

LARGE WILDLIFE POPULATION IN BAGHMARA BUFFER ZONE COMMUNITY FOREST, NEPAL

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ABSTRACT

A year round monitoring of large wild mammals was conducted from April 2010 to March 2011 in Baghmara Buffer Zone Community forest at central lowland area of Nepal. The main objective of the study was to assess large wild mammals' population in pre- and post- community management period. Direct observations either by establishment of transects passing through different habitats or scan count of the total area were applied to find out the population of large mammals. During pre-community management period, only two large wild mammals were reported, and one was resident and other was frequent visitor from nearby National Park. In the post-community management period, the number of resident large mammals increased to nine species. Now the area has become a safe breeding habitat for those large mammals.

Key words: Baghmara community forest, buffer zone, large wildlife census.

INTRODUCTION

Lowland (subtropical) region of Nepal is famous for charismatic and diverse representation of wildlife. The riverine subtropical forests with flood plain added its richness in biodiversity. The commercial demand and needs of the local marginalized people pressured to decrease biodiversity outside the protected areas. However, the protected areas and community forestry programs out side and the protected areas are the last refuge of biodiversity.

In Chitwan of central Nepal, the first step to conserve biodiversity was initiated with the establishment of rhino sanctuary in 1956 followed by Wildlife Protection Act in 1957. In early seventies, the Baghmara Buffer Zone Community

Forest was favorable habitat for tiger and rhinos, and was also a hunting ground for wildlife. However, systematic wildlife and vegetation study of this area was conducted for the first time in 1995 (NCRTC 1995). Although the conservation initiative started from 1989, Baghmara Buffer Zone Community Forest was officially institutionalized only in 1994 under the legislation of Department of Forest (BCF 1994). But, in 2003 this forest was registered according to Buffer Zone regulation under Department of National Parks and Wildlife Conservation. After more than 20 years of conservation efforts a healthy forest area, with different habitat types, was created and some endangered flagship species and other common large wildlife species were re-colonized (NCRTC 2000).

Community conservation efforts for more than twenty years have ameliorated the condition of Baghmara Buffer Zone Community Forest. The study is focused on the status of large mammals' population in pre and post community management period. The institutional engagement in the resource management and involvement of local stakeholders in process of conservation of the community forest where, grazing and illegal collection of fuel wood and fodder and hunting is totally controlled provided good option for conservation. The study provided comprehensive information on wildlife and their population in the area.

STUDY AREA

Baghmara Buffer Zone Community Forest is located in Bachhauli Village Development Committee at eastern sector Buffer Zone area of Chitwan National Park. It is located in between 27°34.78'-27°35.53' northern latitude and 84°28.43'-84°29.40' eastern longitude in subtropical region of central lowland Nepal at an elevation of 200 to 250 m above sea level. This forest borders cultivated land to east, Budhi Rapti river to west and north and Bodreni village and Rapti river to south near Sauraha market (Pant 2003).

The climate is sub-tropical monsoon type with relatively high annual humidity. Monsoon rain prevails from late June to September and amount of monthly mean rainfall ranges from 14.04 mm to 602.2 mm (Tamrakar 2002). Heavy flooding occurs in the valley during the monsoon. The average daily maximum temperature of the area during hot summer days is about 36.8°C. The minimum temperature is about 7.8°C in cool dry winter season which occurs from October to February. Spring starts from March and is immediately followed by summer and that ends in June (Pant 2003).

This area basically consists of riverine forest habitat. The dominant species are Simal (*Bombax ceiba*), Bhellar (*Trewia nudiflora*) and Padke (*Albizia* sp). There are some patches of grasslands with major species of *Imperata cylindrical*, *Saccharum spontaneum*, *Ageratum conyzoides*, *Peperoxia pellucida*, *Cyanodon dactylon*, and *Themeda villosa*. From the community forest 104 species of plants including endangered *Butea monosperma* and *Rauvolfia serpentina* has been recorded (Pant 2003).

The forest has provided an excellent habitat for the wildlife and harbors different wildlife species such as tiger (*Panthera tigris*) as frequent visitor, rhino (*Rhinoceros unicornis*), spotted deer (*Axis axis*), sambhar deer (*Cervus unicolor*), barking deer (*Muntiacus muntjack*), wild pig (*Sus scrofa*), hog deer (*Axis porcinus*), Rhesus monkey (*Macaca mulatta*) and mugger crocodile (*Crocodylus palustris*) (NCRTC 2000). The users of the Baghmara Buffer Zone Community Forest are local residents of ward number 1, 2, 3, and 4 of Bachhauli VDC with 780 households as the members (49.68% male and 50.32% female) (Pant 2003).

