Local Residents Perception of Benefits and Losses From Protected Areas in India and Nepal

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Abstract High densities of people living around protected areas (PAs) in South Asia require management strategies to balance conservation goals and livelihood needs. Based on a survey of 777 households around five PAs in India and Nepal, this paper provides a comparative perspective of Indian and Nepali households’ views of protected area benefits and costs, their attitude toward conservation in general, and attitude toward protected area staff. Results indicate mixed responses towards tourism, varying from very favorable in Nepal to less favorable in India. The majority (81%) held positive attitudes towards the existence and importance of PAs but had negative perceptions of PA staff (69%). Most residents perceived benefits from access to fuel wood, fodder and other PA resources including benefits from tourism, while crop and livestock losses from wildlife were the main costs.

Households overall positive attitudes towards the PAs and conservation despite high losses from living around PAs suggests that local residents may support conservation if their livelihood needs are met. Comparisons of household attitudes and perceptions suggest that locally based strategies rather than top-down approaches are likely to be more effective. Extending PA benefits to smaller landholders, households that are highly resource-dependent or experiencing higher income losses from human-wildlife conflicts, and less educated residents are particularly important to balance costs and losses from living around protected areas.

Keywords Local attitudes · Conservation · India · Nepal · Park–people relationship · Perceptions · Protected areas · Tourism

Introduction

Landscapes and protected areas (PAs) in South Asia possess high biological value while sustaining high human densities, supporting local livelihoods, and facing pressures from growing commercial interests (tourism, roads, mines, dams) (Karanth and DeFries 2010). Balancing conservation goals and needs of local residents is particularly challenging in this milieu. Tension between exclusionary protectionist approaches and people-inclusive approaches is high. Supporters for exclusion argue that PAs remain the last refuges of biological diversity and have a critical role to play in minimizing species extinctions (Terborgh 1999; Joppa and others 2009; Karanth and others 2009, 2010). Critics suggest that ignoring the social, political and economic challenges that engulf PAs is not realistic or viable (Wells and Brandon 1993; West and others 2006).
Amidst these differing views, there is increased interest in engaging local residents in management and conservation efforts in PAs (King and Stewart 1996; Hutton and Leader-Williams 2003; West and Carrier 2004). However, participatory conservation approaches such as the integrated conservation and development (ICDP) approaches and community-based conservation approaches (CBCs) implemented in many places have had mixed success and their ability to conserve biodiversity is questionable (Wells and Brandon 1993; Mehta and Kellert 1998; Zimmerer and others 2004; Zimmerer 2007; Gubbi and others 2008). Understanding the benefits and losses to people living in and around PAs is fundamental to balancing conservation goals and needs of local human populations (Terborgh and Peres 2002; Naughton-Treves and others 2005; Shahabuddin and Rangarajan 2007; Bruyere and others 2009; Karanth and DeFries 2010).

Benefits to local residents from PAs can be substantial, ranging from basic services such as fuel wood, grazing land, and forest products to economic benefits derived from tourism-related employment income as well as religious and cultural values (Campbell 1999; Gillingham and Lee 1999; Archabald and Naughton-Treves 2001; Adams and Infield 2003; Stem and others 2003; Stone and Wall 2004; West and Carrier 2004; Kruger 2005; Karanth and others 2006; Spiteri and Nepal 2006; He and others 2008; Sandbrook 2010). Living in proximity to PAs also poses costs such as damage or loss of crops, livestock and occasionally injury or death to people. People living closer to PAs may have positive (Badola 1998; Mehta and Kellert 1998) or negative attitudes (Mehta and Heinen 2001; Walpole and Leader-Williams 2002; Naidoo and Ricketts 2006; Spiteri and Nepal 2008a, b) towards the PAs. Balancing these trade-offs and understanding factors that support positive attitudes towards PAs and conservation is critical to long-term sustainability of these places (Newmark and others 2003). We focus on examining residents’ attitudes towards protected areas and conservation in five PAs in India and Nepal.

India has 1.2 billion people (30% urban) and Nepal has 28 million people (18% urban, UN 2009). GDP per capita is $2753 in India and $1049 in Nepal. The United Nations Human Development Index ranks them as medium for human development (India 134th, Nepal 144th) and poverty (India 88th, Nepal 99th) (people living on <$1.25/day, UN 2009). Life expectancies are similar (63.4 years for Indians, 66.3 years for Nepalese). Sixty-six percent of adults are literate in India and 56% in Nepal (UN 2009). In both countries, women have lower literacy, enrollment in education and estimated earned income (UN 2009). These characteristics can influence attitudes, particularly PA residents’ who often live in poor conditions.

