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Social preferences regarding the delivery of ecosystem services in a semiarid Mediterranean region

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ABSTRACT

The valuation of ecosystem services has primarily been conducted within the context of the economic value of these services to society. Ecosystem services research has since advanced to identify conflicts of interest between different sectors of society while prioritizing conservation actions. This approach can be important in semiarid ecosystems, where biodiversity conservation can be hindered by a lack of community awareness. In the south-eastern Iberian Peninsula, conservation is perceived by society as a barrier to the economic development provided by agricultural or tourism activities. We use the contingent valuation method to identify community perception and economic values of different ecosystem services provided by semiarid ecosystems in the south-eastern Iberian Peninsula. This method identifies the perceptions of individuals benefiting from ecosystem services and examines their willingness to pay for the maintaining of these ecosystem services. Results showed that most respondents recognized the importance of services to human well-being and were willing to conserve these services. Preferences for maintaining water and air quality showed that respondents understood the relationship between the conservation of ecosystem services and local well-being. However, responses varied greatly across categories of beneficiaries; this finding highlights a potential conflict of interest that should be considered in any decision-making processes.

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1. Introduction

Ecosystems provide a variety of benefits to society, commonly known as ecosystem services, which are essential for human well-being (MA, 2005). The concept of ecosystem services can be considered to be a new approach in decision-making processes regarding conservation actions (Harrison, 2010) because of its capacity to incorporate the value of nature into decision-making processes by translating ecosystem functions into human contributions. As a result, the scientific community has expressed a strong interest in finding ways to incorporate ecosystem services into decision-making processes. The Millennium Ecosystem Assessment (MA) initially classified ecosystem services into four categories: provisioning services (e.g., food, water); regulating services (e.g., water regulation, erosion control); cultural services (e.g., tourism, environmental education); and supporting services needed for the provision of all other services (e.g., nutrient cycling, primary production; MA, 2003). However, Hein et al. (2006) proposed that supporting services should not be taken into account in the economic valuation exercises of ecosystem services because their inclusion could lead to double counting. The economic valuation of ecosystem services is often used as an argument to promote conservation issues and to solve problems of environmental degradation. After Costanza et al. (1997) highlighted the economic importance of ecosystem services throughout the world, the economic valuation of services became the most frequent target of ecosystem services research (Egoh et al., 2007). In fact, this research presents an interesting approach for identifying conflicts of interest between different sectors of the society while prioritizing management actions (Vermeulen and Koziell, 2002; Hein et al., 2006; Menzel and Teng, 2010).

One of the main problems in landscape planning is addressing conflicts between the interests of different stakeholders groups (Vermeulen and Koziell, 2002). As several authors have recently highlighted, landscape management that attempts to maximize the production of one ecosystem service often results in substantial

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declines in the provision of other services, thus creating conflicts between different social groups that are influenced by these services (Gordon et al., 2010). This is especially important in the semiarid ecosystems of Mediterranean regions, where biodiversity appears to be undervalued by the general public. This attitude toward biodiversity in turn affects landscape management and, therefore, the delivery of ecosystem services (McNeely, 2000). Semiarid ecosystems in the south-eastern Iberian Peninsula are particularly susceptible to overexploitation because of the recent increase in intensive agriculture and tourism activities (García-Latorre and Sánchez-Picón, 2001; Downward and Taylor, 2007; Sanchez-Picón et al., 2011), which has led society to perceive nature conservation as a threat to human development (Tschakert, 2007).

In particular, the marked land use changes in recent decades in the Mediterranean Basin (Underwood et al., 2008) have led to conflicts of interest between social groups with different preferences for landscape management (e.g., the increase in horticulture greenhouse surfaces located in El Ejido, the increase in beach tourism activities associated with the Almeria coast, or the promotion of protected areas by governments, see Fig. 1). However, many of the economic activities promoted by global markets (e.g., greenhouse horticulture) increase the loss of other ecosystem services, such as erosion control, local identity, or aesthetic values (Sayadi et al., 2009).