METHODS

Wildlife were daily observed and monitored on foot by traversing along 34 parallel east to west transects spacing 150 m that pass through all three major habitats of the forest namely grassland, forest and wetland. Total length of transects were 68 km. The counting was done thoroughly in each group in each observation session (morning, afternoon or evening) to assure the total population of that session (Martin and Bateson, 1993). Physical count was done for deer and antelopes. For predator species, like tiger, indirect methods described by Karanth and Nichols (2002) were used for their enumeration. In addition to daily monitoring during observational period, total count

of the large mammal's population was made through scan counts method as described by Caughley (1977). Daily observations lasted a maximum up to 8 h with several specific activities as follows.

Before undertaking population census, area of surveys were identified in the topographic map and satellite images. The representations of different microhabitat were included in the survey transect in such a way that the total picture will reveal a picture of community forest as a whole.

Regular monitoring of the wildlife population was conducted from April 2010 to March 2011 on daily basis. The monitoring was conducted on foot or on elephant back whenever necessary. Elephants were used for security reason to avoid rhino or carnivores attack. Similarly, observations from elephant back were conducted in the areas along the thick bushes and tall grasslands where it was difficult to observe wildlife on foot. During the monitoring name of observed wildlife species, number of groups or individual, age and sex with their total population were recorded. Monitoring was conducted 25 days per month (n = 300 days in one year). Observations were conducted in three different sessions namely, morning (starts from 6:00 am), afternoon (starts from 12:00 noon), and evening (starts from 4:00 pm) regularly on the same day or alternate session of days. Among 300 average observation, 123 events (41%) were conducted in the morning, 84 events (28%) were conducted in day, and 93 events (31%) were conducted in the evening. As per need photographs of individual or groups were taken for identification. Binoculars were also used to categorize the wildlife from distance.

Final count

The scan count was conducted in the mornings and in the late afternoons by fanning 16 people at regular intervals and moving through the study area silently, combing it for recording of directly

observed (sighted) large mammalian species. Three observers were positioned on the platform made on the tree at vantage points to record any large mammals which may have been temporarily displaced due to the drive count. Data on the spot were recorded as per sex, number, age category (adult/juvenile/infant), and location with reference to the line of travel and direction of movement of animals. The GPS locations of the count sites were also recorded. Individual mega herbivores such as rhinoceros observed in the study area were distinguished from marks on their bodies (DNPWC 2011). Their photographs identified with the help of marks and scars were taken as reference for identification for future identification and finalizing the total population in the area. Age and sex structure of the observed wildlife were categorized on the basis of Mishra 1982 to adult male (AM); adult female (AF); sub-adult male (SAM); young adult female (YAF); juvenile male (JM) and juvenile female (JF).

RESULTS AND DISCUSSION

In this study the management period as well as population references were considered on the basis of decade of conservation. That included: a) pre-community managed period from 1989 to 2000, and b) post-community managed period from 2001 to 2011.

Population of ungulate prey species

The current study indicated that there were nine resident large wildlife species in Baghmara Buffer Zone Community Forest. Most of the herbivores were in groups and only few were wandering alone while carnivores were in individual basis in each event. The previous study indicated this area was quite favorable habitat of large and charismatic wild mammals (NCRTC 1995). The main causes of their sparse distribution during that period were destruction of their habitats due to anthropogenic activities (Mishra 1982).

However, due to heavy anthropogenic pressure, like overgrazing and illegal cutting of available florae, during late 1970s and 1980s wildlife became frequent visitors only (NCRTC 1990).

Barking deer are solitary animal and observed mostly lonesome in dense forest habitat (Chalise 2001). In total 12 resident barking deers were recorded from Baghmara Buffer Zone Community Forest (Table 1). Adult male population was found higher ($n = 8$) than female. The population by age and sex of this species revealed that adult female ($n = 2$), infant ($n = 1$) and unidentified ($n = 1$). Any record regarding its presence and absence was lacking in the pre-management stage of this forest. This area was too much disturbed from heavy grazing by cattle of surrounding villages and other anthropogenic activities of local community caused their absence during the pre management phase.

Current study recorded two hog deer with one adult female and other unidentified sex from floodplain grassland in this community forest (Table 1). That indicated the availability of some habitat for hog deer inside forest. As its general distribution character to live along alluvial grassland (Mishra 1982) this deer preferred to live solitary along the floodplain grassland of Baghmara forest. In the pre-management phase there was not single record of this species from the study area (NCRTC 1990). Current annual wildlife monitoring recorded this species at the edge of oxbow lake rather than from floodplain.

