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Marine Sites and the Drivers of Wellbeing: Ecosystem vs. Anthropic Services

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Abstract: Coastal sites offer a range of services that contribute to human wellbeing. While some of the services are entirely human-made (e.g., parasol and sunbed rental), others are produced thanks to the contribution of marine ecosystems (e.g., water clarity). The purpose of this paper is to investigate the preferences of a sample of beachgoers for these two categories of services that policymakers have to balance when designing management strategies for coastal sites. We consider a marine site in the north of Italy that partially falls within the boundaries of a protected area but that is characterized by a medium-to-high level of anthropization. The results of a discrete choice experiment show that in the current state of things, the ecosystem services proposed for the sample have, on average, a higher marginal utility, suggesting that actions increasing those services have a larger effect on well-being.

Keywords: marine and coastal ecosystems; discrete choice experiments; ecosystem services; conditional logit; mixed logit; latent class logit

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1. Introduction

Ecosystems contribute to human wellbeing through the provision of a range of goods and services that are used in many productive and consumptive activities, frequently in combination with human inputs [1,2]. When used in production by private economic agents, ecosystem services become part of market transactions, and their value to human wellbeing, revealed by consumer behavior, can be estimated. This revealed information can be used, to some extent, by producers to adjust the mix of ecosystemic and human inputs in their products and to pursue their profit goals. However, a substantial flow of ecosystem services is never transacted in markets, being instead consumed directly and for free by individuals or collectively. When that is the case, the value of the service is not revealed, and the decisions concerning the management of the relative ecosystem might be distorted as nature's contribution to individual wellbeing, and social welfare is not accounted for. The issue is particularly relevant for local and national governments, who act as managers of a large share of the world's ecosystems and are supposed to steer management strategies using public resources towards maximizing the wellbeing of their constituency. Protected areas are a notable case where concerns of this kind are likely to arise. When not exclusively devoted to ecosystem conservation, protected areas are expected to attract visitors, and the overall production of welfare deriving from their management should also come from the experiential, recreational, and educational services obtained from the site by those flows of visitors [3]. Such services consist of a variable mix of human and natural inputs that, at different levels of governance, could be combined to maximize wellbeing that is conditional on the availability of information on the value that the different inputs have to those benefitting from them. In other words, every level of policymaking, from the regulations produced by the governing bodies of protected areas to the high-level legislation concerning ecosystem conservation, can be designed around the social welfare generated by ecosystem services only insofar as their contribution to collective wellbeing is measured.

While there is a rich body of literature discussing the value of various features of protected areas to tourists, a comparison of how human and natural inputs affect the wellbeing of visitors of protected areas is still unexplored. However, such a comparison could provide public decision-makers with crucial insight to help improve management and conservation efforts. Information on user preferences for single ecosystemic and human-made services provided at a site can help design efficient nature-based solutions that stimulate local economic development and, at the same time, preserve local ecosystems. Furthermore, from a management standpoint, it is also relevant to observe aggregated information on the two categories of services. Indeed, when large interdependencies exist between bundles of services of the same type, managing the trade-offs between natural and human-made services is likely to be a higher-priority decision than that about any single service. For example, before focusing on single ecosystem services, the public decision-makers managing conservation sites will likely have to choose whether to prioritize the limitation of anthropic activities to increase the production of ecosystem services or the promotion of sustainable tourism to increase the services that are available to the visitors.

In this paper, we use a discrete choice experiment (DCE) to elicit the stated preferences of the visitors of a coastal site in Northern Italy concerning some of its natural and artificial characteristics. The site is partly included in a protected area, and the various alternative states of its future condition proposed in the DCE are associated with an annual tax that is commensurate to the current public expenditure for protected areas in Italy. The saliency of the site comes from it being part of a protected area and, at the same time, of significant interest for anthropic activities that provide a rich supply of tourist services but that reduce the naturalness of the area and threaten its biodiversity. Under such conditions, the main concerns of the managing public authorities are about the trade-offs between broad policies, such as business development, where environmental regulations allow it, or the expansion of visitor services, versus re-naturalization or the more stringent protection of parts of the site. A priori, it is difficult to predict the types of preferences that respondents may have: in the context described, one could expect either a preference for human services due to a large effect from the self-selection of visitors preferring artificial services or a preference for ecosystem services due to the decreasing marginal utility for the touristic ones.

The paper is organized as follows. Section 2 reviews the literature and explains the contributions of the paper, Section 3 presents the case study of Montemarcello Magra, Section 4 describes the methodology, Section 5 shows the results, and, finally, Section 6 discuss policy implications and concludes.