To help the general public to understand appropriate landscape management, we need to explore societýs preferences so as to design a new conservation paradigm for human well-being (MA, 2003). In this sense, ecosystem services can be assessed through different disciplines and can take into account diverse types of value (De Groot, 2006). Ecosystem services can be assessed from an ecological viewpoint in which services are quantified in biophysical units (e.g., Balvanera et al., 2005), from a cultural or social perspective in which the opinions of stakeholders are explored as potential services beneficiaries (e.g., Agbenyega et al., 2009; Sodhi et al., 2009), and from an economic view when the market and non-market value of a service is estimated (e.g., Spash, 2000). Methods based on preferences of socio-economic information have been proposed as a useful tool to support environmental policy decisions (Martín-López et al., 2007b, 2009; Shafer et al., 2000). In particular, the contingent valuation method (CVM) has been used widely to capture socio-economic information that is relevant to ecosystem services by establishing how much people are willing to accept as compensation for the loss of services, or their willingness to pay (WTP) for maintaining services (Venkatachalam, 2004).

The standard neo-classical model of preferences assumes the following: (i) individuals have underlying preferences, which are clear, comprehensive, well-behaved, and reasonably stable; and (ii) the expressed choices of the individuals reflect those underlying preferences. However, there is a continuing debate regarding the suitability of CVM for environmental decision making (Carson et al., 2001). In this study, we considered the limitations and uncertainties of CVM, such as strategic responses (the expressed answers to a WTP question could be biased as respondents might actually be expressing their feelings about the valuation exercise itself), willingness to accept-WTP disparity, negative respondents and unfamiliarity or sequencing effects (Carson et al., 2001; Schläpfer, 2008). However, CVM research has matured due to the recent focus on this subject. A great deal of research is currently being conducted to improve the methodologies, to make the results more valid and reliable as well as to better understand the strengths and limitations of this type of research. Carson et al. (2001) emphasized that many of the alleged problems with CVM can be resolved by careful study design and implementation. In fact, Kahneman et al. (1999) argued that statements of WTP are better viewed as attitudes or social preferences rather than as indicators of economic preferences.

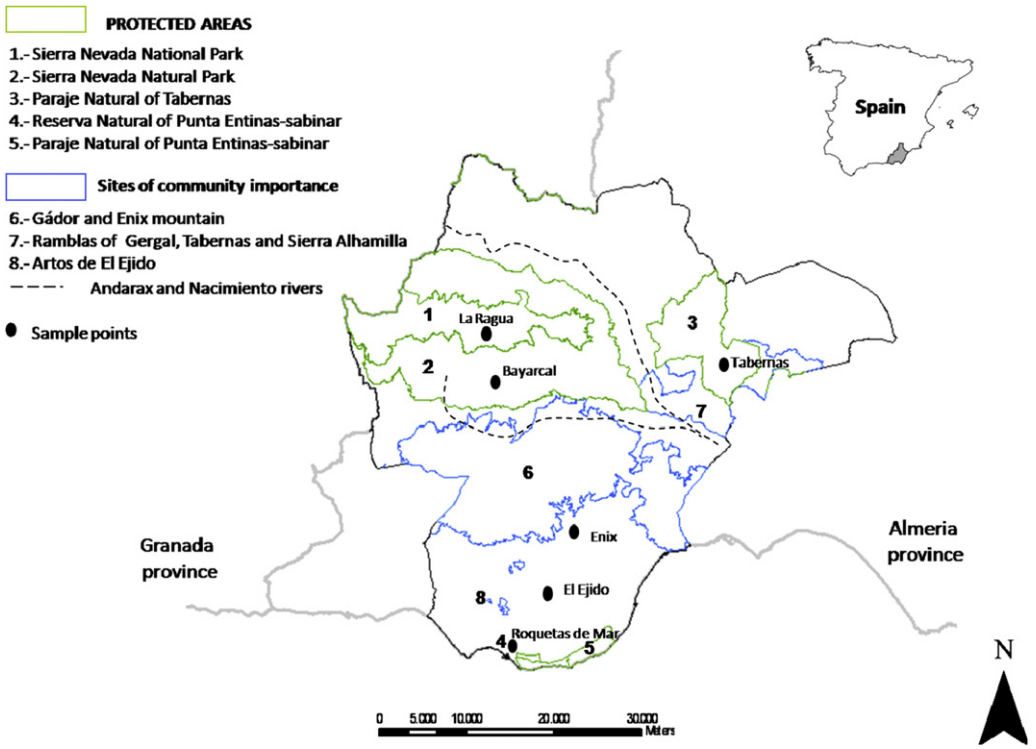

Fig. 1. Location of study area, natural protected areas, and sample points.

