Animal Conservation

ZSL LIVING CONSERVATION

Animal Conservation. Print ISSN 1367-9430

Understanding heterogeneous preference of tourists for big game species: implications for conservation and management

E. Di Minin[1,2], I. Fraser[3,4], R. Slotow[5] & D. C. MacMillan[1]

1 Durrell Institute of Conservation and Ecology, School of Anthropology and Conservation, University of Kent, Canterbury, UK
2 Finnish Centre of Excellence in Metapopulation Biology, Department of Biosciences, University of Helsinki, Finland
3 School of Economics, University of Kent, Canterbury, UK
4 School of Economics, La Trobe University, Melbourne, Vic., Australia
5 Amarula Elephant Research Programme, School of Life Sciences, University of KwaZulu-Natal, Durban, South Africa

Keywords
Big Five; charismatic; choice experiment; latent class model; marketing; nature-based tourism; segment.

Correspondence
Enrico Di Minin. Current address: Finnish Centre of Excellence in Metapopulation Biology, Department of Biosciences, PO Box 65, FI-00014 University of Helsinki, Finland.
Email: enrico.di.minin@helsinki.fi

Editor: Iain Gordon
Associate Editor: Nick Hanley

Received 17 February 2012; accepted 20 August 2012

doi:10.1111/j.1469-1795.2012.00595.x

Abstract

The 'Big Five' charismatic megafauna concept is considered key for financial competitiveness of protected areas in South Africa. However, this Western colonial concept is also leading to an underappreciation of wider biodiversity and the recovery of other endangered species. This study assessed the heterogeneity of tourist preferences for big game species in KwaZulu-Natal, South Africa, using a choice experiment approach, employing latent class modelling, in order to identify tourists' segments not necessarily drawn to the Big Five. The latent class segmentation identified two segments for both international and national tourists, largely defined by socio-economic characteristics. Less experienced and wealthier tourists were mostly interested in charismatic megafauna, while more experienced, but lower income tourists showed preferences for a broader range of species. Exploring viewing preferences in this way illustrates the potential to realign conservation businesses to achieve biodiversity conservation objectives. In the short term, managing protected areas for the Big Five and other favourite species will continue to deliver significant financial benefits to local stakeholders, but policy makers should consider using financial mechanisms to subsidize conservation actions for less charismatic species and develop the biodiversity base of safari tourism in South Africa.

Introduction

The debate over the role of ecotourism in biodiversity conservation is ongoing (Balmford *et al*., 2009). Supporters believe non-consumptive use is a powerful tool that can support biodiversity conservation by generating important economic benefits for local people with whom biodiversity coexists (Krüger, 2005). This is particularly so for poor local communities in developing, biodiversity-rich, countries (Kiss, 2004). Detractors argue that ecotourism adds little to local livelihoods (Bookbinder *et al*., 1998; Sandbrook, 2010), and that tourists are mostly interested in charismatic species, leading to an underappreciation of other biodiversity (Goodwin & Leader-Williams, 2000; Kerley, Geach & Vial, 2003). Charismatic species are thought to be a primary motivator for tourist decision-making, and the key factor to financial competitiveness for protected areas (PAs) (Goodwin & Leader-Williams, 2000; Krüger, 2005). Species popularity, driven by factors such as the publicity that the species has enjoyed in the media, physical attractiveness, size, and conservation status, with rare and endangered species holding special appeal, are considered the two most important factors affecting tourists' experience (Reynolds & Braithwaite, 2001).

The 'Big Five' are the 'holy grail' of the nature-based tourism industry in sub-Saharan Africa (Goodwin & Leader-Williams, 2000), and supposedly the most important flagship species for conservation (Williams, Burgess & Rahbek, 2000). Originally, this term was coined by big game hunters to refer to the five most dangerous species to hunt on foot in the African savannah (Mellon, 1975). In reality the Big Five consists of six species, namely lion *Panthera leo*, leopard *Panthera pardus*, elephant *Loxodonta africana*, buffalo *Syncerus caffer*, black rhino *Diceros bicornis* and white rhino *Ceratotherium simum* (Williams *et al*., 2000). In South Africa (Goodwin & Leader-Williams, 2000), where PAs, especially private game reserves, are being run as conservation businesses to maximize economic return and provide local stakeholders with economic incentives (Lindberg, James & Goodman, 2003), the Big Five are a key

marketing strategy (Scholes & Biggs, 2004). Although research has shown how other species may be in demand (see, e.g. Kerley *et al.*, 2003; Lindsey *et al.*, 2005, 2007; Gusset *et al.*, 2008), the economic benefits of other species coexisting within PAs have not been studied (see, e.g. Kerley *et al.*, 2003; Lindsey *et al.*, 2007).

This study used a choice experiment (CE) approach to understand heterogeneous preferences of tourists for big game experiences, as an alternative to the Big Five in the South African province of KwaZulu-Natal. Specifically, we were interested in understanding whether tourists' heterogeneous preferences were in conflict, or could support ongoing conservation initiatives of restoring viable populations of charismatic megafauna in the study area. Specific objectives of the study were: (1) to investigate tourists' heterogeneous preference for increases in population levels from individuals to breeding groups; (2) to provide conservation and management recommendations. CEs, a form of stated preference methods, are becoming a popular means of environmental valuation that involves eliciting responses from individuals in constructed, hypothetical markets (Hanley, Wright & Adamowicz, 1998). Environmental goods are valued in terms of their attributes, by applying probabilistic models to choices between different bundles of attributes (Adamowicz *et al.*, 1998). By making one of these attributes a price or cost term, marginal utility estimates can be converted into willingness to pay (WTP) estimates for changes in attribute levels, and welfare estimates obtained for combinations of attribute changes (Boxall *et al.*, 1996). CEs have been used with success in biodiversity-rich countries to evaluate the use benefits from ecotourism before (see, e.g. Hearne & Salinas, 2002; Naidoo & Adamowicz, 2005; Bush, Colombo & Hanley, 2009). To account for heterogeneity in the population sampled we used latent class modelling (Boxall & Adamowicz, 2002). Finally, we decided not to use a revealed preference method because many of the PAs in the study area did not have data that would allow for the implementation of such method.

