SNOW LEOPARD FOUNDATION

ASSESSMENT OF MUSK DEER THROUGH CAMERA TRAPPING IN KALA PANI VALLEY, DISTRICT ASTORE, GILGIT-BALTIDTAN

JUNE-JULY 2013

Study report

Doc. Ref: R13V01SLF,
Date: September 13, 2013

Musk deer captured at Kalapani, Astore ©SLF/ONE UN (JPE)/GBWLD/WCS

Authors
Hussain Ali and Jaffar Ud Din

Prepared for
ONE UN JPE
Through
Parks and Wildlife Department, Gilgit-Baltistan
Forest Complex Jutial, Gilgit

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1. INTROUDCUTION

Musk deer (*Moschus chrysogaster*) is an endangered species (IUCN, 2013), critically endangered in Pakistan (Sheikh and Molur, 2004), and is listed in Appendix 1 of CITIES. Musk deer belongs to Genus *Moschus,* which is distributed sporadically throughout the forested 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, Assam, and the Himalayan region (Flerov, 1930 &1952). It is also present in northern Vietnam (Dao, 1977). Three species of musk deer are recognized following taxonomic revisions of the genus by Grover(1975) and more recently by Grubb (1982) i.e., *Moschus moschiferus* in eastern Russian, northern China and Korea; *Moschus berezovskii* in southern China and northern Vietnam; and *Moschus chrysogaster* in western China, Tibet and the Himalaya. Green (1986) takes Himalayan Musk deer to be *Moschus chrysogaster.* (Fig. add IUCN Map)

Musk deer is considered rare in Afghanistan and is found between 1,500 and 3,000 meters in oak and scrub forests of Nuristan. In India, it is rare in Jammu and Kashmir. In Eastern Nepal the species occurs in the vicinity of Lake Rara. In Bhutan, musk deer is found north of Paro Valley, in thick bamboo forest between 2600 and 3000m. In Burma, the species is recognized as *Moschus fuscus* which according to Green (1986) may be sub-species of *Moschus chrysogaster* and it occurs only in Kachin state of Northern Burma.

1.1 DISTRIBUTION OF MUSK DEER IN PAKISTAN

In Pakistan, it is found in sub-alpine and scrub zone. It remains usually above 10,000 feet even in mid winters and in summer it occurs mostly between 11,000 ft. and 13,000 ft. It used to be present in Chitral but now it is considered very rare. It also occurs in the remote valleys of Hazara, Gilgit, and Indus Kohistan. A captive male was seen at Naran in 1966. It is believed to be widespread in Baltistan particularly around Hushe Valley (Roberts, 1997). Roberts considers the population at Machiara Game Reserve, Azad Kashmir to be the best population in Pakistan.

1.2 HABITAT OF MUSK DEER IN PAKISTAN

Musk deer is associated with the sub-alpine scrub zone, above coniferous forests (Roberts, 1997). In the Western Himalaya the altitude of sub-alpine scrub zone ranges between 11,000 ft. to 13,000 ft. with a mean annual temperature of about 50F° and annual rainfall between 8.5 cm to 65 cm; annual snowfall varies from 6 feet to 18 feet (Champion *et al*. 1965). Typical flora of this zone includes: *Abies pindrow, Pinus wallichiana, Betula utilis, Salix himalayensis, Juniperus communis*, Viburnum, *Rhododendron*, Lonicera, Ribes, Berberis, Sorbus, Poa, Primula (Champion *et al.* 1965)

Fauna of this zone include Royle's High Mountaine vole (*Alti colaroylei*), True's Vole (*Hypera criusfertilis*), Chinese Birch mouse (*Sicista concolor*), Musk deer (*Moschus moschiferus*), snow leopard (*Uncia uncia*), markhor (*Capra falconeri)* (Roberts, 1997)

1.3 GENERAL BEHAVIOR

Musk deer is a solitary and territorial in behavior (Green, 1987) and only congregates during rut periods. It uses latrines for defecation. Latrines are most frequently used during autumn rut but in summer (May- August) they are used less frequently and animals defecate wherever they happen to be. Latrines may be used by more than one animal. Droppings covered with debris in autumn (Green, 1987). This animal adopts squatting position while urinating.

