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Study of human and monkey conflict in Dhankuta Municipality, Dhankuta, Province 1, Nepal

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Abstract

The study was launched in 2017 in Dhankuta Municipality, mid hill region of Nepal. The area has been suffered from monkeys' activities for many years but detail study and management plan of overpopulated monkey have not been made yet. Questionnaire, focus group discussion, key informants survey, direct observation methods were used for collection of data. 45% of respondents observed monkeys group twice a day in their area and 40% of monkeys were from Salleri forest. The finding showed that human threated the monkey and monkey were also disturbing the human. Mostly (71%) was found threats to the monkey from human side. From the side of monkey major problem was crop loss (66%). The maximum victim persons from monkey (40%) were adult female. Mostly raided crop was maize (29%) followed by rice (18%). Most of the respondents (35%) revealed that annual loss was US dollar 100 to 150. For the deterrent 52% used catapult. It was found that 38% respondents had left the fallow land due the negative impact of monkey. Most of the respondents (57%) opinioned that the monkeys of that area should be translocated to other places. Some (22%) suggested killing would be the best policy.

Keywords: Catapult, fallow land, growing, maize, Salleri, translocation.

Introduction

The interaction between human and non-human primates which may create a negative impact on the resources may be called human-primate's conflict (Hill *et al.*, 2002). The conflict between humans and monkeys now is not limited to the marginal settlements nearby forests, it became a growing problem in towns also which are not close forests (Adhikari, 2016). Human and monkey conflicts are increasing specially in developing countries in the comparison with developed ones. There is one main reason behind it, which is well diversified biota and lack of prevention measures (Seoraj & Pillay, 2016). The growing number of monkeys specially the rhesus species is rapidly increasing in recent times has led to increased competition for food and space between humans and monkeys (Srivastava, 1999).

The World Conservation Union, World Park Congress 2003, tells that human-wildlife conflict occurs when wildlife's requirements overlap with those of human population, creating cost to residents and wild animals (IUCN, 2003). Here is one finding that the monkeys have got success in life in relation to human. They have become commensals and competitors of human beings in and around villages, towns and cities hence these are urbanized monkeys (Rajpurohit *et al.*, 2006)

In many places of the hill region including Dhankuta district the conflict between humans

and monkeys was established as a persistent problem. Although it is the residential area of humans in Dhankuta Municipality also the problem was established as a major environmental issue because every year monkeys harm to people and their cultivation. The population of non-human primate is increasing due to increase of forest area. The groups of monkey enter to the agricultural farm and even to house in search of food. The local people go to the reserve for getting resources which activities may harm monkeys also. Not only this, the villagers try to remove them from their locality. Consequently, the conflict occurs.

Among 12 species of world monkeys, rhesus is considered as important because they are well adapted, available and they could be used as experimental animals by medico-biological institutes (Shrestha, 1997). In Nepal, there are three species of Monkey which are *Macaca mulatta, Macaca assamensis* and *Semnopithecus entellus.* Among them, the most common species is *M. mulatta*. It is well distributed in east-west of the plain, Sivalik and hill region (Southwick *et al.,* 1982). The Langur monkey (*Semnopithecus entellus*, Dufresne 1797) is presents in the wild forest and marginal areas.

M. mulatta is brown or grey in color. It has a pink face, which is bereft of fur. Its tail has a length from 20.7 to 22.9 cm. The female weighs about 5.3 kg and its length is 47 cm. But the male is larger with a length of 53 cm and weighs about 7.7 kg. They have the peculiar identifying character as 50 vertebrae. Their rib cage is wider and the ratio of arm length to leg length is 89% (Shrestha, 1997).

