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**Trophy hunting for wildlife conservation? On sport hunters' willingness to pay for conservation and community benefits**

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## **Abstract**

In the face of fundamental land use changes, the potential of trophy hunting to contribute to the conservation cause is being increasingly recognised. Trophy hunting can, for example, provide economic incentives to protect wildlife populations and their habitat, but empirical studies on these relationships are scarce and tend to focus on the effects of benefit sharing schemes from an *ex-post* perspective. Here, we present an *ex-ante* study that investigates the conditions under which trophy hunting could facilitate wildlife conservation in Ethiopia. We conducted a survey of international trophy hunters' preferences for trips to Ethiopia, using a choice experiment approach. Participants expressed strong preferences (and were willing to pay substantial premiums) for hunting trips to areas with abundant non-target wildlife where domestic livestock was absent, and for arrangements which foresaw benefit sharing with local communities. By contrast, they objected to hunting revenue being retained by governmental bodies. Hunters' preferences varied depending on the degree to which they declared an interest in Ethiopian culture, nature conservation, or believed Ethiopia to be politically unstable. Our respondents thus expressly valued the outcomes of nature conservation activities – the presence of wildlife in hunting areas – and they were willing to pay for them. Our findings highlight the usefulness of insights from choice modelling for the design of wildlife management and conservation policies, and suggest that trophy hunting in Ethiopia could generate substantially more financial support for conservation than is currently the case.

## Introduction

Trophy hunting is still regarded as controversial by many conservationists, and negative impacts of hunting on, for example, species of conservation interest have repeatedly been reported (Packer et al. 2010). However, in the face of fundamental land use changes such as the conversion of habitats such as forests and savannah into intensive agriculture, the potential of trophy hunting to contribute to the conservation cause is being increasingly recognised (Dickson et al. 2009; IUCN 2012). Trophy hunting can be defined as hunting that is managed as part of a formal programme which charges the hunter a substantial fee to hunt an animal with specific trophy characteristics (IUCN 2012). It is argued to potentially help conservation aims in various ways, for example, through the designation and enforcement of protected areas, as a way of providing an economic argument for conserving game species, and as a source of revenues for land owners and land managers which is dependent on the maintenance of wildlife populations (Lindsey et al. 2006a; IUCN 2012). Revenue from hunting can contribute to rural economies and thus motivate people living in or adjacent to wildlife areas to be supportive of its conservation (Lewis & Alpert 1997; Jones 2009). In eastern and southern Africa, trophy hunting generates comparatively large profits per visitor and substantial amounts overall (Baker 1997a; Lindsey et al. 2006a). It could thus be regarded as an alternative or complement to the income from non-consumptive wildlife tourism (Mayaka et al. 2005; Bush et al. 2009), which is often insufficient to have a strong effect on the land use practices of local people (Suich 2013; Yitbarek et al. 2013). Evaluations of wildlife management approaches that aim to generate income for conservation are usually conducted *after* these schemes are established (see Mayaka et al. 2005, for an exception). Here, we present an *ex-ante* study to examine the potential of trophy hunting to foster conservation in Ethiopia, a country that is currently re-shaping its hunting policies.

In Ethiopia, as elsewhere, land uses are increasingly competing with each other, due to a growing population with increasing economic demands. In many places, the existing Controlled Hunting Areas and National Parks are encroached by livestock grazing and conversion to agricultural land (Teshome et al. 2011; Vial et al. 2011; Tadie & Fischer 2013), but in the future, large-scale agricultural developments might have an even bigger impact on today's semi-natural areas. This contrasts with the high importance that many conservationists assign to the preservation of Ethiopia's unique Afro-alpine habitats that harbour many endemic species, such as the mountain nyala (*Tragelaphus buxtoni*), Ethiopian wolf (*Canis simensis*), Walia ibex (*Capra walie*) and gelada (*Theropithecus gelada*). The conservation of lowland habitats, in particular, the Gambella landscape bordering South Sudan, with its migration of hundreds of thousands of white-eared kob (*Kobus kob leucotis*) is also regarded of high conservation priority (Siege pers. comm.).

Apart from Tanzania and Uganda, Ethiopia is the only country in eastern Africa where trophy hunting is currently possible. However, some international hunters have voiced strong criticism of the current governance of trophy hunting as a system which has resulted in under-utilisation of trophy hunting as an income source, and even more importantly, in rapidly declining wildlife populations and habitats, as illegal hunting, livestock grazing, and agricultural conversion remain unchecked (Flack 2011).

