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WINTER DISTRIBUTION AND POACHING OF MUSK DEER, MOSCHUS CHRYSOGASTER AND MOSCHUS LEUCOGASTER IN JIGME DORJI NATIONAL PARK, BHUTAN

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Abstract

Jigme Dorji National Park is home to 2 species of musk deer: Alpine (Moschus chrysogaster) and Himalayan musk deer (M. leucogaster). In summer months, they inhabit alpine areas and in winter, they are found in fir (Abies densa) forest. They are distributed within the altitudinal range of 3171 masl to 4327 masl in winter. The study on musk deer distribution and poaching was carried out in all the potential musk deer habitats under 6 range offices in the month of October to December 2016. A total of 400 snares were removed following 84 days of active patrol by the park staff. One male musk deer was released into the wild which was caught in the snares set around Chutey Goempa forest. Traditional snaring method (leg and neck snares) with barricade were adopted by the poachers. Nylon ropes were the primary material used as snares. During the entire patrol period, two poachers were apprehended under Lingzhi Range, while attempting to set snares for musk deer. They were fined as per the provisions set under Forest Act, 1995. Annual anti-poaching activities should be carried out and anthropogenic activity should be strictly monitored to protect this endangered species.

Keywords*: Agriculture; Income; Musk deer; Patrolling; Poaching; Protected areas; Snares;*

Introduction

Seven species of musk deer are known to exist as of today and all the species are considered Endangered on the IUCN Red List except for *Moschus moschiferus* which is vulnerable [1-3]. Musk deer are distributed along Arctic Circle in Russia to Asian countries such as Afghanistan, Bhutan, China, India, Korean Peninsula, Mongolia, Myanmar, Nepal, Pakistan and Vietnam [4]. In Bhutan musk deer is listed in Schedule I of Forest and Nature Conservation Act, 1995 and it is highly protected [5]. Musk deer are distributed along the western, northern, central and eastern region of the country and it is found in six protected areas (PA) [6]. Two species of musk deer roam the forests of Jigme Dorji National Park (JDNP). Alpine musk deer (*Moschus chrysogaster*) and Himalayan musk deer (*Moschus leucogaster*), both categorized as Endangered on IUCN Red List [1, 2, 7]. Musk deer (*Moschus* spp.) have high economic importance and therefore, are highly endangered mammal species [8]. Population existence is threatened across its habitat due to deforestation, habitat fragmentation and anthropogenic activities, such as poaching for its musk pod [9, 10]. Musk pod has high commercial values and musk deer are over exploited. This has led to the decline in its population. Musk remains to be one of the most expensive natural products and the values are

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calculated to be more than gold [11-13]. East and Southeast Asian are the major traders and consumers of musk products [14]. Musk has been used in perfumes and in some Chinese medicines [15]. The population decline has been aggravated by increased use of snares [16]. Musk deer develop latrine sites by defecating repeatedly at one particular site and such sites serve functions for chemical communication [17]. Latrines are ecologically very important and it is highly developed communication methods used by musk deer as they are confounded by minimal visual contact, dense forest cover, solitary behavior and no vocalization [18-21]. Musk deer are poached setting snares based on the location of latrine sites [17]. The collection of timber, fodder, food, medicinal plants and livestock grazing inside PA by the local communities has also aided the decline in musk deer population [22].

Conservation of these species inside JDNP is a huge challenge due to lack of funding, inadequate and ineffective patrolling and highly porous park boundary. The aim of this study was to ascertain the extent of musk deer poaching and to assess winter distribution in the park.

Materials and Methods

Study site

The study on musk deer distribution and poaching was initiated in all the 6 range offices (Gasa, Laya, Lingzhi, Lunana, Ramina and Soe) of JDNP (Fig. 1). JDNP with an area of 4449km^2 is second largest PA in Bhutan and it is spread over northwest part of Bhutan. The elevation changes from 1200 *meters above sea level* (masl) in south to 7314masl in the north. There are about 1258 households living inside the park and fir (*Abies* densa) forest – winter suitable habitat of musk deer, alone contributes to about 11% of the park area (486 km^2).