Rhesus Monkey is popularly-known Simian species of family Cercopithecidae. They are distributed in Southeast Asia from northern Afghanistan in the east and south to the Godavari River in India, Thailand, Laos, Cambodia, Vietnam, Nepal, Bangladesh, Tibet and China in the west (Roonwal & Mohnot, 1977). Langurs (*Semnopithecus entellus*) also called Dhendu Bandar are popularly named after the Hindu monkey-god Hanuman, and considered the sacred animal. It is the most widely distributed of the 19 non-human primate species found in the Indian subcontinent and is a highly adaptive species (Chhangani & Mohnot, 2004). Hanuman langur has the largest geographical distribution of the 250 or so non-human primates, and dwell from the Himalayan Mountains to the cultivated plains of Tarai. They distribute across India, Pakistan, Bangladesh, Sri Lanka and Burma. Assamese monkeys are shy, timid and less aggressive to human beings incomparisons to rhesus monkey. They are arboreal, terrestrial and omnivorous animals with multi-male and multi-female social troops (Chalise, 2003). The growing problem of human monkey conflict can be managed by participatory approach (Awasthi & Singh, 2015). Some researcher had found different types of infectious viruses in the body of monkey so there is the chance of transmission of zoonotic. At Swoyambhu, humans who come into contact with macaques risk contracting enzootic primate borne viruses. They explored the consequences for public health as well as primate management options that would decrease human-primate contact (Jones-Engel *et al.*, 2006).

The conflict of human and monkey in Dhankuta municipality has been growing every year. The local people loss a lot of crops, fruits and other financial properties because of activities of monkey. They have been defending the harmful activities of monkeys. On the other side the monkeys are also not feeling safe in their habitat specially in forest and temple area and they are migrating to residential area. Due to scarcity of food they come to

the village and conflict against the local takes place. In the localities the population of monkey has been rapidly increased for few years. The locals appealed to the local and provincial government for the management of monkeys but no sufficient action is taken to manage it till now. No more research works have been happened in this area in the context of human monkey conflict. To explore the causes, situation, economic loss, kinds of harmful activities, local methods applied for the defense and management etc. this study was done in 2017. It is hoped that recorded scenario may help for the mitigation of the conflict and support for the belonging authority to manage the monkey and conflict.

Materials and Methods

Study area

Dhankuta Municipality is located on the North-South Koshi Highway in mid hill region of Province 1 (Fig. 1). It lies at the coordinate of 26°59′0″N and 87°20′0″E. It covers an area of 111.6 km^2. The altitude ranges from 300 to 2500 masl. Two large rivers Tamor in east and Arun in west flow side by side on its foot (Dhankuta Municipality, 2017).

The depth of the pond is up to 1.5 m in the dry season and 2.5 m in the monsoon. The water is drained out continuously through an outlet from the southern side of the pond.

