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Conservation and threat to selected monkey species in Nepal compared to selected species in Tanzania

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Declaration

I, Karun Baral, declare that this thesis is a result of my research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been included. This work has not been previously submitted to any other university for award of any type of academic degree.

Signature.....

Date.....

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Acronyms

AWA	Animal Welfare Act
CHIMP	Chimpanzee Health Improvement, Maintenance and Protection
CITES	Convention on International Trade in Endangered Species
DNPWC	Department of National Parks and Wildlife Conservation
EIA	Environmental Impact Assessment
GACF	Great Ape Conservation Fund
HMG	His Majesty's Government
IUCN	International Union for the Conservation of Nature
JGI	Jane Goodall Institute
MNRT	Ministry of Natural Resources and Tourism
NCS	Nepal Conservation Strategy
NPWC	National Parks and Wildlife Conservation
NPWCA	National Parks and Wildlife Conservation Act
PA	Protected Area
PHVA	Population Habitat Viability Assessment
SLC	School Leaving Certificate
TANAPA	Tanzania National Parks
UNEP	United Nations Environment Programme
VDC	Village Development Committee
WPA	Wildlife Protection Act
WRI	World Resources Institute

Abstract

Nonhuman primates are special as they are similar to humans genetically and behaviorally. They are ecologically important species for maintaining a healthy forest ecosystem. According to IUCN, more than a third of world's primate species are threatened or critically endangered. Monkeys and Apes are flagship species for conservation and different nations have different traditions and approaches to this. Tanzania has a long-standing tradition for conservation of monkeys and apes. A coherent conservation strategy for monkeys in Nepal seems to be absent. The conservation study with focus on the attitude of locals towards these primates has been a focus point for my study. This study also aims to make a comparative analysis of the primates Rhesus and Langur of Nepal and Red Colobus and Chimpanzee of Tanzania in relation to their habitat and conservation management strategies along with park-people conflicts. Sampling sites were selected based on presence of forest inhabited by primates and with a buffer zone with possibility of experiencing human-nonhuman primate conflict. The monkeys in Tanzania are more studied and effective conservation actions are in practice. Monkeys seem to adjust living alongside human settlement and are thus thriving easily in Nepal. As observed in my study, large numbers of rhesus troops thrive in completely urban areas where the natural food is scarce and they have adapted to live alongside humans. About 75% of the people with higher education and the similar percentage (72 %) of people who can simply read and write were against the hunting and live capture of monkeys. But, if human encroachment continues at the same alarming rate alongside the lack of proper research and prevention of possible disease transfer in addition to lacking conservation measures for primates, the future survival of healthy urban monkeys is in jeopardy. Primates, as generally considered pest species in crop raid areas, as well as urban areas, of Nepal seem to lack proper attention in conservation in Nepal as compared to Tanzania. Because monkeys have negative effect on their agriculture, local people are not much in favor of conserving them. It has been observed that the monkeys in Tanzania are more studied and that there are effective conservation tools present, which could possibly be useful for a better primate conservation strategy in Nepal.

1. Introduction

Monkeys and apes are fascinating animals, not the least because much of their behavior resembles our own. They may also get in close contact with people in some areas and some of the species are endangered. In my home country, Nepal, both of these aspects are present. However, a coherent conservation strategy for monkeys in Nepal seems to be absent. I have therefore decided to compare strategies and selected species conservation between Nepal and Tanzania. This is because Tanzania has a long-standing tradition for conservation of monkeys and apes. People and non-human primates have lived in close association in most primate ranges for thousands of years (Hill, 2002). The direct and close interaction between monkeys and humans is common in urban areas of Nepal although monkeys can be found in hilly regions and lowlands of Nepal where they are predominantly living in their natural habitat. Monkeys are generally taken as a 'pests' in Nepal because of their crop raiding behavior (Chalise, 2001). Tanzania, on the other hand has a wider variety of monkey species, as well as apes that do not occur in Nepal. Their ecology, as well as their threats in vicinity of conservation areas provide an example of protection of group. Chimpanze, particularly in Gombe National Park and Mahale mountains national park in Tanzania has been a study species for several researchers. A number of facts including their behavior, ecology and diseases have been studied. Zanzibar Red Colobus monkeys live in close contact with humans (Siex and Struhsaker, 1999). Hunting, poaching and close interaction are reported on these frequently studied primates (Struhsaker, 2005). On the contrary, hanuman langurs found in lowland Terai of Nepal and the common rhesus are relatively less studied primates. Rhesus and langur monkeys are abundant and frequent crop raiders in most part of Nepal and are of less conservation importance. The attitude of locals towards these primates has been the focus of my study. The idea of making a comparative study of Tanzania and Nepal in relation to the habitat and national policies could give suggestive lessons to be learnt for primate conservation in Nepal. Hence, it seemed a very good opportunity to study the contrast scenario of primates in Tanzania and Nepal. This study could give opportunity to contribute with suggestions towards a better primate conservation in Nepal.

Several studies have revealed that non-human primates, like human infants possess a number of remarkable cognitive capacities. Lemurs (*Eulemur mongoz*) can add and subtract small numbers of objects (Lewis et al., 2005). Tamarins (*Saguinus oedipus*) have been reported of abilities to track statistics in speech streams (Hauser et al., 2001; Newport et al., 2004) and learn rudimentary grammatical rules (Hauser, Weiss & Marcus, 2002). Rhesus monkeys (*Macaca mulatta* Zimmermann, 1780) can make precise physical predictions about object motion (Santos & Hauser, 2002) and understand some of the physics behind simple tools (e.g. Santos et al., 2004).

Among the non-human primates, only three species are reported from Nepal (Chalise, 1999). The rhesus macaque is found freely ranging in the wild, as well as in urban religious forested areas. The Himalayan Langur (*Semnopithecus (Presbytis) entellus* Dufresne, 1797) is found freely ranging in wild forest and marginal areas. These two species are common and widely distributed from tropical *(Terai)* to sub-alpine (high mountains up to 3,758m) regions of Nepal (Southwick et al. 1982; Bishop, 1979). The Assamese macaque (*Macaca assamensis)* is reported from mid-hill and high montane forest but its ecological and behavioral details are still poorly known (Jackson, 1990 as cited by Chalise, 1999).

Primates are one of the most studied groups of mammals in Tanzania. Though the taxonomic status of some of Tanzania's primates is still under debate, it is mentioned that Tanzania holds 14 genera, 28 species and 28 subspecies of primates (Butynski and Perkin, 2011).

2. Research Objectives

The main goal of this study is to get insight into the habitat requirement and distribution of primates in Nepal and gather information about the prevalent reasons for primate population status of these monkey species in their potential habitats. This study also aims to make a comparative analysis of the primates Rhesus of Nepal and Red Colobus and Chimpanzee of Tanzania in relation to their habitat and conservation management strategies along with park-people conflicts. The conservation aspects and threats to these primates are also

highlighted. In order to achieve these goals, following are the objectives and issues raised.

- To study the habitats of primates in Kathmandu (close to human civilization) and compare with their natural habitat (Park buffer zone).

- To make a comparative study of national level policies and management strategies relating to primate conservation in Nepal and Tanzania.

- To study the human-primate conflict associated with primates (The impact and type of interaction between primate species and humans).

- To study the attitude of locals towards the conservation of primates in Nepal.

- To get an impression, based on literature, of the trend of primate populations and estimate their future in Nepal and Tanzania.

3. Limitations of the study

The field study was conducted in a rather short time of almost five weeks. It was only possible to do field work in Nepal and not in both countries. The time was not sufficient enough to gather more data in terms of interviews in local communities or to conduct a more elaborate behavioral study of monkeys in their natural habitat and urban habitat with direct human interaction. Most of the respondents were busy at their work and were not willing to talk to strangers. My study was did not seem to benefit them, so they were not interested and did not talk openly while giving answers. Financial limitation was another reason why the study could not be carried out in several different locations.

4. Literature review

4.1 International Union for Conservation of Nature (IUCN)

IUCN is an international organization dedicated to finding "pragmatic solution to our most pressing environment and development challenges (IUCN). The organization lists out the IUCN red list of threatened species, which assesses the conservation of species (cbsnews, 2007). It was established with a vision that is a just world that assists societies throughout the world to conserve the integrity and diversity of nature and to assure that any use of natural resources is ecologically sustainable (IUCN). The IUCN Red List of threatened species is the most comprehensive source of information that illustrates global conservation status of plants and animals (Rodrigues et al., 2006).

4.2 Protection status of selected monkey species under IUCN

4.2.1 Chimpanzee

Although Chimpanzee, *Pan troglodytes* have four sub species identified as *P. t ellioti, P. t troglodytes, P. t schweinfurtii and P. t verus,* Fischer et al., 2006 argues that differences between chimpanzee populations are too small to warrant sub-specific designations. Chimpanzees are considered the most abundant and widespread of the apes with many populations in protected areas. However, the declines that have occurred are expected to continue and are therefore ranked Endangered in IUCN red list (Oates, 2006) and the population trend is found to be decreasing. Habitat destruction, poaching and diseases are considered major culprits of chimpanzee population decline.

4.2.2 Red Colobus Monkey

Procolobus kirki, the Zanzibar red colobus, is listed as Endangered as this species has an extent of occurrence only on the Zanzibar islands, where there is severe

fragmentation and continuing decline in area of occupancy habitat, and the number of mature individuals. Because of severe threat by habitat destruction resulting from timber felling, charcoal production, clearance for cultivation and brush burning, the population of Zanzibar red colobus is in decreasing trend. Hunting for food, sport or as a supposed crop pest, though habitat loss remains the most serious threat (Siex, 2003).

4.2.3 Hanuman Langur

The northern plain gray langur, *Semnopithecus entellus* commonly known as hanuman langur is listed as Least Concern in the IUCN red list of endangered species in view of its wide distribution, tolerance of a broad range of habitats and is because it is unlikely to be declining fast enough to qualify for listing in a more threatened category. The total existing population is still unknown for this species. Most of the populations occupy human-dominated landscapes, with few occurring in forested areas. Conflict with humans is a major cause of concern and predicted decline are highly based on this. These terrestrial, foliovorous and diurnal (Molur et al. 2003) primates are threatened mainly by intensive agriculture, habitat loss, human-wildlife conflict and fires. Hunting for food by newly settled human populations in some parts of India is considered very rampant and many populations are affected locally (Molur et al., 2003). The trend of this species is decreasing (IUCN Red list).