Methods

Study area and species

The KwaZulu-Natal province of South Africa (92 000 km^2) forms the central component of the Maputaland-Pondoland-Albany biodiversity hotspot (Steenkamp *et al.*, 2004). KwaZulu-Natal is home to the oldest PA in Africa, namely the Hluhluwe-iMfolozi Park, established in 1895, and the centre of a thriving game ranching industry based on consumptive and non-consumptive nature-based tourism (Aylward & Lutz, 2003). Ezemvelo KwaZulu-Natal Wildlife, a parastatal organization, is responsible for biodiversity conservation and management in the area (Goodman, 2003) (Fig. 1).

Our research focused on eight species with varying degrees of conservation status and economic potential, including the original Big Five. The IUCN Red List threat status of the study species varies as follows: black rhinoceros are classified as Critically Endangered; African wild dog *Lycaon pictus* as Endangered; lion, cheetah *Acynonix jubatus* and elephant as Vulnerable; leopard and white rhino as Near Threatened; and buffalo as of least concern (IUCN, 2008). In South Africa, under the Threatened or Protected Species List, black rhino and African wild dog are classified as Endangered; cheetah, leopard and lion as Vulnerable;

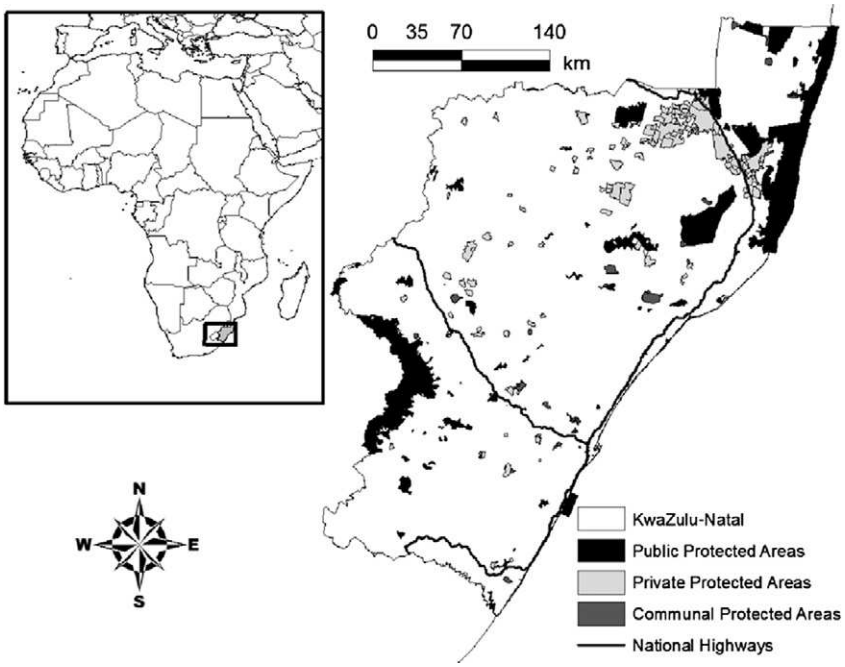

Figure 1 Map of KwaZulu-Natal showing public, private and communal protected areas.

and buffalo, elephant and white rhino as Protected Species (DEAT, 2007).

The CE

Following extensive focus group discussions and according to the specific objectives of this study, the choice attributes included in the design were species, the number of PAs required to visit to see the preferred species combination and cost. Each study species was included as an attribute with three different levels (absent, individual and group) (Table 1). Instead of selecting absent and present levels only, we decided to split up the present level into 'individual' and 'group' levels because we wanted to understand whether respondents had definite preferences regarding specific characteristics (e.g. male adult lion against pride with cubs, etc.) for each species (Table 1). We did so to understand the marginal benefits of increasing population levels from individuals to breeding groups for both common and rare species. The species attributes and their corresponding levels were included in the CE as pictures (see supporting information Fig. S1). Each chosen picture was also tested for clarity, simplicity and bias in a focus group comprising 20 participants. The other chosen attribute was number of PAs required to visit to see the species combination (1 PA, 3 PAs and 5 PAs). We wanted to test whether tourists would prefer seeing all of their favourite species in the same PA rather than having to visit several. This attribute was also used as a proxy for time. Finally, there was a cost attribute with five levels, which covered a realistic range of additional cost to be paid as higher entrance fees and accommodation charges (Aylward & Lutz, 2003). We decided to focus on both accommodation charges and entrance fees together because we sampled both overnight visitors (not required to pay the entrance fee) and day visitors (required to pay the entrance fee). For foreign tourists this was an additional cost to the current costs, while for South African residents this was the total additional cost per year. Because of space and

Table 1 Attributes and corresponding levels used in the choice experiment. For foreign tourists cost was additional to the overall safari, while for South African cost was the total additional cost per year for visiting protected areas

