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ORIGINAL PAPER

Can conservation in protected areas and visitor preferences converge? An empirical study in Central Chile

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Abstract The assessment of visitors' willingness to pay (WTP) to achieve scenarios that guarantee good conservation status in protected areas and that positively contribute to visitor experience is crucial to revealing the potential to harmonize the development of nature-based tourism and the conservation of biodiversity. We estimated visitors' WTP for a variety of environmental attributes in a protected area in a biodiversity hotspot in central Chile. Using a choice experiment (CE), WTP was estimated for the protection of animals, plants, and soil; for guaranteeing the provision of ecosystem services related to water resources; and for increasing touristic infrastructure. Among animals and plants, the marginal mean WTP/visitor/visit for single levels of variation in the attribute ranged from ~ US $1.4 (for herbaceous species) to ~ US $7 (for birds). The WTP for soil protection in camping areas and walking trails reached a mean of ~ US $2.8. The mean WTP for guaranteeing the provision of water benefits ranged from US $− 1.98 (for activities such as hydroelectricity and mining) to ~ US $5.6 (for the conservation of biodiversity and ecological processes). Small increases in infrastructure for recreation are well accepted by visitors (a mean WTP of US $1.50) compared to medium or large increases, which generate a negative WTP. Our results indicate that the protected area conservation and visitor preferences can converge. Broader assessments that include multiple biological attributes have emerged as useful approaches in designing management strategies for protected areas that align with conservation goals and visitor preferences.

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Introduction

Visitor activities in protected areas are recognized as being an important source of ecological disturbance to these natural spaces (Rankin et al. 2015; Tolvanen and Kangas 2016). For example, nature-based activities of the visitors may negatively affect vegetation, soil and species facing conservation problems (Kelly et al. 2003; Newsome et al. 2013; Rankin et al. 2015; Ritchie 2013), thereby threatening the achievement of prioritized goals for biodiversity conservation. Further, the problem can worsen when visitors are not well informed about the potential impacts of their activities (Lindsey et al. 2005). Thus, one of the main challenges of protected areas is to integrate the socio-economic goals of nature-based tourism with the ecological goals of biodiversity conservation (Juutinen et al. 2011; Marques et al. 2017). Recreation and observing large charismatic mammal species have been recognized as the main motivations for people to visit protected areas (Leader-Williams and Dublin 2000; Veríssimo et al. 2009), and several studies have been conducted to assess visitor preferences (e.g., willingness to pay, WTP) towards these issues. However, to harmonize nature-based tourism with biodiversity conservation, the understanding of visitor WTP not only for recreation, tourism, and observing large charismatic mammals but also for a broader spectrum of biological attributes, vegetation, the protection of soil and inconspicuous unpopular species, is receiving increasing attention (Cerda et al. 2017; Hausmann et al. 2017; Juutinen et al. 2011).

The relevance of conserving vegetation has been globally recognized due to the key ecological roles that vegetation plays in sustaining life (Pereira and Cooper 2006; Zamin et al. 2010). The importance of assessing the social meaning of vegetation has also been emphasized (Joseph et al. 2009). Similarly, soils constitute another relevant attribute to consider due to the relevant social and ecological roles that they play (Wall 2012). Land degradation is a global problem, and protected wilderness areas are seen as the most effective places to preserve the ecological functions of soils (DeFries et al. 2007). Hence, this role must be revealed to the users of such areas. In addition, negative impacts on unpopular species such as insects and plants might represent a relatively greater ecological threat because these species may have greater biological significance to the ecosystem (Martin-López et al. 2007; Ressurreicão et al. 2011).

In many protected areas of the world, decision makers must focus on the protection of soil, vegetation and inconspicuous, unpopular species to achieve conservation goals (Cerda et al. 2017; Hausmann et al. 2017). Unfortunately, such attributes have traditionally received a low proportion of conservation funds (Cerda et al. 2017; Zamin et al. 2010) and are usually underrepresented in visitor WTP studies in terrestrial wilderness areas. This underrepresentation may obscure the potential of nature-based tourism to protect biological resources in protected areas. In this regard, a few studies have demonstrated that visitors to protected areas are not only interested in recreation or in observing large, charismatic species but are also interested in contributing to a favorable conservation status (Cerda et al. 2013a, b, 2017; Cerda and Losada 2013; Getzner et al. 2017; Hausmann et al. 2017), even if such a status requires spatial or temporary access bans (Getzner et al. 2017), low-impact recreational infrastructure (Cerda et al. 2014; Cerda and Losada 2013), or the

consideration of broader aspects of biodiversity (e.g., less charismatic species or species that are not under threat).

In this study, we explore the financial contributions that visitors are willing to make (a) to protect a broad spectrum of biological attributes, such as animal and plant species as well as soil quality; (b) to guarantee the provision of ecosystem services related to water resources; and c) to implement progressive changes to the touristic infrastructure in a protected area of Chile. With these objectives our study aims to contribute to the debate regarding the extent to which conservation and visitor preferences can converge by providing information on which features of protected areas are more effective in attracting funds. The analysis was completed using an attribute-based valuation approach, specifically, a choice experiment (CE) (Bateman et al. 2002; Carson and Louviere 2011; Hensher et al. 2005), to assess which of the above attributes are more important to protect and/or guarantee for visitors.

Several CE studies have been conducted to estimate the WTP of visitors for environmental facilities (Hearne and Salinas 2002) and recreation-related issues (Hein 2011; Lawson and Manning 2001; Othman et al. 2004). Our research differs from these studies by including both biological attributes and recreation in the CE. Other studies have only focused on big game species (Di Minin et al. 2013a) and on mammalian species (Maciejewski and Kerley 2014). Our study contributes to this literature by including less-popular species and other biological attributes such as soil, vegetation and hydrological ecosystem services. Other studies (e.g., Jacobsen et al. 2008) have also examined biological protection and recreational facilities as we do here. However, our study includes a more diverse spectrum of biological attributes and provides information on more concrete protected area management issues than have been explored in previous works. From this perspective, our work is close to that of Cerda et al. (2017) and Hausmann et al. (2017) regarding visitors' preferences for conservation management alternatives in protected areas that involve changes to multiple attributes of such areas but in a very different ecosystem.

We believe that our approach may be useful for the protected areas of the world that are underfunded, exhibit high conservation values, and lack big charismatic species as well as areas where nature-based tourism may be a tool to raise funds (Cerda et al. 2013b; Di Minin et al. 2013a).

Methods

Study area

We conducted the study in the Lircay National Reserve, which is located in the Mediterranean biodiversity hotspot of Chile. This biodiversity hotspot is globally recognized for its high floristic richness and numerous endemic species (Myers et al. 2000).

The area of the reserve is approximately 12.163 hectares. The vegetation formations of *Nothofagus* trees are important biological attributes that are protected in the area. In addition, important streams are used for irrigation for agricultural purposes and provide drinking water to some of the surrounding communities. In recent years, the rate of visitation to this area has increased considerably (Cerda and De la Maza 2015). The average visitation rate in the last five years reached 18,000 Chilean visitors and 1300 foreign visitors. The area is characterized by low-scale tourism infrastructure. In general, visitors are

environmentally aware (Cerda and De la Maza 2015). Camping, picnics and walks on the trails are typical nature-based activities performed by the visitors.