2. Literature Review

Originally conceived for applications in more traditional markets, DCEs have since been applied to environmental management problems [4] and are now a standard approach for eliciting preferences and valuing benefits concerning ecosystems. While market research is concerned with products that might someday provide a measurable benefit to consumers in an actual market, environmental problems typically involve goods and services that might never enter a market despite being consumed and producing benefits. In both cases, though, the issue (and the opportunity provided by any stated preference method) is to make valuations possible in places where markets or prices do not exist yet. Furthermore, and unique to DCEs, is the property of highlighting the trade-offs between the attributes of environmental goods and the trade-offs between any such attribute and money. In early environmental applications of the DCEs, the marginal rates of substitution obtained by this experimental approach stood out as more general and externally valid than information that could be elicited through contingent valuation [5]. Such information as well as information on consumer surplus [6] and on the interaction between socio-economic characteristics of the respondents and preferences [7] represent attractive features of DCEs for the sake of environmental valuation.

Research on marine sites and their ecosystems is currently one of the fields that best reflects the interest in DCEs in environmental valuation. The most frequent applications of choice experiments to protected coastal and marine sites take one of the following two forms. Several works evaluate the benefits of activating or extending protected sites by eliciting the value of the environmental good that is under protection [8–12]. The scope of these works frequently leads to samples being identified off-site, from indistinct populations of users and non-users, such as all of the residents in a given area or all of the amateurs of certain recreational activities. In the same vein but with an even broader scope, some works use DCEs to ponder national or supra-national policies, such as the activation of an entire system of well-defined protected marine areas [13], the activation of protected marine areas in general [14] or, rather, the full spectrum of policies against sea warming and ocean acidification [15]. These works necessarily target a sample of the broadest population that is reachable by researchers. The second form taken by experiments on marine areas is that in which valuation efforts are focused on local management issues, and the aims of such studies are to inform management decisions [16–20], to assess public preferences for management regimes before establishing a protected area [21], or to increase awareness about the relationship between the management process and the value of the environmental good [22]. Given the local emphasis of these research designs, samples are carefully crafted among smaller relevant populations that have some strict relationship with the area under study.

While ecosystem-related attributes are typically included in DCEs throughout the mentioned literature (e.g., bathing water quality and clarity, biodiversity levels), tourist services are indirectly included in some DCE on marine sites, but their value is not elicited directly. This is largely due to the expectation that such value can be estimated using other methods that are only available for goods that are being exchanged in markets. Included in a DCE, such services can nonetheless still be valued, and although the estimate will suffer from the limitations of the experimental setting (most importantly, some degree of hypothetical bias), they will be more consistently comparable with the values of the ecosystem services that strictly require a DCE. For this reason, for the first time, we propose a DCE that includes the attributes that are associated with both marine ecosystem and human-made services to allow a comparison between them.

The comparison between the services produced by the economy and by ecosystems is relevant for several reasons. To begin with, it contributes to understanding how to classify nature-based tourism in the ecosystem services framework. Indeed, the existing and growing literature on ecosystem accounting has, so far, regarded tourism in three different ways: as a consumptive industry that does not benefit from the contributions of ecosystems, as an ecosystem service with some provisioning characteristics (involving material consumption), or, in most cases, as an immaterial cultural ecosystem service [23]. Eliciting the two components of value, i.e., ecosystemic and human-made, which are associated with a recreational activity, as in the case presented in this paper, can help shed light on this matter. Furthermore, observing the relationship between ecosystemic and human-made services is crucial for identifying potential trade-offs between biodiversity conservation and socio-economic objectives [24]; this is the case even more so because trade-offs may occur between bundles of services that are co-provisioned or co-dependent more than they occur between pairs of services [25]. Finally, explicitly and separately considering two categories of services is relevant for public participation and the dissemination of information [26], as they can be conceptualized more easily by the public than single specific services.

It should be noted that an approach that is strictly related to the one adopted in this paper was conceptualized in [27] and was later used for empirical research [21], although with two notable differences: the authors of those works look at the ratio between stock measures (natural capital and human-made capital), whereas our focus is on flow measures (the ratio of services from different sources); they were also interested in the enabling role that human-made capital has in turning potential service flows into actual service flows, while the tourist services discussed in this paper are not necessarily intended to play that role.

