction in abundance and diversity.

The decline in biological abundance represents the main focus of the analysis within the literature dealing with CC adaptation in humid lands, while in general the loss of species’ diversity has been neglected. In this framework, our study is consistent with the mainstream approach showing positive preferences of visitors for an increase in species’ abundance, regardless of the species' type (‘specialist’ or ‘generalist’ migratory). However, our results add an interesting point: visitors' preferences are greater for diversity than abundance, as demonstrated by the fact that they assign a higher WTP for an increase in 'specialist' (10.72 euros) rather than 'generalist' migratory species (7.73 euros).

This finding can be interpreted through the analysis of visitors’ profile. Indeed, the particular appreciation of the ‘specialist’ species is likely motivated by the strong attachment displayed to Mallorca’s environment and, in specific, to S’Albufera wetland. Among international visitors, representing 86.91% of all users, 45.17% reported ‘nature enjoyment’ as their main purpose of travel to Mallorca. Also the fact that they are mostly repeat visitors to S’Albufera (55.91%) suggests that these nature-based recreationists are specifically interested in the environmental quality of this wetland and in its unique wildlife.

Visitors were found to maximize their utility under CC when the number of ‘specialist’ species is incremented with respect to the current level, whatever the scenario. However, it’s important not to forget that the achievement of this target would be progressively harder given the growing homogenization process, reason for which, just the maintenance of current level would represent a challenge. In this context, managers could also consider to combine policies to protect ‘specialist’ species –which should anyway be prioritized– with policies to increase ‘generalist’ migratory species or reduce the congestion level.

These results have important implications for tourism planning in the area. Given most of S’Albufera visitors are non-residents, the enforcement of environmental policies becomes a key strategic factor for increasing the competitiveness not only of the surrounding tourist area but also of Mallorca. Indeed, as a mature mass tourism destination highly dependent on Northern-European tour operators, Mallorca has a tourism demand which is not only increasingly sensitive to price variations but also presents marked seasonal patterns. Thus, investing in environmental quality represents the only strategy to improve tourist services and experiences and hence to re-launch the competitive position of the island. In this context, it seems necessary to advocate for high value-added products based on local environmental values: quality and environmental diversity are in fact more and more important pull
factors for new tourists’ segments which show a more balanced time distribution of their holidays.

The results of this analysis then make a contribution not only to wetland adaptation policy to CC but also to tourism-planning. Despite this, some limitations and recommendations for future research need to be outlined. On the one hand, practitioners should further investigate preferences for qualitative adaptation policies under CC to check whether our conclusions can be generalized. On the other one, this paper consisted in the study of preferences for CC adaptation policies under environmental certainty. However, important sources of uncertainty are associated with global warming impacts. In this context, given that risk has been proved to have social welfare implications, it would be also advisable to extend the analysis to a context of environmental uncertainty.

Acknowledgements

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REFERENCES


Web references

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Data provided by the Agència del Turisme de les Illes Balears for the II trimester of 2013
## APPENDIX

<table>
<thead>
<tr>
<th>ATTRIBUTES</th>
<th>POLICY A</th>
<th>POLICY B</th>
<th>NO POLICY INTERVENTION (C)</th>
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<td><strong>‘SPECIALIST’ BIRD SPECIES</strong></td>
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<td>=</td>
<td>-10</td>
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<td>≈15’</td>
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<td>Wait about 7 minutes for a seat in observation cabins</td>
<td>Wait about 15 minutes for a seat in observation cabins</td>
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<td>8€</td>
<td>0€</td>
</tr>
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