
Elephant Habitat and Human-Elephant Conflict: A Case Study in Chunati Wildlife Sanctuary, Bangladesh

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Abstract

*Elephant habitat conservation and human-elephant conflict management are major issues for Chunati Wildlife Sanctuary (CWS). Asian elephants (*Elephas maximus*), critically endangered mammals in Bangladesh, require large undisturbed mosaic habitats and need abundant foraging materials and water for survival. The Chunati forests were originally mixed evergreen and semi-evergreen forests, supporting the type of habitat required for elephants. However, fragmentation of elephant habitat, scarcity of fodder species, and increased human activities within the sanctuary pose serious challenges for habitat conservation and human-elephant conflict management. In my study, I have tried to assess the present condition of elephant habitat and human-elephant conflict in CWS after the adoption of co-management in 2004. I have found that co-management brings some positive changes among participating members in terms of increasing awareness about elephant habitat conservation and the Wildlife Act, and also may help to reduce forest dependence to some extent. The Chunati forests seem to be in a better condition recently, and the number of elephants appears to be increasing. I also found that human-elephant conflict has increased during the last two to three cropping periods, and that the increase in the number of elephants is contributing to increased human-elephant conflict. My study suggests that strengthening co-management organizations through sustainable alternative income-generating activities (AIGAs) and appropriate training programs can promote elephant habitat conservation and human-elephant conflict mitigation. Furthermore, additional management measures, such as participatory elephant monitoring, participatory crop protection measures, and conservation response units can help alleviate human-elephant conflict.*

Introduction

Habitat preservation is the main challenge for elephant conservation and for human-elephant conflict mitigation. Asian elephants (*Elephas maximus*) are forest-dwelling animals that have been described as keystone or flagship species. They are often called the “engineers” of the forest as they play a significant role in maintaining the ecosystems they inhabit. Asian elephants are found in 13 different countries in Asia

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and there are currently fewer than 50,000 animals living in the wild. The status of Asian elephants in Bangladesh is threatened. In 2000, the species was listed by the International Union for Conservation of Nature as “critically endangered” (IUCN 2011).

The Chunati Wildlife Sanctuary (CWS) supports a population of about 20 elephants. They constitute an important part of the forest ecosystem and are an indicator of good forest health (FD 2006). As a large herbivorous mammal, elephants require abundant foraging material and water for drinking and bathing. They prefer a mosaic of habitat types with patches of forest, scrub forest, banana groves, forest clearings, intermittent open spaces, succulent grasslands, and savanna. Forests in CWS currently support these types of habitats, but to ensure the long-term sustainability of this habitat, further management and conservation measures are needed (FD 2006).

The fragmentation of forestland in and around the sanctuary, the associated scarcity of elephant fodder species, and the increase in human activities within the elephant habitat together pose significant challenges for elephant habitat conservation and for reducing human-elephant conflict (HEC) in CWS. Controlling activities such as illegal harvesting, forestland encroachment, forest fires, and grazing is not possible without the active involvement of local people. Therefore, it was deemed necessary to involve local people in biodiversity conservation through co-management initiatives and institutions, including sustaining their motivation and engagement through alternative income-generation activities (AIGAs) (FD 2006). In collaboration with the United States Agency for International Development (USAID), the Bangladesh Forest Department (FD) initiated co-management activities in CWS in 2004, through the Nishorgo Support Project (Roy 2009). The general aim of the Nishorgo Support Project (NSP) was to promote community protection efforts for wildlife and their habitats and, more specifically, to provide diversified food and adequate shelter for elephants by restoring forests (FD 2006). The experience of NSP has shown that co-management has helped to improve elephant habitat conservation (GIZ 2011).

This study investigates the impact of co-management initiatives for improving elephant habitat conservation and reducing human-elephant conflict in Chunati Wildlife Sanctuary. The main goals of this paper are threefold: (1) to assess the current conditions of elephant habitat and human-elephant conflict, and the effect that co-management has had on these conditions; (2) to identify the expected and actual roles and responsibilities of community people, co-management workers, and FD officials for elephant habitat conservation and HEC mitigation; and (3) to identify deficiencies in ongoing management practices and suggest some means for improving elephant habitat conservation and reducing HEC in CWS. On a practical level, this study aims to help field-level FD officials, co-management organizations, community members, and policymakers to take appropriate conservation measures that are compatible with local needs and will benefit elephant populations in the sanctuary.

Background

Chunati Wildlife Sanctuary, located in southeastern Bangladesh, was created in 1986 and encompasses a total of 7,764 hectares of reserved forest. The sanctuary is administered under the Wildlife and Nature Conservation Division office in Chittagong. It is divided into two forest ranges and seven forest beats: the Chunati Wildlife Sanctuary Range, consisting of Chunati, Aziznagar, and Harbang Beats; and the Jaldi Wildlife Sanctuary Range, including Jaldi, Chambol, Napora, and Puichari Beats. The estimated population of this area is 50,000 people living in 9,400 households. They reside in 60 settlements or *para* (hamlet) in and around the sanctuary (IPAC 2011). Major occupations among the local population include day laborers in both the agricultural and non-agricultural sectors (42%) and non-wage agricultural workers (21%). There is also significant unemployment (17%) (Hoque 2009).

