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Role of Community Forests in Faunal Diversity Conservation: A Case Study of Community Forests within Satbariya Range Post of Dang District

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Abstract
A study was conducted to identify the role of community forests in the conservation of faunal diversity in various community forests practiced in the Satbariya Range Post of Dang district. The study aimed to understand and evaluate the role of community forests in biodiversity, especially faunal conservation efforts. Different methods such as questionnaire survey, group discussion and line transect methods were used to collect data for the determination of faunal diversity, abundance and distribution pattern of the wild animals and wildlife-people conflict. The variance to mean ratio was used to determine distribution pattern and chi-square test was used to test hypothesis that the prominent wildlife species were uniformly distributed in all habitat types in the study area. A total of 25 mammals, 16 herpetofauna and 163 bird species were recorded in the study area. Altogether, 251 different signs of the wild fauna were encountered in ten transects taken in the area. Over 93% of the local respondents agreed that the wildlife has dramatically increased due to establishment of community forests in the areas. Seasonal visits of wild elephant and blue bull to the area indicated availability of suitable habitat for the species as they were not seen before the establishment of the community forests. However, the local peoples suffered from economic loss due to the increasing number of the wildlife in the community forest as they damaged their crops and killed their livestock. High incidences of wildlife poaching were found in these community forests.

Key words: community forestry program, human-wildlife conflict, wildlife abundance

Introduction

Nepal has demonstrated that community forestry is a viable strategy for the rehabilitation of abandoned and degraded land through plantations and by promoting the return of a variety of plant and animal species (Rajbhandari 1995). Animal populations are characteristically dynamic over time and it is based on the habitat available for them. Due to the development of community forestry program, it is obviously known that the habitat for wild animals has improved. Several research works have been carried out on wildlife in protected areas. But, due to less research work about wildlife in the community forests one cannot say how the community forestry helps to conserve the faunal diversity, how peoples are surviving with the increasing number of wild animals and is there any loss of initial fauna or not, although it is commonly expected that community forests contribute for the improvement of wildlife habitats and their diversity.

The protected areas by themselves are not enough to support viable wildlife population in Nepal. Additionally, forests and wild areas outside the parks are often not administered and managed for wildlife conservation (MFSC/DNPWC 1999). Therefore, it is important to shift management from protected areas to ecosystem or landscape management, so that entire wildlife populations are treated as a single management unit. The Terai Arc Landscape (TAL)-Nepal is a first landscape level conservation initiative of Government of Nepal (MFSC 2006). Community Forestry is one of the important parts of the TAL Program for the development of corridor for free movement of wildlife, and conservation of biodiversity. In the early stages of the TAL Program, most habitat management has focused on community forestry (Shrestha 2004). However, the improvement in forest cover near villages has not only resulted in an increase in number of wild

animals, but also attacks on the domestic animals (HMGN/MFSC 2002). To find out the role of community forests in faunal diversity conservation, a study was conducted in such forests of Satbariya Range post of Dang District. This paper discusses some of the important findings of the study.

General objective of the study is to understand the richness of the faunal diversity and dynamics in various community forests practiced in Satbariya range post, Dang district, Nepal. The specific objectives of the study are: to enumerate the faunal diversity in the community forests and compare this with the previously found faunal diversity of the area when it was not established as community forests, to determine abundance and distribution pattern of prominent wildlife species and to document and discuss the conflict between wild animals and people residing nearby community forests.

Study Area

The community forests under Satbaria range post of Dang district were selected as the study area. Forests area of Satbariya range post are located at the west of the Arjun Khola and east of the Shiva Khola. South to north it is extended from Rapti River to the boundary of Dang valley lying on both sides of the east-west highway. Satbariya range post includes 22 community forests and covers about 105.84 km^2 (DFO 2006). The study area is connected to the extension area of Bardia National Park in the west. The area also includes a proposed area for tiger conservation which lies Level III of tiger conservation landscape (DNPWC/MFSC 2006). In addition the area is supposed to be a good habitat for the viable population of Bardiya tiger (WWF 1998).