It is Crepuscular in habit i.e., becomes active at dusk and dawn. (Green, 1986). Rut season starts in November and ends in December. Males fight during rut and found wounded, they do not eat anything during rut and use caudal scent glands to mark their territory (Roberts, 1997). Gestation period remains for 160 days, and usually gives birth to single but rarely to two during late May or early June. Young are generally weak at birth and have extended suckling periods. Female becomes sexually mature at the age of 18 months while, males become sexually mature at the age of 3 years.

1.4 STUDY RATIONALE AND OBJECTIVES:

Knowledge of wildlife status in any area is prerequisite for management planning and survival of the specie in the longer run. Status of the wildlife species is ascertained having considered habitat and the behavior of the species and thus, every species requires a certain protocol to assess its status on scientific lines. Species assessment in Gilgit-Baltistan by standard protocol (e.g., silent count method, double observer, strip count method or line transect) is more challenging owing to the unfriendly topographic conditions. Lack of expertise and resources further aggravate endeavors of producing reliable data. Consequently, a survey or sampling technique that could produce reliable understanding of species with minimum manpower and resources will always remain necessary. Especially with animals like snow leopard and Musk deer which are elusive in nature and endangered. Hence, a well-defined study protocol that would produce reliable results and have acceptance in the scientific community is highly suggestive. Having taken into account the knowledge gap regarding the status of musk deer in province, the Wildlife Department of Gilgit-Baltistan, under aegis of *One UN JPE project* collaborated with Snow Leopard Foundation-Pakistan, to confirm the distribution of Musk deer and Ladak Urial aided by an advanced technique that would have recognition in the scientific community. Wildlife Conservation Society Pakistan also extended much needed support. This collaborative study was initiated in GB using state-of-the-art research tools including linking local wisdom with science and camera trapping studies to achieve the following milestones.

- Validate local reports of Musk deer distribution with one of most advanced technique.
- Determine abundance in the study sites.
- Reckon species specific conservation issues and suggest management measures.

2. METHODOLOGY

2.1 STUDY AREA

Kala Pani is situated in Astore district of Gilgit-Baltistan and lies between 34° 52' N and 74° 55' E at 3892 meters with its lush green pastures dominated by birch forest, which makes it an ideal habitat for musk deer. Most of forest patches fall in Dry Temperate Coniferous zone with dry, blue pine *(Pinus wallichiana)*, fir (*Abies spectabilis*), spruce (*Picea simithina*), juniper (*Juniperus spp*) and birch (*Betula uttalis*) (Roa and Marmat, 2003). The valley is situated at a distance of 62 km from district headquarter; the valley comprises of 16 villages, and harbors a population of almost 12000 heads. Livestock herding is the main source of their livelihood along agricultural activities, potato is the cash crop for the valley. The winters are very harsh and the valley men rely on natural forest for fuel wood. (Figure. 1).