I conducted my study in four paras; Bonpukur (Hasnakata) and Goyalmara (Vandarir Depa) in the Chunati Range; and Jaldi Villager Para and Jungle Chambol in the Jaldi Range. All of the paras are situated inside CWS and are frequently affected by elephants. There are 68 households in Bonpukur (Hasnakata), and 88 households in Goyalmara (Vandarir Depa). The residents of Bonpukur (Hasnakata) and Goyalmara (Vandarir Depa) are very poor. Around 50 percent of the households receive loans from different micro-credit organizations, and about 30 percent of the residents usually lease croplands from local elites and cultivate paddy for their own consumption as well as for sale in the market (GIZ 2011). Nearly all of the damage caused by elephants falls upon the shoulders of the villagers.

Jaldi Villager Para is in Banshkhali *Pourashava* (municipality), and people there have several livelihood opportunities. Some depend on the forest mainly for fuelwood, while others also collect housing materials. The Jungle Chambol is situated in Chambol Union under Banshkhali Upazila (Thana), where people largely depend on the forest for fuelwood and housing materials. They also use forest areas for vegetable gardening, cropland, and pastureland. The communities at both sites migrated there from nearby areas and established settlements during the mid-nineteenth century.

The Chunati area originally supported a mixed evergreen and semi-evergreen forest, but the forest has been substantially degraded by heavy human interference. There are hardly any stands of natural forest left. Currently, CWS has five designated habitat types: (1) small patches of secondary forest, (2) plantations, (3) grasslands and bamboo forest, (4) wetlands and water bodies, and (5) cultivated fields (FD 2006). German Development Co-operation (with Deutsche Gesellschaft für Internationale Zusammenarbeit; GIZ) with technical support from the Institute of Forestry and Environmental Sciences, Chittagong University (IFESCU), conducted a baseline survey in CWS during 2011. The survey shows that CWS has an average density of 239 trees per hectare; 60 percent of this tree stock is composed of planted exotic


species (GIZ 2011). A total of 143 plant species, including 17 fodder species suitable for elephants, have been recorded by the IUCN (2004). Fodder species found in CWS forests include bamboo (*Bambusa* spp.), muli bansh (*Melocanna baccifera*), blackberry (*Syzygium* spp.), chapalish (*Artocarpus chaplasha*), jackfruit (*Artocarpus heterophyllus*), mango (*Mangifera indica*), teak (*Tectona grandis*), coconut (*Cocos nucifera*), banana (*Musa* spp.), sungrass (*Imperata cylindrica*), dumur (*Ficus* spp.), house-broom grass (*Thysanolaena maxima*), hill potato (*Dioscorea alata*), sweet potato (*Dioscorea* sp.), chupri potato (*Dioscorea* sp.) jambura (*Citrus grandis*), and deua (*Artocarpus lokoocha*). Among these 17 fodder species, bamboo and banana are the most preferred by elephants, but bamboo is also the most degraded, due to both a recent flowering followed by severe natural death of bamboo culms and to overharvesting. Local people eat banana flowers and the tender core of banana stems as a vegetable, and the local Hindu community collects banana leaves to use as food containers in funeral ceremonies. A 2011 regeneration study indicated that the average density of seedlings in CWS is more than 77,000 per hectare (GIZ 2011). Although many of the naturally regenerated seedlings might die during the summer season, if they could be protected, then the CWS forests could restore their diversity naturally (GIZ 2011).

People living in and around the CWS cannot imagine their existence without the forest. It provides them with food, fuelwood, fodder, medicine, shelter, housing materials, and various other products (Uddin and Foaisal 2006). About 50 percent of the population in the study area extracts forest products from CWS (GIZ 2011). Fuelwood, sungrass, bamboo, dead leaves, and house-broom grass are commonly harvested and used for domestic purposes, such as house construction and agriculture. The extraction of dry and fallen fuelwood and leaves, and the annual collection of sungrass and house-broom grass, may not be harmful for habitat conservation, but the collection of bamboo, green fuelwood, and the cutting of saplings for use as sticks for betel leaf is a major concern for the recruitment of naturally regenerated plants (GIZ 2011). Local people also collect edible wild fruits, seeds, roots, tubers, and leaves for food. Agricultural laborers and the unemployed frequently go to the forest to collect forest products for subsistence and for cash sale (Uddin and Foaisal 2006). Encroachment occurs on forestland inside the sanctuary for agriculture, betel leaf cultivation, vegetable gardening, and the establishment of new settlements. In addition, there are a number of water bodies inside the CWS that are used by influential local people for fish cultivation. All of these activities contribute to elephant habitat fragmentation and degradation.

