

**GENERAL BEHAVIOUR AND HUMAN PERCEPTION TOWARDS
THE ASSAMESE MONKEY (*Macaca assamensis* McClelland, 1840)
IN HEMJA, KASKI, NEPAL**



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DECLARATION

I hereby declare that the work presented in this thesis has been done by myself and has not been submitted elsewhere for the award of any degree. All sources of information have been specifically acknowledged by reference to the authors or institution(s).

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This is to recommend that the thesis entitled, "**GENERAL BEHAVIOUR AND HUMAN PERCEPTION TOWARDS THE ASSAMESE MONKEY (*Macaca assamensis* McClelland, 1840) IN HEMJA, KASKI, NEPAL**" has been carried out by Anita Poudel for the partial fulfillment of master's Degree of Science in Zoology with special paper Ecology and Environment. This is her original work and has been carried out under my supervision. To the best of my knowledge, this thesis work has not been submitted for any other degree in any institutions.

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LIST OF ABBREVIATIONS / ACRONYMS

Abbreviated forms	Details of abbreviation
ACA	: Annapurna Conservation Area
asl	: Above sea level
df	: Degree of freedom
DFO	: District Forest Office
Fig	: Figure
HH	: Household
m	: Meter
IUCN	: International Union for Conservation of Nature and Natural Resources
Km ²	: Square Kilometer
LNP	: Langtang National Park
MBA	: Makaru Barun Area
mm	: Millimeter
SNNP	: Shivapuri Nagarjun National Park
°C	: Degree Celsius
%	: Percentage

ABSTRACT

Assamese macaque (*Macaca assamensis*) is one of the least studied mammals in Nepal. This study is focused on Assamese macaque, and its general behaviour and human perception towards it in Hemja, Kaski District, Nepal. The study site is in the Pokhara Metropolitan City Ward number 25 in Yamdi area of Hemja. Focal animal sampling method was used for the behavioural observations and semi-structured questionnaires were used to find the peoples' attitude/perception towards the macaque. To determine the general behaviour of the monkey, six individuals were selected for focal animal sampling. Four major behaviours were recorded from the Assamese macaque for behaviour study during observation phase and it was revealed that macaque spent 26.11% time on foraging, 23.71% on social, 33.58% on resting and 16.6% on moving. Disturbance and destruction of the things was the main problem with monkeys in this area. There was significant difference ($\chi^2=7.24$, $df=1$, $p=0.0071$) on provisioning activities to the macaque (N=80) between insiders and visitors of the monastery. The results revealed that 28.81% of the respondents provisioned monkeys for sympathy, 27.12% did it by giving surplus food, 18.64% supplied food for enjoyment, 11.86% for evacuating invading monkey from their areas, 6.78% had no specific reasons and 6.78% provided food to the monkeys due to the religious faith. Many people around the monastery (58.46%, N=65) agreed that macaque should be conserved in their natural habitats. In overall, people had positive perception towards the macaque due to the sympathy, enjoyment, religious faith as well as tolerance to the disturbance and destruction. Home range, diet and behaviour of the macaque were significantly changed due to their habituation in human settlement area.

Keywords: Assamese macaque, Behaviour, Provisioning, Yamdi, Nepal.

1. INTRODUCTION

1.1 Background

Monkeys are non-human primates. According to geographical distribution, they are classified into two main categories i.e. New World Monkeys (Infraorder Platyrrhini) found from South Mexico to Central South America except in high mountains and Old World monkeys found in Asia and Africa (Infraorder Catarrhini). New World monkeys morphologically slightly differ from Old World monkeys in several ways. The main important phenotypic difference is the nose that distinguishes between the two groups. The nose of New World monkeys is flatter and side-directed nostrils while Old World monkeys possess the narrow and downward facing nostrils. The New World monkeys have relatively larger and prehensile tail, e.g. Spider monkeys, Woolly monkeys. There is no prehensile tail in the Old World monkeys and also some species are even tailless. Furthermore, the Old World monkeys have both the hands and feet are adapted for grasping and the callous pads on the buttocks are often bright and in case of females swollen during estrus period (Walker 1968).

Three species of the monkeys, i.e. Rhesus macaque (*Macaca mulatta*), Assamese macaque (*Macaca assamensis*) and Hanuman langurs (Tarai Grey Langur (*Semnopithecus hector*), Nepal Grey langur (*S. schistaceus*) and Himalayan Langur (*S. ajax*)) are recorded in the Nepal (Menon 2003, Chalise et al. 2005).

Two species of macaque (Rhesus macaque and Assamese macaque) have been reported from Nepal. After the CAMP (Conservation Assessment and Management Plan) Workshop 2002 held in India, the Assamese macaque of Nepal was postulated as (*Macaca assamensis* 'Nepal Population') due to its morphological characters that differ from the currently recognized subspecies i.e. Eastern Assamese macaque (*M. a. assamensis*) and Western Assamese macaque (*M. a. pelops*) (Chalise 2003, Molur et al. 2003). The 'Nepal Population' differs in the head-body and tail lengths, body weight and colour (darker fur with purple snout). This macaque is considered as the new subspecies endemic in Nepal (Molur et al. 2003).

1.1.1 Morphology

The Assamese macaque is also recognized as the Himalayan macaque or the Hill monkey and one of the least studied primate species of Nepal (Chalise and Ghimire 1998, Chalise 2000). Local saying finely reflects the fur colour differences within a group as this species

called "Missel" means mixed group. The palm sole and nails are dirty brown in colour. The local vernacular names of this monkey are Pahare Bandar, Pupa, Timnyau, and Kala Ganda (Chalise 2001, Chalise et al. 2013). The Assamese macaque's pelt is dark to yellowish brown in colour with adult macaque have red skin. The Assamese macaques have hairless face cheek pouches to store food while foraging. The body length of this macaques measures from 50 to 73 centimeters. The Assamese macaques' tail is between 19 and 38 centimeters long. However, Himalayan form has longer tail than Indian one. The average body weight of the adult male and female Assamese macaque is between 10 and 14.5 kilograms and 8 and 12 kilograms (Flannery 2004).

Because of their general outlook and size, it can be confusing to distinguish Assamese and Rhesus monkeys, but they are easily distinguishable with their morphological structure. Absence of orange red hue on the loins and rump as well as darker fur in the exposed area, whitish blonde-haired to ashy white in abdominal in inner part and purple (eggplant color) snout particularly around the nose while crimsoned red to pinkish red skin around the eyes and chick (Chalise 1999).

1.1.2 Distribution

Assamese monkey can be found in the mountains and hills along the Himalayas. It can be found in Nepal, India (Assam), Upper Burma, South China, Northern Myanmar, Northern Thailand (ranging 610 m to 1,830 m asl.) (Fooden 1982a, Chalise and Ghimire 1998, Chalise 1999) and Yunnan, Southern China (Chalise 1999). The Assamese macaque is not well documented in Nepal. Assamese macaque was found in mid hills from far-west to far west in the broad-leaved forest (Chalise 1999, 2008, 2013, Chalise et al. 2005, Khanal et al. 2018, Wada 2005), which confined to surveying the fragmented populations of Assamese macaque at different patches, lacking a systematic the entire range study of the species. In Nepal, Assamese monkey is recorded from 130 m in Chatara to 2650 m asl in Lantang (Khanal et al. 2019).

1.1.3 Population

Khanal et al. (2019) recorded the total of 829 individuals in 43 groups in different habitats that accounted for the average group size of 19.29 (± 10.40) individuals in Nepal ranges from elevation 130 m to 2650 m, whereas (Chalise 2013) already recorded the Assamese macaque counting in total population in different areas of Nepal around 1,099 individuals in 51 troops, scattered in different habitat of mid-hills of Nepal. However, the isolated

distribution of the Assamese macaque population in Nepal seems insufficient for maintaining a viable population (Wada 2005).

1.1.4 General behaviour

Behaviour and activity connected with the social and individual activities of a monkey group. Behaviour of the Non-human primates such as grooming, feeding, locomotion, resting and others has been studied by many researches. Different types of behaviour are shown by monkeys during active phases and inactive phases.

Assamese macaque is diurnal, social animal living in hierarchical groups of 10 to 50 including both male and female (Environment and Development Desk, DIIR, CTA, 2005). They spend most of their time on feeding followed by moving (Chalise 2003, Schulke et al. 2011, Sarkar et al. 2012). In comparison to Rhesus monkey, Assamese monkey are shy, timid and less aggressive towards the human beings. They are arboreal, terrestrial and omnivorous animals with multi male and multi female social troops (Chalise 2011).

To fulfill the dietary needs, all monkeys require energy, amino acid, minerals, vitamins, water and certain fats. The specific dietary requirements vary and are met in a great variety of ways corresponding to their habitats (Oates 1987). Diet and foraging behaviour have been reported different according to the sex of the non-human primates. The female monkeys typically spend more time in foraging than co-specific males, so the female monkeys need more protein rich food (Rose 1994). The Assamese monkeys utilize significant of their time in feeding activity (Chalise 2003, Schulke et al. 2011, Sarkar et al. 2012). They are omnivorous (Boonratana et al. 2008) because they eat leaves, fruits, flowers, seeds, bark, shoot and caterpillar (Chalise 2003, Chalise et al. 2005) and other animals based diet like mammals, birds, reptiles, amphibians, spiders and mollusks (Schulke et al. 2011). According to Chalise (2003) and Zhou et al. (2011) monkeys are highly folivorous. They are mostly seen doing their foraging activities in the ground with sluggish movements, which is to look for food. However, the movement is typically limited on their home range. The primates are considered successful crop raiders because they can cross fences with ease (Newmark et al. 1994, Hill 2002). Key raiding crops by the Assamese macaque in Nepal are maize, rice, wheat, millets, potato and fruits (Chalise 1999a, 1999b, 2003, 2010). According to the food habitat, availability and the amount of required nutrients monkeys' selection food items varies (Chalise 2000).

Generally, monkeys rest with the body supporting upon the buttocks with hindquarters lowered on to a supporting surface. During resting, monkeys search for lice or bugs or dirt on their fur or the fur of the others which include rubbing, licking and scratching. The monkeys groom at the time of rest. There is a self-grooming in which monkeys search their own body (Chalise 2003).

1.1.5 Human perception towards the macaque

Human beings and monkeys have been sharing habitats since ancient times via different ways. With passage of time, both human and monkey population grew rapidly. Also, due to the scarcity of food, space, habitat destructions (e.g. deforestation), conflicts between human and monkey became inevitable. The positive or negative human-monkey perception depends on varieties of factors such as human-monkey interactions, places, human attitudes, thinking of the human and destructive activities of the monkeys. The positive perception can be seen in the case of tolerance of destructions, where humans do not attack monkeys. The perception can be more positive in religious places such as in temple and monastery. However, the human-monkey perception can be found negative when interaction between human and monkeys results adverse consequences on human social, economic or cultural life, on the conservation of monkey populations as well as in environment. Nowadays, increasing population of the monkeys is prompting them to supplement their natural diets with foods stolen from people or from garbage sites. Also, monkeys are habituated in religious places due to presence of preferred foods like banana. Due to increased interactions, they do not fear humans and sometimes even attack people (Sharma et al. 2011). People are disturbing monkey habitats with their activities and monkeys are also bothering people while searching the food via crop raiding and stealing goods from their houses. Generally, it is normal for people to chase monkeys with stones or sticks. But in some places, not only people do tolerate their destructions/raiding but also have positive perceptions towards them. However, in places where primate's disturbance is significant, people cannot tolerate the disturbance and the conflict begins. Although the conflict between human and monkeys is not new, a solution regarding the conflict needs to be developed or at least it needs to be minimized.

1.1.6 Conservation status

Assamese macaque is listed as "Near Threatened" world-wide by the IUCN Red List (Boonratana et al. 2008). Due to the restricted distribution, threats, and small number of mature individuals in fragmented patches of the habitats, Nationally Assamese monkeys are listed as endangered and one of the primate species protected by the National Park and Wildlife Protection Act 1973 of Nepal (Boonratana et al. 2008, Chalise 2013, Chalise et al. 2013). It was described as key crop-raiders in some parts of Nepal (Chalise 2010, Ghimire and Chalise 2018, 2019, Adhikari et al. 2018) although it is one of the endangered species, therefore, protected Nationally by the NPWC Act 1973.

1.1.7 Threats

Nepalese Assamese macaque faces different types of the conservation threats. Some of the prevailing threats faced by the macaque are high dependency of local people on forest resources for firewood or timber, forest fire, landslides or habitat destruction and fragmentation due to the developmental and industrial projects, high infant mortality rate (Wada 2005). Another huge challenge in protection of Assamese macaque is to stop retaliatory killings by local people who consider the killing as a necessary pest control measure (Chalise 1999a, 2010).