Choice experiment

A CE is a stated preference method for non-market environmental valuation. The CE is based on Lancaster's theory of attribute-based consumer demand (Lancaster 1966), which proposes that consumers do not have preferences for goods per se, but they do have preferences for the attributes or characteristics of given goods that cannot be purchased independently. The CE "decomposes" preferences for a complex good into a small number of components, each referring to specific characteristics (attributes) of the good. These attributes can take on different levels, and by combining attributes and levels, it is possible to create different alternatives (Hensher et al. 2005). In our case, the good corresponds to conservation management alternatives for the reserve, which are characterized by multiple attributes of the area. The attributes include (a) the conservation of wildlife through in-depth research, (b) the protection of soil in camping areas and walking trails, (c) the management of water resources to guarantee benefits in the long term, (d) changes in infrastructure for recreation, and (e) the cost of implementing the conservation management alternatives for the reserve. When selecting the CE attributes, we analyzed the inclusion of the scenic beauty of the reserve as one of the attributes with the potential to attract visitors. However, visitors already pay an entrance fee mainly motivated by the scenic beauty of the place that they can admire through hiking activities offered in the area (Cerda and De la Maza 2015). In close collaboration with decision makers in the area, we decided to include more particular attributes of biological relevance for the area. These attributes were quantified at different variation levels.

The conservation of wildlife through in-depth research

Participants were told that part of the investigation of the reserve would be oriented towards the biodiversity of animals, flora and vegetation and that visitor preferences regarding which biological group should receive the most research would be considered. Following Cerda et al. (2017), to select the groups, we considered whether each group included species with conservation problems, species that fulfill some relevant ecological role recognized in the literature, or species that, according to the literature, have special meaning to humans. In addition, the different groups were selected under the supposition that visitors may be more familiar with some of them, such as birds (Cerda et al. 2014), reptiles (Cerda and Losada 2013), *Nothofagus* species (Trincado et al. 2002), and some sclerophyllous species such as *Quillaja saponaria* (Schlotterbeck et al. 2015). However, others, such as herbaceous species, insects and rodents, may be less familiar (Cerda et al. 2013a, 2017; Cerda and Losada 2013). Among the better-known groups, we included (a) birds, exemplified by charismatic species such as the woodpecker (*Campephilus magellanicus*), *Cyanoliseus patagonus bloxami* and *Sephanoides galeritus*; (b) reptiles, exemplified by the species *Liolaemus chiliensis*, *Liolaemus pictus* and *Pristidactylus torquatus*; (c) *Nothofagus*, exemplified by *Nothofagus obliqua* and *Nothofagus dombeyi*; and (d) sclerophyllous tree species, exemplified by *Quillaja saponaria*. Among the lesser-known groups, the study valued insects (*Epipedonota paulseni*, *Aegorhinus pharelatus*, and *Oogenius chilensis*), rodents (*Spalacopus cyanus*), and herbaceous plants (orchid and fern species). The *status quo,* or current situation, was presented to participants as wildlife-oriented research

currently exists; however, further efforts remain necessary to strengthen research on specific groups. The species were presented simultaneously through carefully selected images. Each group was considered an attribute level.

Soil quality in camping and trails

Improvements to the *status quo* were proposed for the camping areas and the walking trails. Previous studies (De la Maza et al. 2014) have proposed fencing around vegetated areas and continuous visual monitoring of such areas as well as the use of ditches and channels for water diversion control to decrease soil erosion and root damage, complemented with the continuous visual monitoring of trails. The current situation was fully explained to the participants using images that reflect the above mentioned problems at the camping sites and on the trails.

The provision of long-term water benefits

The provision of long-term water benefits attribute took the following levels based on different identified benefits associated with the water courses (DGA-MOP and CADE-IDEPE 2004):

(a) irrigation water for the agricultural activities of the surrounding communities; (b) drinking water for the residents of the surrounding communities; (c) tourism and recreation inside the reserve because water flows contribute to the beauty of the area; (d) conservation of the biodiversity protected in the reserve and relevant ecological processes; and (e) other potential future activities, such as hydroelectricity and mining.

Regarding the current situation, visitors were informed that the water quality of the reserve is as good as the quality at the top of the basin but that no one knows exactly whether the identified uses will be satisfied in the long term due to the uncertainty of how social, economic and political demands could eventually affect the water resources of the region. Considering the current situation, it was proposed to the visitors that improving knowledge about water resources in the reserve with respect to the specific uses mentioned could be achieved through monitoring based on both new technologies and specific research. Thus, visitors could express their preferences regarding the use of water as well as on which use the protection and research should focus.

Changes in infrastructure for recreation

The visitors were informed about the current infrastructure of the area (30 camping sites, each for 6 people, and 30 picnic sites). With this base reference, an increase in the number of camping and picnic sites, which could allow more people to learn about and enjoy the reserve, was proposed to the visitors. We also explained that this change would generate more economic revenue for the area. Three levels of change were proposed with respect to the *status quo*: (a) a small increase: 37 camping sites (222 people) and 37 picnic sites; (b) a medium increase: 45 camping sites (270 people) and 45 picnic sites; and (c) a large increase: 60 camping sites (360 people) and 60 picnic sites.

The cost of implementing the alternatives

We used an increase in the entrance fee to the area as a payment vehicle. Entry rates for protected areas represent a realistic mechanism that enables the estimation of WTP for environmental attributes (Cerda et al. 2013b; Cerda and Losada 2013; Elsasser 1996).We proposed seven entrance fees to the area that are higher than the current price (Table 1).

The orthogonal main effects design procedures used to generate a reduced orthogonal experimental design were calculated following Louviere et al. (2000) and Hensher et al.

Table 1 Description of attributes and levels used in the choice experiment

Attribute	Levels
Conservation of wildlife through in-depth research	Reptiles Birds Insects Rodents *Nothofagus* species Sclerophyllous species Herbaceous plant species **General knowledge of the species. In-depth research is required**
Provision of water benefits in the long term	Irrigation water for surrounding communities Potable water for surrounding communities Tourism and recreation inside the reserve Conservation of protected biodiversity inside the reserve Other future potential uses (hydroelectricity, mining) **No guaranteed benefit in the long term**
Soil quality in camping and walking trail areas	Improvement: Camping: fencing vegetation areas and continuous visual monitoring Trails: runoff and erosion control through the installation of ditches and water diversion channels and continuous visual monitoring **Camping: compaction and loss of vegetation, exposed roots** **Trails: exposed roots, vegetation loss in slopes**
Changes in infrastructure for recreation	Small increase: Camping: 37 sites (222 people) Picnic: 37 sites Medium increase: Camping: 45 sites (270 people) Picnic: 45 sites Large increase: Camping: 60 sites (360 people) Picnic: 60 sites **Camping: 30 sites (180 people)** **Picnic: 30 sites** **Growing tourist demand has been projected**
Entrance fee (CHP/adult visitor/visit)	**2000**; 3000; 4000; 5000; 6000; 7000; 8000; 9000