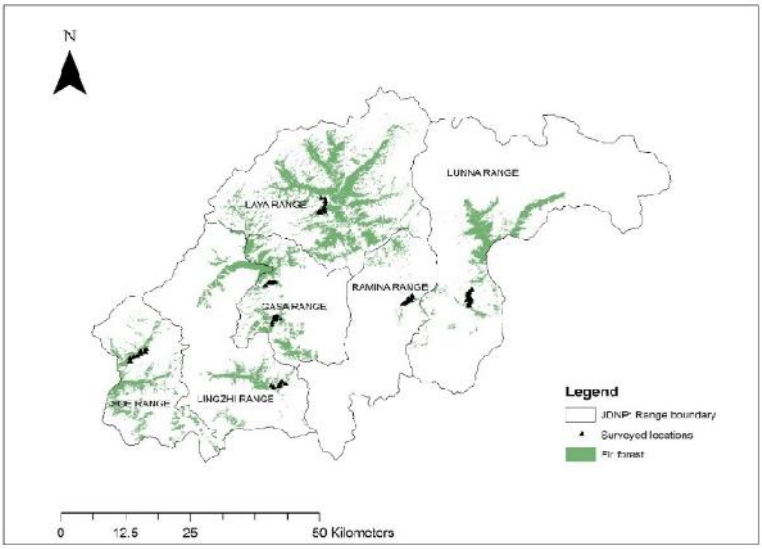

Fig. 1. Map of JDNP showing the surveyed locations.

Common plant species include fir *(Abies densa),* blue pine *(Pinus wallichiana),* birch *(Betula utilis),* rhododendron *(Rhododendron arboreum.),* hemlock *(Tsuga domusa),* oak *(Quercus lamellosa),* juniper *(Juniperus recurva),* spruce *(Picea spinolusa),* maple *(Acer campbelii),* taxus *(Taxus bacata),* larch *(Larix graffithiana)* and chirpine (*Pinus roxburghii)*. In case of faunal species, the park supports snow leopard (*Panthera uncia*) red panda *(Ailurus fulgens*), tiger *(Panthera tigris),* leopard *(Pantheraparadus),* goral *(Naemorhedus goral),* serow *(Capricornis sumatraensis),* Himalayan black bear (*Ursus thibetanus*), barking deer (*Munticus*

muntjak), and wild pig *(Sus scrofa)*. This is the only PA probably in the world where one can find two top predators tiger and snow leopard sharing same habitat [7].

Methodology

With the onset of seasonal migration, musk deer are more prone to poaching in the woods than in the alpine habitat. While in the woods, poachers have all the advantage to set up snares and kill musk deer. This study was initiated in October 2016 – December 2016 coinciding seasonal migrations in the winter. The sites were identified based upon the high number of musk deer presence reported through various surveys and camera trapping exercise carried out by the park management. In some case the sites were determined through the information conveyed by the informants. Patrol team traversed through all the game trails and upon the encounter of musk deer snares, the snares were dismantled and trap materials destroyed along with the barricade. Live wildlife caught in the snares were released back into the wild. Global Positioning System (Garmin GPS eTrex Vista HCX) was used to record locations for future monitoring purposes.

Results

A total of 504 man-days were taken to comb the potential musk deer habitats (14 days x 6 men x 6 range office). Four hundred snares were dismantled and destroyed, 2 poachers apprehended, 1 male musk deer and 2 male Himalayan monal (*Lophophorus impejanus*) released into the wild. Most of the snares were freshly set (43% old traps versus 57% new traps) along the altitudinal range of 3147 to 4100masl and majority of the snares were seen between 3600 to 3700masl. Maximum number of snares was removed from Gasa range and least from Soe range (Table 1). Nylon ropes with the diameter of 3 to 5cm was the main material used as snare. Except for the snares set under Ramina range which was neck trap, all other ranges had leg snares.

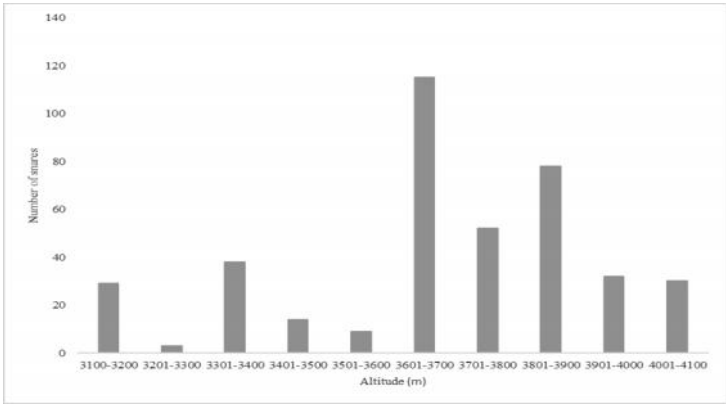

Fig. 2. Number of snares along the altitudinal gradient.

Table 1. Information on snares removed under each range.

