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Research article

Equitable sharing of benefits from tiger conservation: Beneficiaries' willingness to pay to offset the costs of tiger conservation

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A B S T R A C T

Costs of large predator conservation may not be equitably distributed among stakeholders; these include farming communities, tourism business owners and visitors. Financial redistribution mechanisms based on accrued benefits and costs of conservation require relevant data unavailable in many locations. To address this, a contingent valuation method identified willingness to pay (WTP) among national park visitors and connected tourism business owners. Both groups derive benefit from government-funded conservation policies. The study was conducted in Bardia and Chitwan National Parks, Nepal 2017–2018; two locations world-renowned for tiger conservation. Local and international park visitors (N = 387) provided WTP for ongoing conservation via additional park entry fees. Tourism business owners (TBOs; N = 74) proximate to the parks stated their WTP for compensation funding provided directly to farmers. The majority (65%) of park visitors were willing to pay extra to support conservation (sample mean US$ 20) while 85 percent of TBOs supported their payment of funds for compensating farming communities (sample mean annual contribution being US$ 156). Valid WTP regression modelling found that visitor WTP was predicted by international travel costsand environmental organization affiliation. For TBOs indicating WTP, the amount to pay was predicted by annual net income from the tourism business. Application of study data indicates US$ 25 average increase to visitor park fees would maximise revenue and contribute a further US$ 495,000 available for conservation activities. Similarly, a flat-rate tariff on TBOs at the mean WTP amount would contribute more than double the annual budget available for farmer compensation (providing approximately US$ 43,000). More generally, the study findings are informative for policy-makers seeking equitable conservation outcomes while maintaining viable populations of critically endangered wild tigers. They should however be interpreted with caution given limitations of the sampling frame and method of data elicitation. Regardless, any policy decision effects require careful scrutiny to ensure desired outcomes are realized.

1. Introduction

Where large carnivores live alongside farming communities, livestock depredation by the predators and crop raiding by prey species present significant economic costs to local producers (Bhattarai et al., 2019; Thinley et al., 2018). Conversely, engagement in wildlife tourism (e.g., homestays or guiding) can provide economic benefits to *some* local people (Packer et al., 2009). Opportunities to view charismatic wildlife species, including large predators, naturally draw visitors and service businesses from outside local regions. This range of stakeholders in conservation, and ensuing incentives, benefits and costs, manifest as an economic system. And while governments recognise the importance of conserving key species on altruistic grounds, incentive for conservation is also provided through financial benefits realized through tourist activities.

The result from conserving large natural ecosystems may be unequal sharing of costs among stakeholders, and outcomes inconsistent with the objectives of the Convention on Biological Diversity (Aphrodite, 2006). Pertinent data on stakeholder perceptions of implicit benefits and costs may be useful to inform decisions on equitable economic redistributions. In this regard, the study reported here assesses viewpoints from tourism stakeholders benefiting from Bengal tiger conservation efforts in Nepal.

1.1. Human-wildlife conflict in Nepal

Rare large predators such as tigers hold high conservation significance (Macdonald and Loveridge, 2010). Large-scale conservation of these species, through designation of National Parks, may however exacerbate the potential for unwanted encounters between people (particularly those located on park boundaries) and wild animals. This human-wildlife conflict (HWC) may engender negative attitudes among local communities towards protected wild predators, prey species and mega-herbivores and so undermine conservation agency efforts (Bhattarai and Fischer, 2014).

Previous studies in Nepal report that local community support is a key conservation success factor (Bhattarai et al., 2017). For example,

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Nepal's success in reducing illegal hunting by local community members demonstrates the success of conservation policies. HWC mitigation policies may be designed to prevent or decrease incident frequency or the severity of conflict events (Karanth et al., 2012; Bhattarai et al., 2019). Other Government policies also provide compensation to local communities for damage caused through HWC. This damage may be to people themselves through injury or death or to local resources such as crops or livestock supporting livelihoods (Bhattarai et al., 2019). Taken together, Nepalese government policies and attendant strategies encourage co-existence among wildlife and people within high HWC risk zones, including national parks, corridors and buffer zones (GoN, 2016a).

1.2. Human-wildlife conflict: winners and losers

For Nepal and elsewhere, complete elimination of HWC within areas surrounding wildlife reserves, especially those maintained for large predators, is unlikely (Karanth and Madhusudan, 2002). Governments, from countries including India, Nepal and Sweden, frequently compensate local people for losses (Bhattarai et al., 2019; Karanth et al., 2012; Widman and Elofsson, 2018). However, compensation programs are expensive and may require cumbersome administrative procedures to avoid, for example, payment of false claims (Bauer et al., 2017; Ravenelle and Nyhus, 2017). For Nepal, HWC compensation typically involves cash payments to residents located along forest boundaries which may not necessarily equate to the true economic value of losses sustained (Bhattarai et al., 2019).

Nepal provides for an extensive protected areas system to conserve populations of Bengal Tigers *Panthera tigris*. Though seemingly disadvantageous for nearby farming communities, these conservation efforts have proved beneficial for tourism entrepreneurs and park visitors (Bhattarai, 2009). Tourism businesses benefit directly through providing accommodation, ancillary and support services in tourism delivery while park visitors gain satisfaction from use of parks and reserves as leisure commodities. Subsistence farming communities, located along park boundaries, continue to suffer losses from unwanted encroachment from tigers, other megafauna and tiger prey seeking nourishment from livestock or crops. Wildlife encroachment may result also in human morbidity and mortality. In Chitwan National Park, for example, authorities compensate local communities approximately US$ 21,000 annually for livestock losses, crop and property damage and human casualties (Lamichhane et al., 2018).

Nepalese Government conservation policies, designed to maintain and increase tiger populations, supports a vibrant tourism industry while exacerbating detriment for local communities. This apparent unequal sharing of costs and benefits among stakeholders may generate or exacerbate community attitudes and actions, such as retaliatory killing of individual tigers. Fewer available tigers may in turn reduce park visitor demand and so negatively affect associated businesses. This outcome is important given that tourism is a primary sources of revenue for Nepal, where protected areas themselves attract over 600,000 visitors annually (GoN, 2017).

1.3. The costs of compensation

Conservation programs supporting large predators are costly (Dickman et al., 2011). *Nepal's Tiger Conservation Action Plan* budget was estimated at NPR 405 million (US$ 3.71 million) for the five-year period 2016–2020 (GoN, 2016a). Funding for the proposed budget is sourced from government coffers supplemented by contributions from national and international non-governmental conservation organizations. The current plan provides for 18 percent of the budget to be set aside for HWC resolution and associated community engagement activities (GoN, 2016a).

