

Wild and Valuable? Tourist Values for Orang-utan Conservation in Sarawak

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Abstract

Fluffy, orange and endearing, orang-utans have won the hearts of people all over the world. However, all sub-species are endangered in the wild with the Bornean orang-utan population having declined by more than 50% over the past 60 years. Fewer than 2,000 wild orang-utans remain in Sarawak with nearly all truly wild ones confined to a remote site on the Indonesian border. Yet each year thousands of tourists and local Sarawak people see orang-utans semi-wild in a reserve or captive in a rehabilitation centre. We investigated the attitudes of such tourists towards the conservation of the remaining wild populations by means of questionnaires, including a choice experiment. Sixty percent of the respondents were, in principle, willing to pay to ensure survival of a wild orang-utan population. International tourists tended to regard wild survival as being more important than having a high probability of seeing orang-utans personally—indeed they preferred wild orang-utans to be hard to find. Malaysian tourists were more inclined to favour investment in the small number of captive or semi-wild animals. Using conservative judgements of the difference between stated and real willingness-to-pay, we estimated that about USD 6.6 million per year could be made available to wild orang-utan conservation from voluntary contributions by visitors to the semi-wild animals. We also estimated that the 40% of visitors to these facilities who come to Sarawak primarily because of the apes, bring between USD 13 and USD 23 million into the local economy each year through their expenditure on local businesses, about 0.6% of the income earned by Sarawak from timber products. Our results suggest that far fewer would come if there were no wild orang-utans in Sarawak. Thus the value of wild orang-utans in Sarawak can be delivered through the captive facilities but the economic benefits from orang-utans require both captive and wild orang-utans.

Keywords: orang-utans, charismatic species, choice experiment, existence value, willingness-to-pay, Sarawak

INTRODUCTION

Bornean orang-utans (*Pongo pygmaeus*) are among the six non-human members of the Hominidae now listed as Endangered or Critically Endangered (IUCN 2012). The Bornean orang-utan

population has declined by more than 50% over the past 60 years because of habitat loss (Gregory et al. 2012). Clearance and fragmentation for oil palm plantations (Swarna Nantha and Tisdell 2009) and deforestation to accommodate a growing human population (Sodhi et al. 2010) are among the major reasons for the habitat loss. Wildfires (Sodhi et al. 2004; Wich et al. 2011) and climate change (Gregory et al. 2012) amplify the risk of habitat loss. Hunting and capture for the pet trade pose a direct threat to orang-utan populations (Ancrenaz et al. 2008; Wich et al. 2008; Wich et al. 2011). In comparison to oil palm, wild orang-utans are thought to produce trivial returns from tourism and, while many people value their existence in the wild, most do not pay for them (Swarna Nantha and Tisdell 2009). However, a recent more broadly-based study

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by Wich et al. (2011) has shown that the benefits derived from conserving orang-utans exceed the revenues from oil palm. With the conservation of orang-utans and their habitat, important ecosystem services beneficial for humans are also conserved, including, at a local level, mitigation of landslides and floods, and improvements to water supply and quality and, at a global level, carbon storage and reduced emissions from reduced deforestation, human health and food security (Wich et al. 2011).

In Sarawak, on the Malaysian side of Borneo, a small population (<2,000) of the north-western subspecies of orang-utan (*Pongo pygmaeus pygmaeus*) persists in forest near the Indonesian border (Ancrenaz et al. 2008). Other populations in Sarawak were lost to hunting last century or to intensive logging over the last three decades. Nevertheless, tourists are strongly encouraged to associate Sarawak with orang-utans. Orang-utans feature prominently on many websites dedicated to tourism and tourists are invited to visit “Our Friends” at two facilities for apes rescued when their habitat was cleared (Rijksen and Meijaard 1999); Semenggoh (semi-wild) and Matang (strict captivity) near the capital Kuching (Sarawak Tourist Board 2014a). Although less well known than Sepilok in Sabah or Camp Leakey in Kalimantan (Swarna Nantha and Tisdell 2009), tourists come to see these small populations of captive/semi-wild orang-utans from all over the world as well as from around Malaysia. While the tourists do not experience wild orang-utans at these sites, their presence in Sarawak may be because of the wild orang-utans. Thus the wild orang-utans are likely to provide economic benefit to Sarawak by their very existence.

There is much research on the disturbance of habitat in South-East Asia. In spite of predictions that orang-utan numbers will decline and the ecosystem services that they provide will be lost, no economic value has been attached to the orang-utans. Given that “you cannot manage what you do not measure” (Pavan Sukhdev in TEEB 2008), the principal aim of this project is to place a monetary estimate on the value of wild orang-utans to Sarawak. Our analysis and research design was guided by two hypotheses: 1) that tourists visiting the captive and semi-wild populations have a higher value for the existence of wild orang-utans, although they might never see them, rather than they do for the animals in a wildlife park, and 2) that people who travel far to see the orang-utans (international tourists) have different values than domestic tourists who are more familiar with the apes and for whom they could deliver both local benefits and opportunity costs.

We tested the hypotheses by applying a stated preference choice experiment, a multi-attribute environmental valuation technique, to determine preferences for a range of benefits that might arise from improved orang-utan conservation programs. More specific objectives under the broader aim were to: 1) reveal how many of the tourists would pay for wild orang-utan conservation in Sarawak; 2) assess the relative importance of a set of characteristics of wild orang-utan conservation management; 3) elicit respondents’ willingness-to-pay for these characteristics; and 4) compare the willingness-to-pay

estimates across international, domestic, and local tourists. We also estimated a minimum value of the direct economic benefits to the Sarawak economy from the presence of orang-utans. Apart from conservation policies that can be drawn from this study, the results contribute to a growing literature on species valuation.

This is the first study to value an ape (see Martín-López et al. 2008 for a list of species evaluated) and one of the few that uses a choice experiment rather than contingent valuation¹, a method that has been frequently used to quantify peoples’ willingness-to-pay for threatened species (Richardson and Loomis 2009). Choice experiments overcome some of the shortcomings of identifying willingness-to-pay using contingent valuation methods (Wallmo and Lew 2011). Choice experiments are, for instance, better than contingent valuation for valuing species if there is the danger of respondents exaggerating their willingness-to-pay in the presence of a charismatic species (‘warm-glow effect’), potentially a major problem for an animal as endearing as an orang-utan. That is because, in a choice experiment, respondents are not asked directly their willingness-to-pay for a species per se but they are asked to trade-off a series of benefits from a wild orang-utan conservation programme. Such a programme can have many benefits, some related to the survival of wild orang-utans, which can be interpreted as proxy for their value; some to other co-benefits.

METHODS

Study area

Sarawak is 124,000 sq. km, of which 44,000 sq. km is being used for timber extraction (Pakhriazad and Hasmadi 2010) and 12,000 sq. km has been planted with oil palm (Ministry of Land Development Sarawak 2014). In Sarawak, about 1,100–1,700 orang-utans (~97% of the State’s population) occur in the wild (Wich et al. 2008). Almost all of these live in Batang Ai National Park (320 sq. km; 119–580 individuals), where there is a small chance of seeing them by employing local guides and trekking for several days, and the neighbouring, but even less accessible, Lanjak Entimau Wildlife Sanctuary (1,930 sq. km; 1024–1181 individuals). About 15 caged captive orang-utans can be seen at Matang Wildlife Centre (‘Matang’), 35 km from Sarawak’s capital Kuching, and a further 25 orang-utans roam free within the 65 sq. km area of rainforest at the Semenggoh Nature Reserve (‘Semenggoh’), 20 km from Kuching. Eleven animals have been released from the two captive facilities into Kubah National Park, a 22 sq. km rainforest block adjacent to Matang Wildlife Centre, of which eight survived, while two returned and one died (A. Joyce pers. comm). These rehabilitated animals are fully naturalised with low chances of seeing them.