Attribute	Level
Lion	Absent; adult male; pride with cubs
Leopard	Absent; adult male; mother with cub
Cheetah	Absent; adult male; mother with cubs
African wild dog	Absent; individual; pack
Black rhino	Absent; adult male; mother with calf
White rhino	Absent; adult male; mother with calf
Elephant	Absent; adult male; herd with calves
Buffalo	Absent; individual; herd with calves
Number of reserves to visit	1; 3; 5
Cost (US$)	12; 25; 50; 75; 150
Socio-economic variables	Description
Gender	Male, Female
Age	18–30, 31–40, 41–50, 51–65, > 65
Education	Secondary school or less, tertiary diploma, bachelor's degree, postgraduate diploma, master's or PhD, other
Country of residence	Open question
Racial background (South Africans only)	White, non-white (black, Indian, mixed)
Province (South Africans only)	Open question
People in group	1, 2, 3, 4, > 5
Adults	1, 2, 3, 4, > 5
Children	0, 1, 2, 3, > 4
Income (US$)	Less than 10 000, 10 000–20 000, 20 000–30 000, 30 000–40 000, > 40 000
Specific interest for	Charismatic megafauna, other biodiversity (birds, amphibians, reptiles, insects, landscape, etc.) landscape/vegetation
Donation to environmental organizations (US$)	0–50, 50–100, 100–150, 150–200, > 200
Safari before	Yes, No
Number of times visited protected areas	1, 2–3, 3–5, 5–10, > 10
Protected area location	KwaZulu-Natal, South Africa, Swaziland, Mozambique, Rest of Africa
Trip costs (US$)	500, 500–1000, 1000–2000, 2000–3000, 3000–4000, > 4000
Days on holiday	Open question
Days visiting protected areas	Open question
Number of times seen each species before	Open question
Other species you would like to see excluding study species	Open question
Species you would like to see including study species	Open question
Favourite species	Open question

complexity constraints we had to limit the selection to only a few of the many possible attributes. For instance, lodging quality could have been included as an attribute as in previous CEs (Naidoo & Adamowicz, 2005). However, we felt this attribute was less important for national tourists (Aylward & Lutz, 2003). Besides, the main focus of the study was to understand the demand for species and specific characteristics to inform conservation and management initiatives, rather than addressing broader tourism preferences. Finally, choices could have also been framed around increasing the probabilities of encountering certain species or groups (e.g. mother and cub), as a result of visiting additional PAs. However, we had insufficient scientific information to include this issue within the CE.

Survey design

The survey consisted of: (1) an introductory text explaining why the research was conducted; (2) the choice task; (3) the personal socio-economic and demographic characteristics and related biodiversity activities and interests. The introductory text was written in a colloquial style so as to be accessible to respondents of all backgrounds and levels of knowledge of the English language. It was also kept as short as possible since long introductions would be expected to create respondent fatigue, and perhaps diminish the level of cooperation. The choice cards (26 in total), comprising the species attributes and levels defined above, were obtained following Street, Burgess & Louviere (2005). Each choice task included 13 cards, considered to be the maximum number that would avoid respondent fatigue. Each choice card included three potential choices (Safari A, Safari B and Neither) (see supporting information Fig. S1). The Neither' option meant respondents would have rather kept things as they were and not paid anything extra.

In order to obtain a socio-economic profile of respondents, several socio-economic variables were also collected (Table 1). The objective of these variables was to understand if, and how, the socio-economic profile influenced choices and the drivers of these choices. Besides selecting socio-economic variables commonly used in such surveys, we decided to include a question on tourists' specific interest for biodiversity experiences. The purpose of this question was to understand whether respondents had a clear preference for charismatic megafauna or were also interested in other biodiversity. Partly because of the complexity of the term biodiversity for the general public (Christie *et al.*, 2006), respondents were provided with several options, including birds, amphibians, plants, insects, the scenery, as well as the option of writing something else. The respondents were also asked whether they had a favourite species; if they particularly liked to see other species that were not part of the CE; and if they had a species that they had not yet seen, but would especially like to see. Additional information on data collection is provided in Appendix S1.

Latent class modelling

Latent class modelling is generally recognized as one of the best methods to partition the sampled population into relatively homogeneous segments (see, e.g. Boxall & Adamowicz, 2002; Jacobsen, Lundhede & Thorsen, 2012). Its underlying theory postulates that individual behaviour depends on observable attributes and latent heterogeneity that varies with factors that are unobserved by the analyst (Swait, 1994; Greene & Hensher, 2003). Compared with the mixed logit model, the latent class model (LCM) relaxes its requirement that the analyst makes specific assumptions about the distributions of parameters across individuals (Boxall & Adamowicz, 2002; Greene & Hensher, 2003). Here we used LIMDEP NLOGIT 4.0 (Econometric Software, Inc., Plainview, NY, USA; Greene, 2007) to estimate the LCM. Specifically, the analysis assessed simultaneously the influence of individual characteristics, motivational aspects and choice-based attributes in the estimation of latent segments (see model specification in Appendix S1 for more details). As the Neither responses comprised only the 0.5% of the total dataset, the associated respondents were removed from the analysis [while recognizing that the Neither choice is often legitimate (Hanley, Wright & Alvarez-Farizo, 2006) they were conservatively discarded as protest bids]. The attribute specific WTP estimates were estimated as follows:

$$WTP_n = -\sum_{s=1}^{S} p_{ns} \cdot \left(\frac{\beta_{as}}{\beta_{ps}} \right) \quad (1)$$

where β_{as} is a segment-specific non-monetary coefficient and β_{ps} is the segment-specific monetary coefficient on cost (Louviere, Hensher & Swait, 2000). As WTP estimates are ratios of sums of parameters they are complex non-linear functions of the estimated parameters. Thus, the corresponding standard errors were calculated using the Krinsky–Robb method (Krinsky & Robb, 1986). Specifically, 1000 observations were drawn from a multivariate normal distribution parameterized by using the coefficients and variance terms estimated by the LCM.