Based on compensation claim data stemming from situational wildlife damage in Nepal's protected areas, Bajimaya (2012) claims that funding set aside for HWC compensation is rarely sufficient. With regard to Nepal, dedicated funds are limited to damage caused by species listed in the *Wildlife Damage Compensation Guideline* (GoN, 2016b). However, several other species benefit from the establishment of protected areas. These species, including chital and wild boar, are known to also cause damage within adjacent local communities (Bhattarai, unpublished). Further, several authors have contended that Nepal's *Wildlife Damage Compensation Guideline* are perceived by affected local communities as unfair and cumbersome, underpinning the need for additional funds to establish and maintain a fair and efficient compensation system (Bhattarai et al., 2019; Dhungana et al., 2016). Given that Nepal's Government must consider other budget priorities, increased funding to support an equitable compensation scheme acceptable to local communities may require sourcing elsewhere.

1.4. Government compensation approaches and the user-pays principle

Insufficient compensation to counter negative outcomes from conservation implementation is reported for countries beyond Nepal (Ravenelle and Nyhus, 2017). Many countries fail to prioritize expenditure for conservation (Bruner et al., 2004). Moreover, available government funds for developing countries may be too limited to address all national priorities. As a result, funding allocated to support wildlife conservation for most countries is typically small relative to that available, while the sustainability of ongoing financial support, including that for HWC compensation, remains a concern (Nyhus et al., 2003). Hence, mechanisms additional to dedicated government expenditures, following a user-pays principle, should be considered.

Willingness to pay (WTP) for wildlife conservation among visitors has been examined previously in Nepal by Schutgens et al. (2018). In this study, visitors' WTP for snow leopard conservation in Annapurna Conservation Area was assessed using the contingent valuation method (CVM). This method is designed to simulate a hypothetical marketplace by determining WTP over a given range of bid amounts. Study findings revealed that international visitors were willing to pay US$ 59.05 per visit (95% confidence interval 49.70–66.33) in addition to the existing US$ 27 entrance fee. Schutgens et al. reported visitors were WTP additional charges for snow leopard conservation though the relative fee amount may be a barrier. Comparable information on visitor perceived benefits and WTP additional fees, as provided in this study, would be valuable also for tiger conservation zones. Further, data on WTP among a second group of direct conservation beneficiaries, tourism businesses, with regard to offsetting costs borne by adjacent farming communities, may provide a more complete picture of the *hypothetical marketplace*.

1.5. Study aim

To provide further information on WTP for conservation in Nepal, the present study aims to elicit, from both national park visitors and associated tourism business owners (TBOs), their WTP for (1) tiger conservation (and by implication, maintenance of the tiger's natural ecosystems) and, (2) compensation to farming communities for losses associated with tiger co-existence. A secondary aim was to estimate the effect of increasing park entry fees on visitor demand. The study was based on the CVM approach.

2. Methods

To meet the research aim, data were gathered from tourists and businesses servicing tourism in locations close to key tiger conservation areas in Nepal. The research employed a cross-sectional self-report survey design. Two tiger conservation areas surveyed were located in the West and Central regions of Nepal's Terai landscape (Fig. 1); Bardia National Park (BNP) and Chitwan National Park (CNP). These two unconnected national parks are among Nepal's most important tiger conservation reserves (Bhattarai et al., 2019).

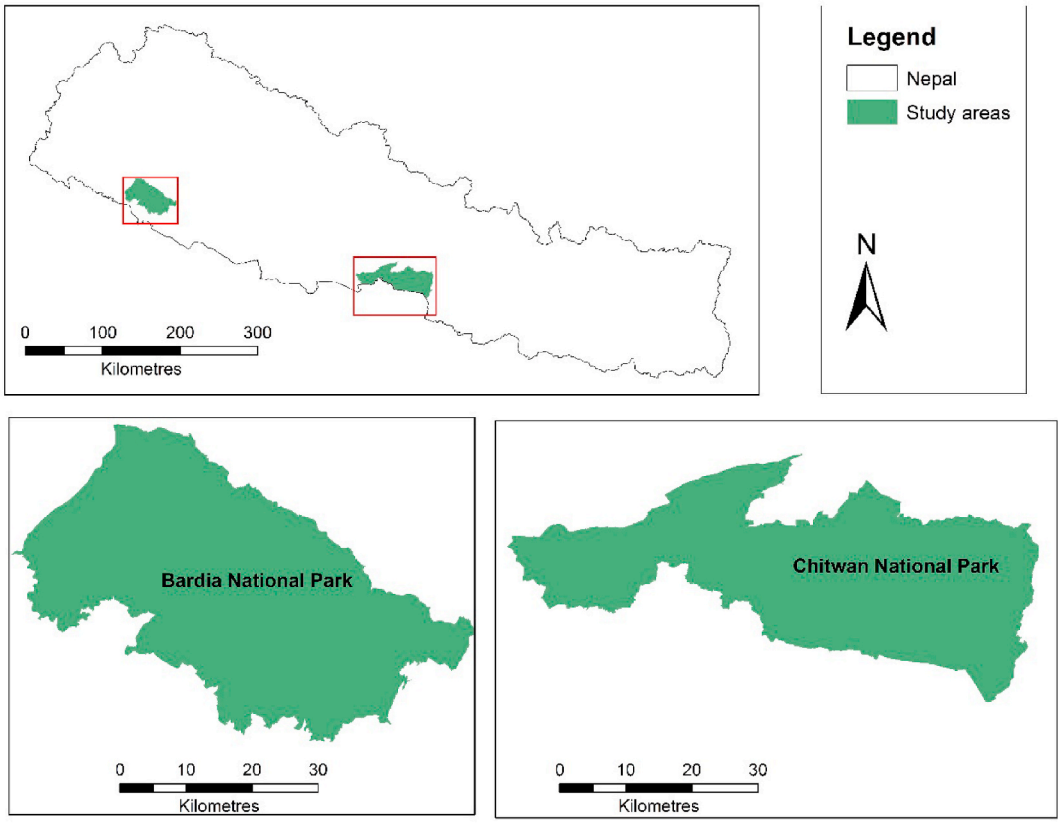

Fig. 1. Location of study areas in Nepal.

Ethical approval was provided by the Human Research Ethics Committee, Federation University (Project no. A16-162). Permission to conduct the study was granted by the Government of Nepal's Department of National Parks and Wildlife Conservation.

2.1. Measuring WTP

The CVM assessed WTP for Park visitors and TBOs. CVM is a widely used and practical approach for valuing non-market environmental goods using a survey based approach (Hanemann, 1994; Lipton et al., 1995). This method has been applied in protected reserves, wildlife and water resources (Carson, 2000; Emerton and Bos, 2004) where respondents are presented a *hypothetical market* to estimate the value (Hanley, 1989; Kahneman and Knetsch, 1992).