4.2.4 Rhesus Monkey

Macaca mulatta, commonly known as rhesus macaques are also listed as Least Concern species in IUCN Red list. They have a wide distribution range, thrive across a broad range of habitats, are less likely to be declining at anything close to the rate required to qualify for listing in threatened category. The population trend of these is Unknown according to IUCN and is considered unthreatened, though the original habitat of these species is increasingly being lost for human settlement. Molur et al., (2003) argues that rhesus monkeys exists easily around humans, has been associated with decreasing levels of human tolerance. A localized threat, considerable for certain areas could be confiscation for

laboratory testing. Another major threat to wild macaques is capture and release of laboratory and 'pest monkeys' (IUCN Red list).

4.3 National parks and reserves

The rational behind establishing protected parks or reserves is critical to the protection of a country's biological diversity (WRI/IUCN/UNEP, 1992). National parks and reserves generally carry one common goal- to conserve biodiversity in their natural habitat so as to protect them and to get benefit from them in a sustainable way alongside. They have economic, scientific and aesthetic/recreational values. National Park system includes three major areas, natural, recreational and historic, and the administrative guidelines for the natural areas emphasize the protection of ecosystem in the following terms:

1. Safeguarding forests, wildlife and natural features against impairment or destruction.
2. The application of ecological management techniques to naturalize the unnatural influences of man, this permitting the natural environment to be maintained essentially by nature.
3. Master planning for the appropriate allocation of land for various purposes in a park and location of use-areas as needed for development (Shrestha, 2003).

Such a system can be best achieved by using a formal plan that identifies the components to be protected (Shater, 1999). The preservation of entire ecosystem and their processes is compatible with scientific research, education, passive recreation, some form of resource utilization (Agee & Johnson, 1988) where management objectives depend on degree of human intervention (Commission of Natural Parks and Protective areas and World Conservation Monitoring Center, 1994). The National Park and Wildlife Department of Nepal is responsible for effective conservation management of Nepal's valuable assets, the fast disappearing wildlife resources and the habitats and at the same time play a valuable part in the development of Nepal's growing, economically important, wilderness oriented tourism

industry without changing the country's natural environment. The third objective is to create National Parks and Reserves for safeguarding the threatened wildlife (Shrestha, 2003).

4.4 Crop raiding by Primates

Humans and primates have been interacting for centuries (Sponsel et al., 2002). Human-wildlife interaction is considered as a major issue in conservation (IUCN 2005). Crop damage is an increasing source of economic loss and local frustration in subsistence agriculture settings and also promotes negative attitudes towards species of conservation value. Mainly in African and Asian reserves' primates are responsible for a huge amount of crop damage with up to 70% of measured crop damage events (Naughton et al., 1998b). Baboons are the most common crop raiders as they forage frequently year round on crops. Crop raiding by primates is not a new phenomenon (Hill, 2000) as certain primate species are very successful crop raiders. Studies reveal the co-operative behavior, opportunistic lifestyle and non-specialized omnivorous diet facilitate primates like baboons, macaques (Pirta et al., 1997) to become highly adaptable and live alongside humans in rural and in some cases urban and semi urban areas (Hill, 2000). Else, 1991 suggest that the highly adaptable nature along with their ability to learn very quickly and change their behavior accordingly, makes baboons very successful and potentially troublesome when living close to humans. In addition, baboons raid a large amount of crops locally more frequently compared to other raiders. They often destroy crops that they don't actually feed on which may seriously affect farmer's livelihoods (Hill, 2000). Chimpanzee foraging on a field of ripe maize, for example pushes the survival of these endangered species at risk and at the same time the livelihoods of poor farmer. In Asian and African countries with primates, crop raiding is very common along the periphery of sanctuaries and parks (Chhangani and Mohnot, 2004). Sekhar, 1998 believes that cropping patterns, wildlife population density and behavior, and availability of food in wild habitat have effect on the extent of damage. Hanuman langurs in some parts of India obtain as much as 90% of food

from cultivated plants (Yoshiba, 1968 as cited by Oppenheimer, 1977). In addition to eating fruits, they also destroy flowers and fruits that they don't eat (Chhangani and Mohnot, 2004). Their study also indicated the farms located adjacent to sanctuary boundary and farms with poor crop protection strategies are at risk and suffer more loss. Langurs, causing severe damage to crops in Sri Lanka are occasionally killed as crop raiders (Muckenhirn, 1972 cited by Bishop, 1979). But in India people usually do not kill langurs mainly because of religious sentiments besides the Wildlife Protection Act, 1977 as these monkeys are considered to be the monkey-god –Hanuman (Roonwal and Mohnot, 1977). But, farmers threaten crop raiding hanuman langurs by throwing stones at them, whistling, shouting at them and using firecrackers to scare them out of the field (Chhangani and Mohnot, 2004). Because of their opportunism, intelligence, adaptability and manipulative abilities, many primate species easily turn to crop foraging and become formidable crop raiders (Lee and Priston, 2005). Naughton et al., believes that crop raiding is variable in intensity and difficult to measure, which is also site specific. In Tanzania, there are a growing number of complaints about red colobus raiding and consuming coconut buds in agricultural areas and requests by local farmers for compensation and/or removal of the colobus (Siex and Struhsaker, 1999). In Nepal, all monkey species available: Rhesus macaque, Hanuman langurs and Assamese macaques are reported as crop raiders among which crop raiding is commonly reported for Assamese macaques and Rhesus which have a significant economic impact on farmers in the highlands.

Crop raiding by primates is an issue that is likely to become a concern for conservationists and conservation in the future (Hill, 2000). In many parts of Africa, farmers have hunted and trapped wildlife coming to their fields, that helps them to reduce local pest species population in the fields (Vansina, 1990). The long tem survival of primates is at risk from the low human tolerance for 'pests' and encroachment into their habitats (Altmann and Muruthi, 1988 cited by Marchal & Hill, (2009). Tweheyo et al. (2005) saw a need of an integral approach involving the local people for conservation of primates in areas where crop raiding problem is high, because they are directly affected by living alongside wildlife.

4.5 Park-people conflict

Habitat loss is a major threat for wildlife and primates are no exception. Lack of sufficient food in their natural habitat and human encroachment in the forest to develop agricultural lands lead to crop raiding. The protection of wildlife inside the parks and reserves has in some areas, serious implications for nearby settlements and communities; each year, local communities suffer human fatalities, loss of livestock and destruction of crops as a result of devastating wildlife; furthermore, for many villagers, the only accessible source of firewood, wild vegetables, medicinal plants and construction materials is within the parks, but to enter the parks means breaking the law and facing extreme danger from the protected wildlife (Shrestha, 2003). The conflict between human and wildlife is driven commonly by crop raiding which influences local people's perception and support for conservation action (Conover and Decker, 1991). Crop damage by wildlife may have numerous impacts on farming households that include high guarding investment, disruption of schooling for children who need to help in guarding fields and increased risk of injury from wildlife attacks along with risks of disease transfer (Hill, 2004). Primates are viewed as sacred in some contexts (e.g, hindus of Bhutan, India, Nepal) whereas in other countries such as in China and Japan, they are considered as cunning and devious creatures. While most of the world's subsistence farmers living in close proximity with monkeys and apes take them as pests and as such people worshipping them in temples might be killing them in the farms (Lee and Priston, 2005). The rhesus monkeys are widely distributed throughout north and northeast India and are highly adapted to exploit human habitation (Srivastava, 1999). The rapid increase in the number of rhesus monkeys in recent years in India have led to increased competition of food and space between humans and monkeys (Srivastava, 1999). Damage to human property and harassment by the monkeys are the common feature in many parts of India. Macaques in particular are found to have a high rate of interaction with humans (Fuentes and Gamerl, 2005). The conflict and interaction patters, if understood might help effectively in assessing macaque-human interconnection in behavioral, epidemiological, ecological and cultural contexts (Fuentes, 2006). The lack of access to forest resources for the rural

community residing in the buffer zones of national parks is the main factor resulting in conflict between the national parks, the people residing in these areas and wildlife and people residing in the buffer zone of national parks suffer losses due to the wildlife, which can impact both crops and human lives (Lamsal, 2012). In Tanzania, human actions relating to habitat destruction that is threatening the biodiversity include physical development, cultivation, deforestation, overgrazing, pole cutting, charcoal burning, use of pesticides and bush-fire. Habitat loss in Tanzania is estimated about 45% (Silkiluwasha, 1998, as cited by Shemwetta and Kidegesho, 2000) and desertification has been reported to occur at a rate of 2.5% per annum (Shemwetta and Kidegesho 2000). The costs inflicted by wildlife conservation to people, and the human problems constraining wildlife sector in Tanzania has made human-wildlife conflicts one of the major challenges calling for attention of the conservationists and as wildlife conservation is accused for marginalizing people, denying local people access to traditional rights, property damage, and risk to human life through attack by wild animals and disease transmission (Shemwetta and Kidegesho 2000).

4.6 Conservation Legislation

4.6.1 Legislation of Nepal

In Nepal, the Department of National Parks and Wildlife Conservation and the King Mahendra Trust for Nature Conservation, governmental and non-governmental agencies are responsible for conservation activities in the country. The first wildlife law in Nepal was published in 1957 (His Majesty's Government (HMG) 1973, 1977a). This law was meant for legal protection of rhinos and their habitat and in 1967, a rhino sanctuary was declared in parts of what is today's Chitwan National Park together with a special guarding force for rhino patrol (Heinen and Kattel, 1992). The principal legislation, the National Parks and Wildlife Conservation Act (HMG 1973), facilitated the establishment of 8 National parks, 4 wildlife reserves, 3 conservation areas, 2 buffer zones and 1 hunting reserve (Shrestha, 2003). This network of protected areas is vital for biodiversity conservation as the network represents most of the major ecosystems of Nepal although the midhills ecosystems are under-represented. A

guard force comprising trained men commanded by the Nepalese Army are being deployed in the National Parks and Wildlife Reserves who deal with law enforcement, control and management. The National Conservation Strategy (NCS) for Nepal (HMG and IUCN 1988) has given emphasis to sustainable use of land and natural resources, which, although a general statement, can be interpreted that the lands in the surrounds of the PAs should not be allowed to degrade. The National Parks and Wildlife Conservation (NPWC) Act has been a key instrument in protecting biodiversity within the Protected Area (PAs) System. Section 3 of the NPWCA prohibits hunting of any animals or birds, building any house, hut or other structure, clearing or cultivation any part of the land or harvesting any crops, cutting, burning or damaging any tree, bush or other forest product, and mining within the national parks or protected areas (Shrestha, 2003). The Act provides complete protection to twenty-seven species of mammals, nine species of birds and three species of reptiles (Shrestha, 2003). IUCN Nepal has prepared a list of Nepal's endangered flora and fauna on the basis of the Convention on International Trade in Endangered Species (CITES) list.