Interviews were conducted at the Semenggoh Nature Reserve. The reserve is open to the public 365 days a year with orang-utans being fed twice daily (9.00–9.30 am and 3.00–3.30 pm; Sarawak Forestry Corporation 2014). In the

dry season at least some apes reliably visit the feeding station twice a day to receive food. For up to 3 months in the fruiting season, however, they may not visit the feeding station at all, subsisting entirely on fruit in the surrounding forest and making it much less likely that visitors will see them.

The number of tourists at Semenggoh averaged about 70,000 per year for the last 12 years (37,000 visitors in 1999, falling to 26,000 in 2001 but increasing to almost 128,000 in 2011; Appendix 1). Of these about half are international and the remainder from Malaysia (Semenggoh Wildlife Rehabilitation Centre. pers. comm. 2011). At the time of the surveys (2010/2011), the entrance fee at Semenggoh was MYR3 (about USD 1) for both domestic and international tourists alike, but in May 2012, it was raised to 30 MYR (about USD 10) for international tourists. Nationally, Malaysia received USD 19 billion in revenue from 28 million tourists in 2010 for whom the average length of stay was 6.8 days (Jabatan Perangkaan Malaysia 2011). Sarawak received about 3.3 million visitors in 2010, of which 58% were international and the remainder from other Malaysian states (Sarawak Tourist Board 2014b).

Sampling, questionnaire, and survey procedure

Data were obtained by interviewing individuals using a structured questionnaire. Respondents for the interviews were randomly selected from the visitors present at Semenggoh at feeding time. Sampling was stratified to obtain similar numbers of international and domestic tourists, including men and women. From our literature review of similar face-to-face stated preference studies (e.g., Bandara and Tisdell 2003; Beharry-Borg and Scarpa 2010; Kim et al. 2012), we estimated that 300 interviews would give us statistically meaningful results after allowing for a small proportion of un-usable questionnaires. Interviews were conducted, mainly over weekends, between November 2010 and August 2011. Collection was intensified during two holiday phases (Christmas and Easter) to take advantage of the larger number of international tourists visiting the wildlife park at this time. Data were collected by local students who were fluent in English, Malay, and the local Iban language, so were able to conduct interviews with most visitors in a language with which they were comfortable. Each interview took about 20 minutes and all respondents were approached and interviewed after the feeding time so as not to disturb their experience. Permission to approach tourists and to conduct the interviews in the park, was granted by the Semenggoh park management, to students involved in the project from Universiti Malaysia Sarawak (authors STP and CJ), and ethics approval for this research was granted by Universiti Malaysia Sarawak.

The questionnaire consisted of five parts. The first part collected socio-demographic information about respondents, including questions about age, education, country of residence, and, if Malaysian, city of residence. The second part asked non-local respondents the number of days spent on holidays in Sarawak, the motivation for their visit, whether they have seen orang-utans in other parts of Malaysia and/or are planning

to, and if they were likely to visit Semenggoh again. The third part asked respondents if they were aware of the existence of wild orang-utans and their opinion about a series of statements concerning the conservation of orang-utans on a scale from 1 to 5. The fourth part constituted the willingness-to-pay question which had two stages: first respondents were asked to state their general willingness to contribute to orang-utan conservation in Sarawak (possible answers: Yes/No). It was explained that some money is already available for their conservation (e.g., Heart of Borneo Project by WWF which marginally covers Sarawak) but that additional money could help the survival of wild orang-utans in Sarawak, in the only national park where they occur. If their answer was positive, the respondents were asked to complete the choice tasks. Prior to completing the choice experiment a standard cheap talk script² was read to respondents. Respondents who gave a negative answer to the first part were not presented with the choice sets but instead were asked to tick one of a set of listed reasons for not paying, including the option for an open-ended statement. For those respondents who attended to the choice sets, the questionnaire concluded with questions rating respondents' degree of understanding of the choice experiment and asking them to rank the importance of the attributes for their choices.

Design of the choice experiment

Choice experiments are based on Lancaster's characteristics model (Lancaster 1966), proposing that consumers not only derive utility from a good or service per se but from the complex of different characteristics embodied in them. In our study these characteristics (often referred to as attributes in choice experiments) are benefits that arise from investments in wild orang-utan conservation in Sarawak. Respondents were presented with a sequence of choice sets each containing three scenarios describing wild orang-utan conservation. Respondents were asked to choose their most preferred scenario out of the three. Deciding what attributes to include, and the combination and levels in which these occur in the choice sets, is a crucial step in every choice experiment survey. We pre-determined a set of attributes which could be used as proxies for benefits that could occur to visitors and local people if conservation of wild orang-utans were to be strengthened. These attributes were discussed with six traditional inhabitants of Batang Ai national park, where orang-utans occur in the wild, and with the park managers at Semenggoh and Matang wildlife parks. We then carried out a pilot survey at Semenggoh with 30 tourists (15 international and 15 domestic) in which participants articulated their reasons for visiting Semenggoh and their desires for the conservation of orang-utans in the future. Based on both the in-depth discussions with local people and park managers, and the answers in the pilot survey, we identified four attributes to investigate through the questionnaires: three attributes related to variations in the conservation management of wild orang-utans in Sarawak and one attribute related to the cost that would hypothetically occur to a respondent when choosing a particular scenario

(the monetary attribute). The four attributes were as follows (Appendix 2):

- 1) Annual donation (in USD) into an orang-utan conservation fund for Sarawak: Putative payments could have been delivered either through an increase in entrance fee or an annual donation. Following our pilot study we selected an annual donation as the payment vehicle - many tourists only visit Semenggoh once in their lifetime so increasing the park fees would not affect them, whereas a donation can be on-going and made from anywhere. We explained that this payment would be an annual payment into a wild orang-utan conservation fund for improving existing conservation efforts in Sarawak. Of the many levels tested in the pilot phase we selected five, which ranged from USD 20 to USD 150. For Malaysian respondents, this was translated into Ringgit (MYR), the Malaysian currency (at an approximate exchange rate of 1 USD = 3 MYR, the five levels for Malaysian respondents ranged between 60 and 450 MYR).
- 2) Distribution of orang-utans in Sarawak in the near future: This attribute was used as a proxy for the size of the wild orang-utan population in comparison to the size in captivity. The attribute had four levels: two levels described a situation where the population of wild orang-utans is much larger than the captive population as is currently the case ('90% in the wild and 10% in wildlife parks' and '75% in the wild and 25% in wildlife parks'), and two levels signified that at least half the population would be in captivity ('50% in the wild and 50% in wildlife parks' and '25% in the wild and 75% in wildlife parks'). We used the lowest distribution of wild orang-utans as the base level ('25% in the wild and 75% in wildlife parks'). During the pilot study we tested a fifth level ('10% in the wild and 90% in wildlife parks') but respondents as well as Semenggoh park managers thought that this was unrealistic for Sarawak.
- 3) Chances for tourists to see orang-utans during one trip: This attribute aimed to explore differences in the demand for the direct use value of experiencing orang-utans, recognising that this will be a minimum figure, given that visitors to Semenggoh had already invested in their visit for the very purpose of seeing them. The attribute described the probability that respondents would encounter orang-utans on a trip, defined as no more than one day at one location given that tourists' chances of seeing a wild orang-utan will increase if they are prepared to spend many days searching (as is usually necessary). The attribute had three levels: 10%, 50% and 90%. To have a 90% chance of seeing orang-utans, one would need to look for them in parks such as Semenggoh in the non-fruiting season or at Matang all year round. The chances of seeing orang-utans at Semenggoh in the fruiting season are about 50% per visit, while the chance of seeing them in the wild within a day/a trip is no more than 10%.
- 4) Local jobs in the orang-utan sector: We included this attribute because we wanted to assess the extent to which

respondents connected orang-utan conservation with benefits derived by local people from it, either directly, such as being able to obtain jobs in the conservation sector, or indirectly in e.g., the hospitality sector. This attribute had two levels: many jobs and few jobs.