An important question is thus under which conditions trophy hunting could facilitate the conservation of wildlife populations. Baker (1997a) concludes that hunting management needs to meet five criteria in order to be sustainable and beneficial. Most of these criteria relate to the good governance of wildlife resources and the revenue generated from hunting. Whilst benefit sharing with local communities has been hailed as the preferred method to reduce poaching (Lewis & Alpert 1997, Baker 1997b), many studies have now shown that revenue sharing schemes need to be very carefully designed in order to have the chance to be

successful (Archabald & Naughton-Treves 2001; Frost & Bond 2008). Fundamental critique of the effect of monetary incentives on intrinsic motivations has also been voiced (Hellin & Schrader 2003, Yitbarek et al., 2013). Although benefit sharing has thus to be considered with caution, it is still regarded by many as a way to obtain support for conservation objectives. Lindsey et al. (2006a) conducted a survey among US-based sport hunters to assess their preferences for hunting trips to Africa. This included their views on the presence of local people in the hunting area (88% of the respondents would accept this) and the importance of attractive scenery and of revenue sharing with local communities (86% preferred to hunt where they knew that local residents would receive a share of the proceeds). Hunters also expressed a readiness to choose hunting packages that would directly or indirectly facilitate wildlife conservation. Lindsey et al. (2006a) thus conclude that the potential of trophy hunting to support conservation aims has not been fully exploited yet. However, while their study gives important insights, the authors did not investigate trade-offs between the different attributes of hunting packages or quantify the value that features such as revenue sharing with local communities have for international sport hunters. Yet an understanding of values and trade-offs is vital for the design of interventions leading to sustainable wildlife management.

Here, we investigate such values and trade-offs by assessing international hunters' willingness to pay for trophy hunting in Ethiopia under varying circumstances using the choice experiment method (Hanley & Barbier, 2009). In addition to characteristics such as the target species, licence fees and duration of the trip, we also assess demand for other trip attributes likely to be of relevance. These include the presence of wildlife and livestock in the hunting area (Lindsey et al 2006a), the degree to which the hunting trip benefits the local population financially (Lindsey et al. 2006a; Bush et al. 2009), and the share of the revenue that is given to governmental conservation organisations (Flack 2011).

## **Hunting governance in Ethiopia**

Licensed wildlife hunting in Ethiopia dates back to the early 20th century (Woldemeskel 1970). However, a formal, structured oversight of hunting activities in the country was not in place until the establishment of the Ethiopian Wildlife Conservation Organization (now called Ethiopian Wildlife Conservation Authority – EWCA) in 1970. The government of the Federal Democratic Republic of Ethiopia consists of several nested levels. Hunting is primarily governed by the federal EWCA – who also issue hunting permits – in collaboration with the regional governments. Hunting takes place in designated Controlled Hunting Areas, for which safari companies can obtain concessions. Quotas for huntable species are set annually by EWCA together with the regional governments, and trophy fees are to be paid in advance of the hunt. Currently, quotas are allocated for 54 species of larger mammals and 49 bird species (Negarit Gazetta 2009), with the endemic mountain nyala as a sought-after specialty.

There are presently 17 active Controlled Hunting Areas (Derbe pers. comm.) in three Ethiopian regions, but in several of these, wildlife populations have been found to have declined dramatically, and some hunters paint a very negative picture of the future of wildlife in Ethiopia, attributing the problems mainly to an inadequate governance of wildlife management (Flack 2011).

Although the number of sport hunters visiting Ethiopia is at present far smaller than in other African countries (about 40 per year) and trophy hunting currently generates only about 1.3 million USD/year (compared to 20-30 million USD/year in Botswana, Tanzania or Namibia; Lindsey et al. 2007), locally it still plays a significant role for the rural economies adjacent to the Controlled Hunting Areas. Federal policies such as the Wildlife Policy of 2005 (Ministry of Culture and Tourism, 2009) encourage revenue sharing from wildlife-related tourism,

although only few regions are currently making concrete steps towards a structured and transparent approach towards benefit sharing with local communities (Yitbarek et al. 2013; Kubsa 2012). The fact that only 15% of the fees collected by the government are retained by EWCA, while 85% are transferred to the regional level, will facilitate benefit sharing with local communities once legislative provisions and mechanisms for distribution are in place.

## **Methods**

### ***Study design***

We conducted a survey of international trophy hunters' preferences for hunting trips, using a choice experiment approach to quantify trade-offs and willingness to pay for changes in the characteristics of these trips (Hensher et al. 2005). This method has been widely used in environmental economics since the mid-1990s, although applications to wildlife conservation in Africa are rare (Moro et al. 2013).

In a choice experiment, respondents are faced with a set of (hypothetical) choice options, each characterised by a set of attributes. Respondents then indicate their preferred choices. These repeated choices reveal the relative weight they place on each attribute, which are given by the parameters estimated for each characteristic of the choice set. Ratios of these parameters show the rates at which respondents are willing to trade off any particular characteristic (such as species hunted) with any other (such as revenues returned to local communities, or the price of a hunting trip).

The questionnaire was developed by the authors in collaboration with professional hunters in Ethiopia and staff of the Ethiopian Wildlife Conservation Authority (EWCA). The attributes of the hypothetical hunting trips (Box 1) were selected based on discussions with professional and recreational hunters and the literature (Lindsey et al. 2006a). An in-depth pre-test with Ethiopian and international hunters, including hunting outfitters, led to further refinement of

the survey instrument. Subsequently, the questionnaire was pilot-tested (n=19) with international trophy hunters.