Status quo is in bold

CHP Chilean pesos

US $1 = 600 CHP at the time of the study

Table 2 Example of a choice set

Attributes	Management alternative A	Management alternative B	*Status quo*
Conservation of wildlife through in-depth research	Birds: *Campephilus magellanicus*, *Cyanoliseus patagonus bloxami, Sephanoides galeritus*	*Nothofagus*: *N. obliqua*, *N. dombeyi*	General knowledge of the species. In-depth research is required
Soil quality in camping areas and trails	Present: Compaction and loss of vegetation, exposed roots in camping and trails	Improvement: Camping: closure of areas with vegetation and continuous visual monitoring Trails: ditch and channel for water diversion control to decrease soil erosion and root damage, continuous visual monitoring	Present: Compaction and loss of vegetation, exposed roots in camping and trails
Provision of water benefits in the long term	Guaranteed use: biodiversity conservation and protection of ecosystem process	Guaranteed use: hydroelectricity, mining	No benefit is guaranteed in the long term
Changes in infrastructure for recreation	Small increase: Camping: 37 sites (222 visitors) Picnic: 37 sites	Medium increase Camping: 45 sites (270 visitors) Picnic: 45 sites	Camping: 30 sites (180 visitors) Picnic: 30 sites An increasing tourist demand is projected
Entrance fee (CHP/visitor/visit)	3000	6000	2000
I prefer	☐	☐	☐

Original choice sets were presented in Spanish

CHP Chilean pesos

US $1 = 600 CHP at the time of the study

(2005). A total of 64 profiles (64 management options for the reserve) were obtained and combined into choice scenarios with two options, A and B, and one *status quo*, which conformed to each set of choices (Bennett and Blamey 2001; Hanley et al. 2001). The situations were randomly blocked into eight different questionnaire versions (8 choice sets per block) (Cerda et al. 2013a) (Table 2).

The structure and contents of the CE instrument

Standard procedures for the implementation of stated preference studies were used in designing the questionnaire (see Bateman et al. 2002; Hensher et al. 2005; Mitchell and Carson 1989). The literature reports potential biases when applying stated preference methods due to the hypothetical character of the proposed scenarios to be valued (Bateman et al. 2002; Diamond and Hausman 1994). Although bias cannot be entirely removed, researchers can control them in stated preference studies (Vásquez-Lavín et al. 2007). Bias related to hypothetical scenarios was controlled by framing the CE questionnaire in a real decision-making process (Cerda et al. 2014; Kanninen 2010). In fact, this study is not theoretical since information like that generated here is being demanded by decision makers in protected areas in Chile for improving management inside these areas. We explained to the participants that the study was being conducted to evaluate the reserve in support of defining future strategies for the management of the area and that information about the value of the area will contribute to an improved capacity to address potential threats to the reserve in addition to ensuring long-term conservation.

In addition, an entrance fee to the area was used for controlling design bias as such a payment vehicle has been recognized as being realistic and familiar (Cerda et al. 2013a; Cerda and Losada 2013; Elsasser 1996; Gelcich et al. 2013).

An introductory section contextualized the study, and the objective of the research was explained as aiming to obtain visitor opinions with respect to potential changes to the nature of the reserve. The second section consisted of a detailed explanation of each attribute and its levels. To reduce cognitive demand, visual materials were used, such as photographs of the species involved in the study, and diagrams were used to explain the proposed changes. The validity of using visual simulations to assess the perceptions of nature to reduce cognitive burden has been established by different studies (e.g., Van Riper et al. 2011). The next section of the questionnaire was oriented to obtaining the socio-demographic information of the respondents. Finally, we asked for the visitors' specific interests in visiting the reserve, the activities in which they engaged in the area, and their thoughts concerning the role of the reserve. In this last section, we also asked the visitors how sure they were that they would truly pay the stated amount if the hypothetical alternatives were to be implemented. Allowing respondents to say how sure they are that they would pay the stated amount asked is an accepted mechanism that contributes to identifying the uncertainty in the stated WTP for environmental goods (Hanley and Barbier 2009).

The administration of the questionnaire

A pilot study was conducted in the area (n = 100) in December 2012 to verify the validity of the questionnaire, which involved minor adjustments. The final questionnaire was conducted face to face and was widely distributed in the reserve among visitors in early 2013 by four well-trained university students. We did not interview foreign visitors because only Chileans citizens were found at the time of the interview. The sample was randomly

selected in the public-use areas of the reserve. The sample was constructed to be representative of the population who visited the area. Following Cerda et al. (2013b), to determine the number of questionnaires to be conducted, statistics on the adult Chilean visitors that entered the reserve between 2007 and 2012 were used. The total average population was 8067 adult Chilean visitors. Considering a 95% confidence interval, an estimated sample of 124 visitors needed to be interviewed. However, considering the number of choice questions per respondent, the number of alternatives per choice set and the largest number of levels in any attribute (Kanninen 2010), 405 surveys were conducted, which ensures the statistical power of the subsequent econometric analysis of the CE (Hensher et al. 2005; Kanninen 2010). Visitors older than 18 years of age and who had an income were interviewed (Bateman et al. 2002; Mitchell and Carson 1989). The average time needed for the administration of the questionnaire was approximately 20 min. A total of 405 visitors were interviewed, and 400 of the questionnaires were suitable for econometric analysis.

Theoretical model and empirical approach

Statistical models that are based on random utility theory (McFadden 1973) predict choice behavior as a function of the attributes that characterize potential management alternatives for the reserve. Through an analysis of the choice patterns among the management alternatives, the relative influence of attributes on the choices can be inferred, and the marginal WTP for improvements in statistically significant attributes can be estimated (Bateman et al. 2002).

According to Hensher et al. (2005), the utility function can be separated into an observable component *Vin* and an unobservable (error) component *Ein*:

$$Uin = Vin + Ein$$

where *Uin* is the total utility of option *i* for individual *n*. The probability (Pr) that individual *n* will choose alternative *i* over alternative *j* within the complete choice set *C* is given by:

$$\Pr in = \Pr(Vin + Ein > Vjn + Ejn, allj\_C)$$

If a deterministic utility component *V*1 is hypothesized to be a linear function of attribute *Z*1 itself as well as an interaction term of the attribute *Z*1 with an individually varying socio-demographic variable *A*, *V*1 can be expressed as:

$$V1(Z1, A) = cA\,Z1A + c1Z1$$

where *cA* is the utility coefficient of the interaction term (Barkmann et al. 2007). In the econometrically estimated utility models, a positive coefficient *c* indicates a positive influence of the respective term on choices and thus on utility. To reduce the collinearity between the interaction term and the non-interacted attribute term, the socio-demographic variable *A* can be standardized before being multiplied by *Z*1. The vector of the utility coefficient is usually estimated with maximum likelihood estimation techniques. Usually, the estimated choice models include an alternative specific constant (ASC) that picks up systematic differences in choice patterns between the three choice cards (Barkmann et al. 2007).