To reduce the large number of unique scenarios³ that can be developed from this range of attributes and levels (too large to be either practical or cognitively sound; Mazzotta and Opaluch 1995; De Shazo and Fermo 2002) while minimising the information loss, we used the experimental design software Ngen (Institute of Transport and Logistics Studies 2007). We applied the D-efficiency criterion which aims at constructing a design that minimises the point D-error (see Scarpa and Rose 2008). The final design included 12 choice sets. Rather than have each respondent attending to all choice sets, the design was further blocked into two groups of six choice sets each. Besides the three scenarios in each set from which to choose, we allowed respondents to opt-out since 'forcing' them to choose one of the scenarios presented, when they liked none of them would be inconsistent with demand theory (Bennett and Blamey 2001; Bateman et al. 2003).

Data analysis

It is assumed that respondents make their choices based on the utility they derive from the characteristics of the scenarios and some degree of randomness (random utility framework theory; Luce 1959; McFadden 1974; Manski 1977). In this approach, the utility of a choice is comprised of a deterministic component and an error component that is independent of the deterministic component and is assumed to follow a predetermined distribution. Choices made by respondents between scenarios will be a function of the probability that the utility associated with a particular scenario and its characteristics is higher than that associated with other scenarios. Respondents therefore express their willingness-to-pay for the chosen scenario and associated characteristics. In our case study, the economic theory of valuation is based on respondents' willingness-to-pay for the benefit gained from additional money spent for the conservation of wild orang-utans. Assuming that the relationship between utility and the characteristics is linear, and that the error terms are identically and independently distributed with a Weibull distribution, the probability of any particular scenario being chosen can be expressed in terms of a logistic distribution (McFadden 1974).

To analyse the choice data we estimated Random Parameter Logit (RPL) Models because of their flexible assumptions, because they can address unobserved preference heterogeneity (Train 1998, Hensher et al. 2005a) and can take full advantage of panel data (i.e., one respondent attending to a series of choice sets; Hensher et al. 2005a). Specifics of RPL models are covered by Hensher and Greene (2003) and Train (2003), among others. The monetary attribute entered the models as a continuous variable. All other attributes were dummy-coded, thus allowing for non-linear marginal utilities. For each

attribute with L levels, we created L-1 discrete variables in order to avoid perfect dependence. The omitted level of each attribute was considered the base level. Preference towards the monetary attribute was assumed to be homogeneous, i.e., non-random, to facilitate calculation of the willingness-to-pay (Hensher et al. 2005b). Preference for all other attributes was assumed to be heterogeneous, i.e., random, and normally distributed. For each random parameter a mean value (interpreted as the average preference of respondents for the attribute) and a standard deviation value (interpreted as the magnitude of differences in respondents' preferences for the attribute) were estimated. The deterministic part of the individual indirect utility function took the functional form:

$$U_{ij} = \text{con}_a - a_j \sum_k \beta_k X_{ijk} + \sum_{kj} \eta_{kj} X_{ijk} + \sum_n \delta_{kn} X_{ijk} \quad (1)$$

con_a is a specific constant for scenario A, β_k is a vector of coefficients associated with the k^{th} attribute, X is a vector of the attributes, η_{kj} is a vector of k deviation parameters which represents how the preference of respondent i differs from the average preference (β_k), and δ_{kn} is the vector of coefficients of the interactions between the k^{th} attribute and the n^{th} characteristic of respondent i (S_{ni}). Besides commonly included socio-demographic characteristics, S_{ni} also included attitudinal variables.

The willingness-to-pay estimates were calculated as the negative ratio of the coefficients of the attribute of interest, divided by the coefficient of the monetary attribute. These estimates express the degree of utility a respondent has for an attribute. Individual-specific willingness-to-pay estimates and the 95% confidence intervals were calculated, using 10,000 replications, following Krinsky and Robb (1986, 1990) procedure. We also provide aggregated values of the individual willingness-to-pay estimates, i.e., the product of values over the relevant sample frame (visitors to Semenggoh; Appendix 1). It is possible that all of the visitors agreeing to donate to a conservation fund would actually do so if requested (optimistic scenario). It is almost certain, however, people will be more likely to say (especially in face-to-face interviews) that they will be willing to pay in the presence of charismatic species like orang-utans, than actually do so in reality (known as hypothetical bias). The extent of hypothetical bias is contextual (Kim et al. 2012) with meta-analyses suggesting that people will really pay about 75%, of what they promise (Murphy et al. 2005b). In this study, however, we conservatively follow Morrison (2000), and List and Gallett (2002) in assuming that no more than 30% of those who stated that they would be willing to pay would actually have donated money if given the opportunity (or that, on average, each person would in fact pay 30% of what they promised). We therefore multiplied the aggregated willingness-to-pay estimates for all visitors willing to pay by 0.3 (conservative scenario). Aggregations were carried out separately for domestic, international, and all visitors.

Data derived from six statements about orang-utan conservation on a five-point Likert scale (1=definitely disagree,

2=rather disagree, 3=don't know, 4=agree, 5=strongly agree) were analysed using Principal Component Analysis (PCA) with varimax rotation. PCA is used to reduce the number of variables and to classify them according to their correlations and structure (Hair et al. 2009). Such multivariate analyses have recently been used to explain preference variation across respondents in stated preference methods (e.g., Boxall and Adamowicz 2002; Karousakis and Birol 2008). Components with eigen values larger than 1.0 were retained.

Survey data were also analysed descriptively using frequency tables. We further used the non-parametric Mann-Whitney test to compare the means of two independent groups of interest (e.g., domestic vs. international tourists). For multiple categorical variables, we used the non-parametric Kruskal-Wallis test.

To calculate the direct value that orang-utans contribute to the Sarawak, and Malaysian, economy, we calculated the average amount spent per day by international tourists for Malaysia from national statistics (Jabatan Perangkaan Malaysia 2011). Data on length of stay in Sarawak was combined with information on the number of visitors to Semenggoh and the daily spend of tourists to estimate a minimum direct value of the Semenggoh orang-utans to the Sarawak economy. This value (in USD) was calculated as the product of the average amount spent per day by an international visitor to Malaysia, the length of time the questionnaire respondents said that they intended to spend in Sarawak, the proportion of respondents visiting Sarawak primarily for the purpose of seeing orang-utans and the annual Semenggoh visitation rate. The minimum value was obtained by estimating the contribution of only those tourists who stated that they visited Sarawak primarily to see orang-utans. Potential higher values were calculated by assuming that, among the other respondents, orang-utans provided 10% and 50% of the motivation for visiting Sarawak, which was then added to the values derived for those coming primarily for orang-utans.

