*Environmental Conservation* **33** (4): 344–352 © 2006 Foundation for Environmental Conservation doi:10.1017/S0376892906003389

# Community attitudes toward three protected areas in Upper Myanmar (Burma)

TERI ALLENDORF[1]*, KHAING KHAING SWE[2], THIDA OO[3], YE HTUT[4], MYINT AUNG[5], MYINT AUNG[2], KEERA ALLENDORF[6], LEE-ANN HAYEK[7], PETER LEIMGRUBER[8] AND CHRIS WEMMER[9]

*[1]110 Elm Street, Mazomanie, WI 53560, USA, [2]Chatthin Wildlife Sanctuary, Kanbalu Township, Sagaing Division, Myanmar, [3]State High School, Chatthin Village, Kanbalu, Shwebo, Sagaing Division, Myanmar, [4]Alaungdaw Kathapa National Park, Yinmabin, Sagaing Division, Myanmar, [5]Htamanthi Wildlife Sanctuary, Htamanthi, Sagaing Division, Myanmar, [6]Department of Sociology, University of Wisconsin-Madison, 1180 Observatory Drive, Madison, WI 53706, USA, [7]Smithsonian Institution, Washington DC 20560-0136, USA, [8]National Zoological Park, Conservation and Research Center, Front Royal, VA 22630, USA, and [9]California Academy of Sciences, 875 Howard Street, San Francisco, CA 94103, USA*

Date submitted: 20 April 2005 Date accepted: 11 September 2006 First published online: 7 December 2006

## SUMMARY

**An effective protected area system is essential for the long-term conservation of Myanmar's biodiversity. This study examined the attitudes of 2915 residents in 97 communities around three protected areas (PAs) in upper Myanmar: Alaungdaw Kathapa National Park in the western mountains, Htamanthi Wildlife Sanctuary in the hills bordering the Chindwin and Uru rivers, and Chatthin Wildlife Sanctuary in the central dry zone. Logistic regression indicated a positive attitude toward the PAs was most highly correlated with a perception of conservation benefits and benefits resulting from management of the areas. Attitude was also significantly correlated with a perception of extraction benefits, conflicts with PA staff and crop damage by wildlife. Socioeconomic variables were less powerful than perceptions in predicting attitude and, unlike perceptions, their effects varied among the areas. The much greater effect of perceptions, especially positive ones, on people's attitudes indicates that understanding perceptions is important to improving the relationship between local residents and these PAs. This finding underscores the fact that a focus on conflicts to understand people's attitudes toward PAs may undervalue or miss critical positive perceptions that people hold. Understanding local residents' perceptions of PAs makes possible the creation of strategic, place-based management strategies that build on people's positive perceptions and mitigate their negative perceptions.**

*Keywords*: attitude, Burma, conservation, management, Myanmar, park-people, protected areas

* Correspondence: Dr Teri Allendorf Tel: +1 608 238 3427
e-mail: teriallendorf@yahoo.com

## INTRODUCTION

Myanmar is one of the most biologically diverse regions in Asia (Myers *et al.* 2000; Wikramanyake *et al.* 2001) and, unlike many other nations in South-east Asia, has been able to maintain large tracts of its natural habitats (Leimgruber *et al.* 2003). In 1990, more than half of the remaining forests in mainland South-east Asia could be found in Myanmar (Dinerstein & Wikramanayake 1993), and they are among the last strongholds for large mammals species such as tigers and elephants (Leimgruber *et al.* 2003; Lynam 2003). However, Myanmar's growing human populations have increased pressure on its natural resources and protected areas (PAs), and resources are increasingly strained by demands from Myanmar's neighbours, China, India, Thailand and Bangladesh (Aung *et al.* 2004). These pressures make an effective protected area system essential for the long-term conservation of Myanmar's biodiversity (Braatz *et al.* 1992).

However, little research has been done on the status of Myanmar's PAs, and little is known about the perceptions and beliefs of local residents toward these (Rao *et al.* 2002). Most of the threats to PAs in Myanmar come from small-scale activities of local communities (Rao *et al.* 2002), such as deforestation (Leimgruber *et al.* 2005), hunting (Rao *et al.* 2002; Lynam 2003) and agricultural practices (Aung *et al.* 2004; Leimgruber *et al.* 2005), which have caused significant declines in wildlife populations and loss of natural habitats. Environmental education and conservation and development activities have been very scarce around Myanmar's PAs and, as in many countries, PA managers have neither the human capacity nor technical and financial resources to manage the areas without the cooperation of local communities.

Finding ways to improve and strengthen the relationships between local residents and PAs is critical to the long-term successful conservation of PAs (Dasmann 1984; Machlis & Tichnell 1985; Zube 1986; Brandon & Wells 1992; Newmark *et al.* 1993; Fiallo & Jacobson 1995; Furze *et al.* 1996) and a positive public attitude is a key indicator of PA success (Struhsaker *et al.* 2005). However, the relationship between people and PAs is often contentious, as PA establishment often

https://doi.org/10.1017/S0376892906003389 Published online by Cambridge University Press

