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Local communities perception of anthropogenic threats to the habitat and population of barking deer (*Muntiacus veginalis)* in Murree-Kotli Sattian-Kahuta National Park District Rawalpindi, Punjab, Pakistan

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Abstract

To assess distribution, abundance and anthropogenic threats to habitat and population of barking deer (*muntiacus veginalis*), a social survey was conducted in Murree-Kotli Sattian-Kahuta National Park (Pakistan) from August 2015 to November 2017. 600 questionnaires filled from three zones by local community, Forest and Wildlife Department and hunters to gather information on the major threats to barking deer in National Park. The interviewees were given 3 sets of questions and most data was presented as percent interviewees in a certain response category, where multiple responses were permitted to a single question. Barking deer categorized as Endangered in Pakistan on the 2015 IUCN Red List, threatened due to habitat loss (illegal and commercial logging) for domestic and international markets. Wild olive (*Olea ferruginea)*, pine (*Pinus roxburghii*) and *Acacia spp* are mostly removed from the habitat of barking deer. Chi Square tests (SPSS 21) were conducted using a level of 0.05 to test any significant differences of three zones with anthropogenic activities. As forest area and barking deer population is decreasing over time so human hunting and deforestation emerged as principal threats to species across sites. Habitat degradation and poaching by livestock were the other threats to the conservation of barking deer in the study area. Although the area of Murree-Kotli Sattian-Kahuta has been declared as protected but elimination of hunting, strengthening the management of existing protected areas (PA) and involvement of local communities are recommended for long-term conservation of barking deer.

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Introduction

For many global wildlife populations, technical (scientific) information required for sustainable management is insufficient. So other possible sources of information concerning populations and their habitats should be searched, evaluated and integrated into management decisions (Ludwig *et al.,* 1993). Distribution and abundance of wildlife species are critical parameters in ecology and conservation. In general, however, wildlife populations' estimation is time consuming and requires extended funding, and may even be impossible sometimes. It has been proposed that knowledge of people can provide relevant biological information for conservation efforts (Folke, 2004).

Local people's knowledge of abundance and distribution of species is usually acquired through observations of individuals during their lifetime, and this knowledge is not transmitted from generation to generation (Gilchrist *et al*., 2005). This type of knowledge is called local ecological knowledge (LEK). Local ecological knowledge has been used to obtain information about presence or quality abundance of species (Moller *et al*., 2004) and qualitative demographic trends (Ferguson *et al*., 1998).

The protectionist approach to wildlife conservation, where the state protects wildlife, has proved inadequate to save wildlife from poaching and other threats in rural areas. This approach tends to marginalize nearby local communities of wild areas. Communities are losing both the land and the right to hunting wild animals. This situation leads to resource use conflicts between communities and wildlife officers. The protectionist approach is sometimes described as the "fortress" style of conservation (Taylor, 2001). It was against conflict between wildlife and communities around a new paradigm. A new approach to wildlife management has evolved, which is community-based wildlife management. As part of this strategy, wildlife in and around rural areas is supposed to be managed with and used for the benefit of residents (Phuthego and Chanda, 2004). Ungulates form an important element of biodiversity and act as key indicators of habitat quality in the Himalayas and associated mountains. These the mountain ranges offer home to about 31 species (38.7%) of Caprinae found worldwide, the richest in any part of the world (Shackleton, 1997). Wildlife in Pakistan has been particularly affected due to increased habitat disturbance and over-exploitation caused by an explosion in the human population, industrialization, and improved socio-economic status. There is a dire need for effective enforcement of protection laws until the time when small isolated populations of rare and unique species become viable and reach threshold level for sustainable harvest (Zafar *et al.,* 2014).