India’s 590 PAs cover less than 4% of total land area in contrast to Nepal’s 16 PAs covering 20% of total land area (WWF 2006; WDPA 2009). The average size of Indian PAs is ~300 km² while Nepalese PAs are larger at ~1100 km² (WDPA 2009). Conservation efforts and establishment of protected areas date back to the nineteenth century in both countries. India and Nepal established the legal framework for protection of wildlife and parks in 1973 with the passage of the Wildlife Protection Act and the National Park and Wildlife Conservation Act respectively (Rangarajan 2001; WWF 2006). India is recognized as a megadiversity country with biodiversity hotspots in the Western Ghats and North-eastern Himalayas. Nepal has globally important ecoregions such as the Terai Arc Landscape (Mittermeier and Mittermeier 2005; WWF 2006). Together these countries support some of the largest global populations of conservation flagship species such as tigers (Panthera tigris), elephants (Elephas maximus) and rhinos (Rhinoceros unicornis). Protected areas in both countries support resident people collecting forest resources, grazing livestock, and hunting with increased growth of commercial interests such as nature-based tourism (Nepal and Weber 1995a, b; Tiger Task Force 2005; Spiteri and Nepal 2008b; DeFries and others 2010; Karanth and DeFries 2010, 2011; Khadka and Nepal 2010). The challenges confronting protected area management are similar although the socio-economic-political contexts may vary.

In this article, we examine:

1. How do local residents perceive benefits and losses from living in and around PAs? Benefits include employment opportunities from tourism, access to resources, and conservation of wildlife. Losses include damage of crops and livestock, threats to human safety from wild animals, restrictions on resource use, and conflicts with park staff.

2. What factors (the PA, age, gender, religion, education level, migrant status, land holding size, income loss, resource dependency, importance of park, problems caused by park establishment) are associated with the perceived benefits and losses to residents living around the PAs? How do these factors vary across PAs? Are there differences between Indian and Nepalese PAs?

Specific questions include whether the Nepal households are more favorable to PAs and tourism, as these PAs are better known for tourism and benefit sharing with locals (Bookbinder and others 1998)? Are younger residents more receptive to the PAs and tourism opportunities (Jantzi and others 1999; Rao and others 2003; Stem and others 2003)? Are men more than women likely to support tourism, PAs and conservation (Mehta and Kellert 1998; Rao and others 2003)? Does religion influence people’s attitudes towards PAs and conservation (Jantzi and others 1999; Stem and others 2003)? Do better-educated respondents view the PAs more favorably
(Salafsky and others 1999; Stem and others 2003)? Are long-term residents more positive about PAs than migrants (Newmark and Leonard 1993)? Do poorer households view PAs and tourism more positively than wealthier households (Mehta and Kellert 1998; Stem and others 2003)? Do households with greater income losses due to human-wildlife conflicts perceive the PA more negatively (Badola 1998; Newmark and Leonard 1993; Gadd 2005; Salum 2008; Spiteri and Nepal 2008a, b)? Comparing PAs in India and Nepal provides insights into people-park relations in the context of varying PA management and livelihood needs in different ecological and socio-economic settings (Mehta and Heinen 2001; Kiss 2004; Bajracharya and others 2005; Becker and others 2005; Allendorf 2010). Similarly, examining these questions in the socio-economic and institutional contexts of the two countries allows for broader generalizations about local views about conservation and their attitude toward park policies. An important contribution of this article is the comparative assessment of park-people relationship in India and Nepal.

Methods

Study Sites

We selected three Indian protected areas—Ranthambore (RNP), Kanha (KNP), and Nagarahole (NNP) national parks—and two Nepalese protected areas—Chitwan National Park (CNP) and Annapurna Conservation Area (ACA)—to compare local residents’ perceptions (Fig. 1). We selected these PAs because they are well-established, popular wildlife tourist destinations, and we were provided access and support to conduct research by the park management. The five terrestrial PAs are located in biologically rich but diverse ecological settings (scrub, high altitude, dry and moist deciduous forests, alluvial grasslands) and socioeconomic settings (poor small land holders to large plantations). All PAs are known for conservation flagships such as tigers, elephants and rhino (Bookbinder and others 1998; Karanth and DeFries 2011). All PAs are under pressure from growth of wildlife tourism (Bookbinder and others 1998; Nagendra and others 2005; Spiteri and Nepal 2008a; Karanth and DeFries 2011). Human population densities range from 91/km$^2$ in KNP to 681/km$^2$ in NNP. Table 1 provides additional details on each PA.

Social Surveys and Interviews

Structured and open-ended surveys were conducted with 777 randomly selected households in the five PAs (Table 2). In India surveys were conducted during June–August 2009 in the local languages Hindi and Kannada. In Nepal surveys were conducted September–December 2004 in Nepali. The survey included questions about demographic characteristics, attitudes towards tourism, the protected area, PA staff, resource use and human-wildlife interactions and responses were translated to English (Mehta and Heinen 2001; Karanth and others 2006; Spiteri and Nepal 2008a, b).

Data Analysis

Respondents characterized benefits from tourism, importance of and reasons for establishment of PAs, and perceptions of park staff in the PAs. We summed weighted responses towards tourism, the PA, park staff, and overall attitude (all statements) to derive composite scale scores. Variables were converted into ordinal scale to create neutral, negative and positive responses. The three categories worked well as there were few cases with extreme positive or negative attitudes. For example, the composite score for overall attitude is based on 23 questions (total scores could range from $-23$ to $+23$). Scores between $-6$ and $-15$ (<mean 1 standard deviation) reflect a negative attitude, $-5$ to $+5$ (mean $\pm$ 1 SD) neutral and +6 to 15 (>mean + 1 SD) a positive attitude. This approach was applied towards attitude scores toward tourism, the PA and PA staff.

