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HABITAT UTILIZATION OF HIMALAYAN MUSK DEER (*MOSCHUS CHRYSOGASTER*) IN THE MUSK DEER NATIONAL PARK GURAIZ, AZAD JAMMU AND KASHMIR, PAKISTAN

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ABSTRACT

In Pakistan, Himalayan musk deer (*Moschus chrysogaster*) inhabits sub-alpine scrub, and mixed coniferous forest usually between 2785m and 4000m. We took 42 sample plots of size 10×10m for trees, 41 sample plots of 4×4m for shrubs and 42 of 1×1m for herb/grass layer to study the priority habitat of musk deer at different aspects between 2785m-3420m elevation. Of total vegetation , trees, shrubs, and herbs/grasses contributed 40.47%, 17.35%, and 42.17% of relative frequency, respectively. Among trees, *Betula utilis* (IVI=53.29), *Abies pindrow* (IVI=49.63), *Picea smithiana* (IVI=33.61) and *Taxus wallichiana* (IVI=8.60) were dominant in the musk deer habitat. Major shrubs included *Betula utilis, Viburnum grandiflorum, Rosa moschata, Rosa macrophylla* and *Lonicera spp.* Herb/grass layer was dominated by *Poa annua* followed by *Polygonum amplexicaule*, *Sambucus wightiana Viola* spp., *Ajuga parviflora*, *Saxifraga ciliata* and*Podophyllum emodi*. The animal showed association with *Betula utilis, Abies pindrow, Picea smithiana* and *Taxus baccata* along with the shrubs of *Skimmia laureola*, and *Rosa moschata.* Musk deer is listed as Endangered in Pakistan. Major threats to the population of Himalayan musk deer are habitat degradation due to deforestation and illicit livestock grazing along with illegal hunting for musk pod collection.

Key words. Musk Deer, Guraiz, Neelum valley, Habitat preference, Threats.

INTRODUCTION

The Himalayan musk deer (*Moschus chrysogaster*) is a small forest dwelling species, weighing about 10kg, measuring about 100cm long and 60cm tall (Kattel, 1992). Female musk deer are larger than males in length and body mass. Himalayan musk deer is the smallest of the Himalayan ungulates (Schaller, 1977) living in a cold environment. Males possess elongated upper canine teeth that project far below the lower lip, used in fights between rivals (Green, 1985).

The Himalayan musk deer is distributed across the Himalayas from Nuristan in Afghanistan in the west to Nepal, Sikkim and extreme north-west Myanmar in the east (Green, 1986) and northwards into extreme south western China and Tibet (Corbet and Hill, 1992). In Pakistan, the species is believed to be widespread in Baltistan especially in Hushe Valley (Roberts, 1997). Formerly common in Chitral (Scully, 1881), it is now considered rare throughout this state and occurs mainly in the mountains east of Drosh (Roberts, 1997). The best population is considered to exist in Machiara National Park, Azad Jammu & Kashmir (AJ&K). They also survive in Salkhala Wildlife Sanctuary, AJ&K (Roberts, 1997).

In Pakistan, Himalayan musk deer inhabits sub-alpine scrub, usually found between 3000m and 4000m in association with *Betula utilis* or in Gilgit area *Juniperus polycarpus* (Green, 1986). Priority habitat of the deer in the Neelum Valley of AJ&K is sub-alpine birch forest and mixed coniferous forest having plant species as *Abies pindrow, Picea smithiana, Taxus baccata, Betula utilis, Acercaesium, Viburnum spp., Berberis aristata, Rosa moschata, Skimmia laureola, Salix alba, Viola spp. Polygonum amlaxicaul, Saxifraga ciliata, Polygonum alpinum, Poa annua* and *Berginia cialata* (Qureshi, 2000).