The choice models of the data were generated by statistical routines using the software package LIMDEP 9.0. From the dataset, we generated several multinomial logit models (Hensher et al. 2005) and detected violations of the independence of irrelevant alternatives (IIA) and the conditions for multinomial logit models (Hausman and McFadden 1984). Thus, nested logit (NL) procedures that partly relax the IIA assumption (Hensher et al.

2005, p. 518) were used to identify a suitable NL model structure. Other studies in similar contexts use this econometric approach for generalist CEs (Barkmann et al. 2008; Cerda et al. 2013a). We did not use the NL model to approximate a 'nested' choice process (e.g., first deciding whether the 'buy nothing' alternative is better than the offered alternatives; if not, choosing among the offered options). Instead, we used NL models to account for systematically differing error variances between the alternatives that can lead to IIA violations (see Hensher et al. 2005, p. 418). The inclusive value (IV) of the degenerated branch was set to 1.0 (Hensher et al. 2005, p. 570). The scale parameters were normalized at the lowest level (RU1; Hensher et al. 2005, p. 538). The best-fitting tree structure with an IV value between 0 and 1 was selected (Hensher et al. 2005, p. 494).

We included an ASC, which was coded as 1 for the *non-status quo* options, A and B, and as 0 for the *status quo* option (Bateman et al. 2002). The socio-economic variables sex, educational status, age, individual monthly income, probability of real payment, residence location, and whether the participant is a member of a citizen support group or environmental organization were introduced into the model as interaction terms with the ASC to test for their influences on choice (Bateman et al. 2002; Hensher et al. 2005). The participants' perceptions of the role of the reserve as well as the aspects through which they relate to the reserve (biodiversity, traditional uses, and tourism or economic projects) were also evaluated using interactions with the ASC to detect the influence of these factors on choice (Bateman et al. 2002). The attributes related to water benefits and the conservation of wildlife were assessed using dummy codes to derive point estimates of the utility of each attribute level (Bateman et al. 2002; Hensher et al. 2005), for which we consider a zero value for the *status quo*. The attributes of soil quality in the camping and trekking areas and increases in infrastructure for recreation were assessed using an effect code because we cannot assume a zero value for these *status quo* conditions. The cost attributes were entered into the model as continuous variables using the actual attribute levels. The measures of the WTP for specific dummy-coded attribute levels were calculated as the ratio of the attribute level parameter to the costs (Hensher et al. 2005). For each effect-coded attribute, the magnitude of the omitted base-level coefficient is assumed to be equal to the negative sum of the utility weights for the other estimated categories (Louviere et al. 2000).

A distribution of 10,000 observations for each WTP estimate was estimated using parametric bootstrapping (Krinsky and Robb 1986).

Results

Sample characteristics

The socio-economic characteristics of the sample are summarized in Table 2. The reserve attracts Chilean visitors with a wide variety of socio-economic characteristics. We mostly interviewed men (n = 232, 58%). The most common groups were young (18–30 years old, n = 120, 30%), middle-aged (31–41 years old, n = 100, 25%), and highly educated people (technical or university studies, n = 340, 85%). Most of the respondents had an individual monthly income of over US $700 (n = 248, 61%). Most of the respondents (n = 380, 95%) did not belong to a citizen support group or environmental organization, and 52% of the respondents (n = 208) were from the region in which the reserve is located.

Most of the visitors were sure or very sure of being able to pay to implement the chosen alternatives in the CE. Most of the visitors (n = 300, 75%) associated the reserve with

the conservation of biodiversity, followed by tourism. A total of 88% of the respondents (n = 352) believed that the main role of the reserve is the conservation of biodiversity.

Econometric results

Table 3 shows the results of the NL model, including the marginal WTP. The model was highly significant ($P(\chi^2) < 0.0001$) with an adjusted pseudo-R^2 value of 0.26, which corresponds to an R^2 value of ~ 0.5 in the OLS model equivalent (Hensher et al. 2005). The IVs are not significantly different from 1 and indicate that the IIA condition holds for this model (Hensher et al. 2005). All attributes are significant predictors of choice ($p < 0.05$). For the attribute "protection of wildlife through in-depth research" all attribute levels, except that for reptiles, were significant ($p < 0.05$). The monetary attribute was highly significant ($p < 0.001$) and had a negative sign, as expected.

Birds received the highest mean WTP, reaching US $6.78. Herbaceous species and rodents obtained the lowest mean WTPs of US $1.44 and US $1.85, respectively. *Nothofagus* and sclerophyllous species obtained similar mean WTPs of US $3.86 and US $3.52, respectively. Insects reached a positive mean WTP of US $2.41. The respondents were willing to pay US $3 for improvements in the soil quality in camping areas and trails. Regarding the "benefits of water resources" attribute, the visitors were willing to pay average amounts of US $2.79 and US $5.46 to guarantee the provision of irrigation water for agriculture and drinkable water, respectively, to surrounding local communities in the long term. In addition, for this attribute, the management of water resources for their role in biodiversity conservation reached the highest mean WTP (US $5.63). The visitors were willing to pay US $3.04 to manage water resources for tourism and recreation purposes. Potential future uses of water, such as hydroelectricity and mining, were not well regarded by respondents and had a negative mean WTP of US $− 1.98. For the "changes in infrastructure for recreation" attribute, a negative utility was associated with medium and large increases, yielding negative mean WTPs of US $− 1.43 and US $− 0.6, respectively. A small increase in infrastructure generated a positive mean WTP of US $1.5.

The interactions among the ASC (NON-STATUS QUO) and socio-economic characteristics that were not significant at the 95% level were dropped from the final model. In the end, the variables "*Educational status"* (EDUCATION), "*Age*" (AGE) and *Probability of real payment* (PROBAL_PAYMENT) were significant in the model and therefore affected the choice of either option A or B. The interaction coefficient of the EDUCATION variable shows that higher levels of education resulted in increased attractiveness of the offered changes versus the *status quo*. With respect to the AGE coefficient, the older participants were more reluctant to move from the status quo and consequently to pay for one of the offered alternatives.

The PROBAL_PAYMENT coefficient indicates that when the respondents felt more certain that they could pay for the cost of the offered alternatives, they more positively valued the choice of an offered alternative (Table 4).