Conflicts between humans and elephants have become an important issue for conservationists. In Bangladesh, elephants come into conflict with humans because of inadequate space—they compete for the same habitat (IUCN 2011). Major incidents of conflict in CWS involve agricultural crop damage. In the Chunati Range, people have expressed severe complaints as elephants damage portions of their crops or entire fields, resulting in low crop yields. In the Jaldi Range, elephants frequently

come to the villages as well as to the fields. People complain that elephants destroy their home gardens and their vegetable gardens. Paddy lands are the most severely damaged by elephants, and conflicts are intensified during the paddy maturity periods. Elephants raid crops as these provide an easy source of highly nutritious food (Sukumar *et al.* 1987). Elephants come to the villages to eat and destroy banana, coconut, jackfruit, guava, and bamboo groves in home gardens, and they prefer to eat watermelon, sugarcane, cucumber, green chili, pineapple, potato, sweet potato, brinjal (eggplant), and pea plants in the vegetable gardens. Often a single bull elephant, or sometimes two to three elephants, comes to the villages for food, but during crop raiding the elephants come in large groups. The local FD office does not have any official records, but they have estimated that the economic loss from crop destruction is around 5,000,000 BDT (about USD 59,000) per year in and around CWS. HEC is mainly due to such agricultural intrusions; there have been very few incidents of house or infrastructure destruction or human-elephant casualties reported in the sanctuary. CWS is a site for the Monitoring of Illegal Killing of Elephants (MIKE) Program, authorized by a resolution of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Conference of the Parties (CoP 10) in Harare, Zimbabwe in 1997. MIKE is a monitoring program aimed at providing the information needed to make appropriate management and enforcement decisions, and to build institutional capacity within the elephant range countries. FD officials regularly send monthly reports to the MIKE headquarters in Kenya.

FD started co-management activities in CWS in 2004, through the Nishorgo Support Project. The organizations responsible for co-management are the co-management councils and co-management committees, and Nishorgo assisted in forming two of each. These councils and committees are comprised of representatives of civil society groups, local administrators, local villagers, and representatives of various government organizations. The councils are responsible for planning, management, and decision making in CWS, whereas the committees are the operational bodies responsible for the implementation of the decisions and plans approved by the council. Community patrolling groups (CPGs) have been created through consultations with the committees and are responsible for regular patrolling with FD officials. Village conservation forums (VCFs) consist of forest-dependent households in each para, which enlist and motivate each other, as well as other community members. There are 12 CPGs, including 220 male and 49 female members, and 60 VCFs with a total of 2,694 male and 601 female members. Under the NSP, almost all CPG members have received direct cash incentives, ranging from 3,500 to 5,000 BDT (USD 41 to 60), as well as training and uniforms. After the NSP completed its efforts in 2008, the Integrated Protected Area Co-management (IPAC) project began its work with the same co-management organizations in 2009, with assistance from USAID. Up to December 2011, IPAC provided AIGA support to 56 VCF members in the Chunati Range and 28 VCF members in the Jaldi Range, for weaving fishing nets and bamboo baskets and for vegetable cultivation. CPG members in Chunati and Jaldi Ranges planted 300 seedlings of fruit trees, timber trees, and various medicinal



species; while VCF members in the Chunati Range planted a total of 350 seedlings of these same species. Co-management organization (CMO) members conduct regular patrolling with FD officials and are also building awareness among non-members. However, no concrete measures have been taken for reducing HEC, except in a few cases in Jaldi Range in which some CPG members helped FD officials to drive elephants back into the forest.

FD prepared a management plan for CWS in 2006, under the NSP. The management plan stated that elephant habitat would be conserved by protecting remaining vegetation from illicit harvesting, encroachment, grazing, and fire; by encouraging natural regeneration through the active involvement of co-management organizations; and by rehabilitating degraded forests by raising enrichment plantations of fruit-bearing shrubs, trees, and palatable grasses. Under this plan, existing water bodies would be repaired and excavated, and unwanted weeds would be removed. Unauthorized fishing, hunting, and cattle grazing would be curbed, the contamination of water would be reduced or eliminated, and the development and use of fisheries by local people would be implemented on a shared basis. Furthermore, privately owned land within the sanctuary would be acquired by the FD by offering suitable compensation to the owners. Provisions for giving compensation for the damage of property or personal casualty would also be ensured.

The FD has implemented several planting programs in CWS for improving elephant habitat. They have established a 429-hectare buffer zone area through participatory planting with co-management organization members as well as 1,123 hectares of long-rotation plantations with rare and endangered indigenous species; 243 hectares of fruit and fodder plantations; 81 hectares of medicinal plantations; and 77 hectares of habitat enrichment plantations (Hossain 2011). The FD has some provisions for compensation of damages caused by elephants and has amended the Wildlife (Preservation) (Amendment) Act, 1974 (i.e. Wildlife Act), to include compensation for damage caused by elephants. However, several measures mentioned in the management plan that may also contribute to elephant habitat conservation have not yet been implemented.

Methodology

This research combines qualitative and quantitative research methods, including a household survey; semi-structured interviews with both households and key informants, such as local-level FD officials and elephant researchers; and focus group discussions with co-management organizations like the co-management committee (CMC), community patrolling group, and village conservation forum. I also collected and incorporated secondary literature on CWS, Asian elephants, and the status of Asian elephants in CWS.