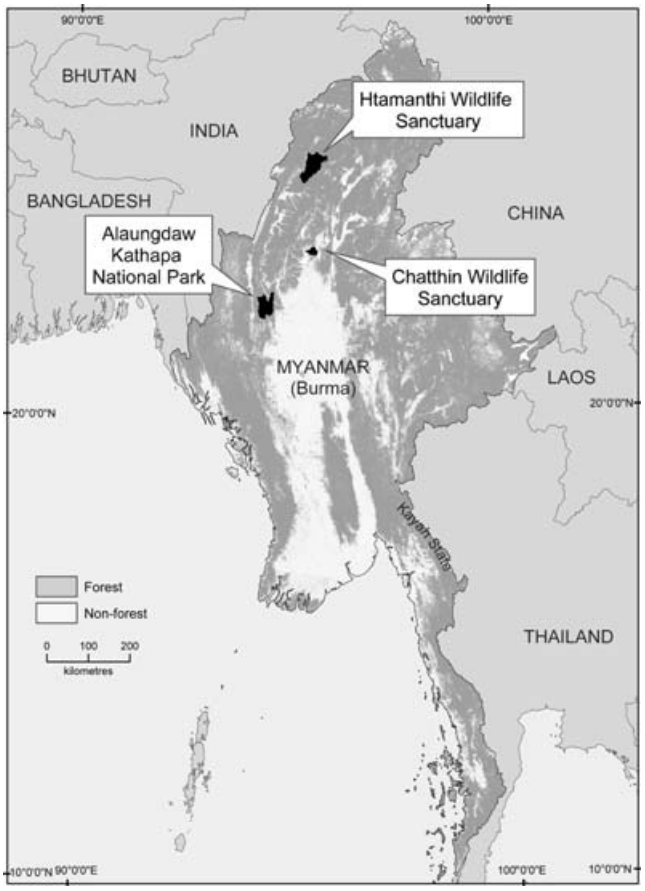



**Figure 1** Location of protected areas in Myanmar.

entails resettling or depriving people of access to resources upon which they have depended for generations (Western & Pearl 1989; West & Brechin 1991). Understanding residents' attitudes is key to improving the PA-people relationship because it can provide guidance for policy and management decisions (Parry & Campbell 1992; Hill 1998; Weladji *et al.* 2003) and provide a baseline for assessing the success of future activities (Gillingham & Lee 1999; Weladji *et al.* 2003).

This study was conducted in three PAs: Alaungdaw Kathapa National Park (AKNP), Chatthin Wildlife Sanctuary (CWS), and Htamanthi Wildlife Sanctuary (HWS) (Fig. 1, Table 1). They represent a range of human pressure levels, from relatively low in HWS, which is surrounded by extensive intact forest, to high in CWS, which is surrounded by agricultural land and severely degraded forest. AKNP is intermediate because it is surrounded by a mix of relatively intact buffer zone forests and agricultural fields.

Our objectives were to (1) determine local residents' attitudes toward PAs in Myanmar, (2) describe their perceptions of PA benefits and problems, and (3) explore the effects of socioeconomic status and perceptions of benefits and problems of the PAs on their attitudes.

## METHODS

### Study areas and people

AKNP, located in rugged mountain ranges 250 km west of Mandalay, was designated reserve forest in the 1890s and was selectively logged, but is now extensively forested. Large mammal populations are still relatively abundant, but the tiger was extirpated within the past 15 years (Lynam 2003). AKNP is of national importance because it contains a shrine of Maha Kathapa, an incarnation of Buddha, which as many as 70 000–80 000 pilgrims visit each year between February and March. A large buffer zone exists around the Park, managed by the Department of Forestry, from which communities can legally extract resources such as fuelwood and bamboo.

CWS is a fragment of second growth monsoonal forest known as *indaing* (Aung *et al.* 2004). This deciduous dipterocarp habitat was once dominant in the arid central plains between the Shan plateau and the Chin Hills. Human use over the past century destroyed the forest, and livestock grazing and collection of wood have degraded the remaining fragments (Aung *et al.* 2004). The Sanctuary is the primary source of forest products for local communities. Extraction is illegal, except along the southern boundary where a buffer zone has been established. Communities adjacent to the buffer zone are allowed to extract fuelwood and minor forest products such as thatch grass, mushrooms and resin. CWS is the largest remaining habitat of the endangered thamin or Eld's deer

**Table 1** Summary description of protected areas studied in Upper Myanmar.

| | *Alaungdaw Kathapa National Park (AKNP)* | *Chatthin Wildlife Sanctuary (CWS)* | *Htamanthi Wildlife Sanctuary (HWS)* |
|---|---|---|---|
| Management objective | National Heritage Site; biodiversity conservation | Conservation of thamin (Eld's deer) | Conservation of Sumatran rhinoceros |
| Habitat | Semi-monsoon dipterocarp, mixed deciduous, evergreen, and pine forests | Monsoon dipterocarp forest | Mixed evergreen forest |
| Year established | 1984 | 1941 | 1974 |
| Size ($km^2$) | 1606 | 268 | 2151 |
| Buffer zone ($km^2$) | 1205 | 52 | – |
| Villages outside | 41 | 25 | 28 |
| Villages inside | 0 | 3 | 0 |
| PA staff | 129 | 72 | 41 |

https://doi.org/10.1017/S0376892906003389 Published online by Cambridge University Press

(McShea *et al.* 1999; Koy *et al.* 2005), and it harbours wild dogs, four species of endemic birds and other biota.

HWS is located in the catchment of the Uyu and Chindwin Rivers. The area is densely forested, remote and accessible mainly by waterways. Its predominantly tropical and semi-evergreen forests were never systematically logged because the timber is marginally suitable. The area was primarily protected for the Sumatran rhinoceros that existed in small numbers earlier in the century, but rhinos are now extinct and tigers very rare (Rabinowitz *et al.* 1995; Lynam 2003). Dredging and placer mining for gold are common in the region, and miners persistently attempt to mine within the PA. HWS has no buffer zone but is surrounded by government forest from which people can extract minor forest products with permission from the District Forest Officer.