4.6.2 Laws and Policies of Tanzania

The main laws that are designed to affect chimpanzees are found in the Convention on International Trade in Endangered Species (CITES) regulations, the Animal Welfare Act, the Endangered Species Act, and the Chimp Act, in addition to various state laws that have impact on chimpanzees. CITES regulations are the international efforts to conserve endangered species, the regulations require all participating countries to manage endangered species populations and to actively halt trade in that species (CITES). Even though, illegal trade in chimpanzee parts and meat are reported often and wild populations are steadily declining (Ivory, 2007).

The government of Tanzania recently adopted a new Wildlife Policy intended to better address the problems being faced in wildlife management in Tanzania. The new policy, however, retains state ownership and control of wildlife resources, the new policy, however, retains state ownership and control of wildlife resources (Shauri, 1999).

"In recognition of the importance of conservation of biological diversity to the livelihood of mankind, the state will retain the overall ownership of wildlife. The government will access user rights to various stakeholders, provide clear policy guidelines, stimulate public and private sector investment in the wildlife industry and provide support to investors (MNRT, 1998:7, as cited by Shauri, 1999).

From a legal perspective, the wildlife sector in Tanzania is governed mainly by:

- National Parks Ordinance of 1959, which covers wildlife within national parks and is enforced by TANAPA;
- Ngorongoro Conservation Area Ordinance of 1959, enforced by the NCAA;
- Forestry Ordinance of 1957, which covers forest reserves and is enforced by the Forestry Department;
- Wildlife Conservation Act of 1974, which covers wildlife outside national parks and the Ngorongoro Conservation Area and is enforced by the Wildlife Division;
- Marine Parks and Reserves Act of 1994 and the various fisheries laws and regulations enforced by the Fisheries Department (as of Shauri, 1999).

The Animal Welfare Act has a requirement for the psychological wellbeing of chimpanzees, which is scantily defined and also difficult to enforce. Any dealer, exhibitor or research facility that deals with chimpanzees must conform to AWA requirements, but enforcement is difficult because the treatment afforded by those entities is often not subject to public view. Further, to bring any action under AWA, standing must first be established, and doing so in animal cases has proved thus far to be difficult (Ivory 2007).

The Endangered Species Act is another which covers chimpanzees found anywhere in the world. The ESA imposes a heavy mandate upon participating countries, requiring them to affirmatively conserve chimp species and the habitats within which they are found (Ivory, 2007).

"The CHIMP (Chimpanzee Health Improvement, Maintenance and Protection Act) puts forth several requirements for the facilities housing these chimps, and for the type of living arrangements to be provided them for the rest of their lives. Generally, only chimps that are federally owned fall under the CHIMP Act, but there are methods by which non-federally owned chimps may enter the system of sanctuaries" (Ivory, 2007).

4.6.3 Conservation Actions in Tanzania

Chimpanzees in Tanzania are under threat due to unsustainable agriculture, fuel wood extraction, logging, expansion of human settlements, disease and a growing problem of hunting for bushmeat and witchcraft (Jane Goodall Institute). Chimpanzees are listed under Appendix I of CITES and as Class A under the African Convention. Law in most countries protects chimpanzees and they are present in numerous national parks throughout their range, although many populations occur outside protected areas. Even though, strict enforcement of wildlife laws, and more effective management of protected areas are urgently needed. Engagement with the extractive industries are predominant in Central Africa towards curtailing the bushmeat trade is essential. Some marked success in co-management and other arrangements have been implemented and these should be duplicated and extended (Morgan and Sanz in prep, as cited by IUCN Red List). With the help of U.S Fish and Wildlife Service's Great Ape Conservation Fund, JGI and partners develop strategies designed to abate the most critical threats to chimpanzees and their habitats. JGI has build strategies to prevent disease outbreak in chimps, identify conservation needs and preserve habitats of these apes outside the protected areas and develop policy reforms for the benefit of these animals (Jane Goodall Institute).

JGI also has the plan to bring primatologists, population biologists, land and wildlife managers, legal experts and others by using IUCN Conservation Breeding Specialist Group's Population and Habitat Viability Assessment (PHVA) process.

CITES, Convention on International Trade in Endangered Species of Wild Fauna and Flora, an international treaty with more than 144 member countries. The chimpanzees are protected under Appendix I, Endangered Species Act of CITES. Appendix I listed species cannot be traded commercially. Law in most countries

protects chimpanzees and they are found in a number of national parks throughout their range, although many populations may occur outside protected areas.

The IUCN Primate Specialist Group has action plans with financial aids for African primate conservation with the aim of assisting the continued monitoring of Gombe stream national park and its chimpanzee population. The action plan believes that research has had an important role in promoting a wider knowledge of primate behavior despite a low diversity of primate species in Gombe and hence pose a significant site to provide long-term data on ape population (Oates, 1986).

The understanding of current population status of chimpanzee is inadequate as of their range has not been surveyed, survey methods were inconsistent, and several of the surveys are now believed to be out of date. Older survey data are particularly unreliable as Ebola, commercial hunting and extractive industries are known to have caused dramatic declines in some areas (Tutin *et al*., 2005 as of Humle and Kormos, 2011). Kühl et al. (2008) saw a need of new surveys using consistent methods throughout most of the range of chimpanzee habitat. These might enable researchers and conservationists to better understand the true impact of Ebola, the bushmeat trade, habitat loss and to effectively set priorities for conservation (IUCN redlist).

5. Material & methods

5.1 Study sites

5.1.1 Pashupatinath temple Area, Kathmandu (interactions with humans)

Located in between the co-ordinates of 27°42'32"N 85°20'51"E is the famous Pashupatinath temple premises of Kathmandu, Nepal. The temple is considered to be one of the most important Hindu temples in Nepal and the world. There is an excellent selection of ancient Hindu temples, bathing ghats, and *sadhus* (hindu holy men) here. A sacred but highly polluted river Bagmati flows by the temple.

It is believed that being cremated here after death will release one from the cycle of repeated birth and death. This famous and important heritage site is a place of visit for a huge number of people both domestic and foreign. Small patches of forests less than a square kilometer in area called the *Bankali forest, Bhandarkhal jungle* and *Mrigasthali* that lie around the temple premise are important refuges for a large number of rhesus monkeys. The map (fig. 1) shows the study site green areas representing forest patch as island of trees within the city.

Figure 1. Pashupatinath area premises, green patches representing the forest island (Source: google maps).

5.1.2 Chitwan National Park (Natural Habitat)

This study is also based on the questionnaire survey conducted during 15 February and 25 March 2013 in Piple village development committee in Chitwan district in the Narayani Zone of southern Nepal. The study site lies in the buffer zone of the park. The survey area is mainly farming area with 8260 people living in nearly 1555 households (Nepal Census Data, 2001). The main source of income of people there is agriculture and fishing from nearby Rapti river and some people work as guides for park visitors in nearby village of Sauraha, which is a major tourist attraction place to enter the park. People there are directly or indirectly dependent on the park as a source of food, firewood, timber, fodder for cattle. Poaching in the park has been reported, but mostly for rhino, tiger, deer

and other charismatic species. Hunting and poaching of monkeys is not common, although chasing monkeys and other herbivores and occasional killing as crop raiders or pests is common.

figure 2. Map of Nepal pointing Chitwan National Park (Source: Google maps).

Figure 3. Map of Chitwan National Park with the buffer zones (Source: Wikipedia).

Figure 4. Piple village development committee and Chitwan National Park (Source: Google maps).

5.2 Selected monkey and ape species

Monkeys belong to the mammalian order primates. Primates have large brains, thumbs that are opposite to the other four fingers and eyes at the front of their faces. Other than humans, primates are arboreal. They are capable of solving problems and are intelligent. Unlike other animals primates are generally social and many of them live in large groups called troops. The New world monkeys live in arboreal habitats throughout the Amazonian ecosystem and the neotropics (Rosenberger and Hartwig, 2001). They have flatter noses with wider set, sideways facing nostrils. In contrast, the old world monkeys have large noses and forward and downward pointing nostrils and do not have prehensile tails and some of them spend a considerable amount of time on the ground (Throp, 2013).

5.2.1 Chimpanzee

Chimpanzees *Pan troglodyte* are one of the four species of apes that are the closest genetic relatives to humans. Once abundant throughout equatorial

ranges, these apes are now endangered due to human activities (Ivory, 2007). Primates and humans have intricate relationship in plethora accounts including forage collection, bushmeat hunting habitat fragmentation and competition for wide array of resources, which drives the signature species in the verge of extinction. (Kaur et al. 2011). Chimpanzees are among the most threatened primates in Africa for many reasons (Goodall, 1986). Several factors have led to the decline in chimpanzee populations in Africa. These salient threats include hunting, habitat loss and degradation due to human activities like industrialized logging and human population growth, and disease (Kormos, 2003, as cited by Lang, 2006). Knowledge and diagnosing demographic dynamics of chimpanzee is of utmost importance as it has multiple implications in diverse fields (Pusey et al. 2007). And timely conservation needs conscious concern to mitigate unprecedented abatement of its number (Oates, 2006). The exogenous and endogenous factors that triggers population decline in chimpanzee can be used as a baseline for implementing conservation campaign and Goodall's (1983, 1986) analytical method might provide necessary insight for exploring mortality causes Due to overwhelming upsurge in socio-ecological practices humans and chimpanzee are exchanging microorganisms in an alarming rate (Kaur et al. 2011).

Habitat and distribution

Chimpanzees are found predominantly in moist and dry forests, and forest galleries extending into savanna woodlands. These apes thrive widely in equatorial Africa though their distribution is discontinuous. Their abundance is higher in southern Senegal across the forested belt north of the Congo River to Western Tanzania and Uganda. Chimpanzees are social animals and live virtually in permanent communities of 5 to 150 animals. Home ranges are larger in woodland forest mosaics than in mixed forest, and average 12.5 km^2. Male chimps are more social than females, and individual females vary in sociability (Goodall, 1986). At most studied sites, almost all female chimpanzees emigrate from their natal community to another at adolescence, but at Gombe National

Park, many females are found remaining in their natal community (Pusey et al. 1997).

Anatomy and Morphology

The male common chimp is up to 1.7 m (5.6 ft) high when standing, and weighs as much as 70 kg (150 lb); the female is somewhat smaller. Figure 1 is a picture of a common Tanzanian chimpanzee (female) with her young. They have shortened spine and relatively short but broad pelvis that helps them in upright posture. Flattened face, well developed jaws, close set of features and downward directed grasping hand and feet are other anatomical features of chimpanzees in general.