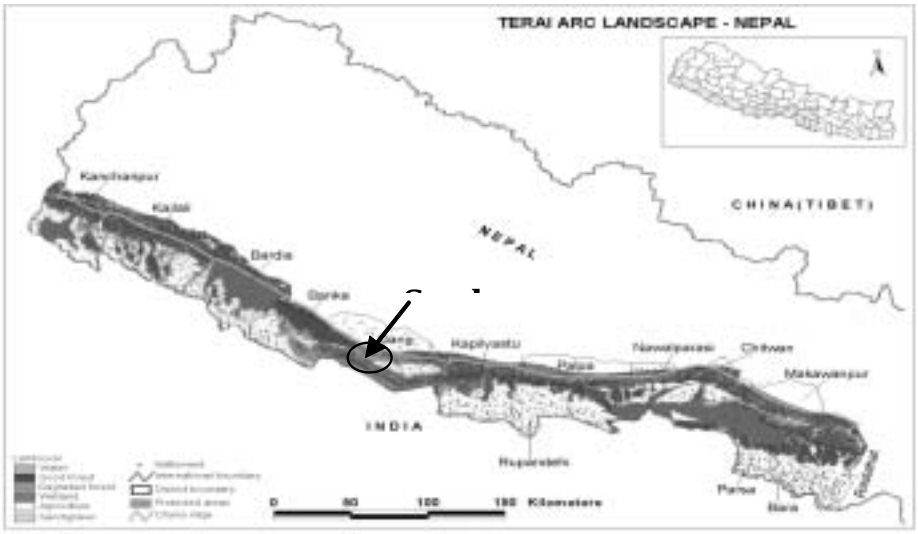

Fig.1. The study area

Materials and Methods

Field methods

A preliminary survey of the study area was carried out before actual field survey and general information were collected. Based on this information, sampling techniques and questionnaire were developed. The actual field survey was conducted on April-June, 2007. The earliest settlers and members of the community forestry user groups were identified and interviewed to collect information on the previous and current faunal diversity and to know the impacts of these wild animals

on the local livestock, agriculture and human settlements. The questionnaire survey also provided information on abundance of the wild animals, frequency of encounters, time and location of the sightings and date of the last sightings. Group discussions and key informant interviews were also conducted for getting in-depth insight into the wildlife of the area. A total of 96 persons (male 79.2% and female 20.8%) were interviewed based on purposive sampling technique (Gupta & Kapoor 1994).

Faunal survey was conducted by walking along the transect lines. For this, map of the study area was taken and 10 transect lines from south to north were drawn having 3km distance between each transect. At first, geographical position of the start and end points of the transects were identified from the map, and by using GPS the start point was identified in the field and then started to walk in straight lines following constant easting as much as possible according to the feasibility of the topography. If the human settlements occurred on the path then walking on transect was started after the end of the settlements by taking GPS reading. During this course, direct observation of the species, their foot prints, scats and other indirect signs were observed. All wildlife signs were observed in both side (up to 5m distance) of the transect lines and recorded in the data sheet. The crop field observation was also performed to cross-check the responses of local people on damage of crops.

Data analysis

All the collected information were categorized and tabulated according to objectives of the study using Microsoft Excel and SPSS. The data were processed and analyzed in descriptive way as well as by statistical measure. The abundance of wildlife was determined on the basis of indirect signs, encounter rate, visual field observation and questionnaire survey. The distribution pattern of some prominent species such as leopard, barking deer, wild boar and sloth bear were also determined.