With the development of firearms, der everywhere become more vulnerable (Bennett and Gumal, 2001). Deer provide various readily utilized products (meat, hides and antlers) and their populations have faced reduction from over-exploitation, competition with free grazing livestock, feral dogs, and hunting (Timmins *et al*., 2008). One of the species listed as endangered in Pakistan and about which we have little ecological knowledge is the northern red muntjac (*Muntiacus vaginalis*; known locally as "barking deer") (Anwer, 1997). Barking deer distribution in Pakistan is limited to the outer Himalayan foothill forests of Punjab, where they are associated with low but dense thickets of *Acacia modesta* ("phalai"), *Olea ferruginea* ("wild olive") and *Zizyphus nummularia* ("mallah"). In this region, barking deer are usually found below 1200 m elevation (Roberts, 1997).

Conservation initiatives are required to save last remaining barking deer population, however, given the lack of knowledge about abundance and current status of threats to barking deer in Murree-Kotli Sattian-Kahuta National Park. In this paper, we focused on documenting the current extent of distribution, abundance and threats (e.g., levels of disturbance, deforestation, habitat destruction, and overgrazing) through local ecological knowledge, which is a valuable, reliable and extensive method for collection of data and knowledge. Furthermore, our goal was to provide management authorities a general view of current status of barking deer and community based natural resources management should be used

in design of future conversation practices, then there would be little practical loss and much gain to achieve management goals.

Materials and methods

Study Area

The study was conducted in Murree-Kotli Sattian-Kahuta National Park, located in the district of Rawalpindi with three sections ("zones"): Murree, Kotli Sattian, and Kahuta, comprising a total area of 57,581ha. This district is situated on the southern slopes of the north-western extremities of the Himalayas, including large mountain tracts with rich valleys traversed by Mountain Rivers. In Punjab Province, the distribution of barking deer habitat lies between 33°17" and 33°51" North latitude and 73°13" and 73°35" East longitude. The tropical dry deciduous forest, which the barking deer inhabits, lies on ravine and hilly tracts at 600 to 1000m elevation with a steady rise from the south towards the north (Ali, 1991; Roberts, 1997). The rocks are sedimentary in origin and comprise sandstone, shale, limestone, marls, and conglomerate. Soil erosion is high, especially where the soil has been denuded by heavy grazing or deforestation. The climate of the area can be described as sub-humid sub-tropical continental type in the southern parts, changing to humid sub-tropical continental type towards the northern parts of the distribution range. During winter, especially January, temperatures often fall below zero; however the mean minimum and mean maximum temperatures for this season are 1.6 and 21°C, respectively. During the summer the temperature may rise to 40.2°C (Ali, 1991; Jilani, 1990). The park holds and is surrounded by at least 372 villages with a human population of >410,000 in 1998. The average household size is 6.13. Villagers in the region practice subsistence cultivation of cereal crops. Many villagers living inside or close to the Park extract non-timber forest products derived from species such as wild olive, pine (*Pinus roxburghii*), and *Acacia* spp. for commercial markets.

Study design

The study was based on primary and secondary data collection from August 2015-November 2017. Secondary data was collected from published literature. We conducted a social survey in Murree-Kotli Sattian-Kahuta National Park to collect primary quantitative data through a structured questionnaire. In total 600 respondents from local community and staff of Forest / Wildlife department was interviewed to gather information on distribution, abundance the major threats to barking deer. We randomly selected households from a village during the course of study. 54 people refused to respond or share information. Prior contacts were used in the region to identify local villagers who admitted to hunting, and we coaxed these hunters to lead us to their other hunting companions. Using this method, we were able to hold detailed personal interviews with 24 active hunters, besides several neutral informants.

We quantitatively evaluated Local Ecological Knowledge (LEK), as a source of information for distribution, abundance and major threats and presented as percent interviewees in a certain response category; where multiple responses were permitted to a single question; therefore total percentages may exceed 100.

Interviewees were given 3 sets of questions. The first set pertained to socio-demographic information including age, sex, education, and occupation. In addition, information on livestock holdings, grazing practices and agriculture practices were collected from local inhabitants. The second set of questions gathered information on the presence-absence and encounter rates of barking deer. We also probed the perceptions of respondents regarding changes in the population of this species, hunting practices, and motivations for hunting. The third set of questions assessed major economic activities that could affect the habitat of barking deer.

