Assessing the Population Dynamics of Blackbuck, Its Habitat Condition and Peoples Interaction in Blackbuck Conservation Area, Khairapur Nepal

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ABSTRACT

Blackbuck, locally known as 'Krishnasaar' is a medium sized antelope, is an endangered species in the natural habitats of India, Nepal and Pakistan. The IUCN Red list has listed this animal as near threatened with stable population trend and is included in Appendix III of the CITES. Such study is limited in Nepal, thus this research was objectively carried out to assess the distribution and population status, food preference and people's perception about the management of Black buck. The Blackbuck Conservation Area, Gulariya Bardia Nepal was selected as the study site. A preliminary survey, 43 household survey and discussion with 8 key informants were conducted to collect the primary data of the area regarding the threats of Blackbuck and its habitat management issues. Total 55 quadrats having 1m *1m was used to identify the short grass and other low growing vegetation. The analysis was done to show the feeding grass preferences of Blackbuck. Secondary data were collected from the reports of BCA, DNPWC reports etc. A large fluctuation in the population of blackbuck was recorded in Khairapur. Statistical comparison was done using ANOVA, Turkey B test and Chi-square. The result showed that, Its number increased gradually from 11 to 190 in between 1975 to 1988. The present population of Blackbuck in BCA is 241. Altogether 30 species of grasses were recorded in the month of November-December in which the undesirable and unwanted species like Imperatacy lindrica, Casia tora (Tapre) and Ageretum conyzoides were abundant than the preferred grass species particularly, Cynodon dactylon, Bothrio chloabhadhii, Youngia japonica, Echino chloacolona etc. Predation by Leopard, Hyena and attack of Stray dogs were the major threats of Blackbuck inside BCA. The disastrous flood of Babai River inside the Blackbuck habitat was also the threat for Blackbuck. The Chi-square test showed that people perception towards proper management of Blackbuck habitat is significantly different at 5% level of significance. This study will be useful for wildlife experts.

Keywords: *Blackbuck, Threats, Habitat Condition, grass preference, Conservation*

INTRODUCTION

The Blackbuck was once a common animal throughout the Indian sub-continent from Punjab to Uttar Pradesh of India and from Nepal to Bangladesh (Bhatta, 2008). Prior to the 19th century it was the most abundant ungulate in this region, with a population of around four million. However, hunting and habitat loss has caused a substantial population decline and the species is now listed as 'near threatened' in the IUCN Red List, with populations in Nepal and Pakistan regionally extinct (Long, 2003). In 1988, the Texas Parks and Wildlife Department estimated the blackbuck antelope population to be 21,232. In Argentina, blackbuck antelope were first introduced in 1906 and are now established over a large area (Long, 2003).

Nepal is a highly diverse and unique country harboring an extraordinary variety of landscapes, culture and wildlife. Despite less than 1 percent of the world's total land mass, its physiographic features range from the highest terrestrial ecosystem in the world, the Himalayas, to the sub tropical lowlands of Terai (Tamang, 2003). This contrast makes Nepal one of the most bio-diverse countries in the world, containing within this small area of 1, 47,181sq km: 4.2% of all mammals, 8.5% of all birds, 2.2% of all flowering plants on the earth, including threatened flagship species. In addition to the vast faunal diversity, 35 forest types and 118 ecosystems are present in Nepal (GoN & MoFSC, March 2009). Nepal has more than 13% of the land as grassland. Its distribution follows great variation in tropography and climate

ranging lowland to highland of the country. The lowland of Nepal is very famous for its valuable plant and animal species of tropical forest to grassland habitat (Khanal, Jnawali, & Khanal, 2002). The lowland grasslands of Indian sub-continent are not in climax but are seral in nature. Their origin is generally linked to human activities such as deforestation, cultivation, cattle grazing and burning (Meena & Chourasia, 2018).

