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Diversity of Mammalian Fauna and Conservation Issues of Dhankuta Municipality of Dhankuta District, Nepal

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Abstract

Dhankuta municipality is a mid-hill town in Dhankuta district, Province 1, Nepal. The municipality consists of 10 wards scattered across 111.6 square kilometers of geographical area and is situated between 26°59'59'' and 27°02'55'' north latitude and 87°17'52'' and 87°23'09'' east longitudes. Mammalian diversity in the municipality has not been so far recorded. The present study was conducted from August 2021 to July 2022 with a view to bridging this knowledge deficit and presenting an up-to-date account of the mammalian species in the agricultural fields and forests of the municipality based on questionnaire survey, direct sightings and indirect evidence. A total of 19 mammal species belonging to 7 orders and 13 families were registered. Among 19 species, 6 species belonged to Carnivora, 2 species to Cetartiodactyla, 3 species of Primate, 5 species to Rodentia and 1 each to Chiroptera, Eulipotypha, Lagomorpha. The major threats to mammalian fauna of the municipality include habitat loss and degradation, persecution, human-wildlife conflict and poaching. For long-term conservation of wild mammals more research is needed on their population genetics, habitat ecology, food web and climate change vulnerability. The information contained in the present study is expected to form the baseline for further development and research in the field of mammalian conservation in the municipality.

Keywords: Dhankuta municipality, mammalian fauna, order, family, threats, conservation

Introduction

Nepal is rich in biodiversity. Despite making up less than 1% of the world's total land mass, Nepal boasts of unique physiographic features ranging from the highest terrestrial ecosystem, the Himalayas to the sub-tropical lowlands of the Terai. This is the reason why the country is one of the most bio-diversified countries in the world. The country is affluent in mammalian diversity as well with almost 4.2% (n=208) of all recorded mammals in the world. Among 208 mammal species found in the country 23% are considered Nationally threatened with

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extinction, 4% critically endangered, 12% Endangered and 7% Vulnerable and 3% Near Threatened. Also, 35% of Nepal's mammals are considered least concern, and 38% are considered Data Deficient.

Mammals are a remarkably diverse group of animals having been adapted to almost all the available ecological niches (Ungar, 2010). They play a crucial role in the dynamics of ecosystems in which they live and their communities play a significant role in maintaining ecological integrity (Jones and Safi, 2011). Mammals are critical for human well-being as they maintain energy flow in the ecosystem and command their productivity through herbivory, predation and granivory along with shaping other biodiversity and their habitats from pollination, seed dispersal and insect-pest control (Lacher et al., 2019). Despite their crucial role in the ecosystem, mammals are always in threat and are imperiled worldwide. It has been estimated that worldwide, approximately 25% of the mammals are threatened with extinction (Ceballos et al., 2020). Main threats to their survival encompass anthropogenic hazards like habitat fragmentation, habitat loss and its degradation, biological resource extraction (Ceballos et al., 2020) and in some instances from commercial, illegal, or unregulated hunting (Bowyer et al., 2019).

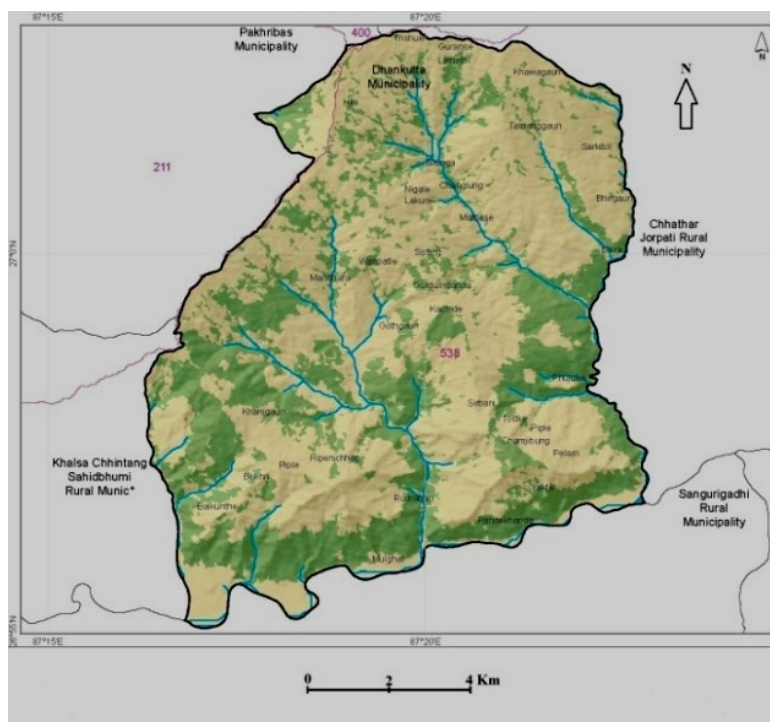
Mammals right away seize our curiosity and thereby enhance their inherent value. This is because humans are mammals in the first place. Additionally, we are always closely associated with diverse groups of mammals like canids, felids, and other domestic mammals as companions or livestock (Clutton-Brock, 1999). This deep-rooted alliance between humans and mammals obviously generates opportunities for education about populations, ecological communities, ecosystems, global climate and conservation of all species in general (Bowyer et al., 2019).