The majority of residents around all three PAs are farmers. Those around AKNP and CWS are of Burman origin, while those around HWS are mainly Shan, with the exception of two Chin villages and one Naga village. Both Shan and Chin are ethnic minority groups traditionally more reliant on the forest than the majority Burman group. There are no villages located within AKNP and HWS, and none are known to have existed there in the past 100 years. CWS has had 16 villages within the sanctuary boundaries. Thirteen were relocated in the mid-1990s and the remaining three villages were scheduled for resettlement in 1996 but, to date, resettlement has not occurred (Aung *et al.* 2004). There had been no environmental education projects in any of the areas prior to the surveys, except in CWS. In 1996, in conjunction with an Eld's deer conservation project sponsored by the Smithsonian Institution, a Burmese environmental educator and a small team of CWS staff visited schools and discussed conservation of the deer. There had also been some community projects in the town of Chatthin adjacent to CWS, such as a clean-up campaign that provided trash barrels and signs about keeping the town clean.

## Survey techniques

We conducted standardized open-ended surveys (Patton 1990) of both men and women to determine attitudes and reasons for attitudes toward the three PAs. We define attitude using attitude theory (Ajzen & Fishbein 1980), attitude being a human psychological tendency expressed by evaluating a particular object with favour or disfavour, or, in this case, like or dislike of a PA. Attitude consists of beliefs, which are associations people establish between the attitude object and various attributes. For example, in the phrase, 'a national park is part of a country's wealth,' 'national park' is the attitude object, 'country's wealth' is an attribute, and 'is part' is a relational term. We generated a list of beliefs, which we refer to as perceptions, about PAs by asking people why they liked or disliked the area and the benefits and problems the area caused for them. In addition, we collected five socioeconomic variables: gender, age, education, landholding and family size.

Teri Allendorf trained three local school teachers (including co-authors Khaing Khaing Swe and Thida Oo) in survey methods in the fall of 1999. Training included survey design, writing survey questions, random sampling and data compilation. After the training, we jointly designed an attitude survey protocol, conducted trial surveys and created data ledgers and a computerized database. In 2001, Khaing Khaing Swe and Thida Oo, both women, trained local school teachers, both men and women, to conduct the surveys at AKNP and HWS. We selected local school teachers to conduct the survey because school teachers are highly respected in Burma and are easily accepted into the communities. They are also familiar with the area and able to travel and conduct interviews freely. While there is a danger that respondents might want to give the 'right' answers to the teachers as respected authority figures, it is difficult to predict in this case what the 'right' answers might be. In order to minimize bias, we asked open-ended questions. The teachers did not have a previous relationship with the respondents in terms of the PAs, nor had these teachers previously participated in environmental education activities with the communities. The interviewers, who were ethnic Burmese and Shan, reported that they felt respondents were frank and honest in saying what they thought.

We conducted a total of 2915 interviews in the 97 villages around the three PAs, including 1167 interviews in 41 villages at AKNP, 862 interviews in 28 villages at CWS, and 886 interviews in 28 villages at HWS. We randomly selected 30 households from ledgers maintained by village chairmen. In villages with fewer than 30 households, we interviewed someone at each household. Only people over 18 years old were interviewed. To assure representation of the perspectives of different residents, we developed a sampling scheme that included age, gender and household position. At the first house in a village the husband was interviewed, the wife at the second, the grandfather at the third, the grandmother at the fourth, the eldest child 18 years or older at the fifth, and the youngest child 18 years or older at the sixth. If the appropriate person was not available, we proceeded through the sequence. The refusal rate was extremely low, only a handful in each area, usually because a person did not have the time to participate.

Interviewers introduced themselves to respondents by explaining they were local school teachers conducting a survey at the PA warden's request. While this might have biased people's responses, we felt it was important for the future relationship between the communities and PA management to be honest with respondents about the relationship between the school teachers and the PA management. It was also impossible to predict which way people's responses might be biased; people might have been more negative about issues in order to push for changes from PA management or more positive because they wanted to please the teachers or the PA management. There is anecdotal evidence that if people perceive a close a association with the PA management, they are more negative: a study in AKNP and HWS in 2003 indicated that residents were more likely to openly air complaints

https://doi.org/10.1017/S0376892906003389 Published online by Cambridge University Press

**Table 2** Characteristics of survey respondents in all three PAs. For a complete list of benefits see Table 3. For a complete list of problems see Table 4.

| *Variable* | *Alaungdaw Kathapa National Park (n = 1167)* | *Chattin Wildlife Sanctuary (n = 862)* | *Htamanthi Wildlife Sanctuary (n = 886)* | *All areas (n = 2915)* |
|---|---|---|---|---|
| *Socioeconomic variables* | | | | |
| Mean age (± SD) | 44.83 ± 15.97 | 43.76 ± 16.16 | 41.12 ± 14.33 | 43.60 ± 15.26 |
| Mean family size (± SD) | 6.01 ± 2.37 | 5.87 ± 2.39 | 5.96 ± 2.68 | 5.91 ± 2.44 |
| Female (%) | 37 | 44 | 29 | 35 |
| Education (%) | | | | |
| No education | 13 | 13 | 7 | 11 |
| 1–3 years | 28 | 44 | 38 | 33 |
| 4 years | 43 | 32 | 29 | 38 |
| More than 4 years | 15 | 11 | 27 | 18 |
| Occupation (%) | | | | |
| Farmer | 86 | 87 | 64 | 80 |
| Labourer | 6 | 6 | 26 | 12 |
| Professional/business | 4 | 5 | 4 | 4 |
| Land (%) | | | | |
| Landless | 13 | 18 | 36 | 21 |
| < 3 hectares | 28 | 8 | 29 | 23 |
| 3–5 hectares | 26 | 18 | 25 | 23 |
| 5–10 hectares | 24 | 32 | 10 | 23 |
| > 10 hectares | 8 | 24 | 0.3 | 11 |
| *Control variables (%)* | | | | |
| Distance of village from PA | | | | |
| < 5 km | 50 | 100 | 20 | 60 |
| 5–10 km | 33 | 0 | 49 | 26 |
| > 10 km | 16 | 0 | 31 | 14 |
| Population of settlement | | | | |
| < 1000 residents | 63 | 75 | 93 | 76 |
| 1000–2000 residents | 29 | 22 | 7 | 20 |
| > 2000 residents | 8 | 4 | 0 | 5 |
| *Attitude (%)* | | | | |
| Like | 72 | 45 | 62 | 61 |