Results

Descriptive statistics

In total 545 surveys were administered, of which 26 were discarded because responses were incomplete. More tourists were interviewed in the Hluhluwe-iMfolozi Park (65.5%) compared with the iSimangaliso Wetland Park (34.5%) because of higher number of tourists visiting the former (Aylward & Lutz, 2003). Foreign tourists represented 58.4% of the sample, and originated from 36 different countries, while domestic tourists were from seven different provinces in South Africa. Furthermore, 85% of domestic tourists were from a white background and 15% from a non-white background (9% from an Indian ethnic background and 6% from a black ethnic background). The sample was

composed of 58.9% males and 41.1% females, with an average age of 34 years for international tourists and 58 years for domestic tourists. The level of education was very high, where more than 60% of international tourists had a bachelor degree or higher and 60% of domestic tourists had gone to college or had a bachelor's degree.

Annual income was significantly higher for international than national respondents [t(545) = 21.467; $P = 0.0001$] with an average of more than US$39 000 per person per year compared with an average of US$28 000 per person per year for domestic. The trip costs were higher for international tourists [t(545) = 69.706; $P = 0.0001$] with an average cost of more than US$3000 compared with an average of less than US$500 for domestic. International tourists also spent more time on holiday compared with domestic who generally spent just a few days visiting PAs. Annual donations to conservation causes were higher for international tourists [t(545) = 69.706; $P = 0.0001$] with an average of more than US$70, compared with an average of US$63 for domestic.

For international tourists, 44.9% of the sample found charismatic megafauna to be of most interest, 41.7% other biodiversity or the scenery, and 13.4% birds. For national tourists, 43.4% of the sample found other biodiversity and the scenery to be of most interest, 30.6% charismatic megafauna and 26.0% birds. Lion, leopard, cheetah and elephant were clearly the favourite species for both international and national tourists (Fig. 2a, b). The three big cat species (lion, leopard and cheetah), in particular, were the most sought-after species by respondents. Interestingly, African wild dog ranked fourth for both international and national tourists among species they had not yet seen, but would particularly like to see. Additional results are provided in Appendix S1.

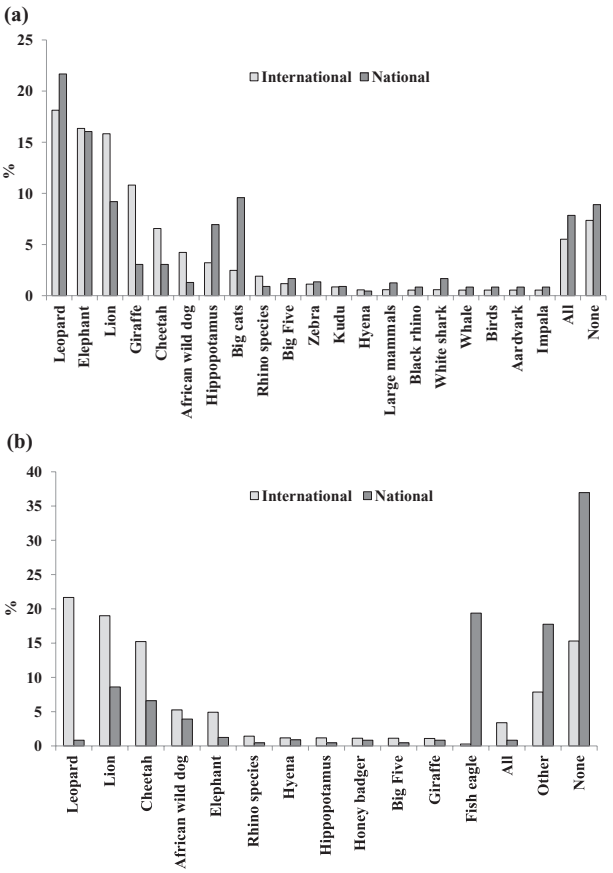

Figure 2 Favourite species (a), and species yet not seen but would particularly like to see (b) for national and international tourists. Scientific names for each species are provided in supporting information Table S1, Appendix S1.

LCM

Initial estimation of the LCM required an analysis of alternative number of segments. The analysis revealed the optimal number was two for both international and national tourists, as the increase in segments did not improve model fit significantly (Table 2). Segment membership was explained by the various socio-economic variables. Those that had a statistical significant predictive influence over segment membership are presented in Table 2. For international tourists, the first segment (31.1% of the sample), called 'experts on a budget' (I*ex* hereafter), was composed of significantly younger, but more experienced, PA visitors with lower income than average, who were travelling for longer and in smaller groups, and paid less than the average for their trip. I*ex* were attracted primarily by large carnivores (lion, leopard, cheetah and African wild dog) and elephant, but also had a specific interest for other biodiversity. The second segment (68.9% of the international sample), called 'safari novices' (I*nov* hereafter), was composed of significantly older visitors with higher income and travelling in bigger groups than the average, who paid more for their safari, and were mainly interested in seeing lion, leopard, cheetah, elephant, and white and black rhino. For nationals, the first segment (34.4% of the sample), called 'biodiversity experts' (N*ex* hereafter), was composed of significantly older and more experienced visitors to PAs from a white background with lower income than the average, who had seen both leopard and black rhino fewer times compared with the other study species, and with a specific interest for broader biodiversity. The second segment (65.6% of the national sample), called 'big game novices' (N*nov* hereafter), was composed of younger and less experienced visitors with higher income than the average who had clear preference for charismatic megafauna, including both popular (elephant, lion and white rhino), and rare/threatened (African wild dog, black rhino, cheetah and leopard) species. The other important difference between the 'experts' and the 'novices' for both international and domestic tourists was the strong aversion of the latter segment to visit more than one PA to see their favourite species (Table 2).