There were 23 sambar deer in this community forest (Table 1). Except one group with three individual sambar deer, they were solitary. The number of adult female sambar deer were found highest ($n = 13$) followed by adult male ($n = 7$), which indicated the healthy breeding population. Other individual included sub-adult female ($n = 1$), juvenile male ($n = 1$), and infant ($n = 1$). There was no report of its presence at the initial stage of community management (NCRTC 1995). Only one sambar deer was reported for the first time in the study area during 1995. Population count of this

species was discontinued from its first record. During 1997 one sambar deer was killed by tiger in the study area (KMTNC 1997). The conservation of favorable habitats, like forests, grassland and wetlands inside the study area increased population of this mammal, in the post community management period. Sambar is resident species of the region inhabiting in mature forest, undulating topography and interior forest (Mishra 1982).

The population composition of spotted deer ($n = 182$) included highest number with adult female ($n = 63$) followed by adult male ($n = 43$). Other age group of their population was sub-adult male ($n = 8$), sub-adult female ($n = 5$), juvenile male ($n = 7$), juvenile female ($n = 8$), infant ($n = 13$) and unidentified sex ($n = 35$). The composition of this species also revealed a healthy population for breeding and long-term survival in the area. There were no residential spotted deer during the initial phase of community forest management. They may be frequent visitor from nearby Park Forest during those days. Wildlife count in 2000, immediately after flooding, reported 24 spotted deer in the area (KMTNC 2001). This was the first official record of spotted deer from the Baghmara area. Thereafter the systematic count of this species was the current study, which reported 182 individual spotted deer from this community forest (Table 1).

Only one resident wild pig group was recorded from Baghmara Community Forest. Total individuals of this species were five with more juvenile male ($n = 4$) and only one adult female (Table – 1). Current study recorded other four species, such as spotted deer, barking deer, hog deer and sambar deer from Baghmara forest (Table 4). There were no reports about their presence in previous studies.

Population of other wildlife

Two species of monkeys were recorded during this study. However, only one resident male Langur monkey was observed from this forest. This solitary male used to travel to nearby other

forest frequently at day time. Rhesus monkeys were found quite common in this forest. A total of 76 individual Rhesus monkey were recorded during current study. They belonged to eight troops and symbiotically available with spotted deer. Their population varied from a minimum of five individuals to maximum of 25 individuals in the troops. Among the total population 5 were adult males, 9 were adult females and 62 individuals were unidentified age and sex. During the pre

management phase of this community forest there was no report about the monkey's species, either Langur or Rhesus (NCRTC 1995). The availability of food plant seems to be the main cause of their presence in this forest (Chalise 2000). Attraction of those primate species in this community forest and availabilities of larger number indicated the conservation of their habitat as the random anthropogenic disturbance was banned after the formation of community forest (Table – 2).

Table 1. Population with age and sex composition of prey species (2011).

Wildlife species	Age / Sex / number								Total number
	AM	AF	SAM	YAF	JM	JF	Infant	UN	
Barking Deer	8	2	-	-	-	-	1	1	12
Hog Deer	-	1	-	-	-	-	-	1	2
Sambar Deer	7	13	-	1	1	-	1	-	23
Spotted Deer	43	63	8	5	7	8	13	35	182
Wild Boar	-	1	-	-	4	-	-	-	5

Note: AM = adult male; AF = adult female; SAM = sub-adult male; YAF = young adult female; JM = juvenile male; JF = juvenile female; UN = unidentified sex and age

Table 2. Population with age and sex composition of other wildlife species (2011).

Wildlife species	Groups	Age / Sex / number								Total number
		AM	AF	SAM	YAF	JM	JF	Infant	UN	
Langur Monkey	NA	1	-	-	-	-	-	-	-	1
Rhesus Monkey	8	5	9	-	-	-	-	-	62	76
Marsh Muggger	NA	-	-	-	-	-	-	-	35	35

Note: NA = Not available, AM = adult male; AF = adult female; SAM = sub-adult male; YAF = young adult female; JM = juvenile male; JF = juvenile female; UN = unidentified sex and age

Table 3. Population record of wild animals in the Baghmara Buffer Zone Community Forest (1995 to 2011).

Name of wildlife	Recorded year (1995 to 2011)																
	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11
Barking deer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12
Hogdeer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Sambar	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	23
Spotted deer	-	-	-	-	-	-	24	-	-	-	-	-	-	-	-	-	182
Rhino	3	2	2	2	-	2	1	-	-	-	-	-	-	-	6	3	3
Rhino calf born	-	2	3	0	1	-	-	-	-	-	-	-	-	1	1	1	1
Rhesus monkey	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76
Wild boar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Marsh Muggger	-	-	3	-	-	-	29	-	-	-	-	-	-	-	-	-	35

Sources: BCF 1994, BBZCF 2003, KMTNC 1997, KMTNC 2001, Annual Wildlife monitoring record of BBZCF (from 2004 to 2010) and current study

Table 4. Cumulative number of monthly observed wildlife in Baghmara Buffer Zone Community Forest (April 2010 to March 2011)

