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Community-Based Human-Elephant Conflict Management in Assam

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Introduction

Northeast India is considered a high-priority area for Asian elephant conservation (Choudhury 1999; Sukumar 2006) with a particular need for the mitigation of human-elephant conflict (HEC) (Gureja *et al*. 2002). The forests of the Himalayan foothills contain one of the last remaining viable elephant populations and also one of the most acutely threatened (Sukumar & Santiapillai 1996; Choudhury 1999). Estimates for the wild elephant population in Assam vary but are believed to be in the order of around 5,000, which represents around 20% of India's total wild elephant population and 10-15% of the global Asian elephant population (*cf* Project Elephant Synchronised Census 2002, IUCN 2008, Sukumar 2003). Assam, therefore, is one of the most important strongholds for the survival of the Asian elephant.

However, in Assam, unsustainable extraction of forest products and encroachment of forests for agriculture are fragmenting habitat, the most visible and immediate effect of which is direct conflict between elephants and people (Kushwaha & Hazarika 2004). This conflict has become an annual occurrence which results not only in loss of crops, but also destruction of property and loss of human lives, and in turn, retaliation against elephants. An indicator of the severity of this conflict is seen in the response of the affected communities, many of which, despite revering elephants in their culture (e.g. Ganesha in Hinduism) have taken to poisoning and electrocuting elephants in desperate attempts to protect their lives and livelihoods (Gureja *et al*. 2002). A series of elephant poisonings in 2001 attracted extensive media attention and raised awareness of the severity of HEC in Assam. Between 1997 and 2001 there were 208 human and 175 elephant deaths in Assam as a result of the conflict (Gureja *et al*. 2002).

For the long-term, landscape-scale strategies for habitat restoration and elephant conservation are essential, but these are conceptually and politically challenging to devise and take many years to implement. Meanwhile community tolerance of elephants is deteriorating, threatening to undermine larger-scale conservation efforts. Addressing this is precisely the objective of human-wildlife conflict mitigation: to prevent community tolerance of wildlife from deteriorating in order to buy time for the development of long-term solutions.

In 2004, the UK-based North of England Zoological Society (which runs Chester Zoo) joined forces with the Assam-based NGO EcoSystems-India to create the *Assam Haathi Project for human-elephant conflict mitigation* (www.assamhaathiproject.org), which received funding from the UK Government's "Darwin Initiative" in 2007 (Defra 2008). The project uses a community-based approach to integrate research and monitoring with conflict mitigation and the protection of livelihoods. In this paper we describe our approach as a case study for effective approaches to human-elephant conflict mitigation.

Study area

The state of Assam in Northeast India has an area of 78,438 km^2 and a human population of over 26 million people (Census of India, 2001). Our project works in two districts, called Sonitpur and Goalpara (Fig. 1), which are particularly prone to frequent and severe cases of HEC. Within these