Specific characteristics for each species were found to drive tourists' preference in each segment. Adult male lion, for instance, was preferred by all segments to the lion pride level. The same happened for cheetah with I*ex*, I*nov* and N*no*v preferring adult male to the mother with cubs' level.

Table 2 Latent class model parameters for each recognized segment of international and national tourists visiting the Hluhluwe-iMfolozi and iSimangaliso Wetland Parks. The top block of the table shows the estimated parameters of the segment-specific utility functions, while the bottom block shows the corresponding parameters for the segment membership functions. The parameters for the segment membership functions of I*nov* and N*nov* are normalized to zero. Standard errors are in parentheses

	International		National	
	I*ex*	I*nov*	N*ex*	N*nov*
Lion adult male	0.856 (0.281)**	1.219 (0.079)***	0.950 (316)*	0.743 (0.083)***
Lion pride with cubs	0.565 (0.219)**	0.838 (0.069)***	0.898 (0.313)*	479 (0.075)***0.
Leopard adult male	1.124 (0.208)***	0.577 (0.074)***	1.293 (0.257)***	0.556 (0.079)***
Leopard mother with cub	1.572 (0.290)***	0.712 (0.078)***	1.241 (0.371)**	0.724 (079)***
Cheetah male	0.814 (0.261)**	0.860 (0.071)***	0.358 (0.295)	0.536 (0.074)***
Cheetah mother with cubs	0.400 (0.296)*	0.629 (0.093)***	0.421 (0.342)	0.219 (0.097)
African wild dog individual	0.861 (0.348)	–0.777 (0.103)***	0.215 (0.352)	–0.099 (0.093)
African wild dog pack	0.679 (0.129)**	0.036 (0.087)	0.706 (0.366)	0.315 (0.092)**
Black rhino adult male	–0.095 (0.244)	0.616 (0.076)***	0.564 (0.262)*	0.131 (0.075)
Black rhino mother with calf	0.330 (0.227)	–0.200 (0.100)	–0.039 (0.345)	0.101 (0.094)***
White rhino adult male	1.019 (0.339)	–0.098 (0.103)	–0.078(0.485)	0.367 (0.106)***
White rhino mother with calf	–0.031 (0.300)	0.456 (0.111)***	–0.321 (0.434)	0.411 (0.097)***
Elephant adult male	0.655 (0.220)**	1.260 (0.084)***	0.355 (0.297)	0.594 (0.079)***
Elephant herd with calves	1.077 (0.315)**	0.854 (0.082)***	0.806 (0.371)	0.587 (0.081)***
Buffalo individual	–0.491 (0.288)	0.217 (0.078)**	–0.223 (0.323)	0.194 (0.085)
Buffalo herd with calves	0.493 (0.304)	–0.357 (0.077)	0.227 (0.343)	–0.133 (0.084)
Protected areas to visit	0.122 (0.077)**	–0.139 (0.022)***	0.232 (0.176)**	–0.265 (0.046)***
Cost	–0.024 (0.003)***	–0.010 (0.001)***	–0.039 (0.004)***	–0.006 (0.001)**
Racial background	–	–	–0.300**	–
Age	–0.248 (0.067)**	–	0.344 (0.121)**	–
People in the group	–0.435 (0.137)**	–	–0.144 (0.274)	–
Income	–0.178 (0.031)*	–	–0.200 (0.096)*	–
Trip costs	–0.103 (0.001)**	–	0.248 (0.001)	–
Days on holiday	0.348 (0.054)*	–	–0.321 (0.014)	–
Time visited protected areas	0.180 (0.014)*	–	0.788 (0.398)*	–
Interest for other biodiversity	0.126 (0.033)*	–	0.137 (0.074)*	–
Time seen leopard	0.004 (0.014)	–	–0.587 (255)*	–
Time seen black rhino	–0.003 (0.001)	–	–0.838 (0.378)*	–
Latent class probabilities	0.311	0.689	0.344	0.656
No. of observations	3939		2808	
Log likelihood	–2157.658		–1499.425	
ρ^2	0.1541190		0.1752907	

***(**)*show significance at 1(5)10 % level within each segment.

The opposite was true for leopard, with mother with cub being preferred to adult male; only N*ex* preferred the opposite. Individual male elephant was preferred by both I*nov* and N*nov* to the herd with calves level, but the opposite was true for I*ex*. Both of the segments that preferred African wild dog had a strong aversion for the individual, preferring the pack. I*nov* and N*ex* preferred mother with calf to the individual for white rhino, while for black rhino the former preferred adult male while the latter preferred mother with calf.

Marginal prices for attributes

WTP, estimated using equation (1), varied between levels and segments (Fig. 3a, b). Leopard mother with cub and adult male elephant were most valued scenes for I*ex* and I*nov*, with a WTP of over US$60 and US$120, respectively. Adult male leopard and adult male lion were most valued by N*ex* and N*nov*, with a mean WTP of over US$30 and US$120, respectively. There was a high level of variability in both the international and national tourists for the value placed on other species levels (Fig. 3a, b). Interestingly, the negative result for reserves for I*nov* and N*nov* indicated that they would prefer to pay an additional fee to visit fewer reserves for their preferred sightings.