Respondents also characterized perceived costs due to PA such as restricted access to resources and losses from human-wildlife conflicts. For human-wildlife conflicts, income loss was derived by combining loss of crops and livestock and recoded as loss reported or not reported. Similarly, we combined both crop and livestock as questions were almost identical. Monetary values provided by respondents varied due to respondents’ propensity to exaggerate losses or inability to recall exact losses. We also examined species responsible for damage and range of economic losses in the five PAs.

Additional indices were created from the questions for use in the analysis. For overall resource dependency, we used dependency on dead trees, live trees, plants/herbs, wild animals, and grazing land to create a three-point scale—never, sometimes, and frequently. A score for problems due to PA existence was generated from nine statements. Similar indices were created for tourism benefits and importance attached to PA establishment. Other predictor variables were reclassified into a maximum of three categories (to minimize categories with low frequencies). Some variables such as land size were simplified into small, medium and large in order to facilitate analysis. Age was recoded to <24 years, 24–45 years and >45 years. The existence of >100 caste groups did not permit simple classification and we excluded this variable. Bivariate correlation tests were conducted to ensure multicollinearity does not exist among variables and some.
variables were combined (for example crop and livestock loss) for regression analysis.

Differences among the five PAs in the responses to each question were examined using chi-square ($\chi^2$) tests of independence and strength of the significant ($P < 0.05$) relationships assessed using Cramer’s V (where values range from 0 to 1 indicating no association to perfect association). Ordinal regression was used to analyze relationships between predictor variables and residents attitudes towards tourism, the PA and PA staff. The predictor variables included in the analysis include gender, age, education, land size, migration status, religion, PA name, PA importance, resource dependency, PA problems, and income loss. McFadden’s Rho was calculated, where values between 0.2 and 0.4 indicate satisfactory goodness-of-fit (Wrigley 1985).

Regression analyses were conducted separately for PAs in India, Nepal, and combined to determine if (1) tourism attitude (2) PA attitude (3) PA staff attitude (4) overall attitude is associated with the predictor variables.

Results

Respondent Characteristics

Household survey respondents were largely male (71%, Table 2). Average age of respondents was 40 in India and 38 in Nepal with largest group (57%) between 25 and 45 years of age. The communities were largely Hindu (81%) with more than 100 caste groups (Table 2). Many (67%) respondents were born locally. The average household size was six people, with single families comprising 53% households in India and all households in Nepal. Household land ownership was 80% in India and 85% in Nepal. In KNP and RNP the largest group comprised of households owning $\geq$3 acres of land, and in NNP households with 1–3 acres were marginally higher. In Nepal households with <1 acre of land comprised the largest group. Agriculture was the primary income source for 66% of households in India and 46% in Nepal.
Perceived Benefits

Tourism

Households were asked if they would be happy to see more tourists and differences across PAs emerged. The NNP households (23%) were least favorable and CNP households (100%) were the most favorable to increase in tourists (Table 3). Few (25%) of households felt that there were too many tourists. Households in Indian PAs did not perceive benefits from tourism in contrast to Nepalese PAs. Tourism was thought to offset losses due to conservation by households in RNP, ACA and CNP, and increase cost of living by households in KNP, RNP and CNP. In Nepal tourism was perceived to strengthen cultural traditions and benefit households, in contrast to KNP and RNP where households strongly felt that only outsiders benefited from tourism and tourism was damaging their culture.

Access to Resources

Overall household dependency on natural resources was high (81%) but varied across PAs (Table 4). Households in all PAs relied heavily on dead trees, but households in KNP relied on live trees (55%) as well as plants and herbs (58%). NTFPs were important for households in KNP (74%) and RNP (35%). Grazing land was important in ACA (93%), KNP (79%) and RNP (54%). Dependency on wild animals and fish was low across all households, but this may be due to under reporting since hunting is against existing Indian and Nepali laws.

Environmental Management

Table 1 Characteristics of five protected areas in India and Nepal

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Kanha (KNP)</th>
<th>Nagarhole (NNP)</th>
<th>Ranthambore (RNP)</th>
<th>Annapurna (ACA)</th>
<th>Chitwan (CNP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>940 km²</td>
<td>644 km²</td>
<td>392 km²</td>
<td>7629 km²</td>
<td>932 km²</td>
</tr>
<tr>
<td>Location</td>
<td>22°7′–22°27′N, 80°26′–81°3′E</td>
<td>11°5′–12°15′N, 76°0′–76°15′E</td>
<td>25.54°–26°12′N, 76.23°–76°39′E</td>
<td>28°35′–28°55′N, 83°49′–83°81′E</td>
<td>27°21′–27°53′N, 83°55′–84°48′E</td>
</tr>
<tr>
<td>Tourists/year</td>
<td>132,601³</td>
<td>67,841³</td>
<td>159,110³</td>
<td>~75,000</td>
<td>~60,000</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Sal (Shorea robusta) and mixed deciduous forests</td>
<td>Dry and moist deciduous forests, teak plantations</td>
<td>Dry scrub and deciduous forests</td>
<td>Tropical forest, temperate mixed forest, tundra, alpine scrub</td>
<td>Broad leaf Sal forests, riverine grasslands</td>
</tr>
<tr>
<td>Rainfall</td>
<td>1,371 mm (June–September)</td>
<td>1,500 mm (June–September)</td>
<td>800 mm (June–September)</td>
<td>3,000 mm (June–August)</td>
<td>2,500 mm (June–September)</td>
</tr>
<tr>
<td>Key species</td>
<td>Tiger, Leopard, Dhole, Barasingha, Sambar, Chital</td>
<td>Tiger, Leopard, Dhole, Elephant, Gaur, Sambar, Chital</td>
<td>Tiger, Leopard, Blackbuck, Sambhar</td>
<td>Snow leopard, Tibetan wolf, Musk deer, Argali sheep</td>
<td>Tiger, Leopard, Rhino, Elephant</td>
</tr>
<tr>
<td>Human settlements inside PA</td>
<td>27 villages relocated</td>
<td>340 households relocated</td>
<td>195 households relocated</td>
<td>120,000 people inside</td>
<td>10,600 people relocated³</td>
</tr>
</tbody>
</table>