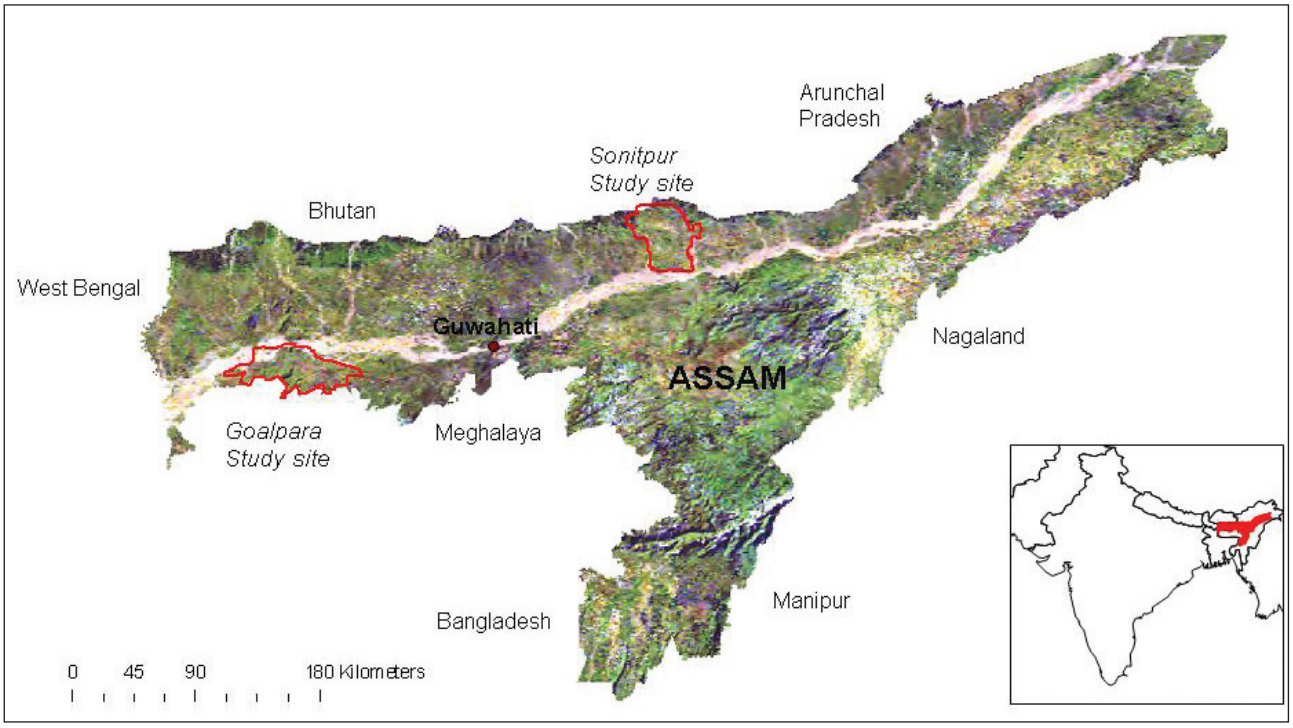

Figure 1. Map of Assam, showing locations of Sonitpur and Goalpara study sites.

districts the project works intensively with 825 households from six villages, and less intensively with a further 26 villages, which adds up to an outreach span of over 5,000 households. Both districts contain a mosaic of land-use, including rice cultivation, homestead gardens, villages, tea plantations, degraded secondary forest and protected areas. The study site in Sonitpur district covers an area of 1,175km^2 and is bordered by the protected areas of Nameri National Park and Sonai Rupai Wildlife Sanctuary to the north and the Brahmaputra River to the south. The Goalpara district study site is a 1,325 km^2 transect delimited to the south by the forested Garo Hills and to the north by the Brahmaputra River. The majority of people within our study sites are farmers, tea-estate workers and day-wage labourers.

Community-based elephant monitoring

In order to develop strategies for human-elephant conflict management in the long-term, it is essential to understand the spatial and temporal patterns of crop-raiding and the movements of elephants in the area. Spatial monitoring of elephants can be achieved in various ways, ranging from expensive satellite telemetry studies to simply following elephants on foot or by vehicle. While telemetry provides high-quality and ample data, it lends itself less well to community involvement and is highly donor-dependent. Visual tracking, on the other hand, can compromise the accuracy of some of the data, but is a sustainable way to involve communities and therefore conducive to long-term conservation efforts.

In the Assam Haathi Project we follow the latter method: 27 community members have been trained and engaged as "field monitors" to record elephant movements and details about conflict incidents. This approach also establishes an independent conflict reporting system (as suggested by Hoare 1999) and prevents the common problem of farmers' exaggeration of crop-raiding and elephant damage (*cf* Siex & Struhsaker 1999). Field monitors are stationed throughout each study area and visit crop-raiding and property damage incidents as they occur, verifying these and recording their locations with a GPS unit. Details of the incident are entered onto a reporting form, including: elephant group size, composition or herd identity, time of incident, damage to crops and/or property, any crop protection methods in place, and any human or elephant injuries.

The field monitors also record the locations of elephant herds (and single males or bachelor

Figure 2. Training session for elephant monitors: how to identify individual elephants.

groups) as they pass through the agricultural landscape, identifying bulls and matriarchs by distinguishing body features (Fig. 2). Elephant groups are followed across the study area landscape by a relay system, where field monitors are responsible for recording all movement and conflict on their patch of land until the elephants move into the patch of another field monitor, who then picks up the observation. The elephants are monitored only in the agricultural areas, as following them inside the dense forests is not logistically possible with this method (another limitation of visual tracking). The data collected by the field monitors are then transferred into a GIS database for spatial analysis, which is currently being analysed for elephant migration routes, conflict hotspots, spatial correlates and seasonal variation (Wilson *et al*. in prep).