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In response to these suggestions, our study assesses the social perception and the WTP of different categories of ecosystem services beneficiaries (ESBs) with the goal of maintaining ecosystem services provided in Mediterranean ecosystems in the southeastern Iberian Peninsula. To achieve this goal, we (1) identified and characterized the ESBs types according to how they use, enjoy and value ecosystem services; (2) analyzed the factors underlying economic support for maintaining services; and (3) assessed the WTP estimation results, taking into account the influence of the type of ESB. This research is focused on the differences in social preferences regarding ecosystem services by a representative sample of stakeholders, which constitutes a key step in advancing the identification of potential conflicts of interest in landscape planning within semiarid ecosystems of the Mediterranean region.

2. Materials and methods

2.1. Study area

The study area, covering 200,000 ha of Almeria province, is located in Andalusia on the south-eastern coast of Spain (Fig. 1). Almeria province is one of the driest regions in Spain. Thirty-two percent of the province area is protected, which includes Mediterranean mountains, arid and semiarid lands, coastal regions and agricultural lands. This region is influenced by the Atlantic rain shadow of the Sierra Nevada National Park, with an average of 250 mm of rainfall per year and an annual average temperature of 17 °C (Lázaro et al., 2001). Average winter temperatures vary between 12 and 15 °C, and average summer temperatures are as high as 40 °C. The climate is subdesertic over a large portion of the territory, with an annual average rainfall of 300 mm, although rainfall is occasionally less than 200 mm per year.

2.2. Sampling strategy and questionnaire design in the WTP analysis

We conducted social sampling based on individual face-to-face surveys. To sample as many potential ESBs as possible, 340 questionnaires were completed. Sampling was conducted at six locations including visitor centers, urban zones, beaches, recreation zones, and intensive agriculture areas (Fig. 1). The population sample included local residents and tourists (on both extended holidays and day trips). The sample population was randomly chosen during February and March 2008, representing the late winter outdoor tourist season. The questionnaires included 27 questions, divided into five sections: (1) type of visit; (2) preferences for ecosystem services; (3) economic valuation questions; (4) environmental attitudes and environmental knowledge; and (5) socioeconomic data. Finally, the survey included various case-based follow-up questions.

In the third question, the economic question was formulated as follows to understand the individual's WTP to maintaining ecosystem services delivery in the region:

> *If you think that the Almería ecosystems provide some ecosystem services to society, would you be willing to pay so that these ecosystems can continue to fulfill their services? Your financial contribution would be in the form of an annual donation to a trust fund that would be managed by the environmental organization to maintain these ecosystem services.*

If the response was affirmative, that is, if the respondent indicated a maximum WTP for ecosystem services, we then ascertained the level of financial support that the respondents would be willing to provide (Spash, 2000). If the response was negative, we asked why the respondents would not want to provide financial support to distinguish the protest responses from the real zero values. Individuals who are not willing to pay anything for the service under analysis are frequently encountered in CVM studies with open-ended question formats (Boyle and Bergstrom, 1999) and are encountered even more frequently in the case of natural resources management (Mitchell and Carson, 1989). The monetary contribution was in the form of an economic donation to a trust fund, which has been found to be the most popular means of payment in this region (Garcia-Llorente et al., 2011). Finally, respondents were asked to evaluate 10 services by proportionally distributing the total amount of money they were WTP for services they considered to be important.

2.3. Identification and characterization of ESBs

To classify ESBs groups, we analyzed the data with a two-step clustering technique, which is appropriate for data sets with mixed variables (in this case continuous and ordinal variables; Norusis, 2003; see Appendix 1 in Supplementary Data). Using this method, continuous and categorical attributes can be derived from a probabilistic model where the distance between two clusters is equivalent to the decrease in the log-likelihood function as a result of merging. The Schwarz Bayesian Criterion (BIC) for each cluster within a specified range was initially used to estimate the number of clusters. This estimate was then refined by finding the largest increase in distance between the two closest clusters at each hierarchical clustering stage. Both background noise and outliers were identified and screened out using this methodology.