if PA staff were present in group meetings (Eberhardt 2003). After introducing themselves, the teachers asked the survey questions beginning with the five socioeconomic questions. They then recorded verbatim responses to the questions, 'What are the problems the protected area causes you?' and 'What are the benefits of the protected area?' Finally, respondents were asked if they liked or disliked the PA and why.

To facilitate analysis of the data, people's perceptions of benefits and problems and reasons for liking or disliking the areas were sorted into major categories. The categories were created inductively after consideration of the responses gathered in the survey.

To test the factors influencing attitude, we calculated three logistic regression models. The first model contained socioeconomic predictors (age, gender, education, landholding and family size) and control variables (settlement size and distance from PA). The second model contained the categories of perceptions. The third model included all the predictors from the first and second models. In addition, to explore similarities and differences among the PAs, we created models for each PA using the full set of variables.

## RESULTS

In two of the PAs, the majority of respondents had positive attitudes: 72% of respondents in AKNP and 62% in HWS liked the area. In CWS, 45% of respondents liked the PA (Table 2). Positive perception categories that emerged from the survey responses were natural resource conservation, availability of resources for extraction and PA management activities (Table 3). Negative perception categories that emerged were prohibition of resource extraction, conflicts with PA management and crop damage by wildlife (Table 4).

Conservation benefits were the most frequently mentioned positive perceptions of all three areas, particularly forest and wildlife conservation and improved climate (Table 3). People also appreciated extractive benefits in all three areas. At AKNP and CWS, people liked PA management activities, including development such as road construction (Table 3). The commonest negative perceptions were the prohibition of natural resource extraction from the PAs, followed by conflicts with PA management (for example fines by PA staff for illegal extraction) (Table 4).

https://doi.org/10.1017/S0376892906003389 Published online by Cambridge University Press

**Table 3** Residents' positive perceptions of protected areas (by category).

| *Benefits* | *Alaungdaw Kathapa National Park (%)* | *Chattin Wildlife Sanctuary (%)* | *Htamanthi Wildlife Sanctuary (%)* |
|---|---|---|---|
| *Conservation* | 63 | 37 | 52 |
| Protect deer | 0 | 6 | 0 |
| Protect elephants and tigers | 0 | 0 | 4 |
| Conserve forest | 33 | 25 | 21 |
| Improved climate | 27 | 14 | 4 |
| Increase/conservation of wildlife | 28 | 4 | 27 |
| Wildlife live in freedom | 0 | 3 | 0 |
| Conservation of natural resources | 2 | 0 | 2 |
| Protected area's obligation to conserve | 1 | 0 | 0 |
| Joy in greenness | 19 | 0 | 0 |
| *Extraction* | 14 | 7 | 7 |
| Fuelwood | 0 | 3 | 0 |
| Fertilizer | 1 | 1 | 0 |
| Furniture | 10 | 1 | 4 |
| Leaves for packing | 0 | 1 | 0 |
| House poles | 0 | 1 | 0 |
| Food | 1 | 2 | 1 |
| Thatch | 0 | 1 | 0 |
| Grow rice | 0 | 2 | 0 |
| Bamboo | 0 | 1 | 3 |
| Palm leaf | 0 | 0 | 3 |
| Cane | 0 | 0 | 3 |
| Deodar (perfume) | 0 | 0 | 1 |
| Fishing materials | 3 | 0 | 0 |
| *Management* | 16 | 6 | 0 |
| 'Clean and Green Chatthin' programme | 0 | 1 | 0 |
| Increased interest/education in conservation | 4 | 1 | 0 |
| Youth increased interest/education in conservation | 0 | 1 | 0 |
| Education signboards | 0 | 1 | 0 |
| Development | 3 | 3 | 0 |
| Transportation | 5 | 1 | 0 |
| Employment | 1 | 1 | 0 |
| No robbers | 1 | 1 | 0 |
| Grazing in return for capturing deer | 0 | 1 | 0 |
| Conservation of shrine | 1 | 0 | 0 |
| Ecotourism | 2 | 0 | 0 |
| *Country* | 4 | 4 | 31 |

Most of the socioeconomic variables were significantly correlated with attitude (Table 5, Model 1). The odds of an individual liking the PA were twice as great if he or she had four or more years of education compared to none at all. People who owned land were about 1.5 times more likely to like the PA than the landless. People who were not farmers had greater odds of liking the PA. Among this group, business people and professionals (such as school teachers) were three times more likely to like the PA, and labourers were 1.5 times as likely. Women were half as likely to like the PA as men. Family size and age were the only variables not significantly correlated with positive attitudes.