Diet

The diet of these omnivores is highly variable according to individual populations and seasons as fruit comprises about half the diet though leaves, bark, and stems are also important and in contrast mammals comprise a small but significant component of the diet of many populations.

Threats

The four subspecies face similar threats but to varying degrees in different regions.

Major threats include according to IUCN include:

1. Habitat destruction and degradation, mainly by

(a) Slash and burn agriculture: Rapid human population growth across Africa is putting pressure on forested area and woodlands to convert into agricultural lands. Estimates show more than 80% of region's original forest cover has been lost already (Kormos et al. 2003) and such deforestation across West and Central Africa has greatly reduced chimpanzee habitats.

(b) Logging, oil and gas mining: Habitat degradation and fragmentation for road building in order to increase road accessibility to remote areas poses a risk to chimpanzee populations and potential increased poaching in previously not seriously impacted areas by such anthropogenic pressures. In western Central Africa deforestation rates are relatively low but selective logging is likely to be

carried out in the majority of forests outside of national parks. Logging in general has a negative impact on chimpanzee density due to habitat alteration and disturbance (IUCN Redlist).

2. Poaching. Chimpanzee populations are affected by poaching which may lead to local extirpation as they have low population densities and slow reproductive rates. The main reasons for hunting being for meat, pet trade although illegal, for medicinal purposes and some countries officially allowing chimpanzee capture for scientific research. People also kill intentionally chimpanzees to protect their crops by using snares which maybe meant for actual crop raiders, such as baboons or cane rats (IUCN Redlist).

3. Disease. In Gombe, Mahale and Taï national parks of Tanzania, chimpanzees are also killed by diseases among them or those they got directly or indirectly from humans (Goodall, 1986, Nishida et al. 2003, Butynski, 2001).

Figure 5. A female chimpanzee with a baby (Photo: Michael Wilson).

5.2.2 Zanzibar Red colobus Monkey

Red colobus are commonly grey to black with bright red-orange undersides, cheeks, and lower half of limbs. 'Colobus' is derived from the Greek word "Colobe" which means "cripple" or "mutilated". They earned this name because they only have a small nub where the thumb should be. They have four extra long fingers that are used to wrap around branched like a hook. A normal thumb would hinder this activity, and thereby reduce their chances of survival. This is an Old World monkey and has a dental pattern of 2:1:2:3 that is the same as humans. This is due to the fact that they lack opposable thumbs. However, this can be an advantage for such arboreal species as it facilitates them in maneuvering among trees. Colobus monkeys jump up and down on a branch in order to get liftoff for a leap of as much as 50 feet using tree branches as trampoline. They have long tails (around 24 inches) to help them balance on branches. Average males measure around 23 inches in length and weigh 18.5 pounds, while females are slightly smaller (Diane, 2002).

Figure 6. Red colobus monkey (Source: dpreview.com).

Habitat and distribution

This species is endemic to Zanzibar Island (Siex and Struhsaker). Kirk's Red Colobus may once have occurred on the mainland (as, for example, does Aders' Duiker *Cephalophus adersi*), but is certainly extirpated there now. On Zanzibar, it is found mainly in the southeastern part of the island in Jozani-Chwaka Bay National Park, the adjacent agricultural areas to the south, and the coral thickets and mangrove swamps of Uzi Island 10 km to the southwest. Also found at low densities in isolated populations in the coral thickets along Zanzibar's eastern coast from Kiwengwa in the north to Mnyambiji in the south, and on the west coast there is a small isolated group in the mangrove swamps of Maji Mekundu. A small translocated population of ca. 56 individuals also occurs in Masingini Forest Reserve (Siex and Struhsaker).

Approximately 14 animals were introduced to Ngezi Forest Reserve, Pemba Island, around 1974 (Struhsaker and Siex, 1998), where the species is believed to persist in small numbers (Ciani et al. 2001).

Diet

Red colobus monkeys are herbivores and feed mainly on leaves. Mostly, they prefer tender young leaves and shoots in their diet, although their complex stomachs allow them to digest mature or toxic foliage that other monkeys cannot. They also eat flowers and unripe fruits. Higher amount of sugary substances in ripe fruits might be difficult for them to digest (Diane, 2002).

Threats

Red colobus monkeys have both natural and human-induced threats to their existence. Leopards and large eagles are two of their natural predators. Chimpanzees occasionally prey on colobus monkeys. They are an endangered species due to being hunted for their meat, as well as habitat loss and degradation from agriculture, logging, and human settlement (Diane, 2002). The remaining populations are severely threatened by habitat destruction resulting from timber felling, charcoal production, clearance for cultivation, and bush-burning. This species is occasionally shot for food, sport, or as a supposed crop pest, but habitat loss remains the most serious threat (Siex, 2003). In Jozani

Chwaka Bay National Park, habitat degradation occurred in the past mainly from commercial logging, agriculture, tree-cutting for fuelwood, and charcoal production, but this has now stopped. Occasional deaths have been reported south of the park due to road kills (IUCN).

5.2.3 Hanuman Langur

The Hanuman langur *(Semnopithecus entellus)* belongs, within the order of Primates, to the Cercopithecidae and is the largest among the subfamily Colobinae. So far, 16 subspecies of *Semnopithecus* have been described. (Roonwall and Mohnot, 1977). Hanuman langurs have a grey coat and black skin with no fur on the face and the palms of feet and hands (fig. 8). The coloration of the face and also palms and soles is generally black, hands and feet are long, slender and well furred. The fur color changes with age of infant. Newborn infants have red skin and blackish fur. The eyebrows of these monkeys are prominent and are directed forward. Within the first 6 months of life, skin and fur colors change to black and grey respectively. Infants and juveniles are mostly light grey in coat color while adults are dark grey. With slender body, long limbs and tail, langurs are well adapted to arboreal as well as terrestrial habitats.

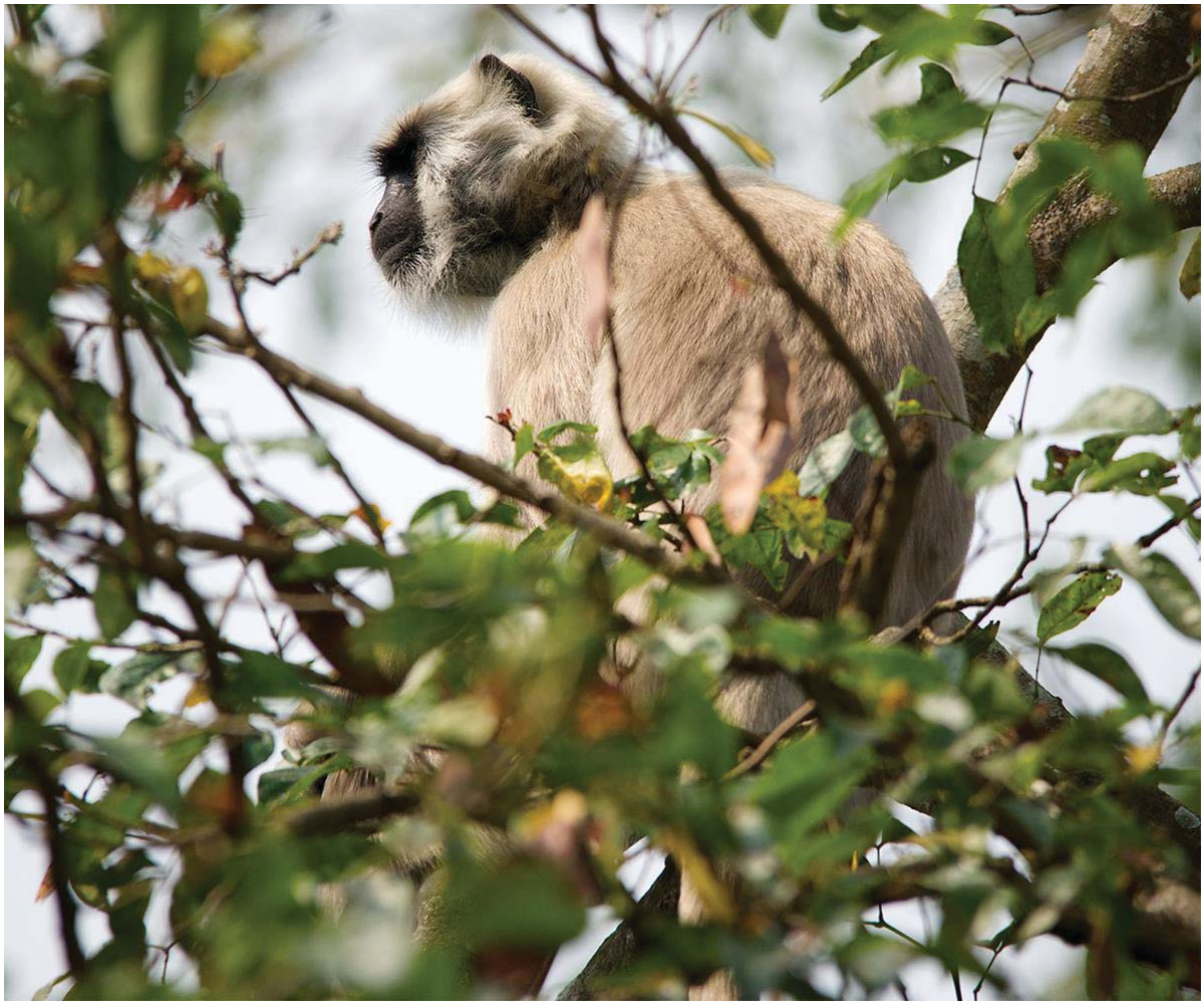


Figure 7. Hanuman langur *(Semnopithecus entellus)* in its habitat (Photo: K Baral).

Habitat and Distribution

Hanuman langurs are the most widespread nonhuman primates that occur throughout the various habitats of the Indian subcontinent and Sri Lanka in the south and from and from Kathiwar in the east to the Shan state of China in the west (Roonwal and Mohnot, 1977). These monkeys are found free ranging in wild forest and marginal areas. These species along with the rhesus macaque are common and widely distributed from tropical (Tarai) to subalpine (high mountains up to 3,758m) regions of Nepal (Southwick, et. al, 1982; Bishop, 1979).

Hanuman langurs occur in a wide range of ecologically diverse habitats. They are found in the mountainous areas up to the Himalayan belt as well as in semi

desert areas (Rajesthan, India), subtropical monsoon dry forests (Terai, Nepal) and tropical rain forests (SriLanka). These habitats include a wide range of vegetational zones: semi desert, dry open scrub, open cultivated regions, open parkwoods, dry deciduous forests, moist deciduous evergreen dense forests, and mountain forests up to the zones of rather homogenous oak-coniferous forests. The habitats are located from sea level up to heights of about 4000 meters (Roonwal and Monhot, 1977).