Discussion

Overall, our results confirm how tourists' experience affects preference heterogeneity for wildlife species (Lindsey *et al.*, 2007). Less experienced visitors are mainly interested in charismatic megafauna, while more experienced visitors have broader interest for species they have seen fewer times, including rare or difficult to observe species, or other biodiversity. However, compared with previous findings on tourists' preference for biodiversity experiences in Africa using

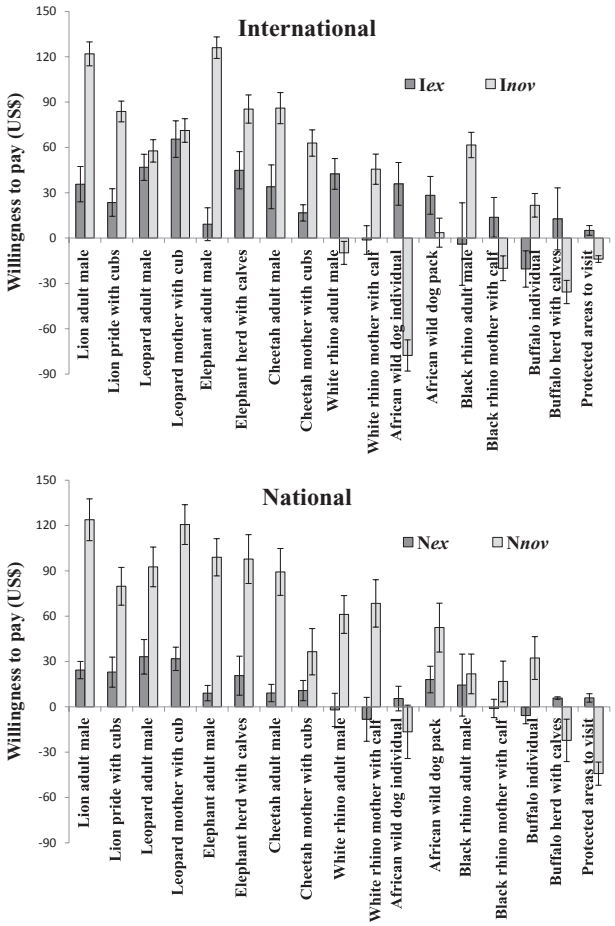

Figure 3 Willingness to pay for choice experiment attributes derived from the latent class model for international (above) and national (below) tourists. Willingness to pay estimates were calculated by employing equation (1). The standard errors were calculated from the coefficients and variance terms of the latent class model. I*ex*, experts on a budget; I*nov*, safari novices; N*ex*, biodiversity experts; N*nov*, big game novices.

CEs (Naidoo & Adamowicz, 2005), our results demonstrate how heterogeneity in preferences is also defined by important socio-economic characteristics. Wealthier tourists, for instance, are most interested in viewing charismatic megafauna, particularly popular species, without having to visit many PAs. Visitors with lower income levels, instead, are prepared to visit several PAs to see rarer or less easily observable species, as well as broader biodiversity. Also, wealthier segments are mostly interested in seeing individual adult males, while tourists with lower income levels, but more experienced, are generally more interested in the breeding groups. For international tourists this distinction is further explained by differences in age, number of people in the group, travel costs and number of days on holiday, suggesting the two segments can also be categorized into younger more independent (I*ex*) and older on a package tour (I*nov*) type of tourists (Fredline & Faulkner, 2001).

As confirmed by the qualitative survey, all segments excluding N*ex* are mostly interested in big cats (lion, leopard and cheetah) and elephant. Buffalo, instead, did not maintain its Big Five reputation and is most probably part of a wider group of species that tourists visiting the study area wanted to see after they had seen their favourite species. Compared with previous studies (see, e.g. Lindsey *et al.*, 2005; Gusset *et al.*, 2008), our results confirm that there is interest for African wild dog, but highlight how this is particularly so for experienced international tourists (I*ex*) and national respondents interested in large mammals (I*nov*). In our study, respondents were not informed as to whether African wild dogs were endangered or not (cf. Gusset *et al.*, 2008). Thus, it may be plausible that both segments interested in African wild dogs were more aware of their rarity and, consequently, willing to pay more to see them (Caro & O'Doherty, 1999). It was also interesting that respondents valued African wild dog as a pack rather than as an individual, which may suggest an appreciation of this species' natural behaviour (Creel & Creel, 2002). While we acknowledge that our CE focused primarily on big game species, our results also show that more experienced tourists had a specific interest for other biodiversity and/or the landscape. Future research should examine this interest more in depth by applying the same methodology we used here to explore viewing preferences for a wider range of biodiversity, which may be in demand (see, e.g. Huntly, Van Noort & Hamer, 2005). This will be particularly important to create further incentives for the conservation of less charismatic biodiversity and attract more tourists to PAs, which were, or will be, created to conserve important biodiversity, rather than to maximize profit.

Conservation policies target increases in population size, as a means to enhance chances of species persistence. Yet, resources are scarce and evaluation studies are important to understand whether such conservation initiatives may be supported or not by the general public (see, e.g. Jacobsen *et al.*, 2012). Previous studies (see, e.g. Freeman, 2003; Jacobsen *et al.*, 2012) have highlighted how increases in population levels are not equally relevant to all respondents. Our results confirm that there is heterogeneity in preferences for increases in population levels. Wealthier tourists, for instance, wanted to travel to fewer reserves mainly attracted by individual adult males, which condense factors such as physical attractiveness, size, danger and iconic reputation (Reynolds & Braithwaite, 2001), showing how charismatic megafauna potentially have high ecotourism value even when populations are not viable and only few individuals are present. Specifically, our results seem to confirm the economic reasons behind conservation businesses' strategy of artificially managing small populations within electrified fences to maximize economic return from ecotourism and minimize management costs (Aylward & Lutz, 2003). In other words this is 'conservation for ecotourism', rather than 'ecotourism for conservation', in which PA managers actively manage their reserves to provide the species levels that tourists want to see. Currently, PAs in South Africa have no policies or paradigms requiring a wildlife

population to be viable. Addressing important conservation issues facing some of the study species, particularly wide-ranging carnivores, may require developing new policies under which PAs would need to be larger than a species-specific area size in order to enhance species persistence.