³ Residents from Padampur, a village encompassed by the park on three sides along the northern boundary of the park, were relocated outside the park

Awareness of the PAs existence was high (81%) among households (67% in ACA and NNP to 96% in KNP, Table 5). Strongest reasons selected by respondents for establishment of PAs by the government included protection of wildlife (85%), forests (84%), stop poaching (79%), and promote tourism (74%, Table 6). Many households (84%) had a positive attitude towards the PA (68% in NNP to 97% in CNP). Residents favored conservation efforts that protect plant species (98%), and animal species (95%) in the PAs (Table 5). Many households supported access to plant and tree collection inside the PAs (91%) and punishment for poachers (95%). Details are in Table 5.
Table 2 Respondent characteristics across 777 households interviewed in five Indian and Nepalese protected areas

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>KNP</th>
<th>NNP</th>
<th>RNP</th>
<th>ACA</th>
<th>CNP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households Interviewed</td>
<td>111</td>
<td>184</td>
<td>105</td>
<td>188</td>
<td>189</td>
</tr>
<tr>
<td>Male (%)</td>
<td>93</td>
<td>87</td>
<td>87</td>
<td>52</td>
<td>50</td>
</tr>
<tr>
<td>Age (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–24</td>
<td>5.9</td>
<td>9.7</td>
<td>12.2</td>
<td>11.7</td>
<td>16.4</td>
</tr>
<tr>
<td>25–45</td>
<td>59.3</td>
<td>61.8</td>
<td>64.3</td>
<td>47.9</td>
<td>57.1</td>
</tr>
<tr>
<td>46–64</td>
<td>28.0</td>
<td>21.0</td>
<td>18.4</td>
<td>33.5</td>
<td>22.8</td>
</tr>
<tr>
<td>&gt;65</td>
<td>6.8</td>
<td>7.5</td>
<td>5.1</td>
<td>6.9</td>
<td>3.7</td>
</tr>
<tr>
<td>Religion (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buddhist</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>69.2</td>
<td>6.3</td>
</tr>
<tr>
<td>Hindu</td>
<td>100.0</td>
<td>98.9</td>
<td>95.9</td>
<td>29.7</td>
<td>91.4</td>
</tr>
<tr>
<td>Other</td>
<td>0.0</td>
<td>1.1</td>
<td>4.1</td>
<td>1.2</td>
<td>2.3</td>
</tr>
<tr>
<td>Education (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>37.3</td>
<td>45.7</td>
<td>39.9</td>
<td>34.6</td>
<td>36.5</td>
</tr>
<tr>
<td>Primary</td>
<td>13.6</td>
<td>12.4</td>
<td>11.2</td>
<td>28.2</td>
<td>15.9</td>
</tr>
<tr>
<td>Lower secondary</td>
<td>32.2</td>
<td>20.4</td>
<td>22.4</td>
<td>12.8</td>
<td>14.3</td>
</tr>
<tr>
<td>Secondary</td>
<td>5.9</td>
<td>12.4</td>
<td>12.2</td>
<td>18.6</td>
<td>19.6</td>
</tr>
<tr>
<td>College</td>
<td>11.0</td>
<td>9.1</td>
<td>14.3</td>
<td>5.8</td>
<td>13.7</td>
</tr>
<tr>
<td>Migration (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Born</td>
<td>91.5</td>
<td>80.1</td>
<td>91.8</td>
<td>69.1</td>
<td>23.8</td>
</tr>
<tr>
<td>Moved</td>
<td>8.5</td>
<td>19.9</td>
<td>8.2</td>
<td>30.9</td>
<td>76.2</td>
</tr>
<tr>
<td>Land holding size (Acres)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1</td>
<td>26.3</td>
<td>33.3</td>
<td>24.5</td>
<td>71.8</td>
<td>50.3</td>
</tr>
<tr>
<td>1–3</td>
<td>35.6</td>
<td>34.4</td>
<td>23.5</td>
<td>27.7</td>
<td>38.1</td>
</tr>
<tr>
<td>&gt;3</td>
<td>38.1</td>
<td>32.3</td>
<td>52.0</td>
<td>0.5</td>
<td>11.6</td>
</tr>
</tbody>
</table>

Perceived Costs

Human-Wildlife Conflicts and Compensation:

Differences in human-wildlife conflicts exist across the five PAs (Table 7). Damage by wild animals affected 90% of households in all PAs (Table 7). Threats to human safety varied across PAs, from low in ACA (6%) to high in KNP (74%) and RNP (77%).