Discussion

We estimated the financial contribution that domestic visitors to a protected reserve in South America are willing to make to protect multiple attributes of the area. We found that visitors are willing to pay to protect multiple attributes of the area. Among the attributes

Table 3 Socio-economic characteristics of the sample (n = 400)

Characteristics	Frequency	Percent (%)
Sex		
Female	168	42
Male	232	58
Educational status		
Secondary school	60	15
Technical or university studies	340	85
Age (years)		
18–30	120	30
31–41	100	25
41–51	80	20
51–61	64	16
61–71	36	9
Individual monthly income (CHP)		
300,000 or less	108	27
301,000–400,000	44	11
401,000–500,000	60	15
501,000–600,000	36	9
601,000–700,000	40	10
701,000–800,000	16	4
801,000–900,000	4	1
901,000 or more	92	23
Probability of real payment if conservation alternatives were implemented		
Very unsure	12	3
Unsure	16	4
I do not know	92	23
Sure	108	27
Very sure	172	43
Residence location		
Maule region	207	52
Other region	193	48
What aspects do you associate with the reserve?		
Biodiversity	300	75
Traditional uses	12	3
Tourism, economic projects	88	22
Role of the reserve		
Conservation of biodiversity	352	88
Tourism development	48	12
Member of a citizen support or environmental organization		
Yes	20	5
No	380	95

CHP Chilean pesos

US $1 = 600 CHP at the time of the study

Table 4 Nested model parameters

Variables	Nested model parameters Coefficient (SE)	Adj.	Marginal mean WTP/visitor (US $/visit) for single levels of variation and confidence intervals
Protection of wildlife through investigation			
Reptiles	0.117 ^{ns} (0.100)		
Birds	1.023*** (0.100)		6.78 (6.57–6.99)
Insects	0.364*** (0.097)		2.41 (2.20–2.63)
Rodents	0.279*** (0.092)		1.85 (1.65–2.04)
Nothofagus species	0.583*** (0.103)		3.86 (3.63–4.07)
Sclerophyllous species	0.531*** (0.096)		3.52 (3.31–3.74)
Herbaceous (orchids and ferns)	0.218* (0.109)		1.44 (1.20–1.67)
Soil quality in camping areas and trails	0.229*** (0.024)	0.458	3.03 (2.97–3.09)
Provision of long-term water benefits			
Irrigation water for surrounding communities	0.253*** (0.071)		2.79 (2.63–3.01)
Potable water for surrounding communities	0.494*** (0.077)		5.46 (5.27–5.64)
Tourism and recreation	0.459*** (0.092)		3.04 (2.81–3.26)
Conservation of biodiversity	0.850*** (0.094)		5.63 (5.39–5.84)
Other future potential uses such as hydroelectricity	− 0.299* (0.148)		− 1.98 (− 2.24 to − 1.67)
Changes in infrastructure for recreation			
Small increment	0.139** (0.043)	0.227	1.50 (1.38–1.58)
Medium increment	− 0.128** (0.047)	− 0.216	− 1.43 (− 1.58 to 1.32)
Large increment	− 0.179*** (0.027)	− 0.091	− 0.60 (− 0.66 to 0.51)
Entrance fee	− 0.150 (0.000)		
Non-status quo × education	0.403*** (0.190)		
Non-status quo × age	− 0.033*** (0.006)		
Non-status quo × PROBAL_PAYMENT	0.395*** (0.080)		

Table 4 (continued)

Variables	Nested model parameters	Adj.	Marginal mean WTP/visitor (US $/visit) for single levels of variation and confidence intervals
	Coefficient (SE)		
Model summary			
Log-likelihood	− 4.260, 5		
P(χ^2); DF	< 0.0001; 22		
Inclusive value (IV)	0.98		
Adj. ρ^2 (pseudo-R^2)	0.26		

Standard errors in parentheses and WTP values (Krinsky and Robb's (1986) 95% confidence intervals in parentheses). Entrance fee coefficient for 1000 Chilean Pesos (CHP)

*** Significant at $p \leq 0.001$; ** significant at $p \leq 0.01$; * significant at $p \leq 0.05$; *ns* non-significant

related to the conservation of wildlife through in-depth research, birds appear to be the most preferred species in which monetary resources for research should be invested. Other studies have also shown that birds can command a very high WTP (Martin-López et al. 2007). From the perspective of wildlife conservation, the value that visitors attribute to the reserve is likely heavily dependent on birds, which may indicate the feasibility of using bird species as emblems of protected areas to motivate public awareness and thus support the conservation of biodiversity within them. Other studies (e.g., Veríssimo et al. 2009) propose the use of birds as tourism flagship species to promote biodiversity conservation in areas of the world where it is difficult for visitors to encounter large charismatic mammals. However, our result regarding birds differs from those of other studies of visitor WTP in desert coastal environments. Cerda et al. (2017) found that in desert ecosystems in Chile, visitors with similar socio-economic characteristics to those of the visitors of this study (i.e., similar average income, age class and average education level) but with different touristic motivations and demands for services offered by the protected area (camping in the coastal dessert environment) are more interested in financing conservation actions for terrestrial mammals, amphibians, reptiles, insects and plants than for bird species. Reptiles were not considered important by the visitors in the present study. In the desert, Cerda et al. (2017) found that the protection of reptiles in protected areas is valued by visitors, who are willing to pay for their conservation. These results highlight the importance of the socio-environmental context in which studies of WTP for species are conducted as this context can be a determinant of people's preferences (Ressurreicão et al. 2011). Following this result, it may be that in open landscapes such those found in desert ecosystems, and particularly in coastal areas, reptiles and mammals are more visible to visitors than in closed landscapes such as the forest ecosystems found in the Altos de Lircay National Reserve. Indeed, these types of animals are usually hidden by the vegetation. Birds, on the other hand, are more visible and are also heard by visitors. Hence, in forest landscapes, birds would have a greater probability of being preferred for protection purposes. For instance, Dallimer et al. (2014) found that the WTP estimates for a 25% increase in the number of bird species were significantly higher in sites with above-median tree cover. However, additional research is required to support our findings because in many coastal environments, birds are the main interest of visitors (Almudi and Coswig Kalikoski 2010; Vásquez Lavín et al. 2016).

The visitors were also willing to pay to protect a native rodent, showing an interest in the conservation of less-popular species. Cerda and Losada (2013) also found WTPs for rodents in protected areas, mainly motivated by the right to existence of such species (Krutilla 1967). We are aware that this result may be affected by the attitudes of visitors towards the species and how informed these visitors are about current threats to the species (Loyau and Schmeller 2017). Future research should conduct a deeper exploration of these factors in order to strengthen the understanding of WTP in the contexts of conservation and nature-based tourism.

Our study is one of the few in the literature that visualizes the socio-economic importance of the conservation of trees and plant species. Here, we obtain a positive WTP for the protection of the *Nothofagus* and sclerophyllous species. Given the recognized importance of conserving vegetation (Pereira and Cooper 2006; Zamin et al. 2010) and of assessing its social meaning (Joseph et al. 2009), our study facilitates a preliminary analysis of the potential of vegetation species to be used as species symbols for the conservation of protected areas. This approach may be useful to the protected areas of the world that feature interesting mosaics of vegetation but do not offer opportunities for visitors to encounter large charismatic animals.