I conducted the survey during my field visits to CWS in November and December 2011, using a semi-structured questionnaire for household surveys, focus group discussions, and key informant interviews. Specifically, I collected data on people's perceptions of how co-management does or does not contribute to elephant habitat conservation, as well as their level of knowledge about their roles and responsibilities regarding elephant habitat conservation and HEC mitigation. I also used key informant interviews to assess deficiencies of ongoing management practices and to identify opportunities to improve elephant habitat conservation and reduce human-elephant conflict.

The study sites were situated in the Chunati Wildlife Sanctuary Range and the Jaldi Wildlife Sanctuary Range. I selected villages that elephants visited frequently, identifying two beats from each range and one village from each beat, for a total of four villages. In each village, I selected two categories of households: households related to CMOs and households not related to CMOs. Out of the 627 households in the four selected villages, 174 households were included in the CMO. Of these, 64 households are receiving AIGA assistance and 110 households are not receiving any AIGA support. I randomly selected eight households from those receiving AIGA support and eight households from those not receiving support, and also conducted household surveys with male and female respondents in 16 of the 453 non-member households. To ensure a more diverse sample, I deliberately selected respondents with different occupations, like agricultural workers, small business owners, day laborers, and others. In addition, I conducted focus group discussions with two CMCs working in CWS, four of the 12 CPGs, and 12 of the 60 VCFs. I selected the VCFs and CPGs that are working in the four selected villages. I also conducted key informant interviews with FD officials, two Range Officers and seven Beat Officers working in the area, since their work is directly related to co-management. Finally, I interviewed some independent wildlife researchers in order to triangulate the data by including an impartial, expert opinion for improving elephant habitat conservation and reducing human-elephant conflict.

Results and Discussion

Assessment of Current Conditions and Effects of Co-management

To find out about the current conditions of elephant habitat, I reviewed recently published and unpublished study reports on CWS. I have conducted interviews and gathered opinions from CMO members (local people working with co-management organizations like CMCs, CPGs, and VCFs), non-members (local people not working with the co-management organizations), local-level FD officials, and wildlife experts. I have tried to determine the level of awareness among CMO members and non-members about elephants, their habitat conservation, and the Wildlife Act. I also

assessed the level of forest dependence and the perception of habitat conditions among both CMO members and non-members, to determine if co-management has had any effect on elephant habitat pressure and conservation. In addition, I have tried to determine the nature and extent of damage caused by elephants, the reasons behind these damages, and what relationship, if any, might exist between human-elephant conflict and co-management activities.

Awareness of elephants and habitat conservation. Awareness about elephants and the conservation of their habitat is an important factor in improving these habitats and in reducing human-elephant conflict (HEC). I asked 16 non-member households and 16 CMO households whether the forest resource that is, the elephant habitat should remain protected. As you can see from the table 1 below, all of the CMO households (HHs) participating in AIGAs replied that the forest should remain protected; whereas six of the CMO households not participating in AIGAs replied that the forest should remain protected, and two replied that the forest should not remain protected. Among non-member households, 10 replied that the forest should remain protected, two replied that the forest should not remain protected, and four replied that they did not know.

Table 1: Perceptions about elephant habitat conservation

Response	CMO HHs with AIGA (n = 8)	CMO HHs without AIGA (n = 8)	All CMO HHs (n = 16)	Non-member HHs (n = 16)
Forest should remain protected	8 (100%)	6 (75%)	14 (87.5%)	10 (62.5%)
Forest should not remain protected	0 (0%)	2 (25%)	2 (12.5%)	2 (12.5%)
Don't know	0 (0%)	0 (0%)	0 (0%)	4 (25%)

I also asked 16 CMO households and 16 non-member households whether they feel elephants are a threat or a blessing to them. Among the CMO households with AIGAs, all replied that they feel elephants are a blessing; while among the CMO households without AIGAs, two saw elephants as a threat and six thought that they were a blessing. Among the non-member households, 13 replied that they were threats and three said that they were a blessing. These results are reported in Table 2 below.

Table 2: Perceptions about elephant conservation

Response	CMO HHs with AIGA (n = 8)	CMO HHs without AIGA (n = 8)	All CMO HHs (n = 16)	Non-member HHs (n = 16)
Threat	0 (0%)	2 (25%)	2 (12.5%)	13 (81%)
Blessing	8 (100%)	6 (75%)	14 (87.5%)	3 (29%)

The Wildlife Act is important for wildlife conservation efforts in Bangladesh. The recent amendments that include the provision of compensation for damage caused by elephants may be a milestone in ongoing efforts to reduce human-elephant conflict. Awareness of local people about the Wildlife Act may have an impact on wildlife habitat conservation. I asked 32 households 16 CMO members (both with and without AIGAs) and 16 non-members if they were aware of the Wildlife Act. The results showed that all (100%) of the eight CMO households with AIGAs surveyed were aware of the Act, compared with just five of the eight CMO households without AIGAs (62.5%), and only four of the 16 non-participant households (25%), as reflected in Table 3.