3. Case Study: Montemarcello Magra

The site of Montemarcello Magra (Figure 1) is located on the north-western coast of Italy (Tyrrhenian Sea), at the border of Liguria and Tuscany. It surrounds the mouth of the river Magra, forming a wide bay for a total span of about 3 Km. The eastern side of the coast consists of a strip of sandy beach equipped with a dozen of anti-erosion stone jetties. Most of the beach is occupied by public concessions to beach resorts that rent spots equipped with a parasol and a sunbed on the beach as well as dressing rooms, showers, and other amenities and parking lots on the backside of the beach. This part of the site is not subject to use restrictions and presents high levels of anthropization. The central and western parts of the coast consist, respectively, of the mouth of the river Magra, with its riverbed and riverbanks, and of cliffs and small beaches that can be only reached by sea or on foot. These areas are protected and fall within the boundaries of the Montemarcello Magra regional park. The regional park was established in 1995, with the aim of not only preserving the environment but of also restoring a balance between the natural environment and anthropic activity. Indeed, the area near the river mouth is characterized by a high level of artificiality, with limited vegetation and degraded habitats. Recently, the park proposed the relocation of (boating) economic activities for the subsequent environmental recovery of the riverbanks. As for what concerns the beaches in the protected area, access was recently reopened for a controlled number of 300 visitors per day after many years after access was forbidden due to the danger of potential landslides. For this reason, on this western side of the site, the landscape is still mostly natural, with only a few protected historical rural settlements.

Figure 1. The site of Montemarcello Magra.

Montemarcello Magra park also includes the hinterland with wetlands and green hills, and the managing authority of the park mainly conducts activities that are related to environmental education, research projects, and trail monitoring. A conservative estimate of the residents in the overall site area is around 2000, with arguably just as many accommodations for tourists.

Differently from other Ligurian marine protected areas, the park rules and regulations do not impose limitations on recreational or professional marine activities, such as boating, fishing, bathing, or scuba-diving. Based on these considerations, the main purpose of the DCE proposed in this study is to elicit beach visitors' preferences for ecosystem services and human-made services to propose nature-based options that pursue human wellbeing and local economic development through the sustainable management of marine ecosystems.

4. Methodology

4.1. Discrete Choice Experiments

DCEs, as defined by [28], first appeared in the market research literature and were aimed at studying consumer choices in actual or simulated markets. A DCE is essentially a structured method to generate data from stated consumer preferences regarding two or more discrete alternatives [29]. Each experiment consists of a hypothetical market constructed through a survey. Respondents face choice sets consisting of mutually exclusive and hypothetical alternatives and are asked to choose the one they prefer: since the alternatives are defined by a set of key attributes that take in several levels, every choice reflects implicit trade-offs between the attributes [30]. If relevant to the case under study, an alternative reflecting the status quo is included. The design of the experiment requires the respondent to decide if the respondents can be presented with all possible combinations of attributes and levels (full factorial design) or, typically, an efficient subset of those combinations (fractional factorial design) that allows reducing the number of combinations presented to the respondents while limiting the loss in the estimating power [6]. Then, making use of the conventional frameworks of random utility [31] and welfare theory, it is possible to estimate the parameters of the behavioral model that supposedly led to the stated choice. Usually, a cost variable is included in the list of attributes, and its coefficient can be interpreted as the marginal utility of income [7] and can thus be used to derive a willingness-to-pay for changes from the initial state for every attribute considered in the DCE [6].

4.2. Definition of the Attributes and Survey Design

The DCE was designed within the framework of the strategic cross-border project GIREPAM, financed by the European Fund for Regional Development, and launched in January 2017. The project was conceived to improve the governance of coastal and marine areas and to contribute to their preservation and valorization. It needed to fit in a pre-existing survey structure that would be administered every year in some of the Ligurian parks and marine protected areas, and it thus had to comply with some significant constraints. Indeed, the existing questionnaire already included 27 questions that are asked to visitors directly on the beach during the spring and summer months. After some pilot testing of various questionnaire formats, the research team determined that the only practicable option to introduce a DCE choice set in the existing survey without over-fatiguing the interviewee was to limit the experiment to one choice task per respondent. Given the relative complexity of a choice task compared to other parts of the questionnaire, the DCE was located early in the interview, immediately after questions concerning the demographic information of the respondent.

Table 1 reports a full description of the attributes and levels used in the choice sets, which were determined via focus groups with a team of ecologists and representatives from the management services of the protected area. As a general remark, the focus of the experiment concerns changing management policies that are unlikely to result in improvements or losses to the public good across all attributes. On the other hand, while public expenditure may increase or decrease under different management policies (hence, the presence of a cost attribute), a major aim of the experiment is to elicit preferences concerning likely trade-offs between non-monetary attributes, in the spirit of [29].