Maintaining the quality of the soil at camping sites and on walking trails also appears to be accepted by visitors, although strategies to confront the current degradation suggest spatial or temporary bans of access. Other studies (e.g., Getzner et al. 2017) have obtained similar results. Despite the recognized relevance of soil in regulating and supporting ecological functions and consequently in affecting human well-being worldwide (Pimentel 2006), the social relevance of soil has mostly been assessed from the perspective of its productivity capacity and rarely from that of the benefits of its conservation. In the context of protected areas, visitors' activities generate substantial impacts to soils (Kelly et al. 2003; Newsome et al. 2013; Rankin et al. 2015; Ritchie 2013). The explicit interest of visitors in paying for its conservation may contribute to the visualization of its ecological and social significance as a provider of benefits and to the more effective achievement of conservation goals as visitors should be willing to accept access restrictions to sectors in which the quality of soil is more affected.

The results also demonstrate that visitors can appreciate the different values of the water resources in the area. Visitor preferences are essentially motivated by non-use values (i.e., the role of water in the conservation of biodiversity and ecosystem processes) but also by the values of direct use (drinking and irrigation), which indicates that the study participants conceive of a dichotomous role of the protected areas that is related, on one hand, to the conservation of biodiversity and, on the other hand, to a social function through the provision of ecosystem services. The respondents are not knowledgeable about the potential future uses of water, such as hydroelectricity and mining. Future research should investigate whether visitors actually perceive conflicts between these uses of water in Chile and the conservation of biological diversity.

Concerning the changes in infrastructure for recreation, our results clearly demonstrate that from a non-market valuation perspective, a small-scale tourism infrastructure scenario is favored by the respondents over more aggressive changes, which indicates that visitors are willing to accept increases in the amount of infrastructure for recreation but only to a certain extent. The fact that medium levels of change generate more negative effects in the utility of the visitors than do high levels of change is difficult to interpret. The visitors may actually perceive that greater economic revenue can be derived from the implementation of large increments than from more moderate changes; however, the perceived economic revenue may be not sufficient to enable positive utility. The visitors likely envision the potential damage that medium and large increases to the infrastructure could bring to the area. Future research is necessary to more deeply explore the preferences of visitors for changes in touristic infrastructure. Still, small increases are clearly preferred by visitors, and this input is important for the planning processes to develop sustainable nature-based tourism in protected areas.

In summary, our visitors are interested in protecting multiple biological attributes of the reserve and would be interested in small-scale, nature-based tourism development. The conservation of biological attributes that are rarely incorporated into social valuations, such as vegetation, soil and less charismatic biodiversity such as insects and rodents, may be an integral part of nature-based tourism strategies to be implemented in protected areas. Other authors also support this idea. For example, Loyau and Schmeller (2017) emphasize the importance of focusing on species that may be important components of ecosystems but are not necessarily big, cute and furry to promote conservation. The authors argue that complex relationships in biodiversity should be made accessible to the public to facilitate the understanding of the status of biodiversity and to advance conservation of the neglected species groups. If we do not precipitate the complex ecological reasoning of visitors to protected areas and welcome them as participants in broader assessments, the achievement

of conservation goals will become more complex. CEs are useful instruments that allow considering the socio-economic importance of multiple attributes of protected areas. Managers of protected areas worldwide must address the multi-attribute nature of such areas to achieve their conservation goals. The results of our study shed light on how to finance protected areas with high conservation values that are not necessarily related to large, threatened or charismatic mammals. Additionally, our approach allows visitors and tourists from emerging economies such as those of South America (Di Minin et al. 2013b) who are increasingly visiting protected areas in their own countries to be informed about ecological issues. This development may lead to the generation of alternative markets for the conservation of biodiversity. In accordance with other studies (Cerda et al. 2017; Di Minin et al. 2013b; Hausmann et al. 2017), we have demonstrated the potential for monetary payments from visitors to enable the protection of a considerable proportion of biological attributes, which can contribute to the design of marketing strategies for the protection of less-popular conservation areas.

The limitations of our study also deserve attention. Empirical evidence has shown that in stated preference surveys, respondents have the ability and the motivation to valuate changes in environmental goods in a valid way (Barkmann et al. 2008; Fischer and Hanley 2007). However, we are aware that our results are based on a particular economic and social stratum, and therefore, they should be assessed with caution. In our case, more educated people are more willing to pay for an offered scenario, and the more secure that people feel about being able to pay for an offered scenario, the higher the probability will be that they participants will end up choosing a scenario that is different from the status quo. Visitors to protected areas are not the only actors that should be involved in the management of such areas (Hartter et al. 2014). In this regard, local communities may show divergent interests with visitors to the reserve that may also affect the achievement of conservation goals (Cerda et al. 2017). Thus, understanding how the local communities value the area is also relevant. Hence, to allow for sustainable decision making in protected areas, CE may be combined with other forms of stakeholder engagement such as narrative and multicriteria analysis (Cerda et al. 2014). There are also other issues with WTP; for example, some authors argue that participants may not express a value for the good under discussion but rather express feelings about the scenario (Kahneman 1986). Future research on the role of attitudes and opinions and the underlying rationale would be helpful to more deeply exploring this aspect (Hjerpe and Hussain 2016; Martin-López et al. 2007). Still, our results provide useful information about individual preferences that complement biological research. Visitors expressed a WTP for multiple attributes, and their preferences appear to indicate that they are interested in a good conservation status for the area, for which they also prefer low-scale tourism development. In addition, studies of this type contribute to show which biological attributes of protected areas might be useful for increasing conservation awareness. Our approach may be relevant to protected areas of the world with high conservation values, little funding and a lack of large, charismatic species. Our results are relevant to the discovery of sustainable solutions in biological conservation and nature-based tourism development.

Conclusion

The conservation of biological attributes in protected areas and visitor preferences can converge. Visitors to a protected area in a biodiversity hotspot expressed a WTP for multiple attributes, and their preferences appear to indicate that they are interested

in a good conservation status for the area, for which they also prefer low-scale tourism development. Visitors are willing to pay for the conservation of different species, including popular and less-popular ones. Among the animals, birds emerge with the highest WTP, which indicates their potential to build awareness and attract conservation funds. Plant and tree species are also perceived to be important and in need of protection, which serves as an invitation to design management strategies that draw upon the full potential of vegetation to motivate people's environmental awareness in scenarios where charismatic and threatened animals are not present or are difficult to see. The quality of soil is also relevant for visitors, and they are willing to accept access restrictions to degraded areas. Visitors are also aware of the social role of protected areas, and they are willing to pay to guarantee the provision of ecosystem services related to water for surrounding human communities. In summary, visitors can be a key component in the design of management strategies that aim to unite biological conservation in protected areas and the development of nature-based tourism; however, we must present visitors with a broader spectrum of biological attributes. We believe that administering broader assessments is important to developing a more conscious and informed society that understands the complex problems of conservation for which communication strategies are extremely relevant. CEs have emerged as promising approaches to achieving goal.

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Compliance with ethical standards

Conflict of interest The authors have no conflicts of interest to declare.

