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Research Article

CROP RAIDING STATUS BY ASSAMESE MONKEYS (*Macaca assamensis*) ALONG THE KALIGANDAKI RIVER, WESTERN NEPAL

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ABSTRACT

A study on Assamese monkeys (*Macaca assamensis*) in Kaligandaki river basin at Ramdi of Palpa and Syangja districts of western Nepal was performed. The field study was conducted from February 2015 to January 2016 spending 1804 hours to explore the ecology and feeding behavior of Assamese macaque. The study mainly focused the Ramdi village area. A total of 24 individuals of Assamese monkeys were counted towards Palpa district and 18 individuals were counted towards Syangja district. Crop raiding status was examined each year by questionnaire survey method for local household villagers as well as direct observation by the researcher. It was found that maize (47.14 %) was the highest raided among the crops, followed by fruits (16.43 %), wheat (11.13 %), millet (5.72 %), rice (4.58 %), potato (4.27 %), lentil (4.07 %), mustard (1.26 %), pumpkin (1.14 %), bread (0.96 %), brown lentil (0.81 %), broad beans (0.80 %), sesame (0.60 %), black pulses (0.35 %), dal (0.20 %), cauliflower (0.14 %), tomato (0.1 %), egg (0.1 %), *samosa* (0.1 %) and gram (0.1%).

Keywords: *Macaca assamensis*, Crop raid, Questionnaires, Local villagers, Kaligandaki riverside

INTRODUCTION

Among several species of macaques found in the world, three species have been reported from Nepal. These are the Rhesus macaque (*Macaca mulatta*, Zimmerman 1780), Hanuman Langur (*Semnopithecus entellus*, Dufresne 1797) and the Assamese macaque (*Macaca assamensis*, McClelland 1839). Information on the distributions, behavioral ecology and conservation status of these species are provided by Bishop (1979), Southwick *et al*. (1982), Johnson *et al*. (1988), Jackson (1990), Chalise (1995, 1997, 1998, 1999, 2000, 2000a, 2000b), Chalise *et al*. (2001) and Khanal *et al.* 2018. *Macaca assamensis* inhabits the foot-hills of the Himalayas and the adjoining mountain chains of south-east Asia including Nepal, Bhutan, north-eastern India, northern and eastern Burma, southern China, northern and western Thailand, Laos and northern Vietnam, besides an isolated record in south-western Bangladesh.

The species of Assamese macaque was recorded from north Thailand ranging from 610 m to 1830 m above the sea level (asl) (Sanjay *et al*. 2003). Chalise (2013) recorded it from 284 m asl in Abukhaireni, Tanahu to 2350 m asl in Langtang of Nepal. It was reported to cover wider geographic ranges, with fragmented population, distributed along rivers in the tropical and subtropical areas. In Nepal, the reported areas of Assamese monkeys covered Kankai valley of Ilam, Sabhaya valley and its range further extended west to Makalu-Barun National Park, Melamchi, Langtang National Park (Chalise 2003), Nagarjun area of Shivapuri Nagarjun National Park, Makwanpur, Dhading, Myagdi, Ramdi of Palpa and Syangja districts, Achham district (Chalise, 2003 & 2008; Wada, 2005), Baglung and Parbat to Chamelia river basin at 1607 m asl of Api Nampa Conservation Area (Chalise, 2013).

Assamese monkeys have been categorized as endangered species by International Union for Conservation of Nature (IUCN) red list category and one of the protected species by National Parks and Wildlife Conservation Act 1973 due to the low population and conservation threats (Jnawali *et al*. 2011). They are kept as Appendix II of Convention on International Trade in Endangered Species (CITES) (Chalise 2013).

MATERIALS AND METHODS

Study area

The study was carried out in Ramdi village area of Palpa and Syangja districts of Lumbini and Gandaki zones, respectively. It lies in the western developmental region of Nepal, but according to the constitution of Nepal 2015, Palpa district lies in Province No. 5 and Syangja district lies in Province No. 4. The study area, Ramdi village area lies about 27 km east of Tansen of Palpa district, at the mid-point of Siddhartha (Sunauli-Pokhara) Highway. The study area is situated between 27°54'9.34" N latitude and 83°38'3" E longitude. The altitude is 433 m above the sea level.