1.2 Objectives of the study

General objective of the study was to assess general behaviour and human perception towards the Assamese monkeys in Hemja, Kaski, Nepal.

Specific objectives were:

- i. To study the general diurnal behaviour of Assamese monkey in Hemja.
- ii. To explore the human perception towards the monkey in the study area.

1.3 Significance of the study

Various studies have been already conducted about macaque in different geographical areas. This study was conducted in an urban area which acts as a linking of Pokhara - Baglung - Beni road. The area is underdeveloped area and emerges through different physical developments such as highway, hydropower and new settlements. This is clear

that in near future the area will lose much of its natural habitats for wildlife and mostly for primate species. Very few people were aware about the presence of Assamese macaque in this study area. This study mainly covers the behaviour of Assamese monkey and human attitudes towards them in a monastery of Yamdi inside the one of the Metropolitan City of Nepal i.e. Pokhara Metropolitan City. This study also tries to capture relationships between human beings and monkeys and how they use natural resources and interact in human settlements.

It is hoped that this study will help planners, policy makers, development officials, researchers, students and others for their study and work around the human settlements and even in religious spots. Similarly, the findings of this study can be used for further research and conservation programs for protected species in the vicinity of the Annapurna Conservation Area.

1.4 Limitations of the study

- i. The research only focused on the Assamese troop of the area of the Pema Ts' Al Monastery area of the Yamdi.
- ii. Behaviour of the macaque can be influenced by provisional food given by visitors, people who live inside and outside the monastery.

2. LITERATURE REVIEW

2.1 Behaviour of the monkey

In provisioning habitat behaviour of macaque were conducted in different parts of Nepal. Behaviour of the Assamese macaque and Rhesus macaque in the Nagarjun Forest of SNNP were different because Rhesus macaque were less dependent on provisioned food whereas Assamese macaque largely dependent on provisioned food from army canteen area (Ghimire 2017). The results of season wise behaviour patterns of Assamese macaque, were different (Koirala 2014, Ghimire 2017). Resting behaviour of Assamese macaque in Ramdi and Nagarjun forest was same and other behaviour were different (Koirala 2014, Adhikari et al. 2018). Similarly, the behaviour pattern in Nagarjun Forest and Ramdi area were found different in two provisioning troops (Ghimire 2017, Adhikari et al. 2018) because of presence of provisioning food as well as natural food, habitat and different geographical condition of two areas. Nagarjun troop was habituated in the army canteen area whereas Ramdi troop habituated in the Shidhha baba temple area. Koirala (2014) compared diet composition of two troops of Assamese macaque in Nagarjun forest and found significant difference in the diet composition in these troops. The difference in the diet composition was due to their feeding habit as troop 'A' fed on waste food from army canteen area and troop 'B' on natural food.

Behaviours of the Assamese macaque in the natural habitats in different parts of the mid-hills of Nepal were also found dissimilar. Foraging behaviour was recorded highest than other behaviour (Adhikari and Chalise 2014, Chalise 1999, Chalise 2010, Chalise et al. 2013, Panday and Chalise 2015, Paudel and Chalise 2017) whereas Bhattarai (2002) reported that macaque spent more time for sitting than other activities in Syafrubeni Area of LNP. Similarly, Ghimire (2019) reports that macaque spends highest time for inactive behaviour in Nagarjun forest, SNNP. Macaque activities are found different in the mid-hills of different parts due to differences in seasons, climatic condition as well as abundance of food and types of the vegetation in the habitat of the macaque.

Activity pattern of primate species was affected by the distribution and presence of natural resources. Aggressive interactions with humans were found in the provision habitat where food was provided by human (Mitra 2002). The provisioning actions significantly decreased the macaque intake of natural food resources (Sengupta and Radhakrishna 2018).

Sarkar et al. (2012) reported that Assamese macaque spends more than one third of time for foraging followed by locomotion and so on in Jokai reserved forest of Assam, India. In that forest, food was randomly distributed so the group cost was effectively arranged. The Assamese macaque spends more time for foraging and moving from one feeding sit to another to get appropriate quantity of food.

The provisioning alters the feeding behaviour of the macaque (Koirala et al. 2017). There was higher grooming interaction in the provisioned troop compared to the forest troop irrespective to age-sex class. Grooming helps to reduce agnostic interaction between primate individuals in the provisioned troop (Sarkar 2014).

Rhesus macaque mothers spend significantly more time in feeding and moving than Assam macaque mothers but reverse is true in the case of resting and grooming. Assam macaque infants spent significantly more time in resting compared to the Rhesus macaque infant and vice versa in the case of playing and being groomed in SNNP (Upadhayay et al. 2018).

2.2 Human-monkey interaction

Provisioning increases the human-macaque conflicts (Koirala et al. 2017). Crop raiding was reported as a main cause of conflict between human and primates (Cabral et al. 2018, Dittus et al. 2019, Khatri 2006, Khatuen et al. 2013, Paudel 2016, Uddin and Ashan 2018). Mehta and Heinen (2001) reported that 96% of their respondents around the buffer zone of MBNP had been facing crop depredation by different wildlives.

Maize is the most important crop raided by the macaque (Chalise 2001, Regmi 2008, Khatri 2006, Paudel 2016, Paudel and Shrestha 2018, Ghimire and Chalise 2018, Ghimire and Chalise 2019, Sharma and Archarya 2017). Rice was also reported as another main crop raided by the macaque (Ghimirey et al. 2018). Naher et al. (2017) reported that paddy is the prominently vulnerable crop for raiding by primates.

Sharma and Archarya (2017) reported 10% physical attack, 58.30% crop raid, 21.70% house raid, and 10% all in which five dogs were killed and locals also injured due to the Rhesus monkey in Pumdivumdi. Around 100 Assamese macaque killed in human retaliation within five years period (Ghimirey et al. 2018).

Ghimirey et al. (2018) estimated the crop damage due to macaque in Makalu-Barun National Park Buffer Zone to be US\$ 602/HH. Similarly, Paudel and Shrestha (2018) estimated the crop damage in Jaidi VDC in Baglung to be US\$ 75.10/HH.

Ganguly and Chauhan (2019) reported 1802 conflict incidences. Similarly, Deb et al. (2014) recorded 35 cases of monkey bite and 76 cases of aggressive threats in Assam. Adhikari (2016) recorded two cases of bite in children and different events of injuries such as four fell and three scratch cases in Ramdi.

Thus, it is shown that monkey's aggression towards the human is mainly due to search for the food and human interference on their habitat.

2.2 Human attitude towards the monkey

Ghimire et al. (2018) reported many of the respondents had negative and hostile attitudes towards the Assamese macaque and Mehta and Heinen (2001) reported the 91% of the respondents wanted to eliminate pest macaque in around Mararu-Barun National Park, buffer zone. People want to conserve golden langur and the capped langur monkeys because people believe these are descendants of the lord Hanuman by Hindus. However, attitude towards the Rhesus monkey are negative due to actions of damaging the crops (Medhi et al. 2007).

People's willingness to conserve was found dependent on the extent of damage they encountered. Paudel and Shrestha (2018) reported that more people perception towards the conservation of monkey in Jaidi VDC in Baglung was not willing to conserve monkeys. People's perception towards the rhesus macaque had changed over time in northern India, but farmers were still unwilling to harm the macaques (Anand et al. 2018). People's attitude towards the monkey was influenced by how frequently monkeys were visited and damaged their properties. Shri Lanka people show generally either neutral or positive attitude but majority (80%) of the people desired a translocation of the monkey from their properties to a protected area due to the troubles (Dittus et al. 2019). Alelign and Yonas (2017) reported negative perception towards the grivet monkey in Ethiopia. Perception towards the grivet monkey differed based on farming size. Negative attitude of people towards the macaques due to the economic loss by Rhesus monkey in Pumdivumdi (Sharma and Acharya 2017). Similarly, negative altitude of the farmers to the monkeys with respect to food security in LNP (Regmi 2008).

Riley and Piston (2010) reported positive perception towards the macaque despite of crop raiding due to the tolerance level of conflict between them in Indonesia.

2.4 Threats to the monkey

Threats to the temple primate in Northeast India has been due to the loss of natural habitats through human settlements in and around the temples, increasing cases of human-monkey conflicts and changing of the people attitude towards the monkey (Medhi et al. 2007). Threats to the Assamese macaque in Makalu-Barun National Park, buffer zone is due to killings in retaliation (Ghimirey et al. 2018). According to Mazumber (2014) main threats of the primate species in Southern Assam, India have been the poaching, human-primate conflicts and depleting of food plants. The main threats of the Assamese macaque in LNP was habitat encroachments (Regmi 2008).

3. MATERIALS AND METHODS

3.1 Study Area

3.1.1 Location

This study was carried out at Hemja Pokhara Metropolitan City, ward number - 25, in Kaski District. The study area lies few kilometers south from Annapurna Conservation Area. Pokhara Metropolitan City covers a 464.24 km² area including in all 33 wards. The study area Hemja lies in 28.28⁰N latitude and 83.92⁰E longitude having with 12,262 population (Source: CDS 2011).

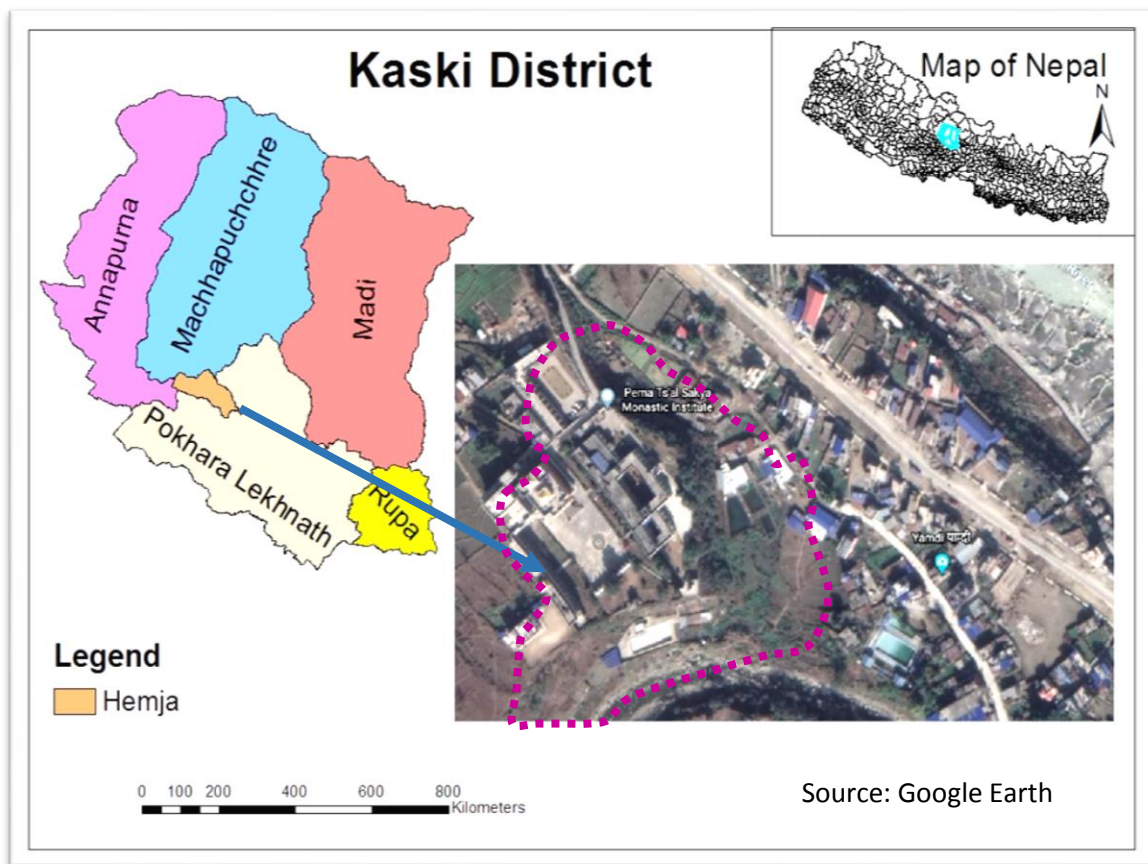


Fig. 1: Map of the study area in Pokhara area, Kaski District, Nepal

3.1.2 Climate

The study area spans foot-hill and valley. It has humid subtropical monsoon climate and sub-tropical type of the forest. The detail climatic data of the study area was carried from nearest metrological station at Malepatan, Pokhara (28.22⁰ N latitude, 83.97⁰ E longitude

and 859 m elevation). The metrological data of temperature, humidity and rainfall was mentioned from January to July, 2019 A.D. (Appendix IV).