Although mammals have been one of the most frequently studied taxa (Basnet et al., 2019) a full-scale knowledge of the mammalian status of the municipality is still desired. Hence, a methodic study was carried out considering the mammalian diversity of the municipality and to provide an informed perspective on the main threats to the survival of these animals before also articulating conservational recommendations. Not forgetting, the major goals of mammal conservation irrevocably include fighting back extinction and safeguarding their population (Bowyer et al., 2019).

Materials and Methods

Study area

Study was conducted from August 2021 to July 2022 in Dhankuta Municipality, Dhankuta. The municipality consists of total 10 wards scattered across 111.6 square kilometers of geographical area (Fig. 1). It is a mid-hill town with total population of 36, 619 and is situated between 26°59'59'' and 27°02'55'' north latitude and 87°17'52'' and 87°23'09'' east longitudes. The elevation ranges from 250 masl to 2144 masl. The municipality has the vegetation zones ranging from sub-tropical Sal forests along the Tamor River, and temperate forests on higher altitudes. A well-preserved forest (Chuli Ban) spreads along a ridge line on the northwest side of the village with well-developed mature stands of rhododendron and Sallo (Pine) trees. Located towards the North-west of the main town is 'Salleri ban' which, as the name suggests, comprises majorly of Pine trees. Higher altitudes have temperate forests. Also, majority of the geographical area of the municipality are covered by private agro-forests, crop fields and human dwellings. The climate of the municipality may be classified as warm and temperate.

Fig.1: Map of study area

Methods

Mammalian diversity of the area was discovered by both direct and indirect methods. The direct method included total/physical count, calls or voices, while indirect method included observation of nests, fecal pellets, and marks on trees, and footprints. Transects of varying lengths were laid along the forest's trails covering different habitats. Caves, burrows and other natural holes were also explored during the field survey. Binoculars (32x50) were used to observe the mammals, and identification of the mammalian fauna was done by using standard field guides (Baral and Shah, 2008). Photographs were taken to ease the identification of mammals.

Most of the mammals are nocturnal and hide under thick undergrowth which restricts their direct sighting during the daytime. Hence, people (n=20 respondents) living inside and periphery of the forests were also interviewed (Semi-structured questionnaire survey). The mammal species were then identified on the basis of the photographs taken or hints/clues given by them regarding their morphology, appearance, calls and prints.

The recorded mammals were categorized according to IUCN categories 2018 (IUCN, 2018) as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Data Deficient (DD), and Least Concern (LC).

Data were collected from all the 10 wards of the municipality.

Results and Discussion

A total of 19 mammalian species belonging to 18 genera, 13 families and 7 orders were recorded from the study area (Table 1). The mammalian orders included Carnivora (4 families and

6 species), Cetartiodactyla (2 families and 2 species), Chiroptera (1 family and 1 species), Eulipotypha (1 family and 1 species), Lagomorpha (1 family and 1 species), Primate (1 family and 3 species) and Rodentia (3 families and 5 species). The present study recorded only terrestrial species among which 5 were arboreal species (*Macaca assamensis*, *M. mulatta*, *Semnopithecus hector*, *Funambulus pennantii* and *Callosciurus pygerythrus*), 1 aerial species (*Rhinolophus pusillus*), and the rest using more than one ecological niches as terrestrial habitats. The diets of mammals are diverse. Some mammals are sternly carnivorous while others herbivorous. However, there are mammals which feed on mixed diets depending on their availability. In most terrestrial communities, carnivores occupy the top predator rank while herbivores are the primary feeders (Subramanyam and Khan, 2017). The study documented 2 species as the seed-feeders (10.53 %), 4 (21.05 %) herbivorous, 3 (15.79 %) carnivorous, 1 (5.26 %) insectivorous, 1 (5.26 %) mixed feeders, and the rest 8 (42.11 %) omnivorous. Total 4 different IUCN categories: LC, VU, NT and DD were reported in the present study. Among these, LC category mammals formed the highest percentage (94.74 % Global; 73.68 % National).