2.4. Ranking ecosystem services preferences

Social preferences toward services delivery can be explored by ranking (Bateman and Turner, 1993), which is a useful tool for understanding which services are considered to be more important by stakeholders (Agbenyega et al., 2009). The study included ten types of ecosystem services, classified as provisioning (agriculture and forest production), regulating (air quality, water quality, soil formation, and biodiversity conservation), and cultural services (environmental education, aesthetic value, cultural identity, and recreation or tourism). The respondents were asked to indicate the relative importance of each type of service (provisioning, regulating, and cultural services) to their lifestyle. From this information, we created an ordinal numerical measure of the importance indicated by the individuals for each service (Winkler, 2006). We determined the percentage of respondents who agreed that the study area provides services that were essential for human well-being, and then we analyzed the differences in these perceptions across categories of ecosystem services using a nonparametric Kruskal–Wallis test.

2.5. Data analysis: economic evaluation method

A common problem in the analysis of open-ended questions (Mitchell and Carson, 1989) is the large number of responses with zero WTP. To address this problem, a Heckit model (Heckit) may be applied, in which 'pay or not' is determined in the first stage and the positive WTP is estimated in the second stage. Following Sigelman and Zeng (1999), the Heckit model was designed in response to sample selection bias, which arises when data are available only for cases in which a variable reflecting 'pay', z^*, exceeds zero.

$$Z_i^* = W_i\gamma + \mu_i \quad (1)$$

$$Y_i^* = X_i\beta + \mu_i \text{ observed only if } Z_i^* > 0 \quad (2)$$

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where for the ith individual, X_i is a vector of explanatory variables, β is a parameter vector common to all individuals and μ_i is a random disturbance term. The error terms are assumed to follow a bivariate normal distribution with a mean of 0, variances $\sigma\mu = 1$ and σ_ϵ and correlation coefficient ρ. The observed variables are $z = 0$ if $Z^* \leq 0$ and $z = 1$ if $Z^* > 0$; $y = 0$ if $Z^* \leq 0$ and $y = y^*$ if $Z^* > 0$. The expected Y is:

$$E(Y|Z^* > 0) = X\beta + \rho\sigma_\varepsilon\lambda(-WY) \quad (3)$$

where $\lambda(-WY) = \varphi(-WY)/1 - \varphi(-\mathrm{WY})$, which is the inverse of the Mill's ratio, φ is the standard normal density function, and the standard normal function. Eq. (3) implies that the conditional expectation of Y is $X\beta$ only when the errors of Eqs. (1) and (2) are uncorrelated. In the first stage, we obtained γ from a PROBIT estimation of Eq. (1), where $z = 1$ if $Z^* > 0$ and $z = 0$ if $Z^* = 0$. A pseudo coefficient of determination (R^2) was calculated according to the method proposed by Veall and Zimmermann (1992). In the second stage, we estimated Eq. (3) using ordinary least squares (OLS) regression. A summary of the variables used in the analysis is shown in Appendix 2 in supplementary data.

3. Results

3.1. Identification and characterization of ESBs

Cluster analysis indicated that a five-cluster solution was the best model because it minimized the BIC value, as well as the change in this value between adjacent numbers of the cluster (see Appendix 3 in Supplementary data). The resulting cluster included the following five classes of ESBs: (1) active tourists, environmentally aware visitors to the region who actively engaged in recreational activities (e.g., bushwalking, swimming; 10.3%); (2) passive tourists, visitors to the region who preferred to relax in the natural protected areas (16.5%); (3) local residents who had some level of environmental awareness and maintained a positive attitude toward nature conservation (18.8%); (4) local residents who were not environmentally aware (32.1%); and (5) workers, interviewed during normal daytime business hours, whose work depended directly on ecosystem services generated by the study area (e.g., shop owners, farmers, hoteliers; 22.4%). Table 1 summarizes the main characteristics of these groups of beneficiaries.

We found that 78% of all respondents thought that the ecosystems in the study area provide ecosystem services to society (Table 2). Active tourists and environmentally aware local residents reflected this opinion most strongly and also had a higher level of knowledge about ecosystem services (Table 2). An analysis of the different perceptions showed that regulating services were the most likely to be perceived as providing a service by stakeholders, followed by cultural and provisioning services. In addition, we observed significant differences among stakeholders' views about provisioning, regulating and cultural services (Kruskal–Wallis test, $\chi^2 = 18.5$, d.f. $= 2$, $p < 0.0001$). The groups composed of active tourists and workers showed more differences in the perception of whether the area provides services. The importance attached to cultural services was more consistent than the regulating and provisioning types, which showed more different opinions among ESBs groups. The importance placed on provisioning services was higher in local respondents than in tourists, while active tourists and workers valued the cultural and regulating services the most and least, respectively. Water quality was judged to be the most important by all ESBs (more than 50% of the respondents considered water quality to be the most important service), followed by air quality and recreation (Fig. 2). In contrast, forest production and environmental education were the services that were perceived to be the least important by beneficiaries.