In the last few decades the developing country like Nepal is facing the problem of fast depletion of rich treasure of wildlife (Pradhan et al., 2001). National Park and Wildlife Conservation Act of Nepal, 1973 has listed 27 species of protected mammals and blackbuck is one of them (IUCN, 2015). It is included in Appendix III of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Through several studies on blackbuck were carried out by various researchers however research gap still remain in their habitat management and conflict evaluation of blackbuck in Khairapur. National Red List Series of Nepal (2011) has considered blackbuck as critically endangered mammal species. It is one of the smallest conservation area located in the country covering an area of 16.95 km^2 of Khairapur. Out of the total area, 5.27 km^2 is set aside as core area while 11.68 km^2 was considered as community development zone. The core area of 5.27 km^2 has further shrunk due to illegal settlers and encroachers. Thus, the core habitat available for the blackbuck at present is only 2.57 km^2 of grassland as there is a forest patch of 2.1 km^2.

The blackbuck is significantly important fauna in the world so as in Nepal because of its limited population and limited specific habitat. The study regarding the distribution, food preference and people perception regarding management of this antelope species is not so far done in Nepal, this is very important to know about these species. Thus, this study was objectively carried out to assess the distribution and population status, food preference and people's perception about the management of black buck

MATERIALS AND METHODS

Study Area

Blackbuck Conservation Area is situated in Gulariya municipality of Bardia district of western lowland Terai of Nepal. It lies between 28º7' and 28º39'N latitude and 81º3' to 81º4'E longitude. BCA lies in between old and new river course of Babai River and Conservation Area's headquarter is at Khairapur, Bardia district, approximately one km north from Bhurigaon- Gulariya road. BCA was established in 2009 with an area of 16.95 km^2 of Khairapur covering ward number 1, 2, 3 and 4 of Gulariya Municipality. The area is mostly marginal agricultural and grazing land bordered on the three sides by the Babai river-bed, locally called SarjuNadi on west, north and south of the conservation area and the other side by scrub forest (figure 1).
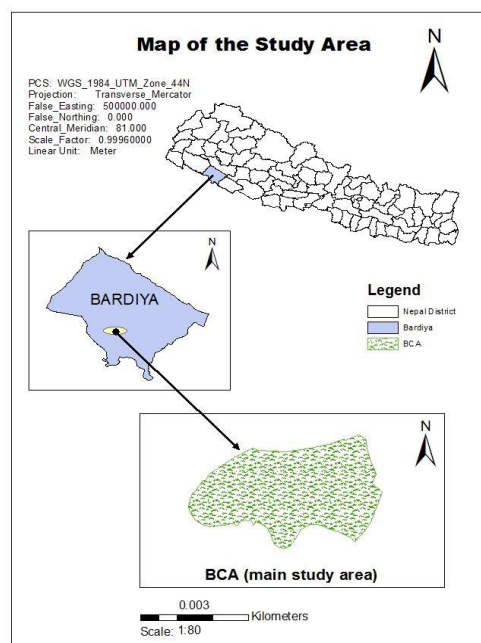

Figure1. *Map of the Study area*

It is very dry due to its slight slope with sandy and porous soil (Bolton, 1976). The sandy slopes are heavily leached, whereas the lowland plains are more fertile consisting of finer sand and clay loams (Wegge & Wilson, 1976) . The Siwalik range of north is of late tertiary origin and contains fine-grained sand stone with deposits of clay, shale, conglomerate and freshwater limestone (Tamang, 2003).Topography of the area is more or less flat with a gentle slope towards the south with an elevation ranging between 142 m to 152 m above mean sea level.

A preliminary survey was carried out before the actual field work to know the situation of blackbuck at present and for the further study. It was carried out by field visit, discussion with experts, warden of BCA and other staffs, local people and through the relevant literatures.

Key Informant Interview

Discussion with key informant including 8 members (Ranger, Chairman of BCA, Warden of BCA, and other line agencies supporting the conservation work) to identify the present condition of blackbuck, and its habitat and also the management practices in Blackbuck conservation area.

Household Survey

Out of 142 households inside the BCA, 43HHs (30%) were surveyed applying simple random sampling without replacement. Structured as well as semi-structured interview was carried out to get the required information.

The area of the BCA was surveyed by using GPS and from GIS blackbuck distribution map was prepared. Simple random sampling was carried to during the field visit.