Table 1: A list of mammals recorded in Dhankuta Municipality

Family	Scientific name	Common name	Local name	Conservation status		Foraging type
				G	N	
Order: Carnivora						
Felidae	<i>Prionailurus bengalensis</i> (Kerr, 1792)	Leopard Cat	Chari Bagh	LC	VU	Carnivorous
Canidae	<i>Canis aureus</i> (Linnaeus, 1758)	Golden Jackal	Syal	LC	LC	Carnivorous
Canidae	<i>Vulpes bengalensis</i> (Shaw, 1800)	Bengal Fox	Phusro Phyauro	LC	VU	Omnivorous
Felidae	<i>Felis chaus</i> (Schreber, 1777)	Jungle Cat	Ban Biralo	LC	LC	Carnivorous
Herpestidae	<i>Herpestes javanicus</i> (E. Geoffroy Saint-Hilaire, 1818)	Small Asian Mongoose	Sano Nyaurimusa	LC	LC	Carnivorous
Mustelidae	<i>Martes flavigula</i> (Boddaert, 1785)	Yellow-throated Marten	Malsapra	LC	LC	Omnivorous

Order: Cetartiodactyla						
Suidae	<i>Sus scrofa</i> (Linnaeus, 1758)	Wild Boar	Bandel	LC	LC	Omnivorous
Cervidae	<i>Muntiacus vaginalis</i> (Boddaert, 1785)	Barking Deer	Ratuwa	LC	VU	Omnivorous
Order: Chiroptera						
Rhinolophidae	<i>Rhinolophus pusillus</i> (Temminck, 1834)	Least horse shoe Bat	Sano Ghodnale Chamero	LC	LC	Insectivorous
Order: Eulipotypha						
Soricidae	<i>Suncus murinus</i> (Linnaeus, 1766)	House Shrew	Ghar Chuchundro	LC	LC	Omnivorous
Order: Lagomorpha						
Leporidae	<i>Lepus nigricollis</i> (F. Cuvier, 1823)	Indian Hare	Khairo Kharayo	LC	LC	Herbivorous
Order: Primate						
Cercopithecidae	<i>Macaca assamensis</i> (Hodgson, 1840)	Assam Macaque	Pahare Bandar	NT	VU	Herbivorous
Cercopithecidae	<i>Macaca mulatta</i> (Zimmermann, 1780)	Rhesus Macaque	Rato Bandar	LC	LC	Herbivorous
Cercopithecidae	<i>Semnopithecus hector</i> (Hodgson, 1840)	Nepali Gray Langur	Lampuchhre Bandar	LC	LC	Herbivorous
Order: Rodentia						
Muridae	<i>Mus musculus</i> (Linnaeus, 1758)	House Mouse	Duhure Ghar muso	LC	LC	Granivorous

Muridae	<i>Rattus rattus</i> (Linnaeus, 1758)	Black Rat	Ghar muso	LC	LC	Granivorous
Sciuridae	<i>Funambulus pennantii</i> (Wroughton, 1905)	Five-stripped Palm Squirrel	Panch dharke Lokharke	LC	LC	Omnivorous
Sciuridae	<i>Callosciurus pygerythrus</i> (I. Geoffroy Saint Hilaire, 1832)	Hoary-bellied Squirrel	Pahadi Ban Lokharke	LC	LC	Omnivorous
Hystriidae	<i>Hystrix brachyura</i> (Linnaeus, 1758)	Himalayan Crestless Porcupine	Malaya Dumsi	LC	DD	Herbivorous and Insectivorous

Abbreviations: G-Global, N-National

The highest number of mammals were recorded from the Order Carnivora (6 species), followed by Rodentia (5 species), Primate (3 species), Cetartiodactyla (2 species) and Chiroptera. One species each was recorded from the orders Eulipotypha and Lagomorpha.

Least horseshoe bat (*Rhinolophus pusillus*) was recorded from the forest and cave 'Chamero gupha' near Bancharo khola, Ward 4. Despite making up almost a quarter of all mammal species that occur in Nepal, bats have always been largely neglected in terms of research (Amin et al., 2018). 3 species of monkeys (*Macaca assamensis*, *Macaca mullata* and *Semnopithecus hector*) were recorded from near the edge of dense forests and crop fields of the municipality. Primates are currently considered the least threatened group of mammals in Nepal (Jnawali et al., 2011). Monkeys are highly versatile species and can easily adapt around human settlements. The Assam Macaque is categorized as the only threatened primate species in Nepal (Amin et al., 2018). Taxonomy of langurs remains controversial. All three langurs (*Semnopithecus hector*, *S. ajax* and *S. schistaceus*) may be grouped under Himalayan gray langurs with split into multiple distinct species (Jnawali et al., 2011).