Despite its scientific limitations, this low-tech monitoring method is very appropriate for a community-based approach because: a) it is easy to expand or to replicate in other areas, b) it is sustainable (it is cheap and can easily be adopted or copied by other communities without external NGO input), c) it provides ample opportunity for awareness-raising and capacity–building in the communities, d) it encourages leadership and responsibility for dealing with HEC at the community level, and e) it provides indirect education about elephants and conservation.

Crop-raiding in Assam occurs from June to February, with peaks from October to December, coinciding with the harvesting of paddy. As observed by other studies on HEC, crop-raiding takes place from late evening to early morning (e.g. Sitati *at al*. 2003; Venkataraman *et al*. 2005). There are two identified herds within Goalpara; one with a mean herd size of 21 and 22 individuals and maxima of 50 and 35 individuals respectively. The Goalpara herds predominantly use the forested Garo Hills to the south of the study site, moving north to the forested area by the river. Both herds are found more frequently around agricultural areas during crop harvesting season. In Sonitpur, seven herds have been recorded, with mean herd sizes ranging from three to 13 individuals and a maximum of 130. Most of the herds in Sonitpur leave the protected forests in the north around June/July and travel to the banks of the Brahmaputra River in the south, using tea-estates along the way as refuge and resting areas. Understanding the migration patterns of the herds, and the landscape variables, which facilitate elephant movement and create conflict hotspots (Wilson *et al*. in prep) allows us and the communities to anticipate crop-raiding

Figure 3. A spotlight for deterring elephants.

incidences and plan interventions accordingly.

Community-based crop protection

Most studies of best practice in human-wildlife conflict mitigation advocate the need to empower local communities and encourage them to take responsibility for preventive action (e.g. O'Connell *et al*. 2000; Jackson & Wangchuk 2001; Osborn & Parker 2003). Our project works closely with a village to develop the most appropriate and beneficial mitigation method for the given village. This involves a considerable amount of initial effort in rapport-building and discussions about past and existing interventions. We then offer ideas for suitable options appropriate for the community, which makes the decision of which method to take forward.

A variety of crop and property protection methods have been devised in Asia and Africa. We consider these to fall into three categories: 1) *Early warning systems:* to alert villages in advance that elephants are approaching (e.g. trip wire; watchtower) 2) *Barriers:* to prevent elephants from entering a particular area (e.g. trench; electric fence; chilli fence; buffer zone) and 3) *Deterrents*: to discourage elephants from entering an area and/or chase elephants away (e.g. chilli smoke; spotlights). Most of these methods work better in combination with one another and when used in irregular rotation, as elephants can become habituated to deterrents and have been known to outsmart barriers and early warning systems.

The total losses of crops and property between 2005-2008 in our study areas was £98,000 (Rs 6,86,00,00). Response to the mitigations has been positive, with communities taking initiative to improving or adapting the methods to best suit specific local situations. We have observed a marked reduction in crop losses in the Sonitpur district from 227 ha lost in the 2005/06 crop-raiding season to 58 ha in the 2007/08 season.

Among the methods we have tried, we found hand-held spotlights to be the most popular option. In response to demand, we developed a spotlight with a voltage regulator to withstand the fluctuations in the local electricity supply (Fig. 3). Spotlights are effective when used in conjunction with other methods such as noise, fencing and chilli smoke.

We have assisted communities with the installation of simple electric fences at three sites. These are 2.2 m high and have two strands of electrified wire, powered by solar photovoltaic panels (Fig. 4). Although this is our most expensive

Figure 4. A two-strand electric fence installed in Sonitpur district.

intervention option (at a cost of approx £1,400 / Rs1,11,000 per kilometre), it is extremely effective for vulnerable areas such as villages that are exceptionally prone to crop-raiding or the protection of granaries.

With this method, the community contributes materials (usually wooden posts), plus the labour of constructing the fence, and we provide the more expensive materials, such as wire and energizers. The villagers are taught how to maintain the fence and are asked to take responsibility for this. Where the village is un-electrified, solar-powered lighting systems has been used, which has the added value of providing the community with a little extra electricity supply.