All of the perception categories were highly correlated with attitude (Table 5, Model 2). The perception of conservation benefits had the strongest association, increasing the odds that an individual liked the area 28-fold. An individual who perceived management benefits was 10 times more likely to like the PA, and a perception of extraction benefits increased the odds the individual liked the area fivefold. The perception that the country benefits from the area slightly decreased the odds that an individual liked the area. The negative perception categories were also strongly associated with attitude. An individual who perceived problems with management or wildlife causing crop damage had one-fifth the odds of liking the area than someone who did not perceive either problem, while an individual who perceived extraction problems had one-seventh the odds.

Comparing Model 1 to Model 2, socioeconomic status significantly affected attitude to PAs, but perceptions of the PAs, particularly positive perceptions, were better predictors of attitude and had much larger effects on attitude than socioeconomic variables. For example, while a perception of

https://doi.org/10.1017/S0376892906003389 Published online by Cambridge University Press

**Table 4** Residents' negative perceptions of protected areas (by category).

| *Problem* | *Alaungdaw Kathapa National Park (%)* | *Chattin Wildlife Sanctuary (%)* | *Htamanthi Wildlife Sanctuary (%)* |
|---|---|---|---|
| *Extraction (no extraction of the following)* | 22 | 50 | 46 |
| Fuelwood | 1 | 26 | 0 |
| House poles | 7 | 19 | 0 |
| Fodder | 1 | 15 | 0 |
| Food | 0 | 8 | 0 |
| Furniture wood | 6 | 5 | 17 |
| Thatch | 0 | 5 | 18 |
| Bamboo | 0 | 2 | 18 |
| Leaves for packing | 0 | 1 | 0 |
| Fertilizer | 0 | <1 | 0 |
| Palm leaf | 0 | 0 | 30 |
| Cane | 0 | 0 | 21 |
| Resin | 8 | 0 | 7 |
| Gold | 0 | 0 | 6 |
| Fish | 4 | 0 | 5 |
| Other | 1 | 0 | 2 |
| Orchids | 4 | 0 | 0 |
| Hemp | 6 | 0 | 0 |
| Pasture | 2 | 0 | 0 |
| No extraction in general | 0 | 3 | 0 |
| No extraction for profit | 0 | 1 | 0 |
| Charcoal/fuelwood expensive | 0 | <1 | 0 |
| *Management* | 4 | 39 | 9 |
| Cropland reclaimed for protected area | 0 | 21 | <1 |
| Restricted access for travel through CWS | 0 | 13 | 0 |
| Protected area staff punish people | 2 | 9 | 8 |
| Not allowed to extend cropland into protected area | 2 | 5 | 1 |
| Resettlement planned for villages inside CWS | – | 1 | – |
| No timber allowance for public buildings | 0 | <1 | 0 |
| *Wildlife damage* | 0 | 14 | 1 |

conservation benefits increased the odds that an individual liked the PA 28-fold, the most influential socioeconomic variable, occupation, increased the odds of liking the area threefold if the individual was a professional or business owner rather than a farmer.

Not only were perceptions much more strongly correlated with attitude than socioeconomic variables, but the perception model also had a much better fit than the socioeconomic model, as demonstrated by the much lower Akaike's Information Criterion (AIC) for the perception model (Table 5).

The relatively large effects of the perception variables on attitude remained largely unchanged when socioeconomic variables were added, and the model fit was not much better (Table 5, Model 3). There was little to no change in the effect of age, gender, family size and education on attitude. The effect of land ownership increased, indicating that it was related in an inverse way to perceptions. Finally, the effect of population disappeared in the complete model.

Looking at separate models for each area, the effects of socioeconomic variables were inconsistent (Table 5). The effect of the socioeconomic variables differed most in HWS where people with medium levels of education, non-farmers and people who owned more land tended to have smaller odds of liking the area (Table 5). In the other areas, the effects of the variables were the opposite; people with more education generally had the same or higher odds of liking the PA, and people who were not farmers or who owned more land had higher odds of liking the PA.

The effects of the perception categories on attitude remained the same in the models for each PA with two exceptions. First, no one mentioned management benefits in HWS. Second, the perception that the country benefits from the PA had opposite effects in HWS and CWS (Table 5). In CWS, people who said the area had benefits for the country had greater odds of liking the area, while those in HWS had smaller odds of liking the area.

## DISCUSSION

Many residents living around these PAs in Myanmar have generally positive attitudes, even in CWS, where the conflicts are the greatest. The large number of respondents mentioning

https://doi.org/10.1017/S0376892906003389 Published online by Cambridge University Press

**Table 5** Odds ratios for predictors of positive attitude toward a protected area. $^{*}p < 0.10$; $^{**}p < 0.05$; $^{***}p < 0.01$; na = not applicable.