2.2. Study populations

For the previous ten years (2007–2016), an annual average of 150,000 domestic and international tourists visited these two National Parks. Tourists visiting either national park comprised one population surveyed in the current study. A second study population comprised some 280 TBOs servicing these tourists including accommodation providers and tour operators (GoN, 2017). TBOs were located in the buffer zone areas surrounding these national parks.

2.3. Population sampling and general procedure

2.3.1. Park visitors

Visitors (N = 387) to BNP or CNP were surveyed from May 2017 to January 2018. For BNP, all surveys were conducted at the single park entrance point (township of *Thakurdwara*). While CNP has multiple entrance points, the majority of visitors were known to enter the park via *Sauraha*. CNP surveys were collected at this general location.

Study piloting revealed surveying at park entry points was problematic, as visitors did not wish to delay their trip into the parks. Instead, visitor surveys were completed at selected accommodation providers. Most park visitors were known to stay at such establishments during their trip. These visitors may have entered the park multiple times during their stay, be repeat park visitors or had visited other national parks in Nepal. Therefore, the timing of instrument completion (e.g., before or after the park visit) was not controlled.

Accommodation providers were sourced from lists held by the *Thakurdwara* and *Sauraha* Offices of the Hotel Association at local level. Five establishments were selected at random to represent Thakurdwara (from some 30 listings) and 10 from *Sauraha* (from around 100 listings). Staff at all selected hotels agreed to distribute the instrument to park visitors staying at their establishments.

2.3.2. Tourism business owners

Approximately 30 TBOs operate in or proximate to BNP, with all being located in *Thakurdwara*. Some 250 TBOs operate in or proximate to CNP, with two-thirds located in *Sauraha*. An opportunistic sampling method was used in selecting participants. This involved driving to stated locations and from there attempting to identify the establishment. In several cases no establishment could be identified or no owner was located. Following this procedure, 74 TBOs (16 from *Thakurdwara* and 58 from *Sauraha*) participated in the study, representing approximately 26 percent of the defined TBOs population. Respondents were owners and/or managers representing hotels with restaurant (81%), restaurants only (14%), travel offices (4%) and souvenir outlets (1%), all catering to BNP or CNP visitors.

2.4. Instruments

2.4.1. Park visitors

A structured, self-explanatory questionnaire in English was used for

the visitor sample (Supplement data 1). The questionnaire was field tested on the target population prior to administration. Minor revisions were made following testing to improve clarity. The questionnaire opened with a broad study context including an overview of tiger conservation in Nepal and ensuing potential effects from human-tiger conflict on local farming communities. This was followed by a series of dichotomous (yes/no) questions, multiple-choice questions and open-ended questions.

Reported questions included: i) person questions (age, gender, household size, environmental organization affiliation, gross annual income, whether on organised tour, nationality, country of residence); ii) visitor travel expenditure for round-trip transport (international and local travel costs), accommodation and food during park stay plus additional direct tiger viewing costs (e.g., hire of qualified nature guide or safari tour); iii) primary attraction for park visit (tiger, rhinoceros, elephant, bird, culture, landscape), travel behaviour or intention to visit other national park and attitude toward tiger conservation (5-point Likert-type scales from strongly agree to strongly disagree), and; iv) WTP questions.

Visitors' WTP a fee for tiger conservation in addition to current expenditure was assessed as *yes* or *no*. Those responding *yes* to WTP completed a nine-option scale response specifying the *bid amount*. WTP bid amounts (US$ 5, 25, 50, 75, 100, 125, 150, 175 and 200) were elicited using a payment card method (Ryan et al., 2004). Visitors indicating no WTP were asked to provide reasons.

2.4.2. TBOs

TBOs were interviewed using a structured questionnaire containing binary choice (yes/no), multiple choice and open-ended questions (Supplement data 2). Items included were: person characteristics (age, gender, time length in the business operation, annual family income from other sources, plus business size (in bed numbers for hotels only); annual net business income from tourism business; estimated customer patterns for previous year (annual total, average duration and amount paid daily per customer) grouped by domestic and international tourists; attitude to tiger/other wildlife protection and effectiveness of farmer compensation, and; WTP questions.

TBOs were asked their WTP for farmer compensation for losses through tiger conservation (*yes* or *no*). Those indicating a WTP then specified a monthly amount payable for the next five years on a 6-point scale in local currency-Nepali Rupees[1] (NPR 1,000, 2,000, 3,000, 4,000, 5,000 and 6,000). Since no previous WTP studies for TBOs in Nepal were available, bid amounts presented were based on as the first author's experience as a Protected Area Management Officer in Nepal's Department of National Parks and Wildlife Conservation. Finally, TBOs were questioned on their reasons for indicating their selected WTP amount.

2.5. Procedure

Visitors at participating establishments were invited to complete questionnaires by hotel staff, during the time period May 2017 to January 2018. Completed questionnaire were returned to hotel staff in a sealed envelope. Questionnaires were self-completed anonymously, taking around 10 minutes, within the hotel. Although number and reasons for refusals were not recorded (considered too burdensome on hotel staff), the availability of questionnaires only in English may have reduced sample representation. Completed questionnaires were collected from hotel reception desks immediately following the survey period.

TBO interviews were conducted from May 2017 to January 2018 by trained research assistants. The broad study objective was explained plus background information including current conservation costs to government, funding sustainability and compensation available to farmers.

2.6. Data analysis

Data were combined for both national parks providing a single sample for visitors and single sample for TBOs. This decision provided a larger sample size for statistical modelling. Data for country of residence of visitors were grouped by global region. Minor differences in visitor and TBO profiles by location, respectively, were noted and reported where statistically significant. Further justification for pooling locations was provided since a sizable proportion of visitors indicated that they had previously visited, or intended to visit, both national parks during their trip. To counter potential bias, n*ational park* (BNP or CNP) was included as a control variable in statistical models. Possible limitations of this approach are noted in the discussion.

Collected data were analysed using SPSS (IBM, 2017). Critical alpha level was 0.05 using hypothesis test appropriate to the data (e.g., *t*-test and chi-square) with effect sizes reported for statistically significant results. WTP data were modelled using person-variable data as candidate predictors for both the visitor and TBO samples. Logistic regression was applied for WTP (*yes-no*) and WTP amount using ordinary least squares (OLS) regression as a quasi-confirmatory process.

For logistic regression, the Hosmer and Lemeshow test assessed the robustness in fitting the data (Hosmer and Lemeshow, 1980). Other standard assumptions for all reported regression models were tested following recommendations by Field (2013). Qualitative responses were grouped into representative themes. Using WTP results, expected changes to park visitor numbers over a range of scaled entry fees were calculated. The annual recorded parks visitation for the previous 10 years was used as the base-level for calculations (GoN, 2017).