Table 3: Awareness of the Wildlife Act

Response	CMO HHs with AIGA (n = 8)	CMO HHs without AIGA (n = 8)	All CMO HHs (n = 16)	Non-member HHs (n = 16)
Know about Wildlife Act	8 (100%)	5 (62.5%)	13 (82%)	4 (25%)
Don't know about Wildlife Act	0 (0%)	3 (37.5%)	3 (18%)	12 (75%)

The above data seem to indicate that among local people, CMO members are more aware of elephants and habitat conservation than non-members. This also suggests that, among all the CMO members, those receiving AIGA support are more aware than those without AIGAs. There may be many other factors influencing respondents' level of awareness such as literacy, access to different media, and NGO activities but this study suggests that involvement in co-management and in AIGAs in particular, has had a positive impact on raising awareness about elephant habitat conservation.

Forest dependence. Dependence of local people on the forest resource is a major concern for elephant habitat conservation and human-elephant conflict mitigation. To identify the impact of co-management on elephant habitat conservation, I first asked if the respondent was using the forest resource and, if they were, whether their collection of forest products was for subsistence or other purposes. Among the eight CMO households with AIGAs, only one reported using the forest. However, among the eight CMO households without AIGAs, four used the forest. The non-member households showed the highest rate of forest use, with over 50 percent (9 of 16) responding that they use the forest (table 4).

Table 4: Number of forest-dependent households

Variable	CMO households with AIGAs (<i>n</i> = 8)	CMO households without AIGA (<i>n</i> = 8)	All CMO households (<i>n</i> = 16)	Non-member households (<i>n</i> = 16)
Use forest	1 (12.5%)	4 (50%)	5 (31.25%)	9 (56.25%)
Do not use forest	7 (87.5%)	4 (50%)	11 (68.75%)	7 (43.75%)

The GIZ (2011) study found that 50 percent of the households in CWS are forest dependent; whereas my study found that about 44 percent (14 out of 32) are forest dependent. The results of the two studies are similar, but it is evident from my study that only 12.5 percent of CMO members getting AIGAs depend on the forest, which means that involvement in AIGAs provided by the Nishorgo/IPAC initiatives may be one factor helping to reduce forest dependence, and thereby contributing to elephant habitat conservation.

Habitat conditions. The collection of forest products by community members puts pressure on elephant habitats. The extraction of dry and fallen fuelwood and leaves, and the annual collection of sungrass and house-broom grass, may not be harmful for habitat conservation, but the collection of bamboo and green fuelwood are major threats. Table 5 below shows that, of the resources collected by forest dependent households, the most commonly used are fuelwood, sungrass, house-broom grass, and bamboo, in that order.

Table 5: Collection of elephant fodder species by households

Forest product	CMO household with AIGAs (<i>n</i> = 8)	CMO household without AIGAs (<i>n</i> = 8)	Non-member households (<i>n</i> = 16)
Fuelwood	1 (12.5%)	3 (37.5%)	8 (50.0%)
Bamboo	0 (0%)	0 (0%)	2 (12.5%)
House-broom grass	0 (0%)	0 (0%)	3 (18.75%)
Sungrass	1 (12.5%)	3 (37.5%)	7 (43.75%)

Among the CMO households, only 12.5 percent (1 of 8) of those with AIGAs collect fuelwood and sungrass, and 37.5 percent (3 of 8) of those without AIGAs collect fuelwood and sungrass. Among non-member households the rate of collection is higher. Since the collection of fuelwood is one of the major threats to elephant habitat conservation, and since this data indicate a strong positive correlation between non-participation in CMOs and fuelwood collection, this study seems to indicate that participation in CMOs helps reduce threats to elephant habitat conservation.

In addition to speaking with CMO members in focus group discussions, I conducted interviews with nine FD officials as key informants about the status of elephants in

CWS. I asked them how many herds of elephants were found and the number of elephants in each herd. The majority replied that they found five to six herds, though the number in each herd was reported to vary based on the time of year and the activity engaged in by the herd. One to three elephants come to the villages to eat seasonal fruits and vegetables, whereas the number typically increases from five to six, and can be up to 15 to 16, during crop raiding. Respondents indicated that the frequency of crop raiding was increasing. I also asked about the reasons for the increased number of elephants. The majority expressed that it was due to elephant habitat improvements, followed by better protection of forests and elephants coming from nearby areas.

The GIZ (2011) survey report stated that, after co-management was adopted, natural regeneration of trees is increasing rapidly and the amount of wildlife has grown. The presence of natural regeneration in CWS is another indicator of improving habitat conditions. My study echoes these results. While there may be some other factors, it seems clear that after the adoption of co-management in CWS the elephant habitat is in a better condition.