Furthermore, heterogeneous tastes can be expected such that, in a few cases, the polarity we gave to attributes is arbitrary, and the preferences that consumers had for them were unknown before the experiment. For instance, respondents might prefer marine sites that offer different amounts of commercial services (restaurants, shops, beach equipment rentals), depending on their taste for highly developed beach facilities versus preserved natural sites. Equivalently, they might prefer painstaking maintenance activities (along with their potential nuisance) or, rather, less restoration work. The payment vehicle identified for the experiment is a tax, and the levels were set around the current average cost of the system of protected areas in Italy per taxpayer (about EUR 3). Following this choice, only individuals paying taxes in Italy were interviewed. To mitigate the hypothetical bias, we opted to keep changes from the status-quo in the payment vehicle at plausible levels, as changes that were more drastic than ±33% would appear as quite unlikely.

Concerning the non-monetary attributes, the overall design of the choice set can be compared to that in [20]. Each level is described with a title and a short descriptive text to compound the readability and precision of information. A full description of the status-quo was chosen after the pre-tests demonstrated the more burdensome cognitive effort of a choice task without a described status-quo, which resulted in poor model fit. This is consistent with the prevailing approach in the literature [32].

Attribute levels were allocated via a D-efficient fractional factorial design to 81 choice sets consisting of a single choice task with two unlabeled alternatives (A and B) and the fully described labeled alternative corresponding to the status-quo (Current situation). The levels highlighted in grey in Table 1 represent the status-quo levels of the attributes of the site.

Table 1. Attributes and levels for the choice experiment.

Attribute	Level = 1	Level = 2	Level = 3
Water characteristics (Car)	**Low clarity** Diffused lather Visible seaweeds Floating material Pungent smell	**Medium/high clarity** Traces of lather Few seaweeds No floating material Rarely perceptible smell	**Excellent clarity** No lather No seaweed No floating material No perceptible smell
Richness of marine flora and fauna (Ric)	**Low richness** Rare presence of marine organisms	**High richness** Frequent presence of marine organisms	**Excellent richness** Remarkable presence of marine organisms
Changes to the landscape produced by man (Mod)	**Obvious changes:** Visible changes to the coast, historic buildings, and seabed	**Moderate changes:** Moderate changes to the coast No transformation in recent times to historic buildings Minimal changes to the seabed	**No changes:** No changes to the coast, historic buildings, and seabed
Maintenance work (Mai)	**Rare maintenance works** Occasional works on trails and beach	**Periodic maintenance works** Periodic works on trails and beach	**Frequent maintenance works** Frequent works on trails and beach
Crowding level (bathers and boats) (Cro)	**High crowding**	**Medium/high crowding**	**Low crowding**
Customer services (Ser)	**Numerous services** Many beach resorts, restaurants, shops	**Standard services** One beach resort, showers, toilets, rubbish bins	**Basic services** Showers, a toilet, rubbish bins
Annual tax (Tax)	**EUR 2**	**EUR 3**	**EUR 4**

Notes: Cells highlighted in grey represent the status-quo levels for each attribute. For each level, the title is bold.

The survey questionnaire was tested on a group of students from the faculty of Economics at the University of Genoa. Based on insights from these interviews, the questionnaire wording was modified to better deliver the description of the attributes. The final survey was conducted with face-to-face interviews with visitors directly on Montemarcello Magra (interviews were administered along the coast on both sides of the river Magra) coast between June and September 2018 by trained students coordinated with the help of a team of ecologists. Sample descriptive statistics are presented in Section 4.

4.3. Econometric Analysis of Choice Data

DCEs combine two distinct frameworks of positive theory. As in the characteristics theory of value [33], it is assumed that there is a functional relationship between the satisfaction (or utility) expected from something and the set of its observed attributes. As such, in front of a discrete choice between two alternatives, the decision-maker can be represented as actually choosing between two sets of attributes. This represents an extension of the standard (rational) choice behavior theory in economics, which is formally defined for the comparison of "whole" alternatives. Secondly, DCEs assume a functional relationship between the utility associated with an alternative and the probability that the alternative will be selected, following the random utility theory [31]. The relationship is modeled around what the researcher can observe and is defined stochastically because the researcher may be unable to track every factor contributing to a choice, as the full range of such factors is only known to the decision-maker. This also represents an extension (oriented to empirical testing) of the standard model of choice, which is deterministic and centered on the decision-maker. Both extensions are consistent with the standard choice theory ([7]), and respondents can be seen as utility maximizers that rationally pursue their satisfaction by carefully selecting among alternative options. In this paper, DCE data are analyzed using conditional logit, mixed logit, and latent class logit models. It is assumed that a respondent n choosing an option j out of a set of options $i = 1, \ldots, J$ gains utility

$$U_{nj} = \beta_n' x_{nj} + \varepsilon_{nj}, \tag{1}$$

where U_{nj} is the indirect utility of the respondent, x_{nj} is a vector of attribute levels of option j and the respondent characteristics, and β_n is the coefficient vector. The unobservable component ε_{nj} follows a type I extreme value distribution.