| *Variable* | *All areas* | | | *AKNP* | *CWS* | *HWS* |
|---|---|---|---|---|---|---|
| | *Model 1* | *Model 2* | *Model 3* | | | |
| *Socioeconomic* | | | | | | |
| Age | 1.00 | | 1.01 | 1.01* | 1.01 | 1.00 |
| Female | 0.63*** | | 0.62*** | 0.62** | 0.99 | 0.67* |
| Family size | 0.99 | | 0.96 | 0.88** | 0.95 | 0.99 |
| Education | | | | | | |
| No education (ref) | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 |
| 1–3 years | 0.87 | | 1.32 | 1.00 | 1.75 | 0.94 |
| 4 years | 1.12 | | 1.32 | 1.13 | 1.76 | 0.80 |
| More than 5 years | 2.02*** | | 2.33*** | 3.61** | 1.07 | 2.06 |
| Occupation | | | | | | |
| Labourer | 1.45* | | 2.70*** | 4.61** | 2.77 | 0.52 |
| Professional/business | 3.11*** | | 2.73** | 9.26** | 3.57* | 0.57 |
| Farmer (ref) | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 |
| Land | | | | | | |
| Landless (ref) | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 |
| < 3 hectares | 1.52** | | 2.01*** | 3.27* | 3.93** | 0.59 |
| 3–5 hectares | 1.59** | | 2.15*** | 6.13*** | 5.40*** | 0.57 |
| 5–10 hectares | 1.66** | | 2.67*** | 4.30** | 11.88*** | 0.78 |
| > 10 hectares | 1.32 | | 2.89*** | 8.99*** | 5.96*** | 0.28 |
| *Control* | | | | | | |
| Village distance from protected area | | | | | | |
| < 5 km (ref) | 1.00 | | 1.00 | 1.00 | | 1.00 |
| 5–10 km | 1.80*** | | 1.03 | 0.63* | | 1.01 |
| > 10 km | 3.81*** | | 2.88*** | 1.53 | | 1.92* |
| Population of settlement | | | | | | |
| < 1000 residents (ref) | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 |
| 1000–2000 residents | 1.41** | | 0.85 | 0.98 | 1.00 | 1.30 |
| > 2000 residents | 3.89*** | | 0.98 | 0.31** | 8.46* | na |
| *Perception* | | | | | | |
| Conservation benefits | | 28.96*** | 28.85*** | 75.54*** | 88.86*** | 15.38*** |
| Country benefits | | 0.93*** | 0.64** | 1.16 | 62.98*** | 0.46** |
| Extraction benefits | | 5.33*** | 5.03*** | 2.92*** | 85.13*** | 2.21 |
| Management benefits | | 10.53*** | 11.37*** | 15.98*** | 17.24*** | na |
| Extraction problems | | 0.14*** | 0.12*** | 0.16*** | 0.35*** | 0.02*** |
| Management problems | | 0.18*** | 0.17*** | 0.39* | 0.11*** | 0.28*** |
| Wildlife damage | | 0.18*** | 0.17*** | 0.17*** | 0.15*** | 0.57 |
| Log likelihood | −1706.90 | −996.97 | −946.83 | −292.16 | −213.25 | −280.02 |
| Model $\chi^2$ | 314.28*** | 1783.16*** | 1834.43*** | 710.59*** | 721.92*** | 509.27*** |
| AIC | 3447.80 | 2009.95 | 1941.65 | 630.32 | 470.50 | 604.05 |

conservation benefits and the important role of these benefits in predicting positive attitudes indicate that these positive perceptions play a key role in people's relationships with these PAs. This finding demonstrates that a focus on conflicts to explain people's attitudes undervalues or misses the positive perceptions that people hold. More attention should be given to understanding how important the role of conservation benefits may be in the PA-people relationship and how they might be integrated into management strategies to improve the PA-people relationship (Norton 1989; Infield 2001; Kuriyan 2002).

People's perceptions of the PA management also strongly influenced their attitude. Although relatively small numbers of people mentioned positive management activities, such as community programmes and road maintenance, they were significant predictors of positive attitudes in AKNP and CWS. Negative management activities in all three areas, such as reclamation of PA land from local communities and punishment for illegal extraction, were associated with a negative attitude toward the PAs. Many studies have found that people's perceptions of management play an important role in people's attitudes toward PAs (Parry & Campbell 1992; Newmark *et al.* 1993; Fiallo & Jacobson 1995; Ite 1996; Alexander 2000; Adams & Infield 2001; Infield & Namara 2001; Holmes 2003; Picard 2003; McClanahan *et al.* 2005). In some cases, people's attitudes toward management can

https://doi.org/10.1017/S0376892906003389 Published online by Cambridge University Press

be even more negative than toward the PAs themselves (Infield 1988; Newmark *et al*. 1993), demonstrating that in some cases it is not necessarily the PA-people relationships that need improving as much as the management-people relationships. This study highlights the diversity of perceptions that communities can hold toward management and demonstrates that management can play both a positive and negative role simultaneously in people's attitudes toward PAs.

In these PAs, people's perceptions play a far more significant role than socioeconomic status in predicting attitude and, therefore, provide a more powerful method of understanding people's attitudes. Using three simple questions to capture people's perceptions allowed us to predict attitude with much greater accuracy than using multiple questions concerning socioeconomic status. The greater power of perceptions to explain attitude compared to socioeconomic variables suggests that perceptions have a direct effect on attitude, while socioeconomic variables indirectly affect attitude through perceptions. For example, where women were more likely to dislike the area than men, this was probably because their gender affected their perceptions of the PA. If women are the primary gatherers of resources, then the illegality of extraction negatively impacts them more than men. The idea that socioeconomic variables play a moderating role rather than a determining role is further supported by research examining the link between demographic indicators and environmental perceptions in developed countries (Van Liere & Dunlap 1980; Milbrath 1984; Samdahl & Robertson 1989; Vaske *et al.* 2001).

Socioeconomic characteristics playing a moderating role in people's attitudes through perceptions may explain why no clear patterns have emerged across studies that correlate people's attitudes toward PAs with socioeconomic variables (Fiallo & Jacobson 1995; de Boer & Baquete 1998; Mehta & Kellert 1998; Abbot *et al*. 2001; Holmes 2003). Some studies have found that men have a more positive attitude toward PAs than women (Gillingham & Lee 1999; Mehta & Heinen 2001). Other studies have found that wealthier individuals (Newmark *et al*. 1993; Gillingham & Lee 1999) and people who own more land have more positive attitudes (Nepal & Weber 1995; Infield & Namara 2001). In some cases, individuals with more education have been found to have more positive attitudes (Infield 1988; Heinen 1993; Akama *et al*. 1995; Fiallo & Jacobson 1995; Mehta & Heinen 2001).