Nature and extent of HEC. Conflict between humans and elephants has become an important issue for elephant conservation. I have tried to determine the causes and extent of HEC in CWS, and to assess whether co-management has had an impact in reducing HEC. I asked 16 households in the Chunati Range and 16 households in the Jaldi Range whether they have been affected by elephants or not. Of those surveyed, 13 households in Chunati Range and nine households in Jaldi Range (22 households total) replied that they have been affected by elephants. Furthermore, a majority of those households affected by elephants indicated that the frequency of elephant incursions has grown significantly in the last few years. Figure 1 shows a comparison of elephant impact in the Chunati and the Jaldi Wildlife Sanctuary Ranges.

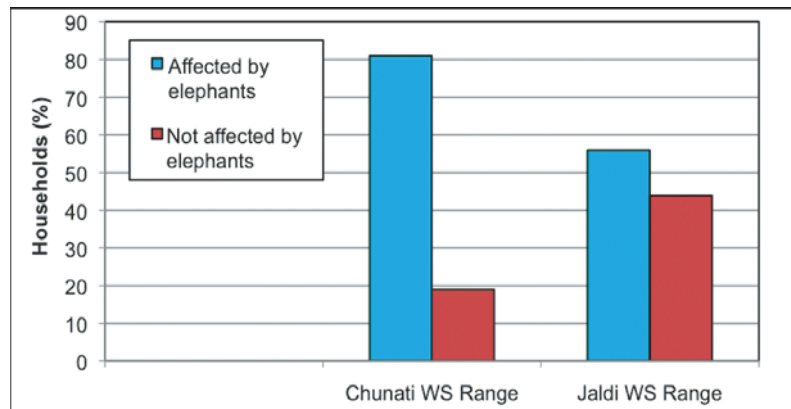
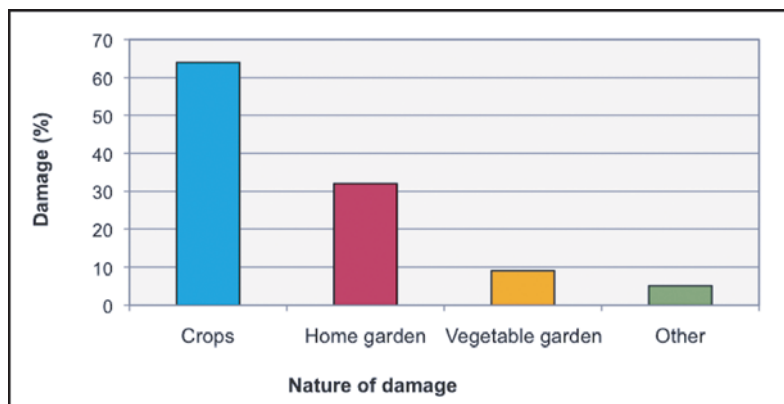


Figure 1: Comparison of elephant impacts in Chunati WS Range vs. Jaldi WS Range

I also asked the 22 households affected by elephants about the nature of the damage caused by elephants. Results show that crop raiding is the most frequent form of damage, affecting 64 percent (14) of the respondents, followed by the destruction of home gardens at 32 percent (7 households), vegetable gardens at 9 percent (2 households), and other forms of damage at 5 percent (1 household). These results are shown in Figure 2.



Note: Respondents could choose more than one response, so total exceeds 100%.

Figure 2: Nature of elephant damage in Chunati WS Range and Jaldi WS Range


Although local people believe that a shortage of food in the forest is the main cause of increased human-elephant conflict in CWS, according to other sources, including scientific research conducted on elephants, it is likely that elephants raid crop lands and vegetable and home gardens not only due to the scarcity of food in the forests, but also because crops and vegetables are easy sources of food and meet some mineral requirements.

My research suggests that the increasing number of elephants is one of the causes of increased human-elephant conflict in CWS. In fact, the success of co-management in enhancing elephant habitat may be contributing to an increase in human-elephant conflict in CWS. Historically the sanctuary area has functioned as a corridor for elephants moving between surrounding forests, so while elephants do not always remain in CWS, they frequently pass through it. Currently, because of the heavily fragmented and depleted forests in surrounding areas, elephants feel more comfortable remaining in the sanctuary. While this may be contributing to increased HEC, there are means of reducing the incidence and impacts of conflict while increasing elephant populations, such as participatory elephant monitoring and crop-raiding (conservation) response units.

Expected and Actual Roles and Responsibilities of Non-members, Co-management Institutions, and FD Officials

Expected vs. actual roles of non-member households. Determining if gaps exist between the expected and actual roles of community people in co-management can provide important information to determine methods for improving co-management. I interviewed CMO households, FD officials, and wildlife experts to determine their perceptions about this. The results reveal that most of these respondents expected that non-members should not go to the forest to harvest elephant fodder and should not disturb the elephants. In addition, FD officials and experts expected that non-members should not engage in cultivation in forestlands and should not plant fruit and fodder species that are preferred food sources for elephants in their home gardens. The question is, what are the non-members actually doing? A majority of CMO households and FD officials said that they do not disturb the elephants, but about one third think that non-members are going to the forest to harvest forest products. In addition, very few CMO households believed that non-members should not go to the forest for cultivation, or that they should not plant certain crops (i.e. fruit and fodder species) that elephants like to eat in their home gardens. Community people practice some traditional methods to drive away elephants from croplands like shouting, making fires (*ujala*), and keeping a human-like decoy (*kak tarua*) in the crop fields, but they said that the elephants have adapted to these methods so they do not work well any more.