Name of Range	Number of snares removed	Type of trap	Alltitude range (m)
Gasa	164	Leg trap	3147 - 3972
Lingzhi	90	Leg trap	3649 - 3953
Lunana	70	Leg trap	3677 - 4048
Ramina	39	Neck trap	3172 - 3789
Laya	36	Leg trap	3174 - 4093
Soe	1	Leg trap	4100

Discussion

Musk deer are generally found along the altitudinal range of 2500 to 4800masl [23]. In winter season, musk deer in JDNP were found distributed along the altitudinal gradient of 3171 to 4327masl (Fig. 3). Their distribution was mostly within fir forest since lichens (a primary winter food for the musk deer) were recorded plentiful in fir forest. The elevation range of 3600 to 3700masl was the most suitable winter habitat as the survey team recorded majority of musk deer droppings within this altitudinal range. The same was also indicated by the maximum number of snares set within this range. In Manaslu conservation area, from Nepal, *A. Subedi et al.* [24] showed that altitude range of 3600 to 3800m is the most suitable altitudinal range.

Fig. 3. Patrol team of Gasa Range rescuing and releasing male musk deer which was caught in the snares set by poachers.

The result from our current study revealed that Gasa range had the highest number of snares. One of the main reasons for such finding could be related to easy accessibility with many alternative entrance routes (Gasa, Ponjothang, Gayza, Zomina, Damji, Panikong, Phuentshogang) to musk deer habitat. Gasa district is connected with un-paved road facilities and with easy accessibility, the distance to the musk deer habitat is about a day walk or less from the nearest road point.

Annual household income is also one of the major factor contributing to musk deer poaching. Resident communities of the park earn enough income to support their family. Their income comes from the sale of agriculture products, livestock products, medicinal plants, raw material for incense and through the sale of Chinese caterpillar (*Ophiocordyceps sinensis*). Chinese caterpillar contributes to major portion of annual income as it fetches high amount in the auction yard. Local communities of the park do not involve in musk deer poaching as they have strong religious sentiments towards both wild and domestic animals. People do not even consume the meats of animals killed by wild predators. Non-resident communities of the park are the main poachers who come and poach musk deer in JDNP. The park authority in the previous years apprehended some poachers and all of them were identified to be non-resident communities. These are the group of people with low level of income and their poor socio-economic status is the driving factor behind musk deer poaching. They live in areas where agriculture farming and livestock rearing do not bring much benefit.

With regard to other ranges, accessibility is the main issue. A minimum of two days walk is required to get into the musk deer habitat and the poachers do not have alternate route. With only one entrance route, poachers are under the high risk of getting caught by the park officials. Under Lingzhi range, two poachers were caught while attempting to set snares for the musk deer around Tsatugang forest area. Both were non-resident of the park and they were fined as per the existing rules.

In Soe range during the entire patrol period, the team had removed only one trap and the team had recorded many musk deer evidences. In the past (>10 years) Soe range used to have many poaching incidences. Finding of minimum poaching evidence is also directly related to socio-economic status of the people. Some people residing around Soe range have diverted their activity towards illegal trade of Red Sandalwood (*Pterocarpus santalinus*) across border to Tibet which generated high income.

Other probable reasons related to musk deer poaching may be due to less amount of fine mentioned in the forest rules. The fine amount is relatively less than what they supposedly earn in the black market. For killing of musk deer 200,000.00Nu is imposed (Forest and Nature Conservation Rules and Regulations of Bhutan 2017). On contrary, wildlife crime is a huge and lucrative business and musk pods can fetch as much as 45000 USD per kilogram (2.2 pounds) in international market [1]. Another most important factor contributing to the poaching of any wildlife species is the lack of fund to conduct regular and organized patrolling.

Conclusion

Majority of the snares were fresh and they were set within the month of October. Poachers are aware of the seasonal migrations of the musk deer and hence take advantage to trap maximum musk deer. In order to apprehend poachers, patrolling effort should be focused before the onset of the seasonal migration. Entire musk deer habitat within the park should be intensively combed for the snares. Only male musk deer have musk pods but the use of snares have high negative conservation implications. The snares not only traps target species but other non-targeted species are also killed indiscriminately. Musk deer are endangered species and the only method to save musk deer is through active patrolling of its habitat. Therefore, adequate fund is required for extensive anti-poaching program and frontline staff should be trained with technology-driven communication and surveillance system. In addition, local informants should be deployed in every village and they should be given incentives for their information. Further, study on movement ecology of musk deer in different locations should be carried out to help park management develop area specific anti-poaching plan.

Acknowledgements

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