The distribution pattern was calculated by variance (S^2) to mean ($\overline{X}$) ratio (Odum 1996). If $S^2 / \overline{X} < 1$, distribution is uniform; if $S^2 / \overline{X} = 1$, distribution is random and if $S^2 / \overline{X} > 1$, distribution is clumped. A chi-square (χ^2) test was performed by setting hypothesis that the species were uniformly distributed in all habitat types in the study area. The hypothesis was tested at 5% level of significance. Under null hypothesis (Ho), the test statistic is given by:

$$\text{Chi-square } (\chi^2) = \sum \frac{(O-E)^2}{E} \sim \text{(n-1) df}$$

Where, O= Observed frequency and E= Expected frequency

Results and Discussion

Faunal diversity

The major mammal species found in the area were: tiger *(Panthera tigris)*, common leopard (*Panthera pardus*), barking deer (*Muntiacus muntjac*), wild boar (*Sus scrofa*), spotted deer (*Axis axis*), four horned antelope (*Tetracerus quadricornis*), sambar deer (*Cervus unicolor*), leopard cat (*Felis bengalensis*), jungle cat (*Felis chaus*), sloth bear (*Melursus ursinus*), striped hyaena (*Hyaena hyaena*), jackal (*Canis aureus*), hare (*Lepus nigricollis*), flying squirrel (*Petaurista petaurista*), palm squirrel (*Funambulus pennati)* and porcupine (*Hystria indica*). According to the respondents, most frequently observed animals were: wild boar (97.9%), barking deer and sloth bear (91.7%), striped hyaena (90.5%), common leopard (87.5%), spotted deer (71.9%) and less frequently observed animals were four horned antelope (55.8%) and sambar deer (59.4%).

During survey all the above mentioned species were recorded by both direct and indirect sign observation methods except tiger. A total of 25 mammals, 16 herpetofauna and 163 bird species were recorded in the study area. At least 35 tracks and 19 killings of domestic animals by tiger was recorded by 'Bagh Heralu' (local trained person for tiger watch) hired by Bhim Gurung's research team during the period of 1999 to 2003 (Gurung *et al*. 2006). An adult tiger

was killed by local people in March, 2003 by poisoning its kill, a domestic animal (Aita Ram Baral, Pers. Comm.).

Cobra (*Naja naja*), common krait (*Bungarus caeruleus*), rock python (*Python molurus*), asiatic rat-snake (*Ptyas mucosus*), common monitor (*Varanus bengalensis*) and golden monitor (*Varanus flavescens*) were common reptiles found in the area. Gharial crocodile (*Gavialis gangeticus*) and mugger crocodile (*Crocodylus palustris*) inhabited in the Rapti River. Turtles were recorded in Rapti river and also in forest during rainy season. Similarly, elongated tortoise (*Indotestudo elongata*) was also found in the forest areas. Major bird species recorded were- indian peafowl (*Pavo cristatus*), kalij pheasant (*Lophura leucomelanos*), red jungle fowl (*Gallus gallus*), indian grey hornbill (*Ocyceros birostris*) and oriental pied hornbill (*Anthracoceros albirostris*).

Comparison with previous faunal diversity

No record of faunal diversity of the area before its inclusion as community forests was available therefore, based on the questionnaire survey and discussion with the earliest settlers and members of the community forest users group some information were collected during this study. According to the respondents, 93.8% responded that wildlife was increasing after the establishment of the community forests against 6.2%, who opined negatively. New wildlife species were appeared in the area after the establishment of the community forests, 99% respondents agreed with the appearance of wild elephant (*Elephus maximus)* in their community forests, likewise 18.8% agreed with spotted deer, 14.6% agreed with blue bull (*Boselaphus tragocamelus)*, 11.5% agreed with wild boar and 7.5% agreed with the appearance of tiger after the establishment of community forests in the area.

Most of the respondents told that wild elephant was new visitor in the area. It generally visited the area between September to December during harvesting period of maize and paddy. Tiger was seen in some parts of the area before the establishment of the community forests but now it had also appeared as a new animal in some of the community forests. Visits of wild elephant and other wild animals to the area was a positive sign indicating creation of suitable habitats for the wildlife as they were not seen before the establishment of the community forests.

Abundance and distribution pattern

A total of 251 signs (both direct and indirect) of wild fauna were encountered in 10 transects taken in the 22 community forests of Satbariya range post. These signs were assigned to the following animals: barking deer (75), wild boar (72), sloth bear (23), common leopard (14), hyaena (9), spotted deer (6), four horned antelope (5), sambar deer (4) and others (43) which include the signs of common monitor, porcupine, jungle cat etc.