3. Results

3.1. Sample profiles

For the 387 sampled visitors, 196 (51%) were male, 185 (48%) female, 6 (2%) gender not disclosed, with mean age group 30–39 (median age group 18–29) years. Visitor reported pre-tax mean income as US$ 50,000 (median = 25,000). The average resident household size was 4.2 persons. Sixty-six visitors (22% of the sample) reported holding an environmental affiliation and 139 (36%) were on a package tour. For country of residence, 166 (43%) were from European countries, 160 (42%) Asian, 44 (11%) North American and 15 (4%) Oceanian. No visitors resided in South America or Africa. For nationality, Nepalese were most frequent (61, comprising 16% of the sample).

TBOs (N = 74) had an average age of 41 years with 67 (91%) being male. TBO annual business revenue from tourism (less costs) showed a negative distribution skew with mean $ 2,752 and median $ 4,587. The mean length of business operation was 11.3 years. TBOs estimated a total number of visitors serviced for the previous year to be 15,318 for internationals visitors (mean per establishment at 212 vistors) and 46,856 for domestic visitors (mean 689 visitors). By park, these TBO estimates were higher for CNP relative to BNP for both international and domestic visitors (CNP means 243 and 822, BNP means 99 and 177 respectively), with differences statistically significant (*international*, $t_{67} = -2.6$, $p = 0.010$, d = 0.5) and *domestic* ($t_{64} = -4.8$, $p < 0.001$, d = 0.9). According to TBOs, international visitors on average stayed 2.8 nights and domestic visitors 1.4 nights. For accommodation, international visitors paid on average US$ 38 per day and domestic US$ 25.

3.2. Visitor characteristics and behaviors

Visitors reported choosing national parks to see/experience tigers (129, 41.3%), rhinoceros (66, 21.2%), wild elephant (24, 7.7%), the landscape (58, 18.6%), the culture (25, 8%) and birds (10, 3.2%).

[1] During the data collection period, the average conversion rate was US$ 1 = NPR 109.1.

Relative to CNP, BNP, visitors chose to see tigers more frequently and rhinoceros less frequently ($\chi^2 = 13.1, p = 0.02$). The majority of visitors for both parks (217, 58.8%) strongly agreed with the statement: *do you agree that tigers should be conserved in this park and elsewhere?* More than one-third (38%) of visitors had visited or planned to visit other protected areas in Nepal (Bardia, Chitwan, Sagarmatha and Langtang National Parks were most frequently identified, in that order).

The average reported *international travel cost* for visiting the park was US$ 891 (SD = 625, n = 381) for all visitors and US$ 1,030 (SD = 548, n = 320) excluding domestic visitors. *Local travel costs* (within Nepal) averaged US$ 130 (SD = 92, n = 353) for all visitors and US$ 143 (SD = 87, n = 298) when excluding domestic visitors. For international versus domestic visitors, the former subgroup paid more for both *accommodation* (US$ 42 v. US$ 16) and *associated costs* (US$ 110 v. US$ 29) with both differences statistically significant (respectively, $t_{158} = -7.4$, $p < 0.001$ and $t_{129} = -9.3$, $p < 0.001$). Costs of *accommodation* and *associated costs* followed similar distributions for *BNP* and *CNP* visitors.

3.3. Reasons associated with WTP and candidate predictors

For 387 visitors, 253 (65.1%) were willing to pay an additional fee to support tiger conservation. Park visitors (n = 141) not willing to pay for tiger conservation provided 121 reasons. The most frequent representative category was *limited financial resources* (64%), followed by *existing park fee adequate* (17%) and *government or NGO responsibility* (11%).

Direct logistic regression identified statistically significant WTP predictors with correct classification for 72 percent of cases (Hosmer and Lemeshow test, $\chi^2 = 2.7$ df = 8, $p = 0.951$, indicating a good fit). From 10 predictors, *international travel costs* and *environmental affiliation* predicted WTP intention at $p < 0.05$ (Table 1).

For 74 TBOs interviewed, 63 (85.1%) indicated willingness to pay compensation for farmers losses due to conservation. The most frequent reason provided by TBOs for this intention was to *encourage positive attitudes for wildlife conservation among farmers* (32.8%), followed by *to support wildlife based tourism* (27.8%). Logistic regression for candidate factors predicting TBO's WTP failed to provide a statistically valid model (predictor variables: *age*, *gender*, *number of international visitors serviced*, *no of domestic visitors serviced and income from tourism*).

3.4. WTP characteristics

For the visitor sample, mean WTP amount for conservation was US$ 20 (median = 5, SD = 35, n = 387, range = 0–200, $CI_{95\%} = 16.8–23.8$). As an indicator of scale validity, the proportion of respondents choosing the highest amount was 1.5 percent. WTP amounts had similar distributions for *BNP* and *CNP* visitors but differed between *international* (US$ 23) and *domestic* (US$ 7) visitors ($t_{107} = -4.1$, $p < 0.001$). WTP differed also by continent of origin ($F_{3, 381} = 6.3$, $p < 0.001$). Mean WTP amount by continent was highest for North American residents (mean = US$ 38, SD = 45) and lowest for residents of Asia (mean = US$ 14, SD = 33). Post hoc tests (Games-Howell) found a single significant differences between group means for North America and Asia (Supplement data 3). However, this difference may have been confounded by inclusion of domestic visitors (Nepali) having lower travel costs. When excluded, Asian residents had a relatively higher WTP at US$ 19 (SD = 35) while overall, continent of origin continued to have a significant effect ($F_{3, 324} = 4.0$, $p = 0.0087$). Post hoc comparison revealed group difference as no longer statistically significant, a result is likely explained by reduced power from smaller sample sizes.

Using WTP amount for conservations the outcome variable, a valid OLS regression model found *household size*, *annual income*, *associated costs* and *environmental affiliation* as statistically significant predictors ($F_{10, 225} = 15.2$, $p < 0.001$, $R^2 = 0.40$, $R^2_{adjusted} = 0.38$). The parsimonious model excluding non-predictors is given as: Visitor WTP = −22 + 0.00001 (*income*) + 2.563 (*household size*) + 0.145 (*associated costs*) + 18.71 (*affiliation*).

For TBOs, mean WTP per month, for the next five years, for farmer compensation was US$ 13 (SD = 11 with median amount 9.0). Applying the mean score to population of TBOs (~280) proximate to the parks would provide approximately a WTP figure of US$ 43,000 per year for compensation to farmers. For TBO WTP amount for farmer compensation, OLS regression revealed that *annual net income from tourism business* was the single significant predictor ($F_{5, 58} = 6.9$, $p < 0.001$, $R^2 = 0.37$, $R^2_{adjusted} = 0.31$). The single predictor regression equation was: TBO WTP = 294.7 + NPR 522.2 (*annual net income from tourism*).

