Mammals: The Jewels of Banpale Forest, Kaski District, Nepal

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Abstract

Study of mammals outside protected area is limited in Nepal especially small patches of forest used by small carnivores and very less is known about current biodiversity status. With the importance of research in such area, this study was carried out in the Banpale forest using non-invasive method camera trapping and past records as a tool to monitor the mammals. A total of 20 mammal species were recorded in 36.33 ha patch of forest in between December, 2016 to March, 2017. Large Indian civet has been trapped in the camera for the most time during the entire survey. Common leopard was also sighted and camera trapped however the prey species were neither camera trapped nor any direct sighting was made. The forest has a wide diversity of least researched small mammals which have been trapped by the camera. The threats have been in the peak causing negative interaction between the wildlife and humans. Conservation action plan for the wildlife should be duly implemented with strict rules and regulations for the conservation of remaining wildlife present in the forest.

Keywords: Banpale forest; Camera trapping; Mammals; Encroachment

Introduction

The first complete systematic review of all mammals of the world was produced by Trouessart [1] followed this number of taxonomical research has been made on mammal species of the world by Simpson and Gaylord [2] Walker [3], Nowak [4], Sokolov [5] Corbett and Hill [6], McKenna and Bell [7], Wilson and Reeder [8] reported a total of 5416 species of mammal belonging to 154 families and 29 orders have been reported from the globe. Because of the variance in climate, from tropical to arctic, Nepal has a large variety of plants and animals [9].

Nepal harbors 208 mammalian species constituting 4.2% of world’s mammalian species [10,11] along with the discovery of two species Pallas cat (Otocolobus manul) [12] and Rusty-spotted cat (Prionailurus rubiginosus) [13] in Nepal makes the total species of mammals to 210 in Nepal. Of the 208 known species of mammal in Nepal, one is considered Regionally Extinct, 8 are considered Critically Endangered, 26 are considered Endangered, 14 are considered Vulnerable and 7 are considered Near Threatened [11] and 2 other species added new on the list Pallas cat and Rusty-spotted cat falls under the Near-threatened category by IUCN red data list.

Banpale forest which is under the ownership of Institute of Forestry (IoF), Pokhara campus, Nepal is scientifically unexplored forest to great extent. Much of the biodiversity in the country has been conserved through the establishment of the protected area system, which covers nearly 25% of the country’s land mass and represents diverse ecosystems at various elevations [11]. The main objective of the research was to understand the mammalian profile in the small patch of forest outside the protected area.

Study area

Banpale forest lies in the South-west of Pokhara metropolitan city, ward number 15 which is under the ownership of Institute of Forestry, Pokhara campus [14]. The altitude varies from 750m at Seti river bed to 915m at the top of small hill lock of forest above mean sea level. The total area of the forest is 31.85 hectare and the area of the campus is 15 hectare however, we deployed the camera to few more hectare of land which is connected with the Banpale forest [15]. As a result, the total area surveyed was 36.33 hectare. Study area covered the whole of Banpale Forest featuring trees, shrubs, rocky slopes, landslide area and the flat land of Iof along the surrounding area consist of human settlement and agricultural fields [14]. Banpale forest is a natural forest of Katus (Schima species).- Chilauna (Castanopsis species) as main species conserved and managed by IOF Pokhara [15,16]. The other species in Banpale forest are Diospyrus melanaricum, Dalbergia latifolia, Dalber gia sissoo, Albezia species, Cinnamom camphora, Delonix regia, Acacia catechu. Total 155 species of plant have been reported in IOF premises (Map 1) [17].

Methods and Methodology

Camera trap (Bushnell, 8MP, active motion inbuilt function) approach, which is non-invasive and reduces survey effort substantially was used for this research [18-22]. Single piece of camera trap was used during the whole survey. Camera was placed based on the presence of the signs and on pocket areas as well as through the key informant survey was carried out with forest guard and local people around the forest. Camera was transferred from the initial site to the new sites and followed the same rules for all the remaining sites (except site E and J) both were highly potential sites as per key informants. The camera trap survey was carried out from December, 2016 to March 2017 for about four months and consisted of a total survey effort of 120 trap night in 11 different camera trap station. The camera trap locations are from the 735-844m altitude ASL. Active Motion sensor camera trap were placed at the height from 25cm to 65 cm in different locations from the...
ground level. The time interval between the two photos was 1 second. The mammals were identified using the book Wild Mammals of Nepal [10]. Mist netting wasn’t conducted for Bat survey however data were collected from secondary sources. The camera trapping was carried out with the intention to explore the mammals of the Banpale forest. The capture rate of the species was calculated by using the formula: The Capture rate for each species was calculated using formula: 