The final questionnaire consisted of three parts. The first part introduced the participant to the survey context and gave a detailed description of the attributes that characterised the (hypothetical) hunting packages. Each respondent was asked to choose their preferred package in each of eight choice sets (Fig. 1).

The second part of the questionnaire consisted of open-ended questions on the respondents' hunting interests and their previous experiences with trophy hunting. They were complemented by the following closed-ended questions, formulated as statements and to be used to understand heterogeneity in preferences: "I believe Ethiopia is politically unstable at the moment" (hereafter "Political stability") and "I believe a trip to Ethiopia would culturally be very interesting" (hereafter "Interest in culture"). These were rated on a scale from 1 (strongly disagree) to 5 (strongly agree). Additionally, we asked participants to characterise their interests in hunting by means of six items, again on a scale from 1 (strong disagreement) to 5 (strong agreement). Three of these items, capturing interest in nature and conservation ("I would call myself a person widely interested in the outdoors/a conservationist/a nature lover"), displayed strong inter-item reliability (Cronbach's  $\alpha=0.76$ ) and were summarised in an index (hereafter "Interest in conservation").

A brief section on personal information, including country of residence, and a comment section that encouraged participants to give us their views concluded the questionnaire.

### ***Sampling***

Our study aimed to elicit the preferences not only of international hunters who had previously been to Ethiopia, but also of those who might consider visiting this country in the future. The target population thus included all international trophy hunters with an interest in hunting in

Africa. In the last twenty years or so, the largest group of hunters visiting Ethiopia came from the United States and Canada, followed by residents of European countries (Siege pers. comm. based on EWCA records). To sample from these populations, we used a mixed approach. First, we compiled a database of hunting operators and hunting networks in a wide range of countries in North America, Europe and Africa and used these as gatekeepers, asking them to forward our questionnaire to their clients and members by email, together with an introductory letter that explained the purpose of the survey. Ethiopian hunting outfitters also distributed hardcopies of the questionnaire to their clients. The largest part of the sample (84%) was obtained through an online survey hosted on the internet platform of an international hunting network ([www.huntnetwork.net](http://www.huntnetwork.net)) from October 2012 to March 2013. The platform has about 100,000 users, who received the link to the online survey through an email newsletter. Overall, we obtained 224 completed and thus useable questionnaires.

### *Attributes of hunting trips*

Participants were asked to consider options for different possible future hunting trips to Ethiopia (Fig. 1). These options were described in terms of the six choice attributes (Box 1). A priori, we expected hunters to prefer hunting trips with more wildlife viewing opportunities but less grazing livestock, since these might decrease the perceived remoteness and wilderness of the place and are thought to compete for grazing with target species. At present, the minimum length of a hunting trip is determined by the Ethiopian government and depends on the type of game targeted. For example, the minimum stay for big game such as mountain nyala is 21 days. During the scoping phase of our survey development, hunters had indicated that a more flexible arrangement would be desirable, as many international hunters might have the money, but not the time, to spend three weeks or more on one single trip.

Finally, we included the trophy fee rate such that it reflected the currently observed range (the trophy fee for a mountain nyala was \$10,000 at the time the survey was designed).

Each respondent faced eight choice cards each offering three possible hunting packages, from which the respondent was asked to choose their most preferred, or else to say that they would choose none of them and therefore not take a trip. To generate a statistically efficient experimental design, we used the software Ngene, based on the responses to the pilot survey of the questionnaire, which generated 24 choice cards. This necessitated three versions of the questionnaire being used (3 versions x 8 choices per version = 24 cards). We obtained n=72 completed questionnaires for Version 1, n=77 for Version 2 and n=75 for Version 3.

### *Data analysis*

Modelling of choice data is based on the random utility model (McFadden 1974). The utility function of hunter  $i$  from the choice of alternative  $J$  can be expressed as:

$$U_{ij} = \boldsymbol{\beta}'\mathbf{x}_{ij} + \varepsilon_{ij}, \quad (1)$$

where  $\boldsymbol{\beta}$  is a vector of parameters to be estimated,  $\mathbf{x}$  is a vector of the attributes and the levels they take in any choice situation, and  $\varepsilon$  is a random or stochastic component of utility, stemming from the inability of the researcher to observe all the relevant characteristics of respondents or due to uncertainty on the part of individuals on their preferences (Manski 1977). By assuming that the random component is extreme value type I distributed, a multinomial logit (MNL) model is obtained which conveniently lends itself to maximum likelihood estimation of the utility function parameter vector  $\boldsymbol{\beta}$  (Greene 2011). More complex models, such as the random parameters logit (RPL) model, allow the researcher to take the variation in preferences across respondents (un-observed preference heterogeneity) into account. Estimation of the RPL model yields a mean effect on choices for each attribute, and

an estimate of the standard deviation around this mean effect which accounts for preference heterogeneity in the sample. The RPL model typically achieves a much better fit to the data at the cost of a more complicated estimation procedure (Train 2009). We used this RPL approach to determine the main effects of the six attributes of the hunting packages on respondents' choices.