References

Almudi T, Coswig Kalikoski D (2010) Traditional fisherfolk and no-take protected areas: the Peixe Lagoon National Park dilemma. Ocean Coastal Manag 53:225–233

Barkmann J, Glenk K, Handi H, Sundawati L, Witte JP, Marggraf J (2007) Assessing economic preferences for biological diversity and ecosystem services at the Central Sulawesi rainforest margin—a choice experiment approach. In: Tscharntke T, Leuschner C, Zeller M, Guhardja E, Bidin A (eds) Stability of tropical rainforest margins. Linking ecological, economic and social constraints of land use and conservation. Springer, Berlin, pp 181–208

Barkmann J, Glenk K, Keil A, Leemhuis C, Dietrich N, Gerold G, Marggraf R (2008) Confronting unfamiliarity with ecosystem functions: the case for an ecosystem service approach to environmental valuation with stated preference methods. Ecol Econ 65:48–62. https://doi.org/10.1016/j.ecolecon.2007.12.002

Bateman IJ, Carson RT, Day B, Hanemann M, Hanley N, Hett T, Jones-Lee M, Loomes G, Mourato S, Pearce DW, Sugden R (2002) Economic valuation with stated preference techniques: a manual. Edward Elgar, Cheltenham

Bennett J, Blamey R (2001) The choice modelling approach to environmental valuation. Edward Elgar, Cheltenham

Carson RT, Louviere JJ (2011) A common nomenclature for stated preference elicitation approaches. Environ Resource Econ 49:539–559. https://doi.org/10.1007/s10640-010-9450-x

Cerda C, De la Maza CL (2015) Evaluación de servicios ecosistémicos proporcionados por áreas protegidas: implicancias para áreas protegidas Chilenas. Editorial Gráfica Metropolitana, Santiago

Cerda C, Losada T (2013) Assessing the value of species: a case study on the willingness to pay for species protection in Chile. Environ Monit Assess 185:10479–10493. https://doi.org/10.1007/s10661-013-3346-5

Cerda C, Barkmann J, Marggraf R (2013a) Application of choice experiments to quantify the existence value of an endemic moss: a case study in Chile. Environ Dev Econ 18:207–224. https://doi.org/10.1017/S1355770X12000472

Cerda C, Ponce A, Zappi M (2013b) Using choice experiments to understand public demand for the conservation of nature: a case study in a protected area of Chile. J Nat Conserv 21:143–153. https://doi.org/10.1016/j.jnc.2012.11.010

Cerda C, Barkmann J, Marggraf R (2014) Non-market economic valuation of the benefits provided by temperate ecosystems at the extreme south of the Americas. Reg Environ Change 14:1517–1531. https://doi.org/10.1007/s10113-014-0591-2

Cerda C, Fuentes JP, De La Maza CL, Louit C, Araos A (2017) Assessing visitors' preferences for ecosystem features in a desert biodiversity hotspot. Environ Conserv. https://doi.org/10.1017/S0376892917000200

Dallimer M, Tinch D, Hanley N, Irvine KN, Rouquette JR, Warren PH, Maltby L, Gaston KJ, Armsworth PR (2014) Quantifying preferences for the natural world using monetary and nonmonetary assessments of value. Conserv Biol 28:404–413. https://doi.org/10.1111/cobi.12215

De la Maza CL, Cerda C, Cruz G, Mancilla G, Fuentes JP, Estades C, Medrano F, Aliste E, Angel P, Vielma E (2014) Manual para aplicar indicadores de sustentabilidad en áreas protegidas: ámbito biofísico. Editorial Gráfica Metropolitana, Santiago de Chile

DeFries R, Hansen A, Turner BL, Reid R, Liu J (2007) Land use change around protected areas: management to balance human needs and ecological function. Ecol Appl 17:1031–1038. https://doi.org/10.1890/05-1111

DGA-MOP, CADE-IDEPE (2004) Diagnóstico y clasificación de los cursos y cuerpos de agua según objetivo de calidad. Cuenca del Río Maule

Di Minin E, Fraser I, Slotow R, MacMillan DC (2013a) Understanding heterogeneous preference of tourists for big game species: implications for conservation and management. Anim Conserv 16:249–258. https://doi.org/10.1111/j.1469-1795.2012.00595.x

Di Minin E, Fraser I, Slotow R, MacMillan DC (2013b) Conservation marketing and education for less charismatic biodiversity and conservation businesses for sustainable development. Anim Conserv 16:263–264. https://doi.org/10.1111/acv.12060

Diamond PA, Hausman JA (1994) Contingent valuation: is some number better than no number? J Econ Perspect 8:45–64. https://doi.org/10.1257/jep.8.4.45

Elsasser P (1996) Recreational benefits of forests in Germany. In: Roper CS, Park A (eds) The living forest. Non-market benefits of forestry. The Stationery Office, London, pp 175–183

Fischer A, Hanley N (2007) Analysing decision behaviour in stated preference surveys: a consumer psychological approach. Ecol Econ 61(2–3):303–314

Gelcich S, Amar F, Valdebenito A, Castilla JC, Fernandez M, Godoy C, Biggs D (2013) Financing marine protected areas through visitor fees: insights from tourists willingness to pay in Chile. Ambio 42(8):975–984

Getzner M, Jungmeier M, Špika M (2017) Willingness-to-pay for improving marine biodiversity: a case study of Lastovo Archipelago Marine Park (Croatia). Water 9:2. https://doi.org/10.3390/w9010002

Hanley N, Barbier EB (2009) Pricing nature: cost-benefit analysis and environmental policy. Edwar Elgar, Cheltenham

Hanley N, Mourato S, Wright RE (2001) Choice modelling approaches: a superior alternative for environmental valuatioin? J Econ Surv 15:435–462. https://doi.org/10.1111/1467-6419.00145

Hartter J, Solomon J, Ryan SJ, Jacobson SK, Goldman A (2014) Contrasting perceptions of ecosystem services of an African forest park. Environ Conserv 41:330–340. https://doi.org/10.1017/S0376892914000071

Hausman J, McFadden D (1984) Specification tests for the multinomial logit model. Econometrica 52:1219–1240. https://doi.org/10.2307/1910997

Hausmann A, Slotow R, Fraser I, Di Minin E (2017) Ecotourism marketing alternative to charismatic megafauna can also support biodiversity conservation. Anim Conserv 20:91–100. https://doi.org/10.1111/acv.12292

Hearne RR, Salinas ZM (2002) The use of choice experiments in the analysis of tourist preferences for ecotourism development in Costa Rica. J Environ Manag 65:153–163. https://doi.org/10.1006/jema.2001.0541

Hein L (2011) Economic benefits generated by protected areas: the case of the Hoge Veluwe forest, the Netherlands. E&S 16:13. https://doi.org/10.5751/ES-04119-160213

