Research Article *Gajah 42 (2015) 15-21*

Human-Elephant Conflict around Manas National Park, India: Local People's Attitudes, Expectations and Perceptions

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Abstract. We conducted a study on local peoples' attitudes, expectations and perceptions of human-elephant conflict in fringe areas of Manas National Park. A questionnaire was administered to 563 residents in 24 villages during 2007-09. We found the respondents had positive attitudes towards elephants. Support for elephant conservation was significantly associated with gender, age and education of the respondents. We also found significant differences between actual and perceived frequency of conflict incidents, with respondents quoting far higher numbers of conflicts than what occurred.

Introduction

Religious and cultural ties between people and wild animals in India are of special significance where elephants are concerned. The Asian elephant (*Elephas maximus*) is inextricably linked to the country's mythology and history. Traditionally worshipped as Lord Ganesha, the elephant is also a symbol of fertility, wealth and abundance. This indirect presence of the animal in the daily lives of the general populace has saved the species from extinction (Nath & Sukumar 1998; Varma *et al.* 2008).

The close and ancient relationship between people and elephants provides hope for the long-term survival of Asian elephants in India (Sukumar 1989; Lahiri-Choudhury 1991; Daniel 1995). However, growing incidences of human-elephant conflict (HEC) are affecting the socio-economic status of villagers living in and around elephant habitats, leading to negative feelings towards elephants, thus hindering conservation efforts.

Most elephant habitats in India are surrounded by human habitations. Therefore success in conservation efforts depends on the local people, their perceptions, expectations and attitudes towards the issue. If these aspects are not taken into account, conservation goals would be difficult or costly to achieve. Unfortunately, as little or no emphasis has been given to understanding peoples' attitude towards HEC in planning or developing conservation and management strategies, this issue is becoming a major conservation concern (Varma *et al.* 2008).

While individual economic losses suffered from crop raiding can be relatively high, farmers in developing countries often have limited access to cash and are rarely compensated for their losses (Nyhus *et al.* 2005; Linkie *et al.* 2007; Warren *et al.* 2007). Inability to prevent crop raiding and the absence of compensation may lead to retaliatory killing of problem animals (Jackson & Wangchuk 2001; Nyhus *et al.* 2005).

The survival of Asian elephants is crucial from an ecological point of view as elephants play an important role in maintaining ecosystem balance. Therefore long-term strategies need to be developed for conservation of elephants and their habitats. To develop and implement such conservation strategies it is necessary to assess people's attitudes towards elephant conservation and HEC. Here, we describe the local peoples' attitudes, expectations and perceptions of HEC in the fringe areas of Manas National Park (MNP), Assam, India.

Materials and methods

Study area

MNP is a prime Asian elephant habitat within the Bhutan Biological Conservation Complex in the Eastern Himalaya Biodiversity Hotspot (CEPF 2005) and facilitates trans-boundary movements of elephants and other wildlife between India and Bhutan. MNP is located in Baksa and Chirang districts of Assam, India (26°35'-26°50'N, 90°45'-91°15'E) within the Chirang Ripu Elephant Reserve (2600 km^2) (Fig. 1). MNP spans both sides of the Manas River and is contiguous in the east and west with Reserve Forests. It is bounded in the north by Bhutan and in the south by a belt of thickly populated villages.

There are 61 recognized fringe villages within ~2 km distance from the park boundary which are followed by layers of additional villages further south. Increasing human population in fringe villages has led to encroachment, illegal hunting and tree-felling within MNP (Sarma *et al*. 2008). Many people residing in the fringe areas are dependent on MNP for their livelihoods, such as livestock grazing, thatch, fodder and fuel wood collection. The majority of the population in these villages belongs to the *Bodo* tribal community. The other communities are *Assamese*, *Bengali*, *Nepali* and a negligible number of *Adivasi* (Tea tribe).

Data collection

Simple random sampling was used for selecting households of respondents. Prior to the survey the questionnaire was tested with 50 people and ambiguities and misinterpretations were clarified (Kumssa & Bekele 2014). The survey was conducted in 24 randomly selected villages during 2007-09. We interviewed people one at a time to assure independence of data (Lammertink *et al*. 2003) and interviews lasted between 20 to 30 minutes. The questionnaire sought information on the demography, education and livelihood of respondents; their concerns on elephant conservation and MNP; and their attitudes, expectations and perceptions on HEC. Additionally, we conducted weekly field visits and recorded the number of HEC incidents that occurred in the 24 villages.

Results and discussion

Profile of respondents

A total of 563 individuals were interviewed of which 89.88% (n=506) were men. Since women were reluctant to face interviews their participation was less. Moreover, men were the general spokespersons in the community. This constraint in questionnaire-based sampling in the region is reflected in other studies as well (Barua *et al*. 2010; Das *et al*. 2011). People interviewed were between the ages of 18 to 58 with a median age of 39 years.