Households listed many crop-raiding species including herbivores, carnivores, primates and peacocks. In KNP, most frequently listed species were wild pig (94%, *Sus scrofa*), leopard (92%, *Panthera pardus*), and chital (78%, *Cervus axis*). In NNP, elephants (86%) and wild pigs (42%) were ranked the most problematic. In RNP, top ranked species were wild pig (79%), nilgai (74%, *Boselaphus tragocamelus*) and sambar (72%, *Cervus unicolor*). In ACA, problem species were rhesus macaque (*Macaca mulatta*), black bear (*Ursus thibetanus*), porcupine (*Hystrix brachyura*) and muntjac (*Muntiacus muntjac*) (Bajracharya and others 2005; KMTNC 1997). Crop-raiding species in CNP included rhinoceros, sambar and wild pig and 90% households reported crop losses due to wildlife (Spiteri and Nepal 2008a). Studies have reported the highly intense wildlife-human conflict in CNP as a result of crop and livestock losses (McLean and Stræde 2003; Nepal and Weber 1993). In India crop damage was highest during the months of September to December in KNP and RNP and May to August in NNP. In Nepal crop damage was highest during June to August.

Most households (93%) were unfamiliar with compensation for crop losses (ranging from 85% in NNP to 99% in ACA). In India most households (89%) did not receive any compensation from the forest department for crop damage. Average compensation received by households was Rupees 4,206 (range Rupees 500–20,000, 1 US $ = 45 Indian Rupees). In Nepal compensation was almost non-existent until very recently. There are new policies formulated but yet to be implemented (http://www.mfsc.gov.np). Loss of income was significant affecting 69% of all households (ranging from 53% in NNP to 81% in RNP). In India average annual loss of income per household due to crop loss varied from Rupees 6,834 in KNP to Rupees 24,025 in NNP. Only households in KNP reported loss of income from hunting and fishing restrictions.

Livestock ownership varied across PAs and domestic animals were grazed inside the PAs and in fallow village lands. Livestock predators in India include tiger, leopard, hyena (*Hyena hyena*), wolf (*Canis lupus*), jackal, mongoose (*Herpestes edwardsii*), civet cat (*Viverricula indica*) and macaques (*Macaca sp*). In Nepal predators include tiger, snow leopard (*Uncia uncia*), langur, marten (*Martes flavigula*), fox (*Vulpes vulpes*), mongoose, jackal (*Canis aureus*) and leopard (*Panthera pardus*) (DNPWC 2004; Mehta and Heinen 2001; Spiteri and Nepal 2008b). In the Indian PAs, 5–12% of households experienced livestock predation compared to 61% of households in ACA and 45% in CNP.

Average annual loss of income due to livestock loss ranged from Rupees 6,625 in KNP to Rupees 12,275 in NNP. Compensation awareness for livestock loss was low, with 94% of households being unaware (with the exception of KNP). The majority of households (99%) in Indian PAs did not receive any compensation for livestock losses. Average compensation received by households in Indian PAs was Rupees 3,833 (range Rupees 3000–7,000). In Nepal ACA currently had no direct compensation program in place and in CNP some households were offered nominal compensation. Most households do not apply for compensation as they feel the amount given is not worth the effort (Spiteri and Nepal 2008b).

We also examined injury and death to people and retaliation by people. In the Indian PAs most (96%) households were not injured or killed in confrontations with wildlife, and 99% of households did not kill problem animals. In ACA and RNP few (<10 people/year) were injured in confrontations with wildlife and there is little information available in Nepal (Nepal pers obs.).

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Households in all PAs were presented with possible reasons why wild animals damage crops and livestock, and the differences among households are significant (Table 8). Wildlife favoring agricultural crops and domestic animals was selected by 96% of households and insufficient food for wild animals was chosen by 78% of households. Over-population of wild animals was chosen by 85% and failure of PA authorities to control wildlife was selected by 77% of households (PA level details are in Table 8).

Resource Restrictions and Park Management Conflicts

Restrictions placed by PA staff with regard to access to resources (>57%) and grazing areas (66%) were highest for households in KNP and RNP. Households in KNP and RNP also reported loss of economic opportunities from restricted access to non-timber forest products (NTFP, >40%), grazing (>42%) and fuelwood (>35%) in KNP and RNP.
Many households perceived park management negatively (69%) but varied across PAs (Table 9). Confrontations with PA authorities were high in KNP (54%) and RNP (51%). Authorities were perceived to be uninterested in residents’ concerns (24% in ACA to 83% in RNP) and unhelpful (80% in NNP to 97% in RNP). Only NNP households (58%) reported encouragement by authorities to participate in conservation-development programs and authorities were open to residents’ suggestions.

### Ordinal Regression Analysis

We used ordinal regressions to analyze relationships between predictor variables and composite scores for residents’ attitudes towards tourism, the PA, PA staff and overall attitude. We find overall residents view towards tourism was neutral (62% in CNP to 92% in NNP) and the PA type and religion were the major predictors of attitudes towards tourism (Fig. 2; Table 10). Residents
from the Indian PAs viewed tourism less favorably compared to Nepal PA residents. Additionally, we find that Hindus viewed tourism less favorably than other religions. The McFadden’s Rho (0.25) suggested a robust analysis. At the country level, the Nepal PAs had religion and education as the main predictors of tourism attitude and for the Indian PAs, there were no significant predictors.

