

Himalayan musk deer: ecology and conservation



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The Himalayan musk deer (*Moschus chrysogaster*) is one of the endangered deer species of Nepal found in the sub-alpine and alpine vegetation of the Himalayan region. Poaching and natural predation along with human induced habitat alteration are the main reason for declining musk deer population. Due to this vulnerability, it is in the list of protected species in Nepal. However its population is still in critical stage and knowledge on distribution, status and conservation threats for this species is crucial. This paper aims at identifying the distribution over protected areas of Nepal and the potential conservation threats prevalent in those areas. In order to mitigate these threats, ex situ conservation, in situ conservation and strict ban on the trade of this species should be imposed. Besides, conservation awareness programs about musk deer should be carried out among the local people living nearby the protected areas. Eventually, there should be focus on identifying conservation strategies and priorities areas for musk deer within the protected areas.

Key words: Awareness, habitat, endangered, protected areas, poaching, Nepal

Introduction

Himalayan musk deer (*Moschus chrysogaster*) is found in the birch and rhododendron coniferous forests of the Himalayan region of Nepal (Kattel, 1992), belongs to Moschidae family (Brooke, 1878, Flerov, 1952, Groves and Grubb, 1987, Whitehead, 1972) though they were initially placed in Cervidae family (Aryal et al., 2010, Flower, 1875, Zhau et al., 2004). It possesses well developed canines and lacks cranial appendages (Flower, 1875, Scott and Janis, 1987, Webb and Taylor, 1980). It is of dark brown color and its body is

covered over with coarse and brittle hairs (Green, 1985). Female is slightly larger than males both in mean body mass and length (Kattel, 1992). It is hornless and without facial glands and unlike other deer, it possesses a gall bladder, a caudal gland and a musk gland (Aryal et al., 2010, Prater, 1993). It is a very shy, solitary and territorial animal and crepuscular in habit i. e. active at dusk and dawn (Green, 1986, Green and Kattel, 1997). At night, it can be seen in the open areas of their habitat as they graze while during the day, they remain in dense cover. The Himalayan musk deer does not undertake any seasonal migration, remaining in the same area year around despite harsh weather condition (Kattel, 1992).

Musk deer feed on herbaceous and woody plants, leaves, flowers, twigs, lichens, moss, shoots and grass. In the winter, arboreal lichens and some terrestrial bushy lichens make up about 70% of musk deer's diet where as herbaceous plants are the main diet in the summer (Green and Kattel, 1992, MacDonald, 1995). They are true concentrate selectors (Kattel, 1992). Musk deer inhabit steep, forested or shrub-covered slopes, mainly in the sub-alpine zones of mountain regions. Dense undergrowth of rhododendron, bamboo and other shrubs form the typical habitat (Bannikov et. al, 1978, Green, 1987a). Use of the habitat depends upon the availability of cover; food and other factors (Aryal, 2005). They prefer to inhabit rocky outcrops in order to dodge predators. It has been commercially exploited by poachers for centuries for its valuable musk pod, which is usually excised after killing the deer (CITES, 2002, Zhau et al., 2004). On the other hand, human population growth is leading to deforestation and reduction of musk deer habitat (Eckholm, 1975). Very few studies have been done in this deer

species. In addition, it is under lower risk (near threatened) status of IUCN Red List of threatened species; appendix I of Convention on International Trade of Endangered flora and fauna (CITES) and protected species of National Parks and Wildlife Conservation Act, 1973, Nepal (HMG/Nepal 2002).

The purpose of this paper is to present information about the distribution of the Himalayan musk deer and assess the conservation threats in the Nepal and potential conservation strategies that can be employed to mitigate these threats.

Distribution

Musk deer (*Moschus* spp) are distributed throughout the forest and mountainous parts of Asia from north of the Arctic circle southward to the northern edge of Mongolia and to Korea. Further south, avoiding the Gobi desert, the musk deer occurs in China, Burma, Northern India, Northern Vietnam and the Himalayan region (Flerov, 1952, Green, 1986, Yang et al., 2003). In central Asia, musk deer occur in Kazakhstan, possibly in Kyrgyzstan and the south of Russia (Dao, 1977, Flerov, 1952, Green, 1986 and Whitehead, 1972). Out of 5 musk deer spp, himalayan musk deer (*moschus chrysogaster*) are endemic to Afghanistan, Bhutan, India, Myanmar, Nepal and Pakistan (Khan et al., 2006). They occur in the Himalayan region at an altitude of 2400 to 4300 m in Nepal (Shrestha, 1998). Musk deer are commonly found in Bajhang, Doti, simikot, Markhor lake, Dhorpatan and Langtang in west and central region of Nepal while they are occurred in Jatapokhari, Taplejung, Chipuwa, Arun and Wallangchung gola of eastern Nepal. Their habitat is better protected in the upper Langtang valley, vicinity

of Thyangboche monastery in Khumbu and upper Budi Gandaki than other parts of Nepal (Aryal, 2006).