This area is rich in biodiversity which may be due to presence of alluvial soil along the basin of Kaligandaki River and high productivity of tropical deciduous riverine forest (Chalise 2013). Mixed type of forest especially

tropical deciduous riverine forest, sub-tropical grassland and sub-tropical evergreen forest are the forest types found in the study area.

Methods

Information on the data of crop raiding were collected each year from local household villagers as per the pre-set questions format as well as by direct observation of the researcher. More than 200 respondents were randomly selected from the people living around the Ramdi area for this study. The pre-set questionnaires formats were used to get the information on human-monkey conflicts. The respondents were interviewed separately to ensure the independence of the individual response. To minimize the bias, questions were asked to the villagers on the expected production of crops without crop raiding and the amounts of crops after raiding. The data were compiled together and calculated in terms of percentages.

Fig. 1. Location of study area (Ramdi area) in the map of Nepal

RESULTS

In this study all the wards of Darlamdanda village development committee and Khanichhap village development committee of Palpa district and Malunga Tunibot village development committee of Syangja district were found affected by monkey species of Rhesus, Langur and Assamese. Among all these wards, Darlamdanda-2, Ramdi village; Darlamdanda-6, Sunadi village; Khanichhap-2, Ramdi village; Khanichhap-2, Bardanda village; Khanichhap-9, Padhari village of Palpa district and Malunga Tunibot-6, Ramdi village of Syangja district were the most affected by the Assamese monkeys. According to 33 respondents of Darlamdanda-2, Ramdi village, a total of 18.98 quintals crop was damaged by the monkeys. The crop damaged in Darlamdanda-6, Sunadi village, according to 25 respondents was recorded 31.15 quintals. It was found 1.97 quintals of crop loss in Khanichhap-2, Ramdi village responded by 8 people. In Khanichhap-2, Bardanda village and in Khanichhap-9, Padhari village, the crop loss was recorded 2.3 quintals and 2.2 quintals, respectively. According to 29 respondents of Malunga Tunibot-6, Ramdi village, the total crop damage by the monkeys was found 42.04 quintals. The highest crop damage due to monkeys was recorded in the crop field of Raj Kumar Shrestha. The total of 11.4 quintals crop was damaged in his field which included 5.4 quintals maize, 1.8 quintals wheat, 1.8 quintals millet, 0.6 quintal fruits, 0.3 quintal lentil, 0.3 quintal broad beans and 1.2 quintals mustard. This huge loss may be due to the proximity of field to the forest being less than 100 m.

The crop loss data were collected to make a generalized scenario of the area and calculated in average percentages. It was found that maize (*Zea mays*) was the highest raided crop, followed by fruits, wheat (*Triticum aestivum*), millet (*Eleusine coracana*), rice (*Oryza sativa*), potato (*Solanum tuberosum*), lentil (*Lens culinaris*), mustard (*Brassica nigra*), pumpkin (*Cucurbita maxima*), bread, brown lentil, broad beans (*Vicia faba*), sesame, black pulses (*Vigna mungo*), dal, cauliflower, tomato (*Lycopersicum esculentum*), egg, *samosa* and gram (*Cicer arietinum*). The percentage of crop raided was calculated as 47.14 %

maize, 16.43 % fruits, 11.13 % wheat, 5.72 % millet, 4.58 % rice, 4.27 % potato, 4.07 % lentil, 1.26 % mustard, 1.14 % pumpkin, 0.96 % bread, 0.81 % brown lentil, 0.8 % broad beans, 0.6 % sesame, 0.35 % black pulses, 0.2 % dal, 0.14 % cauliflower, and 0.1 % each of tomato, egg, *samosa* and gram. The percentage of total crop raided was calculated as 30.06% and the average loss of crop items was calculated as 23.62 % (Fig. 2).