The present study also documented the presence of *Prionailurus bengalensis* (Common name-'Leopard cat') in the dense forest of the municipality. However, the documentation simply reckoned upon the hints given by the local inhabitants about the animal's rare sightings and its predation upon domesticated chickens.

Frequently sighted was the *Muntiacus vaginalis* (Common name-'Barking deer') visiting the agriculture fields, especially during night and feeding upon crops and vegetables. During feeding the deer was observed moving about very slowly, zigzagging over a small area for a long time.

Sus scrofa (Common name-'Wild Boar') was also recorded roaming about and feeding on various vegetable substances in the morning and evening. Local inhabitants posit that there are no animals more damaging to their crops than this mammal.

The present study also found clues about the disruption of the ecological equilibrium of the municipality due to developmental activities and human interventions. For example, the forest area of the municipality has been fragmented due to construction of roads and is unfavourably affected by expansion of urban land and crop cultivation. As a consequence, many mammalian species have left their natural habitat and have been compelled to come near human settlements. This has unquestionably led to recurring human-wildlife conflict.

Major Threats to mammalian fauna of the municipality

The major threats to mammalian fauna of the municipality include habitat loss and degradation, persecution, human-wildlife conflict and poaching. The present study identified a large number of threats which were invariably depleting the forests at an unrivalled rate. The increased level of toxic chemicals from fertilizers and pesticides in agricultural areas, uncontrolled wood gathering, forest fires, overgrazing by livestock have contributed to the depletion of the forest area of the municipality. Conversion of grasslands and forests to agriculture fields have led to habitat loss. Habitat loss and degradation and overharvesting pose the greatest threat to mammals worldwide (Schipper et al., 2008). Spread of invasive plant species such as *Lantana camara* (Local name-‘Ban Fada’), *Chromolaena odorata* (Local name-‘Seto Banmara’) are also attributed to the habitat loss and degradation of habitat. Plant invasions can alter community composition resulting in a negative impact upon the mammals such as reduction in the availability or quality forage for herbivorous mammals (Brooks et al., 2004). Uncontrolled forest fire also poses a serious threat to the mammals of the municipality. Forest fires adversely affect the regeneration of native species of flora which have negative consequences upon the mammals, especially the herbivores. The study also recorded the hunting of several species of mammals for food in the municipality. The hunted mammals included *Sus scrofa* (Wild Boar), *Hystrix brachyura* (Himalayan Crestless Porcupine). Bunn and Gurtov (2014) commended that humans have been hunting other mammals throughout our species existence and the primary motivation for hunting has always been for food (Harrison et al., 2016).

The present study also found that human-wildlife conflict is on rise in the municipality due to fragmentation, degradation and disturbance of habitats. The underlying reasons are the rampant construction of roads, human settlements and urban land expansion.

Another major threat to the mammalian fauna of the municipality is inadequate knowledge and research. Due to traditional beliefs and lack of awareness several mammals such as bats and rodents are persecuted. For example, in spite of their considerable importance in pollination and seed dispersal, bats are persecuted. Also, since baseline data on population size, distribution and ecology of mammalian fauna of the municipality is almost lacking it is hard to come up with an effective conservational programme for these animals.

Recommendations

Based on the findings of the present study following recommendations have been made.

- Minimize the use of pesticides in agricultural fields.
- Overgrazing of the forests by livestock should be monitored and controlled.
- Prevention of illegal trade of animals and animal products.
- Reduction in human-wildlife conflicts through repaying of damaged crops by wild animals.

- Mobilizing the local communities in wildlife conservation and sustainable use of the ecosystem goods and services.
- Declaration of the municipality as an important wildlife area.
- Conduction of public awareness raising programs such as campaigns and public information to improve the behaviour of local people towards mammals and reduce threats.