Temperature

The warmest and coldest months of the Pokhara during field visitation were June (32.36°C) and January (3.59°C) respectively. The average maximum and minimum temperature were recorded (27.58°C) and (12.94°C) respectively (Fig 2).

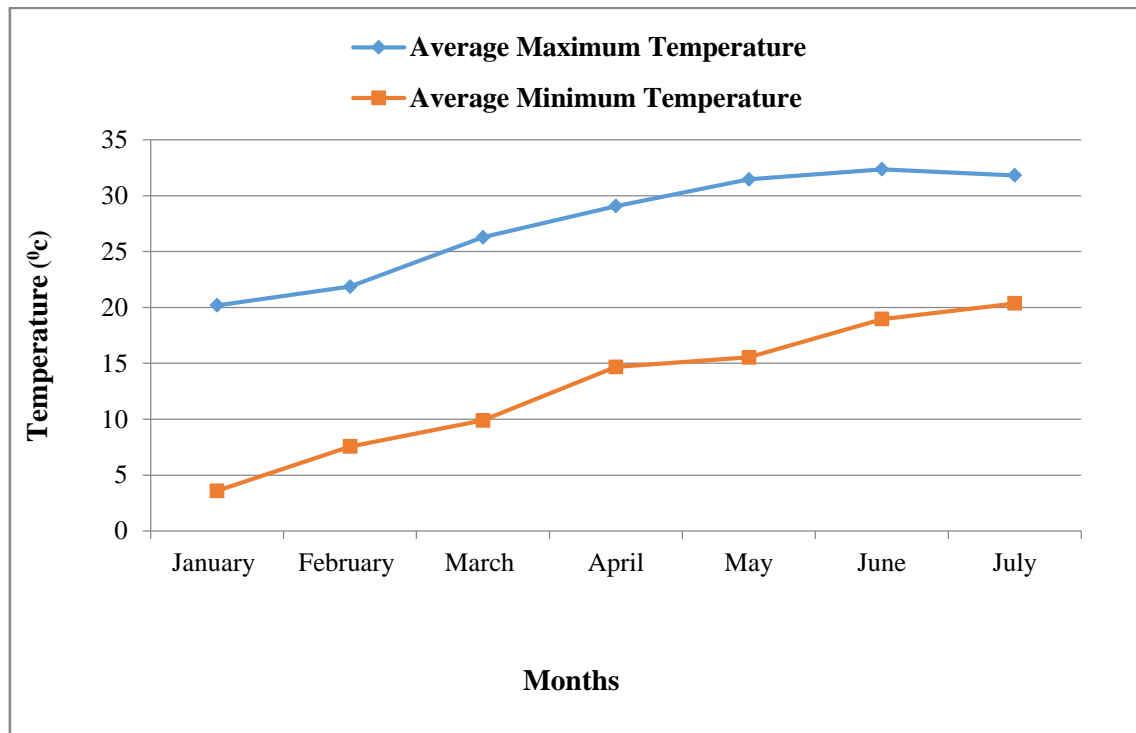


Fig. 2: Monthly average temperature of Malepatan station in 2019 A.D.
(Source: Department of Hydrology and Meteorology, 2019)

Humidity

Relative humidity in the month of July was maximum (77.75%) and in March was minimum (59.29%). According to the climatic data, average monthly relative humidity (at 3) of the area was 71.74% and average monthly relative humidity (at 12) of the area was 67.76%.

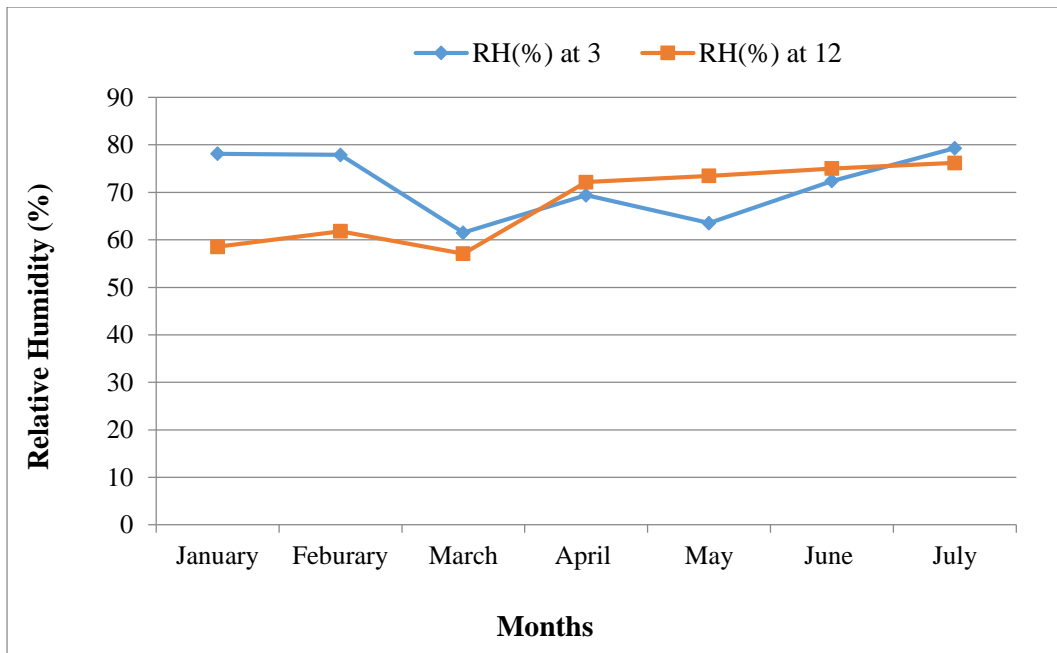


Fig. 3: Monthly average humidity of Malepatan station in 2019 A.D.
(Source: Department of Hydrology and Meteorology, 2019)

Rainfall

The rainfall of the Malepatan station data shows the highest raining was recorded (828.2 mm) in the month of July while lowest raining was recorded (40.2 mm) in the month of January (Fig 4).

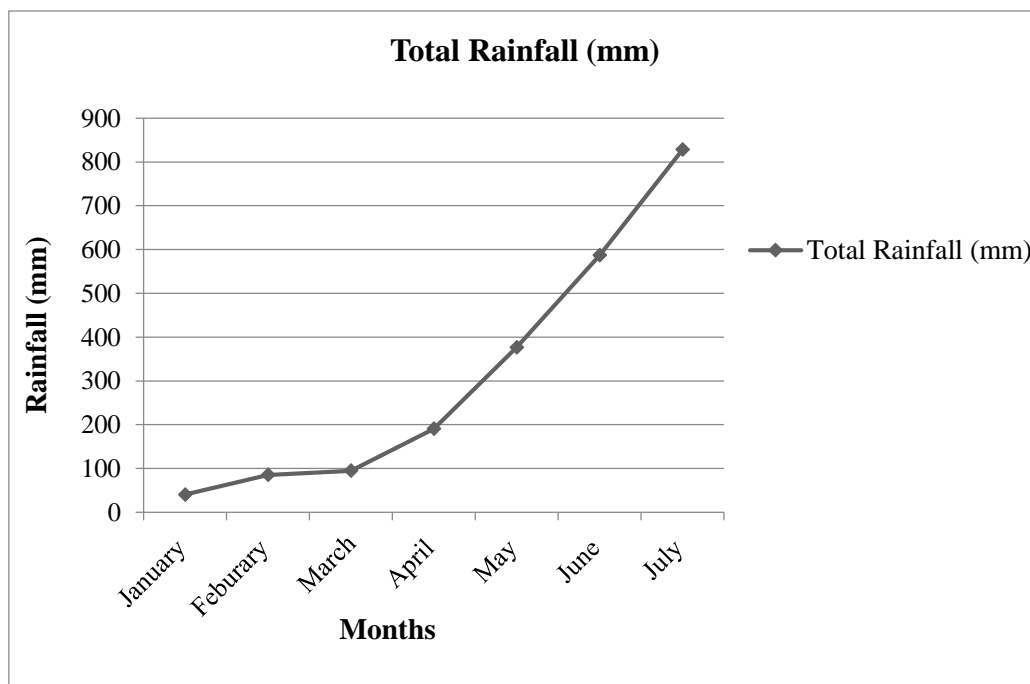


Fig. 4: Monthly average rainfall of Malepatan station in 2019 A.D. (Source: Department of Hydrology and Meteorology, 2019)

3.1.3 Flora and fauna of the study area

Pokhara is not only important for the tourism, but also in floral and faunal diversity due to the prevalence of wide range of climatic and topographical variations. Many species of the flora are found in this area. Some important flora of this area are: salla (*Pinus wallichiana*), utis (*Alnus nepalensis*), sal (*Shorea robusta*), sissau (*Dalbergia sissoo*), simal (*Bombax ceiba*) (Annual report of DFO, Kaski 2075, field visit).

Also many species of the fauna are found in this area. Some common mammals of this area are Common leopard (*Panthera pardus*), Barking deer (*Muntiacus muntjak*), Rhesus monkey (*Macaca mulatta*), Hanuman langur (*Semnopithecus schistaceus*), Wild cat (*Felis chaus*), Mongoose (*Herpestes species*) etc. (Annual report of DFO, Kaski 2075). Different endemic as well as migratory birds were found in Pokhara valley in different seasons. Some of these bird species includes Cattle egret (*Bubulcus ibis*), house swift (*Apus nipalensis*), house crow (*Corvus splendens*), Himalayan bulbul (*Pycnonotus leucogenys*), red-vented bulbul (*P. cafer*), common myna (*Acridotheres tristis*), white-throated kingfisher (*Halcyon smyrnensis*), black kite (*Milvus migrans*), himalayan vulture (*Gyps himalayensis*) etc. (Annual report of DFO, Kaski 2075, field visit).

3.2 Materials

- Binoculars (Bushnell 9X-27 X 50)
- GPS (Garmin, 64s)
- Camera (Canon 42X)
- Measuring Tape (50m)
- Stationery

3.3 Methods

3.3.1 Preliminary field survey

The preliminary survey was carried out from 24th January to 2nd February 2019 to recognize the geographical, climatic condition as well as population status, habitat, and likely areas of occurrence of Assamese macaque in Hemja before starting the field work. The survey process included mainly field observation and discussion with local people.

During the survey period, the macaques were observed with binoculars and naked eyes. The distribution and population status of the monkeys in the Hemja was carried out by scan sampling and counted by using binocular or naked eye.

3.3.2 Data collection

The following methods were followed during the research work:

3.3.2.1 Population status

Population census

Firstly, observation of the monkeys was performed by scan sampling. The head count of individual population of the monkey was done to determine the total population and sex of the monkeys was determined with the help of binocular or naked eyes. Regular monitoring was conducted to identify the individuals of the troops and to recognize their home range. During behaviour observation, population of the focal troop was counted every day.

Age-sex composition

Age-sex ratio of the monkeys were distinguished according to body color, body proportion, height and body size (Roonwal and Mohnot 1977). The compositions of the troop were classified into adult male, adult female, sub adult male, sub adult female, juveniles and infants according to monkey's body size, colouration and behaviour (Chalise 1995) and similar patterns in this species too.

Age Classification:

- a) Adults are those who attained maximum height and body maturity. Adult males were distinguished by large and hanging scrotal sacs and flat head whereas females had small head, protruded nipple and sexual swelling in estrus period.
- b) Young and sub-adults are independent, grown up and achieve the height of adulthood but not mature in the case of body fitness and reproductive activities. There was no hanging of scrotal sac in the case of young male and protruded nipple in female.
- c) Juveniles are the primate individuals that left nipple contact (weaned) and depend on natural foods and mostly following their kin.

d) Infants are those who still suck the nipple as their main food and follow the mother. Similarly, sex ratio was taken as the number of males in 100 females.

3.3.2.2 Focal/Study animals

The general behaviour were observed in six individuals. Each individual macaque was recognized by its physical appearance and behaviour (Table 1).

Table 1: Distinguishing characteristics with individuals' macaque for focal animal sampling

S.N.	Category	Distinguishing Characteristics
1	Adult female (F ₁)	Back of left part hair is absence may be during fighting and larger body size compared to another female.
2	Adult female (F ₂)	Smaller body size compared to F ₁ .
3	Adult male (M ₁)	Larger body size.
4	Sub-adult female (F ₃)	Tail is small due to accident.
5	Sub-adult male (M ₂)	Comparatively body size is larger than M ₃ .
6	Sub-adult male (M ₃)	Body size is comparatively smaller than M ₂ and bites his hand himself during aggressive situation.