Data Analysis

Data were summarized according to zones and threat scores were assigned accordingly. All statistical tests were performed using SPSS 21 statistical software (Norusis, 1990) using an alpha level of 0.05 to determine statistical significance. Chi-squared tests were conducted to assess significant differences among the three zones.

Results

Profile of the Respondents

It was interesting that some of the observations of local people were similar to scientifically studied observations. The plants species that barking deer is associated with in park is same as indicated in scientific observations. Knowledge of species distribution and abundance seemed to be more associated with males than females common throughout three zones, although, the respondents were predominantly male (86%). The mean age of the respondents was 35 years, while the presence of young respondents (aged 20 or below) was 20%. Most of the respondents fall in the age of 30-40 Human and livestock population is supposed to consider as threat to the habitat fragmentation and decline of its population. Human encroached in habitat of barking deer and force it to confine to the limited space. The mean human population in the National Park was calculated as 2700. Most of the questionnaires were filled out by members of the local community (85%). Additional questionnaire data was collected from Forest and Wildlife Department staff (11%) as well as hunters.

Distribution and abundance in the wild

The majority of local people (82%) have observed barking deer in their natural habitat. Most of the people have seen barking deer recently (27%) followed by two years ago (21%). Mostly local people saw barking deer in forest area and 2-3 times in their life histories (Table 2). Recent encounter of barking deer with local people showed that they were approaching its core habitat for different purposes. Due to harsh climatic conditions in winters, fuel wood needs for domestic energy are very high. The people of surrounding villages mostly fulfil their needs of fuel through the wood collected form the potential habitat of barking deer. Lopping for firewood purposes is common around densely populated villages. Collection of timber for construction of houses, cattle sheds and other buildings. Trees are also cut for extending cultivation land. Girding of trees is carried out to give it a look like a naturally dead tree and thus clear the land for future encroachment. Similarly, all the fodder requirements of domestic livestock are fulfilled from the Park area either by direct grazing or by grass cutting. The park area is used to meet the fodder requirements of livestock (Table. 1).

Table 1. Socio-demographic profile of respondents.

Characteristics	Frequency	Valid percent
Number of respondents	200	33.3
Zone 1(Murree)	250	41.7
Zone 2 (Kahuta)	150	25
Zone 3 (Kotli Satiyan)		
Age		
16-20	120	20
21-30	80	13.8
31-40	200	33.3
41-50	147	24.5
51-60	34	5.7
61-70	16	2.7
Gender		
Males	517	86.2
Females	83	13.8
Total human population		
1000 or under	10	41.7
1100-3000	9	37.5
3100-5000	5	20.8
Major livestock		
Cattle	9	1.5
Sheep/goat	32	5.3
Both	559	93.2
Source of forage for domestic animals	348	58
Forest	0	0
Crop fields	252	42
Both		
Education level		
Illiterate	11	1.8
Under-Matric	98	16.3
Matric	142	23.7
Intermediate	110	18.3
Bachelors	118	19.7
Masters	116	19.3
Above Masters	5	0.8
Profession/origin		
Local community	510	85
Forest/Wildlife department	66	11
Hunters	24	04

Threats to barking deer from over-exploitation

Respondents showed a huge knowledge of the characteristics of animal. On average, respondents indicated that of the barking deer population was decreasing in and around the protected area due to human activities. Hunting is a considerable problem throughout the country. The main informants of hunting were hunters so; their information was very useful of such a scenario. Although knowledge of local community is not recognized by authorities such as wildlife department, local knowledge pertaining to

hunting also influenced on hunting season. Barking deer are frequently taken, probably because their meat is highly regarded for many years, and most of them had been hunting for more than 10 years as reported by deer hunters in their interviews. Group of hunters comprises 4-5 people and main hunting methods include nocturnal hunting with head-lamps, and hunting with guns and dogs during the day.