Mixed logit models allow for random taste variation across the population with respect to one or more parameters ([28]); thus, β_n varies with the respondent n. In conditional logit models, β_n is assumed to be fixed across respondents. If β_n is known, then the probability of the respondent n choosing i becomes

$$L_{ni}(\beta_n) = \frac{e^{\beta_n' x_{ni}}}{\sum_{j=1}^{J} e^{\beta_n' x_{nj}}}. \tag{2}$$

If β_n is unknown (with a density $f(\beta)$), then the unconditional choice probability becomes:

$$P_{ni} = \int \left(\frac{e^{\beta' x_{ni}}}{\sum_{j=1}^{J} e^{\beta' x_{nj}}} \right) f(\beta)\, d\beta, \tag{3}$$

which in this paper, is specified to be normally distributed. Latent class models allow the specification of a discrete rather than a mixing distribution of $f(\beta)$, which is the case if the respondents belong to a finite number of unobserved (latent) classes. Therefore, following [29], latent class logit models assume that if the respondents belong to a set of C different classes of preference parameters $\beta = (\beta_1, \beta_2, \ldots, \beta_C)$ and the population share of class c is specified as

$$\pi_{cn} = \frac{e^{s_n' \gamma_c}}{1 + \sum_{l=1}^{C} e^{s_n' \gamma_c}}, \tag{4}$$

where s_n' is a row vector of the respondent's characteristics, and γ_C is a column vector of the membership model coefficients for class c. The probability for respondent n belonging to class c of choosing i ([28]) thus becomes

$$P_{ni}(\beta_c) = \sum_{c=1}^{C} \pi_{cn} \frac{e^{\beta_c' x_{ni}}}{\sum_{j=1}^{J} e^{\beta_c' x_{nj}}}. \quad (5)$$

All of the models were estimated through maximum likelihood estimation and were fitted using Stata (ver. 15.0). For conditional logit models, the study uses the asclogit command, and the code used to estimate the conditional logit model is available on request (Stata versions from 16.0 onwards have a built-in estimation command *cmclogit* that can be used to replicate the same results). Mixed logit models are estimated with the user-written command *mixlogit* [34] and can also be replicated using the newer, built-in command *cmmixlogit*. The latent-class conditional logit model presented in this paper can be fit using the estimation command *lclogit* [35]. (A more recent version of the command, called lclogitml2 is available for later versions of Stata. The estimation of latent class models is the only procedure used in the paper that requires a significant input from the user, as the number of latent classes is (as is usually the case with latent classes in most statistical procedures) set manually, along with the (case-specific) variables on which class membership is estimated. The authors of the estimation command suggest, in great detail, a procedure to define the appropriate number of latent classes ([35]), and we followed their approach, obtaining two latent classes.)

The coefficient vector β represents the influence of the explanatory variables on the probability of choosing one of the offered alternatives. The coefficient of the cost variable β_{Tax} is interpreted as the marginal utility of income, and for linear utility specifications, the willingness-to-pay for attribute k can be expressed as

$$WTP_k = -\frac{\beta_k}{\beta_{Tax}}. \quad (6)$$

5. Results

5.1. Sample Characteristics

Table 2 shows the descriptive statistics of the sample. In total, 303 respondents completed the questionnaire. The average age was 44.93, and the sample included an almost equal number of males and females. The observed distance from respondents' residences is relatively low: most of the sample was composed of residents from one of the 16 municipalities that are part of Montemarcello Magra regional park. Both the level of income and education are rather modest, and frequent visitors to the site are largely prevalent. Perceptions in terms of satisfaction, wellbeing, and evaluation of environmental and landscape quality are also not particularly good, and the stated willingness to pay for protected areas in general is such that more respondents would pay less than the current cost of EUR 3 per taxpayer compared to the number of respondents who were willing to pay more than that.

Table 2. Individual level variables.