Fig. 5: Adult female (F₁)



Fig. 6: Adult female (F₂)



Fig. 7: Adult male (M_1)



Fig. 8: Sub-adult female (F_3)



Fig. 9: Sub-adult males (Left – M_2 , Right – M_3) **Fig. 10:** Focal Macaque as well as juveniles

3.3.2.3 Behavioural observation

For the research work, a semi-habituated troop of Assamese monkey in Yamdi area was selected. During 300 hours of observation phase all events and behaviour were noted from 7:00 AM - 17:00 PM. Behavioural data were observed by focal animal sampling as well as Ad-libitum sampling (Appendix: I).

An ethogram was developed for use in related to behaviour of monkeys.

Foraging: Foraging or feeding of food, either natural or provisioned (Photo 1).

Moving: Locomotion from one place to another place for different motivations (Photo 21).

Resting: Staying in a place (Photo 10) either sleeping (Photo 5) or monitoring (Photo 13).

Social: Activities either playing (Photo 9), grooming (Photo 14) or fighting.

Focal animal sampling

Focal sampling is the type of sampling method for measuring primate time activity budget of an individual, or specified group of individual. For each focal individual, all individual monkeys have same observation time duration (continue one hour, Table 2) once they have chosen. All the behavioural activities of the Assamese monkey were recorded continuously whenever they were noticed (Altman 1974).

Table 2: Focal animal sampling working chart for data collection

Time Days	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
1 st	M _A	M _B	M _C	M _D	M _E	M _F	M _A	M _B	M _C	M _D
2 nd	M _D	M _E	M _F	M _A	M _B	M _C	M _D	M _E	M _F	M _A
3 rd	M _B	M _C	M _D	M _E	M _F	M _A	M _B	M _C	M _D	M _E
4 th	M _E	M _F	M _A	M _B	M _C	M _D	M _E	M _F	M _A	M _B
5 th	M _C	M _D	M _E	M _F	M _A	M _B	M _C	M _D	M _E	M _F
6 th	M _F	M _A	M _B	M _C	M _D	M _E	M _F	M _A	M _B	M _C

Where,

M = Monkey

M_A, M_B, M_C, M_D, M_E and M_F refer to F₁, F₂, M₁, F₃, M₂ and M₃ respectively (Table 1).

Ad-libitum sampling

This is a sampling technique in which additional information on rare events and on general occurrence (behaviour) in the troops noted down systematically (Chalise 1995). It is only used for descriptive purpose not for quantitative.

3.3.2.4 Questionnaires survey

A questionnaires survey was conducted in July 2019. A total of 80 respondents were selected from Yamdi area. Out of the 80 respondents, 15 were visitors, 25 were students (19 from Pema Sakya Ts' Al Monastic Institute and six from Orphanage), 25 were Lama, teaching and non-teaching staffs of Monastery and Orphanage and 15 were local people.

A semi-structural questionnaire containing curiosity, to get information like the monkey visitation, monkey related problems, preventing methods used by local or monastery people, provisioning food, possible remedial measures of conflicts as well as human

perceptions towards the monkey etc. were used to collect the information from respondents (Appendix II).

3.4 Data analysis and presentation

The collected data was analyzed using MS EXCEL 2007 and Statistical Package PAST. Arc GIS software was used to draw the study area map. Birth ratio of the infant of the macaque was calculated by dividing total number of infants by total number of adult females (Chalise et al. 2013). Likely sex ratio is calculated by dividing total number of adult males by the total number of adult females (Chalise 2003). Responses from different respondents were processed to make report writing. PAST was used for chi square test in questionnaires like monkey as a problematic animal, provisioning food, monkey visitation time and human perception on monkey conservation. The collected data was processed, coded and tabulated. Pie-charts, tables, graphs and bar diagrams were used to present the data in simplified and understandable forms.

4. RESULTS

4.1 Population status of the macaque

4.1.1 Population census

A total of 10 Assamese macaque (*Macaca assamensis*) and 51 Rhesus macaques (*Macaca mulatta*) were observed during preliminary survey in the study area. Out of them, four adults (one male and three females), three sub-adults (two males and one female) and three juveniles in the Assamese monkey troop and 19 adults (five males and 14 females), 20 sub-adults (eight males and 12 females) and 12 juveniles in the Rhesus monkey troop (Table 3).

Table 3: Population of Assamese macaque and Rhesus macaque found in Hemja during preliminary study 2019

Species	Latitude, longitude	Population						Total
		Adult		Sub-adult		Juvenile	Infant	
		Male	Female	Male	Female			
Assamese macaque	28.2572N, 83.9608E	1	3	2	1	3	0	10
Rhesus macaque	28.2725N, 83.9416E	5	14	8	12	12	0	51

4.1.2 Age/sex structure

Among observed two troops, a troop (Assamese macaque) was selected from semi-provisioned habitat of the Yamdi for studying as a part of the research objective.

A total of 12 individuals of the Assamese macaque were observed in focal troop which were habituated in provisioning habitat in Yamdi, Hemja. Out of them, two were infants, three juveniles, three sub-adults (two males and one female) and four adults (one male and three females). During observational period population of the monkeys was fluctuated due to the birth of infant, fatalities of infant after the birth (Photo 12) and missing of one adult female (Photo 7 (i)) (Table 4).

Table 4: Age/sex structure of Assamese macaque in the Yamdi, Hemja, 2019

Date	Population status of the Assamese macaque						Remarks	
	Adult		Sub-adult		Juvenile	Infant		Total
	Male	Female	Male	Female				
2019/1/24	1	3	2	1	3	0	10	
2019/5/13	1	2	2	1	3	0	9	One female missing
2019/5/22	1	2	2	1	3	1	9-10-9	Infant died after birth
2019/6/8	1	2	2	1	3	1	10	Birth of infant

4.1.3 Sex ratio

Out of four individuals, the adult sex ratio (male to female ratio) observed during preliminary survey in Yamdi troop was 0.33 (33 adult males to 100 adult females) i.e. 1:0.33 and last visitation was 0.5 (50 adult males to 100 adult females) i.e. 1:0.5.

Among sub-adult, out of three individuals, male to female ratio was 2 (200 sub adult males to 100 young adult females) i.e. 1:2.

4.1.4 Recruitment rate (birth rate)

Recruitment rate (female to infant ratio) observed during the entire study period was 0.67 (67 infants per 100 females) i.e. 1:0.67.

4.2 General behaviour and diurnal activity pattern

4.2.1 General behaviour

The semi-habituated troop of Assamese macaque with three males and three females, individuals from the Assamese macaque troop in Yamdi area of the Hemja were selected for the Focal animal Sampling to explore the general diurnal behavioural of Assamese macaque. These Assamese monkey troops were semi provisioned and usually fed the surplus food and discarded materials from Monastery, and Orphanage and also partly relied on the supplemental food from visitors, local people and by the stealing the belonging of Lama, students, local people and visitors.

Field work for behaviour observation was carried out from March to July, 2019. Major behaviour like foraging, moving, resting and social activities were recorded during this study period. Behavioural data were observed daily from 7:00 A.M. to 17:00 P.M. using instantaneous focal animal sampling method. Behaviour observation was done by direct ocular observation as well as aided with 9X-27 X 50 mm binoculars.

During 300 hours of observation period, the focal animal of the focal troop revealed that the macaque spent more time for resting (33.58%) followed by foraging (26.11%), social (23.71%) and least for moving 16.60% (Fig 11).

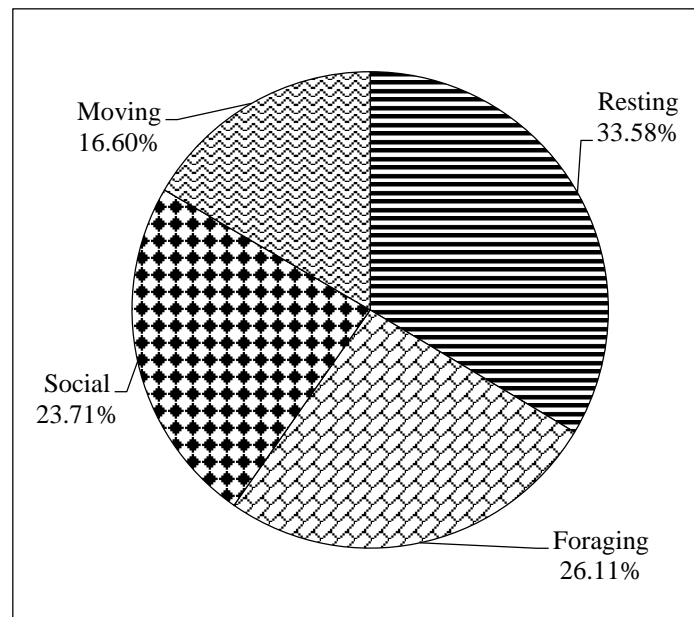


Fig. 11: General behaviour of Assamese macaque in Yamdi, Hemja, at 2019

4.2.2 Diurnal activity pattern

The daily observation schedule divided into four shifts i.e. early morning shift: 7:00-9:30, late morning shift: 9:30-12:00, afternoon shift: 12:00-14:30 and late afternoon shift: 14:30-17:00. Foraging time of the Assamese macaque was found highest 35.51% in late afternoon shift followed by 32.22% in early morning shift, 20.60% in late morning shift and 16.09% in afternoon shift in the observational phase. Assamese macaques were seen mostly in social activities 24.36% in afternoon shift followed by 24.18% in the late afternoon shift, 23.73% in the early morning shift and 22.58% in the late morning shift. Moving time of the Assamese monkeys was seen highest 18.49% in late afternoon shift, followed by 17.49% in the early morning shift, 15.30% in the afternoon shift and 15.11% in the late morning shift. The macaques were seen mostly resting 44.25% in afternoon shift followed

by 41.71% in the late morning shift, 26.56% in the early morning shift, and 21.82% in the late afternoon shift observational phase (Fig 12).

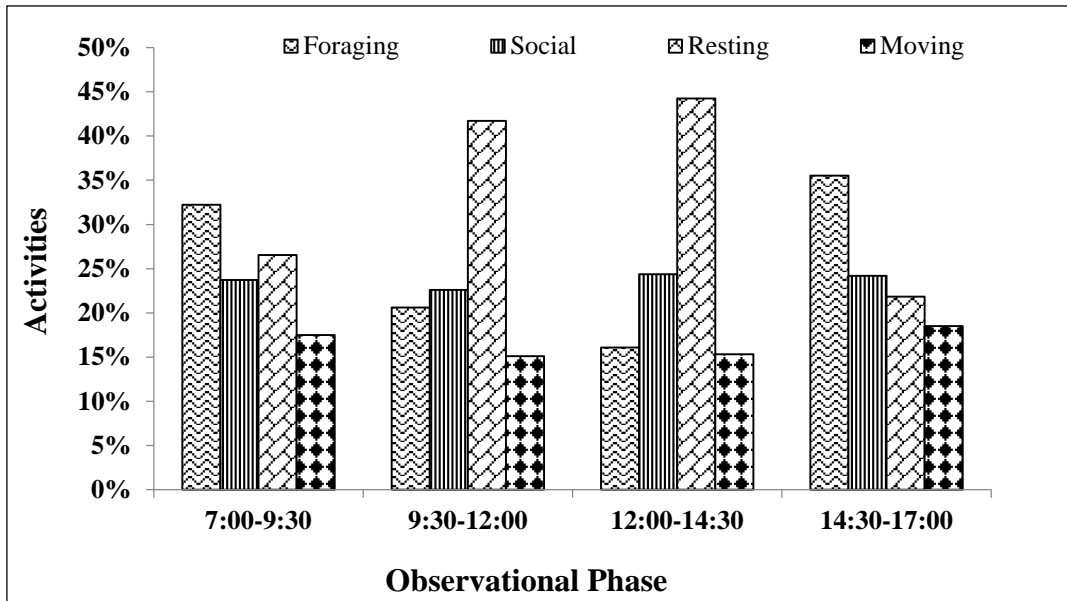


Fig. 12: Diurnal activity pattern of Assamese Macaque in Yamdi, Hemja, at 2019

4.2.3 Seasonal change in behaviour

As the data were collected in two seasons of the study year i.e. spring and summer. Time spent in resting behaviour was 32.36% in spring whereas in summer season it was 35.63%. Similarly, moving behaviour was 18.57% in spring and 15.10% in summer but foraging and social behaviours were slightly different in two seasons (Fig 13).