We then used an MNL model with interactions to investigate the moderating effects of attitudinal variables on these preferences (i.e., observed preference heterogeneity). Both models are non-linear and require (simulated) maximum likelihood methods for estimation. The selection of moderating variables was hypothesis-driven, i.e., we included interactions based on their potential meaningfulness in explaining heterogeneity.

## **Results**

### ***Hunters' experiences and attitudes***

Of our respondents, 83% had hunted in Africa before, mostly in South Africa, Zimbabwe and Namibia, but 85% had never hunted in Ethiopia. The vast majority (95%) had ten or more years of hunting experience. Just over 70% lived in the USA, an additional 3% in Canada, and 14% in a European country. Most participants expressed a strong interest in nature and conservation (index from three items, see above; mean=4.78, std dev=0.49), and a slightly less strong interest in Ethiopian culture (mean=4.4, std dev=1.18). Views on Ethiopia's political stability were divided (mean=2.87, std dev=1.21).

### ***Choice modelling***

The final dataset included 1851 choices made by 241 respondents. Overall, the RPL model fitted the data very well, and all the attributes significantly influenced respondents' choices.

The parameters for mean effects (Table 1) describe the relative importance (utility) associated with the attribute levels.

Hunters were more likely to select alternatives which included mountain nyala and were less likely to choose hunting trips that targeted Nile lechwe (*Kobus megaceros*) and white-eared kob. They preferred trips with more wildlife viewing opportunities and less livestock in the hunting grounds. Trips with a higher share of the fees redistributed to local communities were more likely to be chosen, as were those with a lower share of the fees being given to the government. Longer trips were preferred over shorter ones but the cost of a hunting trip negatively influenced choice probability, as would be expected when variation in other trip characteristics are controlled for.

Respondents displayed considerable preference heterogeneity, as indicated by relatively high and statistically significant coefficients associated with the standard deviations of the preference parameters. This heterogeneity was particularly high for the type of trophy animal and for the abundance of wildlife or livestock seen during the trip. In contrast, hunters were relatively homogeneous with respect to their preferences for the length and the cost of a hunting trip.

In order to provide a better insight into the hunters' preferences we then calculated their maximum willingness-to-pay (WTP) for the changes in the characteristics of a hunting trip. These are based on the ratio between the mean effect parameter for an attribute and the mean effect of the fees attribute (Table 2, Fig. 2).

Respondents did not display significant differences in preferences between hunting 'other highland game' compared to lowland game. In both cases they were willing to pay over 6000 USD for such an opportunity (*in addition to* the mountain nyala). Where the trophy offered was Nile lechwe and white-eared kob (*instead of* mountain nyala) a trip was, on average, worth almost 10,000 USD less to them than a trip that included mountain nyala alone.

Another important characteristic of a hunting trip reflected in the hunters' WTP was the abundance of other (non-target) wildlife or grazing livestock encountered during the trip. Respondents were on average willing to pay up to 17,000 USD for trips where a lot of wildlife could be seen, in comparison with trips which had none. On the other hand, encountering a lot of grazing livestock during a trip reduced its value to hunters by over 2000 USD.

Interestingly, respondents were willing to pay an additional 4000 USD for 10% of their overall hunting fees re-distributed to local communities. On the contrary, they were willing to pay almost 2000 USD less for 10% of their fees being directed to the central government. Note that these estimates of marginal values are only valid within the ranges of the two attributes in the experimental design.

Finally, we found that each week of a hunting trip was worth over 7,000 USD, irrespective of its additional benefits (trophies, wildlife viewing experience). This may indicate that the hunters derive utility (pleasure) from the entire trip experience, and not only from obtaining a particular trophy.

In a third step, we ran an MNL model to examine observed preference heterogeneity by incorporating interaction effects between key attitudinal variables and preferences for attributes (Table 3). These attitudinal variables comprised views on the political stability of Ethiopia, interest in Ethiopian culture, and interest in nature conservation, with their scores normalised. Additionally, we included residence in Canada/USA to explore if residents of these countries had different preferences to other hunters.

Participants who believed that Ethiopia might currently be politically unstable tended to be less willing to see the revenue from trophy hunting shared with governmental bodies than other respondents. Those with a strong interest in Ethiopian culture were more likely to express a higher preference for hunting mountain nyala together with lowland species (maybe

because on such a trip they would be able to experience the famous cultures of the Omo valley), and somewhat more likely to support revenue sharing with local communities. Participants with a strong interest in nature conservation tended to express stronger preferences for wildlife experiences during their hunting trip, and were less negative than others about revenue sharing with governmental bodies. Residents of the USA and Canada tended to have stronger preferences for trips that included mountain nyala combined with lowland species, and had a higher preference for longer trips than residents of other continents.