Hunting and deforestation was assessed as a serious threat to barking deer in study and surrounding areas. Due to ruthless hunting from these invaders, population of barking deer is declining critically. Barking deer population appears to be relatively not tolerant of hunting pressure and forest degradation. To investigate whether the Barking deer population has depleted over time due to illegal hunting and poaching, we used Chi-square test. Results of frequency of hunting and poaching showed that there were no significant differences in poaching and we assumed that responses from different zones were similar but hunting contributed a difference in three zones, although hunting put a significant and severe threat in decline of barking deer population (Table 2).

Table 2. Distribution and abundance of barking deer.

Have you seen barking deer	Frequency	Valid percent
Yes	489	81.5
No	111	18.5
When you have seen barking deer		
Recently	160	26.7
One year ago	119	19.8
Two years ago	128	21.3
Three years ago	87	14.5
How many times did you observe barking deer?		
Not observed	118	19.7
One time	56	9.3
Two times	215	35.8
Three times	122	20.3
Four times	23	3.8
Five times	35	5.8
More than five times	31	5.2
Where have you observed?		
Forest	344	57.3
Near Water point	75	12.5
Crop fields	67	11.2
Forest and crop field	3	0.5
Forest and water point	1	0.2

Table 3. Trends of population dynamics in study area.

Whether population of barking deer is increasing or decreasing?	Frequency	Valid percent
Decreasing	598	99.7
Increasing	02	0.3
Why population of barking deer is decreasing?		
1. Hunting	483	80.5
Yes/No	117	19.5
2. Poaching	116	19.3
Yes/ No	484	80.7
3. Deforestation	600	100
Yes/ No		
Does hutting occur in or around National Park?	598	99.7
In/ Around	02	0.3
How many hunters hunt barking deer?		
3	79	13.3
4	237	39.6
5	282	47.1
How they hunt barking deer?	598	
1. By gun	02	99.7
Yes / No		0.3
1. By dog	448	74.7
Yes / No	152	25.3

Table 4. Causes of habitat degradation.

	Frequency	Valid percent
Whether forest is increasing or decreasing?		
Decreasing	600	100
Why forest is decreasing?		
1. Local people are cutting forest for fuel	592	98.7
Yes/No	08	1.3
2. Cutting of forest for business purposes	372	62
Yes/ No	228	38
3. Human settlements	335	55.8
Yes/ No	265	44.2
Which type of wood is being remove from forest		
1.Tree	592	98.7
Yes/No	08	1.3
2. Shrubs		
Yes/ No	340	56.7
	260	43.3
3. Herbs	197	32.8
Yes	403	67.2
No		
Which tree species is mostly removed from the forest?		
Chir	319	53.2
kahu	215	35.8
beri	22	3.7
snatha, chir and kahu	17	2.8
phulai	11	1.8
jungli anar	1	0.2
don't know	9	1.5

Table 5. Anthropogenic activities going on in habitat of Barking deer.

	Murree	Kahuta	Kotli Satiyan	Pearson Chi square	Degree of freedom	Significance value
Poaching	33 (28.4%)	42 (36.2%)	41 (35.3%)	8.214	2	0.16
Hunting	171 (28.4%)	211 (28.4%)	101 (28.4%)	22.173	2	0.00
Tree	194 (32.8%)	248 (41.9%)	150 (25.3%)	6.791	2	0.034
Shrub	89 (26.2%)	166 (48.8%)	85 (25%)	21.702	2	0.00
Herbs	55 (27.9%)	53 (26.9%)	89 (45.2%)	65.687	2	0.00
Human Settlements	101 (30.2%)	113 (33.7%)	121(36.1.4%)	51.282	2	0.00
Cutting for Fuel	194 (32.8%)	249 (42.1%)	149 (25.1%)	6.385	2	0.41
Cutting for Business	129 (34.7%)	158 (42.5%)	85 (22.8%)	2.494	2	0.287