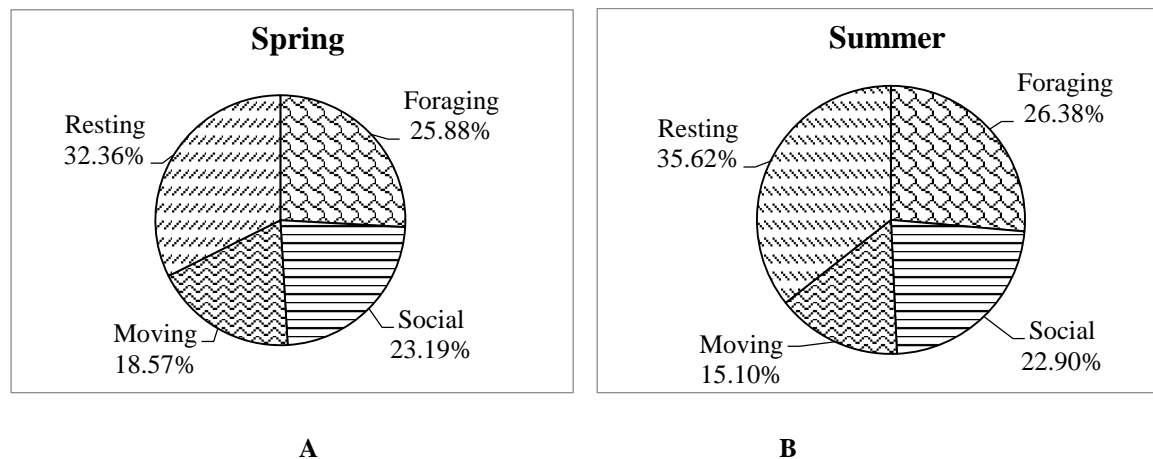


Fig. 13: Seasonal behaviour; A. Spring season, B. Summer season

4.2.4 Behavioural records from Ad-libitum sampling

Some interesting behaviour of the Assamese macaque were recorded through Ad-libitum sampling; begging foods, playing with shoes and clothes, drinking residue of juices (Photo 19) from cups and bottles, fighting, chasing, biting each other, thieving things (shoes, clothes, foods, utensils from the room of the children and lama), thieving food, fruits, vegetables, utensils from kitchen of the monastery, orphanage as well as houses of near the monastery, mother teaching infant to jump from one tree branch to another branch, caring to adult female who misses infant after pregnancy period, obstructing the path to people (Photo 17), killing bird like to nuisance of monkey (Photo 3), detection of edible food through testing like lizard (Photo 4), snatching the food from cup (Photo 11), dying of the infant after birth (Photo 12), playing with cloths (jacket) (Photo 16). Some of the behaviour of the macaque were influenced by visitors, local people, monastery people and so on.

4.3 Human perception towards the macaque

4.3.1 Socio-economic profile of the respondents

A total number of 80 (i.e. 15 visitors, 15 local people, 25 students, and 25 staff, teacher and people lived in the monastery as well orphanage) respondents were selected for questionnaires (Appendix: III).

4.3.2 Macaque problem

When asked the problems of monkeys, many of the respondents (75.38%, except visitors) said that they have different problems from the monkey (Fig 14). The response from the respondents showed that stealing and damaging the goods were major problems in this area. the monkey problem responses from different respondent showed significant difference (Chi-square (χ^2) = 6.9132, d.f. = 1 and $p = 0.0086$) depending on religion and gender of the respondents.

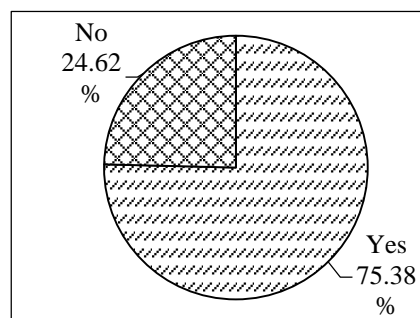


Fig. 14: Respondents having problem

4.3.3 Human-macaque interaction

When human and monkeys utilize the same resources of the habitats the interaction between human and the monkeys can be either positive or negative or neutral. The interaction depends on how they utilize the resources as well as how they disturb each other. People who live in monastery and orphanage area have interacted with monkey for a longer period (Photo 18). People who live or work in monastery and orphanage have found more problems with the monkeys (Photo 15). The residents near the monastery are suffered significantly with problems of the monkeys. Monkeys had stolen goods from houses or the monastery. Women and children were suffered from monkey while walking alone was found. Some of the troubles created by monkeys are: teasing, showing aggressive behaviour and blocking paths (Photo 17), disturbing the students while reading in classroom, breaking and damaging of the glasses and net of windows, stealing the of things (like bag, mobiles, clothes, utensils as well as passport of tourist who came to visit in Pema Ts' Al Sakya Monastic Institute). It was also found that monkeys go to the cultivated lands and raid crops (like maize (Photo 6), potato, vegetables or anything that is cultivated near the monastery area). They became aggressive when people walking as well as who tease them with food or sometimes taking photographs of them. Monkeys not only troubled human and dog, they also destroyed the nest and killed the hatchling of bird (Photo 3). While playing, they raided Monastery's garden plants and flowers.

Monkeys were also disturbed by the children in that monastery. They chased monkeys by shouting, ringing bell loudly, beating them with stick or hurling stones. Although the monkeys troubled people many ways, I also observed many people (monastery, orphanage and local people near the monastery) still had positive perceptions towards monkeys because of the tolerance of the destructions and raiding activities. Thus it can be said that people showed positive attitudes towards the monkey which has reduced conflicts between human and monkeys. Many Buddhist followers believe that animals can contain the souls of their past relatives and can take rebirths in the form of the animals. So, they strongly considered these primates also have equal right to survive and utilize the resources of the nature, which is also one of the causes of the tolerance.

4.3.4 Causalities by macaque

One case of fall-down and two cases of injures (man and dog) were obtained through the questionnaires (Table 5).

Table 5: Causalities by macaques

S.N.	For whom	Activity of victim	Where	Remarks
1	A 35 year's man	During chasing monkey comes inside the home	Home	Injured
2	A 65 year's women	Walking in stair	Home	Fall down
3	Dog	Chasing	Monastery	Injured

4.3.5 Provisioning food

The provision food is a stock of food or any kind of eatable materials that were collected or stored and provided or supplied to someone. People are seen provisioning food (Photo 1, 2 and 8) to the monkeys during visiting due to religious faith, sympathy, entertainment or when they have leftover or surplus food. The surplus food is an amount, quantity of the food which is greater than needed.

The observed troop lives in a semi-natural environment or monastery area. These monkeys are habituated close to human and received supplementary food provided by human by the human.

The types of food that was given to the monkeys in this study area were surplus food, decay and wastage foods, fruits (apple, banana, watermelon, pineapple), pearls of vegetables and fruits, bread, boiled eggs, biscuits, noodles (Photo 2), chocolate (Photo 1 (i)), juice, 'Prasad' (Photo 8) worshiped by Lama.

The 73.75% responses to the question of "have you ever given food items to monkey" as part of the questionnaire was yes (Fig 15). The responses indicated the feeding was due to surplus food, begging by the monkey, for time passing, sympathy to the animal, enjoyment as well as to take photos with monkey and with religious faiths. Thus, the total number of people who fed food to the monkeys and who do not fed food to the monkeys showed significant differences (Chi-square (χ^2) = 7.2359, d.f. = 1, p = 0.0071).

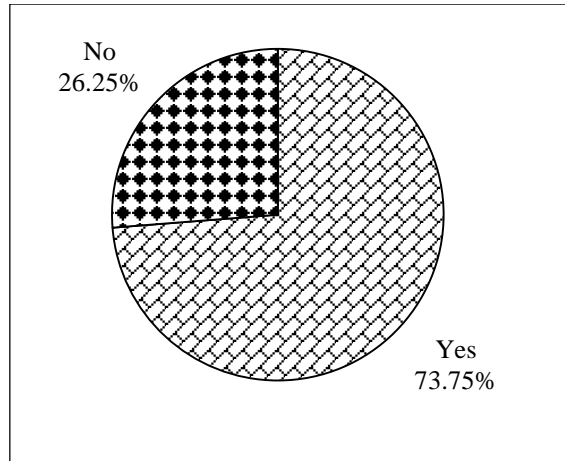
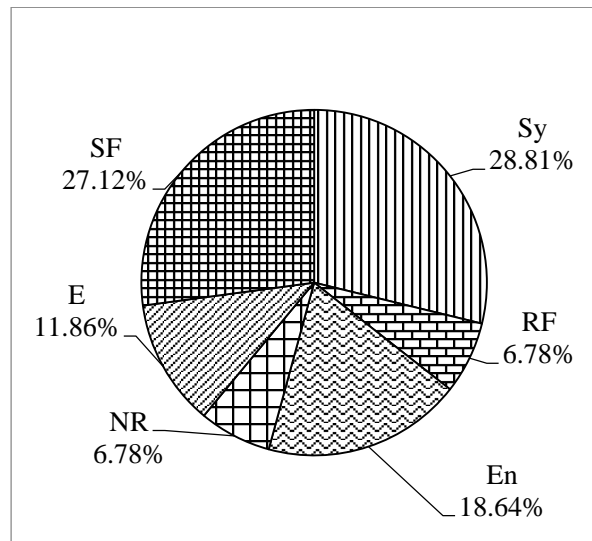


Fig. 15: Provisioning food to the macaque

Out of these 73.75% respondents (who had given any types of the foods to monkey) 28.81% respondents said that they have given food to monkey due to sympathy, 6.78% for religious faith, 18.64% for enjoyment, 6.78% respondent had no clear reason, 11.86% as means to evacuate monkey from their house/room and 27.12% for utilization of surplus food of (Fig 16).



Sy = Sympathy; RF = Religious faith; En = Enjoyment; NR = No response;
E = to evacuate monkey from their room; SF = Surplus food

Fig. 16: Reasons for provisioning

4.3.6 Macaque visitation/problematic time

Respondents were also asked questions like: at what time of day, monkeys are most active and visit their room/house or crop land". About 21.43% respondents (local people, N = 15) of these question pointed to the morning time, followed by 35.71% for day time, 28.57%

for evening and 14.29% said that monkeys were visited all time in their house or crop land (Fig 17 A).

About 28% respondents (students, lama and other people who live or occupation in monastery, N = 50) said that morning time followed by 20% day, 12% evening and 40% all time in their room or monastery area to searching the food materials (Fig 17 B).

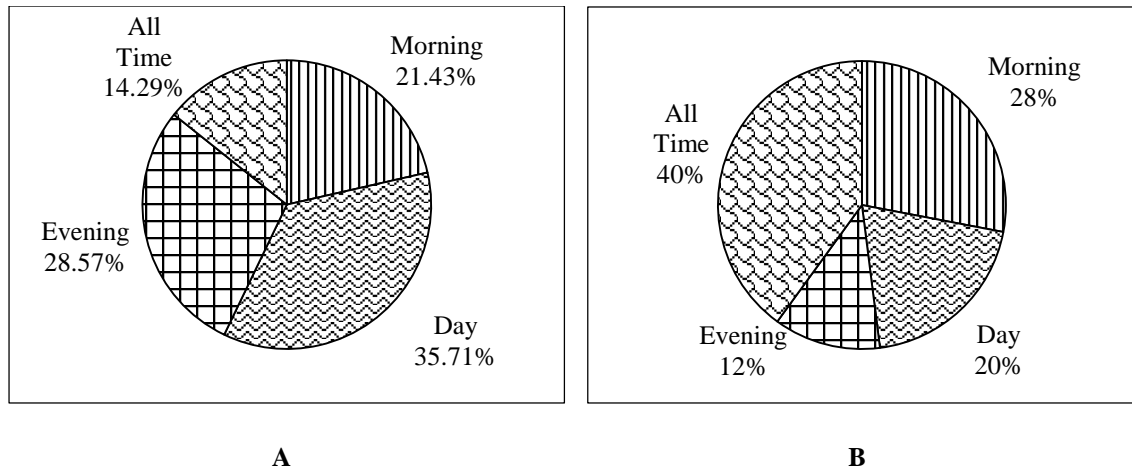


Fig. 17: Macaque visitation/problematic time, **A:** local people and **B:** monastery as well as orphanage people)

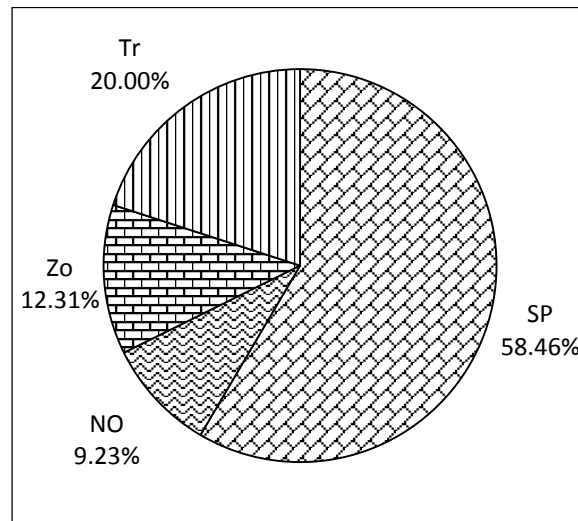
Mainly rocky area or trees were used to resting purpose by monkey. They come to the Orphanage as well as Monastery area for searching the artificial food to fulfill their diets with less efforts and energy. In this site, monkeys mainly searched artificial food rather than natural food. Thus, stealing of items is more problematic than crop raiding in this area. There was no significant difference (Chi square (χ^2) = 5.3564, d.f. = 3, p = 0.14749) in responses for this question (monkey visiting time) by the respondents who lived inside the monastery/orphanage.