RESULTS

Forty-one of the 300 interviews could not be used for further analysis because respondents did not answer at least one of the choice questions, did not answer the basic questions about their socio-economic background or did not understand the choice experiment. The final dataset was thus 259.

Sample characteristics

Slightly more respondents were female (57%) than male (43%) and the mean age was 34, ranging from 16 to 81 (Appendix 3). Half of the respondents were international tourists, the other half from Malaysia (in line with the sampling strategy). Ninety percent of Asian tourists were from Malaysia, with 32% of the entire sample being local (from Kuching and surrounding districts). Of the international tourists, most were from Europe (27%) or Australia/NZ (10%). A large proportion of the tourists (89%) were visiting Semenggoh for the first time and 92% were aware of the existence of wild orang-utans.

Respondents' views on orang-utan conservation

The PCA identified two components which together accounted for 55% of the variation in attitude towards orang-utan conservation. Based on the magnitudes of the loadings of individual statements, the first component was labelled 'wild oriented' because statements relating to concern for wild orang-utans loaded highly in this component (Component 1 shaded-grey in Appendix 4). The second component, named 'captive oriented', had high loadings for the statements relating to the benefits of keeping more orang-utans in wildlife parks. Scores for the two components were then calculated for each respondent, leading to two variables being included in the S_{ni} vector in equation (1).

After grouping the two scores (4 and 5) that indicated agreement with a statement, the results suggested that, overall, there was a general consensus that wild orang-utans are threatened, that orang-utans conservation is important for habitat protection and also for future generations (Table 1). There were significant differences in attitudes between domestic and international respondents for two of the statements. More domestic than international tourists (p -value < 0.001) agreed that orang-utans were hard to see in

the wild, so it is better to spend more money to keep them in wildlife parks. Secondly, domestic tourists were more likely to agree that it did not matter if wild orang-utans became extinct because there were enough in wildlife parks such as Matang and Semenggoh (p -value = 0.0019). These two statements were the ones that formed component 2 ('captive oriented').

Who would not pay?

Sixty percent of respondents were willing to pay for orang-utan conservation in principle and only these proceeded to the choice experiment. Forty percent were unwilling to pay. As reasons for not paying, 44% would either like to have paid but felt that they could not afford to and 44% believed that the Malaysian government should pay for orang-utan conservation (Table 2). Twenty percent of non-payers did not trust conservation funds and agencies and doubted that money would be passed on effectively. A few (11%) thought that there is already enough money for the conservation of orang-utans and 8% said that they would never donate on principle. Only one respondent (<1%) did not think that orang-utans need to be protected. There was no significant difference between the in-principle willingness to donate between domestic and international tourists (62% of

Table 1
Response to value statements about orang-utan conservation (% of those agreeing)

Statement	All	Domestic	International	Level of significance
Orang-utans are threatened in the wild	84%	82%	87%	-
Orang-utans may become extinct within the next 20 years in Malaysia	67%	70%	64%	-
It does not matter if wild orang-utans become extinct because there are enough in wildlife parks such as Matang and Semenggoh	12%	18%	5%	**
They are hard to see in the wild, so it is better to spend more money to keep them in wildlife parks	36%	55%	17%	***
Orang-utan conservation is important because their protection helps to protect other habitat and species	90%	90%	91%	-
Orang-utan conservation is important because it is our responsibility to protect them for future generations	94%	93%	96%	-

***Denote significance at 1% significance level

**Denote significance at 5% significance level

*Denote significance at 10% significance level

Note: The level of significance indicates if there was a difference between domestic and international visitors to Semenggoh Nature Reserve, Sarawak, Malaysia

Table 2
Reasons for unwillingness to pay for improved orang-utan

Characteristics	All	Domestic	International	Level of significance
Respondents not willing to pay	40%	42%	38%	-
Reasons for not paying				
Think that there is already enough money for the conservation of orang-utans	11%	16%	7%	-
Don't think that orang-utans need to be protected	1%	2%	0%	-
Would like to pay but can't afford to	44%	53%	36%	*
Never donate on principle	8%	6%	9%	-
Do not trust conservation funds and agencies and doubt that money will be passed on	20%	27%	14%	-
Believe that the Malaysian government is responsible for orang-utan conservation and that it should make more money available for it	44%	61%	29%	***

***Denote significance at 1% significance level

**Denote significance at 5% significance level

*Denote significance at 10% significance level

Note: The level of significance indicates if there was a difference between domestic and international visitors (multiple answers were possible)

international tourists would pay, compared to 58% of domestic tourists). There was also no statistical difference in most reasons for not paying between the two samples. However, more domestic than international tourists were unwilling to pay because they believed that it is the government's responsibility to pay for orang-utan conservation (p-value = 0.0008), and domestic tourists were also more likely to feel that they could not afford to pay (p-value = 0.0739).

Choice experiment results

We estimated models based on the entire data set, and to test our hypothesis of preference differences we included interaction parameters between socio-demographic characteristics and attributes (see equation 1). We tested many interactions but only present the best fitting model here, which included only significant interactions. The final model had a good fit⁴ (McFadden R² = 0.27) and included a constant for scenario A (Table 3). This was insignificant, verifying the absence of left-right bias, the bias that occurs when respondents always choose the first, the left, scenario in a set. The coefficient of the monetary attribute was negative,

as expected, suggesting that, all else being equal, respondents chose the cheapest scenario. Most other attributes had the expected positive signs, i.e., respondents preferred many local jobs over few jobs in the orang-utan sector and a 90% to 10% proportion of wild to captive orang-utans over a 75% to 25% proportion, which was preferred over a 50% to 50% proportion which itself exceeded a proportion of 25% in the wild to 75% in captivity. It was expected that respondents would prefer a 50% and 90% chance of seeing wild orang-utans during a visit over a 20% chance, but in fact they preferred a 50% chance over a 90% chance.

The standard deviation of the attribute '50% in the wild and 50% in wildlife parks' were insignificant, suggesting that preference for this attribute is homogenous across the sample. The standard deviations of all other random parameters are significant, suggesting an overall high degree of preference variation across the sample. Respondents' age, level of education, gender and household structure had no significant impact on the preference of any of the attributes. The reason why tourists were visiting Sarawak (i.e., whether they were coming primarily for orang-utans) also made no difference. However, the interaction between 'international' and three of the attributes was significant, with international tourists more likely to choose a scenario that would result in persistence of 90% and 75% of orang-utans as wild and less likely to choose a programme with a high (90%) chance of seeing them. The preference for the highest distribution of wild orang-utans was also influenced by respondents' attitudes. Respondents with a high loading for Component 1 ('wild oriented') were more likely, and respondents with high loadings for Component 2 ('captive oriented') less likely, to chose a scenario with a 90% persistence of wild orang-utans. We also tested whether local people from Sarawak had different preferences to those from the rest of Malaysia but they did not.