Musk deer is listed as endangered species in Pakistan (Sheikh and Molur, 2003). Population of Himalayan musk deer is on rapid decline mainly due to habitat degradation resulting from expanding human population and hunting for the musk pod (Qureshi *et al*, 2004). Realizing the threatened status of this species, Government of AJ&K has established Musk Deer National Park Guraiz (MDNPG) in 2007 for its conservation. Adequate information on various aspects of the deer biology/ecology, especially habitat utilization is lacking which is a pre-requisite for conservation planning. This study recorded data on habitat structure and utilization of the Himalayan musk deer population of the Musk deer National Park Guraiz.

MATERIALS AND METHODS

Intensive field surveys were conducted from September, 2008 to August, 2009 in MDNPG to collect the requisite data from over a 52,817 ha area.

The base of forest compartments along Neelum River bank and main nullahs and in the moist depressions in Jagran, Sharda and Guraize Ranges comprise the moist temperate forest. The sub-alpine forest lies between the altitude of 3,352m and 3,657m on northern aspects and slightly higher on warmer aspects. Conifer trees include silver fir and blue pine standing singly and in groups over irregular lower story of broad leave trees in which Birch (*Betula utilis)* is dominant at higher elevations and depressions. Silver fir is a dominant species while other major vegetation includes *Fraxinus excelsior, Aesculus indica, Juglans regia and Acer caesium* at the bank of river and main nullahs in moist depressions (Qureshi, 1990).

The other deciduous trees found in the area are *Pyrus pashia* and *Salix alba*. Notable shrubs in this belt are *Viburnum nervosum* with the evergreen *Rhododendron spp*. and *Juniper spp.* (Qureshi, 1990).

Floristic survey was conducted in the area where signs of musk deer were recorded while the plots were selected with random sampling methods. Plot size of 10×10m was used for tree layer, 4×4m for woody undergrowth up to 3m in height and 1×1m for herb layer (Schemnitz, 1980). Physical Features such as cover (broken, unbroken, smooth, boulder or small rock), caves, water sources, etc were also recorded. Habitat was categorized into four different types i.e. forest land, shrub land, grass land and open land where frequency of occurrence of Musk deer was recorded on the basis of direct and indirect evidences.

Habitat preference of the musk deer was calculated using the following formula by Aryal (2005).

$$HP = \frac{PPE}{TPP} \times 100$$

Where:

HP= Habitat preference.

PPE= Pellets present in each habitat in plots.

TPP= Total pellets present in habitat types in all plots.

RESULTS AND DISCUSSION

To study the vegetation of the survey area, 42 sample plots of size 10×10m for trees, 41 of 4×4m for shrubs and 42 of 1×1m for herb/grass layer were taken between 2785m-3420m elevation at different aspects within musk deer habitat. The plots were selected in Kala Bun, Hangol Behk and Doodgai forest in MDNPG. Of total vegetation, trees, shrubs, and herbs/grasses contributed 40.47%, 17.35%, and 42.17%, of relative frequency, respectively. Among trees, *Betula utilis*, Abies *pindrow*, *Picea smithiana* and *Taxus wallichiana* were dominant in the Musk Deer habitat (Table. 1). Major shrubs included *Betula utilis*, *Viburnum grandiflorum*, *Rosa moschata, Rosa macrophylla* and *Lonicera spp.* (Table. 2). Herb layer was dominated by *Poa annua* followed by *Polygonum amplexicaule*, *Sambucus wightiana*, *Viola spp.*, *Ajuga parviflora*, *Saxifraga ciliata* and *Podophyllum emodi* (Table. 3).

Table 1. Average values of dominant tree species in musk deer habitat in the study area

Sr. No	Scientific name	Relative density	Relative frequency	Relative dominance	Importance value
1	*Abies pindrow*	5.67	12.08	33.85	49.63
2	*Acer caesium*	0.04	0.43	0.10	0.36
3	*Aesculus indica*	0.66	1.78	1.69	4.47
4	*Betula utilis*	9.26	10.02	34.85	53.29
5	*Juglans regia*	0.61	1.71	2.24	4.56
6	*Picea smithiana*	5.25	9.97	19.63	33.61
7	*Taxus wallichiana*	1.78	3.78	3.03	8.60

During the winter season when most of the vegetation was masked under heavy snow, musk deer utilized lichens and branches of conifer trees as food. They mostly used the trees of *Abies pindrow, Picea smithiana or Taxus wallichiana* for shelter as well as for food. During the period of vegetation paucity in winters the snow piles provided availability to the upper branches of the trees. The branches of *Picea smithiana* provided shelter and food to the musk deer during the periods of heavy snowfall in other areas of its habitat in Neelum Valley (Qureshi, 2000).

