

# Distribution and Population Status of Himalayan Musk Deer (*Moschus chrysogaster*) in the Machiara National Park, AJ&K

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**Abstract.-** A study was conducted in November-December 2006 to determine the current distribution, population status and habitat utilization of Himalayan Musk Deer (*Moschus chrysogaster*) in the Machiara National Park, Azad Jammu and Kashmir. Line transect method was applied for estimating its population size using both the direct observation of the animal as well as indirect evidences from its signs. A total of 31 Musk deer were sighted from 19 sites, comprising six in sub-alpine scrub forest and 25 in Himalayan moist temperate forest. Total population of Musk deer was estimated at 64 individuals in the park which showed an increase over the previous population of 35 animals estimated in 2004. The increase in Musk deer population could be attributed to the initiatives taken under Protected Areas Management Project. This project has involved local communities residing at the periphery of the park for the protection and management to conserve the biodiversity resources of the park, which had positive impact on the population of Musk deer. Study indicated that Musk deer undergo seasonal migration to lower elevations in the Himalayan moist temperate coniferous forest during the heavy snowfall in the park. Hence, sub-alpine scrub forest and Himalayan moist temperate forest, the two habitats used by Musk deer which need total protection.

**Key words:** Musk deer, population size, habitat preference, seasonal migration, Machiara National Park, AJK.

## INTRODUCTION

Musk deer belongs to the family Moschidae and genus *Moschus*. It is a small, stockily built animal with small head. Hind legs appear longer than forelegs, indicating the tendency to move by leaping when browsing the shoots. Both sexes have conspicuous outstanding ears to detect danger. Adult males possess large abdominal scent gland i.e. musk pod, the feature from which its name is derived and have downward curving canine teeth from upper jaw up to 5.41cm long which are used in territorial defense during the rut period (Kattle, 1992) and against any attack of predator. In females and juveniles, canines are shorter and invisible. Body weight of males is less than females. Large size females have an advantage in intra-sexual competition for mates (Trivers, 1972). Big mother hypothesis is most relevant to Musk deer i.e. a fawn born from larger female should be able to achieve a larger size prior to onset of long and harsh winter (Barrette, 1987).

Musk deer is solitary and territorial animal.

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Its habitat is characterized by small valleys between steep inaccessible ridges at the upper limits of the tree line (Roberts, 1997). In Pakistan, it is associated with sub-alpine scrub forest, above coniferous forest, between 3000m-4000m elevation in Machiara and Neelum Valley of AJK, Indus Kohistan, Chitral, Astore, Chilas and Gilgit (Roberts, 1997). Though solitary they use communal latrines helping to maintain separate territories (Qureshi *et al.*, 2004). Smaller latrines are often found in 50m radius of its day resting sites. As a crepuscular animal, it remains active at dusk and dawn in search of food. This deer is the smallest of Himalayan ungulates living in the cold environment (Kattle, 1992).

Musk deer are killed to get musk pod found in mature males. The high value of musk has been an incentive for illegal hunting of musk deer. Hunting methods often by setting snares, do not discriminate age and sex of animals and both females without musk gland, and juveniles, which secrete little musk in case of males, are also killed along with adult males (Schaller, 1977, Green,

1986, Khan *et al.*, 2006). The Himalayan Musk deer (*Moschus chrysogaster*) is listed as critically endangered in Pakistan and endangered globally (Sheikh and Malour, 2005) and listed under Appendix I of CITES (CITES, 2003).

#### Study area

Present study was conducted in the Machiara National Park (MNP) which is part of the Great Himalayan chain that branches off from Nanga Parbat (Negi, 1983, Qamar, 1996). Machiara Forest was declared as Game Reserve in 1982, Wildlife Sanctuary in 1984 and National Park in 1996 (GOAJK, 2005; Qamar and Minhas, 2006). MNP lies at 34°-31' N latitude and 73°-37' E longitude between 2,000 to 4,700m elevation, covering an area of 13,532ha. It is located on the right bank of River Neelum at about 35km from Muzaffarabad. On its western side lies the Kaghan Valley of NWFP and on eastern side lies the Neelum Valley (GOAJK, 2005; Qamar and Minhas, 2006).

The park falls in the moist temperate zone with cold winters and deep snow. High peaks remain covered with snow till June or even longer. Summers are extremely pleasant and cool. The mean annual rainfall is 1526.7 mm, with 84.5 rainy days per year. The rainiest month is July with a mean rainfall of 327.6 mm, while the driest month is November receiving a mean rainfall of only 35.4 mm (Beg, 2004; Hassan, 2004; GOAJK, 2005).