Table 3
Results of Random Parameter Logit Model

	Coefficient	SE	SD
Constant for scenario A	-0.142	0.134	
90% in the wild/10% in wildlife parks	2.668***	0.333	1.736***
75% in the wild/20% in wildlife parks	1.844***	0.256	0.616*
50% in the wild/50% in wildlife parks	0.919***	0.238	0.666
50% chance of seeing orang-utans	0.589***	0.187	0.955***
90% chance of seeing orang-utans	0.362**	0.180	1.009***
Many local jobs in the orang-utan sector	0.528***	0.151	0.941***
Annual donation	-0.009***	0.002	
90% in the wild/10% in wildlife parks×Wild oriented	0.387*	0.222	
90% in the wild/10% in wildlife parks×Captive oriented	-0.556***	0.204	
90% in the wild/10% in wildlife parks×International	1.118***	0.259	
75% in the wild/20% in wildlife parks×International	0.790***	0.196	
90% chances to see orang-utans×International	-0.307*	0.175	
Number of observations	818		
Number of respondents	154		
Number of Halton draws	200		
Log likelihood function	-654.93		
McFadden R ²	0.27		

***Denote significance at 1% significance level

**Denote significance at 5% significance level

*Denote significance at 10% significance level, SD=Standard deviation of random parameters; SE=Standard error

Note: The parameters are calculated from responses to a choice experiment on the values of orang-utans (results for the entire sample and split samples of international and domestic tourists)

Willingness-to-pay estimates

Across all respondents who would contribute in general ('contributors'), they would pay most for a future in which 90% of orang-utans are in the wild and 10% in wildlife parks USD 289; Table 4), followed by a ratio of wild to captive orang-utans of 75% to 25% (USD 199) and a 50%-50% distribution (USD 99), all relative to a distribution of 25% in the wild and 75% in wildlife parks. Overall, respondents would be willing to pay USD 14 more for a 50% chance of seeing wild orang-utans during a visit than a 90% chance and USD 58 for a conservation programme that provides many local jobs in the orang-utan sector. More important than the absolute estimates, are the estimates relative to each other and the differences between domestic and international tourists' willingness-to-pay. Overall, the value for a high (90%) persistence of wild orang-utans was about 1.5 the value for the medium (75%) level and almost three times the low level (50%). International tourists would be willing to pay 1.5 times more than the average and 2.4 times more than domestic tourists for 90% of orang-utans to persist in the wild. Domestic tourists, on the other hand, were willing

to pay almost twice as much as the average for a high chance of seeing wild orang-utans (USD 74) and almost ten times the amount international tourists would pay (USD 8; Table 4). Domestic tourists hence had a higher willingness-to-pay for a 90% chance of seeing the animals during the trip than a 50% chance, while international tourists valued a 50% chance more than a 90% chance. The willingness-to-pay for local job creation (USD 58), for a 50% chance of seeing wild orang-utans and for a 50%-50% distribution (USD 99) were the same across domestic and international tourists. The 95% confidence interval reflected how much the preference for some attributes varied across respondents. This was especially noticeable for the chances of seeing wild orang-utans and potential for local job creation, suggesting that some respondents had a positive and some had negative values for the levels of these attributes available in the choice experiment. The willingness-to-pay of the contributors do not reflect the willingness-to-pay of the whole sample because many (40%; Table 2) respondents, when asked before the choice experiment questions, stated that they would not be willing to contribute anything to orang-utan conservation. The willingness-to-pay estimates across the sample were therefore 40% lower than those of the contributors (Table 4). Conservatively about USD 6.6 million could be collected per year from voluntary contributions by visitors to Semenggoh if this was allocated towards preventing extinction in the wild (Table 5). Most of this money would come from international tourists (USD 3.9 million). These figures do not add up to the total willingness-to-pay where the modelled values for domestic

and international tourists were different to the modelled values for all tourists on average. If visitors to Semenggoh were to donate into a conservation programme that leads to a high chance of seeing wild orang-utans during one visit, about USD 1 million could be collected, almost entirely from domestic tourists. If tourists were to pay for a programme increasing the number of local jobs in the orang-utan sector, about USD 1.3 could be made available, provided almost equally by domestic and international tourists.

Direct benefits to the Sarawak economy

The total amount delivered to the Sarawak economy was at least USD 13 million in 2010 only taking into account the money likely to have been spent by those visitors whose primary motivation for coming to Sarawak was to see orang-utans. If the main motivation for coming to Sarawak is seeing orang-utans for 10% of the remaining international tourists, then this amount is USD 15 million. If this is the main motivation for 50% of the remaining tourists, the amount is USD 23 million. Assuming the proportions have stayed the same over the last ten years Semenggoh has delivered between USD 85 and USD 150 million at an average of USD 7.6 to USD 13.6 million a year, an amount that has increased by about USD 1 million a year since 2000 (Figure 1). The income in 2010 amounted to 0.55% of the income earned by Sarawak from timber products in that year (Malaysian Timber Council 2014), a proportion that has increased by 4% per year since 2001. The proportion

Table 4
Visitor's willingness-to-pay

	All visitors		Domestic		International	
	Contributors (USD)	Across sample+	Contributors (USD)	Across sample++	Contributors (USD)	Across sample+++
90% in the wild/10% in wildlife parks	289 [161–413]	172 [97–248]	169 [41–293]	98 [24–170]	409 [281–532]	252 [174–330]
75% in the wild/25% in wildlife parks	199 [153–243]	119 [92–146]	114 [69–158]	66 [40–92]	284 [238–328]	176 [148–203]
50% in the wild/50% in wildlife parks	99 [51–147]	59 [31–88]	99 [51–147]	57 [30–85]	99 [51–147]	61 [32–91]
50% chance of seeing orang-utans	65 [-5–133]	39 [-3–80]	65 [-5–133]	38 [-3–77]	65 [-5–133]	40 [-3–83]
90% chance of seeing orang-utans	41 [-34–112]	25 [-20–67]	74 [-1–145]	43 [-1–84]	8 [-67–79]	5 [-41–49]
Many local jobs in the orang-utan sector	58 [-11–125]	35 [-7–75]	58 [-11–125]	34 [-6–72]	58 [-11–125]	36 [-7–77]

*This includes the 40% of all respondents who would not pay for wild orang-utan conservation, and who were regarded to have zero values for the conservation outcomes

**This includes the 42% of domestic respondents who would not pay for wild orang-utan conservation, and who were regarded to have zero values for the conservation outcomes

***This includes the 38% of international respondents who would not pay for wild orang-utan conservation, and who were regarded to have zero values for the conservation outcomes

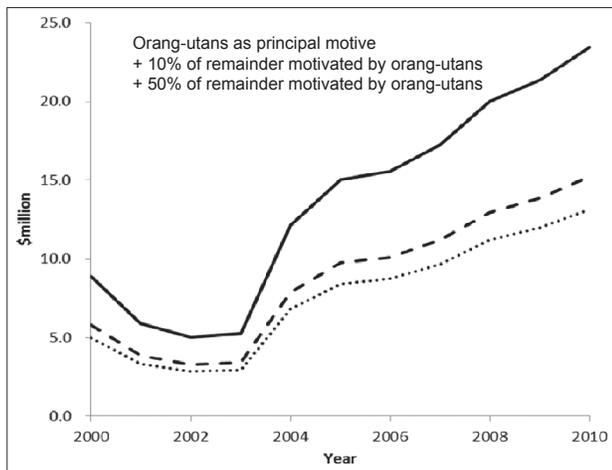
Note: The willingness values (in USD) are for different levels of the attributes in the choice experiment presented to visitors at Semenggoh Nature Reserve, Sarawak, Malaysia (mean and 95% confidence intervals)

Table 5
Aggregated willingness-to-pay for benefits of orang-utan conservation

	A high proportion of orang-utans living in the wild	A high chance of seeing orang-utans	Job creation in the orang-utan sector
All*	USD $172 \times 0.3 \times 127,945 =$ USD 6,601,962	USD $25 \times 0.3 \times 127,945 =$ USD 959,588	USD $35 \times 0.3 \times 127,945 =$ USD 1,343,423
Domestic	USD $98 \times 0.3 \times 76,748 =$ USD 2,256,391	USD $43 \times 0.3 \times 76,748 =$ USD 990,049	USD $34 \times 0.3 \times 76,748 =$ USD 782,830
International	USD $252 \times 0.3 \times 51,197 =$ USD 3,870,493	USD $5 \times 0.3 \times 51,197 =$ USD 76,796	USD $36 \times 0.3 \times 51,197 =$ USD 552,928