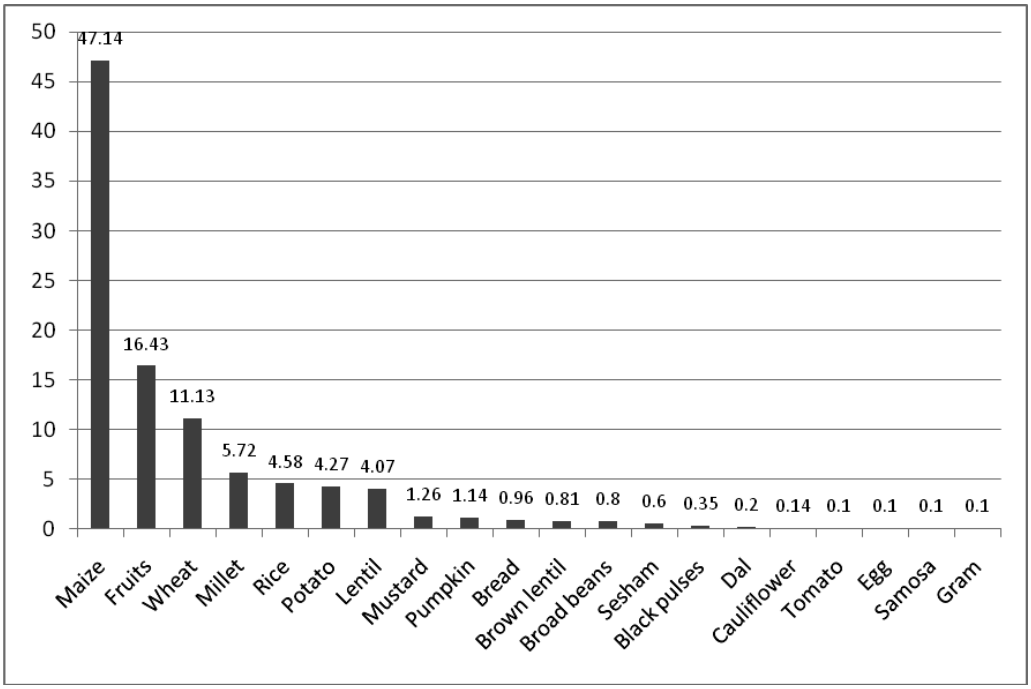

Fig. 2. Percentage of crop raid by Assamese monkeys

DISCUSSION

Crop damage by the monkey species is very common in Nepal. Upreti (1985) reported that the buckwheat and barley raided by wild animals in Langtang and Rara National Parks. Similarly, Jackson (1990) also recorded the damage to crops by monkeys in the southern boundary of the Makalu-Barun Conservation Area (MBCA). In many parts of the distribution range, anthropogenic habitat alteration has forced the non-human primate into conflict interactions with humans and their livelihood activities, especially through crop raiding (Priston *et al.* 2012). Crop damage caused by raiding primates is one of the most widespread and common examples of human-primate conflicts in the areas where local people are mainly subsistence farmers (Hill, 1998). When the supply of natural food is not enough, high quality and easily digested human food is a good alternative form of nutrition for primates, which could be the most important cause of the intensity of crop raiding (Khatun *et al.* 2013).