Quadrat Sampling: Quadrat sampling was used to sample the grassland flora. Total 55 quadrat having $1m^2 *1m^2$ was used to identify the short grassland and other low growing vegetation.

Grass species encounter during counting were noted down into the field book with their local names and their botanical names. The collected data were analysed statistically applying descrypttivee and inferential statistics like ANOVA test, Turkey btest, Chi-square test.

RESULT AND DISCUSSION

Distribution of Blackbuck

Blackbucks were observed in different plots in PatahaPhanta of the main study area. Number of blckbucks observed in different plots in different distribution patterns is present in the table below:

Table1. *Group and Size of Blackbuck*

X-Coordinate	Y-Coordinate	Blackbuck(Size)			Distribution		Remarks
		Male	Female	Calves	Group	Individual	
0531511	3125055	15		2	17		
0531682	3124844	1	10		11		Sick cow was going to die
0531473	3125053	49			49		
0532481	3124595	1				1	
0532409	3124524	1	12		13		Dead cow
0531552	3125115	29			29		
0532166	3124609	1				1	
0531449	3124649	1	30		31		
0531582	3124473	3			3		
0532409	3124524						3 stray dogs
0531876	3125367						Cow grazing

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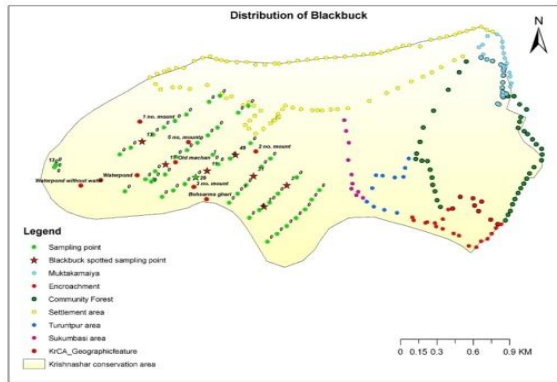

Figure2. *Distribution of Blackbuck*

Figure3. *Status of Blackbuck population*

In different plots, Blackbuck were distributed in group; their numbers ranging from 3 to 49. Only in 2 plots Blackbuck were distributed individually. Most of the time, the group of females were lead by single matured male and female were not seen alone. Females are either lead by a matured male or they are present in group of several females.

Population Status of Blackbuck in BCA, Khairapur

Large fluctuations were seen in the population of Blackbuck in Khairapur. In 1976, the Blackbuck number was only 9. After 1984, there is gradual increase in the population of Blackbuck in Khairapur and its number reached to 100.

Due to many threats caused by anthropogenic activities and other wild animals, the Blackbuck population was found to be decreased in between 2000 to 2005. After 2006, the Blackbuck number again increased gradually and became 300 by the year 2014.

It was due to the various conservation efforts made by the government and by the park level. In 2016, several blackbucks were died due to the transmission of diseases and at the same time devastating flood caused death of 40 Blackbuck in Khairapur and their number decreased to 230. Due to the predation of leopard, stray dogs and some natural deaths the present population of Blackbuck in khairapur is 237 (Table 1, Figure 3).

Table1. *Descriptive statistics of Blackbuck population*

Mean	Standard Error	Standard Deviation	Sample Variance	Range	Minimum	Maximum
143	12	80	6406	291	9	300