*The figures for domestic and international respondents do not add up to the total figure because of rounding errors and because the mean s of the modelled values for domestic and international tourists do not add up to the modelled values for all tourists

Note: The aggregation is over all visitors to Semenggoh Nature Reserve, Sarawak, Malaysia in 2011. We assumed that 30% would pay in reality



Note: The benefits derived from visitors who certainly visit Sarawak primarily for the orang-utans (dotted line), with additional amounts assuming that 10% (dashed line) or 50% (continuous line) of the remaining visitors also visit Sarawak primarily for the orang-utans

Figure 1
Financial benefit from visitors to Semenggoh Nature Reserve, Sarawak, Malaysia

of international visitors to Sarawak (derived from Sarawak Tourist Board 2014b) who then visit Semenggoh has risen by an average of 16.5% per year since 2001 to 2.4% in 2010.

DISCUSSION

Value, proximity, and experience

Environmental resources often have the highest value to those who live close to them (Smith et al. 2012) and willingness-to-pay is often described as a decreasing function of the distance from respondents' place of residence to the resource (e.g., Bateman et al. 2006; Schaafsma et al. 2012). In this study we found the opposite. Although there was still a positive value for wild orang-utans among Malaysian residents, they were less likely than international tourists to appreciate their ongoing existence in the wild, preferring to concentrate on conservation of the captive population. While this reversal in the distance/value relationship has been noted for other charismatic species (Loomis and Larson 1994), the findings in this case are also likely to reflect both the underlying belief systems of those visiting Semenggoh and the relative wealth of the sampled populations. Of the international tourists interviewed, 66% originated from western Europe or other countries where a sense of responsibility for the natural environment has a longer history than in Malaysia (Weiss and Hassan 2002) and where 'naturalness' is commonly believed to have an intrinsic value beyond personal experience of it (e.g., Winter and Lockwood 2005). For many of these tourists the experience of the orang-utans at Semenggoh or Matang may have been a proxy for experiencing the animals in the wild—that wild orang-utans, even if never seen, had far greater value to them than captive ones. Indeed international tourists placed a value on 90% of

the orang-utans being wild that was eight times higher than the situation where half were wild and half captive. The results even suggest that their desire for 'wildness' was even greater than their desire to see them if they visited the wild with a 50% chance of seeing them preferred over a 90% chance. And, just as with tourists visiting Giant Panda *Ailuropoda melanoleuca* in China (Kantoleon and Swanson 2003), they would far rather that nearly all orang-utans occur in a wild state than that they personally would have the chance to see them (willingness-to-pay: USD 252 vs. USD 5; Table 4). This corroborates the assertion that it is the wild orang-utans that provide the true economic benefit to Sarawak from international tourists, not those in captivity, and without the existence of a wild population, fewer tourists would be likely to visit the country for the purpose of seeing orang-utans if all of them were in captivity.

For Malaysian visitors to Semenggoh the wild orang-utans had less value, though overall Malaysian visitors still valued the wild orang-utans more highly than the captive ones. Studies elsewhere in Asia have suggested that people place far higher priority on poverty reduction and governance improvement than on conservation, with the amount available for conservation being largely a function of affluence (Jin et al. 2010). Indeed, in Kalimantan, there is both puzzlement and resentment at the western willingness-to-pay for orang-utan conservation when the people who live in the forest are themselves so poor (Meijaard and Sheil 2008).

The amount international tourists to Semenggoh were willing to pay for continued existence of wild orang-utans is high (USD 252). Even Malaysian tourists would pay the exceptionally high amount of USD 98 if that resulted in the continued existence of wild orang-utans. While this is higher than many other estimates of willingness-to-pay derived using contingent valuation (see lists in Martín-López et al. 2008; Richardson and Loomis 2009), it compares well with some estimates under similar settings. For instance, using contingent valuation, Duffield (1992) estimated that visitors to the Yellowstone National Park would be willing to pay a lump sum of USD 162 for reintroducing gray wolf into the park, as happened in 1995. We could not find willingness-to-pay estimates derived from choice experiments that we could compare with our findings. Like wolves, orang-utans are both endangered and highly charismatic (Richardson and Loomis 2009; Morse-Jones et al. 2011), and have the added advantage of their likeability (Tisdell et al. 2006) and their similarity to humans (Tisdell and Swarna Nantha 2007). Also values are particularly high for endemic species and where the payment aims to ensure that extinction does not occur, as is the case here (Morse-Jones et al. 2011; Jacobsen et al. 2012). The high willingness-to-pay estimates are therefore not unrealistic. Furthermore the questionnaire was undertaken among people who had encountered, or were hoping to encounter orang-utans, which, for many people, were the reason they were visiting Sarawak.

Surprisingly, we could not detect a difference in attitude between tourists from Peninsular Malaysia and those from Sarawak, whom one might have expected to appreciate the benefits arising from job creation and other direct benefits.

However our study did not explore the value placed on orang-utans by local people within their current range in Batang Ai National Park. Horowitz (1998) noted that the orang-utan has traditionally been treated as a special species by the local Iban people, the inhabitants of long houses in the Batang Ai national park, who believe that their ancestors took on the form of orang-utans after death. However, in some communities these values have been eroded in recent decades (Meijaard et al. 2012) and we do not know to what extent the reverence for orang-utans has persisted.

It was perhaps surprising that respondents were willing to pay more for a 50% chance of seeing orang-utans during a trip than a 90% chance. This is an important finding of our study, implying that international tourists in particular value the challenge of spotting the animals. Uncertainty about whether the apes will be encountered or not, appears to be valuable to tourists; perhaps accentuating the difference from seeing a 'zoo' animal. In Batang Ai, encounter with a wild orang-utan may only last for seconds before the animal vanishes into the trees, but it is a truly authentic experience. Thus, wild orang-utans have not only conservation values such as being 'endangered', 'charismatic', 'endemic' (Morse-Jones et al. 2011; Jacobsen et al. 2012), humanistic - given their similarity to humans' (Tisdell and Swarna Nantha 2007) - and theistic values (Horowitz 1998), but they also have experiential value and values equivalent to the 'mastery' sought by hunters but without their utilitarian intent (see Kellert 1996 for a typology of values).

Willingness-to-pay for local benefits of orang-utan conservation

Respondents did not value local jobs as highly as the existence of wild orang-utans, as was also the case among tourists trekking to see gorillas (Bush et al. 2009). However, the persistence of the orang-utans may well rely on the local employment of Iban people. This engagement of people from local longhouses was already happening 15 years ago (Horowitz 1998) and can have a range of co-benefits. Currently there are limited local employment opportunities for Iban from Batang Ai longhouses. Some tourists visit the seven longhouses of the traditional owners of Batang Ai and a few are employed by a local resort but, increasingly, Iban are seeking work away from the longhouses in cities or as workers in the timber, oil palm, and petro-chemical industries. While this returns income to the longhouses in the form of remittances, it also leads to a gradual out-migration. While this could reduce hunting pressure on local game species and a reduction in the small-scale, slash-and-burn agriculture that persists in the park, it is also likely to contribute to the rapid decline in traditional ecological knowledge which could inform both conservation and monitoring of orang-utans. Thus, greater employment of local people in orang-utan protection should not only lead to an improvement in orang-utan survival but also allow people the choice of retaining and passing on the traditional ecological knowledge needed for effective conservation management.