It was recorded the highest percentage of crop damage by monkey species was maize 34.12 % which was followed by potato 23.05 %, rice 12.01 %, fruits 11.68 %, wheat 9.57 %, millet 5.13 %, buckwheat 2.38 % and pulses 2.06 % in Bandipokhara-Palpa of Nepal (Ghimire 2000). Chalise (1997, 1999) recorded that crop depredation proportions in different crops. In his investigation in Makalu-Barun Conservation Area (MBCA), the highest percentage of damage on maize was 32 %, which followed by potato 24 %, rice 14 %, fruits 12 %, millet 11 %, wheat 4 %, buckwheat 2 % and pulses 1 %. Chalise (2001) recorded that crop loss in Lakuwa village due to monkey species was maize 7.76 % and pulses 4.14 %. During a study in Shiva village, Chalise (2001) noted that crop loss by the monkey species was maize 13.88 %, fruits 41.86 %, rice 19.16 %, wheat 8.97 %. Adhikari *et al.* (2018) recorded the crops raided by monkeys in Ramdi area as maize (35 %), vegetables (20 %), pulses (13 %), fruits (13 %), potato (6 %) and rice (2 %). In this study, it was found that highest raided crop by Assamese monkeys was the maize 47.14 % which was followed by fruits 16.43 %, wheat 11.13 %, millet 5.72 %, rice 4.58 %, potato 4.27 %, lentil 4.07 %, mustard 1.26 %, pumpkin 1.14 %, bread 0.96 %, brown lentil 0.81 %, broad beans 0.8 %, sesame 0.6 %, black pulses 0.35 %, dal 0.2 %, cauliflower 0.14 %, tomato 0.1 %, egg 0.1 %, samosa 0.1 % and gram 0.1 %. The highest crop damage was found the maize (47.14 %) and the lowest loss was the tomato (0.1 %) as well as other cooked food items such as egg (0.1 %), samosa (0.1 %) and gram (0.1 %). The average loss of crop items was found 23.62 %. The total crop raided percentage was found 30.06 %. Present study shows the highest crop raid maize (47.14 %) in the Kaligandaki river basin as compared to Ghimire (2000),

Chalise (1997, 1999, 2001) and Adhikari *et al.* (2018), those recorded low crop loss in Bandipokhara, Palpa, Makalu-Barun Conservation area (MBCA) and Ramdi, respectively. The main reasons for these differences are due to less availability of natural food plants for the monkeys and destruction of their habitats (constructing Kaligandaki corridor) which tends to move the monkeys to the human settlements and crop fields to raid the crops.

The frequency of crop raiding is affected by the availability of natural food as well as number of individuals of the monkeys in the area. Crop raiding is an essential component of the ecology of primates inhabiting human settlements (Naughton-Treves *et al.* 1998) but it is likely to minimize the tolerance of subsistence farmers towards conservation of such crop-raider threatened primate species (Khatun *et al.* 2013). This fact may be useful in predicting the vulnerability of the Assamese monkey survival in Kaligandaki riverside area. Artificial provisioning causes changes in the diet, home range and habitat and even the behavior of the monkey (Southwick *et al.* 1976). In Ramdi area monkeys are habituated to human because of provisioning of foods, therefore their diet, home range, habitat and behavior are also changed. Most of the respondents believe the scarcity of food, increase in monkey population, loss of habitat, behavioral changes of monkeys due to artificial provisioning by Hindu Pilgrims etc. are the major causes of monkeys turning into crop-raiders. Monkeys living in the habitat with fewer wild food resources are more likely to utilize human settlements and areas around them with dependence on crop foods (Yamada & Muroyama 2010). The food provided by the Hindu Pilgrims in temple areas of Ramdi might have caused behavioral changes and increased their dependence to provisioned food rather than foraging from the wild. The food supplied in the temples may not be enough and to meet the nutrients requirement the monkeys enter the crop fields, orchards or even the grain storage houses instead of foraging the wild food, which increase the conflicts with local people. Crop raiding by monkey species is one of the serious problems in the village area (Chalise 1997). Although they raid the crops, they also help in dispersal of wild seeds in the forest (Chalise 1999). Monkeys raid the crops, mainly due to the scarcity of wild edible foods and reduction of their habitat. Such situation forces them to survive on human crop field and settlements. The detail assessment of the habitat quality and its management would minimize the human-monkey conflicts and it will be helpful in conservation of the endangered and protected Assamese monkey species along the Kaligandaki riverside of western Nepal.

CONCLUSION

The highest raided crop by Assamese monkeys was maize (47.14 %) along the Kaligandaki river basin of western Nepal. Crop damage by the monkey species is a common problem in the mid-hills of Nepal. Monkeys raid crops, mainly due to the scarcity of wild edible foods and reduction of habitat. Human-monkey conflict in Ramdi area was found to be a serious social problem which may be due to the proximity of forest to the settlements, artificial provisioning, availability of palatable crops and abundance of safe hiding sites on the rocky outcrops on the bank of Kaligandaki River. Under a systematic management scheme, we should educate people on the importance of wildlife including the endangered and protected Assamese monkey species of Nepal.

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