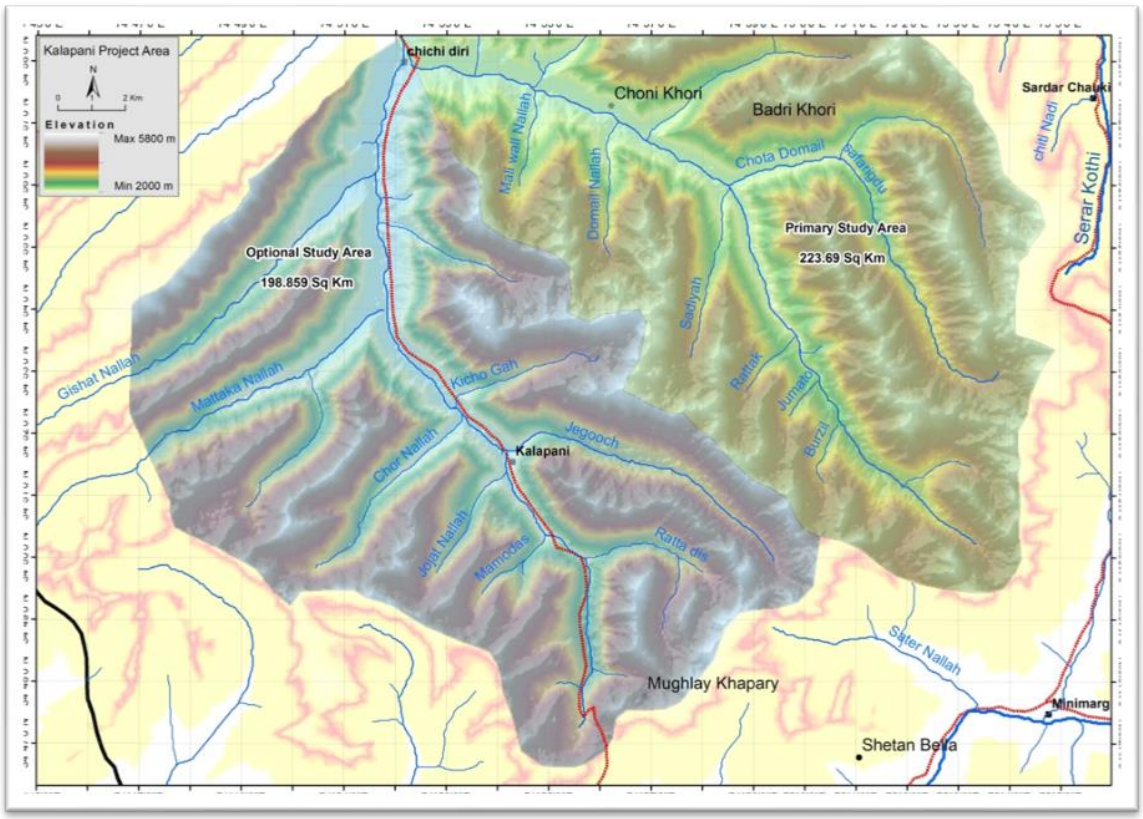


Figure 22.I: Map of study area

2.2 DISTRIBUTION MAPS THROUGH QUESTIONNAIRE SURVEYS

Formerly reported sites (Roberts, 1977; GB Wildlife Department, 1995-2012) were identified. GIS maps of the sites/valleys were developed for each district. Data collection protocol was set in such a way that the data collected could be depicted in the GIS maps to develop distribution map of musk deer in Gilgit-Baltistan. The informants (hunters, herders, and wildlife guards) were asked to reckon musk deer status in their respective valleys and show the distribution (summer and winter) on the map. They were further asked to prioritize potential threats and suggest conservation measures.

2.3 SIGN SURVEYS

The findings of the questionnaire survey were further evaluated through sign surveys prior the initiation of camera trapping. Potential areas where previous information on the occurrence of musk deer was available were scanned for signs including tracks and latrine sites. Signs reckoned were noted on the prescribed format and coordinates of each sign post was taken to highlight on the maps.

2.4 CAMERA TRAPPING

Wildlife cameras are used worldwide to assess the distribution, population, and abundance of elusive species ranging from felids to wild ungulates. ReconyxTM (HC500 HyperfireTM and PC900 HyperfireTM; Reconyx, Holmen, Wisconsin, USA) cameras were used for monitoring Musk deer population. We used 25 motion-triggered camera traps and each camera was set to take three consecutive images (1-sec picture interval) each time they were triggered. Cameras were mounted on a metal pole about 40-60 cm above the ground. Cameras generally faced towards the north or south to avoid erroneous pictures caused by direct sunlight. The camera sensors were placed in such a position that there was no vegetation in the foreground that could trigger the camera (Jackson and Hunter, 2006). Signs and specific travel routes provided basis for selecting sites for camera trapping. Trap site specific parameters were noted on the data sheets.