How much are orang-utans worth to Sarawak

The minimum amount that orang-utans delivered to the Sarawak economy in 2011 as direct benefits was USD 13 million using conservative assumptions and, optimistically, could be as high as USD 23 million. This compares quite well with other studies. For instance, Duffield et al. (2008) have estimated that visitors to Yellowstone National Park spend an additional USD 35.5 million in the local economy per year because of the presence of wolves. As it is, the estimate provided here is almost certainly an underestimate of the true amount. Omitted from our calculations are (1) the international tourists who visit only Matang (visitation averages 9% of the Semenggoh total from 1999-2011, but some people may visit both sites); (2) the domestic Malaysian tourists visiting from Sabah and west Malaysia; (3) the international tourists who come to Borneo primarily to see orang-utans but do so in Sabah and continue to Sarawak to gain other benefits; (4) the people who visit Batang Ai National Park to search for wild orang-utans but do not visit the other locations and (5) the people for whom the presence of orang-utans in Sarawak adds to its allure, and thus their reason for visiting, but never visit Semenggoh. Thus, the annual contribution of orang-utans to the Sarawak economy may well be substantially greater than the amount estimated here. Furthermore this amount has been increasing steadily for a decade and showed no sign of decline as a result of recent economic downturns. This increase has been occurring not only in absolute terms but also as a proportion of the total tourist income brought to Sarawak and Malaysia. The contribution of the orang-utans at Semenggoh, in combination with the wild, unseen orang-utans of Batang Ai and Lanjak Entimau, have also been increasing relative to the far larger timber industry. In fact the orang-utans now generate a direct economic benefit to Sarawak that is 0.5-1.0% of that generated by the entire timber industry. Also, unlike in other range states of the orang-utan where the opportunity costs of retaining wild orang-utans are high compared to transforming the habitat to palm oil plantations (Swarna Nantha and Tisdell 2009), there are no substantial opportunity costs for conserving the orang-utan in Sarawak because virtually all its habitat is protected.

One could argue that the stated willingness-to-pay estimates were overestimated because respondents were interviewed in Semenggoh immediately after the experience of viewing the orang-utans. Choice experiments, however, are designed to avoid this bias as much as possible and even a contingent valuation study, which is more susceptible to such effects, showed no significant difference in the willingness-to-pay between respondents who had seen the Mahogany Gliders and those respondents who visited a national park but had not seen them (Tisdell et al. 2008). Our conservative estimate is that only 30% of the 60% of respondents who said they would pay would actually do so. However, even under this conservative scenario, visitors to Semenggoh would be willing to pay an aggregated total of about USD 6.6 million each year into a conservation fund aimed at conserving orang-utans in

the wild. This is about five times the amount they contributed directly in 2010 through entrance fees to the two wildlife sanctuaries, although the recent increase in the entrance fees for international visitors to Semenggoh will increase this direct income. Nevertheless the income will be far less than the USD 6.6 million that could be obtained. Thus the direct benefits already accruing to the Sarawak economy from the international tourists visiting to see orang-utans could be increased by about half, were these potential payments realised.

Conservation policy implications and future research

This study was undertaken in a wildlife park among tourists who had encountered, or were hoping to encounter orang-utans. It would be interesting to follow up this survey by interviewing tourists in other parts in Malaysia who have no direct connection to orang-utans. The study could also be extended to other wildlife parks where orang-utans can be seen, such as Sepilok in Sabah, to see how the value given to orang-utans by tourists compares with those given by visitors to Semenggoh. Compared to many other sites with orang-utans, those in Sarawak receive little funding for conservation and there are also relatively few orang-utan—development conflicts. The research could readily be extended further to estimate the global value of orang-utans across Malaysia (Borneo) and Indonesia (Borneo and Sumatra). A study of the value of orang-utans including all sub-species in all regions where they flourish would not only reveal the total global value of the animals to these economies to set against other potential uses of their habitat, but would allow more coherent planning of their conservation. Economic research of this nature has been identified by Meijaard et al. (2012) as having the highest priority for conservation. Currently the Sarawak Tourist Board (Sarawak Tourist Board 2014a) is not alone in featuring orang-utans among their attractions – so too do the equivalent entities in Sabah (Sabah Tourist Board 2014) and Indonesia (Indonesian Ministry of Tourism and Creative Economy 2014). However, at least in Indonesia, habitat clearance for the ongoing expansion of the oil palm industry (Koh and Ghazoul 2010) may be in direct competition with orang-utan habitat. While carbon payments may eventually offset that loss (Venter et al. 2009), these markets are still tenuous. Any global study of orang-utans will also have wider implications. Orang-utans are particularly appropriate as umbrella taxa for other elements of biodiversity given their large home ranges and wide range of interactions with the other species in their environment (Wich et al. 2008). Also, while species specific valuation studies do not necessarily reveal the value of biodiversity, generally, they are easier for government policy-makers to understand than valuations of something as nebulous as biodiversity.

Another area where more research is needed is on the implications of orang-utans for local people's livelihoods. Endangered species conservation in developing countries often depends on the participation of local people and the resolution of potential human-animal conflicts (e.g., Brouwer et al. 2010) and charisma holds little sway among the desperately poor

(Meijaard and Sheil 2008). For the longhouses of Batang Ai the orang-utans represent a major asset, not only spiritually but, potentially, also economically. However it is an asset that has so far failed to realise its potential given that local people continue to migrate away from the region. At one level this could be considered good for both orang-utans and people. It is important to ensure that tourism is not a threat to the very asset that is most highly valued by tourists. Unlike the local populations near many other tourist assets (Julio 2001), the people at Batang Ai do not have to play host to a vastly increased number of tourists to maintain the value of orang-utans to the Sarawak community. Rather they need only ensure that the orang-utans persist in the forests over which they have traditional ties – the tourists will remain concentrated near Kuching. Keeping tourism to the wild orang-utans at minimum levels would also reduce negative impacts, such as the increased risk of disease transmission, increased psychological stress and behavioural change and an increased vulnerability to poaching (Macfie and Williamson 2010). However, with little actual tourism, there is a danger that local people will be denied employment as guides and the opportunity to host tourists in their long houses where they currently also offer, for payment, cultural activities and handicrafts. Thus it will be important for some of the value from orang-utans delivered to Kuching to be repatriated to the people who oversee conservation of the wild orang-utans by expanding the role of the people at Batang Ai in orang-utan conservation. This may also help counter the view held by many Malaysian tourists, and revealed by the choice experiment, that there are few links between orang-utans and local jobs.

Given that visitors to Semenggoh are willing to contribute substantially to conservation of wild orang-utans, it is worth considering what the jobs might entail. While orang-utan habitat in Sarawak is no longer in danger of being logged or cleared for oil palm given that virtually all now live in protected areas and Batang Ai is also the catchment area for a hydro-electric dam; poaching may continue. In particular, the effects of killing adult orang-utans to capture their offspring for trade (Nijman 2005) could cause continued declines given the low inherent population growth rate (Meijaard et al. 2010). One of the most important investments may therefore be for greater enforcement of existing wildlife protection laws along with education programs among the poaching communities and interventions in the markets for orang-utan meat or baby apes.