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\text{Capture rate} = \left( \frac{\text{Species photos}}{\text{Total trap nights}} \right) \times 100
\]

\[\text{adopted} \text{ [23].}\]

Results and Discussions

The total number of photos captured and is further best for detection is 1011. Pictures were chosen only if they further improved the detectability and identification of species. Total 19 mammals were identified and is confirmed that some of them are currently using small patch of this habitat. Most frequently sighted species were Large Indian Civet Viverra zibetha (capture rate: 75.00), Jungle Cat Felis chaus (30.833), Himalayan Field Rat Rattus nitidus (0.833), Indian Crested Porcupine Hystrix indica (2.500), Common leopard Panthera pardus (4.1667), Masked Palm civet Paguma larvata (0.8333). Other mammals recorded through the photographs and previous studies were Barking deer Muntiacus muntjak, Rhesus Macaque Macaca mulatta, Indian Hare Lepus nigricollis, Northern palm squirrel Funambulus pennantian, Small Indian mongoose Herpestes auropunctatus, Asian house shrew Suncus murinus, Yellow throated marten Martes flavigula, Himalayan field rat Rattus nitidus, Little Nepalese Horse shoe bat Rhinolophus subbadius, Small bent winged bat Miniopterus pusillus, Painted bat Kerivoula picta, Assam Macaque Macaca assamensis. A colony of 7 Indian flying fox Pteropus giganteus was recorded with its roosting site in Diploknema butyraceae species (Table 1 and 2).

Species like Barking deer, Indian hare have been recorded with the photographs previously but were not camera trapped in this present survey. The biggest predator recorded in the forest was Common Leopard Panthera pardus however rate of detection is poor based on the trapped capture (0.0074488). The recording of large carnivores is scanty however small carnivores were recorded frequently in the camera traps.

Out of 19 species of mammals found through extensive camera trapping survey as well as through the previous studies and literature survey. Large Indian Civet (Viverra zibetha) was most recorded species in camera traps which was followed by the Jungle cat (Felis chaus). The Leopard wasn’t recorded frequently nor was large prey species recorded for leopard so it could only be a visitor. Jungle cat and Large Indian civet
both have been recorded in the same camera traps in 7 stations which depicts that these two small carnivores are sharing the same habitat. Since the area of forest is small with few prey species so the forest is best for the small carnivores. A total of 4 bat species have been reported in this forest. Out of 210 species of mammals present in the Nepal, 19 have been recorded from this small patch of forest which is 9.047% of the total mammals present in Nepal.

The Forest of Banpale has been under severe encroachment since many years. Nowadays, the jungle has been unwisely used for subsistence living along with the destruction of the forest trees. The forest has been used as the shorter route to cross two villages which has created a human dominated trail in the forest. The garbage and sewage thrown in the forest area is directly and indirectly affecting the forest as a shortcut route to pass to another village should be stopped and night as well to stop the encroachment. Similarly, use of Banpale forest has been used as the shorter route to cross two villages which has created a human dominated trail in the forest. The garbage and sewage thrown in the forest area is directly and indirectly affecting the wildlife. Since prey species weren’t recorded much which might be due to excessive hunting by locals. Thus, it seems hard to thrive in such existing forest for large carnivores. Forest is suitable for small carnivores and bird species so proper management and protection should be given priority to protect the remaining population of wildlife in this forest.

It seems that the remaining folds of mammals are surviving with great threat and with less prey distributed area which has really made the existence very hard.

**Recommendation**

Conservation action plan for the wildlife should be duly implemented with strict rules and regulations for the conservation of remaining wildlife present in the forest. Forest guard (Ban heralu) should be active enough to monitor the forest time by time in the day and night as well to stop the encroachment. Similarly, use of Banpale forest as a shortcut route to pass to another village should be stopped so as to increase the density of the forest suitable for the wildlife. Locals around the forest should be abandoned using the resources unwisely. Human induced forest fire should be stopped in the forest. Livestock and cattle grazing on the forest should be strictly prohibited. For long term conservation awareness seems to be utmost need of the time.