3. RESULTS

3.1 LINKING LOCAL WISDOM WITH SCIENCE: GIS BASED QUESTIONNAIRE SURVEYS:

3.1.1 Musk deer abundance

Local knowledgeable people opined that Kala Pani Valley and surroundings to hold healthy population of musk deer (Table 3.1). The data revealed that Kala Pani Valley harbors musk deer population ranging from 21-30 individuals distributed across 68.3Km². The abundance ranged from 2.27 to 3.25 animals per square kilometer.

Table.3.1: Distribution and abundance of musk deer in Astore District ascertained through questionnaire survey

S#	Valley	Area km²	Population		Density	
			Minimum	Maximum	Maximum	Minimum
1	Bunji	19.694	6	10	3.282333	1.9694
2	Gutum Sar	28.464	6	10	4.744	2.8464
3	Chhichi	67.487	6	10	11.24783	6.7487
4	DMT	57.732	6	10	9.622	5.7732
5	Doyan	16.46	1	5	16.46	3.292
6	Kashiroo Niril	16.334	6	10	2.722333	1.6334
7	Astore Kala Pani	68.333	21	30	3.253952	2.277767
8	Chugam	20.658	6	10	3.443	2.0658
9	Minimerg	46.133	21	30	2.19681	1.537767
10	Qamari	13.9855	21	30	0.665976	0.466183
11	Bubind	17.521	21	30	0.834333	0.584033
12	Chillam	67.847	6	10	11.30783	6.7847

3.1.2 Conservation issues and suggested measures

The respondents were asked to highlight major conservation issues related with musk deer and suggest measures to tackle the issues in the longer run. About 95% (n=97) respondents opined that musk deer population is declining with the

march of time mainly due to poaching, habitat loss & fragmentation, and climate change. They suggested tackling these issues through 1) law enforcement/ deployment of guards, 2) community based conservation programs, 3) conservation education and awareness, 4) periodic monitoring, 5) and establishment of protected areas (PAs), respectively.

3.2 SIGN SURVEYS

Sign surveys are considered vital tool while assessing nocturnal and elusive species dwelling in high altitude areas. We scanned the study area for musk deer signs including tracks, latrine sites, and potential water sources to have better sites for camera placement. We encountered 12 fresh tracks, 11 latrine sites both old and fresh, besides identifying 2 potential water points in the dense birch forest patches in an area of 223.7 square kilometer (Table 3.2).

Table.3.2: Results of the sign survey conducted in Kala Pani Valley, Astore

Serial No.	Location/station sites	Sign Type
1	Saqamal	Track
2	Saqamal	Track
3	Saqamal	Track
4	Gishaat	Track
5	Gamuko Gah	Pellets
6	Chota Domail	Water point
7	Gishaat	Pellets
8	Safar-e-Giri	Water point
9	Badri Khori	Pellets
10	Kalapani BKN	Pellets
11	Gamuko	Track
12	Dado Jail	Track
13	Gamuko	Track
14	Chuni Khori	Pellets
15	Gamuko Gah	Pellets
16	Gamuko Gah	Pellets
17	Chuni Khori	Track
18	Domail Nallah	Track
19	Domail Nallah	Pellets
20	Gamuko	Pellets
21	Dado Jail	Track
22	Galow	Track
23	Galow	Track
24	Chichidi Nadi	Pellets
25	Chichidi Nadi	Pellets