3.2. Willingness to pay for maintaining ecosystem services

Using probit regression, we found six significant variables that explained the probability of participation in the hypothetical market (Stage 1 of the Heckit model; Table 3). The variables reflecting the respondents' *understanding* (if they understood the purpose of the survey) and *NPA* (if they visited protected areas

Table 1
Description of socio-cultural characteristics of Ecosystem Services Beneficiaries identified in the study area by the two-step cluster statistical analysis.

Characteristics	Ecosystem service beneficiaries (% of total sampling)					
		Active tourist	Passive tourist	Local people with environmental attitude	Local people without environmental attitude	Workers
Type of visit	Aim of visit	Nature	Culture	Living in area	Living in area	Occupation
	Frequency of visit (times/year)	47	11	248	264	177
	First visit	60%	23%	0.5%	2.5%	10%
Environmental attitude	Flow of information	Leading Internet	Personal decision	–	–	Other people
	Transport used to visit	Walking Bicycle	Car	–	–	Walking
	Material used	Guiding Binoculars Mountain shoes	Sport shoes			Sport shoes
	Number of PAs previously visited	67%	64%			64%
	Membership of NGO	18.6%	1.8%	8.3%	1.7%	3.9%
Socio-economic variables	Studies	Secondary University	Secondary	Primary Secondary	Primary Secondary	Secondary
	Monthly income (€)	1474	1500	1045	1062	1323

PAs, protected areas; NGO, nongovernmental organization. The objective of the visit was classified as follows: nature (when visitors demanded activities associated with biodiversity or ecosystems), cultural (when visitors were interested in aspects such as local traditional practices, folklore or gastronomy) or those associated with living or working in the area (when the subjects were working at the time that the survey was conducted).

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Table 2
The perception of ecosystem services by different stakeholders expressed as the % within each ecosystem services beneficiary (ESBs) group.

ESBs	*N*	Ecosystem services perception (% within each group of stakeholders)				
		% of total sampling	% of ESBs perceived study area provides services	Provisioning	Regulating	Cultural
Active tourist	35	10.3%	97.1	17.1	94.2	91.4
Passive tourist	56	16.5%	76.8	25.0	71.4	64.3
Local people with environmental attitude	64	18.8%	85.9	34.4	73.4	62.5
Local people without environmental attitude	109	32.1%	65.2	29.4	67.2	52.3
Workers	76	22.4%	67.1	19.7	59.2	52.6
% of Total sampling	340	100%	77.9	26.2	70.3	60.3

N, number of people interviewed in each ESBs group.

during 2007–2008) were positively related to the probability of participating in the economic valuation exercise. However, the *number of places visited* (the number of places visited by the person surveyed in the area), the *first visit* (if they were visiting the area for the first time) and *age* were negatively related. These results indicated that if the respondent visited NPA and showed a positive understanding of the purpose of our survey, the probability of their participation in the hypothetical market was higher. The negative relationship with *age* showed that older people were less willing to participate in the hypothetical market than younger individuals. Variables associated with the type of visit (*number of places visited* and *first visit*) showed that respondents were less willing to participate in the economic exercise if they were visiting the area for the first time but who also often visited other places. Moreover, active tourists and environmentally aware local residents had a higher probability of participation, while passive tourists had a lower probability of participation (Table 3).

In the second stage of the Heckit model (Table 3), we identified four statistically significant positive variables: *income* (monthly family income), *education level* (level of studies of each respondent), *NPA* and *service* (whether the respondents thought that the area provides any service); and one significantly negative variable, *first visit*. Respondents with a higher level of education were more likely to donate more money for maintaining services. Not unexpectedly, higher *income* and *service* values were associated with individuals who had a higher income and/or who recognized the importance of ecosystem services. These individuals were more amenable to providing financial support to conserve these services. In addition, people who travelled further to visit NPA were more likely to favor a higher level of financial support for ecosystem services. Conversely, people visiting the area for the first time were less willing to contribute to the maintenance of ecosystem services.