### ***WTP in context: respondents' comments on hunting in Ethiopia***

At the end of the questionnaire, many study participants commented extensively on hunting in Ethiopia. This information contextualises, and to some degree triangulates, the findings from the choice experiment.

Overall, even though most had never been there, our survey respondents expressed a very strong interest in hunting in Ethiopia, and felt strongly about wildlife conservation in this country, hoping that the survey would help to improve the situation. However, their main criticism was that hunting was prohibitively expensive, and that only very few, very rich hunters could afford a trip to Ethiopia, while governmental rules and regulations created a situation that further excluded interested hunting tourists.

*Ethiopia is a strikingly beautiful country with great potential but dwindling wildlife resources. I recognize that the tiny hunting industry is of no great importance to the country... but it represents the best and perhaps last chance for Ethiopian wildlife. Although licenses are currently high, quotas are ludicrously low, placing inadequate value on the wildlife. The low quotas coupled with the strange rules (24 days for two areas, all license fees paid up front, etc.) are strangling the industry and keeping all*

*except the wealthiest trophy collectors away from Ethiopia. I wish you luck in your efforts.* [29; numbers in square brackets denote questionnaire identifiers]

Another aspect that was frequently mentioned was human population pressure on the remaining nature areas and related to this, ubiquitous livestock and lack of wildlife. Some hunters compared this to the setting in other countries such as Botswana where they “*saw almost no other people and lots and lots of game*” [1]. While such perceptions of human pressure drastically lessened their enjoyment of the hunting experience, they were also concerned about the future of Ethiopian wildlife:

*Ethiopia is a great country and a fine destination to hunt. The problem is that human encroachment is seizing the habitat of wildlife. I saw huge change between my 2 safaris and it is heartbreaking.* [28]

Many respondents did not support financial contributions to the central and regional governments at all, expressing little respect for the conservation authority, but believed that if revenue was channelled to local communities, poaching and agricultural use of wildlife areas could be reduced.

*Villages and communities should always get the largest share not the government. It is the only real way to stop poaching by making the animals more valuable to be conserved and for hunting. There should never be a package where they get nothing.* [42]

Two respondents explicitly expressed an interest in hunting Nile lechwe and white-eared kob, as these were seen as “*unique*”, and could provide the “*opportunity to increase the number of hunters coming to Ethiopia*”. Others suggested that Ethiopia should provide a broader spectrum of hunting options, not necessarily including mountain nyala, but other highland and lowland game, “*so those of us who enjoy challenging stalking of common animals can come to Ethiopia and enjoy the country*”.

Several respondents regretted that hunting trips had a minimum duration which made it impossible for them to come, as they might have the financial means, but not the time for a fortnight away from work.

Issues related to prices attracted the largest number of comments. Many participants felt that hunting in Ethiopia was overpriced compared to other African countries. Some respondents used strong expressions such as “*it is an absolute rip-off*”. Under these circumstances, hunters preferred to hunt in other African countries. Several respondents argued that the high prices in combination with a low quota and rigid regulations meant that Ethiopia was not using its potential as a hunting destination at all.

*I believe that if you have only a few hunters paying high prices, you are shutting down the hunting and leaving your wildlife resource exposed. But if you lower your cost, you will have more hunters, more conservation protected areas, and in the long run more money for everyone. [43]*

## **Discussion**

Our study findings indicate a substantial potential for trophy hunting in Ethiopia to contribute to conservation objectives: Survey participants were on average willing to pay a sizeable premium on hunting packages that featured revenue sharing with local communities, and for hunting in landscapes with a lot of wildlife, as opposed to landscapes dominated by farm livestock (Table 2). This implies that hunting tourists to Ethiopia do not only expressly value the outcomes of nature conservation activities – the presence of wildlife and the absence of grazing livestock in hunting areas – but they are also willing to pay for them. While such a study cannot answer questions on the morality of trophy hunting (Fischer et al. 2013), it offers insights on the potential relationships between hunting and conservation that may be relevant to other countries with developing hunting industries and to those Ethiopian regions

that currently do not offer trophy hunting. And while it could be argued that the respondents' preferences seem to prescribe a continuation of 'fortress conservation' that excludes local residents from the land (Benjaminsen & Svarstad 2010), participants were very willing to financially support communities neighbouring the hunting areas.

Our qualitative data support the choice modelling outcomes – many prospective hunters were worried about the future of wildlife in Ethiopia and would like trophy hunting to further conservation aims. The qualitative data also add detail and context to our modelling results. While our findings suggest that support for community benefit sharing is widespread among international hunters and are thus in line with current plans in Ethiopia to develop revenue sharing schemes (Yitbarek et al. 2013), they highlight, at the same time, a lack of acceptance of hunting revenue being retained by governmental bodies. This lack might to some degree be due to views on Ethiopia's political stability (Table 3) and associated lack of trust in its institutions, but also to disagreement with EWCA's wildlife and hunting policies, as repeatedly expressed in the comments. Our study did not include the views of local residents on trophy hunting, but there is some evidence (Yitbarek et al. 2013; Fischer et al. 2013) to suggest that in order to make trophy hunting sustainable, the dialogue between concessionaires, local governments and residents needs to be improved.