If there are, indeed, no consistent relationships between socioeconomic variables and attitudes towards PA than it is difficult, if not impossible, to improve the PA-people relationships strictly via socioeconomic interventions, such as raising education levels or increasing wealth. It is much more feasible to design and test interventions based directly on people's perceptions of PAs. Such activities should build on positive perceptions that people already hold and work on mitigating negative perceptions where possible. Understanding local residents' perceptions and using them as a starting point to improve the park-people relationship can yield efficient and targeted interventions that are meaningful to local communities and their relationships with PAs.

## References


Abbot, J., Thomas, D., Gardner, A., Neba, S. & Khen, M. (2001) Understanding the links between conservation and development in the Bamenda Highlands, Cameroon. *World Development* **29**(7): 1115–1136.

Adams, W.M. & Infield, M. (2001) Park outreach and gorilla conservation: Mgahinga Gorilla National Park, Uganda. In: *African Wildlife and Livelihoods: The Promise and Performance of Community Conservation*, ed. D. Hulme & M. Murphree, pp. 131–147. Oxford, UK: James Currey.

Ajzen, I. & Fishbein, M. (1980) *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ, USA: Prentice-Hall, Inc.

Akama, J.S., Lant, C.L. & Burnett, G.W. (1995) Conflicting attitudes toward state wildlife conservation programs in Kenya. *Society and Natural Resources* **8**: 133–144.

Alexander, S.E. (2000) Resident attitudes toward conservation and black howler monkeys in Belize: the Community Baboon Sanctuary. *Environmental Conservation* **27**: 341–350.

Aung, M., Khaing Khaing Swe, Thida Oo, Kyaw Kyaw Moe, Leimgruber, P., Allendorf, T., Duncan, C. & Wemmer, C. (2004) The environmental history of Chatthin Wildlife Sanctuary, a protected area in Myanmar (Burma). *Journal of Environmental Management* **72**: 205–216.

Brandon, K.E. & Wells, M. (1992) Planning for people and parks – design dilemmas. *World Development* **20**: 557–570.

Braatz, S., Davis, G., Shen, S. & Rees, C. (1992) Conserving biological diversity, a strategy for protected areas in the Asia-Pacific region. *World Bank Technical Paper* **193**: 1–66.

Dasmann, R.F. (1984) The relationship between protected areas and indigenous people. In: *National Parks, Conservation, and Development: The Role of Protected Areas in Sustaining Society*, ed. J.A. McNeely & K.R. Miller, pp. 667–671. Washington, DC, USA: Smithsonian Institute Press.

de Boer, W.F. & Baquete, D.S. (1998) Natural resource use, crop damage and attitudes of rural people in the vicinity of the Maputo Elephant Reserve, Mozambique. *Environmental Conservation* **25**(3): 208–218.

Dinerstein, E. & Wikramanayake, E. (1993) Beyond 'Hotspots': how to prioritize investments to conserve biodiversity in the Indo-Pacific region. *Conservation Biology* **7**: 53–65.

Eberhardt, K. (2003) Report of Assessment for Integrated Conservation and Development Project in Alaungdaw Kathapa National Park and Htamanthi Wildlife Sanctuary. Care Myanmar and the Center for Research and Conservation, National Zoological Park, Smithsonian Institution, USA.

Fiallo, E.A. & Jacobson, S.K. (1995) Local communities and protected areas: attitudes of rural residents towards conservation and Machalilla National Park, Ecuador. *Environmental Conservation* **22**: 241–249.

Furze, B., de Lacy, T. & Birckhead, J. (1996) *Culture, Conservation, and Biodiversity*. New York, USA: John Wiley and Sons.

Gillingham, S. & Lee, P.C. (1999) The impact of wildlife-related benefits on the conservation attitudes of local people around the Selous Game Reserve, Tanzania. *Environmental Conservation* **26**: 218–228.


https://doi.org/10.1017/S0376892906003389 Published online by Cambridge University Press

Heinen, J.T. (1993) Park-people relations in Kosi Tappu Wildlife Reserve, Nepal: a socio-economic analysis. *Environmental Conservation* **20**: 25–34.

Hill, C. (1998) Conflicting attitudes towards elephants around the Budongo Forest Reserve, Uganda. *Environmental Conservation* **24**: 244–250.

Holmes, C. (2003) The influence of protected area outreach on conservation attitudes and resource use patterns: a case study from western Tanzania. *Oryx* **37**: 305–315.

Infield, M. (1988) Attitudes of a rural community towards conservation and a local conservation area in Natal, South Africa. *Biological Conservation* **45**: 21–46.

Infield, M. (2001) Cultural values: a forgotten strategy for building community support for protected areas in Africa. *Conservation Biology* **15**: 800–802.

Infield, M. & Namara, A. (2001) Community attitudes and behaviour towards conservation: an assessment of a community conservation programme around Lake Mburo National Park, Uganda. *Oryx* **35**: 48–60.

Ite, U.E. (1996) Community perceptions of the Cross River National Park, Nigeria. *Environmental Conservation* **23**: 351–357.

Koy, K., McShea, W., Leimgruber, P., Haack, B. & Aung, M. (2005) Percent canopy cover – using Landsat images to delineate habitat for Myanmar's endangered Eld's deer (*Cervus eldi*). *Journal of Animal Conservation* **8**: 289–296.