Majority of the people interviewed were tribals (94.14%, n=530) of the *Bodo* community. Due to their traditions and ethno-specific practices the *Bodo* tribe is heavily dependent on MNP for cattle grazing, collection of timber, firewood, thatch, wild vegetables and fruits, fishing and occasional hunting of wild animals for meat (although removal of any kind of forest produce from the park is not permitted). As they are the dominant tribe in the entire Manas landscape, their participation in conservation planning is very important.

Of the respondents 83.13% (n=468) were educated and the balance had no formal education or were illiterate. Among the educated, the level of education ranged from primary to the Graduate level. Education is an important factor in being

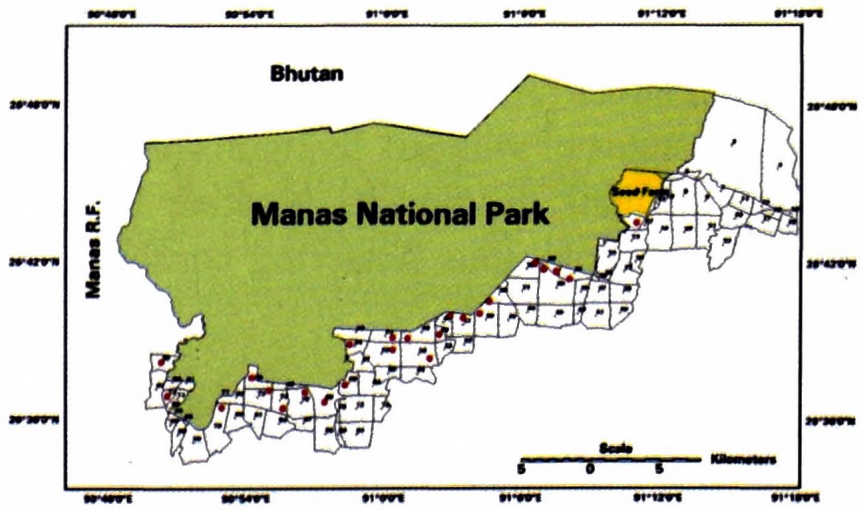

Figure 1. Map of study area (red dots indicate the sampled villages).

able to understand HEC, and conservation in general. The value people place on wild animals often depends heavily on their knowledge and so education is a major tool in conservation (Sutherland 2000; Mishra *et al.* 2003).

The prime agricultural crop cultivated in the region as stated by the respondents was paddy (summer paddy: 9.77%, autumn paddy: 19.54%, winter paddy: 70.69%). Majority of the local people were subsistence farmers (71.23%, n=401) without any alternative source of livelihood. Thus, the impact of elephant depredation is likely to be quite high. Lower income groups that generally do not get incentives from protected areas are more likely to resist rules and regulations, and continue to encroach upon wildlife habitat (Kumssa & Bekele 2014). This phenomenon was quite evident in MNP where 20.47 km^2 of the park has been encroached (Sarma *et al.* 2008). In MNP, initiatives should be immediately undertaken to stop further destruction of elephant habitat and to restore the already lost (encroached) forest areas through eviction followed by allowing regeneration of natural vegetation.

Attitudes towards elephants

The respondents had positive attitudes towards elephants, with 77.09% (n=434) saying that elephants should be conserved and that they have a right to be in MNP, 14.74% (n=83) of the people's response was neutral whereas 8.17% (n=46) said, elephants should not be conserved and they have no right to be in Manas (χ^2_2=913.55, P<0.001). When asked if they had benefitted from elephant presence, 91.83% (n=517) said no, 0.71% (n=4) said yes and 7.46% (n=42) of the people did not respond (χ^2_2=1040.92, P<0.001). Thus, even in the absence of any benefit from elephant presence the local people had a positive attitude towards elephants, which was perhaps influenced by the religious and cultural belief of the elephant as a God. Support for elephant conservation was significantly associated with gender (χ^2_2=9.14, P<0.025), age (χ^2_2=10.71, P<0.005) and education (χ^2_2=347.03, P<0.001) of the respondents. Female, older (≥39 years) and literate respondents were found to be more compassionate towards elephants (Table 1).

The association of a positive conservation attitude with literacy confirms the importance of education and awareness in conservation. Heinen (1993) and Kumssa and Bekele (2014) observed similar situations in their studies in Kosi Tappu Wildlife Reserve in Nepal and Abijata-Shalla Lakes National Park in Ethiopia respectively. Local people were also very conscious of the importance of forest resources in MNP and the benefits of living near the park. Of the respondents, 91.83% (n=517) said they liked living near the park and supported the existence of MNP. The benefits mentioned by the people included obtaining forest resources like thatch, firewood, medicinal herbs, and access to grazing land for their cattle, forest department jobs and tourism related services.