We find attitudes towards the PA were positive (68% in NNP to 97% in CNP), and PA type and land size were the main predictors (Fig. 2; Table 10). Indian PA residents viewed the PAs less favorably than their Nepalese counterparts (McFadden’s Rho is 0.19). Additionally, small landowners viewed (<1 acre) the PAs less favorably. Land size was also significant for the country level in Nepal and individually for ACA and CNP. All three regression results had McFadden’s Rho \([0.32, indicating the analysis to be robust.

Residents’ attitudes towards PA staff were negative (27% in NNP to 88% in CNP) and PA type, resource dependency, and land size were the main predictors of attitudes but the low McFadden’s Rho (<0.18) should be noted (Fig. 2; Table 10). Residents in NNP and ACA viewed the staff more favorably, and so do residents not depending on PA resources. Analyses at the country level indicated no significant predictors. At the individual PA level, in NNP residents not dependent on PA resources and in ACA residents with less land were more favorable to PA staff.

<table>
<thead>
<tr>
<th>Statements</th>
<th>India</th>
<th>Nepal</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KNP (n = 111)</td>
<td>NNP (n = 184)</td>
<td>RNP (n = 105)</td>
</tr>
<tr>
<td>Damage caused by wild animals</td>
<td>92.1</td>
<td>78.0</td>
<td>79.1</td>
</tr>
<tr>
<td>Confrontations with conservation authorities</td>
<td>54.9</td>
<td>17.3</td>
<td>50.6</td>
</tr>
<tr>
<td>Threats to human safety</td>
<td>74.8</td>
<td>24.6</td>
<td>77.3</td>
</tr>
<tr>
<td>Restrictions on access to resources</td>
<td>70.8</td>
<td>19.1</td>
<td>56.7</td>
</tr>
<tr>
<td>Restrictions on livestock grazing areas</td>
<td>75.4</td>
<td>7.1</td>
<td>65.5</td>
</tr>
<tr>
<td>Inability to meet livelihood needs</td>
<td>69.3</td>
<td>8.3</td>
<td>65.2</td>
</tr>
<tr>
<td>Decline in cultural values</td>
<td>31.4</td>
<td>4.4</td>
<td>23.2</td>
</tr>
<tr>
<td>Loss of economic opportunities from NTFP collection restrictions</td>
<td>69.8</td>
<td>2.2</td>
<td>40.4</td>
</tr>
<tr>
<td>Loss of economic opportunities from grazing restrictions</td>
<td>41.7</td>
<td>1.1</td>
<td>45.6</td>
</tr>
<tr>
<td>Loss of economic opportunities from fuel wood restrictions</td>
<td>34.8</td>
<td>0.6</td>
<td>44.9</td>
</tr>
<tr>
<td>Loss of economic opportunities from hunting restrictions</td>
<td>30.1</td>
<td>0.0</td>
<td>7.8</td>
</tr>
<tr>
<td>Loss of economic opportunities from fishing restrictions</td>
<td>32.7</td>
<td>0.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Increased costs of living</td>
<td>75.3</td>
<td>2.2</td>
<td>68.9</td>
</tr>
</tbody>
</table>

Figures indicate % of respondents identifying the item as a major problem.

<table>
<thead>
<tr>
<th>Reasons</th>
<th>India</th>
<th>Nepal</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KNP (n = 111)</td>
<td>NNP (n = 145)</td>
<td>RNP (n = 105)</td>
</tr>
<tr>
<td>They do not have enough food</td>
<td>19.6</td>
<td>56.2</td>
<td>65.9</td>
</tr>
<tr>
<td>They like agricultural crops/ domestic animals</td>
<td>73.2</td>
<td>86.1</td>
<td>71.4</td>
</tr>
<tr>
<td>Over population of wild animals</td>
<td>76.8</td>
<td>40.0</td>
<td>78.3</td>
</tr>
<tr>
<td>Authorities do not control the wild animals</td>
<td>65.2</td>
<td>13.6</td>
<td>85.5</td>
</tr>
</tbody>
</table>

Figures indicate % of respondents stating the reason; n number of respondents who reported either crop or livestock damage.
We examined residents overall attitude and find that only PA type, education, and land size were the main predictors. Indian PA residents are less favorable than Nepal PA residents (McFadden’s Rho is $0.20$; Table 10). We found no significant predictors at the country level in India, but for Nepal PA education was a significant predictor. In Nepal, residents with no education viewed the PAs less favorably. At the individual PA, small landowners were more favorable in ACA (in both cases the McFadden’s Rho is below $0.12$).

Discussion

Local perceptions of the benefits and losses from living in and around protected areas revealed several interesting commonalities and differences. Most local residents were familiar with the existence of the PA and had favorable attitudes towards PAs. Local residents benefited from the access to fuelwood, NTFP, fodder and other PA resources. These attitudes provide great incentive to educate and encourage local resident participation in conservation and protection efforts. However, less favorable attitudes towards PA staff pose challenges and have implications for implementing conservation policies.