The attitudes surrounding WTP for sustainable ecosystem services showed that ESBs were more willing to pay for regulating services (e.g., maintenance of water and air quality) than provisioning services (e.g., forest production and agriculture; Table 4). We found differences of WTP for ecosystem services among ESBs, especially for regulating services, such as water quality, soil formation, and biodiversity conservation. In addition, we observed significant differences among ESBs WTP for the following cultural services: environmental education, aesthetic values, cultural identity, and recreation. Again, both active tourists and environmentally aware local residents were willing to pay higher amounts to sustain ecosystem services.

4. Discussion

The social and economic assessment of ecosystem services is an essential tool that can be used to incorporate new criteria into current conservation goals for the management and planning of social–ecological systems. Ecosystem services have been examined in studies with widely different objectives. These include: studies of

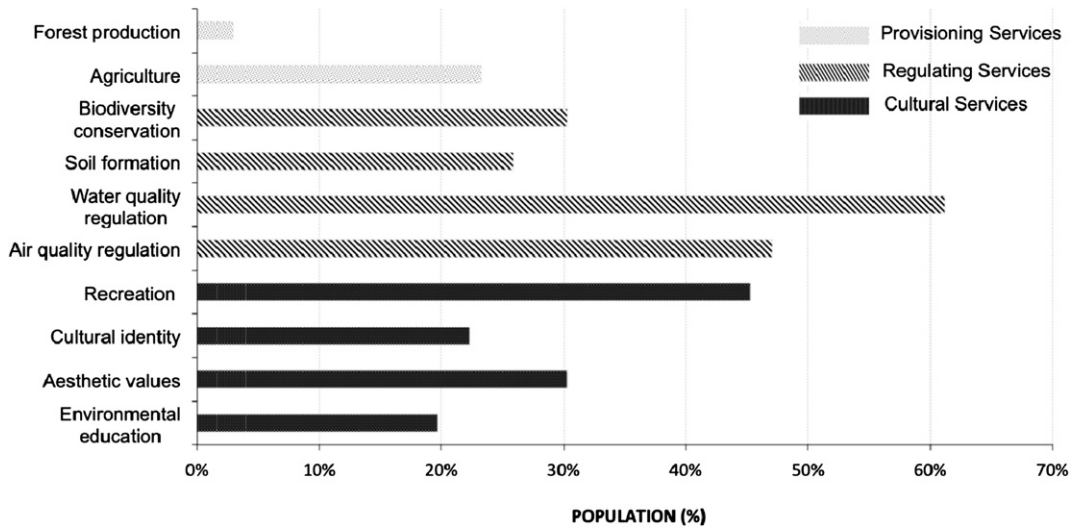

Fig. 2. Social perception of ecosystem services by the surveyed population expressed as the % of the total population interviewed.

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Table 3
Heckman model results showing the determinant factors influencing whether respondents were WTP for ecosystem services. Probit regression results are presented for the first stage of the Heckman model regarding willingness to pay (WTP) or not to pay for maintaining ecosystem services, and along with the MCOS regression to estimate WTP for maintaining ecosystem services for the second stage of the Heckman model (standard errors are shown in brackets).

Variables	Probit	MCOs
	Coefficient	Coefficient
Active tourist	2.474** (2.062)	0.957** (1.463)
Passive tourist	−0.351** (−0.341)	−0.077 (−0.103)
Local people who are environmentally aware	2.150* (1.867)	0.554* (0.716)
Local people who are not environmentally aware	1.650 (1.437)	0.077 (0.106)
Workers	−0.234 (−0.232)	0.159 (0.304)
Satisfaction		0.148 (0.591)
Frequency	−0.001* (−1.609)	
Number of places visited	−0. 038* (−1.688)	−0.072 (−1.482)
First visit	−0.666*** (−3.029)	−0.730* (−1.601)
Service		2.218*** (5.638)
NGO	0.452 (1.143)	0.431 (0.565)
NPA	0.158** (1.991)	0.195* (1.115)
Age	−0.505*** (−2.612)	−0.479 (−1.223)
Income	0.012 (0.082)	0.261** (0.820)
Understanding	0.242** (2.225)	0.314 (1.335)
Inverse of Mill's ratio		−5.050 (0.001)
Log likelihood	−200.90	−409.09
Log likelihood restricted	−226.62	−433.59
R^2		0.50
R^2 adjusted		0.48
Chi- square	51.43	
% correct predictions	77.78	
Pseudo R^2	0.43	