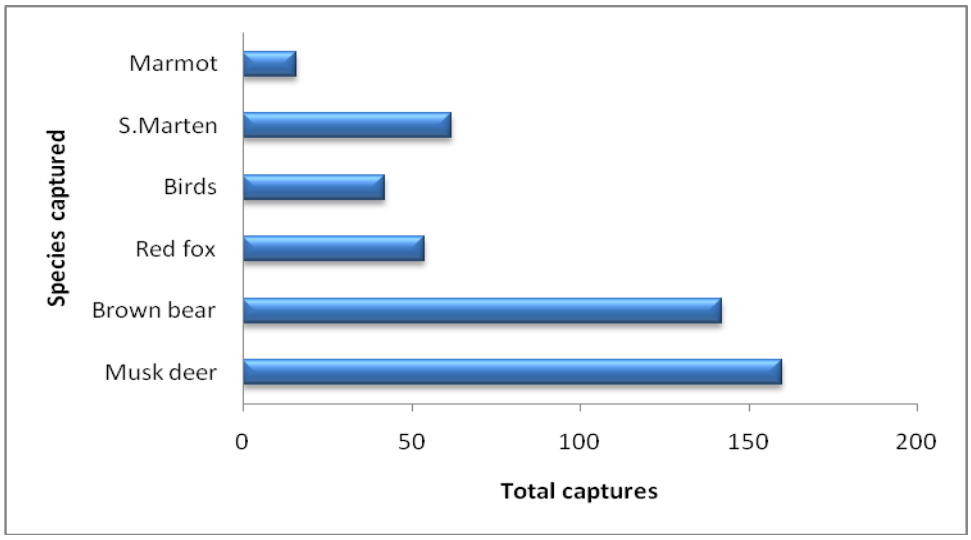
3.3 CAMERA TRAPPING

A total of 25 cameras were installed in an area of 223.69 square kilometer. The area was divided into sub blocks and cameras were installed at a distance of 1 km from each other in each block. All the trap stations followed the sign identified during the sign surveys. Each of the cameras was remained operational for 12 days with a total trap of 300 days. We recorded 3944 (excluding ghost shots of 3742) captures including 258 images of canids with cumulative independent captures (photos) of 200. Overall capture rate (CR) of canids was 19.9. Besides, 7233 captures of livestock and 15332 of human were also recorded during the study, which together constitute 79.7% of the total photos taken, while birds and other small mammals reckoned 2.69% of the total captures (Table 3.3).

Table.3.3: Trap location, species capture, and time of capture

Trap site/ Catchment	Species captured	Capture Time
Saqamal	Musk Deer	4:51-5:20 am
Gamoko	Marmot	9:36-9:36 am
Chichidi Nallah	Musk Deer	1:49-2:50 am
Gamoko	Fox	2:17-4:19 am
Ghishat Nallah	Stone Marten	4:18 am
Ghishat Nallah	Marmot	8:20 am
Ghishat Nallah	Marmot	11:22 am
Choni Khori	Stone Marten	7:33-8:15 pm
Choni Khori	Brown Bear	8:14-8:16 pm
Domail Nallah	Fox	3:33 am
Gamoko	Stone Marten	11:49 pm
Choni Khori	Brown Bear	8:24-8:25 pm
Gamoko	Musk Deer	10:49 pm – 4:31 am
Safar-e-Giri	Stone Marten	8:45 pm
Gamoko	Musk Deer	2:46 am
Gamoko	Musk Deer	11:58 pm
Badi Khori	Brown Bear	5:53 am
Badi Khori	Musk Deer	15:15-15:16 am

Musk deer was captured from six stations, while brown bear from three, and fox from two stations, respectively. Cumulative independent capture (IC) of Musk deer was 10 (CR=30.0 & RAI=3.3) with highest captures (IC=2; RAI 0.7) recorded from three stations. Brown bear was second abundant species (IC=3; CR=100; RAI=1.0) and fox was third abundant species having total captures of 2 (CR=100; RAI=1.0) (Figure 3.1).



3.1: Total photo captures by species

All the trap species except birds and marmot were found nocturnal and were found active mostly from 8 pm after sun set and 7 am, brown bear was active from 8 pm to 7 am followed by fox from 10 pm to 3 am while Musk deer was found active from 1 am to 4 am (Figure. 3.2).