The distribution pattern of three prominent species, barking deer, wild boar and sloth bear, found in the area was a clumped type distribution, while it was found to be a uniform distribution in case of leopard. H_0 was rejected during chi-squire test for barking deer, wild boar and sloth bear. The rejection of H_0 further confirmed that the distribution was uneven type. In case of the common leopard, H_0 was accepted, this further confirmed that the distribution pattern was uniform type. Pokhrel (2005) found a clumped type of distribution pattern for ungulates including barking deer and wild boar in Suklaphanta Wildlife Reserve, and Nagarkoti (2006) found the same for barking deer in Nagarjun forest. Shrestha (2004) also reported similar type of ungulate distribution in TAL areas. The clumped pattern of distribution of biological populations is common in natural habitat (Odum 1996). In this study area and in other natural habitats, resources such as food, water and cover are not distributed uniformly leading to the uneven distribution of the species. Distribution pattern of the common leopard showed an uniform distribution. Uniform distribution occurs where competition between individuals is severe or where there is positive antagonism which promotes even spacing (Odum 1996). Random distribution is relatively rare in nature and occurs where the environment is very uniform.

Wildlife-people conflict

About 81.25% of the respondents reported that they had faced crop damage problems due to invasion of wildlife in their agriculture land. Wild boar caused the

highest crop damage followed by elephant, porcupine, and others. According to the respondents (90.9%), these animals invaded the agricultural land during night. This is similar to the findings of DNPWC/PCP (2006) in buffer zone areas of Parsa Wildlife Reserve where most of the crop damage occurred during night.

About 71.06% of the respondents said that wildlife frequently visited agriculture land and the remaining 28.94% responded occasional visit. Maize was heavily damaged followed by wheat, rice and potato. Among the respondents, 89.2 % told that their livestock were depredated by the wild animals. Only 10.8% had no livestock depredation. The highest depredated livestock and poultry were chicken (33.82%) and goat (33.82%) followed by cattle (19.56%), pig (8.68%), buffalo (2.72%) and sheep (1.36%). Upreti (1995) also mentioned that the domestic animal killed by the wildlife was mostly chicken followed by goat and cattle. Jackal, jungle cat, and leopard were the major wildlife species responsible for the livestock depredation in the area. Chicken were most vulnerable to predation by jackal and jungle cat while goat and cattle were vulnerable to predation by leopard. Sometimes tiger also killed the cattle and buffalo. Mostly livestock depredation occurred in the community forests during the grazing period. Depredation inside the animal shed rarely occurred. However, predation of chicken within the settlements by small carnivores such as jungle cat and jackal was a common phenomenon in the area.

So far no human beings had been killed by the wild animals in the study area. There were some cases of injury when people were swarming in the forests to collect fuelwood and other forest resources. The main wild animal causing human injury was the sloth bear. Among the injury cases, 85.7% were due to sloth bear, 9.5% due to crocodile and 4.8% due to leopard. Yogananda *et al.* (2000) also mentioned sloth bear as the major wildlife which caused more human injures in Panna National Park, India and thus considered more dangerous than that of tiger or leopard. Crocodile attacked the people during fishing and bathing in the Rapti River.

Some people suffered from the increasing number of wildlife in the community forests as the wild animal damaged their crops and killed their livestock. Wild boar, spotted deer, barking deer, leopard, and sloth bear were the prominent animals due to which conflict occurred in that area. Elephants made seasonal visits but they also inflicted large scale damage. The extent of people wildlife conflict was comparatively higher especially within the settlements located near the forest areas.

About 88.5% respondents suggested that provision of compensation scheme to people suffering from crop damage and livestock depredation should be ensured and 11.5% opined compensation was not necessary. Some people claimed that human encroachment to the wildlife habitat for cropping and settlement is the key factor that instigated the human wildlife conflict, therefore, compensation should not be given to the people. So far no compensation scheme against wildlife damage was introduced in the area. Bhattarai and Khanal (2005) rightly mentioned that the lack of provisions in the work plan regarding compensations for users and other affected people for wildlife damage is a serious weakness of the community forestry program. Regarding the crop protection measures, our survey showed that 55.7% of the respondents did general care or guarding, 7.6% made noises, 3.8% made Machan (a tall and safe shelter made in the field to look after the crops), and 2.5% made fire for crop protection, and 30.4% did nothing. These measures were mostly primitive and labor intensive in nature.