Threats to barking deer through habitat loss and degradation

Shifting cultivation in National Park is estimated on primary forest, although the government has a policy of shifting cultivation, both habitat degradation and hunting pressure are likely to increase in view of the country's high population growth rate. Current commercial developments in central city, particularly nuclear and hydroelectric power projects and logging operations, will cause rapid habitat losses. It should be assumed that long-term survival of the barking deer is likely to come to depend on the populations within protected areas. These areas are currently protected mainly by their large size, inaccessibility and inhospitable terrain. Further protection is hampered by the inexperience within the newly created government conservation strategy and infrastructure, together with shortages of funding and trained manpower. Resisting further habitat loss and reserving restricted areas with controlled hunting are of primary importance. A chi-square test conducted to check disturbance in its habitat by removal of different plant species (tree, shrubs and herbs) showed that all plant species contribute a habitat cover and make significance difference with removal of plants in decline of barking deer population.

So plant species contribute to high population density of barking deer in its natural habitat of research area. Test of different anthropogenic activities in habitat of Barking deer showed that human settlement is supposed to major threat to habitat destruction and fragmentation as compared to cutting of plant species for fuel and business. High demand of land use due increased growth of human population has put risk of extinction to many wildlife species (Table 5).

Discussion

Interviews with farmer, nomads and hunters were a source of good quality and low cost information. In eighty days we collected a reliable and largest dataset on presence and relative abundance of barking deer on regional scale than standard field sampling. Applications of these large but inexpensive datasets are obvious, which would otherwise be impossible to carry out. The results of this study suggested that illegal hunting is a major threat to the population of barking deer. Similar threats were reported by (Zulfiqar and Minhas, 2011); hunting was also considered to be a serious threat to barking deer in Pir Lasura National Park and surrounding areas (Choch). (Madhusudan and Karanth, 2002) reported that the statements of the hunters in the region also support such an inference: 75% of all hunters identified hunting as the single most important factor responsible for the depressed abundance of large mammals in this area.

(Madhusudan and Karanth, 2002) suggested that local hunting in Kudremukha, India, derives from a tradition-driven demand for wild meat and for sport. The adoption of gun hunting, which is a far more efficient technique than traditional hunting methods, is likely to have resulted in a wider range of species being targeted by the hunters, perhaps with greater success. Barking deer are hard to snare using the technique of local hunters. (Timmins *et al.,* 1998) suggested that hunting is a considerable problem throughout Laos. Barking Deer are frequently taken, probably because their meat is highly regarded and because barking deer are abundant relative to larger quarry such as the sambar (*Rusa unicolor)* and wild cattle (*Bos* spp*)*. Much of the meat is eaten in villages, but there is a ready market for wider distribution in towns. The main capture methods are snaring at gaps in long brush fences, nocturnal hunting with head-lamps, and hunting with dogs during the day. A total ban on hunting of the large barking deer or the small, undetermined species would be unrealistic, in part because this would also necessitate limits on the hunting of the very similar barking deer. Clearing of forest for agriculture and human settlements reduced barking deer distributions throughout their historic range. Disturbance by grazing of domestic livestock also find out as threat (Sheng, 1992; Yang and Feng, 1998).

Conservation measures

At the international level, trade of trophy is controlled through the Convention on International Trade in Endangered Species of Fauna and Flora (CITES). The aim of the convention is to establish worldwide controls over trade in endangered wildlife and their products, in recognition of the fact that unrestricted commercial exploitation is one of the major threats to the survival of species.

The Punjab government now pays much more attention to wildlife protection. It has launched a series of laws and regulations to preserve rare animals and their habitats, such as the Wildlife Protection Law. The enacted laws protect barking deer population to a certain extent. To improve the protection of barking deer in Punjab, it cannot be caught or hunted inside the National Park, anyone who illegally hunts, catches or sells will be prosecuted. Community participation in protection of barking deer has also improved through community escort guides. The Department of Wildlife and National Parks is participating in a pilot project with communities in the process of monitoring resources. We believe that results of this study also highlighted local ecological knowledge consideration as more possible standard tool for medium and long term monitoring population trends. Local ecological knowledge can be particularly useful when population densities are low and traditional scientific sampling methods are expensive or difficult to implement.