Wildlife tourism continues to grow in these PAs (WWF 2006; Karanth and DeFries 2011). Residents’ views on tourism were very favorable in Nepal and less favorable in India. Employment from tourism is often suggested as a benefit for local residents, but in a parallel study Karanth and DeFries (2011) found that tourism employed $<0.001\%$ of population living within 10 km of Indian PAs. Outsiders largely owned these tourist facilities, and although local residents comprised 76–90\% of employees but they were in lower paid positions (gardening, housekeeping etc.) and seasonal jobs (October to April in India, Karanth and DeFries 2011).

Sustaining tourism in these PAs will require sharing of benefits with local people and building support among private enterprises for conservation initiatives. In India,
<table>
<thead>
<tr>
<th>Variables/Statistics</th>
<th>All PAs</th>
<th>Indian PAs</th>
<th>Nepalese PAs</th>
<th>NNP</th>
<th>KNP</th>
<th>RNP</th>
<th>ACA</th>
<th>CNP</th>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McFadden’s Rho</td>
<td>0.251</td>
<td>0.244</td>
<td>0.098</td>
<td>0.180</td>
<td>0.231</td>
<td>0.105</td>
<td>0.136</td>
<td>0.106</td>
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<tr>
<td>$\chi^2$ goodness of fit (df)</td>
<td>666.262 (730)</td>
<td>179.754 (213)</td>
<td>423.440 (507)</td>
<td>68.654 (80)</td>
<td>39.955 (35)</td>
<td>65.936 (64)</td>
<td>145.801 (116)</td>
<td>186.359 (271)</td>
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<tr>
<td>$P$</td>
<td>0.956</td>
<td>0.953</td>
<td>0.997</td>
<td>0.813</td>
<td>0.259</td>
<td>0.410</td>
<td>0.032</td>
<td>1.000</td>
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<td>127.147</td>
<td>360.326</td>
<td>56.120</td>
<td>50.697</td>
<td>61.991</td>
<td>157.906</td>
<td>206.725</td>
</tr>
<tr>
<td>$\chi^2$ (df)</td>
<td>188.963 (18)</td>
<td>45.947 (15)</td>
<td>43.079 (15)</td>
<td>14.201 (11)</td>
<td>18.852 (9)</td>
<td>8.864 (10)</td>
<td>28.464 (13)</td>
<td>27.940 (12)</td>
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<tr>
<td>$P$</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.222</td>
<td>0.026</td>
<td>0.545</td>
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<td>Religion$^2$</td>
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<tr>
<td>Attitude toward protected area</td>
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<tr>
<td>McFadden’s Rho</td>
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<td>0.138</td>
<td>0.344</td>
<td>0.114</td>
<td>0.115</td>
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<td>103.595 (109)</td>
<td>164.758 (250)</td>
<td>86.948 (86)</td>
<td>37.724 (37)</td>
<td>23.009 (29)</td>
<td>86.940 (119)</td>
<td>29.441 (130)</td>
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<td>50.638</td>
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<td>0.000</td>
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<td>474.162 (505)</td>
<td>237.963 (169)</td>
<td>132.034 (91)</td>
<td>41.231 (29)</td>
<td>248.300 (243)</td>
<td>215.303 (273)</td>
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<td>Nepalese PAs</td>
<td>NNP</td>
<td>KNP</td>
<td>RNP</td>
<td>ACA</td>
<td>CNP</td>
</tr>
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<td>----------------------</td>
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<td>-----</td>
<td>-----</td>
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<tr>
<td>( P )</td>
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<td>0.000</td>
<td>0.834</td>
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<td>0.066</td>
<td>0.394</td>
<td>0.996</td>
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<td>Loglikelihood Ratio</td>
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<td>204.590</td>
<td>226.008</td>
<td>71.503</td>
<td>38.613</td>
<td>198.802</td>
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<td>( \chi^2 ) (df)</td>
<td>121.931 (18)</td>
<td>70.086 (15)</td>
<td>38.613 (15)</td>
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<td>8.678 (10)</td>
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<td>28.978 (13)</td>
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<tr>
<td>( P )</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.712</td>
<td>0.563</td>
<td>0.542</td>
<td>0.007</td>
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<td>None</td>
<td>Resource Dependency (No)</td>
<td></td>
<td></td>
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<tr>
<td>Overall attitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McFadden’s Rho</td>
<td>0.216</td>
<td>0.174</td>
<td>0.101</td>
<td>0.062</td>
<td>0.163</td>
<td>0.075</td>
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</tr>
<tr>
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<td>221.675 (197)</td>
<td>462.729 (493)</td>
<td>143.815 (157)</td>
<td>39.996 (33)</td>
<td>51.867 (56)</td>
<td>122.145 (110)</td>
<td>181.646 (254)</td>
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<tr>
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<td>46.151</td>
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<td>( P )</td>
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<td>0.001</td>
<td>0.000</td>
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<td>0.857</td>
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<td>0.000</td>
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<td>None</td>
<td>Education</td>
<td>None</td>
<td>None</td>
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<tr>
<td></td>
<td>Education (No education: ( W = 8.889, \ P = 0.000 ))</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Due to numerous missing cases, and low frequencies in some categories of several variables, the analysis has not been robust in some cases (those with McFadden’s Rho <0.20). Therefore, while the above table may indicate to some interesting comparisons, they should be interpreted with some caution. These results should be compared with the crosstab (Tables 2, 7 and 6)
direct economic opportunities related to tourism are minimal for local residents. In Nepal, Bookbinder and others (1998), and Spiteri and Nepal (2008b) found that local employment in CNP were high but financial benefits were largely to outsiders. The differences between the two countries might be due to greater awareness, involvement, and benefit sharing with local residents in Nepal (Nagendra and others 2005; Spiteri and Nepal 2008a, b). Even in Nepal distribution of benefits was largely restricted to people living in close proximity to tourism centers (Spiteri and Nepal 2008a, b), and regional inequalities in benefit distribution persist (Walpole and Goodwin 2000; Sekhar 2003).