Chilli smoke has also been found to be effective when used correctly. For this method, dried red chillies, tobacco leaves and dry straw or grass are placed on a square of cardboard which is then rolled up to make a tube, and fastened with wire. A stick is then placed into the centre of the tube to create a handle, and the chilli/straw end is lit (Fig. 5). Chilli smokers need to be prepared in advance and are most effective when villagers work as a team using at least three smokers at once. When approaching elephants are sighted, the smoke is directed towards the elephant (and away from other villagers or livestock) to deter the elephants. Sometimes villagers have not prepared the smoker in advance and instead throw chillies into a fire made at the edge of the village – this also works as a deterrent as the burning chillies produce a pungent smell, but is less effective because the chillies burn out more quickly and do not create adequate smoke. Chilli fencing (ground chilli, tobacco leaves mixed with automobile grease and smeared onto rope – a method described by Osborn & Parker 2002) has also been particularly effective at one project village in Goalpara.

Figure 5. A chilli smoker.

Challenges and opportunities

Community-based conservation has been projected as the most practical approach to stem biodiversity loss in developing countries (Mehta & Kellert 1998). However, working successfully with communities to achieve mutually beneficial results poses a number of challenges. First among these is gaining communities' trust and engagement and conveying to them the conservationist's purpose of genuinely wanting to help them in order to protect the survival of habitats and species – an ideology that is often met with suspicion. This step may take considerable time – a challenge particularly if a project is dependent on, for example, a typical three-year project cycle at the end of which measurable results must be demonstrated to the funder. The first year or two of rapport-building may be devoid of any such results, but is crucial for ensuring long-term impact.

Key to this, as we learned in the Assam Haathi Project, is to have frequent meetings with the communities (both formal and informal) and invest full effort into good and regular communication. Meetings need to be followed with action swiftly, and opportunities for not only participation, but also leadership and responsibility, need to be created. For example, in our project, once the community has decided on the mitigation they wish to employ, field monitors will coordinate and provide training to the villagers. Meanwhile, interim results from the data analysed by our project staff are shared with communities regularly, to update them on progress and help them to see the value of research and understand the bigger picture of human-wildlife conflict.

The Assam Haathi Project is now becoming demand driven, with communities approaching the project and asking for assistance. In order to meet this demand and increase the capacity

of our outreach, we have produced a handbook called "Living with Elephants in Assam" - an illustrated guide to making and using crop-protection methods. We are currently evaluating this to determine whether (and with which combinations of outreach) such a guide is effective as a conservation tool (Zimmermann *et al*. in prep).

Measuring success

Measuring the impact of conservation projects that have long-term aims is nearly impossible in the short-term; however, there are interim indicators that suggest whether a project is on a good track to having a positive effect towards its wider aim. Among these are short-term changes in a) community behaviour (via informal observation) b) local people's attitudes (via before-and-after questionnaire surveys) and c) patterns or frequencies of conflict (counts of crop losses, damage and injury or deaths of both elephants and people). Four years into our project we have seen an independent spread of awareness and willingness to take action for crop protection beyond our project villages, we have observed the spontaneous copying of crop-protection by neighbouring (non-project) villages, noticed much more positive attitudes towards elephants in our project villages and recorded significantly fewer elephant and human injuries and deaths (data currently in analysis).

Nevertheless, community-based HEC mitigation is ultimately only a fire-fighting solution and does not address the root cause of the problem. Therefore, once a participatory HEC management approach has been established and community tolerance levels have stabilized, the real challenge begins: how to secure the long-term survival of elephants on a landscape scale. Spatial data on elephant movement should form the basis for long-term management plans, but involving the local communities at every step of the way is essential. This is because participatory HEC management projects create a structure and communication pathway for involving communities in the planning and implementation of long-term strategies, and hence their sustainability.

Conclusion

The Assam Haathi Project is now working together with other local NGOs towards proposing long-term management solutions in Assam, but therein many more serious challenges lie ahead. Ensuring there is adequate habitat conserved for elephants through halting the fragmentation and destruction of forests is a priority, but this requires enforced legislation and further funds. Protecting areas of land that connect forest patches and elephant populations has previously been tried and there are currently five elephant 'corridors' of varying success in India (Johnsingh & Williams 1999). Unfortunately some corridors have failed due to poor protection and poor communication between stakeholders resulting in developmental activities that have rendered the corridor un-usable for elephants (Johnsingh *et al*. 1991). The approach that we foresee for the areas in which we work is to create a 'corridor of tolerance' - a multi-use passage along the elephants' traditional migration routes that allows co-existence, with its inevitable losses of crops, through a system of good depredation management and socio-economic support to communities along this path. While there are various options for the long-term solution in Assam; the only certain aspect is that all stakeholders – including different conservation NGOs - will need to unite in their aims and coordinate their approaches to achieve successful conservation of the Asian elephant and its habitat.

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