Our study shows how the application of choice modelling can add important insights into the *relative* importance of conservation-relevant trip attributes, and can thus supplement findings generated by attitude surveys with potential tourists (e.g., Lindsey et al. 2006a) and approaches related to actual expenditures (Sekar et al. 2014). For example, our study allowed us to vary the attributes "bag mix" and "community share" such that they included levels that are currently not found in Ethiopia, but which may be a realistic future option. By doing so, we found limited interest in hunting two species that are not yet available for trophy hunting, namely white-eared kob and Nile lechwe in Gambella region.

By using attitudinal variables and other characteristics of study participants as statistical moderators in our analysis, we were able to identify groups within our sample with specific preferences. For example, participants with an interest in Ethiopian culture tended to prefer trips that included lowland hunting, and those that had a stronger element of revenue sharing with local communities. This might suggest that hunting trips for these groups would be even more attractive if they included elements of cultural tourism. Elsewhere, tour packages primarily targeted at wildlife tourists have been found to increase in value by, on average, about 700 USD where they comprised visits to local communities; however, such visits have to be carefully set up to avoid negative impacts on the local population (Sekar et al. 2014). Participants with a comparatively stronger interest in nature conservation were less likely to object to hunting revenue being retained by the government. This might imply that a clearer communication of the use of the governmental funds for conservation purposes, such as wildlife and habitat monitoring or ranger patrols, could increase support for revenue sharing with governmental bodies.

In our work leading up to the design of the survey, several hunting outfitters and EWCA staff repeatedly argued that hunting in Ethiopia was an exclusive good – its high price and scarcity making it all the more attractive. However, from a conservation perspective, it might be desirable to attract higher numbers of international hunters in order to increase income that could then be used for conservation purposes, and which could replace revenues lost if grazing livestock are excluded from hunting areas. Our qualitative data suggest that, for example, a more flexible pricing structure and package hunts that do not necessarily include mountain nyala might help to draw in more hunting tourists. Potentially, this could make managing land for hunting more competitive in relation to other land uses such as agriculture which are less conducive to wildlife conservation. While relying solely on such a line of argument might be risky, since it breaks down if the revenue generated by hunting is less than

that earned by intensive, large-scale agriculture, a stronger trophy hunting industry which builds on revenue sharing and actively involves local people (IUCN 2012) can be advantageous for conservation.

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Table 1: Random Parameters Logit (RPL) model results. Contrasting categories for BAG: mountain nyala only; EXP: no livestock, no wildlife. SQ: alternative specific constant used to control the utility associated with choosing the ‘no trip to Ethiopia’ alternative. \*\*\*, \*\*, \* indicate significance at 1%, 5%, 10% level, respectively. Note that a value for the MacFadden pseudo  $r^2$  of between 0.2 and 0.4 is equivalent to an  $r^2$  of 0.7-0.9 in a simple linear model.

<b>Variable</b>	<b>Mean effect (s.e.)</b>	<b>Standard deviation around mean effect (s.e.)</b>
BAG2: mountain nyala + highland game	0.4914*** (0.1569)	0.1328 (0.4323)
BAG3: mountain nyala + lowland game	0.5049*** (0.1841)	0.9605*** (0.1605)
BAG4: white-eared kob and Nile lechwe	-0.7513*** (0.2798)	1.9930*** (0.2953)
EXP2: some livestock, some wildlife	0.6975*** (0.1669)	0.8717*** (0.2013)
EXP3: a lot of livestock, no wildlife	-0.1702 (0.2094)	0.9477*** (0.2449)
EXP4: a lot of wildlife, no livestock	1.3485*** (0.1646)	1.2563*** (0.2067)
COMSH: revenue share to communities	0.0306*** (0.0046)	0.0259*** (0.0066)
GOVSH: revenue share to government	-0.0148*** (0.0053)	0.0347*** (0.0077)

TIME: trip length in weeks	0.5595*** (0.0776)	0.1013 (0.1493)
SQ	-0.8603*** (0.3210)	2.9323*** (0.3118)
FEE: cost of a trip (in 1,000 USD)	-0.0755*** (0.0059)	0.0332*** (0.0044)

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**Model characteristics**

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Log-likelihood	-1896.9373
McFadden's pseudo $r^2$	0.2415
AIC/ $n$	2.0734
$n$ (observations)	1851
$k$ (parameters)	22

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Table 2. Median willingness-to-pay (WTP) for hunting trip characteristics (in 1000 USD).

Contrasting categories as in Table 1.