The natural vegetation of MNP and associated fauna is characteristic of temperate Himalayan mixed-forest/alpine-scrub-rangeland ecosystem. The park is very rich in biodiversity. It provides habitat to hundreds of animals, birds and plant species of economic importance, including the globally threatened Snow leopard (*Uncia uncia*), Musk deer (*Moschus chrysogaster*), Western horned tragopan (*Tragopan melanocephalus*), Cheer pheasant (*Catreus wallichii*), Lammergeier (*Gypaetus barbatus*) and the Himalayan Griffon vulture (*Gyps himalayensis*).

Coniferous trees such as fir (*Abies pindrow*), spruce (*Picea smithiana*), deodar (*Cedrus deodara*), Blue pine (*Pinus wallichiana*) and Yew (*Taxus wallichiana*) dominate the floral cover. Among the broad-leaved species, Horse Chestnut (*Aesculus*

*indica*) and Bird Cherry (*Prunus cornutus*) are important. Himalayan yew (*Taxus wallichiana*), a globally threatened species, also occurs in good number in the MNP which contains Taxol, a chemical which is affective against human cancer. Forest undergrowth comprises a variety of herbs, grasses and shrubs, providing forage for wildlife and livestock. In the MNP, 47 plant species have been identified having medicinal value for local and commercial use (Qamar and Minhas, 2006).

Human population is about 52,000 living in 30 villages around the park boundaries. The literacy rate is 17.5% and majority of the people were reported as poor (GOAJK, 2005). People keep large number of livestock for agriculture, domestic and commercial purposes which forms an integral part of village economy in this area. The total number of livestock is more than 37,000 including buffaloes, cows, goats, sheep and donkeys. About 21 % of the total annual income of local people is directly obtained from the livestock and its products (GOAJK, 2005).

The temperate forests provide vital browsing for cattle, sheep and goats, particularly during the early summer and early autumn migrations. The alpine rangelands provide summer grazing for livestock, which compete with wild ungulates for forage. The present study was designed to determine the status and distribution of Himalayan Musk deer population in the MNP.

## MATERIALS AND METHODS

MNP has a unique physical and biogeographic position representing a number of ecological zones. More appropriate time for wildlife survey of the park seem to be in autumn season, after first snowfall when most of the wildlife descends and gathers in the moist temperate forest, which comprises about 60% of the total park area. During this time, the high alpine pastures and sub-alpine forest become unsuitable for ungulates due to steepness and heavy snow fall. Hence, the study was conducted after early snowfall in November-December 2006. Potential Musk deer habitat areas were selected for sampling its population. Area was divided into 16 sites where line transects were laid

and animals were located with the help of dogs. On the average seven hours daily were spent in the Musk deer habitat for data collection.

In less precipitous areas, two teams walked parallel to each other about half a kilometer apart along transect and flushed the Musk deer with the help of dogs. In steeper areas, only one team walked along the transect line for the collection of data. Besides direct sighting and counting of animals, indirect observations i.e. footprints, fecal pellets and predation signs were also considered in recording the data. Other relevant data such as habits, habitat preference, dominant vegetation, altitude, coordinates and weather conditions were also noted during the field survey. Data sheets were used to record data in the field.

The data was analyzed for calculating the total population of the Musk deer in the park using the parameters such as total number of transects, total area of the transects, number of animals counted/observed in each transect and in all transects, average number of animals in each transect. Based on these parameters, the average number of animal per unit area was calculated which was multiplied with total potential habitat areas of the Musk deer in the park to get its total population estimation.

## RESULTS AND DISCUSSION

Machiara National Park comprises an area of approximately 130 km<sup>2</sup>, having the core zone of 70 km<sup>2</sup>. Approximately 50 km<sup>2</sup> of the core zone of MNP consists of potential habitat of Musk deer. During the survey, 35 transects having an average length of 1.06 km, were laid down at 16 sites in the potential Musk deer habitat for collecting data. Musk deer was observed along 19 transects between 2409m and 3097m elevation (Table 1). Bagjhath in Compartment no. 14 was the lowest site with an altitude of 2409m in the moist temperate mixed coniferous forest, while Kuldaber in Compartment No. 9 was the highest point where Musk Deer was observed at 3097m elevation.

During the survey, 31 Musk deer were sighted in Compartment Nos. 8 (7), 9 (16), 10 (1), 11 (2), 12 (1), 14 (2) and 15 (2) in the Himalayan moist temperate forest habitat and sub-alpine scrub

forest (Table 1, Fig. 1). Musk deer were sighted at the sites including Loi Dandi, Shah Khori, Thelian, Loon Gali, Kuldaber, Magra, Khori, Silian, Par, Thora Ghatian, Kuthiali, Ravri, Domail, Mali, Naka, Chitta Kashkar, Rich Ghar, Bagjhath, and Rich Bela. Musk deer was found fairly widespread throughout potential habitat in the park. Total population of Musk deer in MNP was estimated as 64 individuals.