**Author’s Contributions**

Bist BS, Paudel S and Ghimire P were involved in idea generation. Sharma B

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Table 1: Camera stations Description with elevation, number of days and species trapped.

| S.No. | Camera Station | Elevation(m) | Number of days | Habitat | Species |
|-------|----------------|--------------|----------------|---------|---------|
| 1     | A              | 735          | 10             | Open canopy, river-forest edge | Common leopard and Large Indian civet, Jungle cat |
| 2     | B              | 751          | 10             | Open canopy, river-forest edge | N/A (Pugmark of leopard was previously Observed) |
| 3     | C              | 818          | 10             | Schima castanopsis closed canopy | Large Indian Civet |
| 4     | D              | 833          | 10             | Schima castanopsis closed canopy | Large Indian Civet |
| 5     | E              | 818          | 10             | Schima castanopsis closed canopy | Large Indian Civet |
| 6     | F              | 817          | 15             | Schima castanopsis closed canopy | Common leopard, Large Indian civet, Indian crested porcupine, Masked palm civet, Jungle cat |
| 7     | G              | 810          | 10             | Partially closed canopy | Jungle cat, Large Indian civet |
| 8     | H              | 822          | 10             | Schima castanopsis closed canopy | Jungle cat, Large Indian Civet |
| 9     | I              | 844          | 10             | Schima castanopsis closed canopy | Jungle Cat, Large Indian Civet |
| 10    | J              | 843          | 15             | Schima castanopsis closed canopy | Jungle cat, Large Indian civet |
| 11    | K              | 833          | 10             | Schima castanopsis closed canopy | Jungle cat, Large Indian civet, Himalayan field rat |
| Total |                |              | 11             | 120     |         |

Table 2: Captured Fauna: Local name, Common name, their scientific name, Family, IUCN status, Remarks and Citation.

| S.No. | Local Name | Common Name | Scientific name | Family | IUCN Status | Remarks | Citation |
|-------|------------|-------------|-----------------|--------|-------------|---------|----------|
| 1     | Chituwa    | Common Leopard | Panthera pardus | Felidae | Vu | CT footage | [14] |
| 2     | Ratuwa     | Barking deer | Muntiacus muntjak | Cervidae | LC | Photograph | [14] |
| 3     | Rato bandhar | Rhesus Macaque | Macaca mulatta | Cercopithecidae | LC | Photograph | This study and [14] |
| 4     | Syal       | Golden Jackal | Canis aureus | Canidae | LC | Photograph | This study |
| 5     | Ban biralo  | Jungle Cat   | Felis chaus | Felidae | LC | CT photograph | This study |
| 6     | Kharayo    | Indian hare  | Lepus nigricollis | Leporidae | LC | Photograph | [14] |
| 7     | Lokharke   | Northern palm squirrel | Funambulus penanati | Sciuridae | LC | Photograph | [14] |
| 8     | Nyaurimusha | Small indian mongoose | Herpestes auropunctatus | Herpestidae | LC | Photograph | [14] |
| 9     | Ghar chhuchundo | Asian house shrew | Suncus murinus | Soricidae | LC | Photograph | [14] |
| 10    | Malsapro   | Yellow throated marten | Martes flavigula | Mustelidae | LC | Photograph/Direct sighting | [14] |
| 11    | Himali Khetmuso | Himalayan field rat | Rattus niluidus | Muridae | LC | Photograph | This study and [14] |
| 12    | Chamera    | Little Nepalese Horse | Rhinolophus subbadius | Rhinolophidae | LC | Photograph | [14] |
| 13    | Chamera    | Small bent winged bat | Miniopterus pusillus | Vespertilionidae | DD | Photograph | [14] |
| 14    | Chamera    | Painted bat | Kerivoula picta | Vespertilionidae | LC | Photograph | [14] |
| 15    | Pahare Bandar | Assam Macaque | Macaca assamensis | Cercopithecidae | NT | Photograph | This study |
| 16    | Thulo nirb IRA | Large Indian Civet | Viveria zibetha | Viveridae | LC | CT footage/ Photograph | This study |
| 17    | Gajele nir bira lo | Masked palm Civet | Paguma larvata | Viveridae | LC | CT photograph | This study |
| 18    | Dumshi     | Indian crested Porcupine | Hystrix indica | Hystricidae | LC | CT photograph | This study |
| 19    | Raj chamero | Indian flying fox | Pteropus gigantus | Pteropodidae | LC | Photograph | This study |

CT- Camera trap, LC- least concern, Vu- Vulnerable, NT- Near threatened, DD- Data deficient
and Subedi A worked together with Bist BS and Ghimire P during field survey. All co-authors were involved in manuscript writing and collecting previous data.

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