Poaching

Among the respondents, 72.9% agreed with the existence of poaching in their community forests and only 27.1% disagreed with this. Those who agreed with the poaching, 81.4% told that it was done for food and trade, 11.4% told for food and 7.1% told for trade purpose only.

Poaching was high in these community forests. Four groups of poachers were encountered within the forests with gun and other weapons during the study period. Some peoples' livelihood totally depended on illegal hunting. Poaching was high in west part of the study

area i.e. periphery of the Ameliya region. Dry and fresh meat of wild herbivores was openly sold in Ameliya bazaar. Common langur and rhesus monkey have been disappeared from the community forests due to poaching. About 66 % respondents agreed with the disappearance of monkeys. Their dried meat was found openly sold in the market through fake identity. Squirrels were found disappearing around the Tharu community due to their killing for food purpose. The community forest authorities had not initiated any serious action to control poaching in their areas.

Other human impacts

Various significant human impacts such as over grazing by domestic animals, forest fire, tree cutting and forest encroachment were also observed in the areas. Extensive grazing may affect the wildlife and their habitat in many ways (IUCN/UNEP 1986). Uncontrolled forest fire was another problem in the area. Fresh forest fire was observed in two transects and damage caused by fire was seen in many places of the forests. It was said most of the forest fires were set by the local herders and poachers. According to Terai Arc Landscape- Nepal Strategic Plan (HMGN/MFSC 2004) the majority of the uncontrolled fires in the Terai are induced by people. Forest fire might cause local breakdown of ecological balance between species, progressive reduction of species' diversity and increase in uniformity with fewer ecosystem and specialized niches, migration and concentration of herbivores, loss of biomass and trapping and killing of wildlife (IUCN/ UNEP 1986).

Tree cutting was a serious problem elsewhere in the area. Cutting of a large number of Khayer (*Acacia catechu*), Sal (*Shorea robusta*) and Saj (*Termenalia alata*) were observed at several places. Large trees of Sal and Saj were used by vultures for nesting and roosting purpose. So, haphazard cutting of these trees had negative impacts on the species. Any bulk harvesting of the forest resources will have permanent effects on the continued productivity of the forest (IUCN/UNEP 1986). Forest encroachment was also very common and continuing activity in the area. It was mainly caused by the so called landless people. Various scattered settlements such as Goyeli, Dhabari etc with few households were found even in the core area of the forests. Such settlements may influence wildlife habitat and increase poaching activities.

Community forestry is a viable strategy for the rehabilitation of abandoned and degraded land through plantation. This in return is also contributing in revival of the plant and animal species. Community forestry plays a direct role in augmenting natural regeneration, which in turn increase in forest cover and wildlife habitats. The study area has been included in Terai Arc Landscape Program. Thus, the community forests of this area have important role in the TAL Program for the development of corridor for free movement of wildlife and conservation of biodiversity. The number of wildlife species has been increased after the establishment of community forests. Wild animals like, wild boar, spotted deer were seen in totally planted community forests such as Hasnapur Mahila community forest and Arjun Mahila community forest. Due to restoration of degraded habitats through community forestry program land base for wild animals are increasing in the area.

Seasonal visit of wild elephant and blue bull to the area indicates availability of suitable habitat for these wildlife as they were not seen before the establishment of the community forests. It is obvious that the community forest has played an important role for development of suitable habitat for the fauna and their conservation in the Satbariya Range Post area. However, some conservation issues like poaching, over grazing, tree cutting, forest fire and human-wildlife conflicts are common in the area. Implementation of suitable policies to tackle these conservation issues is necessary for the conservation of these precious fauna and their habitat in the community forests.

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