References

Ali Z. 1991. Study of the habitat and feeding biology of Barking Deer (Muntiacus muntjak) in Margalla Hills National Park, M. Sc. Dissertation. University of the Punjab.

Anwar M. 1997. "Distribution, population status and conservation of barking deer (Muntiacus muntjac) in Margalla Hills National Park." Biodiversity of Pakistan. Pakistan Museum of Natural History, Islamabad, Pakistan and Florida Museum of Natural History, Gainesville, USA 485-495.

Bennett EL, Gumal MT. 2001. "The interrelationships of commercial logging, hunting and wildlife in Sarawak." The cutting edge, conserving wildlife in logged forests. Columbia University Press, New York, New York, USA 359-374.

Ferguson MA, Williamson RG, Messier F. 1998. "Inuit knowledge of long-term changes in a population of Arctic tundra caribou." Arctic 201-219.

Folke C. 2004. "Traditional knowledge in social–ecological systems." Ecology and Society **9(3).**

Gilchrist G, Mallory M, Merkel F. 2005. "Can local ecological knowledge contribute to wildlife management? Case studies of migratory birds." Ecology and Society **10(1).**

Jilani G. I990. Revised working plan for the scrub forest of Rawalpindi district, 1989-90 and 2019-2020. G. o. P. Forest Department.

Ludwig D, Hilborn R, Walters C. 1993. "Uncertainty, resource exploitation, and conservation: lessons from history." Ecological applications **260,** 17-20.

Madhusudan M, Karanth KU. 2002. "Local hunting and the conservation of large mammals in India." A Journal of the Human Environment **31(1),** 49-54.

Moller H, Berkes F, Lyver POB, Kislalioglu M. 2004. "Combining science and traditional ecological knowledge: monitoring populations for co-management." Ecology and society **9(3).**

Norusis MJ. 1990. SPSS: Statistical data analysis, SPSS.

Phuthego T, Chanda R. 2004. "Traditional ecological knowledge and community-based natural resource management: lessons from a Botswana wildlife management area." Applied Geography **24(1),** 57-76.

Roberts TJ. 1997. The Mammals of Pakistan., Oxford University Press, Karachi.

Shackleton DM. 1997. "Wild Sheep and Goats and their relatives: status survey and conservation action plan for Caprinae." IUCN/SSC Caprinae Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK **390.**

Sheng H. 1992. Deer of China, East China Normal University Press, Shanghai.

Taylor MJ. 2001. Life, land and power: Contesting development in northern Botswana, University of Edinburgh.

Timmins RJ, Duckworth JW, Hedges S, Pattanavibool A, Steinmetz R, Semiadi G, Tyson M. 2008. Muntiacus muntjak. IUCN Red List of Threatened Species, IUCN.

Timmins RJ, Evans TD, Khounboline K, Sisomphone C. 1998. "Status and conservation of the giant muntjac Megamuntiacus vuquangensis, and notes on other muntjac species in Laos." Oryx **32(1),** 59-67.

Yang Q, Feng Z. 1998. "Status and conservation of musk deer at the southeast of Qinghai-Xizang (Tibet) Plateau." Resources and Conservation of Vertibrate. Sichuan Sciences and Technology Publishing House, Chengdu (in Chinese).

Zafar M, Khan B, Khan E, Garee A, Khan A, Rehmat A, Abbas AS, Ali M, Hussain E. 2014. "Abundance Distribution and Conservation of Key Ungulate Species in Hindu Kush Karakoram and Western Himalayan (HKH) Mountain Ranges of Pakistan." International Journal of Agriculture and Biology **16(6).**

Zulfiqar S, Minhas RA. 2011. "Population and conservation status of barking deer (Muntiacus muntjac) in Pir Lasorha National Park and other areas of District Kotli, Azad Jammu and Kashmir, Pakistan." Pakistan Journal of Zoology **43(5).**