Conclusion

The landscape of Dhankuta municipality is rich in mammalian fauna and the present study documented a total of 19 mammal species. With the implementation of up to date technologies such as camera trapping many more species will be affixed to the list in the time ahead. Habitat fragmentation, degradation and disturbance of habitats due to construction of roads, human settlements and urban land expansion have led to increased human-wildlife conflicts in the municipality. Habitat restoration holds the potential to conserve the mammalian fauna of the municipality. Additionally, for long-term conservation of these animals more stream-lined research is needed on their population genetics, habitat ecology, food web and climate change vulnerability. Also, in depth research on the aftermath of major threats to the mammalian fauna is crucial for working out the conservation plan for these animals. Nevertheless, the information contained in the present study is expected to configure the baseline for further development and research in the field of mammalian conservation in the municipality.

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References

- Amin, R.H. (2018). The status of Nepal's mammals. *Journal of Threatened Taxa*, 10(3): 11361–11378.
- Subramanyam, B.V.V., & Khan, I.Y.D. (2017). Diversity of mammalian fauna and conservational issues of the Anantapuramu district of Andhra Pradesh, India. *International Journal of Recent Scientific Research*, 8(12): 22646-22652.
- Baral, H.S., & Shah K.B. (2008). Wild Mammals of Nepal. *Himalayan Nature, Kathmandu*, 104-109.
- Basnet, D., Kandel, P., Chettri, N., Yang, Y., Lodhi, M.S., Htun, N.Z., Uddin, K., & Sharma, E. (2019). Biodiversity research trends and gaps from the confluence of three global biodiversity hotspots in the far-eastern himalaya. *Int. J. Ecol.*, 1-14.
- Bowyer, R.T., Boyce, M.S., Goheen, J.R., & Rachlow, J.L.(2019). Conservation of the world's mammals: status, protected areas, community efforts, and hunting. *Journal of Mammology*, 100 (3): 923-941.
- Brooks, M.L., D'Antonio, C.M., Richardson, D.M., Grace, J.B., Keeley, J.E., DiTomaso, J.M., Hobbs, R.J., Pellant, M., & Pyke, D. (2004). Effects of Invasive Alien Plants on Fire Regimes. *BioScience*, 54 (7): 677–688.
- Bunn, H. T., & Gurtov, A.N. (2014). Prey mortality profiles indicate that early Pleistocene *Homo* at Olduvai was an ambush predator. *Quaternary International*, 322–323:44–53.
- Ceballos, G., Ehrlich, P.R., & Raven, P.H. (2020). Vertebrates on the brink as indicators of biological annihilation and the sixth mass extinction. *Proc. Natl. Acad. Sci. U.S.*, 117: 13596–13602.
- Clutton-Brock, J. (1999). *The natural history of domesticated mammals*. Cambridge University Press.
- Harrison, R.D., Sreekar, R., Brodie, J.F., Brook, S., Luskin, M., O'Kelly, H., Rao, M., Scheffers, B., & Velho, N. (2016). Impacts of hunting on tropical forests in Southeast Asia. *Conservation Biology*, 30: 972–981.
- International Union for Conservation of Nature and Natural Resources. (2018). The IUCN Red List of Threatened Species 2018™ Technical Report. <https://www.researchgate.net/>
- Jnawali, S.R., Baral, H.S., Lee, S., Acharya, K.P., Upadhyay, G.P., Pandey, M., Shrestha, R., Joshi, D., Laminchane, B.R., Griffiths, J., Khatiwada, A.P., Subedi, N., & Amin, R. (2011). *The Status of Nepal Mammals: The National Red List Series*. Kathmandu Nepal: Department of National Parks and Wildlife Conservation.
- Jones, K.E., & Safi, K. (2011). Ecology and Evolution of Mammalian Biodiversity. *Philosophical Transactions of the Royal Society B: Biological Science*, 366: 2451-2461.
- Lacher, T.E., Davidson, A.D., Fleming, T.H., Gomez-Ruiz, E.P., McCracken, G.F., Owen-Smith, N., Peres, C.A., & Vander Wall, S.B. (2019). The functional roles of mammals in ecosystem. *J. Mammal*, 942-964.

- Schipper, J., Chanson, J.S., Chiozza, C., Chiozza, F., Cox, N.A., Hoffmann, M., Katariya, V., Lamoreux, J., Ana, S.L., Rodrigues, N., Simon, N., Temple, S., Temple, H.J., Baillie, J., Luigi, B., Lacher, T.E., Mittermeier, R.A., Smith, A.T., Absolon, D., ... Bruce, E.Y. (2008). The status of the world's land and marine mammals: diversity, threats and knowledge. *Science*, 322(5899): 225-230.
- Ungar, P.Y. (2010). *Mammal teeth: origin, evolution, and Diversity*. Baltimore, M.D.: Johns Hopkins University Press.