Statistical Comparison of Population Variation according to 3 Different Periods

The one way ANOVA showed the P-value is less than 0.05. It can be concluded that there is significance difference in blackbuck population in three different periods. The Tukey b t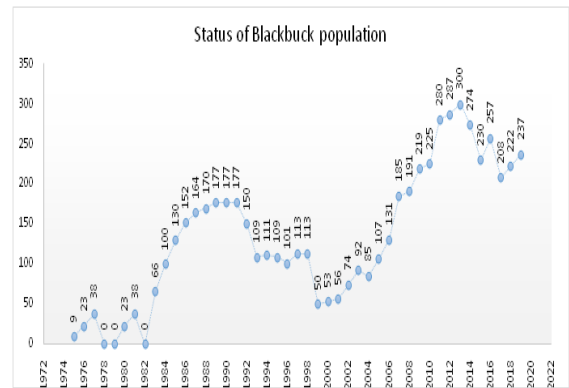est was applied which showed that there is no significance difference between period 1975-1988 and 1989-2005 but the population of blackbuck is significantly differed from 2006-2019 period. Since the population of 1975-1988 and 1989-2005 period falls under same column while the population of period 2006-2019 falls under different column.
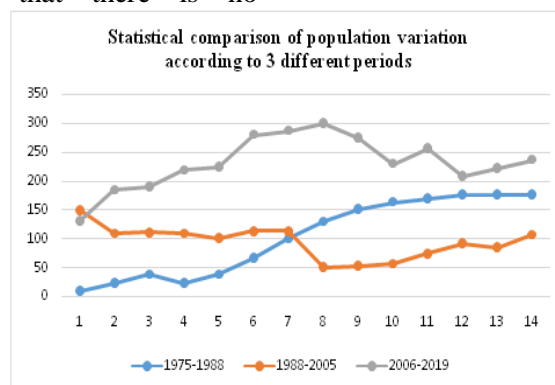

Table 2 shows that most of predation has been done by leopard mainly during rainy season which is 59% followed by hyanae 15%. It is also observed that between 3 months (August-October), 23 male blackbucks have been predated by leopard. This shows that grassland

has to be managed urgently in rainy season to provide blackbuck with favoured short grass and decrease predation. On the other hand, if the predation by leopard increases, the study has to be undertaken to prescribe measure to either adding other ungulates as prey species or dart the predator species and release them in BNP to protect this source population.

Table2. *Death of blackbuck and its cause in FY 2017-2018*

Month	Number of death				Cause of Death				
	Male	Female	Fawn	Total	Leopard	Hyanae	Dog	Natural	Disease
July, 2017	8	2	1	11	5	2	0	0	4
August	5	3	1	9	9	0	0	0	0
September	10	3	0	13	12	0	0	0	1
October	0	1	0	1	0	1	0	0	0
November	1	0	0	1	1	0	0	0	0
December	3	1	0	4	0	2	1	1	0
January, 2018	2	1	0	3	3	0	0	0	0
February, 2018	0	1	0	1	1	0	0	0	0
March, 2018	0	3	7	10	2	3	0	5	0
April, 2018 2074	1	0	2	3	1	1	0	1	0
May, 2018	1	1	1	3	1	0	1	1	0
June, 2018	3	1		4	4	0	0	0	0
Total	34	17	12	63	39	9	2	8	5

Source: *KrCA2016/2017*

Habitat types inside BCA

The total area of Blackbuck Conservation Area is 16.95 km^2 . Out of the total area, 5.27 km^2 is set aside as core area while 11.68 km^2 was considered as community development zone.

The core area of 5.27 km^2 has further shrunk due to illegal settlers and encroachers. Thus, the core habitat available for the blackbuck at present is only 2.57 km^2 of grassland as there is forest patch of 2.1 km^2 (Table 3).

Table3. *Habitat type identified after preliminary reconnaissance survey*

Habitat Type		Area	Remarks
Phanta	PatahaPhanta	2.57 km^2	Core Blackbuck habitat
	PachasKhalaPhanta		Human Settlement
Forest	Natural Forest	2.1 km^2	Khair, Semal forest
	Plantation Forest		Sisoo forest

Food Preference

Blackbucks largely feed on grasses. The main grass species preferred by Blackbuck is Cynodondactylon. Beside this, Bothriochloabhadhii, Youngia japonica Echinochloacolona are also the major grass species preferred by Blackbuck. When there is shortage of above highly preferred grasses they feed upon Dactyl-octeniumaegypticum Desmodium spp. Eragros tistenellaSolanumsps.etc. During shortage of less preferred grasses Blackbuck also feed on the very less preferred grasses like Brachiariaspp, Setaria-glauca, Hedyotis spp., Echinoch lo asppe tc. It was observed that Blackbuck avoids the unwanted grass species like Cyperus spp., Ageret umconyzoides, Casiatora, Desmotachyabipinn-ata, Leucascephalotes etc. (Table 4)