The habitat features that the deer used included cliffs, dense vegetation, gentle slopes, stream beds, small ridges, small valleys and small rocks (Fig.1). During heavy snow fall, avalanches were common which filled small valleys with snow and only dense forest on small ridges provided food and shelter, and protection against avalanches to musk deer. Resting beds, locally called '*Thahi'* were recorded under the outcrop of rocks in the forest area and on small ridges under *Abies pindrow, Picea smithiana* and *Taxus wallichiana*. The resting beds were so located that they serve as vantage points for surveillance of predators. Majority of the musk deer signs were recorded from forest area (80%), followed by shrub area (18%) and open land patches near to forest (2%) (Fig.2). It showed that the subalpine forest was the potential feeding and breeding sites for the musk deer. Hence, any decline in this type of forest cover would have a negative effect on the survival of musk deer population. Small valleys provided food and escape

cover to the musk deer during the summer season. In the MDNPG, musk deer were mostly recorded on the warmer southern slopes of the mountains.

Table 2. Average values of dominant shrub species in musk deer habitat in the study area.

Sr No	Scientific name	Relative density	Frequency	Relative frequency
1	*Betula utilis*	8.81	33	5.52
2	*Juniperus spp*	1.72	5.71	0.82
3	*Lonicera spp.*	1.64	10	1.54
4	*Rosa moschata*	1.55	10	1.58
5	*Rosa macrophylla*	0.81	7.85	1.15
6	*Salix alba*	0.81	6.42	0.92
7	*Viburnum grandiflorum*	6.78	25.71	4.45
8	*Skimmia lauriola*	1.50	7.14	1.07

Table 3. Average values of dominant herbs/grasses in musk deer habitat in the study area.

Sr. No	Scientific name	Relative density	Frequency	Relative frequency
1	*Aconitum heterophyllum*	1.02	10.47	1.60
2	*Aconitum Chasmanthum*	1.19	11.42	1.79
3	*Ajuga parviflora*	3.45	20.47	3.89
4	*Geranium wallichianum*	2.41	14.28	2.19
5	*Phytolacca latbenia*	0.32	3.58	0.51
6	*Poa annua*	11.75	32.37	5.38
7	*Podophyllum emodi*	1.47	12.85	2.26
8	*Polygonum amplexicaule*	9.62	41.89	8.05
9	*Rumex hastatus*	1.53	13.33	1.95
10	*Saussurea lappa*	0.89	9.52	1.43
11	*Sambucus wightiana*	5.50	15.23	2.61
12	*Saxifraga ciliate*	1.91	20	2.81
13	*Themeda anathera*	0.51	4.76	0.72
14	*Viola spp.*	5.67	3.33	6.25