Table 1
The association of candidate predictor variables with park visitors' WTP for conservation.

Predictor variable	*B*	Wald	*p* value	Odds ratio	95% CI for Odds
Age	.257	2.14	0.143	1.294	0.917–1.826
Gender	.222	0.40	0.529	1.248	0.626–2.489
Household size	-.070	0.68	0.408	.933	0.791–1.100
Income	.000	0.28	0.594	1.000	1.000–1.000
Participation in package tour	.207	0.26	0.606	1.230	0.560–2.698
International travel costs	**.001**	**16.01**	**0.000**	**1.001**	**1.001–1.002**
Local travel costs	.000	0.01	0.894	1.000	0.996–1.004
Accommodation costs	-.012	3.77	0.052	.988	0.975–1.000
*Associated costs	.005	2.00	0.157	1.005	0.998–1.012
Environmental affiliation	**1.579**	**8.74**	**0.003**	**4.851**	**1.704–13.812**
Constant	−1.651	5.27	0.022	.192	

Note: Outcome variable *willingness to pay*. * refers to park entry fee, nature guide and safari if any.

3.5. Modelling effects from additional fees on park visitations

WTP results from the visitor sample (N = 387) were applied in forecasting changes to park visitation levels over a range of additional entry fees. Introduction of additional entry fees are assumed to follow a *downward sloping* demand curve for assessing effects on park visitation, *ceteris paribus*. Modelling relied on historic visitor data used to estimate a baseline of 150,000 persons visiting the two parks per annum with an average park entrance fee of US$ 9[2]. Park revenue was maximised at an additional US$ 25 (Table 2 and Fig. 1).

4. Discussion

The aim of this study was to elicit WTP contributions for both park visitors towards the costs of conservation of tigers and TBOs for costs offsetting conservation costs borne by farmers adjacent to national parks. The study found that, on average, visitors to BNP and CNP are willing to contribute an additional amount above current park entry fees. Likewise, TBOs are willing on average to contribute to compensations for farming communities.

Therefore, from self-report by a sample of 387 park visitors and 74 tourism business owners in Nepal, the findings offer evidence that key conservation beneficiaries are willing to share attendant costs. This suggest the potential for policy measures supporting equitable redistribution of funds, an objective of the Convention on Biological Diversity (Aphrodite, 2006). Financial data reported here provide a guide to inform policy options, though further analysis of proposed policy interventions on market outcomes is required.

[2] Based on available data on proportion of domestic, SAC and international visitors in the year 2010/11, the average entrance fee was calculated as (43,833 domestic visitors X US$ 0.68)+(16,165 SAC visitors X US$ 7.4)+(94,676 international visitors X US$ 13)/(43,833 + 16,165 + 94,676).

Table 2
Expected annual visitation and additional revenue for Bardia National Park and Chitwan National Park over an empirical WTP range.

WTP amount (US$)	Park fee (US$)	Sub-sample	Sample proportion	Projected visitors[a]	Expected decrease in total visitors from baseline visitation	Total revenue (US$)	Change in total revenue (US$) from baseline visitation
0	9	387	1.00	150,000	0	1,350,000	–
5	14	252	0.65	97,674	52,326	1,367,442	+17,442
25	34	140	0.36	54,264	95,736	1,844,961	+494,961
50	59	71	0.18	27,519	122,481	1,623,643	+273,643
75	84	28	0.07	10,853	139,147	911,628	−438,372
100	109	22	0.06	8,527	141,473	929,457	−420,543
125	134	9	0.02	3,488	146,512	467,442	−882,558
150	159	9	0.02	3,488	146,512	554,651	−795,349
175	184	7	0.02	2,713	147,287	499,255	850,775
200	209	6	0.02	2,326	147,674	486,047	−863,953

[a] Based on an average annual number of visitors to BNP and CNP for last 10 years of 150,000.

4.1. WTP and determinants

Park visitors' WTP indicated they receive a consumer surplus for their park visit. The surplus may be quantified, in crude terms, as US$ 20 per visit, well above the current entry fees (~of US$ 1 for domestic visitors, US$ 7 for visitors from South Asian Countries other than Nepal (SAC) and US$ 13 per day for (non-SAC) international visitors). This finding is unsurprising given that park visitors, and particularly international visitors, will likely have expended far greater monetary amounts on tourism services to access and stay at park locations. Presumably, WTP amounts specified by visitors' accounts directly or indirectly for their access to financial resources.

The study findings however indicate that monetary factors are not the single determinant of WTP propensity. This contention is supported by previous studies (Baral et al., 2008; Pandit et al., 2015; Schutgens et al., 2018). Factors found to affect visitor WTP amounts for visitors of Nepalese Parks were financial factors of travel costs and income, as well as environmental affiliation. The latter factor presumably indicates a positive attitude towards conservation of natural habitats, which may work to overcome any WTP resistance based on financial concerns. Cognitive mechanisms, and interactions among determinant factors, may prove a fruitful avenue for further research. In any case, the major proportion of shared variance in visitors' WTP was not explained by modelled factors. Other factors including the unique experience offered or altruistic intentions may be involved in the cognitive decisions-making process.

Regardless of reasons, visitors' WTP among nature-based tiger viewing experiences found in this study align to previous reports. For example, visitors to the snow leopard in Annapurna Conservation Area in Nepal were WTP US$ 59 on top of US$ 27 as entrance fee towards conservation (Schutgens et al., 2018). While both visitor samples were willing to contribute funds to compensation above what they are required to pay, differences in WTP amounts may be explained by the different elicitation method, based on dichotomous choice, employed for the snow leopard study.

In general, dichotomous choice methods yield higher WTP amounts compared to the payment card method used for the present study (Ready et al., 2001; Ryan et al., 2004). The payment card method is a frequent choice for WTP due to ease of application. Further, this method is argued to echo the real market situation by allowing consumers choose what they consider the most suitable WTP value (Donaldson et al., 1997). In addition, the method accounts for *protest* responses (visitors not willing to pay any amount), included here in estimates of visitor's mean WTP amounts. Frey et al. (2019) note that a lack of opportunity to elicit protest bids from respondents may bias WTP estimates.