During the survey, Musk deer were observed in two ecological zones/habitat types in the park, i.e. sub-alpine scrub forest zone and Himalayan moist temperate forest zone. In sub-alpine zone, only six Musk deer were located at Loi Dandi, Thelian, Loon Gali and Par. This ecological zone includes the areas above coniferous forest tree line and major plant species of area include *Betula utilis*, *Salix* spp, *Juniperus communis* and *Rhododendron* spp. According to Roberts (1997), Musk deer in Pakistan is associated with sub-alpine scrub forest, above coniferous forest, between 3000-4000m elevation in most of its distribution range.

**Table I.- Sightings of musk deer in different compartments/ sites in MNP**

Sr. No.	Compartment No.	Site	No. of Musk deer Sighted
1	8	Loi Dandi	2
2	8	Shahkhori	2
3	8	Thelian	1
4	8	Loon Gali	2
5	9	Kuldaber	2
6	9	Magra	1
7	9	Khori	2
8	9	Silian	2
9	9	Par	1
10	9	Thora Ghatian	2
11	9	Kuthiali	2
12	9	Ravri	1
13	9	Domail	1
14	9	Mali	2
15	10	Naka	1
16	11	Chita Kashkar	2
17	12	Richghar	1
18	14	Bagjhath	2
19	15	Richbela	2
<b>Total</b>			<b>31</b>

Majority of the animals (25) were observed in the Himalayan moist temperate forest zone. This was probably due to the reason that after the heavy snowfall most of the wildlife descends and gathers in the moist temperate forest, as high alpine pastures/sub-alpine forest become unsuitable. This forest type is well represented in the park and provides safe refuge and food for a diversity of animals ranging from invertebrates to large ungulates and big cats. In the park, Himalayan moist temperate forest is characterized by plant species such as *Quercus incana*, *Cedrus deodara*, *Abies pindrow*, *Aesculus indica*, *Pinus wallichiana*, *Parrotiopsis jacquemontiana*, *Viburnum nervosum*, *Pistacia integerrima*, *Pyrus pashia*, *Berberis lyceum*, *Indigofera gerardiana*, etc. which is typical vegetation of the Neelum Valley.

Data showed that Musk deer spend winter season in mixed coniferous forest having the well developed under story shrubs that provide cover to the animals from predators as well as avalanches, which is natural phenomenon in whole Neelum Valley including the MNP. This dense canopy cover also provides sufficient forage for the animals.

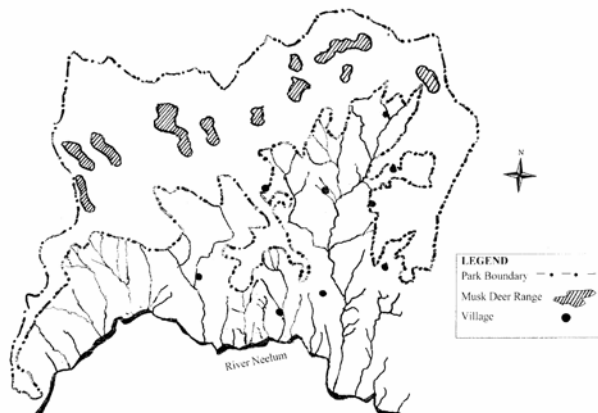


Fig. 1. Distribution of Musk deer in the Machiara National Park, AJK.

It was observed during the study that Musk deer usually rest under thickly spread branches of conifers, *Rhododendron*, *Juniper* spp. and sometimes in thick cover of *Salix alba*. Around resting sites, a grazed field of *Salix alba* and

*Skimmia laureola* was observed. Green (1986) also reported the Musk deer living in natural forest with thick understory of shrubs, grasses and herbs.

## CONCLUSIONS

In the MNP, sub-alpine scrub forest and Himalayan moist temperate forest areas are the preferred habitat of Musk deer. Hence, these areas must be protected as its core habitat in the park. Present population of Musk deer in the MNP was estimated 64 animals which had shown an increase over the last few years which is evident from the comparison with the results of baseline study of this park where 35 Musk deer were estimated in the MNP (Beg, 2004). This could be the result of increased protection and management of the park under the Protected Areas Management Project, a Global Environment Facility/The World Bank funded project which is being implemented in this park with the involvement of local communities residing around the park boundaries. Another factor contributing to the increase in Musk deer population could be the movement of animals to the more protected park area from the adjacent less protected habitat areas.

Generally, the park still faces the threat of habitat degradation as a result of fuel wood collection, lopping for browse fodder, livestock grazing, grass and hay cutting, collection of mushroom and medicinal plants, etc. There is an urgent need to address these issues for improving the quality of wildlife habitat in the park and to increase the population of wildlife especially the threatened species including Musk deer.

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