Kuriyan, R. (2002) Linking local perceptions of elephants and conservation: Samburu pastoralists in Northern Kenya. *Society and Natural Resources* **15**: 949–957.

Leimgruber, P., Gagnon, J., Wemmer, C., Kelly, D., Songer, M. & Selig, E. (2003) Fragmentation of Asia's remaining wildlands: implications for Asian elephant conservation. *Animal Conservation* **6**: 347–359.

Leimgruber, P., Kelly, D. S., Steininger, M., Brunner, J., Müller, T. & Songer, M.A. (2005) Forest cover change patterns in Myanmar (Burma) 1990–2000. *Environmental Conservation* **32**: 356–364.

Lynam, A. (2003) A national tiger action plan for the Union of Myanmar. Myanmar Forest Department, Ministry of Forestry, Myanmar.

Machlis, G.E. & Tichnell, D.L. (1985) *The State of the World's Parks: An International Assessment for Resource Management, Policy and Research*. Boulder, USA: Westview Press.

McClanahan, T., Davies, J. & Maina, J. (2005) Factors influencing resource users and managers' perceptions towards marine protected area management in Kenya. *Environmental Conservation* **32**: 42–49.

McShea, W., Leimgruber, P., Aung, M., Monfort, S.L. & Wemmer, C. (1999) Range collapse of a tropical cervid (*Cervus eldi*) and the extent of remaining habitat in central Myanmar. *Animal Conservation* **2**: 173–183.

Mehta, J.A. & Heinen, J.T. (2001) Does community-based conservation shape favorable attitudes among locals? An empirical study from Nepal. *Environmental Management* **28**: 165–177.

Mehta, J.A. & Kellert, S.R. (1998) Local attitudes toward community-based conservation policy and programmes in Nepal: a case study in the Makalu-Barun conservation area. *Environmental Conservation* **25**: 320–333.

Milbrath, L.W. (1984) *Environmentalists: Vanguard for a New Society*. Albany, USA: State University of New York Press.

Myers, N., Mittermeier, R.A., Mittermeier, C.G., da Fonseca, G.A.B. & Kent, J. (2000) Biodiversity hotspots for conservation priorities. *Nature* **403**: 853–845.

Nepal, S.J. & Weber, K.E. (1995) The quandary of local park-people relations in Nepal's royal Chitwan National Park. *Environmental Management* **19**: 853–866.

Newmark, W.D., Leonard, N.L., Sariko, H.I. & Gamassa, D.G.M. (1993) Conservation attitudes of local people living adjacent to five protected areas in Tanzania. *Biological Conservation* **63**: 177–183.

Norton, B.G. (1989) The cultural approach to conservation biology. In: *Conservation for the Twenty-first Century*, ed. D. Western & M.C. Pearl, pp. 241–246. New York, USA: Oxford University Press.

Parry, D. & Campbell, B. (1992) Attitudes of rural communities to animal wildlife and its utilization in Chobe Enclave and Mababe Depression, Botswana. *Environmental Conservation* **19**(3): 245–252.

Patton, M.Q. (1990) *Qualitative Evaluation and Research Methods*. Newbury Park, CA, USA: Sage Publications.

Picard, C.H. (2003) Post-apartheid perceptions of the Greater St Lucia Wetland Park, South Africa. *Environmental Conservation* **30**: 182–191.

Rabinowitz, A., Schaller, G.B. & Uga, U. (1995) A survey to assess the status of Sumatran rhinoceros and other large mammal species in Tamanthi Wildlife Sanctuary, Myanmar. *Oryx* **29**(2): 123–128.

Rao, M., Rabinowitz, M. & Khaing, S.T. (2002) Status review of the protected-area system in Myanmar, with recommendations for conservation planning. *Conservation Biology* **16**: 360–368.

Samdahl, D. & Robertson, R. (1989) Social determinants of environmental concern: specification and test of the model. *Environment and Behavior* **21**: 57–81.

Struhsaker, T., Struhsaker, P. & Siex, K. (2005) Conserving Africa's rain forests: problems in protected areas and possible solutions. *Biological Conservation* **123**: 45–54.

Van Liere, K.D. & Dunlap, R.E. (1980) The social basis of environmental concern: a review of hypotheses, explanations, and empirical evidence. *Public Opinion Quarterly* **44**: 181–197.

Vaske, J., Donnelly, M., Williams, D. & Jonker, S. (2001) Demographic influences on environmental value orientations and normative beliefs about national forest management. *Society and Natural Resources* **14**: 761–776.

Weladji, R., Moe, S. & Vedeld, P. (2003) Stakeholder attitudes wildlife policy and Bénoué Wildlife Conservation Area, North Cameroon. *Environmental Conservation* **30**: 334–343.

West, P.C. & Brechin, S.R., eds (1991) *Resident Peoples and Protected Areas: Social Dilemmas and Strategies in International Conservation*. Tucson, USA: University of Arizona Press.

Western, D. & Pearl, M., eds (1989) *Conservation for the Twenty-First Century*. Oxford, UK: Oxford University Press.

Wikramanayake, E., Dinerstein, E., Loucks, C., Olson, D., Morrison, J., Lamoreux, J., McKnight, M. & Hedao, P. (2001) *Terrestrial Ecoregions of the Indo-Pacific: a Conservation Assessment*. Washington, DC, USA: Island Press.

Zube, E.H. (1986) Local and extra-local perceptions of national-parks and protected areas. *Landscape and Urban Planning* **13**: 11–17.

https://doi.org/10.1017/S0376892906003389 Published online by Cambridge University Press