Hanuman langurs *are* vegetarian even though occasional feeding on insects has been observed (Sugiyama, 1964, as cited by Chalise, 1999). They eat plant parts of trees, shrubs, herbs and grasses.

Threats

Molur *et al.* (2003) has listed intensive agriculture, habitat loss, human-monkey conflict, and fires. Hunting for food by newly settled human populations in Andhra Pradesh and Orissa of India is very argued to be rampant and affecting many local populations of monkeys.

5.2.4 Rhesus macaques

The rhesus macaques both Chinese and Indian derived, are dusty brown to auburn in color. The face is bare and flesh-colored and becomes reddish during estrus period. They are medium sized animals with robust limbs of equal length. The head and body of the rhesus measure about 45 cm and tail 21 cm. The head bears a crown of hair directed backwards. In adult and adolescent females, swelling and reddening of skin occurs especially in the regions of the thigh, buttocks and hips.

Depending upon the type of their habitat in which they are found, they can be arboreal or terrestrial. They inhabit villages and towns as well. They can tolerate human interference well and are often found on the outskirts of temples and edges of forest in proximity to human habitation.

Figure 8. Rhesus monkeys around Pashupatinath temple, Nepal (Photo: K Baral)

Habitat and distribution

The rhesus monkeys as a whole are found mostly in southern Asia, in Afghanistan, Bangladesh, Bhutan, China, India and Nepal (IUCN redlist). Since, they thrive in such a broad geographic area, it is difficult to concisely summarize the types of habitat they populate. They are found in both tropical and temperate forested habitats although they have been living in areas close to human settlement in urban areas or near cultivated fields (Southwick et al., 1996).

Diet

There is barely any fruit that these monkeys won't eat. Fruits like mango, guava, banana, pears and jackfruit constitute their main diet. Among crops, maize is their favorite. They have special pouch on their cheeks in which they can store food for later consumption. As they don't find enough food in the limited forest area, they come in the village and eat the seasonal fruits and crops such as potatoes, soybeans, peas etc. In off seasons when the fruits and crops are unavailable, they eat shoots and other parts of small plants.

Threats

The main argued threat to rhesus is habitat loss for human settlement and

agricultural lands. Conflict with humans could be another factor affecting the ecology of these monkeys. Otherwise, this species is generally considered unthreatened (IUCN redlist). In Lao PDR and Vietnam the major threat to the species is hunting, although loss of forest in river valleys has also likely impacted the species. Capture and release of laboratory and "problem monkeys" from rural and urban areas into natural forests is a major threat to wild macaques (IUCN redlist). Introduction, through release of confiscated *M. fasicularis*, is at least a localized threat in parts of the species' Vietnamese range (R. Timmins). Tolerance of the species varies locally, from heavily hunted and persecuted, to worshipped and fed.

Social behavior of Rhesus

Rhesus macaques have strong bonding within the family. They select the most powerful member of the troop as their leader though there are other sub leaders as well who assist the main leader. The leader protects the troop from external threats such as intervention from the local people or other troops. They defend the troops from the other troops, people, hunting dogs and other wild animals. In case of death of any of their family members, they mourn and even cry at times. They carry the carcass with them until it begins to decay. When it comes to defending themselves from any threats, they choose to stay on the trees and defend themselves by attacking the intruder from different directions. They usually give birth to two babies at a time. The favorite recreation is scratching each other's bodies, searching for lice in the body and eating them. Mothers do this to their babies and couples to their partners whenever they have time apart from searching for food (personal observation).

Because of their anatomical and physiological closeness to humans, the relative ease at which they can be maintained and bred in captivity, and the available supply from India, rhesus macaques have long been the nonhuman primate of choice on which to conduct research on human and animal health-related topics (Mitruka, 1976). Some of the direct benefits to human health that would not have been possible without the use of rhesus macaques include: development of the rabies, smallpox, and polio vaccines, discovery of rhesus factor in blood, creation of drugs to manage HIV/AIDS, understanding of the female reproductive cycle

and development of the embryo, propagation of embryonic stem cells, and a number of behavioral discoveries (Mitruka, 1976).

6. Data collection

Data collection was designed to get insights into the status of monkeys living in their natural habitat as well as those living in close proximity with humans. Sampling sites were selected based on presence of forest inhabited by primates and the buffer zone with possibility of experiencing human-nonhuman primate conflict. The fieldwork of this study was conducted from 15 February to 22 March 2013. Both questionnaire and quantitative interviews in local village around the park were conducted for a period of two weeks. The observation and behaviour study was carried out on foot. The field study was categorized into three parts.

6.1 Interviews

Self-administered questionnaire (Appendix I) and direct interviews were taken in *Piple* VDC, which lies in the buffer zone north to the Chitwan National Park, Nepal in between 25 February to 15 March. The village is accessible to major highway but majority of population depend on agriculture. The agricultural land mainly lied in the buffer zone of the park. The respondents were chosen at random and asked for permission to be interviewed and in most of the cases people were busy at work. The interviews were carried out in the fields where they were working and some at their homes. Majority of the respondents were between the age group of 30-50 years and no respondents were less than 20.

6.2 Observation

The direct observation of behavior of monkeys was carried out in *Pashupatinath* temple area in Kathmandu between 15 to 23 February where the interaction of rhesus monkeys with humans is high.

6.3 Pictures

Different pictures were captured so as to document various direct interactions between monkeys and humans. Photographs in results section illustrate the information from observation of monkeys having high interaction with humans.

The collected data was analyzed using Microsoft excel and R software and graphical representation were generated to illustrate the data. Photographs under categorized headings represent the interaction and closeness to humans in urban study site of Nepal.

7. Results

7.1 Questionnaire Survey

Above 90% of the respondents were either strictly farmers or doing farming besides other jobs among which more than half of the respondents, both male and female are against capturing and hunting of monkeys though, few of the respondents have no opinion about it. Not surprisingly, some of the interviewees are in favor of live capture or killing of monkeys.

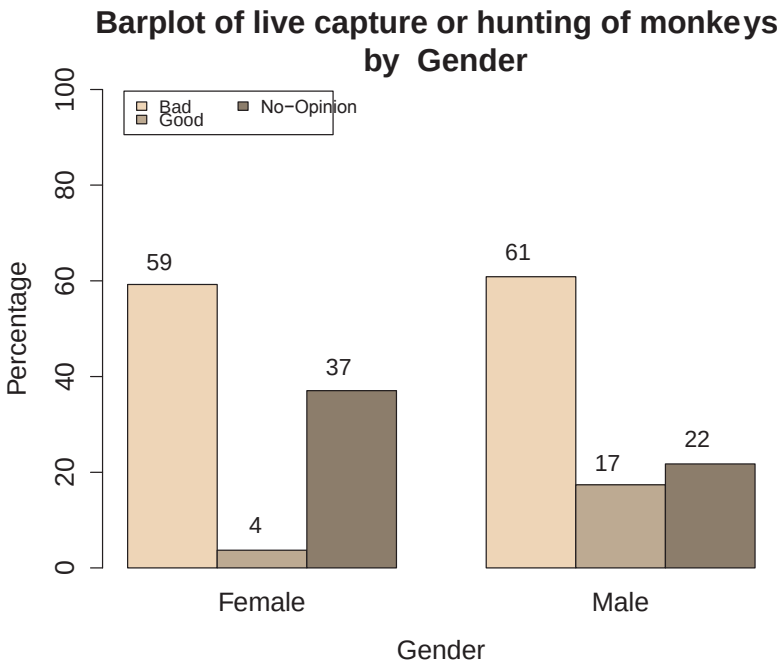


Figure 9. Barplot showing genderwise opinon towards live capture/hunting of monkeys

Agegroup	Total	%
<20	0	0
20-30	6	12
30-40	22	44
40-50	20	40
>50	2	4

Table 1. Age distribution of the interviewees

Occupation	Total	%
Farming + Other	48	96
Farming	7	17
Government service	11	22
Housewife	24	48
Others	8	16

Table 2. Main occupation of interviewees

About 75% of the people with higher education and the similar percentage (72 %) of people who can simply read and write were against the hunting and live

capture of monkeys whereas respondents with school level and high school level education believe in killing and capturing monkeys from the forests.

Parameters	Important	Not important	No Opinion
1. School and other education	50		
2. Support for family livelihood and income	35	6	9
3. Jobs	17	20	13

Table 3. Importance of the park, tourism and its resources.

All the interviewees believed in the importance of park and its resources in school education while 70% of them believe it has positive effect in supporting for family livelihood and income directly or indirectly.

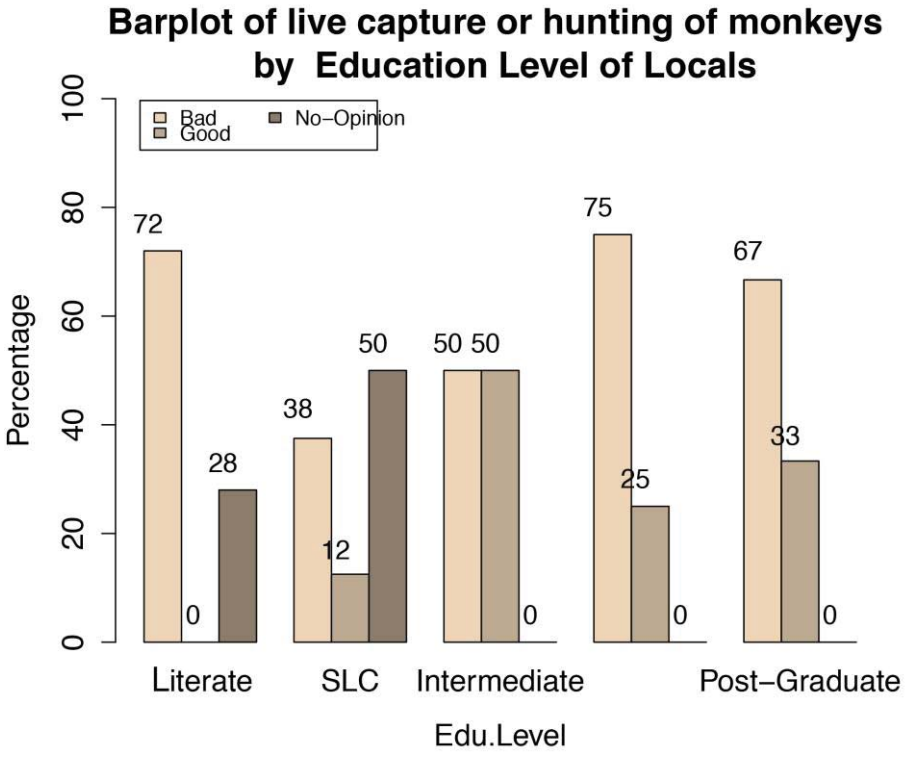


Figure 10. Barplot showing educational level of locals with opinion towards live capture/hunting of monkeys.