Eventually orang-utans in Batang Ai may also be affected by climate change. Orang-utans are most common in lowland peat forest where they are sustained throughout the year by a variety of fruiting trees (Wich et al. 2008). Batang Ai is hilly country and thus there may be periods in the year when fruit is in short supply, reducing recruitment and survival (Gregory et al. 2012). At Semenggoh and for the small population in Kubah National Park adjacent to Matang, seasonal food shortages are overcome with supplementary feeding. If climate change alters fruit availability at Batang Ai then an adaptation strategy may include supplementing food there

as well. Again local knowledge of fruiting trees and seasons will be essential if shortages are to be detected, and rectified.

Other policies that may generate benefits for the people and orang-utans at Batang Ai are the development of partnerships between the wildlife parks and the Iban at the national park, the provision of opportunities for visitors to the park to translate their willingness to pay into reality, and greater prominence of the wild orang-utans and their needs at the wildlife parks that may increase still further visitors' willingness to pay by demonstrating how their money would be used to assist the wild apes. The wildlife parks could also act as a vehicle by which the people of Batang Ai could demonstrate the extent and the relevance of their traditional ecological knowledge to the wider world, including knowledge about many other aspects of the forest and its wildlife that tourists will have the opportunity to appreciate, and pay for, but only ever experience vicariously.

CONCLUSIONS

The economic benefits that Sarawak currently receives from the presence of wild orang-utans, which are delivered to the tourists through the facilities at Semenggoh and Matang, are substantial and growing. The importance of this study is that it demonstrates that it is the wild orang-utans that deliver the value to tourists even though it is the captive ones that they experience, with both being necessary for the animals to deliver a benefit to the Sarawak economy. The wild orang-utans, and the local communities to which the animals have spiritual significance and who are essential to the orang-utans' long term conservation, need not themselves be made more accessible to tourists to realise their value. Rather the orang-utans must simply persist in the wild, for visitors to the captive animals at Semenggoh to gain the pleasure from knowing that they do so.

Secondly, the research demonstrates that there are as yet untapped sources of income for wild orang-utan conservation to be gained from visitors to Semenggoh and Matang. There is also support for increased investment in orang-utan conservation by the Malaysian and Sarawak governments among those who would not themselves pay. Further the steady increase in the visitation rate to Semenggoh indicates that the economic benefits of orang-utans to Sarawak, both realised and potential, are increasing, both in absolute terms and relative to both tourism and timber production.

NOTES

1. Environmental valuation methods can broadly be categorised into revealed preference and stated preference methods (Bateman et al. 2003). Contingent valuation and choice experiments fall under the latter category. Both methods rely on surveys in which respondents respond to hypothetical market scenarios involving changes in the provision of environmental goods and services, allowing quantification of the values of environmental goods and services that are not directly observable from market transactions (e.g., Mitchell and Carson 1989).

2. Cheap talk is frequently used in choice experiments and contingent valuation to minimise hypothetical bias (the difference between hypothetical behaviour and behaviour under real economic consequences). When using a cheap talk script, respondents are read a script in which they are explicitly reminded about the costs of the scenarios to reduce the probability that they will overstate their true willingness-to-pay (Murphy et al. 2005a).
3. In total, $5^2 \times 3^1 \times 2^1 = 150$ unique scenarios could be constructed.
4. Dominick and McFadden (1975) showed in simulations that values of the McFadden R^2 between 0.2 and 0.4 are equivalent to values between 0.7 and 0.9 for the R^2 of ordinary linear regression models.

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APPENDICES

Appendix 1

Visitors to Semenggoh and Matang wildlife parks in Sarawak: 1999-2011

Year	Domestic			International			Total
	Semenggoh	Matang	Subtotal	Semenggoh	Matang	Subtotal	
1999	16,439	52,503	68,942	20,083	1,406	21,489	90,431
2000	24,333	52,473	76,806	18,757	1,429	20,186	96,992
2001	14,416	55,830	70,246	11,735	2,191	13,926	84,172
2002	20,719	31,695	52,414	12,471	2,262	14,733	67,147
2003	22,427	23,828	46,255	11,636	1,231	12,867	59,122
2004	32,885	22,544	55,429	23,747	1,297	25,044	80,473
2005	36,193	16,077	52,270	29,035	3,696	32,731	85,001
2006	33,965	14,106	48,071	28,779	1,916	30,695	78,766
2007	37,903	15,347	53,250	30,508	2,979	33,487	86,737
2008	42,082	12,914	54,996	35,108	2,406	37,514	92,510
2009	47,650	11,741	59,391	39,127	2,012	41,139	100,530
2010	51,217	12,831	64,048	42,715	2,538	45,253	109,301
2011	76,748	20,307	97,055	51,197	2,565	53,762	150,817
Total	456,977	342,196	799,173	354,898	27,928	382,826	1,181,999

Appendix 2

Attributes and levels used in the choice experiment

Attribute	Levels
Distribution of orang-utans in Sarawak in the near future	1) 90% in the wild and 10% in wildlife parks 2) 75% in the wild and 25% in wildlife parks 3) 50% in the wild and 50% in wildlife parks 4) 25% in the wild and 75% in wildlife parks
Chance of visitors seeing orang-utans during one trip	1) 20% 2) 50% 3) 90%
Local jobs in the orang-utan sector	1) Few 2) Many
Annual donation (in USD)	1) 20 2) 40 3) 60 4) 100 5) 150

Appendix 3

Respondents' characteristics

Characteristic	All	Domestic	International
Number of respondents	259	130	129
Percentage of female respondents	57%	58%	56%
Mean age (SD; range)	34 (13; 16-81)	31 (11; 16-81)	38 (14; 18-75)
Number of visits to Semenggoh			
first time visit	89%	81%	97%
2 to 5 visits	8%	13%	3%
> 5 visits	3%	5%	0%
Respondents' residency			
from Europe			27%
from Australia/NZ			10%

Contd...

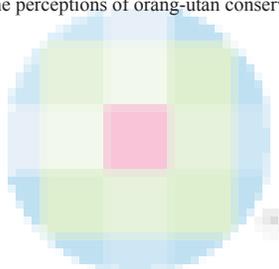
Appendix 3
Continued

Characteristic	All	Domestic	International
from America			7%
from Asia			56%
from Kuching (local)	32%	63%	
Percentage of respondents being aware of wild orang-utans	92%	89%	94%
Percentage of non-local respondents coming to Kuching primarily for orang-utans	38%	38%	38%
Average number of days staying in Kuching for non-local respondents (SD; range)	6.8 (5.2; 1–31)	6.1 (3.4; 1–17)	6.9 (5.2; 3–31)

Appendix 4
Results of Principal Component Analysis

Statement	Component 1 (“wild oriented”)	Component 2 (“captive oriented”)
Orang-utan conservation is important because it is our responsibility to protect them for future generations.	0.756	-0.058
Orang-utans conservation is important because their protection helps to protect other habitat and species	0.713	-0.200
Orang-utans are threatened in the wild	0.655	-0.038
Orang-utans may become extinct within the next 20 years in Malaysia	0.618	0.203
They are hard to see in the wild, so it is better to spend more money to keep them in wildlife parks	-0.002	0.815
It does not matter if wild orang-utans become extinct because there are enough in wildlife parks such as Matang and Semenggoh	-0.054	0.798
Percent of variation explained	32%	22%
Eigenvalues	1.926	1.354

Note: Principle components are derived from six questions on the perceptions of orang-utan conservation (Varimax rotated component loadings across six statements subjected to a 5-point scale)



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