Expected vs. actual role of CMO members. One of the foundations of co-management is the idea that members of co-management institutions are expected to play an important role in the improvement of elephant habitat conservation and in the reduction of human-elephant conflict. I asked non-members, FD officials, and wildlife experts about the expected and actual role of CMO members. Non-members said CPG and VCF members are performing their duties well, but they should be more active to ensure effective elephant habitat protection. Beat officers of the FD said that CPG members are helpful for their protection duty, but that their contribution of only three members per day is insufficient. Each CPG member received a cash incentive in the past, which is now only 10 BDT (USD 0.12) per patrol duty, which makes them frustrated. VCF members are not getting appropriate AIGA support and in many paras you will find few active members. FD officials working in the Jaldi Range said that some CPG members have helped them to drive elephants back into the sanctuary during three separate incidents last year when two to three bull elephants entered a village that was several kilometers from the sanctuary and created anxiety among villagers. CMO members have not received any specific training about elephants. Both FD officials and experts said that if CPG members were trained and involved in participatory elephant monitoring, participatory crop protection methods, awareness building, and motivating local people for elephant and habitat conservation, then human-elephant conflict could be reduced.



Expected role and actual role of FD officials. FD officials are key figures in co-management, due to their authority to control and manage activities in CWS. Thus, they are expected to perform a major role in improving elephant habitat conservation and reducing human-elephant conflict. I asked questions of CMO members, non-members, and experts about the expected and actual role of the FD officials. Of these respondents, the majority of CMO members, and a few non-members and experts, said that the FD raised some enrichment, fodder, and fruit plantations for elephant habitat improvement, and that they conduct regular patrolling with CPG members for habitat protection. Because CWS is a MIKE site, FD officials are required to send monthly reports to the MIKE director in Kenya. FD officials discussed the elephant issue in several monthly meetings of the CMC. All CMO members, non-members, and researchers felt that the FD officials should raise fruit and fodder plantations with indigenous species, excavate and renovate water bodies, establish salt slabs, and ensure habitat protection measures. Some CMO members and non-members said that the FD should establish special elephant patrol parties with trained FD officials, elephant mahouts, and CPG members so that they can help people during crop maturation periods and during an emergency. Researchers and experts placed emphasis on the need to mark elephant corridors and keep them free for elephant movements. They also recommended community-based elephant monitoring and crop patrolling.

Deficiencies of Ongoing Management Practices and Suggestions for Improving Elephant Habitat Conservation and Reducing HEC in CWS

Deficiencies. Hungry people do not obey every law. People living in and around CWS are very poor, so it is unlikely that they will stop using the forest resources that they need for their livelihoods until they have some viable alternatives. Out of 9,400 households in the area surrounding CWS, 3,564 have been included in co-management organizations. Only 620 households are currently participating in AIGAs, which represent only 17 percent of all CMO households and just 0.07 percent of the households living in and around CWS (IPAC 2011). This study has identified some significant behavioral changes of CMO members with AIGAs, but due to the scope of both co-management activities and this study, it is difficult to draw definitive conclusions about positive impacts of co-management on the sanctuary.

The FD prepared a co-management plan for CWS under the Nishorgo Support Project in 2006 and has undertaken some management measures, including enrichment plantations, fruit and fodder species plantations, and participatory plantations in the buffer zone. The GIZ (2011) study stated that 60 percent of the tree stock in CWS is composed of exotic species, and elephant experts working in CWS have indicated that increasing biomass by planting exotic species may not improve the overall elephant habitat. Several other management measures including the renovation and excavation of water bodies, the development of fisheries involving local people on a

usufruct rights basis, the control of unauthorized fishing and cattle grazing, the acquisition of privately owned land within the sanctuary, and the raising of elephant-palatable grasses have not yet been implemented.

The household surveys show that 14 (44%) of the 32 households interviewed go to the forest to collect forest products, and that nearly all households do not agree with the opinions of FD officials and experts that they should not cultivate crops, vegetables, and betel leaf inside the sanctuary. Furthermore, neither CMO members, nor non-members, nor FD officials have received any training on elephant-related issues; and no awareness-building initiatives, such as meetings with local people or the making of banners, posters, signboards, or billboards, have been undertaken by the CMC.


In CWS, co-management activities have not incorporated any notable efforts to reduce human-elephant conflict. The FD's initiative to amend the Wildlife Act, including the provision of compensation for damages caused by elephants, is greatly appreciated by all, but has yet to be effectively implemented both CMO members and non-members said that they do not know the official procedures for how or where to apply, and, in fact, no one has received any compensation payments yet.