Majority of the respondents were aware of their general rights related to the park. 56% of the people interviewed have been attending local community

meetings. Park management, especially in the buffer zone areas actively involves the local communities. Most of the people were positive about the importance of the park believing it aids in school and other education as well as direct-indirect support in family income. Above a third of questioned people believe that the park helps them in their jobs. People also reported seeing monkeys frequently in groups of 10-20 individuals around the buffer zone and in the park.

7.2 Nature of Interactions

In the direct observation for interaction of monkeys with humans it was found that monkeys were very close to humans. They were found looking for food in the waste, expecting leftovers from people, snatching food straightway. Some of the monkeys were found wounded and crippled. The pictures categorized in different headings represent the nature of interaction between humans and monkeys around the temple premises in Kathmandu.

7.3 Visual illustrations from Observation

Primates, especially rhesus monkeys as seen in Pashupatinath temple premises of Kathmandu, Nepal live in surrounding small patch of forest where the lack of enough fruiting trees forces the monkeys to interact with human visitors in and around the temple. A direct observation of monkeys' interaction with humans was performed around the temple premises, which showed different types of interaction between human and these monkeys. These monkeys are not afraid of humans since they have lived in very close proximity for generations. They look for food in waste thrown by temple visitors, sneak and snatch food or any stuff they can possibly expecting food. People visiting the temple for religious activities were found to offer some rice grains, flowers and fruits in the main temple and other small idols of gods. In direct observation monkeys were found to steal such offerings as well. Some *sadhus* (holy men) were seen offering rice grains to these monkeys.

7.3.1 Urban monkeys and human interaction

Rhesus monkeys of Pashupatinath temple premises of Kathmandu are good examples of monkeys thriving amongst human settlement. The temple premise is situated in the heart of the city and gets lots of people every day from early morning till late night. These urban monkeys live on food from temple visitors. They were not found afraid of humans and they only kept distance when tried to chase or when they seem to sense threat from people. They seem to ignore women and children. There is also a small ground within the temple premises where temple visitors spend leisure time and basking while some eating fruits and monkeys wait for a chance to snatch some and search for leftovers. The monkeys can be seen closely interacting with the priests (sadhus/ holy men) in the temple area as seen in Figure 11 (a), (c) (e), (f) and (g). We can see in picture (b) and (h) that they seem to be freely roaming around the outskirts of the temple where people sit and relax. They seem to come in contact with humans for the purpose of getting food for themselves and their babies.

Figure 11. Monkeys in close interaction with humans.

7.3.2 Diseased and crippled monkeys

A highly polluted but sacred river *Bagmati* flows by Pashupatinath temple. Drain from countless houses are let straight in the river which has direct or indirect impact on health of temple monkeys. Potential risk of disease transfer among monkeys and even to humans is ineveitable. There are fewer studies about the parasites in these monkeys but crippled and diseased looking monkeys are often seen as in figure 12(a)- 12(f). In the figure we can see monkeys with different problems relating to their health. In picture (a) we can see a monkey with its finger cut. Picture (b) shows us a poor monkey with a big wound on its eye; it could be the result of a fight with other monkeys or due to human intervention. Similarly picture (c) and (d) show the monkeys which look crippled. In picture (e) we can see one with a skin infection, which probably could be scabies, and in picture (f) we can see a monkey with rashes around its eyes that suggest some eye infection.

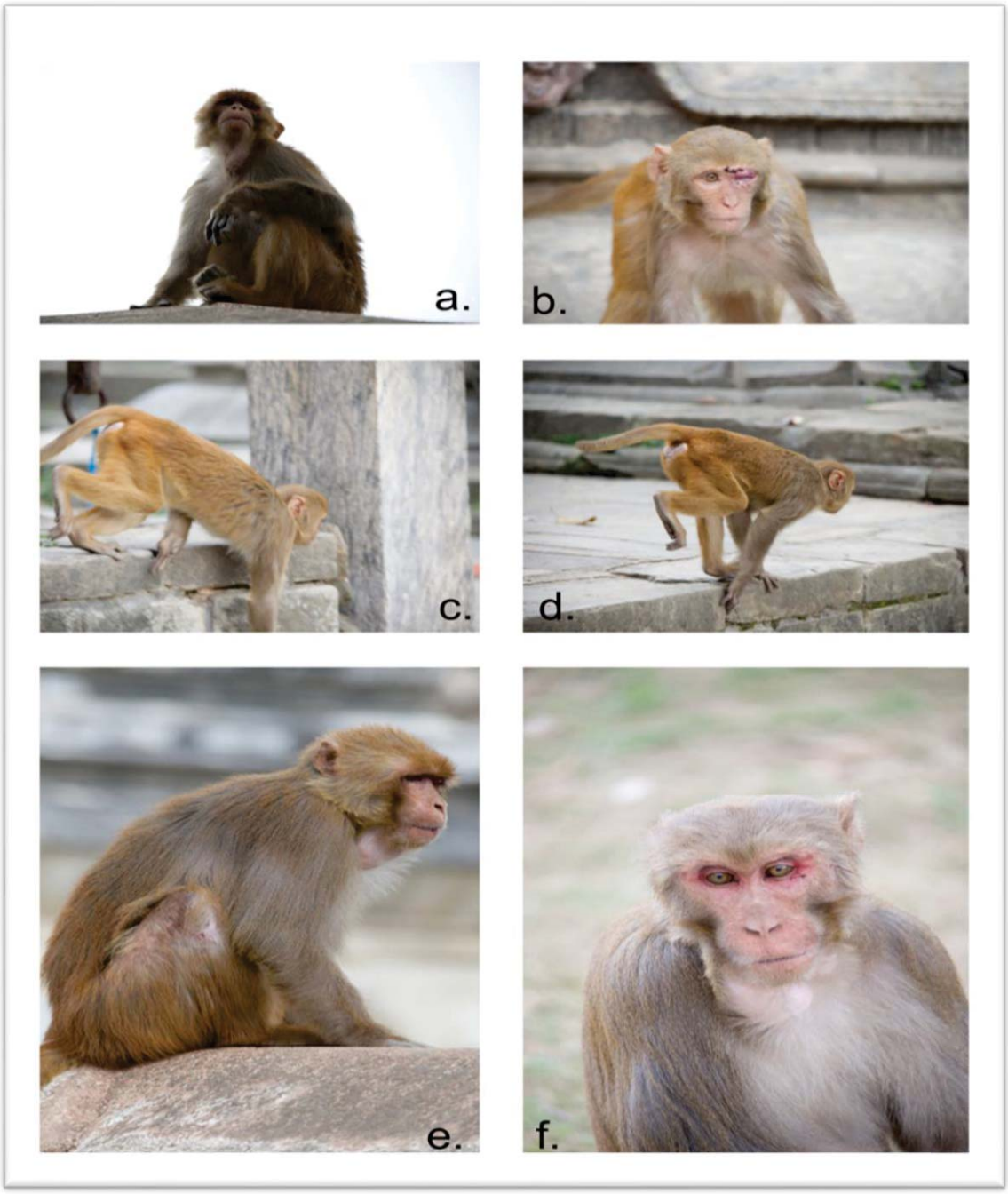


Figure 12. Diseased and crippled monkeys.

7.3.3 Diet of urban monkeys

While in nature monkeys' main diet constitute different fruits and shoots of plants, these urban monkeys live exclusively on food from humans directly or indirectly. During my observation, I found some monkeys feeding on junk food


a.


b.


c.


d.


e.


f.


g.


h.

Figure 13. Monkeys feeding on food from humans.

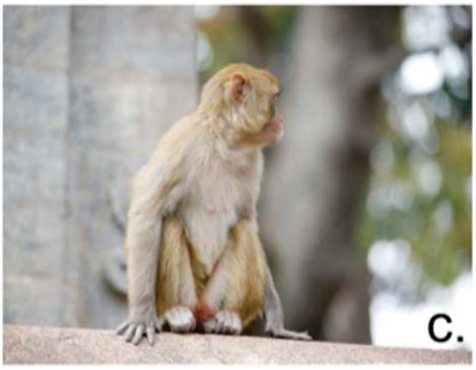
like biscuits and chips in addition to rice (as a part of holy offerings to god) from temple visitors and some were feeding on fruits snatched from humans and others either foraging around for leftovers or eagerly waiting for food from some generous humans. Figure 13a-13j constitutes series of photographs of temple monkeys' feeding behavior at a glance. These monkeys seem to be feeding on either the offerings made by the people who have come to visit the temple or anything they can get hold of. In picture (a) we can see a mother and a baby feeding on biscuits received from the people who were kind enough to give them a packet. In picture (b) we can see the priest of the temple offering some rice grains to a group of monkeys. In the same way, picture (c) and (d) show us the monkeys feeding on the offering made by people in the temple consisting of rice grains, barley, corn, soybean etc. Picture (f) shows a monkey keen on taking some tit bits offered by a person. Picture (g) shows a monkey feeding on orange that could have been plucked from the trees in the forest or from the offering bowl in the temple.

7.3.4 Urban habitat and social behavior

Naturally arboreal rhesus monkeys adapted to live in urban areas with the development of city from which was a forested patch before. They use their acrobatic skills in maneuvering around houses, shrines and the temple itself in search of food and live amongst them. Figure 14a- 14m show these monkeys' primary habitat though they also spend time among trees nearby. The photograph in figure 14m shows the flow of people on one part of the temple area. The temple also has cremation facility for dead bodies of Hindus as people have high religious values in cremating there which in additionally leads the area to be crowded throughout the year and more when it comes to Hindu festivals. It looks completely unnatural for wild monkeys' habitat. Here in picture (a) we can see two mothers sitting at the stairs of the temple with their babies. Picture (b) shows a baby monkey wondering amongst the sculptures carved around the temple area. Pictures (c)-(h) reveal monkeys strolling around the temple premises in search of food. Picture (i) shows an adult monkey swing by the carved wooden window of the temple. Picture (j) and (k) give a view of the monkeys sitting and grooming themselves on a tree whereas a monkey is fiddling with a street light unaware of the hazard of being electrocuted. Picture (m) shows the crowd of people that pass by almost every day to visit the temple and it is the same place where these monkeys thrive and spend most of their daytime in search of food.


a.


b.


c.


d.


e.


f.


g.


h.