<b>Change in attribute</b>	<b>WTP</b> (s.e.)	<b>95% confidence interval</b>
BAG2 – other highland game (in addition to mountain nyala)	6.33 (1.88)	2.55 – 9.83
BAG3 – lowland game (in addition to mountain nyala)	6.46 (2.21)	1.93 – 10.68
BAG4 – Nile lechwe and white-eared kob (instead of mountain nyala)	-9.65 (3.60)	-16.79 – -2.59
EXP2 – some livestock and some wildlife encountered during a hunting trip	9.04 (2.32)	4.65 – 13.80
EXP3 – a lot of livestock and no wildlife encountered during a hunting trip	-2.17 (2.71)	-7.60 – 3.15
EXP4 – a lot of wildlife and no livestock encountered during a hunting trip	17.38 (2.58)	12.79 – 22.85
COMSH – one percentage point of hunting fees redistributed to local communities	0.39 (0.07)	0.27 – 0.54
GOVSH – one percentage point of hunting fees redistributed to the central government	-0.19 (0.07)	-0.32 – -0.05
TIME – one week of a hunting trip	7.29 (0.76)	5.73 – 8.69

Table 3: Multinomial logit (MNL) model results. Contrasting categories for BAG: mountain nyala only; EXP: no livestock, no wildlife. SQ: alternative specific constant used to control the utility associated with choosing the ‘no trip to Ethiopia’ alternative. \*\*\*, \*\*, \* indicate significance at 1%, 5%, 10% level, respectively.

<b>Variable</b>	<b>Standardised coefficient (s.e.)</b>
BAG2: mountain nyala + highland game	0.317** (0.148)
BAG3: mountain nyala + lowland game	0.231 (0.156)
BAG4: white-eared kob and Nile lechwe	-0.200 (0.177)
EXP2: some livestock, some wildlife	0.580*** (0.101)
EXP3: a lot of livestock, no wildlife	0.003 (0.111)
EXP4: a lot of wildlife, no livestock	0.958*** (0.104)
COMSH: revenue share to communities	0.023*** (0.003)
GOVSH: revenue share to government	-0.009*** (0.003)
TIME: trip length in weeks	-0.192*** (0.042)
SQ	-0.308*** (0.201)
FEE: cost of a trip (in 1,000 USD)	-0.049*** (0.004)
Political stability*COMSH	0.003 (0.003)
Political stability*GOVSH	-0.006*** (0.002)
Interest in culture*BAG2	0.174 (0.104)
Interest in culture*BAG3	0.243** (0.116)
Interest in culture*BAG4	0.023 (0.108)
Interest in culture*COMSH	0.005* (0.003)
Interest in culture*GOVSH	-0.002 (0.002)
Interest in culture*FEE	-0.012*** (0.004)

Interest in conservation*EXP2	0.270*** (0.100)
Interest in conservation*EXP3	0.149 (0.097)
Interest in conservation*EXP4	0.256*** (0.094)
Interest in conservation*COMSH	0.001 (0.003)
Interest in conservation*GOVSH	0.009*** (0.003)
Interest in conservation*SQ	0.343*** (0.113)
Canada/US*BAG2	0.171 (0.190)
Canada/US *BAG3	0.407** (0.190)
Canada/US *BAG4	0.094 (0.237)
Canada/US *TIME	0.097* (0.055)
Canada/US *SQ	0.662*** (0.218)

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**Model characteristics**

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Log-likelihood	-2280.816
McFadden's pseudo $r^2$	0.089
AIC/ $n$	2.497
$n$ (observations)	1851
$k$ (parameters)	30