4.3.7 Human perception on macaque conservation

Out of 65 respondents (except visitors) regarding the monkeys of this area, a majority of respondents (58.46%) viewed that monkeys should be protected in this area (may be due to religious faith, sympathy, utilization of the waste food material, ecosystem balance and attractiveness to tourists in this area), followed by 20% respondents to translocation them in another habitat, 12.31% respondent viewed to relocate in a Zoo or protected area and 9.23% respondents had not response (Fig 18).

Thus this indicates that many people who live or work in Yamdi clearly support that monkey should be protected in this area. However, there is no significant difference about

the perception of people of Yamdi on where monkey lies (chi-square (χ^2) = 5.1325, d.f. = 3, p = 0.16235).



SP = Should protected, NO = no response, Zo = Zoo or protected area, Tr = Translocated

Fig. 18: Respondent expression towards the conservation of macaque

4.4 Tree species in the habitat of the macaque

A total of 101 tree plants containing 23 species (Appendix: V) was counted in the habitat of the Assamese macaque in Yamdi.

5. DISSCUSION

During the preliminary survey, Rhesus macaque and Assamese macaque troops were found a few kilometers apart from each other. Accordance with the research objectives, only Assamese macaque troop was focused which found regularly and habituated with human settlements area inside the large populated city (Pokhara).

Pema Ts' Al Sakya Monastic Institute is a school for Buddhist followers. The Assamese monkeys were habituated in this area due to the urbanization as well as religious faith and abundance availability of the raw foods from monastery. People of the monastery believed that all animals, including insects can be their passed relatives or ancestors (like fathers, mothers, sisters, brothers). So people of this monastery do not want to harm or kill the animals and think of their own relatives who may have re-born in different forms of animals or insect. This is one of the main reasons people distribute the food material as well as Prasad of worship for these monkeys. Therefore, due to the abundance of food containing diet, monkeys were least observed in foraging to natural area which may alter the behaviour of the macaque.

5.1 General behaviour and diurnal activities

Response of the physical as well as habitat conditions of the animals are the behaviour which varies from habitat to habitat, depending upon the resources available in the particular area (Sarkar 2000). In case of my study, Assamese macaques were seen feeding by stealing things and 'prasad' which was offered to the god by Lama. During this study of the behaviour of the focal macaque habituated in provision habitat revealed that macaque spent more time for resting (33.58%) followed by foraging (26.11%), social (23.71%) and moving (16.60%).

Various researchers recorded following: Adhikari et al. (2018) reported that 36.96% on feeding, 30.24% on resting, 23.99% on social, 4.14% on foraging, 4.65% on moving in Ramdi; Chalise (1999) recorded 44% on foraging, 25% on walking, 13% on grooming and 18% on sitting in MBA; Bhattarai (2002) recorded 29.20% on eating, 33% on sitting, 28.2% on walking, 6.4% on grooming, 1.1% on mating, 0.71% on aggression and 0.4% on playing; Chalise (2010) recorded 43.4% on foraging, 31.7% on moving, 18.5% on sitting, 3.4% on grooming, 1.7% on stone licking, and 1.3% on troop lost in LNP; Chalise et al. (2013) recorded 46% on foraging/eating, 19% on resting, 16% on locomotion, 12% on sleeping, 6% on grooming and 1% on playing and Ghimire (2017) recorded 44% feeding, 26% on

locomotion, 19% inactive, and 11% grooming of Assamese in semi-habituated and 49% feeding, 29% locomotion, 15% inactive, 7% grooming of Rhesus monkey which were partly dependent upon provision food; Koirala (2014) reported 35.76% on feeding and foraging, 30.98% on resting, 18.45% on moving and 14.80% on social activities in semi-provisioning habitat and 41.69% on feeding and foraging, 28.49% on resting, 23.58% on moving and 6.22% on social activities in natural habitat; Chalise (2016) reported 37.86% on feeding and foraging, 30.06% on resting, 21.88% on moving and 10.18% on social activities in SNNP; Adhikari and Chalise (2014) recorded 45% on foraging, 25% on locomotion, 20% on resting and 10% on grooming in Upper Marsyangdi area, Lamjung; Paudel and Chalise (2017) recorded 47.25% on foraging, 27.25% on moving, 14% on resting and 11.5% on grooming in Kaligandaki river basin; Ghimire (2019) reported 23.41% on foraging/feeding, 27.61% on inactive, 22.9% on locomotion, 25.3% on grooming and 0.75% on fighting in Nagarjun forest, SNNP; Sarkar et al. (2012) reports 40% time for foraging and feeding purpose followed by 25% on locomotion, 13% on resting, 10% on grooming, 9% on monitoring, 1% on playing and 2% on sexual and other activities. The finding of these researches was different than this research which may be due to observing in different seasons, climatic conditions, vegetation, troop sizes, and availability of food and composition of diet in food resources in the habitat where the researches performed their corresponding observations.

Time spent on forage by the macaque can be different based on composition of the diet available in the food material because the appetite for the food varies based on the type of the food and choices of the available food. Therefore, in this study Assamese macaques spent only 26.11% time of total time for foraging in this place or provisional habitat whereas Koirala (2014) reported 35.76% on SNNP which feed on waste food from Army canteen area. This indicates that dietary level of the food found in the SNNP might be lower than the dietary level of the food that is available in this study research site (Yamdi). Also, Adhikari et al. (2018) reported feeding 36.96% and foraging 4.14%. This differing with this study research site may be due to the presence of amount of varying calories level present the provisioned food.

Macaque spends more time for resting to achieve balancing energy demand and supply for the body. So, Assamese macaque spends around one third of their total time i.e. 33.58% for the resting whereas Koirala (2014) reported 30.98% and Adhikari et al. (2018) 26.24% on resting. The discrepancy on time spend on resting on my research site and other researches

may be due to different geography as well as climatic conditions or provisioned degree. Similarly, Koirala (2014) reported 28.49% (resting) whereas Sarkar (2012) 40% (resting). These difference in resting with this research site (Yamdi) also may be macaque spending more time for foraging to fulfill their diet because natural habitat macaque cannot get more amount of energy than provisioned food.

Social tensions between the individuals of the troop have reduced due to the more social activities between them. Assamese macaque spent 23.71% time for social activities in Yamdi which is almost equal as reported (21.99%) by Adhikari et al. (2018). However, Koirala (2014) reported 14.80% for social activities in provisioned environment which is lower than this study. Furthermore, in natural habitats, Koirala (2014) reported the 6.22% for the social activities which is significantly smaller than time spent in social activities by the monkeys of the Yamdi.

The importance resources to control activities in primates were food, mates, drink and available roosting trees. Out of them, food is the most important factor which regulates day-to-day activity profiles (Sarkar et al. 2012). So, activities of the monkeys depend on the types of the habitats and availability of food and composition of diet in the food materials. The amount of time spent on locomotion of macaque is also determined mainly by the distribution of food and food plant species in the habitat and by the nature of food items (Sarkar 2000). Therefore, Assamese macaque has utilized 16.60% time on locomotion in my study. However, Adhikari et al. (2018) reported 3.65% in the Ramdi. In Hemja, macaque wanders around searching provisional food as well as food from the dustbin, room, kitchen, houses or sometimes cropland to fulfill their diet while in Ramdi, macaque does not have to forage for food in large area due to the easily availability of the waste food from dumping site. Also, Koirala (2014) reported 18.45% it is may be due to the monkey frequently visit the Army canteen area to search the food.

Diurnal activity pattern of the macaque were categorized into four shifts i.e. early morning shift (7:00-9:30), late morning shift (9:30-12:00), afternoon shift (12:00-14:30) and late afternoon shift (14:30-17:00). Diurnal activity patterns of the macaque can be different according to geographical, environmental as well as climatic condition of the different habitats. Time spent on feeding/foraging was found to be highest (35.51%) at 14:30 to 17:00 and lowest (16.09%) at 12:00 to 14:30 . Social activities observed highest (24.36%) at 12:00 to 14:30 and lowest (22.58%) at 9:30 to 12:00. Time spent on the resting was found

to be highest (44.25%) at 12:00 to 14:30 and lowest (21.82%) at 14:30 to 17:00. Similarly, Time spent on the moving found to be highest (18.49%) at 14:30 to 17:00 and lowest (15.11%) 9:30 to 12:00. Paudel (2016) reported from Kaligandaki river basin, time spent on feeding/foraging was highest during 15 pm to 18 pm i.e. 54% and lowest is during 12 pm to 15 pm. Time spent on moving was highest (33%) at 12 pm to 15 pm and lowest (22%) at 15 pm to 18 pm. Time spent on resting was highest (15%) during 9 am to 12 am and lowest (13%) at 15 pm to 18 pm. Time spent on grooming was highest (13%) at 12 am to 15 am and lowest (10%) at 15 pm to 18 pm. Koirala and Chalise (2014) reported macaque spent on feeding and foraging behaviour was highest (29%) during 12 pm to 15 pm and lower (15%) during 9 am to 12 noon. During 12 pm to 15 pm macaques spent greater percentage of time on feeding and moving behaviour so the time spent in resting and social behaviour is lowest than other period.

In Yamdi, monkeys were habituated in the monastery area and they fulfilled their diet by stealing or provisioning of surplus or wastage food, so monkeys spent more time for social activities. Due to the easy availability and composition of the diet, these monkeys spent less time for foraging compared to other studies. Due to this type of habituation their diet, home range, habitat and behaviour also greatly influenced. Behaviour of the monkeys also changed due to climatic condition, their population size and status of the particular monkey on the troop.

Behaviour of the monkeys seem like human beings and this protected species troop habituated with human along time period. Behaviour of the monkeys were found different according to the climatic as well as environmental conditions, availability of the food in habitat and diet composition in food, home range, troop size and number, competition for food and space for each other and also interaction with human beings. This focal troop had small size and there was plenty amount of diet containing in provision food. So macaque of this troop spent more time for resting compared to the foraging behaviour.

During the two different seasons i.e. spring and summer season, behaviour of the macaque was almost same. Foraging and social behaviour was slightly changed i.e. less than 1% while 3-4% change in resting and moving behaviour in spring and summer seasons. It is due to the macaque mainly focused on the provisioned food and slightly depends on the natural food, small home range and small troop size. Which reduced them competition with each other for food, space and other their necessary.

5.2 Human-monkey interaction

The troop of monkeys is likely to find in periphery of the monastery so it gets the food with less efforts. It had raided room, houses, garden and sometimes crop land, breaking or damaging the things, blocking the path to people. Bhattarai (2013) reported that 75.38% of respondent said that main problem of monkey had crop raiding followed by 12.31% in house raid, 9.23% in physical attack and 3.08% of infrastructure damage. Alelign and Yonas (2017) recorded the main problem arises by the grivet monkeys was crop damage in the field where monkey damaged around 83.8 kg/ha crop per year. Major problem of the monkey is crop raiding (Paudel 2016, Sharma and Archarya 2017). Major crop raided by monkey is maize (Chalise 2010, Rijal 2015, Poudel 2016, Adhikari et al. 2018, Ghimire and Chalise 2019).

In my study two cases of bites were found in a man and a dog and one case of injuries to a woman because of fall down due to harassment of monkeys. Ojha (1976) found 90 victims who received 104 wounds and most of the bites were during stealing of the food from house and mother monkeys protecting her infant. Deb et al. (2014) reported 35 cases of bites, where in 45.71% were women, 34.28% were children and 20% were adult males. Also 76 cases of aggressive threats with physical attacks in the form of scratching by nails, biting by their teeth, where in 48.68% were women, 30.26% were children and 21.05% were adult males. Rijal (2015) found among 230 respondents, 29% had attacks and harassments which included Snatching (19%), Nail scratch (6%), Bite (2%), stealing (2%) and 71% were threat and also during field observation 150 events of aggressive interaction by monkey where human attacks and harassment was 31% (which included Snatching (20%), Nail scratch (6%), Bite (2%), Stealing 3%) and remaining 69% were threat. Adhikari (2016) recorded two cases of bite in children and different events of injuries such as four falls down and three scratches. This reporting shows that, monkey aggressiveness towards the human is mainly due to the food and human interference of the habitats.