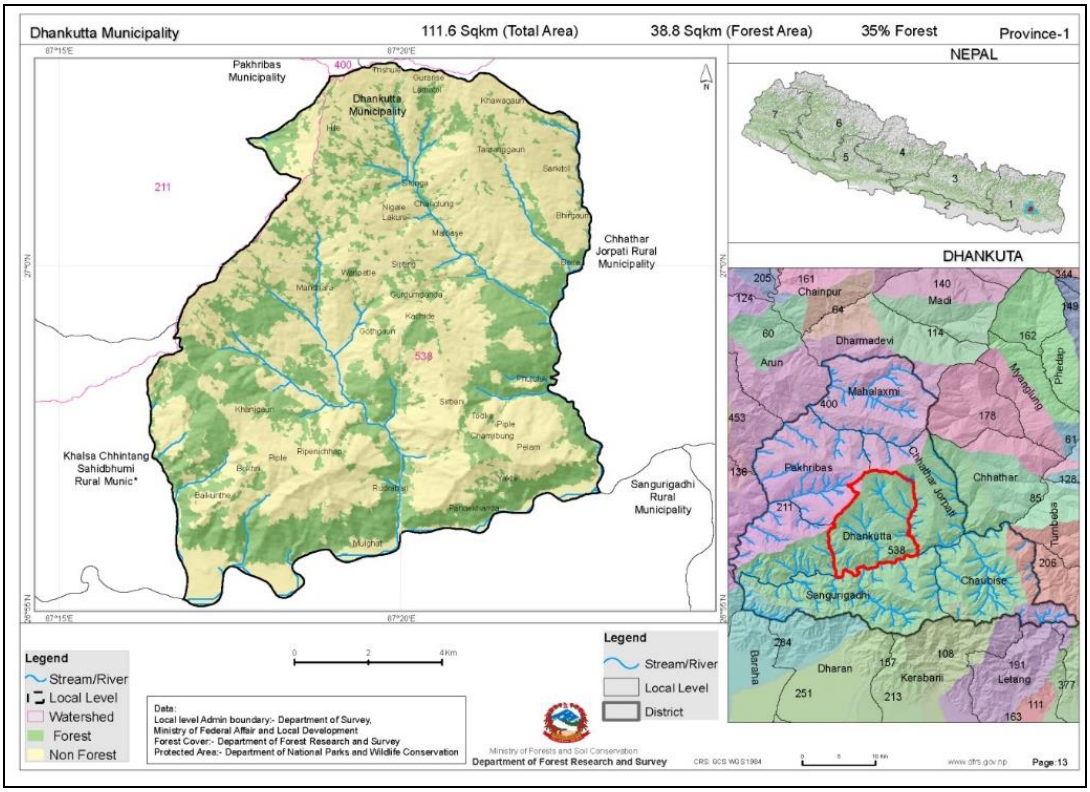

Figure 1. Map of Dhankuta Municipality.

The month with the highest relative humidity is July (87.85%). The month with the lowest relative humidity is March (57.63%). There is a 642 mm difference in precipitation between

the driest and wettest months. August has the greatest average temperature, around 23.5°C. The average temperature in January is 12.1°C. The average temperature varies by 11.4°C throughout the year (Climate-data.org, 2017).

The vegetation zones in the district range from sub-tropical Sal forest and cooler temperate forests on some of the high ridges. A well-preserved forest (Rani Bhan-Queen's Forest) presents along a ridge line on the northwest side of the town. On the upper part of the municipality there is Salleri ban with the dominant *pinus* tree. Many small forests are present which provide resident to monkeys. The majority of the population belongs to agriculture and crops include maize, rice and millet. Important cash crops include citrus fruits, cauliflower, cabbage, ginger, and in recent years, tea (CBS, 2012).

Data collection

Questionnaire survey*:* Purposive sampling method was used for questionnaire survey and 100 households were selected for this study. They were from ward nos. 2 (Bhirgaun,), 3 (Seule), 4 (Debrebas) and 6 (Kachide) of municipality. A pre-tested close and open ended questionnaire was used to collect the information and opinion from respondents. The major information collected were frequency of monkey visit, origin of visitors monkey, problems in monkey from human side, problems on people from monkey side, class of attacked human, most raided crop, annual economic loss, deterrent methods used by the locals, situations of fallowing land and public suggestions for the management of monkeys.

Focus group discussion*:* It was conducted in the study area by representing all categories of local people. The sampled and non-sampled households were also invited and involved in the group discussion. The main issues regarding conflict, response of concerned authorities and resolving methods were discussed in the focus group discussion.

Key informants' discussion*:* Informally the discussions were conducted with the executive committee members of consumer groups, public leaders and representatives, teachers, elder persons, and social workers to get the overall information on human-monkey conflict and verify the information collected in the focus group discussion.

Direct participatory observation*:* The following events of conflict were observed directly too.

i. The problems by monkey to human directly: charge threat, biting and nail scratch, food snatching, grabbing the food carried by human or stored in the house etc.
ii. The problems by human: Stone throwing, catapult or wooden log towards monkey by hand or via catapult chase out or running towards monkey with or without carrying stone and dogs too, stick or any weapons, charge threat towards monkey and giving throw the motion of throwing object towards monkey, shout, encroachment of habitat such as cut trees or clear the natural vegetation or collection of firewood, fodder etc.
iii. The problem by monkey: crop loss, physical attack, house raiding and other harmful activities of monkey to human society and cultivation were observed directly.

