Human-Assamese macaque conflict in Makalu-Barun National Park Buffer Zone, Nepal

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Abstract We conducted a questionnaire survey to study human-Assamese macaque conflict in the buffer zone of Makalu-Barun National Park during December 2011. Most respondents perceived that the macaque population was increasing, and the degree of conflict was high. Rice, maize, cardamom, and millet were the major crops raided by macaques, with cardamom being the most valuable. The average economic loss inflicted by the macaques from these four major crops was calculated to be USD 602 (NPR 60,199.74) per household per annum. The ongoing conflict with humans due to crop depredation has led to retaliatory killings which is a big threat to the survival of macaques in this region.

Keywords Cardamom, crop depredation, *Macaca assamensis*, Makalu-Barun National Park, public perception

Introduction

Assamese macaque *Macaca assamensis* is one of the lesser-studied primate species of Nepal (Chalise 2000a) and is categorized as 'Near Threatened' nationally and globally (Boonratana et al. 2008, Jnawali et al. 2011). These macaques are protected in Nepal under the National Parks and Wildlife Conservation Act (1973) and are listed in Appendix II of CITES. In Nepal, the species is designated as threatened due to its restricted distribution of less than 22,000 km^2 with an estimated area of occupancy of about 914 km^2, that experiences a continuing decline in area, extent and quality of habitat, and population (Molur et al. 2003). Throughout their range in Nepal, Assamese macaques are considered pest animals as they raid on crops (Chalise 2001). As such they are in constant conflict with humans in the area. Assamese macaque has also been recorded from Tamku, Sisuwa, Apsuwa, and Saldim area of Makalu-Barun National Park (MBNP) with reported incidents of crop raiding (Chalise 1999, Ghimirey 2010). This study was conducted in the buffer zone of MBNP to understand the human-macaque conflict.

Materials and methods

Study Area

MBNP lies within Sankhuwasabha district in the Eastern Himalaya biodiversity hotspot covering an area of 1,500 km^2 with an additional 830 km^2 of buffer zone. The altitude ranges from 435 m to 8,463 m (Mt. Makalu) within a distance of 40 km. The inaccessible lower Barun valley and Saldim valley have pristine areas covered by thick, extensive forest and have been designated as a Strict Nature Reserve, the first in Nepal (Carpenter and Zomer 1996). The buffer zone is inhabited by some 32,000 people of diverse ethnic groups of rich cultural heritage; the tribes of *Rai* in majority, *Sherpa* and *Shingsawa* in minority (Chaudhary 1998).

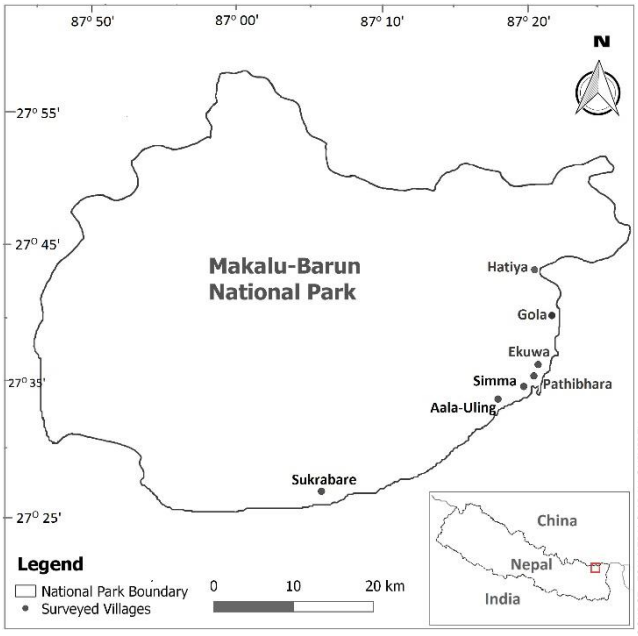

FIG. 1: Map showing seven villages in the buffer zone of Makalu-Barun National Park that were surveyed for human-Assamese macaque conflict study

Questionnaire Survey

We visited seven villages – Sukrabare, Aala-Uling, Simma, Pathibhara, Ekuwa, Gola, and Hatiya, in the buffer zone of MBNP for questionnaire survey (FIG. 1). Four villages - Sukrabare, Ekuwa, Gola, and Hatiya, were selected purposively based on previous knowledge of conflict while the other three were selected randomly. A total of 39 households were selected using systematic random sampling from 350 households. Information on crop raiding was gathered using a semi-structured questionnaire.

Details regarding the respondents' landholdings, crop loss due to macaque raiding, retaliatory killings, and their perception towards Assamese macaque conservation

were collected. These details were verified, and additional details were collected through three informal group discussions and five key informant interviews. We observed their agriculture fields as well. The economic loss was assessed based on the information gathered from the farm owners.