Table4. *Food preference by Blackbuck*

Scientific Name	Family	Common Name	Intake
Ageretumconyzoides	Compositeae	Gandhejhar	-
Alternathareusesselis	Amaranthaceae	Bhringraj/Pankhara	++
Bidensspps	Compositeae	Kuro	++
Bothriochloabhadhii	Poaceae	Janewa	+++
Brachiariaspp	Poaceae	Siuri	+
Casiatora	Fabaceae	Tapre	-
Cynodondactylon	Gramineae	Dubo	+++

Cynodonspp	Gramineae	Panidubo	+++
Cyperusrotundus	Cyperaceae	Mothei	++
Cyperus spp.	Cyperaceae	Chammarbhadi	-
Dactylocteniumaegypticum	Poaceae	Makara	++
Desmotachyabipinnata	Gramineae	Jarakush	-
Desmodium spp.	Fabaceae	Tinpate	++
Echinochloaspp	Gramineae	Chaurighans	+
Eleusineindica	Gramineae	Kodoghans	++
Eragrostistenella.	Gramineae	Sulsule	++
Hedyotiscorymbosa	Rubiaceae	Jhusihariyodana	+
Imperatacyclindrica	Gramineae	Siru	+
Solanumsps.	Solanaceae	Kathkahari	++
Hedyotis spp.	Rubiaceae	Jhusiratodana	+
Sporobolusspp	Gramineae	Jhusiratophool	+
Sporobolusspp	Gramineae	Jhusisetophool	+
Ludwigiaperennis	Onagraceae	Harauwa	++
Medicago denticulate	Fabaceae	Chari amilo	++
Setariaglauca	Poaceae	Bandari	+
Saccharumspantaneum	Poaceae	Kaans	++
Leucascephalotes	Lamiaceae	Gumma	-
Youngia japonica	Asteraceae	Dudhiya	+++
Euphorbia hirta	Euphorbiaceae	Dudhejhar	+
Echinochloacolona	Poaceae	Waiya	+++

High preference = + + +, Medium preference = + + , Low preference = +, Negative preference = —

People's Perception about Management of Blackbuck Habitat

According to the respondent point of view, Blackbuck habitat should be managed properly.30% of the respondents said that there is lack of skilled workers in offices, 23% of the respondents said that there is insufficient food for Blackbuck thus seasonal croping should be done, while 21% of the respondent told that invasive species should be controlled and remaining 19% of the respondent said that well managed fencing is very important for the proper management of BB habitat while 7% of the respondent said that increasing encroachment inside BCA should be controlled for the proper management of BB habitat (Figure 4) .
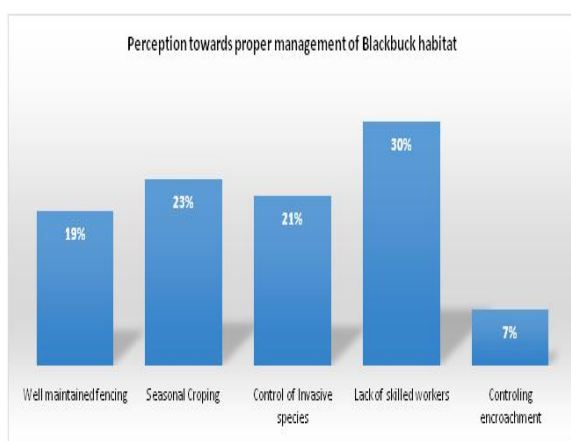

Figure1. *People perception towards proper management of Blackbuck habitat*

The Chi-square test shows that People perception towards proper management of Blackbuck habitat is significantly different at 5% level of significance. Since, P(0.009) <0.05, ά=5%, n=43.