Figure 14. Urban habitat of rhesus monkeys in Kathmandu.

Amongst themselves, they spend time grooming when they are not in search of food. Since, food is available occasionally and not enough for the whole

population at once, they seem to fight among each other for the prize. Chattering noises, screeching and whooping can be heard frequently. Despite this, they seem to have adapted in living social life in their urban habitat (Fig 15a- 15d). In picture (a) we can see a group of monkeys gathered in a ground which is within the premise of the temple near to the forest area that surrounds the temple. Some seem to play around and some are looking around for food. Picture (b) shows us a mother caressing her baby enjoying the recreation time along with another monkey. In picture (c) we can see a mother looking at a distance with fury. It could probable be for the purpose of keeping the other adult monkey off from her baby (as a territorial gesture). Picture (d) depicts a young one holding a bark of a tree in aggression as I approach with a camera in my hand; this makes it clear that these are wild monkeys who only have come near human habitation in search of food.

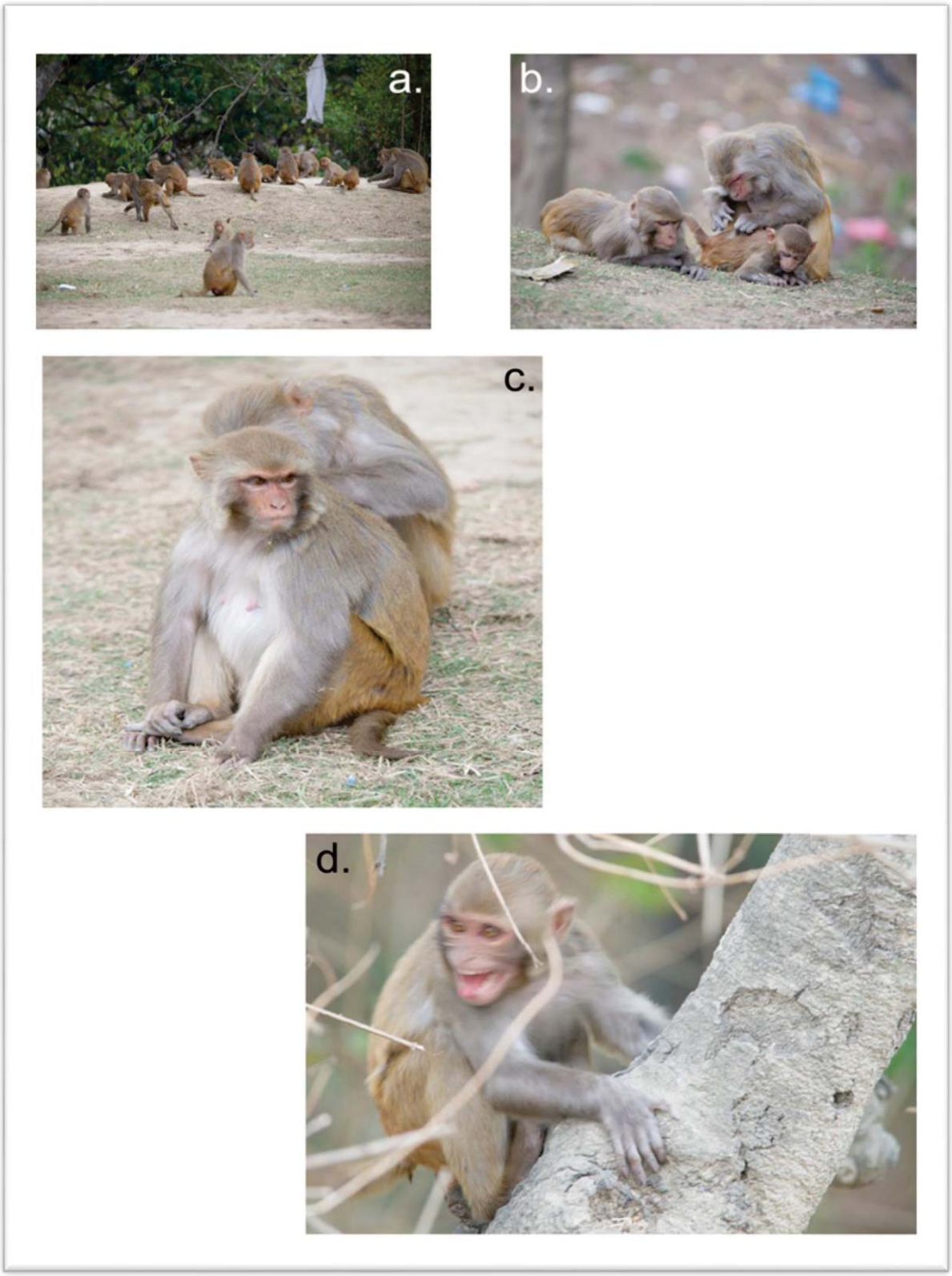


Figure 15. Social behavior of urban monkeys.

These monkeys wander around nearby houses in search of food and are therefore pests for residents nearby. People have built protective high grills and

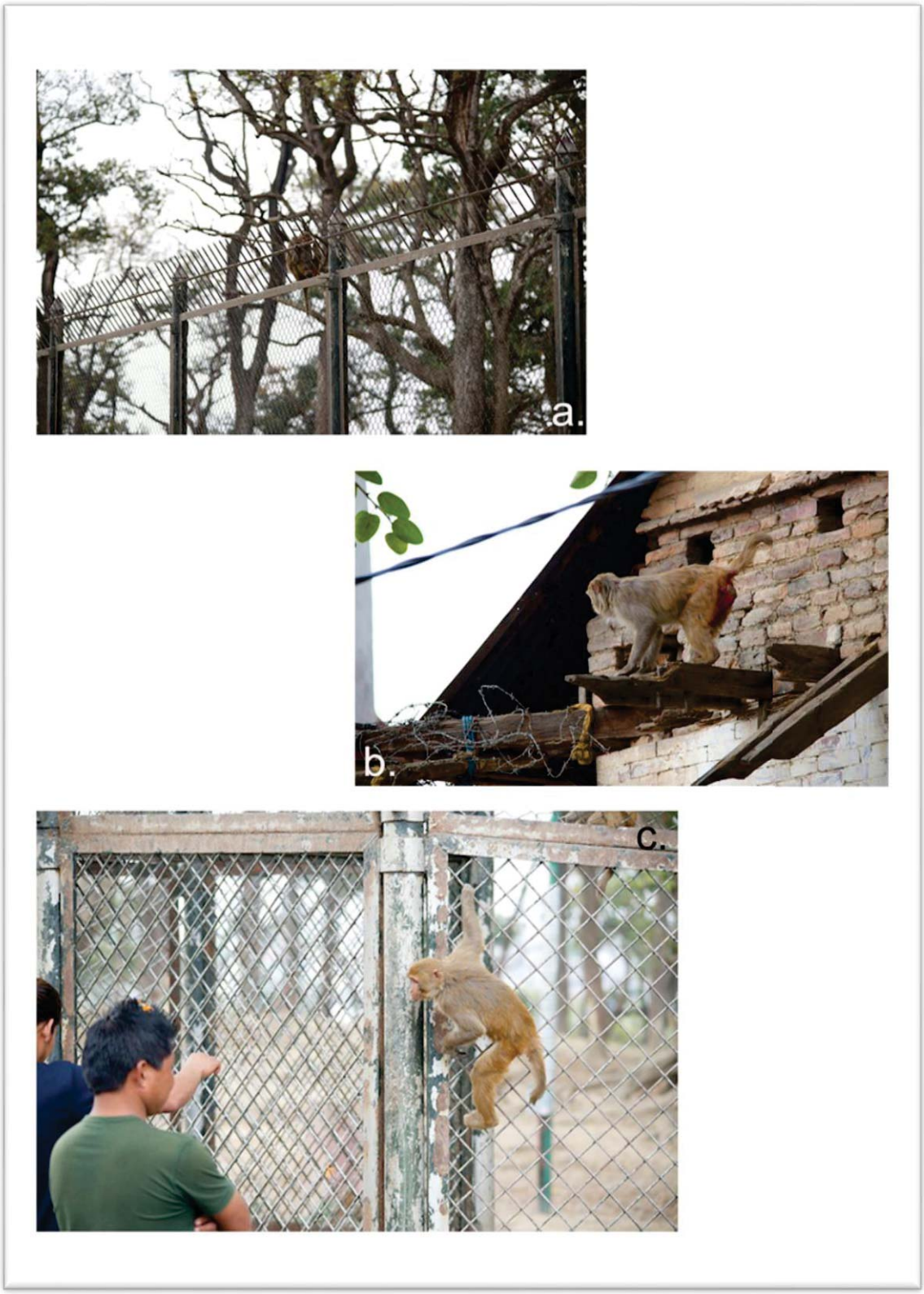


Figure 16. Preventive measures to keep monkeys out.

railings with spikey tops to keep monkeys out. Barbed wires on the outer pillars and beams can be seen in some houses. As we can see in the pictures (a) and (b),

the temple authorities have built high fences to separate the forest and temple boundary. However, this does not seem to make much difference in keeping these monkeys off the human habitation and stay in their natural homes. Similarly, the houses nearby the forest and temple where these monkeys reside, have adopted measures like barbed wire fences as shown in picture (c). This too does not seem to make much of a difference in the act of keeping these monkeys away from human settlement. From the government side, electric poles around the premises barb wired on upper halves to prevent monkeys from getting electrocuted.

8. Discussion

Habitat disturbance has important effects for the morbidity, demography, behavior and ultimately the survival of non-human primates (Bishop et al., 1981). The adaptability of south Asian monkeys, the hanuman langurs and rhesus macaques help them thrive in the forested habitats and also in areas close to human settlements. In fact, Southwick et al. raised the possibility that rhesus might now be only secondarily adapted to the forests, in habitats where they have been driven from human habitations (Bishop et al., 1981).

As observed in my study, large numbers of rhesus troops thrive in completely urban areas where the natural food is scarce and they have adapted to live alongside humans. In national parks and buffer zone areas, though they primarily have arboreal habitats within the forests, crop raiding is common in semi-urban or rural areas of human settlement. The adaptability with some cases of protective religious sanctions in parts of Nepal and India permits these species to inhabit a broad spectrum of habitats with varying amounts of interaction with humans. The increasing human need of natural resources, often have adverse effect on non-human primates sharing the habitat (Bishop et al., 1981). As I observed in my study, local people are mostly utilizing national park for firewood, timber and fodder for cattle and not for hunting and they do support having a national park around them. But, because monkeys have negative effect on their agriculture, they are not much in favor of conserving them. On qualitative interview, some respondents showed ethical reasons for not

killing or live capturing of monkeys but economically, it is clear that they don't want monkeys near them.