PHOTO 1: Researcher interviewing a local woman.

Opportunistic Observations

Assamese macaques spotted opportunistically were observed and the number of individuals and location information were recorded. Information on age and sex of macaques was not collected as it was beyond the scope of the study.

Results

Crop Raiding

In the order of the most affected to least raid-affected crops, the survey indicated that macaques raided rice (69%) and maize (59%) the most followed by cardamom (44%), millet (28%) and others (15.4%).

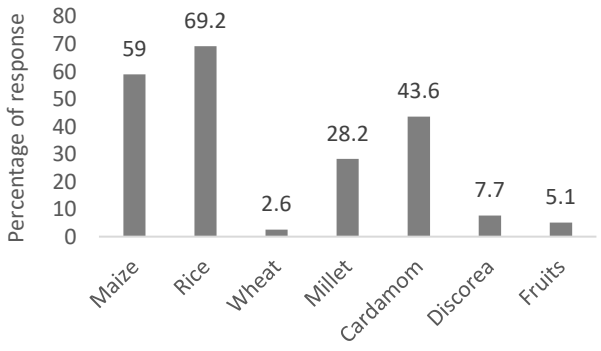

FIG. 2: Crops most affected by Assamese macaque raids in MBNP buffer zone.

The raided crops depended on the season and availability of a particular crop. The incidences of raids were common few weeks prior harvesting seasons for different seasonal crops. Rice was raided mostly in September, maize in July, millet in November and cardamom throughout the year peaking in April.

Economic Loss

Of the 39 households interviewed, 35 reported that they incurred considerable loss due to crop damage caused by Assamese macaques. Economic loss of 39 households was equivalent to around USD 23,477.90 (equivalent to NPR 2,347,790.00; USD 1 = NPR 100) per annum with the average of USD 602 (equal to NPR 60,199.74) per household. This amount of economic loss is only from the major crops of the area - rice, maize, millet and cardamom. Being a high value major cash crop of the region, cardamom holds the major share in the economic loss.

PHOTO 2: Farmers showing cardamom field raided by Assamese macaques.

Although Assamese macaques did not consume harvestable cardamoms, they hindered production by tearing and consuming the buds of growing plants.

Conflict and Conservation needs

Every household had experienced varying degree of conflict with the macaques. People's perception of the degree of conflict situation were ranked into five classes as - high, moderate, low, none, and no idea.

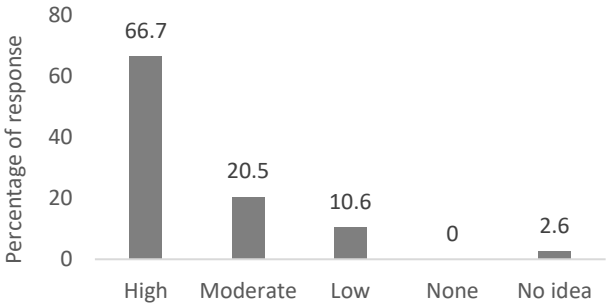

FIG. 3: Public perception of degree of conflict with Assamese macaques in MBNP buffer zone.

TABLE 1: Opportunistic encounters of Assamese macaques on four separate occasions in 2012 at the buffer zone of Makalu-Barun National Park.

Encounters	Troop Size	Location	Coordinates	Elevation (m)	Habitat	Time
I	6	Near Sukrabare	N: 27° 7.555' E: 87° 7.419'	524	*Schima wallichii, Lagerstroemia parviflora*	15h00
II	> 40	Near Sukrabare	N: 27° 7.505' E: 87° 7.494'	500	*Schima wallichii, Lagerstroemia parviflora*	15h30
III	5	Near Hatiya	N: 27° 3.229' E: 87° 1.533'	1,354	*Quercus glauca, Alnus nepalensis, Castanopsis tribuloides, Castanopsis indica, Lyonia ovalifolia*	16h00
IV	5	Near Gola	N: 27° 8.585' E: 87° 0.985'	1,058	*Shima wallichii, Castanopsis tribuloides*	15h00

Most (66.7%) perceived high degree of conflict, 20.5% as moderate conflict, 10.3% as normal conflict, and 2.6% could not assess their conflict. Respondents who considered the conflict as high or moderate experienced regular crop raids that results in lower return of their labour and investment, and economic loss.

Regarding attitude of people towards macaques, only 13% of the respondents said that the macaques' number was declining and that they should be conserved because they had the right to exist as one of nature's creations, and for their ecological role of seed dispersal. However, the majority, 87% of respondents didn't feel the necessity to protect the animal as they depredate valuable crops, but they agreed that the macaques can be conserved if they do not cause such damage.