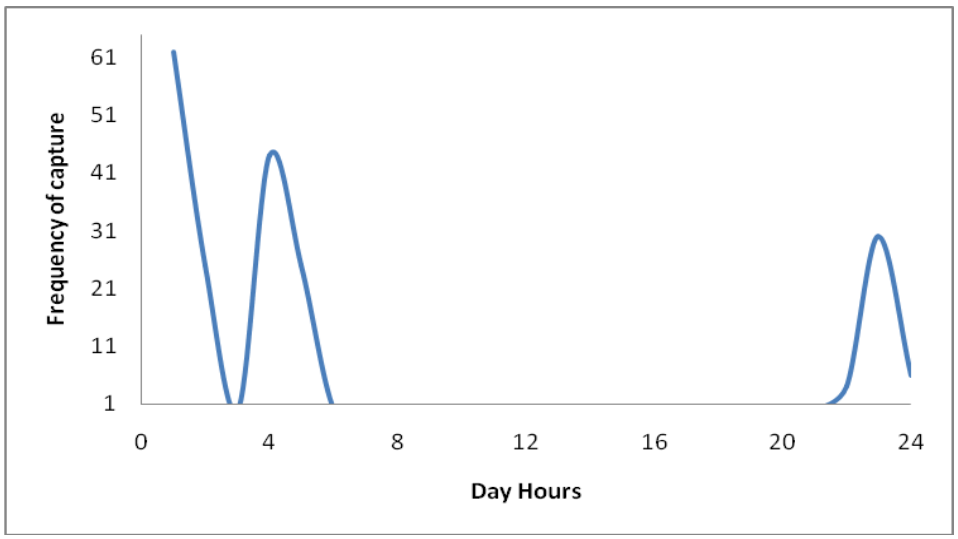


Figure 3.2 Activity pattern of musk deer

Three of the musk deer captures were associated with tracks and three were with pallets/latrine sites. No capture was made at trap sites allocated near water points. Furthermore, as musk deer is a solitary and territorial animal, we identified 6 individuals including 2 females 2 male one fawn while one was with unidentified sex.