Hensher DA, Rose JM, Greene WH (2005) Applied choice analysis: a primer. Cambridge University Press, Cambridge
Hjerpe EE, Hussain A (2016) Willingness to pay for ecosystem conservation in Alaska's Tongass National forest: a choice modeling study. Ecol Soc 21:8. https://doi.org/10.5751/ES-08122-210208
Jacobsen JB, Boiesen JH, Thorsen BJ, Strange N (2008) What's in a name? The use of quantitative measures versus "Iconised" species when valuing biodiversity. Environ Res Econ 39:247–263. https://doi.org/10.1007/s10640-007-9107-6
Joseph LN, Maloney RF, Possingham HP (2009) Optimal allocation of resources among threatened species: a project prioritization protocol. Conserv Biol 23:328–338. https://doi.org/10.1111/j.1523-1739.2008.01124.x
Juutinen A, Mitani Y, Mäntymaa E, Shoji Y, Siikamäki P, Svento R (2011) Combining ecological and recreational aspects in national park management: a choice experiment application. Ecol Econ 70:1231–1239. https://doi.org/10.1016/j.ecolecon.2011.02.006
Kahneman D (1986) Comments. In: Cummings R, Brookshire D, Schulze W (eds) Valuing environmental goods—an assessment of the contingent valuation method. Rowman & Allanheld, Totowa
Kanninen BJ (2010) Valuing environmental amenities using stated choice studies: a common sense approach to theory and practice. Springer, Dordrecht
Kelly CL, Pickering CM, Buckley RC (2003) Impacts of tourism on threatened plant taxa and communities in Australia. Ecol Manag Restor 4:37–44. https://doi.org/10.1046/j.1442-8903.2003.00136.x
Krinsky I, Robb AL (1986) On approximating the statistical properties of elasticities. Rev Econ Stat 68:715–719. https://doi.org/10.2307/1924536
Krutilla JV (1967) Conservation reconsidered. Am Econ Rev 57:777–786
Lancaster KJ (1966) A new approach to consumer theory. J Pol Econ 74:132–157. https://doi.org/10.1086/259131
Lawson SR, Manning RE (2001) Solitude versus access: a study of tradeoffs in outdoor recreation using indifference curve analysis. Leis Sci 23:179–191. https://doi.org/10.1080/014904001316896864
Leader-Williams N, Dublin HT (2000) Charismatic megafauna as 'flagship species'. In: Entwistle A, Dunstone N (eds) Priorities for the conservation of mammalian diversity: has the panda had its day?. Cambridge University Press, Cambridge, pp 53–81
Lindsey PA, Alexander RR, Du Toit JT, Mills MGL (2005) The potential contribution of ecotourism to African wild dog *Lycaon pictus* conservation in South Africa. Biol Conserv 123:339–348. https://doi.org/10.1016/j.biocon.2004.12.002
Louviere JJ, Hensher DA, Swait JD (2000) Stated choice methods: analysis and applications. Cambridge University Press, Cambridge
Loyau A, Schmeller DS (2017) Positive sentiment and knowledge increase tolerance towards conservation actions. Biodivers Conserv 26:461–478. https://doi.org/10.1007/s10531-016-1253-0
Maciejewski K, Kerley GIH (2014) Understanding tourists' preference for mammal species in private protected areas: is there a case for extralimital species for ecotourism? PLoS ONE. https://doi.org/10.1371/journal.pone.0088192
Marques C, Reis E, Menezes J, Salgueiro MdF (2017) Modelling preferences for nature-based recreation activities. Leis Stud 36:89–107. https://doi.org/10.1080/02614367.2015.1014928
Martin-López B, Montes C, Benayas J (2007) The non-economic motives behind the willingness to pay for biodiversity conservation. Biol Conserv 139:67–82. https://doi.org/10.1016/j.biocon.2007.06.005
McFadden D (1973) Conditional logit analysis of qualitative choice behavior. In: Zarembka P (ed) Frontiers in econometrics. Academic Press, New York, pp 105–142
Mitchell RC, Carson R (1989) Using surveys to value public goods: the contingent valuation method. Resources for the Future, Washington DC
Myers N, Mittermeier RA, Mittermeier CG, Da Fonseca GA, Kent J (2000) Biodiversity hotspots for conservation priorities. Nature 403:853–858. https://doi.org/10.1038/35002501
Newsome D, Moore SA, Dowling RK (2013) Natural area tourism: ecology, impacts, and management. Channel View Publications, Clevedon
Othman J, Bennett J, Blamey R (2004) Environmental values and resource management options: a choice modelling experience in Malaysia. Environ Dev Econ 9:803–824. https://doi.org/10.1017/S1355770X04001718
Pereira HM, Cooper HD (2006) Towards the global monitoring of biodiversity change. Trends Ecol Evol 21:123–129. https://doi.org/10.1016/j.tree.2005.10.015
Pimentel D (2006) Soil erosion: a food and environmental threat. Environ Dev Sustain 8:119–137. https://doi.org/10.1007/s10668-005-1262-8

Rankin BL, Ballantyne M, Pickering CM (2015) Tourism and recreation listed as a threat for a wide diversity of vascular plants: a continental scale review. J Environ Manag 154:293–298. https://doi.org/10.1016/j.jenvman.2014.10.035

Ressurreicão A, Gibbons J, Dentinho TP, Kaiser M, Santos RS, Edwards-Jones G (2011) Economic valuation of species loss in the open sea. Ecol Econ 70:729–739

Ritchie EG (2013) Conservation: relaxed laws imperil Australian wildlife. Nature 498:434. https://doi.org/10.1038/498434d

Schlotterbeck T, Castillo-Ruiz M, Cañon-Jones H, Martín RS (2015) The Use of leaves from young trees of *Quillaja saponaria* (Molina) plantations as a new source of saponins. Econ Bot Molina 69(3):262–272. https://doi.org/10.1007/s12231-015-9320-0

Tolvanen A, Kangas K (2016) Tourism, biodiversity and protected areas—review from northern Fennoscandia. J Environ Manag 169:58–66. https://doi.org/10.1016/j.jenvman.2015.12.011

Trincado VG, Kiviste A, Von Gadow K (2002) Preliminary site index models for native Roble (*Nothofagus obliqua*) and Rauli (*N. alpina*) in Chile. N Z J For Sci 32:322–333

Van Riper CJ, Manning RE, Monz CA, Goonan KA (2011) Tradeoffs among resource, social, and managerial conditions on mountain summits of the Northern Forest. Leis Sci 33:228–249. https://doi.org/10.1080/01490400.2011.564924

Vásquez Lavín F, Gelcich S, Paz Lerdón XP, Montealegre Bustos F (2016) The role of information in changing tourists behavioral preferences at the Humboldt penguin reserve in northern Chile. Ocean Coast Manag 125:63–69. https://doi.org/10.1016/j.ocecoaman.2016.03.003

Vásquez-Lavín F, Cerda A, Orrego S (2007) Valoración Económica del Ambiente: Fundamentos económicos, econométricos y aplicaciones. Thomson Learning, Buenos Aires, p 368

Veríssimo D, Fraser I, Groombridge J, Bristol R, MacMillan DC (2009) Birds as tourism flagship species: a case study of tropical islands. Anim Conserv 12:549–558. https://doi.org/10.1111/j.1469-1795.2009.00282.x

Wall D (2012) Soil ecology and ecosystem services. Oxford University Press, Oxford

Zamin TJ, Baillie JE, Miller RM, Rodríguez JP, Ardid A, Collen B (2010) National red listing beyond the 2010 target. Conserv Biol 24:1012–1020. https://doi.org/10.1111/j.1523-1739.2010.01492.x