In contrast, more experienced tourists (I*ex* and N*ex*) are important when realigning ecotourism and biodiversity conservation objectives. Tourists belonging to these segments have an interest in broader biodiversity and are willing to visit several PAs in order to see breeding groups, particularly for less easily observable or threatened species, such as leopard, black rhino and African wild dog. In economic terms, this result could mean that tourists belonging to this segment recognize a low substitution possibility in such characteristics, which leads to a rise in the price they are willing to pay, as the number of possible substitutes decreases. In addition, tourists belonging to this segment are probably more aware of the fact that the probability of encountering rare or less easily observable species or groups (e.g. mother and cub) would increase, as a result of visiting additional reserves.

In conclusion, actively managing PAs to provide wealthier tourists with their favourite levels may not help achieve biodiversity conservation, but may help delivering financial benefits to local stakeholders. Well-established and capitalized conservation businesses, for instance, are increasingly delivering financial benefits and guaranteeing employment to local communities helping achieve human and economic development (Spenceley, 2010). Compared with other African countries, South Africa can count on a large domestic market of tourists visiting PAs (Scholes & Biggs, 2004). Yet, the vast majority of national tourists interviewed in this study belonged to the white minority of the population. An increase in PA visitation by domestic visitors from a previously disadvantaged background, which according to our results belong to the less experienced segment with high income levels and viewing preferences for adult males of charismatic megafauna, will increase conservation funding and raise public and political support for biodiversity conservation. Exploring viewing preferences for a wider range of biodiversity of more experienced visitors, instead, may help realign ecotourism and biodiversity conservation objectives. We suggest policy makers should now invest resources on understanding more about alternative markets to increase support for biodiversity conservation and promote environmental awareness. In addition, policy makers could consider using financial mechanisms such as a 'Safari Tax' to subsidize actions that are promoting the conservation of less charismatic biodiversity (Ferraro & Kiss, 2002).

Acknowledgements

E.D.M. was supported by a Panthera Kaplan Graduate Award and a US Fish & Wildlife Service Rhinoceros grant. Research was carried out with the permission of Ezemvelo KwaZulu-Natal Wildlife and the iSimangaliso Wetland Park Authority. Authors would like to thank D. Pajimans and K. Shevchenko for their help with fieldwork. Pictures of black rhino, cheetah and leopard were taken by C. Sperka; pictures of African wild dog by K. Skinner; all other pictures were taken by E.D.M.

References

Adamowicz, W., Boxall, P., Williams, M. & Louviere, J. (1998). Stated preferences approaches to measuring passive use values. *Am. J. Agric. Econ.* **80**, 64–75.

Aylward, B. & Lutz, E. (2003). *Nature tourism, conservation and development in KwaZulu-Natal, South Africa*. Washington, DC: The World Bank.

Balmford, A., Beresford, J., Green, J., Naidoo, R., Walpole, M. & Manica, A. (2009). A global perspective on trends in nature-based tourism. *PLoS Biol.* **7**, 1–6.

Bookbinder, M.P., Dinerstein, E., Arun, R., Cauley, H. & Arup, R. (1998). Ecotourism's support of biodiversity conservation. *Conserv. Biol.* **12**, 1399–1404.

Boxall, P. & Adamowicz, W. (2002). Understanding heterogeneous preferences in random utility models: a latent class approach. *Environ. Resour. Econ.* **23**, 421–446.

Boxall, P., Adamowicz, W., Swait, J., Williams, M. & Louviere, J. (1996). A comparison of stated preference methods for environmental valuation. *Ecol. Econ.* **18**, 243–253.

Bush, G., Colombo, S. & Hanley, N. (2009). Should all choices count? Using the cut-offs approach to edit responses in a choice experiment. *Environ. Resour. Econ.* **44**, 397–414.

Caro, T.M. & O'Doherty, G. (1999). On the use of surrogate species in conservation biology. *Conserv. Biol.* **13**, 805–814.

Christie, M., Hanley, N., Warren, J., Murphy, K., Wright, R. & Hyde, T. (2006). Valuing the diversity of biodiversity. *Ecol. Econ.* **58**, 304–317.

Creel, S. & Creel, N.M. (2002). *The African wild dog: behavior, ecology, and conservation*. Princeton, NJ: Princeton University Press.

DEAT (2007). *National environmental management: biodiversity act. Lists of critically endangered, endangered, vulnerable and protected species*. Pretoria, RSA: Government Gazette.

Ferraro, P.J. & Kiss, A. (2002). Direct payments to conserve biodiversity. *Science* **298**, 1718–1719.

Fredline, E. & Faulkner, B. (2001). *International market analysis of wildlife tourism*. Gold Coast, Australia: Wildlife Tourism Research Report Series: No. 22, CRC for Sustainable Tourism.

Freeman, A.M. (2003). *The measurement of environmental and resource values. Theory and methods*. Washington, DC: Resources for the Future.

Goodman, P.S. (2003). Assessing management effectiveness and setting priorities in protected areas in KwaZulu-Natal. *BioScience* **53**, 843–850.

Goodwin, H. & Leader-Williams, N. (2000). Tourism and protected areas – distorting conservation towards charismatic megafauna? In *Priorities for the conservation of mammalian diversity: has the panda had its day?*: 257–275. Entwhistle, A. & Dunstone, N. (Eds). Cambridge: Cambridge University Press.