Secondary information: Secondary sources of information such as published papers, theses, books and E-literatures and reports were reviewed.

Data analysis: Data obtained were tabulated and put into Ms-Excel and required chart and diagram were made.

Results and Discussion

Frequency of monkey to enter in the farm or residential area

The study showed that 24% of respondents observed groups of monkeys once a day, 45% twice a day and 31% observed more than twice a day (Table 1). Same type of research work was conducted by Sharma and Acharya in Pokhara Tallokodi and they found that the majority of the respondents observed group of monkeys in the village twice a day. It meant the settlement was adversely affected (Sharma & Acharya, 2017).

Table 1. Frequency of entry of monkey to farm or residential area

S.N.	Frequency	Number of respondents	Percentage
1.	Once a day	24	24 %
2.	Twice a day	45	45%
3.	More than twice a day	31	31%
	Total	**100**	**100%**

Habitat of monkey

In the conflict area ward no 2 Bhirgaun, majority of the monkey was from Nibuwa Khola and Bhirgaun forest area. Only 29 respondents revealed that the monkeys were from Wagle's forest side. It showed the most of the problem was caused from the monkeys of Salleri forest side forest which locates at top of the town (Table 2). The previous work by Dithal explored the outgoing range of monkeys of Ramdhuni Sunsary. According to him they were found to visiting far human settlements and farms (Dhital, 2004) Respondents gave the information that the monkeys from Koshi Tappu were not in large group, they mostly came alone but those from Ramdhuni would come in large group and aggressively.

Table 2. Habitats of monkey

S.N.	Habitat of monkey	No of respondents	Percentage
1.	From Nibuwa Khola side	31	30%
2.	From Wagle's forest side	29	30%
3.	From Salleri forest side	40	40%
	Total	**100**	**100%**

Problems caused by human to monkey

The study showed that the people attacked the monkeys and brought the problems. Mostly (71%) was found threats to the monkey which is followed by chasing by using dogs (10%) (Table 3). One other study which was conducted in Kathmandu where shouting and chasing was maximum (40%) followed by stone and catapult (34%) (Rijal, 2015)

Table 3. Problems caused by people to monkey

S.N.	Problems by people	Number of respondents	Percentage
1.	Injuries	9	9%
2.	Threats	71	71 %
3.	Baby capturing	3	3%
4.	Trapping/Caging	3	3%

5.	Killing	4	4%
6.	Chasing by using dogs	10	10%
Total		**100**	**100%**

Problems caused by monkeys to human

From the side of monkey some problems were noted which might be harmful to human and its cultivation and domestication. Maximum problem was crop loss (66%), second house raid (14%) and least was the disturbances to livestock (6%) (Table 4). The study done by Rijal showed that human attacks and harassment both were 31% and remaining 69% were threats only (Rjal, 2015) The 92% of respondents of Hetauda (McCourt, 2005), 78% respondents of Lamjung (Adhikari, 2013) and 76% respondents of Vijayapur area of Dharan reported crop raiding was main problem. In the study launched by Sharma and Acharya in Pokhara 58.3% respondents said that crop raiding was a serious problem for them (Sharma & Acharya, 2017).

Table 4. Problem caused by monkey to people

S.N.	Problems by Monkeys	Number of respondents	Percentage
1.	Crop loss	66	66%
2.	Physical attack	9	9%
3.	House raid	14	14%
4.	Harassments	5	5%
5.	Disturbances to livestock	6	6%
Total		**100**	**100%**

Class of human victim on physical attack

The study finding was reported that out of 70 people who became victim in the attack of monkey 40% were adult female, 45.71% children and 14.28% adult male were in least percentage (Table 5). It was the data of one year 2017. One other study which was of Gauhati University, India, out of 27 individuals bitten by the monkeys, 13 were women, 10 were children and only 4 were adult men. Also, a total of 23 out of 49 cases of aggressive threats were women, 17 were children and 9 were adult men (Oinam & Saikia, 2008).