Sharma and Archarya (2017) reported 10% physical attack, 58.30% crop raid, 21.70% house raid, and 10% all in which five dogs were killed and locals also injured by the Rhesus monkey. Cabral et al. (2018) reported 70.39% crop damage, 34.89% infrastructure damage, 25.76% roof damage, 20.49% wounding humans/animals, 19.68% nuisance, 14% food theft and 2.64% injured monkey of the different types of conflict.

Fewer attack cases found between human and this troop because of the abundance amount of the food in provisional habitat, small size of troop, shy and timid nature of this protected species.

5.3 Human perception

Among the causes of provisioning food to the monkeys by respondent, 28.81% for sympathy, 6.78% for religious faith, 18.64% for enjoyment, 11.86% for chasing, 27.12% for surplus food and 6.78% have not given any responses and majority of people showed the positive attitude towards the macaque in my study area. It may be Buddhism beliefs of the re-birth of their past relatives in the soul of the animals. Adhikari (2016) reported the provisioning as 13% for religious faith, 14% for enjoyment, 14% for sympathy, 19% for surplus food and 40% do not give any responses in Ramdi, a Hindu religious place (Siddhababa Temple area). Due to the different religious faiths provisioning food to the macaque responses may be different.

Riley and Priston (2010) reported positive perception towards the macaque despite of their crop raiding due to the considerable tolerance of farmers. Uddin and Ahsan (2018) found that local people of Rampur village are aggressive towards monkeys for damaging their major economic crops. Due to the economic loss by raiding/damaging the crop and injuries people showed the negative attitude towards the monkeys (Medhi et al. 2007, Alelign and Yonas 2017, Sharma and Archarya 2017, Ghimirey et al. 2018).

People showed negative attitudes to the macaque due to the crop raiding, economic loss as well as conflicts between them more than the tolerance level. Due to level of tolerance and religious faith people of the Yamdi showed positive perception towards the macaque. In this study provisioning food to the macaque was in the human settlement area which changed the macaque's food, behaviour and habitat and this can further increase in future conflicts between monkeys and human.

This focal troop utilized same habitat with human. So, these monkeys help for human to know the behaviour learned by wildlife through human, to study wildlife, maintenance of the habitat as well as their crucial role for playing in pollinating flowers and dispersing the seed of fruits trees by through moving from one place to another and defecation. This permits their environment and natural habitat to continue regenerating.

6. CONCLUSION AND RECOMMENDATION

6.1 Conclusion

During field visit, Assamese macaque and Rhesus macaque were observed. General behaviour of the focal animal from focal troop revealed that Assamese macaque spent 33.58% of time in resting activities followed by 26.11% feeding or foraging, 23.71% social and 16.60% moving. The food for the macaque was acquired through the stealing and giving of the remaining extra food to monkey when they come or kept in the specific place where monkeys visited regularly. Also sometime monkeys went to the crop land near the monastery and raided crops or vegetables. Sometime visitors also provided food materials like biscuits, noodles, chocolate for fun and recreation and to take the photos with them. Diet was mainly fulfilled by provisioned food material. Thus, these Assamese macaques spend more time for resting, social activities and foraging.

Monkeys were habituated along with human for many years in this site. These monkeys have harassed to the human particularly children. People frequently get harassed due to the presence of food with them. Different types of problems like snatching and taking food, clothes, utensils, blocking path as well as harassment to the children in monastery and orphanage and local people were observed. Because of the provisioning as well as supplementary food in the monastery, it may have drastically altered macaque's behaviour to increased aggressive level.

Since they found supplementary food in the monastery area, they liked to stay in that monastery rather than in the jungle. They were seen lazy to search the natural food. They were observed raiding the plants and flowers of the monastery area. So, the people were found chasing the monkeys (by shouting, beating them with stick, ringing bell).

Due to the religious belief, love and sympathy, enjoyment while watching monkeys in the human habituation area and tolerance of the disturbance people of this area still have positive attitudes towards these monkeys.

6.2 Recommendation

This study was carried on monastery area, one of the religious places of Yamdi. Assamese monkey of this area share habitat with human. They fulfilled their diet by stealing and people's intentional feeding to these monkeys. On the basis to the finding of this study, following recommendation can be made to protect the population Assamese macaque in Yamdi:

- Provision of food should be avoided.
- Conduction of aware-ration program about the conservation of the Assamese macaque to the local people and implementation of conservation plan.

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PHOTOPLATES

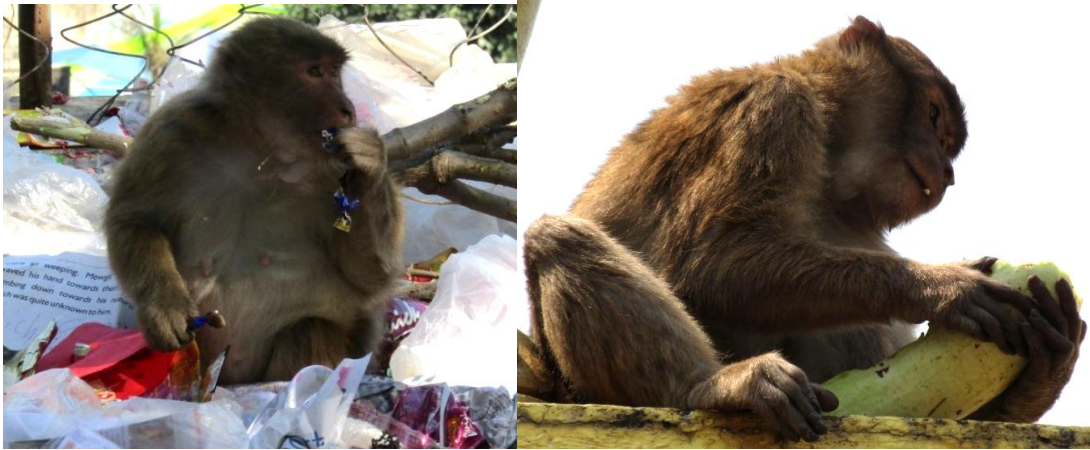


Photo - 1 Eating the chocolate (i) and bottle gourd (ii)



Photo - 2 Eating the provision noodle

Photo - 3 Killing bird like to nuisance of monkey



Photo - 4 Testing the lizard

Photo - 5 Sleeping



Photo - 6 Maize comb raiding



Photo - 7 Sipping and drinking water from ground (i) and tap (ii)



Photo - 8 Taking prasad

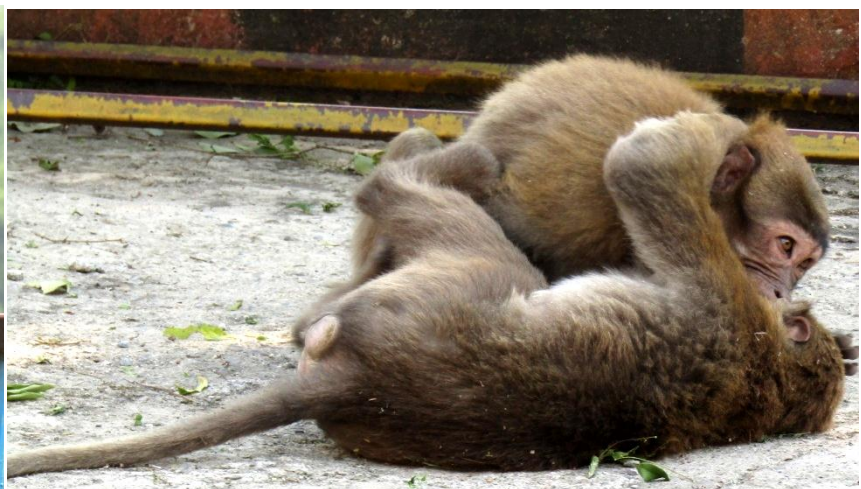


Photo - 9 Rough playing



Photo - 10 Resting



Photo - 11 Snatching food from cup



Photo - 12 Infant died after birth



Photo - 13 Macaque in the roof



Photo - 14 Grooming between the same claw



Photo - 15 Sliding the window to steel food



Photo - 16 Playing with jacket



Photo - 17 Obstructing the path



Photo - 18 Human-macaque interaction



Photo - 19 Drinking residue of juice



Photo - 20 Searching the food from dustbin



Photo - 21 Moving

APPENDICES

Appendix I: Data sheet to record the behaviour of Assamese macaque.

Sheet No.:

Date:

Location of the study area:

GPS location:

S.N.	Time	Behaviour of Assamese macaque				Remarks
		Foraging	Social	Resting	Moving	

Appendix II: Survey questionnaires on human perception on Assamese macaque.

1. (Monastery/Orphanage)

Interview No:

Date:

A. Personal information

Name:

Sex:

Age: a. 10-19

b. 20-29

c. 30-39

d. 40-49

e. 50-5

f. 60-69

g. 70 above

Address:

Education:

Occupation:

How long time have you live here?

B. General knowledge about monkey

1. Do you believe monkeys are god?

a. Yes

b. No

c. Not sure

2. Which types of monkey can be found in this area?

a. Rhesus monkey b. Assamese monkey c. Hanuman monkey e. No idea

3. Do you have any problem from monkeys? a. Yes b. No

If yes, what kind of problem do you have?

a. Stolen food materials b. Harassment c. Stolen clothes d. Disturbing during class

e. Stolen utensils f. Others.....

4. In which time monkey mostly visited in this area?

a. Morning b. Afternoon c. Evening d. Any time

5. Are you provide food to the monkey? a. Yes b. No

If Yes, what?

What is the reason for provisioning food to the monkey?

- a. Sympathy b. Religious faith c. Enjoyment d. Chasing e. Surplus food
- f. No idea

6. Are ban visitors allowed to give food to the monkeys?

- a. Yes b. No

If no, mostly given food

7. Do you know conflict between the visitors and the monkeys in this area?

.....

...

8. When monkeys comes in your room or near you, what you usually do?

- a. Chasing with stone/stick b. Neutral c. Give food d. Shouting and following
- e. Others

9. Are monkeys are aggressive towards you?

- a. Yes b. No

If Yes, condition

- a. Given food b. Playing c. Walking d. Chasing them
- d. Disturbing their activities e. Bag/food taken in the hand f. Surplus material kept in specific place g. Others

10. For whom mostly monkey attack?

- a. Children b. Male c. Female d. Do not sure e. No idea

11. What types of the conflict found in this area?

- a. Stolen food material b. Stolen clothes c. Harassment d. Disturbing during class
- f. Stolen utensils g. Others

12. Do you chase monkeys? a. Yes b. No

13. What types of techniques do you apply while chasing?

- a. Shouting and following b. Chasing with stones/stick
- c. Ringing bell e. Given food material in specific place f. Others

14. Were there attack by the monkeys? a. Yes b. No

If Yes, where, when and whom,

15. What would be the main cause of the conflict?

- a. Scarcity of food in forest b. Population increasing c. Habitat loss d.
- Presence of preferred food e. Other

16. Is there any change in monkeys' number compared to past?

- a. Increasing b. Decreasing c. No idea

If increasing or decreasing what could be the reason?

- a. Electricity b. Killed c. Food availability d. People awareness
- e. Don't know f. Others.....

17. Have you known/seen the death of monkey in last 2 years? a. Yes b. No

If Yes, How

18. To decrease the conflict of the monkeys, which process are you using?

- a. Shouting and following b. Chasing with stones/stick c. Dog
- d. Ringing bell e. Given food material in specific place f. Others

19. Have you seen anybody gives punishment/killing of the monkeys in this site?

- a. Yes b. No

If Yes, specify

20. In your opinion, are monkeys beneficial or harmful?

- a. Beneficial b. Harmful c. Both d. Neither e. Donot know

If beneficial/harmful, Why?

.....

21. Do you think monkeys should be conserved?

- a. Yes b. No c. Not sure d. Other

If yes or no, Specify.....