This positive attitude provides hope for elephant conservation in this region, which can be used to promote human elephant coexistence to ensure future survival of Asian elephant in the Manas landscape. However, on the other hand 8.17% (n=46) of the respondents were unhappy about the existence of the park, due to HEC or restrictions on forest resource use. Education, increasing awareness and compensation may help reduce the negative attitudes observed.

Table 1. Attitude of respondents towards Asian elephant.

Demographic variables		N	Positive (%)	Negative (%)	Neutral (%)	χ^2	df	P-value
Gender	Male	506	75.30	8.89	15.81	9.14	2	*P*<0.025
	Female	57	92.98	1.75	5.26			
Age	Young	269	76.95	11.52	11.52	10.71	2	*P*<0.005
	Old	294	77.21	5.10	17.69			
Education	Illiterate	95	7.37	35.79	56.84	347.03	2	*P*<0.001
	Literate	468	91.24	2.56	6.20			

HEC perception

When the respondents were asked about the level of HEC, 72.11% (n=406) perceived it as medium but that it was on the rise, 18.12% (n=102) as low and 9.77% (n=55) felt that the extent of HEC was high. Measures to reduce conflict at this early stage and initiation of long-term conservation strategies are of utmost necessity before the conflict becomes severe and unmanageable in the future. Such strategies may include creation of a buffer zone between MNP and villages through landuse planning, awareness programs for human-elephant coexistence, promotion of economically viable alternative crops to paddy and diversified livelihood opportunities. The perceptions and attitudes of people are influenced by their background experiences (Karimi 2009). Interestingly, all the people who perceived HEC as high had suffered elephant depredation in the last two years and had crop fields located next to MNP. Conversely, people who perceived HEC as low did not experience any elephant depredation so far. Thus, previous experience of HEC influenced people's perception on HEC. Particularly, when the damage exceeds a certain limit, people's perceptions may change and victims may develop negative attitudes that can lead to retaliatory killing. A study conducted by Karimi (2009) on African elephants in Tanzania also revealed that farmers' perceptions are shaped not only by background experiences, but by individuals' experiences with factors that have the most potential to cause damage.

The entire Manas landscape experienced a severe socio-political crisis (*Bodo* agitation) during the late 80's which devastated the infrastructure of the region, caused large scale destruction of the forest habitat, caused severe lapses in the management of the park and resulted in local extinction of several species, including the Indian rhinoceros (Nath *et al.* 2009; A.R. Rahmani pers. comm.). According to the respondents HEC was higher before the agitation then dropped during the peak agitation period. This could be due to decrease of unplanned agricultural activity by people and disturbance created by the rebel groups inside MNP, which they used as a major hideout during the agitation period. The respondents also stated that HEC has increased since the end of the agitation. However, to establish the fact of this statement historical information on HEC is required which is lacking.

Endangered wildlife sometimes takes more than its share of the blame (Nyhus *et al.* 2005). This fact was evident during our study too. We found that the median differences between the actual and perceived frequency of conflict incidents was significant ($T=69$, $P<0.05$, Wilcoxon's test for matched pairs) with respondents quoting far higher numbers of conflicts than what actually occurred in the villages (Table 2). This type of exaggeration is common and reported in many conflict sites where compensation policies exist. Sekhar (1998) therefore suggested that outside

Table 2. Actual frequency of HEC during the study period and median frequency of HEC perceived by the respondents.

No.	Village	Frequency of HEC	
		Actual	Perceived
1	Barengabari	188	300
2	Koroibari	170	200
3	Chourang (4 no.)	158	250
4	Bamunkhal	156	225
5	Pub Chengmari	132	190
6	New Betbari	120	140
7	Kahitama Gaon	105	125
8	Phulkumari	83	150
9	Lonthybari	72	90
10	Sutradhar Para	58	82
11	Oxiguri	51	100
12	Sadhupara	47	150
13	Ujan Bahbari	39	50
14	Milanpara	24	100
15	Borghagra	15	60
16	Chalchali	15	45
17	Ghilajhar	14	30
18	Aaohata	12	50
19	Moirajharpam	11	30
20	Moinamata (Pathar)	8	10
21	Chaolabari	7	5
22	Elengamari	7	12
23	Kachubil No. 2	7	3
24	Jengrengpara	6	5

verification of wildlife damage is essential because self-reporting results in overestimates of damage.