Table 5. Kind of human victim on physical attack

S.N.	Human's Class	Number	Percentage
1.	Adult Female	28	40%
2.	Children	32	45.71%
3.	Adult Male	10	14.28%
Total		**70**	**100%**

Type of raided crop and cost

The mostly raided crop was maize (29%) which was followed by rice (18%), third was lentil (11%), then wheat (10%) and some other crops were affected as least (2%) (Table 6). The farmers cultivate other types of crops also beside them but the study wanted to find that which were the most raided ones. The research in Pokhara showed mostly monsoon crops i.e. maize, wheat, millet, rice and vegetables such as potato, cauliflower, cabbage and guard were raided most. 31% respondents agreed that the most raided crop was maize (Sharma & Acharya, 2017). The next study which was done along Budhigandaki river, that study found that maize was the highest raided crop, then it was followed by rice, lentil, peanut,

soyabean, wheat, fruits, black pulses, potato etc. (Ghimire & Chalise, 2018). During the study in Langtang National Park (LNP) area, Chalise recorded that the crop depredation due to monkey species was highest in maize (43%) followed by potato (20%), millet (16%), wheat (13%), rice (7%) and buckwheat (1%) (Chalise, 2010).

Table 6. The type of major raided crop

S.N.	Name of Crop	Number of respondents	Percentage
1.	Maize	29	29%
2.	Rice	18	18%
3.	Lentil	11	11%
4.	Wheat	10	10%
5.	Fruits	8	8%
6.	Black Pulses	9	9%
7.	Potato	4	4%
8.	Tomato	4	4%
9.	Mustard	5	5%
10.	Others	2	2%
	Total	**100**	**100** %

Annual financial loss

Out of 100 respondents of different households 35% revealed that annual loss was 100 dollars to 150 dollars which was followed by 200 to 250 dollars (Table 7). They calculated their loss caused by monkey in money value of that period. It was the loss of only of the year 2017. Sharma and Acharya reported from Pokhara as 32% respondents stated that there was annual financial loss of more than Us dollar 200 due to crop damage followed by financial loss of 100-200 dollars (30% respondents) (Sharma & Acharya, 2017).

Table 7. Annual economic loss

S.N.	Annual loss (USD)	Number of respondents	Percentage
1.	Above 250	15	15%
2.	200 to 250	20	20%
3.	150 to 200	15	15%
4.	100 to 150	35	35%
5.	500 to 100	12	12%
6.	Less than 50	3	3%
	Total	**100**	**100%**

Local's deterrent methods

The most of the people of the study area (52%) use catapult for the deterrent to monkey. It was followed by guarding by making hurt (14%) at the way of coming monkey, then stone throwing (14%), after that use of dogs (11%) (Table 8). Some hurts could be seen in the agricultural field. Some used dogs and some used stone to chase or harass the monkey. Making statue and playing loud speaker and unique practice like baby trapping and keeping in cage to threat the monkey were also noted. From the study in Pokhara, it was reported 40% respondents opined that using dog was the effective deterrent method for monkeys which was followed by throwing stone and using catapult (21.7%) (Sharma & Acharya, 2017). In the study of Court in Hetauda, 40% respondents agreed the deterrent method was throwing stone and using catapult (McCourt, 2005). In similar research in Gulmi it was

found that 30% shouted while 24% people used Catapult and stone to chase the monkey (Aryal, 2012)