Retaliatory Killing

Only 20.5% of the respondents admitted the prevalence of retaliatory killing in the study area. It could be inferred from the discussions carried out that more than 100 Assamese macaques were killed in retaliation during the past five years (between 2006 and 2011) in the study area (>50 individuals around Hatiya, >35 in Bala, and around 25 in Pathibhara).

Opportunistic Observation

We encountered four different troops of Assamese macaques on separate occasions with a total of more than 56 individuals (TABLE 1). The mean troop size was 14 individuals.

Assamese macaque mostly remained hidden within the distant forest canopy and sightings out in the open were momentary. Due to difficulty in sighting, we were only able to count the number of individuals and get a rough estimate of age distribution. The groups seemed to be dominated by young individuals with very few adults. The largest number of individuals recorded was near Sukrabare village at the other side of the Sankhuwa River at an elevation of around 500 m. The two smallest groups had 5 individuals in each and were recorded at different locations near Hatiya and Gola.

Discussion

Crop raiding is a serious yet the most common reason of human-macaque conflict throughout the macaque distribution range (Strum 1994, Naughton-Treves 1998, Sekhar 1998, Gillingham and Lee 2003, Linkie et al. 2007, Riley 2007). Residents in the buffer zone of MBNP too are victim of this conflict. The annual economic loss per household experienced by the farmers of this area (USD 601.997 = NPR 60,199.74) from the major crops is very high. This estimated economic loss does not include direct losses to other agricultural products such as pulses, vegetables and fruits, and indirect economic losses of the farmers for their time spent in raising crops, surveillance or the cost of other crop protection strategies.

This crop raiding loss is considerably higher than economic loss per household experienced by the farmers of Langtang National Park (USD 20 = NPR 2,000) as found by Regmi and Kandel (2008). Such considerable difference in the amount could be from damages caused to cardamom farms - a major high value cash crop of the buffer zone of MBNP, which costs around NPR 1,000 per kg. Chalise (2000b) estimated crop damage due to wild animals in this area to be 496.21 kg for each household and the crop included 67.38% of cereals and 32.62% of tubers. However, all the losses cannot be attributed to Assamese macaque alone, although Chalise (2000b) considered them worse raiders than Rhesus macaques. Assamese macaques seem to mostly raid rice followed by maize, cardamom, millet and others. However, generalization of the food preference cannot be made with this data. This also

indicates that cardamom plant depredation as an emerging reason for growing human-macaque conflict in the area. Due to the fear of crop depredation, hectares of farmland, usually isolated land parcels which are far away from the settlement and surrounded by or adjoining to forests, were found to be fallow, abandoned and/or left as ranch throughout the study area.

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PHOTO 3: An abandoned farmland in the study area.

According to our data most of the respondents showed negative and hostile attitude towards macaques and wild animals in general, confirming the findings of Mehta and Heinen (2001) where they found that 96% of the respondent around the buffer zone of MBNP had been facing crop depredation and 91% of the respondents wanted to eliminate pest animals. There are stories in Hatiya village about a campaign for mass killing of Assamese macaques three decades ago using paid hunters which nearly wiped out Assamese macaques from the area.

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PHOTO 4: Male Assamese macaque found dead along the local trail. The cause of death was unknown.

Public perception of wildlife conservation varies greatly from one individual to another and is determined mainly by the effect of wildlife on their socioeconomic wellbeing (Kellert 1985, Nepal and Weber 1992). Assamese macaque is one of the primary depredators of crops, causing huge economic loss to people in the buffer zone area. As the economic loss goes unrequited, the hostility towards Assamese macaques and the national park itself has been further amplified. However, compensation schemes would be a costly affair for remote Himalayan protected areas like MBNP which attracts less tourists due to its difficult terrain and limited accessibility resulting in very low income. During 2016-17, the total earning of MBNP was USD 43,000 (NPR 4.3 million) which is considerably lower compared to popular areas like Chitwan National Park which had a total earning of USD 2.01 million (NPR 201 million) during the same year (DNPWC 2017).

Since MBNP does not have the financial capacity to introduce major conservation efforts to reduce the severe human-macaque conflict at present, the possibility of using natural deterrents as implemented by farmers elsewhere could be useful. Deterrent methods particularly used for monkeys could be implemented, such as shrimp paste and dazer (Witness 2008, Amir 2015). In Uganda, crop raiding by mountain gorilla has been reduced by using tea plants as buffers where farmers also received economic benefit from these deterrents (Mowbray 2016). However it is also important that proper studies be undertaken to assess actual reasons for the Assamese macaque to venture towards human settlements including habitat assessment studies to find if National Park (and Buffer Zone) has enough food available to sustain the Assamese macaques throughout the year.

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Biosketch

YADAV GHIMIREY has been involved in research and conservation of small felids in Nepal since 2008. He is interested in interspecific interaction among felids, particularly between clouded leopards and leopards.

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