Variable	Description	Mean	CV
Age	Observed min = 14 max = 84	44.93	0.35
Sex	Female = 1	0.51	0.98
Distance from residence	Distance site-residence in Km	99.20	1.17
University degree (Edu_Uni)	Holds university degree	0.29	1.58
Income above EUR 50.000	Personal yearly income	0.06	3.73
Resident	Mutually exclusive with owner of holiday home and tourist	0.53	0.94
Owner of holiday home		0.12	2.63
Tourist		0.35	1.37
Previous visit at the site	At least one previous visit	0.83	0.45
Frequent visitor	Self-reports visits to site as frequent	0.68	0.69
Less than satisfied (Sat_MedLo)	Respondent's stated satisf. for the site is 2 or less on a 5-point scale	0.27	1.66

Table 2. *Cont.*

Variable	Description	Mean	CV
Feeling well	Respondent's wellbeing at the time of the interv. is perceived as good	0.59	0.83
Finds high envir. quality (QoE_H)	Perceived environmental quality of the site is 3 on a 3-point scale	0.18	2.15
Finds high landscape quality	Perceived quality of landscape at the site is 3 on a 3-point scale	0.41	1.19
Would pay EUR 5/Y or more for prot. areas	Annual tax considered as acceptable to finance Italian protected areas	0.39	1.26
Would pay EUR 2/Y or less for prot. areas		0.41	1.19
Quality of the interview above 7	Commitment and attention level of the respondent according to the interviewer is above 7 on a 10-point scale	0.70	0.65

Notes: Individual-level variables collected in the survey campaign, all in binary format (0/1) except age and distance from residence; sample size = 303.

5.2. Estimation Results

Table 3 reports the model estimates. (It should be noted that the estimates were also made separately for two subsamples, i.e., visitors interviewed on the east side and on the west side of the river Magra. Indeed, as explained in the case study description, these two parts of the coast have different environmental characteristics. Apart from an overall lower significance due to the reduced number of observations, the results of both estimations are consistent with the ones presented below in terms of coefficients and signs. To further confirm the robustness of our results, we also run the estimations presented in Table 3 while adding a dummy variable on the interview location, and the associated coefficient resulted in being non-significantly different from zero, confirming our previous finding.). We consider three conditional logit models (CL_1, CL_2, CL_3) with a progressively more complex specification: they include, from left to right, the alternative specific constant only, two case-specific variables, and three interaction terms. Then, a mixed logit model (MIX) was estimated by assuming continuous heterogeneity in the parameters for modifications (Mod) and crowding (Cro). The latent class logit model (LCL) was based on two classes built on sex, level of satisfaction (low), and holding a university degree. All of the models found the coefficients of water characteristics, the richness of marine flora and fauna, and crowding to be statistically significant and positive, although there is evidence both in MIX and in LCL that preferences on crowding levels may be heterogeneous. Under the hypothesis of preference heterogeneity, modifications are also statistically significant, at least for a latent class of users who are strongly averse to human-made changes on the landscape. Finally, the payment vehicle (tax) is statistically significant and negative in most cases, but there are hints that at least one (latent) class of individuals may be less sensitive than expected to the price.

A cross-comparison of CL_3, MIX, and LCL suggests greater sensitivity to price for women. All of the models except for LCL suggest a substantial bias against the status quo, as the constant from the conditional models is statistically significant and positive, and the SQ term is significant and negative in MIX. This suggests that there is a considerable inclination of the sample to support management plans that imply change and intervention. The respondent's perceptions regarding the quality of the environment and the respondent's gender may have a role in the prevailing dislike for the status quo: women are estimated to prefer change more than men, and the small group of respondents that have a very good perception of the current state of the environment (QoE_Hi) is instead much less hostile to the status quo. The ranking of attributes in our sample's preferences is largely consistent across model specifications: the water characteristics are given slight priority over the richness of the marine flora and fauna, whereas the preferences for no anthropic modifications of the landscape, if significant, are well below in the ranking and above services that do not seem to affect choices. Crowding is the only attribute of uncertain positioning in the ranking, as the assumption of preference heterogeneity makes it the most impactful attribute in MIX and for one latent class in LCL.

Estimates of willingness-to-pay for the site of Montemarcello Magra are reported in Table 4, along with the lower and upper limits of the .95 confidence interval. Unit improvements in the level of environmental attributes are "bought" up to price levels that are close or even above in some cases to the current overall public expenditure per taxpayer dedicated to protected areas. Therefore, at least for a sample made of users of the site of Montemarcello Magra, the current state of things corresponds to an underprovision of ecosystem services.

Table 3. Models for the site of Montemarcello.