To the authors' best knowledge, this is the first study to report tourism operators' willingness to pay for indirect support of conservation outcomes through farmer compensation. The advantage of these data is to represent benefits and costs accrued to all major stakeholders in the theoretical market. In this study, more than 8 of every 10 tourism business owners were willing to pay some amount monthly towards to support farmers sustaining loss from conversation. The reasons for this intention, while subject to further research, appear to be associated with maintaining a viable tourism industry providing benefit to all key stakeholders, contingent upon business earnings. The findings suggest that TBOs may seek opportunities to support their business through direct conservation contributions using a suitable mechanism. More generally, this finding indicates that tourism businesses realise that a partnership approach will support important conservation outcomes.

For the financial year 2013–2014, farmers located adjacent to the two parks in this study claimed a total of US$ 17,100 (Unpublished data source of BNP and CNP) in compensation (amounts subsequently provided to claimants are not available) for livestock losses and human casualties by tigers but does not include crop damages by prey species of tigers. The findings reported in this study suggest that TBOs are WTP more than double this claimed amount. This evidence submits that new mechanisms may be considered for redistribution of benefits and costs from compensation and the tourism industry supported by this government policy.

4.2. Policy implications from WTP applications

Decisions to apply additional park fees for visitation or tariffs on associated businesses should be in consideration of several key factors affecting demand. One concerns the park fee increase relative to total travel costs. International visitors, for example, in this sample spent on average around US$ 1,200 on the trip, any increase to park fees would represent just a fraction of this total cost. A second consideration is the effects for raising business costs from tariffs. In this study, average WTP amounts reported by operators equates to around 4 percent of annual income from tourism. A third consideration is the lack of direct substitutes for the park experience. This suggests a relatively inelastic demand given that no other protected areas within the region hold comparable ecological and cultural heritage, or in the case of CNP, are listed UNESCO World Heritage Sites.

Table 2 above presented a hypothetical scenario using collected WTP data to estimate the effect from increasing park fees on visitor demand. In absence of actual market data, this analysis provides the best available evidence for supporting management decisions on appropriate fees for park access. Of course, such analysis ignores, or assumes constant other factors which may affect decision including price of substitutes and specific role of fee amount in the park visit decision-making process. Moreover, the method for estimation followed a crude process in the

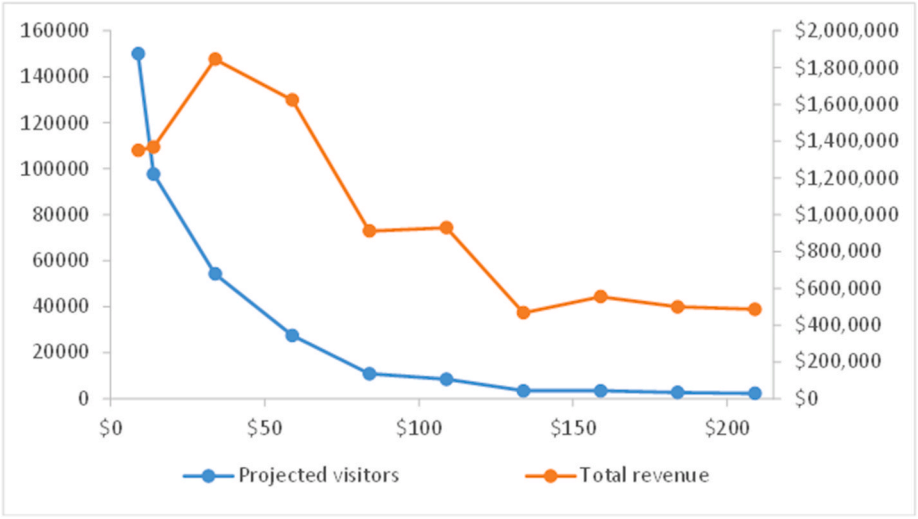

Fig. 2. Expected numbers of park visitors and expected total revenue at different proposed park entrance fee. The orange line shows expected revenue which is represented in right hand vertical axis and the blue line shows the expected numbers of visitors which is represented in left hand vertical axis. $ represents US$. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

sense that an average fee was used.[3] Before decisions on fee changes are implemented, precise analysis on impacts from fee changes on sub-markets required assessment in addition to equity considerations.

Hypothesised market reactions based on study findings may be assessed in light of limitations associated with market complexity and uncontrolled factors. The study indicates that raising park entry fees by US$ 25 (on average) will maximise revenue. This will provide and additional US$ 494,961 for park authorities which may be used to support conservation outcomes. A tariff placed on TBOs, given their WTP, may be used to supplement additional funding of US$ 43,000. Together, adding these two amounts would nearly double the annual budget (i.e. US$ 743,119) specified by Nepal's National Tiger Conservation Action Plan for 2016–2020 (see GoN, 2016a).

Changes to market prices will naturally have flow-on effects. Increased fees are predicted from study data to reduce visitor numbers by approximately 96,000 per year for an additional US$ 25 entrance fee. Other scenarios for fee increases are listed in Fig. 2. One effect may be to reduce ecological impacts on the parks, an important outcome where visitation levels are beyond acceptable limits of change. Fewer visitors, combined with new tariffs, may also have implications for tourism operators. Falls in operating revenue may result in costs passed onto consumers as higher prices. Market interventions may also present barriers to budget conscious travellers including local Nepalese. Other financial impacts may be experienced in local communities, reducing opportunities for economic development.

Several authors (e.g., Mmopelwa et al., 2007; Pandit et al., 2015; Walpole et al., 2001) suggest differential pricing policies for international and other park visitors based on average national incomes. Hence, precise decision-making based on a single case study may be flawed. On this, Baral et al. (2008), Schutgens et al. (2018) and Walpole et al. (2001) suggest that decision-making based on hypothetical surveys should also be supported by social, political and economic studies. Further studies are therefore required to support good decisions that consider economic needs, social and economic impacts of new policy and ecological considerations as well as practical aspects.

[3] Visitors from SAC (South Asian Countries) include Afghanistan, India, Pakistan, Bangladesh, Bhutan, Sri Lanka, and the Maldives) which pay US$ 5 in BNP and US$ 8 in CNP. International visitors from other nations currently pay a park entrance fee of US$ 10 in BNP and US$ 16 in CNP. The average of BNP and CNP for international visitors (other than SAC) is ca US$ 13. Domestic (Nepali) visitors pay a much lower fee of US$ 1.

4.3. Limitations

The study findings should be considered in the context of standard limitations of self-reported data including sampling methods. The sample is representative of the two national parks used for data collection. Findings may be argued as representative of Nepal's remaining national parks in the absence of pertinent data. Data collection methods may have introduced bias from respondents providing socially desirable answers, defective recall, or non-random sampling methods compounded by unknown refusals. Also, respondents yet to visit parks or those on group tourism may have had limited knowledge on questions concerning costs (though respondents were not required to answer cost questions). Nevertheless, in the absence of more rigorously collected data in Nepal or elsewhere, the study results provide best available evidence.