The numbers of the musk deer are increasing significantly within protected areas while outside the protected areas they are declining incessantly. It is estimated that Sagarmatha national park has of 600-800 animals with upto 45 per km². Similarly, there is an estimate of 500 animals in Langtang National Park, 20 in Rara national park and above 1000 in Shey-phoksundo National park (Kattel, 1990, Wemmer, 1998). Musk deer are found in 9 protected areas of Nepal viz. Rara National Park, Makalu Barun National Park, Sagarmatha National Park, Shey-Phoksundo National Park, Khaptad National Park, Langtang National Park, Kanchanjunga Conservation Area, Manasalu conservation area and Annapurna Conservation Area (Aryal, 2005, HMG/Nepal, 2002). Besides, they are occurred in Dhorpatan hunting reserve (IUCN, 1993).

Conservation threats

Environmental degradation has reached unprecedented levels in the Himalayan region of Nepal. Population growth has forced the people of Himalayan region to exploit forest resource to fulfill their forest basic needs such as fuel wood, timber, fodder. An unsustainable harvesting practices in Himalaya region lead to the subalpine and alpine vegetation in degradable condition (Echolm, 1975). Nepal forest Inventory indicates that since 1978 forest cover has declined at a rate of 1. 7 percent per annum and the total woody vegetation (forest and shrub) cover has decreased at an average annual rate of about 0. 5% (FAO, 1999). These activities have urged the degradation of wildlife habitat which ultimately contribute in the reduction of

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musk deer population. In addition, owing to socio-economic and political conditions, musk deer population aren't being afforded safe sanctuary even in remote areas because of tribesmen's poaching and hunting for their livelihood subsistence (Jackson, 1979).

Poaching

Traditional hunting methods have been practiced in the some of the mountainous parts of western Nepal (Jackson, 1979). Although meat and hide are not considered good, Musk deer have been hunting by humans for thousands of years (Hepther and Naumov, 1961). The principal reason for the intense hunting of musk deer has always been the demand for musk. In Russia, hunting and poaching are considered the prime causes for the reduction of musk deer population (Green, 1986, Jackson, 1979, Prikhod'ko, 1997, Wemmer, 1998). Populations of musk deer are declining in nearly all countries where they occur due to poaching. This decline is thought to be particularly dramatic in Russia and china. (CITES 2002). The musk deer populations of Russia were brought to the brink of extinction through over-hunting in the early twentieth century (Homes, 1999). Simultaneously, population of musk deer is declining due to poaching in Nepal, it has been estimated that for every male deer that yields one musk pod, four deer are killed (Green 1986, HMG/Nepal 2002). The research conducted in 2006 by Rajchal showed that the most of illegal activities approximately 64% were happening for poaching musk deer. Snares is the most commonly used hunting technique by the poachers to kill the musk deer which not only killed the male deer but also the cause the death of juvenile, female and other wildlife species (Rajchal, 2006).

Habitat Destruction

Habitat destruction, due to increasing human and livestock populations in Nepal, limited the distribution of musk deer to smaller and fragmented area. As result, population of musk deer has reduced considerably (Green, 1986). Musk deer habitat is converted for settlements, agriculture and other types of landuse (Homes, 1999). The habitats of musk deer in the subalpine region of the Himalayas are increasingly used for harvesting firewood and as pasture land (Harris, 1999). Expanding pastoralism affected musk deer indirectly through predation and harassment by domestic dogs (Green, 1986, Harris, 1991). Besides, this causes the loss of the understorey of vegetation which is of particular importance to musk deer for food and shelter against predators (Home, 1999). Habitat loss is also mentioned as a factor threatening musk deer in the Russian Far East where intensive timber harvest and the frequent burning of forests are destroying their habitats (Prihod'ko, 1997 and WWF Deutschland , 1998). One of the studies carried out in Sagarmatha national park, Nepal in 2005 by Aryal revealed that musk deer habitat has reduced considerably as local people are highly dependent on forest for fodder, fuel wood and timber. In order to fulfill their needs, they have been deforesting forest resource. In addition, fire and other anthropogenic activities also altered the potential musk deer habitat into vulnerable condition (Aryal 2005).

Predation

Musk deer have a number of natural predators. They are generally predated by Leopard (*Panthera pardus*), Clouded leopard (*Neofelis nebulosa*), Snow leopard (*Uncia uncia*), Lynx (*Felis lynx*), Wolf (*Canis lupus*) and Wild dog

(*Cuon alpinus*) (Green 1987a, Shrestha 1981, Kozhechkin 1994 and Zhinvotshenko 1988). Besides, the young are attacked by large birds of prey (Green 1987a, Kozhechkin 1994 and Zhivotschenko 1998). Predators don't however have a significant impact on the size of the musk deer population. In the region of Altai and Eastern Sayans in Russia, musk deer form up to 50% of the diet of the yellow throated marten but nevertheless, the martens in these region remove only about 8-12% of the overall population of musk deer (Bannikov et al. 1978 and Phrikhod'kko 1997). One of the studies carried out by Aryal in Annapurna conservation area showed that yellow threatened marten is the prime predator of juvenile musk deer which killed 15 juvenile musk deer during the period of 2001 to 2004 (Aryal 2006).