Greene, W. (2007). *NLOGIT version 4.0: reference guide*. Econometric Software, Inc., Plainview, NY.

Greene, W. & Hensher, D.A. (2003). A latent class model for discrete choice analysis: contrasts with mixed logit. *Transp. Res. B-Meth* **37**, 681–698.

Gusset, M., Maddock, A.H., Gunther, G.J., Szykman, M., Slotow, R., Walters, M. & Somers, M.J. (2008). Conflicting human interests over the re-introduction of endangered wild dogs in South Africa. *Biodivers. Conserv.* **17**, 83–101.

Hanley, N., Wright, R. & Adamowicz, V. (1998). Using choice experiments to value the environment. *Environ. Resour. Econ.* **11**, 413–428.

Hanley, N., Wright, R.E. & Alvarez-Farizo, B. (2006). Estimating the economic value of improvements in river ecology using choice experiments: an application to the water framework directive. *J. Environ. Manage.* **78**, 183–193.

Hearne, R.R. & Salinas, Z.M. (2002). The use of choice experiments in the analysis of tourist preferences for ecotourism development in Costa Rica. *J. Environ. Manage.* **65**, 153–163.

Huntly, P.M., Van Noort, S. & Hamer, M. (2005). Giving increased value to invertebrates through ecotourism. *S. Afr. J. Wildl. Res.* **35**, 53–62.

IUCN (2008). *IUCN red list of threatened species*. Available from http://www.iucnredlist.org (accessed August 2012).

Jacobsen, J.B., Lundhede, T.H. & Thorsen, B.J. (2012). Valuation of wildlife populations above survival. *Biodivers. Conserv.* **2**, 543–563.

Kerley, G.I.H., Geach, B.G.S. & Vial, C. (2003). Jumbos or bust: do tourists' perceptions lead to an under-appreciation of biodiversity? *S. Afr. J. Wildl. Res.* **33**, 13–21.

Kiss, A. (2004). Is community-based ecotourism a good use of biodiversity conservation funds? *Trends. Ecol. Evol.* **19**, 232–237.

Krinsky, I. & Robb, R. (1986). On approximating the statistical properties of elasticities. *Rev. Econ. Stat.* **68**, 715–719.

Krüger, O. (2005). The role of ecotourism in conservation: panacea or Pandora's box? *Biodivers. Conserv.* **14**, 579–600.

Lindberg, K., James, B. & Goodman, P. (2003). Tourism's contribution to conservation in Zululand: an ecological survey of private reserves and public protected areas. In *Nature tourism, conservation, and development in KwaZulu-Natal, South Africa*: 203–240. Aylward, B. & Lutz, E. (Eds). Washington, DC: The World Bank.

Lindsey, P., Alexander, R., Mills, M., Woodroffe, R. & Romanach, S. (2007). Wildlife viewing preferences of visitors to protected areas in South Africa: implications for the role of ecotourism in conservation. *J. Ecotourism* **6**, 19–33.

Lindsey, P.A., Alexander, R.R., du Toit, J.T. & Mills, M.G.L. (2005). The potential contribution of ecotourism to African wild dog *Lycaon pictus* conservation in South Africa. *Biol. Conserv.* **123**, 339–348.

Louviere, J.J., Hensher, D.A. & Swait, J.F. (2000). *Stated choice methods and analysis*. Cambridge: Cambridge University Press.

Mellon, J. (1975). *African hunter*. Long Beach, CA: Safari Press.

Naidoo, R. & Adamowicz, W.L. (2005). Biodiversity and nature-based tourism at forest reserves in Uganda. *Environ. Dev. Econ.* **10**, 159–178.

Reynolds, P. & Braithwaite, D. (2001). Towards a conceptual framework for wildlife tourism. *Tourism Manage.* **22**, 31–42.

Sandbrook, C. (2010). Local economic impact of different forms of nature-based tourism. *Conserv. Lett.* **3**, 21–28.

Scholes, R.J. & Biggs, R. (2004). *Ecosystem services in southern Africa: a regional perspective*. Pretoria, RSA: Council for Scientific and Industrial Research.

Spenceley, A. (2010). *Tourism product development interventions and best practices in sub-Saharan Africa: part 2: case studies. Report to the World Bank*. Washington, DC: The World Bank.

Steenkamp, Y., Van Wyk, B., Victor, J., Hoare, D., Smith, G., Dold, A. & Cowling, R. (2004). Maputaland-Pondoland-Albany. In *Hotspots revisited: earth's biologically richest and most endangered ecoregions*: 219–228. Mittermeier, R.A., Robles-Gil, P., Hoffmann, M., Pilgrim, J.D., Brooks, T., Mittermeier, C.G. & da Fonseca, G.A.B. (Eds). Mexico City: Cemex.

Street, D., Burgess, L. & Louviere, J. (2005). Quick and easy choice sets: constructing optimal and nearly optimal stated choice experiments. *Int. J. Res. Mark.* **22**, 459–470.

Swait, J.R. (1994). A structural equation model of latent segmentation and product choice for cross-sectional revealed preference choice data. *J. Retail. Consum. Serv.* **1**, 77–89.

Williams, P.H., Burgess, N.D. & Rahbek, C. (2000). Flagship species, ecological complementarity and conserving the diversity of mammals and birds in sub-Saharan Africa. *Anim. Conserv.* **3**, 249–260.

Supporting information

Additional Supporting Information may be found in the online version of this article:

Figure S1. An example of one of the choice cards presented to each respondent in the choice experiment portion of the survey.

Figure S2. Number of times each species was game-viewed before this trip by international (a) and national (b) tourists.

Table S1. Scientific names for the species listed in Fig. 3a, b in the main text.