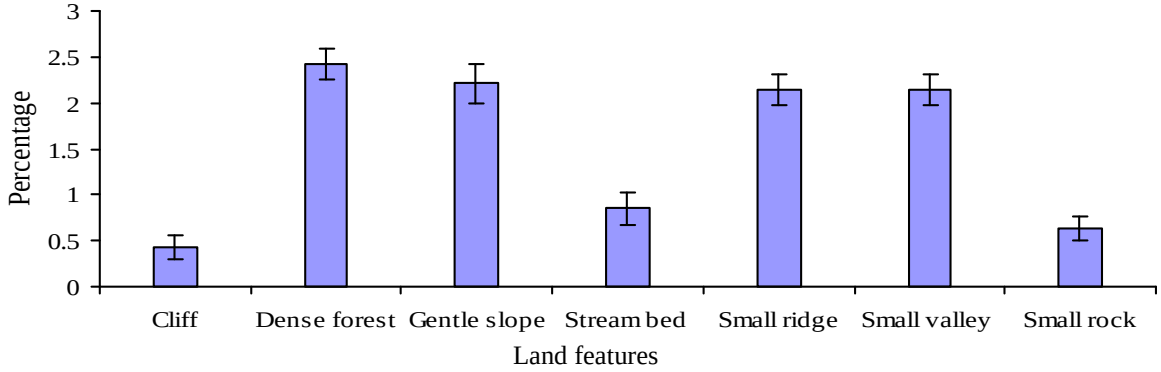

Figure1. Land features recorded within 100 m radius of the signs of musk deer in the study area

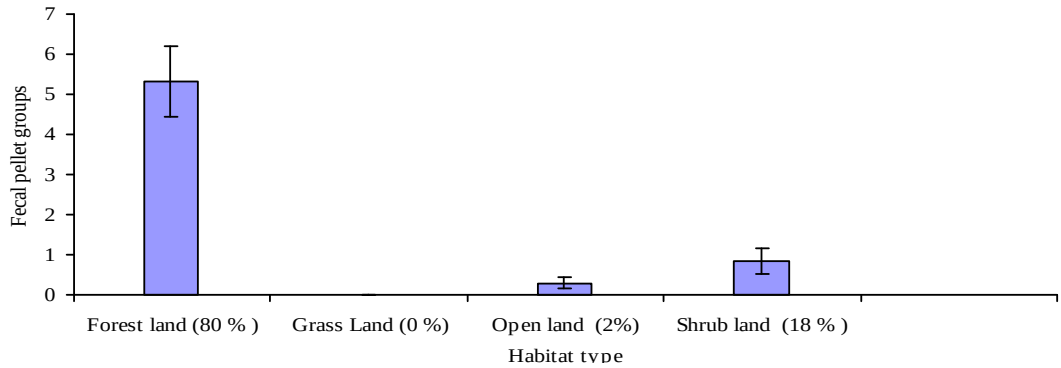

Figure 2. Distribution of musk deer signs recorded in various habitats in the study area.

In our study area the deer preferred *Abies pindrow, Picea smithiana* and *Taxus wallichiana* (80%) for cover against snow and predators as well as for food in both seasons. While it avoided the grass land (0 %), that may be a strategy to keep itself invisible from predators. On the other hand less priority was recorded to open land (2%) as compared to shrub land (18%) (Figure 2).

The musk deer of the MDNP utilized the upper limits of mixed coniferous forest that provided food as well as shelter to it. Birch (*Betula utilis)* tree, and shrubs provided food and escape cover against predators. The sub alpine area in MDNPG received 7 to 10m thick layer of snow which covered nearly all of the vegetation. During this period of food scarcity migration within home range for food and shelter was common. Without shelter, the search for food made the animal vulnerable to predators and hunters. During periods of starvation musk deer travelled long distances in search of food. The animal made such travelling at night perhaps the darkness made the travelling safer against predators. Musk deer could walk even on soft snow easily with the help of its dew claws (Kattel, 1992). Dense forest with gentle slope along small valleys and ridges were favored for reproductive activities.

Major threat to musk deer is the killing of mature males for the collection of musk (Qureshi, 2006). Deforestation, livestock grazing, and construction of seasonal houses in the core habitat of the deer are other major causes that are responsible for decline in population of Himalayan musk deer in the study area. There is competition for space and food with livestock of the local community as well as of the seasonal grazers (*Bakarwals*). The livestock along with the owners create disturbance in the breeding grounds of Himalayan musk deer.

Recommendations

- Community participation approach should be used to impede the rapidly declining habitat of Musk deer in MDNPG.
- A detailed study is required for the habitat management.
- Mining and road construction are the activities which are not compatible to the perspective of the National Park. To prevent such type of activities there is need of strict law enforcement
- Conservation awareness education to the indigenous people will play a key role to conserve natural resources in the area.

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