Grazing

Due to high seasonality and low primary productivity, the himalayan region supports relatively low ungulate/herbivore biomass. It is therefore obvious that with the increase in the biomass of domestic livestock in the areas, musk deer have suffered from competitive exclusion (Aryal 2006).

Sathyakumar et al. 1993, have reported that increased livestock grazing and associated impacts have led to low musk deer densities in many areas in Kedarnath wildlife sanctuary, India. Rajchal 2006 have depicted that local people of Sagarmatha national park graze their livestock haphazardly.

Domestic animals enter the forest to compete for shrubs and undergrowth with musk deer. Even when the canopy is intact, the dense undergrowth favored by musk deer for food and shelter is often extensively damaged by domestic livestock. Livestock have a dramatic impact on the population of

musk deer (Rajchal 2006). Similarly another study conducted by Aryal et al. 2010 showed that there were 35 % habitat overlap between livestock and musk deer which substantiate that there was high encroachment of domestic livestock in sagaramatha national park.

Conservation strategies to mitigate threats

Musk deer conservation efforts should be focused on maintenance of essential ecological processes and life support system in order to preserve genetic diversity and ensure the sustainable utilization of the species and its ecosystem (Shrestha 1998). For this, it is necessary to give proper protection to the species within existing national parks and sanctuaries, to control the musk trade , both at national and international levels and to utilize the species at a sustainable level for the benefits of rural communities,(Green 1986, Shrestha 1998).

In situ conservation

In situ conservation refers to the protection of musk deer within their home range. Poaching and non-sustainable forest harvesting should be highly prohibited at musk deer habitat (Zhou et al. 2004). In order to fulfill this purpose, several national parks, wildlife reserve and conservation reserve has focus on the protection of this species established in Nepal. National parks and wildlife conservation act 1973 is also focused on the conservation of musk deer conservation through listing *moschus* spp as protected species and by providing additional protection for population located in protected area (HMGN 1973). This type of conservation strategies was also successful in china where Chinese government has established a large number of

national, provincial and local nature within their home range.(Zhou et al. 2004).

Ex situ conservation

Ex-situ conservation can be suitable option for musk deer protection where it has been extinct and endangered. Captive breeding is one of the best strategy of ex-situ conservation (Zhou et al. 2004). Musk deer has considerably increased after significantly 1996 in Godavari, Nepal after the establishment of musk deer farming at Godavari, Nepal (Rajchal 2006). simultaneously this type of farming is most successful in China as compared to other countries(Shrestha 1998). Though specific policy has not been built yet for musk deer conservation, tenth plan(2002-2007) has recognized the need for encouraging the involvement of private sector in farming of valuable non-timber forest products, wild animals and birds through the formulation of necessary laws. Special attention has to be given on how forest and wildlife conservation can contribute to human welfare and sustainable development of the country (Rajchal 2006).

Restriction on the use and trade

In order to support the restriction on the musk deer and its production smuggling, an international cooperation is needed to impose the ban on trade of this product. In addition use musk deer on the medical and perfumes products must be banned (Zhou et al. 2004). Two international legal agreements directly related to the conservation and exploitation of musk deer populations. The first is CITES, is an international law that regulates international trade in listed species and the second is the CBD, which is an international agreement to create and enforce specific types of domestic

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legislation designated to conserve biodiversity. Nepal as a signatory to both treaties and having ratified them, is responsible, under international law, for implementation and enforcing their provisions (Belbase 1999, Homes 1999). Both CITES and CBD allow for and support the implementation of in situ conservation (Rajchal 2006).

Recommendation and Conclusion

Himalayan musk deer which is native to Nepal has been declining dramatically due to poaching, habitat loss, live stock grazing, natural predation, and anthropogenic causes. In order to conserve this endangered species of Nepal, several protected areas have focused on the regular monitoring of this species along with stringent restriction on the trade of this species, though their population is still in critical condition. To make the conservation effort effectual, poaching and habitat loss which is considered the main cause of musk deer population diminishing should be reduced by awaring the local people about the importance of musk deer conservation. conservation education, training and awareness programs have to be lauched in schoold, villagers, antipoaching units and park authorities to educate them about musk deer, their ecological and economical role and prevent from poachers. Current firewood and timber harvesting system adoped in their habitat should be reduced by promoting alternative energy like hydropower to meet their enery needs to make a little disturbance in their natual habitat. Area where musk deer is inhabited should be designated as separate core area and have to declared musk deer conservation core areas in all the protected areas where it is found. Besides, scientific studies regarding musk deer habitat, status, diet, threats should be carried out in

those areas. Moreover, musk deer farming should be emphasized and their trade and harvesting must be sustainable.