22. What do you think about the wildlife of this place?

- a. Should be protected b. Translocated c. Killed d. Others

23. How can we conserve monkeys?

- a. Increasing conservation awareness b. Habitat conservation effort
- c. increase food availability d. Others

Additional comments:

2. Visitors

Interview No:

Date:

A. Personal information

Name:

Age: a. 10-19 b. 20-29 c. 30-39 d. 40-49 e. 50-59 f. 60-69 g. 70
above

Address:

Education:

Occupation:

B. General knowledge about monkey

1. Do you believe monkeys are god?

a. Yes b. No c. Not sure d. No idea

2. How many times do you visit here in last month?

3. During visiting you see monkey? a. Yes b. No

If Yes, in your view which monkey is this?

a. Rhesus monkey b. Assamese monkey c. Hanuman monkey d. No idea

4. During your visit, were monkeys are aggressive towards you? a. Yes b. No

If Yes, causes of aggression

5. Did monkey steal your things? a. Yes b. No

If Yes; what, if you found that things?

6. Are you give food to the monkey? a. Yes b. No

If Yes, what

What is the reason for provisioning food to the monkey?

a. Sympathy b. Religious faith c. Enjoyment

d. Chasing e. Surplus food f. No idea

7. Are monkeys beneficial or harmful?

a. Beneficial b. Harmful c. Both d. Neither e. Donot know

If beneficial/harmful, what could be the reason?

.....

8. Do you think monkey should be conserved? a. Yes b. No c. Not sure
d. Other

if yes/no why?.....

9. What do you think about the wildlife of this place?

a. Should protected b. Translocated c. Killed d. Others

10. How can we conserve monkeys?

a. Increasing conservation awareness b. Habitat conservation effort
c. increase food availability d. others

3. Local People

Interview No:

Date: z

A. Personal Information

Name:

Sex:

Age: a. 10-19 b. 20-29 c. 30-39 d. 40-49 e. 50-59 f. 60-69 g. 70 above

Address:

Education:

Occupation:

How many members are there in your family?

How much land do you own?

Khet..... Bari..... Pakho

B. General knowledge about monkey

1. Do you believe monkeys are god?

a. Yes b. No c. Not sure d. No idea

2. Which monkey is found in this area?

a. Rhesus monkey b. Assamese monkey c. Hanuman monkey d. No idea

3. Which time monkey mostly visited/raided crop in this area?

a. Morning b. Afternoon c. Evening d. Any time e. Not sure

4. Are you give food to the monkey? a. Yes b. No

If Yes, what

What are the reasons for provisioning food to the monkey?

- a. Sympathy b. Religious faith c. Enjoyment d. Chasing e. Surplus food
 f. No idea

5. Do animals or birds damage your crops? a. Yes b. No If Yes, Name:

6. Does a monkey raid your crops? a. Yes b. No

7. Do you have any problems from monkeys? a. Yes b. No

If yes what kind of problem do you have?

- a. Crop damage b. Harassment c. Both a and b d. Stolen food/utensils/clothes e. others

8. Which crops were cultivated in your land?

9. Your land is bared or not? a. Yes b. No

If yes, why?, what types of land?

10. Was crop raided by monkey? a. Yes b. No

If yes, which is the main raided crop?

11. What were the crops that you cultivated last year? How much land was used for each crop? What was the yield of each crop? How much crop was damaged by monkey?

S.N.	Crop Cultivate	Land used	Total yield when no damage	Area damaged	Amount damaged	Remarks

12. Which crop is destroyed by the monkey?

Crop	Stage	Part	Amount	Quantity

13. Are monkeys selective on crop? If yes what type of crop do they prefer most?

.....

14. Do you chase monkeys from your field? a. Yes b. No

What types of techniques do you apply?

- a. Shouting and following b. Chasing with stones/stick c. Shouting
d. Hitting tin/boxes e. Given food material in specific place f. Others

15. Do you know any attack of the monkey in this area? a. Yes b. No

If yes, where, when and whom

16. What would be the cause of the conflicts?

- a. Scarcity of food in forest b. Population increasing c. Habitat loss
d. Presence of preferred food e. Other

17. Is there any change in monkey number compared to past?

- a. Increasing b. Decreasing c. No idea

If increasing or decreasing what could be the reason?

- a. Electricity b. Killed c. Food availability d. People awareness
e. Don't know f. If others.....

18. Have you known/seen the death of monkey in last 2 years? a. Yes b. No

If Yes, How

19. Did you punished/killed a monkey? a. Yes b. No

If Yes,

20. Are monkeys beneficial or harmful?

- a. Beneficial b. Harmful c. Both d. Neither e. Donot know

If beneficial (harmful), what could be the benefits (harms) of having monkeys?

.....

21. What do you think about the monkeys of this place?

- a. Should protected b. Translocated c. Killed d. Others

22. Do you think monkeys should be conserved? a. Yes b. No c. Not sure
d. Other

if yes or no why?.....

23. How can we conserve monkeys?

- a. Increasing conservation awareness b. Habitat conservation effort
c. increase food availability d. Others

Appendix III: Socio-economic profiles (in percentages) of the respondents in relation to gender, age, religion and occupation.

Category		Number	%
Gender	Male	55	68.75
	Female	25	31.25
Age	10-20	28	35
	20-30	18	22.5
	30-40	7	8.75
	40-50	11	13.75
	50-60	6	7.5
	60-70	4	5
	70+	6	7.5
Religion	Hindu	32	40
	Buddhist	48	60
Occupation	Farmer	4	5
	Teacher	12	15
	Student	44	55
	Shopkeeper	4	5
	Other	16	20

Appendix IV: Record of temperature, humidity and rainfall from Malepatan station 2019.

Months	Average Temperature (°C)		Total Rainfall (mm)	Relative Humidity	
	Maximum	Minimum		At 3	At 12
January	20.19	3.59	40.2	78.12	58.55
February	21.86	7.55	85.4	77.89	61.81
March	26.28	9.89	95	61.51	57.08
April	29.07	14.68	190.6	69.44	72.17
May	31.46	15.54	376.8	63.53	73.46
June	32.36	18.96	586.8	72.41	75.01
July	31.82	20.37	828.2	79.29	76.21



Appendix V: Tree species found in habitat of monkey in Yamdi.

S.N.	Common Name	Scientific Name	Number
1	Pipal	<i>Ficus religiosa</i>	1
2	Parijat	<i>Nyctanthes arbor-tristis</i>	1
3	Aaru	<i>Prunus persica</i>	2
4	Belauti	<i>Psidium guajava</i>	1
5	Salla	<i>Pinus wallichiana</i>	2
6	Simal	<i>Bombax ceiba</i>	3
7	Badahar	<i>Artocarpus lacucha</i>	2
8	Khanayo	<i>F. semicordata</i>	10
9	Kapur	<i>Dryobalanops aromatica</i>	11
10	Pakhuri	<i>Ficus glaberima</i>	2
11	Sissau	<i>Dalbergia sissoo</i>	22
12	Utis	<i>Alnus nepalensis</i>	8
13	Tejpatta	<i>Cinnamomum tamala</i>	1
14	Faledo	<i>Erayar vnaula</i>	3
15	Ginderi	<i>Premna integrifolia</i>	1
16	Dabdabe	<i>Garuga pinnata</i>	5
17	Khirro	<i>Sapium insigne</i>	12
18	Thotne	<i>F. hispida</i>	2
19	Tooni	<i>Toona ciliate</i>	1
20	Monkey puzzle tree	<i>Araucaria araucana</i>	2
21	Painyu	<i>Prunus cerasoides</i>	2
22	Khair	<i>Acacia catechu</i>	1
23	Unknown 1		2
24	Unknown 2		1
23	Unknown 3		3
Total			101

POSTER PRESENTATION

GENERAL BEHAVIOUR AND HUMAN PERCEPTION TOWARDS THE ASSAMESE MONKEY (*Macaca assamensis* McClelland, 1840) IN HEMJA, KASKI, NEPAL

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Abstract: Assamese macaque (*Macaca assamensis*) is one of the least studied mammals in Nepal. This study is focused on Assamese macaque, to explore the general behaviour and human perception towards it in Hemja, Kaski district of Nepal. Focal animal sampling was used for the behavioural observation and semi-structured questionnaires to find the people perception towards them. Six individuals from an Assamese troop containing 12 individual in the provision habitat of monastery area of Yamdi were selected focal animal for the study. During 300 hours observation period main four behaviour were recorded and it reveals that macaque spent 33.58% time on resting followed by 26.11%, 23.71% and 16.60% on foraging, social and moving. There were significant difference ($\chi^2=7.24$, $df=1$, $p=0.0071$) of the between people inside and outside monastery who provide or not food to the macaque (N=80). Much of the people of monastery and local (58.46%, N=65) revealed that macaque should be conserved in this habituated habitat. In overall, people had positive attitude towards the macaque due to the religious faith as well as tolerance of the stealing things and destruction. Home range, diet and behaviour of the macaque were changed due to habituated in human area with stealing and obtaining the provision food.

Key words: Assamese macaque, Behaviour, Provisioning, Yamdi, Nepal.

Background

Assamese macaque found in the mountains and hills along the Himalayas. In Nepal, they are recorded from 130 m to 2650 m as in Langtang (Khanal et al. 2019) and also reported from the mid-hills with in Nepal as a sub-tropical habitat (Wada 2005, Chalise 1999, 2008, 2013, Chalise et al. 2005). It is listed as Near threatened by the IUCN (Boonratana et al. 2008) and Nationally as Endangered and only one of the primate species protected by the National Park and Wildlife Protection Act 1973 of Nepal (Boonratana et al. 2008; Chalise 2013, Chalise et al. 2013). They are shy, timid and less aggressive towards the human beings to comparison to rhesus macaque. They are arboreal, terrestrial and omnivorous animals with multi-male and multi-female social troops (Chalise 2011).

Objectives

General objectives of present study is to assessing general behaviour and human perception towards the Assamese monkeys in Hemja, Kaski, Nepal. Specific objective include:
 ✓ To study the general diurnal behavior of Assamese Monkey in Hemja.
 ✓ To explore the human perception towards the monkey in the study area.

Materials and Methods

Study area
 ✓ 28.28°N and 83.92°E
 ✓ Pokhara Metropolitan City; 25
 ✓ Southern boarder of Annapurna Conservation Area
 ✓ Gandaki Province

Data collection
 ✓ From January 2019 to July 2019
 ✓ An Ethogram based characters
 ✓ Focal animal sampling
 ✓ Ad-libitum sampling
 ✓ Questionnaires survey

Focal animals

S.N.	Category	Distinguishing Characteristics
1.	Adult female (F1)	Back of left part hair is absence may be during fighting and presence fat in the belly region
2.	Adult female (F2)	Absence of fat in belly region and size is small comparatively (F1)
3.	Adult male (M1)	Body maturity as well as large and hanging scrotal sac
4.	Sub-adult female (S1)	Tail is small due to accident
5.	Sub-adult male (M2)	Comparatively size is more than M1
6.	Sub-adult male (M3)	Comparatively size is less than M2 and like his head covered during NPT/monsoon situation.

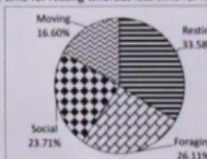
Data analysis
 ✓ Pie-chart and bar diagram
 ✓ χ^2 test for behaviour of the different time phase and to find perception of the people, $\alpha=0.05$

Results


Population status

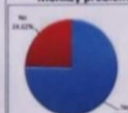
Population of Assamese macaque					
Adult		Sub-adult		Juvenile	Infant
Male	Female	Male	Female		
1	3	2	1	3	2
Total: 12					

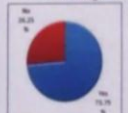
General behaviour
 Three male and three female were selected from semi-habituated troop for focal animal. During 300 hours of observation behaviour of the macaque were done from 7:00 – 17:00. Focal animal revealed macaque spent more time for resting whereas less time for moving.



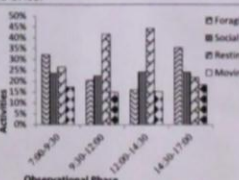
Ad-libitum sampling
 Some behaviour thieving things like clothes (Photo 6), utensils, birding was killed due to nuisance of monkey (Photo 7), detection of edible food through testing like lizard (Photo 8) were observed.

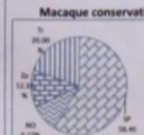


Monkey problem


Provisioning food


Diurnal activity pattern
 Observation schedule divided into four shift i.e. early morning shift: 7:00-9:30; late morning shift: 9:30-12:00; afternoon shift: 12:00-14:30 and late afternoon shift: 14:30-17:00.



Macaque conservation


Conclusion
 Macaque spent more time for resting and less in moving due to the provisioning food. There were significant difference between the different time shift and foraging or resting and vice-versa in the moving. People had positive attitude towards the monkey due to the religious belief, love and sympathy towards the monkey, enjoyment towards the monkey in the study area and tolerance of the disturbance.

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