Variable	CL_1	CL_2	CL_3	MIX	LCL	
					Class 1	Class 2
Car	0.669 *** (0.103)	0.671 *** (0.104)	0.690 *** (0.107)	0.848 *** (0.157)	0.711 *** (0.229)	1.352 *** (0.385)
Ric	0.517 *** (0.105)	0.521 *** (0.105)	0.543 *** (0.108)	0.626 *** (0.146)	0.621 ** (0.308)	1.242 ** (0.626)
Mod	0.167 (0.112)	0.159 (0.113)	0.172 (0.116)	0.273 (0.172)	−0.568 (0.363)	1.941 ** (0.976)
Mod (SD)				0.956 ** (0.428)		
Mai	0.012 (0.091)	0.010 (0.091)	0.025 (0.094)	0.026 (0.116)	0.056 (0.195)	−0.030 (0.336)
Cro	0.354 ** (0.169)	0.353 ** (0.169)	−0.169 (0.254)	0.866 ** (0.440)	1.320 ** (0.673)	−0.851 (0.587)
Cro (SD)				1.285 ** (0.574)		
Ser	0.118 (0.112)	0.123 (0.113)	0.111 (0.115)	0.133 (0.137)	0.443 (0.320)	−0.295 (0.392)
Tax	−0.225 ** (0.099)	−0.226 ** (0.100)	0.018 (0.142)	0.088 (0.173)	0.384 (0.332)	−1.637 *** (0.615)
Cro*Sex			0.581 ** (0.292)			
Cro*Sat_MedLo			0.733 ** (0.371)			
Tax*Sex			−0.513 ** (0.206)	−0.73 *** (0.281)		
SQ				−1.247 ** (0.509)	−0.739 (0.796)	0.461 (1.465)
Sex		0.976 * (0.557)			−0.688 (0.498)	
QoE_H		−1.425 *** (0.531)	−1.235 ** (0.533)			
Sat_MedLo					1.203 * (0.662)	
Edu_Uni					−1.333 ** (0.646)	
_cons	0.905 ** (0.372)	0.89805 ** (0.451)	1.344 *** (0.439)		0.600 (0.554)	
N	303	303	303	303	303	
AIC	458.330	452.768	445.031	452.371	450.547	
BIC	496.828	500.891	502.780	505.306	546.794	
k	9	13	14	11		
Ll	-2.21×10^2	-2.16×10^2	-2.11×10^2	-2.15×10^2	-2.50×10^2	

Notes: For a complete description of the attributes see Tables 1 and 2. In the mixed logit model, Mod(SD) and Car(SD) indicate estimated standard deviations of the parameters Mod and Car under the assumption of the parameter being random Gaussian-distributed in the population. AIC and BIC indicate the Akaike information criterion and Bayesian information criterion, which provide an intuition of the loss of information as the number of estimated parameters k decreases; AIC and BIC values that are close to 0 indicate a better balance between goodness of fit and risk of overfitting. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4. Willingness-to-pay (WTP).

			CL_1			
WTP	**Car**	**Ric**	**Mod**	**Mai**	**Cro**	**Ser**
WTP	3.124	2.415	0.780	0.133	1.590	0.488
ll	0.200	0.001	−0.509	−0.716	−0.543	−0.662
ul	6.047	4.828	2.068	0.981	3.723	1.639
			CL_2			
WTP	**Car**	**Ric**	**Mod**	**Mai**	**Cro**	**Ser**
WTP	3.127	2.431	0.743	0.123	1.582	0.514
ll	0.195	−0.002	−0.527	−0.724	−0.549	−0.647
ul	6.059	4.864	2.013	0.971	3.711	1.674
			LCL (Class 2)			
WTP	**Car**	**Ric**	**Mod**	**Mai**	**Cro**	**Ser**
WTP	0.826	0.759	1.186	−0.018	−0.520	−0.180
ll	0.256	0.176	1.186	−0.018	−0.520	−0.180
ul	1.395	1.342	1.891	0.383	0.120	0.335

Notes: estimated willingness to pay (in EUR) for a unit increase in the value of each attribute, along with the lower limit (ll) and upper limit (ul) of the 95% confidence interval in models CL_1 and CL_2 and for Class 2 of model LCL.

The average coefficient for the ecosystem-related services (Car, Ric) and human services (Mai, Ser) based on model CL_1 is displayed in Table 5. To facilitate the interpretation, we inverted the polarity of Ser, changing the sign of its coefficient so that, only in Table 5, the coefficient refers to an increase in the number of services. It is also worth the reminder that coefficients can be interpreted as the marginal utility of each attribute at the attribute's current level. Notably, the average coefficient for human-made services is close to zero and negative, meaning that, in case of further increases, the effect on utility would be none and more similar to that of a bad economic situation than it would be to a good economic situation. The marginal rate of substitution (MRS) between the two groups can be interpreted as the number of ecosystem services that users are willing to surrender in exchange for an increase in human-made services. As a consequence of the negative coefficient of the latter, we can determine the respondents in our sample are willing to accept a unit increase in human-made services as long as the ecosystem services are also increased by 0.089.