Limitations of the WTP method itself are acknowledged. In the study, a 9 *bid amount* range (as contingent valuations) was presented to participants based on current national park entrance fees, informed by comparable WTP studies in the region. Few respondents (1.5%) selected the highest amount suggesting that bids above this range may be rare. As a hypothetical process, CVM potentially *carries* several forms of bias. Hypothetical bias, for example, threatens the validity of the study where respondents report values different to those expended in a real-life scenario. This form of bias inherent to WTP surveys may produce an overestimation of the true value of the object in question (Hanley, 1989; Kanya et al., 2019). Another form of bias, with a contrasting effect, may stem from respondents' strategic *free-riding* on public environmental goods. That is, respondents may adjust their WTP below a true value as they expect others will pay sufficient amounts (Hanemann, 1994; Venkatachalam, 2004). As a bias countermeasure, participants in the present study were instructed to provide answers as if the situation was real. Further, by asking questions on *annual income*, costs of *travel* and *accommodation*, plus those for *safaris*, prior to WTP questions presumably heightened respondent's awareness of their own economic circumstances resulting in more realistic WTP answers.

Others forms of bias are common to elicitation methods including CVM. One is study bias (Venkatachalam, 2004). For example, the *payment card* method used in this study assumed that participants would locate their maximum WTP amount within the range of bid amounts offered (here US$ 200), whereas some may have wished to provide a larger amount (Ryan et al., 2004). In this study, very few respondents chose this highest bid indicating relatively low potential for bias from

this source. Nevertheless, given unknown effect from biases more generally, the WTP findings reported here, while instructive, should be interpreted with some caution (Kanya et al., 2019; Ryan et al., 2004).

4.4. Further research

From a practical standpoint, further research in market operations is required to support policy decisions. This includes assessment of current prices and the effects of changes on consumers, business and other agents, accounting for transition costs. From a theoretical perspective, methods to validate WTP predictions, based on ecologically valid studies, are required to assess method utility for improving conservations outcomes. Together, these studies will both inform decision on BNP and CNP zones while providing example for comparable natural areas on effective pricing mechanisms that support planned conservation outcomes.

5. Conclusion

This study demonstrates that visitors and tourism business owners are, on average, willing to pay towards the costs of conservation and farmer compensation, respectively, to continue protection of iconic and endangered species including tigers and their prey for two of Nepal's key national parks. The study findings suggest that policy makers could consider increasing park entry fees for visitors as well as tariffs on local tourism businesses. These decisions should be supported by detailed market analysis to assess likely impacts on conservation stakeholders, accounting for conservation funding needs.

Recognition for the value of conservation partnerships among tourists and supporting businesses was a pleasing outcome from this study. Both park visitors and tourism business owners benefit from conservation of biodiversity. It is therefore logical to set pricing mechanism that referent this value, and where suitable, redirect funds to those bearing the costs of conservation including government authorities and local farmers. In this way, benefits and costs accrued from conservation of iconic wildlife species will be more equitably shared among stakeholders.

Author contribution

Bhattarai, B.: Conceptualization, Methodology, Formal analysis, Writing – original draft and Subsequent Revision. Morgan, D.: Conceptualization, Formal analysis, Comments on Draft Manuscript. Wright, W.: Conceptualization, Comments on Draft Manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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References

Aphrodite, S., 2006. Analysis of the objectives of the Convention on Biological Diversity: their interrelation and implementation guidance for access and benefit sharing. Columbia J. Environ. Law 31, 243–331.

Bajimaya, S., 2012. Managing human-wildlife conflict. In: Acharya, K.P., Dhakal, M. (Eds.), Biodiversity Conservation in Nepal: a Success Story. Bagalamukhi Offset Press, Nepal.

Baral, N., Stern, M.J., Bhattarai, R., 2008. Contingent valuation of ecotourism in Annapurna Conservation Area, Nepal: implications for sustainable park finance and local development. Ecol. Econ. 66 (2), 218–227. https://doi.org/10.1016/j.ecolecon.2008.02.004.

Bauer, H., Mā¼ller, L., Van Der Goes, D., Sillero-Zubiri, C., 2017. Financial compensation for damage to livestock by lions *Panthera leo* on community rangelands in Kenya. Oryx 51 (1), 106–114. https://doi.org/10.1017/S003060531500068X.

Bhattarai, B., 2009. Human-tiger (Panthera tigris Tigris) Conflict in Bardia National Park, Nepal. M Sc), University of Greifswald, Germany, Greifswald.

Bhattarai, B., Fischer, K., 2014. Human-"tiger *Panthera tigris* conflict and its perception in Bardia national park, Nepal. Oryx 48 (4), 522–528. https://doi.org/10.1017/S0030605313000483.

Bhattarai, B., Wright, W., Morgan, D., Cook, S., Baral, H., 2019. Managing human-tiger conflict: lessons from Bardia and chitwan national parks, Nepal. Eur. J. Wildl. Res. 65, 1–12. https://doi.org/10.1007/s10344-019-1270-x.

Bhattarai, B., Wright, W., Poudel, B., Aryal, A., Yadav, B., Wagle, R., 2017. Shifting paradigms for Nepalâ€™s protected areas : history, challenges and relationships. J. Mt. Sci. 14 (5), 964–979. https://doi.org/10.1007/s11629-016-3980-9.

Bruner, A.G., Gullison, R.E., Balmford, A., 2004. Financial costs and shortfalls of managing and expanding protected-area systems in developing countries. Bioscience 54 (12), 1119–1126. https://doi.org/10.1641/0006-3568(2004)054[1119:FCASOM]2.0.CO2.

Carson, R.T., 2000. Contingent Valuation: a User's Guide. ACS Publications, University of California, USA.

Dhungana, R., Savini, T., Karki, J.B., Bumrungsri, S., 2016. Mitigating human-tiger conflict: an assessment of compensation payments and tiger removals in Chitwan National Park, Nepal. Tropical Conservation Science 9 (2), 776–787. https://doi.org/10.1177/194008291600900213.

Dickman, A.J., Macdonald, E.A., Macdonald, D.W., 2011. A review of financial instruments to pay for predator conservation and encourage human-carnivore coexistence. Proc. Natl. Acad. Sci. U. S. A 108 (34), 13937. https://doi.org/10.1073/pnas.1012972108.

Donaldson, C., Thomas, R., Torgerson, D.J., 1997. Validity of open-ended and payment scale approaches to eliciting willingness to pay. Appl. Econ. 29 (1), 79–84. https://doi.org/10.1080/000368497327425.

Emerton, L., Bos, E., 2004. Value: Counting Ecosystems as Water Infrastructure. IUCN, Gland.