Living in proximity to the PAs imposes costs to local residents. Conflicts with wildlife over crops, property and human safety issues occurred everywhere, but the Indian PAs had higher conflict levels. Households were largely unaware about compensation schemes available for crop damage and livestock losses. Mitigating and managing conflicts with wildlife, ensuring compensation is provided in the Indian PAs, and establishing new compensation schemes in the Nepalese PAs would greatly improve the attitudes of local people to conservation (Spiteri and Nepal 2008a, b). Overall, most households did not face injury or death from conflicts and problem animals were viewed with tolerance, particularly in RNP. The existence of cultural tolerance in both India and Nepal towards wildlife presents an important opportunity to ensure that people and wildlife continue to share common resources (Karanth and others 2009, 2010).

Conservation success strongly depends on the relationship between residents and park managers. Residents in the Indian PAs (KNP and RNP) reported dissatisfaction with restrictions placed on access to PA resources and resulting loss of economic opportunities. High dependency on forest resources (fuel wood, NTFPs, grazing) warrants developing workable alternatives. Schemes in RNP to provide gas stoves to local people as an alternative to fuel wood based cooking have been met with great cultural resistance to change traditional ways of cooking and residents eventually sold gas stoves provided to them (Sharma pers comm. 2009). Park staff are perceived negatively in four of the five PAs, and this presents significant challenge to involving local residents in protection and conservation efforts. Improving communication and interaction between PA staff and local residents is critical for more positive attitudes and support for conservation initiatives.

Regression analyses examining relationships between resident attitudes’ and predictor variables find that the most important predictor is the PA itself, suggesting that local conditions have significant effects on attitudes (Fig. 2). This suggests that top-down management approaches may be ineffective in landscapes with diverse social, economic, and ecological conditions. We do not find men, younger residents and long-term residents to hold more favorable attitudes in contrast to other studies (Newmark and Leonard 1993; Wells and Brandon 1993; Mehta and Kellett 1998; Jantzi and others 1999; Ross and Wall 1999; Rao and others 2003; Stem and others 2003). There was some support that religion influenced resident’s attitudes with Hindus having less favorable attitudes than Buddhists and other non-Hindus, particularly towards tourism. In concurrence with other studies (Mehta and Kellett 1998; Stem and others 2003), smaller landholders, households with higher dependency on PA resources, and less educated residents perceived the PA more negatively (Newmark and Leonard 1993; Badola 1998; Salafsky and others 1999; Stem and others 2003; Gadd 2005; Salum 2008; Spiteri and Nepal 2008a). As predicted, we find differences with Nepal residents’ more favorable to tourism and PAs than in India. We may attribute this to the Nepal PAs being better known for wildlife tourism, more successful in involving locals, greater benefit sharing and perhaps lower human densities in Nepal that allow easier management (Bookbinder and others 1998; Spiteri and Nepal 2008a, b).

Conclusions

Our comparative analysis of resident attitudes’ towards benefits and losses from living in proximity to protected areas in India and Nepal provided interesting insights to improving conservation and park management policies. Overall, local residents value the existence of the PAs despite incurring losses from crop and property damage and livestock predation. However less favorable attitudes towards PA staff pose a major challenge to implementing conservation policies. The cultural tolerance for wildlife and local appreciation for conservation in India and Nepal can strongly contribute to conservation goals in the region. Employment opportunities from tourism are often cited as a means for local people to offset losses from living near parks. We found that local residents generally perceived little benefit from the rapidly growing wildlife tourism in these PAs.

We found that existing compensation schemes do not achieve the objective of offsetting losses from crop and livestock damage. In the Indian PAs, low rates of compensation have been achieved and compensation schemes are rare in the Nepalese PAs. Restrictions on access to forest resources were a source of conflict between residents and park officials, and there appeared to be significant tensions between park officials and local residents in most PAs. Constructive engagement with local residents (such as providing employment in tourism or park management and alternatives to park resources) would support long-term
success in conservation. We found that local social, economic, political, and ecological realities in each PA play an important role in perceptions about benefits and losses, and may be particularly important for managing trans-boundary protected areas located between these countries. Top-down management efforts that assume the same factors are relevant across all PAs are likely to be less successful than management efforts tailored to individual places. Extending PA benefits to smaller landholders, highly resource-dependent households, households subject to higher income losses due to human-wildlife conflicts, and less educated residents are particularly promising to balance costs and losses from living in and around protected areas.

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