Causes of HEC perceived by local people

When asked about what could be the possible causes of HEC in the region, 38.01% (n=214) said forest destruction and shortage of food resources are the root causes of HEC. Other causes of HEC mentioned were human disturbance inside the park (14.56%, n=82), problem animals (13.14%, n=74), increased elephant population in the park (10.30%, n=58), after-effect of Bodo agitation (9.41%, n=53), Forest Department's inability to manage the elephants (5.86%, n=33), no idea (5.86%, n=33), close proximity of the village to the park (2.13%, n=12) and high palatability of cultivated crops (0.71%, n=4) (χ^2_9=4583.02, P<0.001). Of these, only close proximity of the villages to the park (Lahkar *et al.* 2007, 2009; Nath *et al.* 2009, 2013; Das *et al.* 2011) and high palatability of cultivated crops (Sukumar 1990) are likely to be true.

Existing HEC mitigation measures and their extent of use

HEC mitigation mostly consisted of methods used to drive away elephants, such as noise-making activities like shouting (17.23%, n=97), drum beating (1.60%, n=9), bursting of fire crackers (13.14%, n=74), use of flash lights (6.57%, n=37), pelting stones (14.74%, n=83), throwing burning firewood or other objects that are found within reach (4.97%, n=28) and use of spears (0.89%, n=5). Use of a combination of different methods was high (40.85%, n=230). The noise-making activities and throwing things are reactive and confrontational which increase the risk of injury and death to farmers from elephants as the aggression level increases on both sides (Fernando *et al.* 2007). Moreover, these methods tend to lose their effectiveness as elephants become habituated with increased exposure to them. With increasing habituation people may tend to use lethal methods (e.g. spears), which however should not be encouraged. In MNP, as the intensity of conflict is not severe, low cost mitigation measures such as trip wire alarm systems, use of flash lights, regulated use of fire crackers and strengthening of traditional crop guarding systems could still be effective.

Mitigation measures suggested by local people

When the villagers were asked if they had any ideas on how to make HEC mitigation more effective, 26.29%, (n=148) responded that they had no idea, 21.85% (n=123) suggested patrolling by Forest Department officials along the park boundary during the night so that they can be of immediate help at the time of conflict occurrence, 19.36% (n=109) construction of barriers like rubble walls or electric fences to prevent entry of elephants into the settlement area, 13.85% (n=78) crop guarding by farmers, 10.83% (n=61) capture and removal of habitual raiders and 2.31% (n=13) suggested lighting the park boundary as a HEC mitigation measure. Of the respondents, 5.51% (n=31) suggested culling of problem animals. When queried further, five of the respondents revealed that they had experienced property damage from elephants and had not received any compensation. Underlying reasons for the rest of the respondents who advocated culling were unsuccessful as they were drunk and showed aggressive behaviour at the time of data collection. Different suggestions have been put forwarded by the respondents on possible conflict mitigation measures. However in our view, education and awareness of the local people on how to live safely with elephants should be the foremost HEC mitigation initiative so that precautionary measures can be taken to avoid encounters with elephants. This strategy will minimize incidence of HEC to a large extent and ensure human-elephant coexistence.

Regarding who should be held accountable for HEC, most replied that the Forest Department was (58.08%, n=327). This view was perhaps influenced by the general notion of people that elephants are government (Forest Department) property. According to 25.22% (n=142) elephants were responsible for HEC as they came out of the forest instead of staying inside. Communities were responsible according to 6.04% (n=34) of the respondents and around 10.66% (n=60) had no idea who should be held accountable.

Compensation

When asked about the present compensation policies 88.63% (n=499) said they were not satisfied, 8.70% (n=49) said that they have no idea about the compensation scheme. Of the respondents 2.66% (n=15) were partially satisfied, because they had received in kind support from Forest Department in some way. The dissatisfaction with compensation was because the compensation process of the Forest Department was very slow and in most cases the victims did not get any compensation even after repeated follow ups and consequently stopped claiming for their losses. The absence of or faulty compensation systems may create antagonism towards elephants and may hinder the conservation efforts in MNP. Already there had been four cases unofficially reported in MNP during the period of study where the suspected problem elephants were shot dead by villagers in retaliation (Nath *et al.* 2013).

Compensation schemes can make people more tolerant to damages caused by elephants, but most are often inadequate, highly bureaucratic and open to problems such as fraudulent claims and corruption (Perera 2009). The existing compensation policy in MNP should be transparent, recompense process should be expeditious and victims should be compensated. However, a proper damage verification mechanism should be in place to avoid possible exaggeration errors. This will ensure local community's support in elephant conservation.

Acknowledgements

This study was funded by the Asian Elephant Conservation Fund of the US Fish and Wildlife Service. We gratefully acknowledge Mr. M.C. Malakar, the Chief Wildlife Warden of Assam State Forest Department for granting us permission to work in MNP. We are thankful to Dr. Abhijit Rabha, Mr. Ritesh Bhattacharjee, Mr. Anindya Swargowary, Mr. C.R. Bhobora and the entire Forest staff of MNP for their help and assistance during fieldwork. We are extremely grateful to Mr. Surendra Varma for his invaluable suggestions and technical support.

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