Field, A., 2013. Discovering Statistics Using IBM SPSS Statistics. sage.

Frey, U.J., Pirscher, F., Xin, B., 2019. Distinguishing protest responses in contingent valuation: a conceptualization of motivations and attitudes behind them. PloS One 14 (1). https://doi.org/10.1371/journal.pone.0209872.

GoN, 2016a. Tiger Conservation Action Plan (2016-2020). Government of Nepal, Department of National Parks and Wildlife Conservation, Kathmandu, Nepal.

GoN, 2016b. Wildlife Damage Compensation Guideline Revised (Revised in 2016). Government of Nepal, Ministry of Forests and Soil Conservation, Kathmandu.

GoN, 2017. Annual Report, Fiscal Year 2016/2017. Government of Nepal, Department of National Parks and Wildlife Conservation, Kathmandu.

Hanemann, W.M., 1994. Valuing the environment through contingent valuation. J. Econ. Perspect. 8 (4), 19–43. https://doi.org/10.1257/jep.8.4.19.

Hanley, N.D., 1989. Valuing nonâ€market goods using contingent valuation. J. Econ. Surv. 3 (3), 235–252. https://doi.org/10.1111/j.1467-6419.1989.tb00069.x.

Hosmer, D.W., Lemesbow, S., 1980. Goodness of fit tests for the multiple logistic regression model. Commun. Stat. Theor. Methods 9 (10), 1043–1069.

IBM, 2017. IBM SPSS Statistics for Windows. IBM Corp, Armonk, NY.

Kahneman, D., Knetsch, J.L., 1992. Valuing public goods: the purchase of moral satisfaction. J. Environ. Econ. Manag. 22 (1), 57–70. https://doi.org/10.1016/0095-0696(92)90019-S.

Kanya, L., Sanghera, S., Lewin, A., Fox-Rushby, J., 2019. The criterion validity of willingness to pay methods: a systematic review and meta-analysis of the evidence. Soc. Sci. Med. 232, 238–261.

Karanth, K.K., Gopalaswamy, A.M., DeFries, R., Ballal, N., 2012. Assessing patterns of human-wildlife conflicts and compensation around a central Indian protected area. PloS One 7 (12), 1–13. https://doi.org/10.1371/journal.pone.0050433.

Karanth, U.K., Madhusudan, M., 2002. Mitigating human-wildlife conflicts in southern Asia. In: Terborgh, J., van Schaik, C., Davenport, L., Rao, M. (Eds.), Making Parks Work: Strategies for Preserving Tropical Nature. Island Press, Washington DC, pp. 250–264.

Lamichhane, B.R., Persoon, G.A., Leirs, H., Poudel, S., Subedi, N., Pokheral, C.P., Bhattarai, S., Thapaliya, B.P., de Iongh, H.H., 2018. Spatio-temporal patterns of attacks on human and economic losses from wildlife in Chitwan National Park, Nepal. PloS One 13 (4), e0195373. https://doi.org/10.1371/journal.pone.0195373.

Lipton, D.W., Wellman, K., Sheifer, I., Weiher, R., 1995. Economic Valuation of Natural Resources: a Handbook for Coastal Resource Policymakers.

Macdonald, D.W., Loveridge, A.J., 2010. The Biology and Conservation of Wild Felids. Oxford University Press, Oxford.

Mmopelwa, G., Kgathi, D.L., Molefhe, L., 2007. Touristsâ€™ perceptions and their willingness to pay for park fees: a case study of self-drive tourists and clients for mobile tour operators in Moremi Game Reserve, Botswana. Tourism Manag. 28 (4), 1044–1056. https://doi.org/10.1016/j.tourman.2006.08.014.

Nyhus, P., Fischer, H., Madden, F., Osofsky, S., 2003. Taking the bite out of wildlife damage the challenges of wildlife compensation schemes. Conserv. Pract. 4 (2), 37–43.

Packer, C., Kosmala, M., Cooley, H.S., Brink, H., Pintea, L., Garshelis, D., Purchase, G., Strauss, M., Swanson, A., Balme, G., Hunter, L., Nowell, K., 2009. Sport hunting, predator control and conservation of large carnivores. PloS One 4 (6), e5941. https://doi.org/10.1371/journal.pone.0005941.

Pandit, R., Dhakal, M., Polyakov, M., 2015. Valuing access to protected areas in Nepal: the case of Chitwan National Park. Tourism Manag. 50, 1–12. https://doi.org/10.1016/j.tourman.2014.12.017.

Ravenelle, J., Nyhus, P.J., 2017. Global patterns and trends in human-“wildlife conflict compensation. Conserv. Biol. 31 (6), 1247–1256. https://doi.org/10.1111/cobi.12948.

Ready, R.C., Navrud, S., Dubourg, W.R., 2001. How do respondents with uncertain willingness to pay answer contingent valuation questions? Land Econ. 77 (3), 315. https://doi.org/10.2307/3147126.

Ryan, M., Scott, D.A., Donaldson, C., 2004. Valuing health care using willingness to pay: a comparison of the payment card and dichotomous choice methods. J. Health Econ. 23 (2), 237–258. https://doi.org/10.1016/j.jhealeco.2003.09.003.

Schutgens, M.G., Hanson, J.H., Baral, N., Ale, S.B., 2018. Visitorsâ€™ Willingness to Pay for Snow Leopard Panthera Uncia Conservation in the Annapurna Conservation Area. Oryx, Nepal, pp. 1–10. https://doi.org/10.1017/S0030605317001636.

Thinley, P., Rajaratnam, R., Lassoie, J.P., Morreale, S.J., Curtis, P.D., Vernes, K., Leki, L., Phuntsho, S., Dorji, T., Dorji, P., 2018. The ecological benefit of tigers (*Panthera tigris*) to farmers in reducing crop and livestock losses in the eastern Himalayas: implications for conservation of large apex predators. Biol. Conserv. 219, 119–125. https://doi.org/10.1016/j.biocon.2018.01.015.

Venkatachalam, L., 2004. The contingent valuation method: a review. Environ. Impact Assess. Rev. 24 (1), 89–124. https://doi.org/10.1016/S0195-9255(03)00138-0.

Walpole, M.J., Goodwin, H.J., Ward, K.G.R., 2001. Pricing policy for tourism in protected areas: lessons from komodo national park, Indonesia. Conserv. Biol. 15 (1), 218–227. https://doi.org/10.1111/j.1523-1739.2001.99231.x.

Widman, M., Elofsson, K., 2018. Costs of livestock depredation by large carnivores in Sweden 2001 to 2013. Ecol. Econ. 143, 188–198. https://doi.org/10.1016/j.ecolecon.2017.07.00.