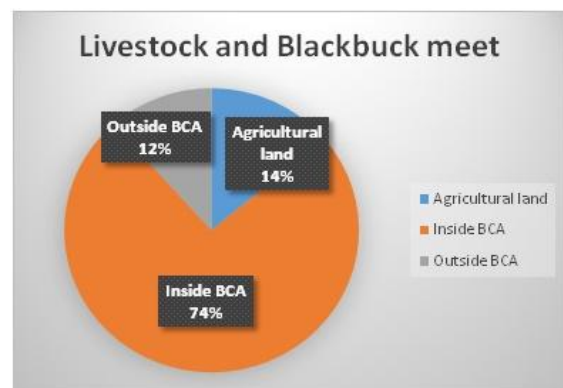## Human and Black buck interaction

Figure5. *Meeting area of livestock and blackbuck*

Out of total, 14% of the respondents said Blackbuck and livestock meet together while grazing in their agricultural land. 74% of the respondents said they come together while grazing in the grassland inside the BCA while remaining 12% said Blackbuck and livestock come together when Blackbuck come out from the BCA fence (Figure 5).

There is a high chance of transmitting Food and Mouth Disease (FMD) from livestock through

saliva while grazing while grazing in the same fallow.

The Chi-square test shows that People perception towards meeting area of livestock and blackbuck is not significantly different at 5% level of significane. Since, P (0.307)>0.05, ά=5%, n=43.

About 88% respondent said that Blackbuck comes in the agriculture land at night, while 7% respondent said they come to visit the agriculture land in the morning time and remaining 5% said that they comes in agriculture land in day time when people are not around.

The Chi-square test shows that People perception towards Time when blackbuck visits agricultural land is significantly different at 5% level of significane. Since, P (0.009) <0.05, ά=5%, n=43.

The most preferred crop species for Blackbuck grown by the respondents are mainly wheat, masuro, mustard, maize, peas etc. Out of the total respondents the majority of 42% of the respondents said that Blackbuck usually feed and cause damage to agricultural crops like wheat, followed by Paddy 23%, masuro 14%, mustard 11%, peas 5% and maize 5%.

The chi-square test shows that People perception towards Crops damaged by blackbuck is significantly different at 5% level of significance. Since, P(0.034)<0.05, ά=5%, n=43

Monetary value of crop damage due to Black buck

Total crop loss was 65922 due to black buck which cost around US $ 16467.92. Among this, the highest loss was paddy about 16842 Kg which value US$ 4030.56 (Table 5).

Table5. *Monetary value of crop damage by blackbuck*

Name of Crops	Total loss(Kg)	Total loss (US$)	Remarks
Wheat	28567	7324.87	
Paddy	16842	4030.56	
Maize	8593	1836.11	
Masuro	4765	285.04	
Mustard	2832	2178.46	
Other vegetables	4323	812.87	
Total	65922	16467.92	

Compensation Received

As directed by late king Birendra, a compen- sation of US$. 100 per month were provided to affected local households to compensate crop damage caused by blackbuck. Out of total respondents, 91% of the respondents have not received any compensation from the goverment and remaining 9% of the respondents have received the compensation.

The key informants were asked about the objectives of Blackbuck conservation. 79% of the respondents said biodiversity conservation as the main purpose of Blackbuck conservation followed by tourism purpose (16%) and religio-us purpose (5%).The Chi-square test shows that People perception towards blackbuck conservat-ion is not significantly different at 5% level of significane. Since, P(0.113)>0.05, ά=5%, n=43.

CONCLUSION AND RECOMMENDATION

The high fluctuation in the population of Blackbuck is found in Khairapur, Bardiya. Since the declaration of Blackbuck Conservation Area

in 2009, the maximum recorded population of Blackbuck was 300 in the year 2013.Blackbucks are primarily grazers and they live in open grassland in the herds of 2 to 50 animals with one or two dominant males. They are present in different numbers. Male was found to be grazed alone but females were always in a group. Altogether 31species of grasses were found in the Blackbuck conversation area. Cyondonda-ctylon (Dubo), Borhriochloabhadhii (Janewa), Baksaghans and Youngia japonica (Dudhiya) were highly preferred food of Black back. Siru has the highest relative density.

Crop damage was the largest problem perceived by the respondents and it was also increasing.

Overgrazing and grass cutting should be controlled; by constructing sufficient guard check post in different location and regular patrolling should be done. Increasing unwanted invasive grass species should be eliminated from the grassland by regular ploughing Introduction of desirable species should be carried out. Seasonal grass should be grown to feed the Blackbuck during food scarcity in winter.

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