8.1 Risks of disease transfer among primates and humans

Parasites play a central role in ecosystem affecting the ecology and evolution of species interactions (Esch and Fernandez, 1993), host population growth and regulation (Hudson et al., 1998) and community biodiversity (Hudson et al., 2002). Close interaction and range overlap between humans and primates pose a very real and potentially dangerous situation of disease transmission (Engel et al. 2002). Interaction with primates risk humans in exposure to a number of simian viruses, including simian T cell lymphotropic viruses (STLV), simian retrovirus (SRV), simian foamy virus (SFV), and herpes B virus, in addition to other infectious agents. On the other hand, macaques, are susceptible of getting infected by human pathogens, including measles, influenza, and other respiratory pathogens such as para influenza and tuberculosis (Engel et al., 2002).

The rhesus monkeys of Kathmandu come into frequent contact with humans and due to their habit of residing in the religious and parkland of human proximity, there is a possibility of zoonotic and anthroponotic disease transmission between them. Latest study of intestinal parasitic investigation using direct smear and concentration methods revealed overall parasitization rate of 76.86% with the highest in sample from Pashupatinath (86%) followed by Swayambhunath (74%) and Tripureswor (61.9%) where approximately 27.96% had single infection while 72.04% had mixed infection which implied that the presence of one parasite reduced the immunity of the host as a result multiple infections existed (Chalise et al., 2005). Parasite identifications were based upon the size and appearance of trophozoites, cysts, eggs and larvae of parasites where both protozoan and helminthes parasites were found in varying rates in three temples. Three species of protozoa and ten species of helminthes were detected by microscopic examination of faecal samples. Chalise et al. (2005) argue that humans are always prone to be infected by most of these parasites and hence they are of zoonotic importance.

The main cause of death in chimpanzees at Gombe, Mahale and Taï is infectious disease (e.g., Goodall, 1986, Nishida et al., 2003). Butynski, 2001 argue that chimpanzees and humans being closely related are to many diseases that afflict each other. The habitat alteration in Africa has led monkeys to inevitably interact with humans or human waste increasingly as human population is expanding leading to higher risks of disease transmission between humans and monkeys.
Research and tourism may also be at risk of disease transfer between humans and monkeys, if not managed properly. Deaths of chimpanzees by Ebola hemorrhagic fever in Côte d'Ivoire in the past 15 years have been reported, and repeated epidemics have resulted in dramatic declines of ape populations in remote protected areas of Gabon and the Republic of Congo (Stoinski, 2009) and researchers argue that the density of great apes has declined by 50 to 90% following Ebola epidemics.

8.2 Level of interaction between human and monkeys

Primates of Nepal are considered pest species. Poaching inside the protected areas and reserves are often reported but those are mostly of species of high monetary value. Hunting monkeys for food is also rare. Mostly farmers are concerned about the problems caused by monkeys and they chase them off throwing stones and occasional live capture, torture and release back expecting them not to return. In urban areas, like in Pashupatinath temple area of Kathmandu, the monkeys seem to have well adapted to live alongside humans. In such frequent and close interaction, people don't seem to be concerned about the possibility of disease transfer among humans and monkeys. There could be several social and economic reasons behind this but the sure reason is lack of enough monkey research in Nepal and thus lack of proper awareness among people.

8.3 Future of Populations and recommendation for Nepal

The abundance of natural habitat of primates is relatively low in Nepal especially in urban areas. My study suggests that the habitat quality required is poor in the scanty forested areas temple area of Kathmandu. The natural habitats are seemingly encroached and wild monkeys are dependent on agricultural lands for food. Primates, as generally considered pest species in crop raid areas as well as urban areas of Nepal seem to have lacking proper attention in conservation. During my study, I found that there is no concrete data regarding the census of primates in Nepal. Only recently, there have been concerns about conservation and protection of wildlife of high monetary value. Rhino, tiger, elephants and other rare and endangered species are protected and researches on such species are frequent. Monkeys seem to adjust living alongside human settlement and are thus thriving easily. Since, there is no awareness about conserving these species in Nepal, researches and studies lack too. It cannot be said if their trend is in decreasing order. But, if human encroachment continues at the same alarming rate alongside the lack of proper research and prevention of possible disease transfer in addition to lacking conservation measures for primates, the future survival of healthy urban monkeys is in jeopardy. During my study, primatologist Dr. Mukesh Chalise on personal communication suggested that it is difficult to approach local residents in order to create awareness about conserving monkeys especially when they are facing crop raiding and other problems by monkeys. The monkeys in Tanzania are more studied and effective conservation actions in practice, which could possibly be useful for primate conservation in Nepal. Extensive research got notable attention since early 60's and wildlife professionals took academic stance. External funding and projects managed by international wildlife organizations frequently take place in Tanzania which seems to be lacking in Nepal specially when it comes to monkey study and conservation.

Effective researches could be based on demand-driven principle. Collaborating with stakeholders, priority areas of wildlife research plan can be carried out promoting the collaboration between national research institutions that are

relevant to wildlife management and aiming at promoting regional and international cooperation.

- To conduct social research in order to achieve clear facts on traditional and current perception of the local communities with respect to the wildlife and their habitat in their neighborhood. This research should identify rights and responsibilities the society have on the wildlife resource around them.
- Conservation attention could be focused not only concerning biodiversity conservation, but in Nepal the issue of wildlife management is equally important for social and economic development.
- To identify, through research, measures to control wildlife damages on human properties living alongside primates.
- All major infrastructure development activities within a wildlife area should be preceded by an environmental impact assessment, and an appropriate authority should approve this.
- It is important to obtain fact through research findings on the social dynamics and ecology of both wildlife and local communities.

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Appendix

I. Questionnaire Sample

1. Date:
2. Gender
3. Age
4. Community/Village
5. Family status (father, mother, son/daughter, grandparent etc)
6. Number of member of the household:
7. Status in the village (committee and/or council chair/member, etc)
8. Education:
9. Occupation(s):
10. Annual Income from main Occupation:
11. Annual income from other work:
12. How does the park/community forest contribute to your income, in which way? (Park resources, tourism, park management, etc) Directly or indirectly?
13.

	Yes	No	No Opinion
1. Do you know about the park/forest?			
2. Do you know about its boundaries?			
3. Do you know what you and your family are allowed to do in the park/forest? *			
4. Are you collecting resources from the park, eg animals, plants, fruits, berries, medicinal plants, etc?*			
5. Do the local communities have meetings with the park managers? If yes, do you attend them?			
6. Do you feel that the park managers listen to local			

communities about park management? In which way or not?			
7. Do u participate in the mgmt. of the park? In which way or not?			
8. Have you observed/ are you aware of hunting or live captures of the rhesus monkeys inside or outside the park/forest?			

* Please describe.

14. State your opinion about:

	Good	Bad	No Opinion
1. The fact that there is a park in your area			
2. The park regulations			
3. The park's protection of monkeys			
4. The protection of the other animals and plants in the park			
5. Illegal live capture or hunting of monkeys			
6. Illegal local hunting of other animals			
7. Illegal hunting or use of park resources by other people than the local communities			
8. Local participation in guiding/assisting tourists			
9. Your relationship with tourists who visit the park			
10. Local participation in park management			
11. Your relationship with park managers			

15. Importance of the park, tourism and its resources (animals or plants) for:

	Important	Not important	No Opinion
1. School and other education			
2. Support of family livelihood and income			
3. Jobs			

16. Have you seen the monkeys nearby: Y/N

17. If Y, where, when and approx. how many? Pls describe

18. Do you see monkeys inside/nearby the forest? If yes, how frequent and how many?

19. Can you describe any hunting/capturing method used on monkeys?

20. How can your relationship with park management to the park be improved? Please describe.

21. Do you know where to channel your complains?

22. Do you think the monkey is likely to be extinct (current situation)?

23. Do you have any problems with monkeys? If yes, how often?

24. Do you have problems with other animals? If yes, which animals and how often?

25. If yes, to crop raiding, which animal makes the most damage?

26. Are there any other important issues not covered by this interview? Please describe.
27. Do you know the value of monkeys in and around your forest.

28. Do you know if there is some kind of rules and regulations about conservation of monkeys/wildlife?

29. Do you have a committee or governing body for regulating the forest/wildlife law/policy?

30. If yes, are the members from the your community or from outside?

31. Is there cast-based hierarchy in decision-making?

32. Are females equally participated in the decision-making?

33. If yes, explain how. If no, what could be the reason?

II. Results from Questionnaire

Community/village	**Sample**
Piple VDC, Chitwan National Park	50

Gender	**Sample**
Male	23

Female	27

Age	**Sample**
<20	
20-30	6
30-40	22
40-50	20
>50	2

Status in family	**Sample**
Father	12
Mother	15
Son/daughter	6
Grandparent	17

Number of members in household	**Sample**
2	2
3	8
4	12
5	12
>5	16

Status in the village	**Sample**
Community forest member	36

Occupation	**Sample**
Farming	7
Government service	11
Housewife	24
Others	8

Annual income from main occupation (in Rupees)	**Sample**
<100000	5
100000-150000	10
150000-200000	15
200000-250000	16
>250000	4

	Yes	No	No Opinion
1. Do you know about the park/forest?	50	0	
2. Do you know about its boundaries?	44	6	
3. Do you know what you and your family are allowed to do in the park/forest?*	48	2	
4. Are you collecting resources from the park, eg animals, plants, fruits, berries, medicinal plants, etc?*	50		
5. Do the local communities have meetings with the park managers? If yes, do you attend them?	28	20	2
6. Do you feel that the park managers listen to local communities about park management? In which way or not?	28	32	
7. Do u participate in the mgmt. of the park? In which way or not?	23	17	10
8. Have you observed/ are you aware of hunting or live captures of the rhesus monkeys inside or outside the park/forest?	34	6	10

14. Importance of the park, tourism and its resources (animals or plants) for:

Parameters	**Important**	**Not important**	**No Opinio**

			n
1. School and other education	50		
2. Support of family livelihood and income	35	6	9
3. Jobs	17	20	13

Have you seen the monkeys nearby	**Sample**
Yes	50
No	

If yes, how many?

<5	1
5-15	5
15-25	10
25-35	20
35-45	11
>45	3