Table 8. Method applied by locals to deterrent the monkey

S.N.	Methods applied for the deterrent	Number of respondents	Percentage
1.	Use of catapult	52	52%
2.	Use of dogs	11	11%
3.	Stone throwing	13	13%
4.	Use of flame	4	4%
5.	Loud speaker	3	3%
6.	Statue making	2	2%
7.	Baby trapping	1	1%
8.	By making hurt in the farm	14	14%
	Total	**100**	**100%**

Fallowing the land

The land of the study area Aatharai Triveni ward no. 3 is very fertile. Farmers harvest different crops thrice a year. Not only this, they cultivate the vegetables and other cash crops also in the marginal areas, on the bank of river, streams, near springs, on the bank of street. It was found that as far as possible the farmer had not left the land without cultivation. But totally 38 % respondents wrote that they left the fallow land due to the harm of monkeys. In the study conducted in 2015 in Kathmandu district it was found that most of the farmers of Goldhunga and Jitpuphedi were compelled to avoid cropping in their field because of the crop raiding by monkeys. About 69% of the respondents had to leave more or less of their land fallow due to monkey problem. Of the remaining 31%, more than half of the respondents said that even the problem of monkeys was very high they had not to leave land fallow (Rijal, 2015).

People's suggestions for the management of monkeys

People might have knowledge and ideas for the management. Among 100 respondents, maximum or 57 opinioned that the monkeys of Hanpang (Aatharai Triveni 3) should be translocated to other places because they had a great harm (Table 9).

Table 9 people's suggestion for monkey's management

S.N.	People's suggestions	Number of respondents	Percentage
1.	Control by killing	22	22%
2.	Fencing to the Reserve	12	12%
3.	Translocation from that area	57	57%
4.	Sterilization	6	6%
5.	Plantation of unpalatable plants	3	3%
	Total	**100**	**100%**

Some (22) suggested that killing would be the best policy to control and other also suggested some applicable ideas. According to the next study in in Kathmandu maximum people suggested financial support (47%) followed by killing (27%), Translocation (23%) and no response (3%) (Rijal, 2015). Chalise reported that farmer's suffering from monkey crop damage in eastern Nepal was considering planting chili, garlic and tobacco. From the study, some unpalatable crops for monkey were also reported, so to minimize the crop raiding

problems. Ginger, garlic, chili, pidalu etc. were the major alternative crops planted by the local people (Chalise, 2001).

Conclusions

The continuing human and monkey conflict in Dhankuta municipality was studied from October to December of 2017. The study area locates in mid hill region in Dhankuta district. The main affected areas were ward no.2 (Bhirgaun), 3 (Seule),4 (Debrebas) and 6 (Kachide) consist of very fertile agricultural land. So, gradually increasing population of monkeys shows that the habitat has become very suitable. This field was selected because it was severely suffered from this type of conflict. The objective of the study was to explore the present situation of human monkey conflict. Questionnaire survey, group discussion, key informants survey, focal group discussion, direct observation and other scientific methods were applied to complete the research work. Secondary sources such as brochure, progress report of rural municipality were also used for the collection of data.

The following findings were made: maximum respondents revealed that the group of monkey entered in the crop field daily. Majority of the monkey (40%) was from Tamor river side forest. Mostly (71%) was found threats to the monkey which was followed by chasing by using dogs (10%) from human side. From the side of monkey major problem was crop loss (66%). Out of 70 victimized persons in the attack of monkey maximum (40 %) were adult female. The mostly raided crop was maize (29%) followed by rice (18%). Most of the respondents (35%) revealed that annual loss was Us dollar 100 to 150 which was followed by 200 to 250 dollars' thousands annual loss of sampled 20 households. For the deterrent 52% use catapult, by making hurt (14%) stone throwing (14%), use of dogs (11%). It was found that 38% respondents had left the fallow land due the negative impact of monkey. Among 100 respondents 57 opinioned that the monkeys of that area should be translocated to other places. Some (22) suggested that killing would be the best policy.

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