Wildlife species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Nov	Oct	Dec
Barking Deer	6	10	4	8	NA	4	1	7	3	NA	2	NA
Spotted Deer	208	72	102	54	136	27	60	77	14	124	71	261
Hog Deer	NA	10	4	8								
Monkey	158	NA	30	104	18	51	86	84	32	214	64	127
Rhino	4	4	3	3	6	3	3	13	4	2	2	2
Sambar	17	18	11	7	2	2	NA	12	4	3	4	NA
Wild Pig	20	23	22	11	6	5	3	1	NA	15	6	16

Initially in 1995, only one mugger crocodile (*Crocodylus palustris*) was recorded in the study area (NCRTC 1995). One small wetland was managed in the center of the forest area and two marsh muggers were released in 1996. Wildlife monitoring in 2000 (KMTNC 2001) resulted the record of 29 crocodile individuals (Table 3). Current study revealed that their number increased to 35 and their resident habitats were found distributed all wetland areas inside Baghmara Buffer Zone Community Forest (Table 2). After conservation initiation of the area wetland habitat was also being improved. Illegal fishing by using poison and electricity banned inside the community forest that supported conservation of wetland. The population increase of mugger crocodile is due to the favorable habitat, less anthropogenic pressure and availability of food (Maskey 1999).

Population of endangered species

Two endangered species, namely Royal Bengal Tiger (*Panthera tigris tigris*) and One Horned Asian Rhinoceros (*Rhinoceros unicornis*), were recorded from the study area. Among them tiger was frequent visitor but rhino became resident after managing the forest by community.

The area especially used for tiger hunting before the conservation initiation in 1957 as it was a prime habitat for those animals. Due to heavy hunting and habitat destruction due to in country migration of people, it was not used as resident

habitat by tiger (Pokharel 2002). During the initial wildlife study there was no report of the presence of any tiger in the Baghmara area (NCRTC 1990). Later during 1997 a tiger killed sambar and 1998 one problematic tiger entered inside this forest and caused human casualties (KMTNC 1997). After capturing this tiger there was no report of presence of any resident tiger. However, pugmark sign of the tigers were recorded during a decade before (NCRTC 2000, KMTNC 2001). After this period the tigers signs were recorded but not a single resident identified. During this study we noticed several signs of a male tiger that shows its frequent movement in the study area but not sure as resident. Although the area consists of sufficient number of prey species, tiger could not accommodate to the Baghmara forest, might be due to its small size habitat.

Asian one horned rhinoceros (*Rhinoceros unicornis*) were frequently observed in the community forest. They were recorded in grassland, forest as well as wetland areas inside the community forest (Chalise 2008). From current study a total of three rhinoceros were recorded from this forest with an adult male (n = 1), an adult female (n = 1), and a sub-adult male (n = 1). The sub-adult male was nearly 2.5 years old and at the stage of weaning from his mother. During the initial period of community management rhino was frequent visitor only (NCRTC 1990). They were

visiting from nearby Chitwan National Park, especially during monsoon when the park floodplain area would heavily inundated from flood (NCRTC 1995). Immediately after the community conservation initiatives these big herbivores started to reside in Baghmara forest. The availability of food plants like *Saccharum spontanium* and *Litsea* species with fewer disturbances from anthropogenic activities might have attracted this wildlife species to be resident in this forest. Regular survey since 1995 indicated that the number of resident rhinos in the study area ranged from one to three within five years. The number of resident rhino was reduced to one individual during 2001 (KMTNC 2001). However, the numbers of resident rhinos were fluctuating and currently their number was three (Table 3). In 2000 there was heavy flood in the Rapti Flood Plain area, which was one of the prime habitats of rhino. This flood inundated all floodplain areas inside National Park and some favorable habitats of rhinos were washed away (KMTNC 2001). After that flood, Icharni island which is one of prime habitats of rhino inside National Park where 22 rhino were resident (NCRTC 1995), hardly can provide shelter for this charismatic wildlife. Baghmara forest was also inundated inside flood and there was no any movement for about a week (KMTNC 2001). That flood disaster caused some human casualties, loss of ungulates and impacted the number of resident rhinos in the area. The study area seems a favorable breeding and rearing place of rhino. In total ten rhinos provided birth of baby inside this Baghmara forest till now (Table 3).

CONCLUSION

During pre-community management period, Baghmara area was encroached and degraded due to different activities and the presence of animals was rare. However, after the establishment of

Buffer Zone Community Forest it became the resting place for frequently visiting large mammals in initial stage with one individual of resident sambar and a rhinocero frequently visiting from nearby National Park. After managing. Currently this forest incorporated eight large mammalian species with different age and sex structure which indicated that the forest started to be a safe breeding wildlife habitat for different animals.

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