Dependent variable in PROBIT regression, 0 when WTP = 0 and 1 when WTP > 0. Dependent variable in MCOs, Ln (WTP). $n = 335$. Statistical significance at the ***, 0.01; **, 0.05 and the *, 0.1 levels.

the use and non-use value of biodiversity (e.g., Nunes and van den Bergh, 2001), studies examining which ecological processes (e.g., pollination, nutrient cycling or primary productivity) support the persistence of biodiversity (e.g., Díaz et al., 2005), or others mapping ecosystem services to identify the ecosystem service providers (populations, species, habitat types or functional units) responsible for providing services (e.g., Balvanera et al., 2005). The importance of biophysical assessments of ecosystem services has recently been highlighted (Balvanera et al., 2005). However, the analysis of community perceptions and preferences about services continues to be a key step in identifying potential stakeholder conflicts of interest and in providing solutions to these conflicts in landscape planning (Anton et al., 2010).

As many authors have demonstrated, landscape management requires the participation of social groups to incorporate the views of these groups into decision-making processes (e.g., Agbenyega et al., 2009; Sodhi et al., 2009). In this sense, we collected a representative sample of different ESBs, each of whom offered different perceptions regarding the importance of services provided by semiarid Mediterranean ecosystems. The information obtained in the questionnaires would have been more homogeneous if we had conducted our sampling at different times of the year to ensure a more representative sample of users. However, respondents that were classified as local were not affected by the periodicity of sampling. Similarly, given that the majority of tourism activities in the study area are associated with rural tourism and outdoor sports, we considered that this effect was not relevant to our results.

Overall, 78% of all ESBs were aware that the semiarid ecosystems of the study area provide services to society. However, we found differences in the perceptions of ecosystem services among stakeholder groups. In this sense, active tourists and environmentally aware local residents had a higher level of understanding regarding the delivery of ecosystem services than locals. In contrast, local workers, who were the least environmentally aware group examined, perceived mostly cultural services and those provisioning services related to modified ecosystems (e.g., agriculture and forest products). These results show that the identification of ESBs with different preferences toward ecosystem services is a useful tool for identifying potential trade-offs. The largest discrepancies observed occurred between local residents and visiting people. As observed by Schmitz et al. (2003), the promotion of cultural and nature tourism is of interest in rural areas, and is closely associated with the maintenance of subsistence agriculture practices but not with intensive agriculture. Considering the importance of cultural and nature tourism in maintaining local economic markets and rural activities, we highlight the necessity of a detailed investigation of the potential social conflicts between local and visiting populations and the land uses that foster the coexistence of both type of ESBs.

Regarding the importance of services, Sayadi et al. (2009) found that traditional agriculture is an important activity in the region, not only as a provisioning service, but also because of its influence on aesthetic values and local identity. In our study, we found that

Table 4
Mean scores for willingness to pay (WTP) for ecosystem services (in €) by ecosystem services beneficiariesgroups (ESBs), shown with standard deviations, and *F*-values (ANOVA).

Ecosystem services	Active tourist		Passive tourist		Local with environmental awareness		Local without environmental awareness		Workers		F value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Provisioning											
Agriculture	0.58	1.12	0.00	0.00	7.02	11.78	3.26	5.75	1.18	2.27	3.95
Forest production	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.20	0.00	0.00	
Regulating											
Air quality maintenance	4.09	5.19	3.46	4.00	4.02	5.29	3.43	4.42	2.86	4.07	0.27
Water quality maintenance	8.10	7.35	6.52	7.85	9.00	9.41	4.06	4.67	5.21	5.92	2.86**
Soil formation	4.09	4.77	1.01	1.56	3.65	5.06	1.25	1.87	1.30	2.01	6.21***
Biodiversity conservation	5.31	6.09	2.05	3.24	2.43	1.61	3.91	2.52	1.94	2.90	2.91**
Cultural											
Environmental education	4.08	5.46	0.96	1.62	2.27	3.56	1.22	1.92	0.79	1.37	3.93*
Aesthetic values	0.65	1.12	1.41	2.27	1.51	2.45	0.53	0.94	0.41	0.75	2.08*
Cultural identity	1.36	2.10	0.40	0.70	3.52	5.46	0.65	1.11	0.54	0.94	4.42*
Recreation	2.08	2.86	0.86	1.38	3.57	5.64	0.77	1.33	1.37	2.26	3.11**
WTP total	39.0	9.92	19.9	10.4	39.14	14.74	18.13	9.97	18.13	9.24	

Significance: ***, 0.01; **, 0.05; *, 0.10.