Table 5. Average MRS between ecosystem-related and human-related attributes.

Ecosystem services (β_e)	0.593
Human services (β_h)	−0.053
MRS ($\frac{\beta_h}{\beta_e}$)	−0.089

6. Discussion and Conclusions

This work reports the results of a DCE conducted in a partially protected marine site along the north-western coast of Italy. Respondents were randomly sampled out of the population of users in the spring and summer of 2018. The DCE concerned the future management policies of the site but was built around the intent to contrast preferences for human-made services with those for a range of ecosystem services that experts indicated as being likely to be relevant for the recreational use of a marine site. This work aimed to investigate the relative importance of each type of service while keeping track of two mechanisms that are hypothetically at play and that potentially lead the results in two opposite directions at the same time. On one hand, in a site where anthropic pressure is significant and where many commercial services for tourists are available, the marginal utility of additional ecosystem services could be comparatively high. Conversely, users of a site where the anthropic impact has been intense may be self-selected as a group favoring commercial services for tourists over ecosystem services. In our results, the respondents displayed a preference for ecosystem services that is consistent across model specifications and that is focused on two specific attributes: clean and transparent water and rich marine flora and fauna. Estimates also indicate a preference for the limited crowding of the site, which, although not directly related to an ecosystem, reinforces the notion that the wellbeing of the respondents would be, on average, better supported under a management regime that is less oriented towards recreational activities that are based on a large volume of visitors. The respondents consistently ignored all of the opportunities presented in the survey to choose more human and tourist services, even those including maintenance. Although the estimates leave room for assuming some heterogeneity in the preferences, we can conclude that the current characteristics of the site do not predict the management preferences of its users and that the measurement of welfare associated with different characteristics of the site is strictly required to design management policies that maximize wellbeing. Notably, the sample did not express a substantial demand for reduced tourist services or the removal of the anthropic footprint from the landscape of the site even though they could. This is a further indication that the management policy of the site with the best chance of maximizing the wellbeing of users encompasses a balancing between services of different kinds, within the framework of existing mandates and regulations.

These findings allow us to fine-tune the nature-based strategy at the base of the protected area. To ensure the preservation of the marine ecosystem and its services and, simultaneously, to pursue human wellbeing, informed management solutions need to be conducted by the managing authority of the site. The results of the DCE are in line with the intentions declared by regional park management: visitors would be willing to pay for increased ecosystem services but are not interested in a decrease in the presence of anthropic activities and services. The current level of tourist infrastructures, even considering its impact on the natural landscape, is well-tolerated overall. In this sense, in the context of their natural-based ecosystem conservation approach, the park authorities of Montemarcello Magra could prioritize actions such as limiting and regulating access to motor boats, professional and recreational fishing, and scuba diving; promoting best practices to reduce plastic waste; increasing ecological education and public awareness on anthropic pressures and ecosystem benefits in marine environments; and facilitating and supporting scientific research activities on local wild flora and fauna.

As a case study, this paper does not have an explicit aim of generalizability and should rather be intended as a proof of concept. To identify the sustainable managing decisions for overprotected or partially protected areas that should be prioritized to provide both human wellbeing and biodiversity benefits—such as for the definition of nature-based strategies—management authorities should investigate visitor preferences over the salient attributes of the site, which can be associated with both natural and human services. The DCE approach and the reference to ecosystem services made in this paper imply that our results have some specific specifications. First of all, adopting the concept of ecosystem services means that the valuation assumes an anthropocentric and instrumental interpretation of value: ecosystem services exist insofar as a human beneficiary of the service exists. As such, if any source of value outside of anthropocentric and instrumental value can be defined and measured and if it is considered relevant, then our approach will be unable to capture it. Secondly, the valuation proposed here is not (and does not aim to be) a full valuation of all the ecosystem services provided by the ecosystems located around the site. That would require considering a much longer list of services and a variety of methods that may be more appropriate to certain specific ecosystem services. Finally, DCEs require the identification of a relevant population, where relevance depends on who is likely to be affected by the alternatives presented in the experiment. Our comparison between certain ecosystem services and some tourist services was focused on use values, for which the identification of a relevant population is relatively straightforward. However, the same approach aimed at non-use values would arguably imply a larger target population and would raise the question if there is any (spatial) threshold beyond which non-use value only makes sense for a class of sites rather than for one specific site.

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