Measures needed to improve elephant habitat conservation and reduce HEC. Co-management experts have noted that, since many of the people living around the CWS forests are poor, a revenue-sharing arrangement involving the local people could be created to provide financial resources for the CMOs to invest in community development.

Some experts have voiced their opinion that all CMO members should be supported by sustainable AIGAs, which would help ensure better protection of elephant habitat. The FD needs to play a pivotal role in strengthening and organizing the CMOs. CMO members, non-members, and FD officials should be trained in elephant-related issues, and awareness-building activities, like meetings and the making of banners, posters, signboards, and billboards, should be undertaken by the CMC.

The co-management plan prepared by the FD is a very good document for elephant habitat conservation. Although it is very challenging to implement every measure, doing so would make a significant contribution to elephant habitat conservation.

Landscape-scale management strategies like habitat restoration and habitat improvement for reducing HEC are essential, but they are conceptually and politically challenging to devise and would take many years to implement. Meanwhile, community tolerance for elephants may deteriorate, which could undermine large-scale conservation efforts (Zimmermann *et al.* 2009). Community-based human-elephant conflict management in Assam, India has successfully introduced



participatory elephant monitoring for early warning and participatory crop protection with innovative techniques to deter elephants. Conservation response units (CRU) have been in use in Sumatra, Indonesia (Azmi 2006) and some other countries in Africa and Asia for human-elephant conflict management. Since HEC is increasing in CWS, successful participatory HEC management programs should be studied and implemented in CWS.

Conclusions

Co-management in CWS has brought about some significant changes among the households belonging to CMOs, especially those participating in AIGAs. Their awareness about elephants and elephant habitat conservation, as well as about the Wildlife Act, has increased. Households participating in AIGAs have also made positive changes in the use of forest resources and have reported a reduction in their forest dependence. Despite a number of threats to elephant habitats, CWS now seems to be in a better condition than in the recent past. Significant natural regeneration is occurring every year, and the amount of wildlife is also increasing. However, human-elephant conflict has also increased significantly in and around CWS. This study suggests that the main types of conflict include crop raiding and the destruction of home and vegetable gardens by elephants. Local people and FD officials believe that the number of elephants in CWS has increased due to habitat improvement and better protection. Therefore, this study suggests that the increased number of elephants is one of the causes of increased HEC in CWS, and that conservation-oriented co-management initiatives, if not run well, could result in increased HEC.

Although this may appear to contradict the earlier claim that fragmentation of elephant habitat has contributed to increased HEC, it is important to look at the larger historical and landscape-level trends. Habitat destruction and fragmentation have been a basic problem for elephant conservation and a root cause of HEC, not only within CWS, but in other areas as well. These are not new problems. Heavy destruction of the CWS forests occurred between 1980 and 1995. The GIZ study (2011) suggests that the habitat in CWS is now in a much better condition than in the recent past. Findings from my household surveys and FGDs indicate that HEC has increased during the last two to three cropping periods. So my conclusion is that elephants are feeling more comfortable remaining longer in CWS due to better protection from co-management, resulting in more potential for HEC. If co-management does not address these elephant related issues, HEC may increase in the future to a level where community tolerance may deteriorate and ultimately hamper long-term conservation efforts for the entire ecosystem. However, if co-management is run well, it can provide better protection for elephants by taking appropriate measures to reduce conflict, and also benefit the surrounding communities.

This study has identified some gaps between the expected and actual roles of non-

CMO members, non-members, and FD officials. Non-members are expected to reduce their dependence on CWS for forest products, cultivation of agricultural crops, betel leaf production, unauthorized fishing, and settlements. Local people should plant those fruits and fodder species that are less appealing to elephants. Local FD officials recognized the help of CMO members in forest protection, but the AIGA support they are receiving is insufficient and covers very few members. The FD initiative to provide compensation for property damage is appreciated, but so far no one has received any compensation. These issues and shortcomings suggest the need for several measures that could enhance the social and ecological outcomes of co-management:

- All CMO members should be supported by sustainable AIGAs.
- A revenue-sharing mechanism involving local people should be created whereby a proportion of government revenue from CWS would go to the CMO for investments in community development.
- A training program on elephant issues should be implemented for FD officials, CMO members, and community leaders.
- CMCs should conduct awareness-raising programs like campaigns and the making of banners, posters, signboards, and billboards.
- The FD should play a leading role in strengthening and organizing the CMOs.
- All measures stated in the co-management plan for elephant habitat restoration and improvement should be implemented.
- Species selection for plantations in CWS should favor plants that are important to the elephants' survival.
- All elephant movement corridors should be marked and kept free of obstructions or disturbances to ensure free movement of elephants and minimize the potential for conflict.
- Legal provisions for damage compensation should be ensured.
- The FD should undertake a special program for elephant habitat restoration and management, including HEC mitigation.

In addition to these specific measures, participatory elephant monitoring, participatory crop protection through innovative elephant deterrent techniques, and conservation response units comprised of captive elephants with mahouts, trained FD officials, and CPG members, which have been successfully introduced in some elephant range states, can be studied and replicated to enhance HEC management in the future.

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