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respondents mostly valued air and water quality services. Greater WTP for maintaining water and air quality could be associated with the social perception regarding the driving forces behind industries that sustain the local economy. In fact, horticultural production has been the driving force behind Almeria's economy, making it one of Spain's most prosperous provinces in the 21st Century (Downward and Taylor, 2007; Sanchez-Picón et al., 2011). The preference for water quality services shows that ESBs understood the importance of water conservation for sustainable horticultural practices, and hence the role of this service in maintaining human well-being (Guo et al., 2000). This result supports the findings of Ward et al. (2000) that respondents who were involved in intensive agriculture in water-limited areas had a better understanding of water conservation issues. The social preference for maintaining soil formation could be related to the stakeholders' understanding of the effect of agricultural abandonment in mountain areas (McDonald et al., 2000), which promotes soil erosion through terrace abandonment processes (Douglas et al., 1994).

Moreover, we found that the preferences of local respondents were differentiated by their level of environmental awareness, with those with a more extensive knowledge of environmental issues showing a preference for the maintenance of regulating services. As observed in previous studies conducted in Andalusia (e.g., Martín-López et al., 2007a; Garcia-Llorente et al., 2011), we found that environmental attitudes determine the WTP for the maintenance of ecosystem services. We also found that understanding the concept of ecosystem services and its relationship to the maintenance of human well-being was positively related to higher WTP. This finding emphasizes the potential impacts of environmental education programs on conservation policies (Lindemann-Matthies, 2005; Martín-López et al., 2007b; Garcia-Llorente et al., 2008). In this sense, income level was a significant variable in our study, showing a strong link between nature conservation and the economic status of the ESBs.

Finally, an important aspect to consider in the assessment of ecosystem services from a social and economic approach is the risk that people do not perceive the ecosystem functions underlying the benefits to society (Peterson et al., 2009). Therefore, we believe that valuations of social and economic ecosystem services must be combined with other valuation approaches that incorporate all of the dimensions responsible for maintaining the integrity of social–ecological systems. We think that socioeconomic assessments of ecosystem services is a useful tool for exploring social preferences in the identification of potential conflicts of interest between stakeholder groups during decision-making processes associated with new land management policies.

5. Conclusions

Some authors have emphasized the importance of using local knowledge and the opinion of tourists to better understand the perceived value of semiarid environments (Bernhardt et al., 2006). This information is helpful for incorporating the ecosystem services approach into the landscape management of Mediterranean semiarid regions. Within these regions, biodiversity appears to be undervalued by the general public, which in turn affects landscape management and therefore the delivery of ecosystem services. In this sense, determining which aspects of the ecosystem services in a region link human well-being with conservation is an important task in conservation planning. This paper supports the widely accepted view that the knowledge of locals and tourists must be considered for the successful management of ecosystem services. Information provided by the CVM is useful in exploring the depth of ecosystem knowledge of locals and tourists, as well as the social perceptions related to conservation practices, and in incorporating the social dimension in decision-making processes. Although CVM limitations have been widely described in literature, the results presented here can be viewed as attitudes or social preferences between local and tourist populations rather than as indicators of their economic preferences. Our study found that different ESBs have remarkably different perceptions about which ecosystem services are the most important in the study area, and they also have different levels of WTP for conservation. When the importance of services, such as the conservation of water and air quality maintenance, is considered, those opinions and views must be considered by managers and included in decision-making processes. At the same time, identifying aspects of these services that are perceived as the least important or those that people are not willing to pay for is useful in detecting potential conflicts associated with new management and planning practices. This research deserves special attention and could help to create a decision-making process based on the interests of the public, of scientists and of managers.

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Appendix. Supplementary data

Supplementary data associated with this article can be found in the online version, at doi:10.1016/j.jaridenv.2011.05.013.

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