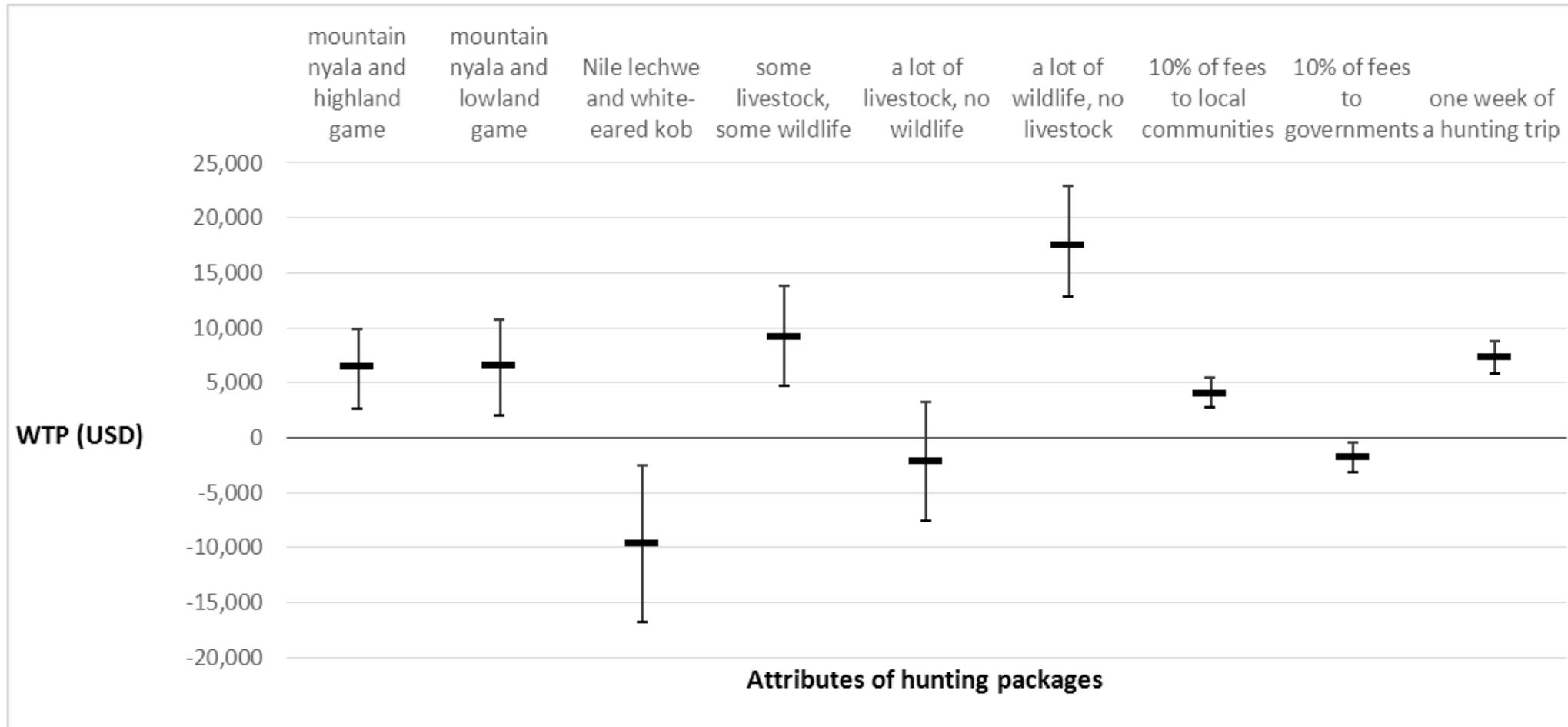
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Fig. 1: Sample choice card.

Please mark your preferred options (only one from each choice card).

	A	B	C	D
<i>Bag mix</i>	Nile lechwe and white-eared kob	Mountain nyala and other highland game	Mountain nyala and lowland game	No trip to Ethiopia
<i>Experience of hunting site</i>	Some livestock and some wildlife	A lot of wildlife, no livestock	A lot of wildlife, no livestock	
<i>Share to community %</i>	0	20	30	
<i>Share to government %</i>	40	30	10	
<i>Length of trip</i>	1 week	4 weeks	2 weeks	
<i>License fees</i>	10,000 USD	40,000 USD	20,000 USD	
<i>Your choice?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 2. Willingness-to-pay (WTP) for characteristics of hunting trips (see Table 2). Values for bag mix and experience at the hunting site are in relation to contrasting category ('mountain nyala only', and 'no livestock, no wildlife', respectively). Error bars: 95% confidence interval.





Box 1: Levels of attributes used to describe hunting packages

**Bag mix** (illustrated with photos of the key species):

- (1) “Mountain nyala and other highland game: You shoot one mountain nyala, and six other animals of the Ethiopian highlands; the exact species will depend on the available quota and cannot be selected beforehand, but your bag will include at least one of the following species: Bush pig, Bohor reedbuck or giant forest hog, and likely also Menelik’s bushbuck”,
- (2) “Mountain nyala and lowland game: You shoot one mountain nyala in the highlands, and then move on to the lowlands and shoot eight lowland animals; the exact species will depend on the available quota and cannot be selected beforehand, but your bag will include at least two of the following species: Beisa oryx, Soemmering’s gazelle, gerenuk, greater or lesser kudu”,
- (3) “Mountain nyala only: You shoot one mountain nyala in the highlands”
- (4) “Nile lechwe and white-eared kob: You travel to the western part of the country and shoot one individual each of white-eared kob and Nile lechwe”.

**Experience at the hunting site** (whether wildlife other than the target species can be seen during the trip, and the extent to which domestic grazing livestock are present):

- (1) No other wildlife seen other than the target species, no grazing livestock seen
- (2) A lot of livestock, but no wildlife is seen
- (3) Some livestock and some wildlife is seen
- (4) A lot of other wildlife but no livestock is seen.

**Share of revenues to local communities** (a variable fraction of the fees charged to hunters is returned to the local village administration who then decide how to use these funds): 0%, 10%, 20%, 30%

**Share of revenues to governmental bodies** (a variable proportion of fees from hunting tourism are retained by regional and national government for use in monitoring of game populations, quota setting and other management actions): 10%, 20%, 30%, 40% (a zero allocation was unrealistic)

**Trip length:** 1, 2, 3, 4 weeks (each day of the trip costing around \$1500)

**Trophy fees:** from \$5000 to \$40,000 (in steps of \$5,000; payable in addition to per-day trip costs, and other charges such as rifle import fees; see Baker 1997a, b for a generic introduction into the structure of trophy hunting fees)