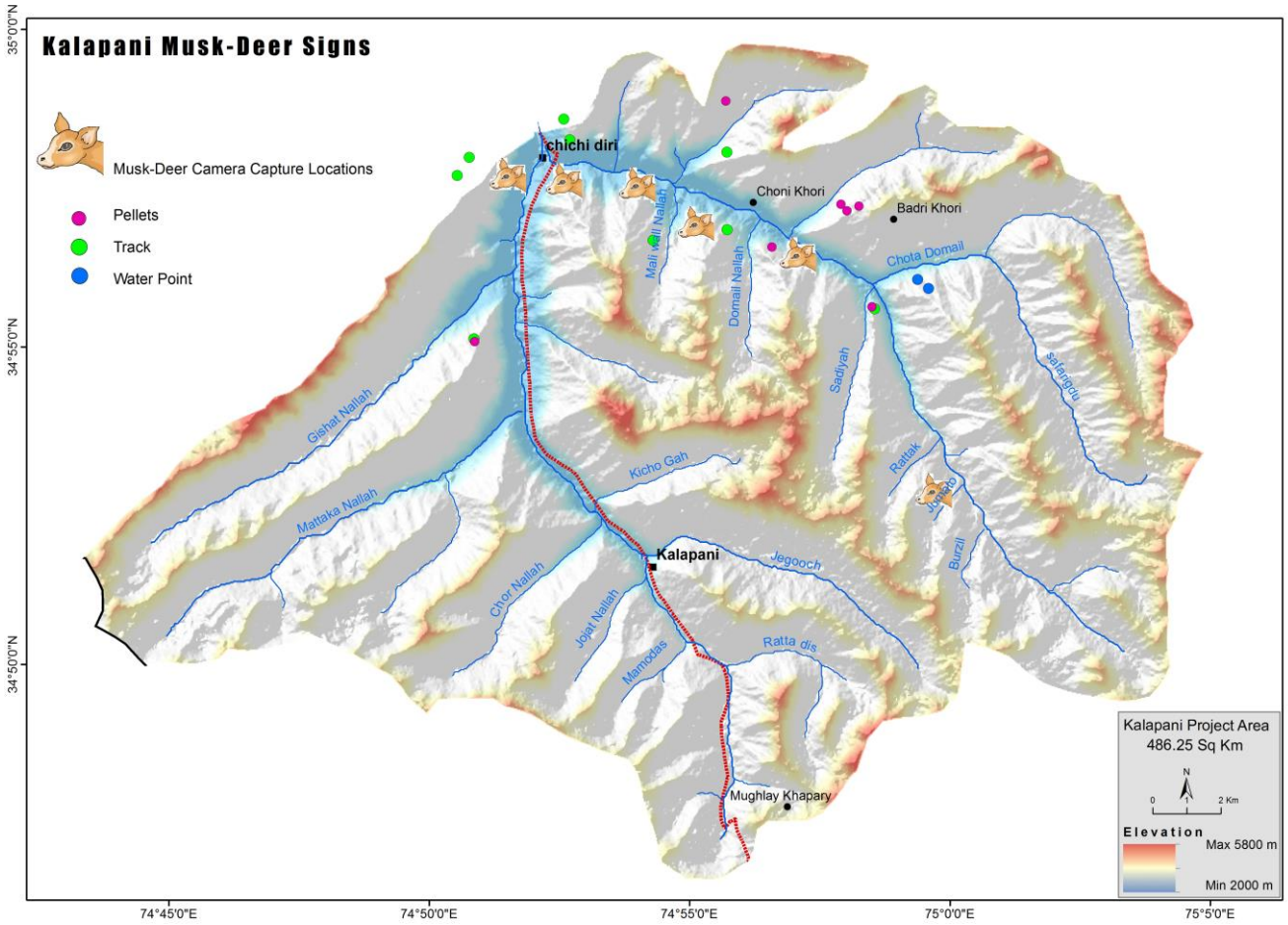


Figure 3.3: Map of the study site showing camera locations and musk deer captures

3.4 ACCOUNT OF SPECIES CAPTURED OTHER THAN MUSK DEER

3.4.1 Brown Bear

The Himalayan brown bear (*Ursus arctos isabellinus*), a subspecies that represents an ancient lineage of the brown bear, is distributed over the Great Himalaya region (Galbreath *et al.,* 2007). The brown bears in Pakistan are categorized as critically endangered by the IUCN (Sheikh and Molur, 2004), and information about their distribution and status is patchy (Nawaz, 2007). Seven populations of brown bears may exist in Himalaya-Karkoram-Hindu Kush ranges. All of these populations are small and declining, except for the Deosai population which is growing (Nawaz *et al.,* 2008).

3.4.2 Common Red Fox

The red fox (*Vulpes vulpes*) is the largest of the true foxes and the most geographically spread member of the carnivores, being distributed across the entire Northern Hemisphere from the Arctic Circle to North Africa, Central America and Asia. Its range has increased alongside human expansion, having been introduced to Australia, where it is considered harmful to native mammal and bird populations. Because of these factors, it is listed as Least Concern for extinction by the IUCN. Due to its presence in Australia, it is included among the IUCN's list of the "world's 100 worst invasive species".

3.4.3 Stone Marten

The marten constitute the genus *Martes* within the subfamily Mustelinae, in the family Mustelidae. Martens are slender, agile animals, adapted to living in taigas, and are found in coniferous and northern deciduous forests across the northern hemisphere. They have bushy tails, and large paws with partially retractile claws. The fur varies from yellowish to dark brown, depending on the species, and, in many cases, is valued by fur trappers.

3.4.4 Golden Marmot (*Marmota caudata*)

Long tailed or Golden Marmot is a member of scisuridae, family and it is found mostly in plateaus. These are typically live in burrows so they need a habitat with less stones so they would easily dig the land.

Figure 3.4:Different species captured during the camera trapping study

a. Musk deer

b. Brown bear

c. Red fox

d. Stone marten

e. Golden marmot

f. Monal pheasant

3.5 VEGETATION STRUCTURE

The vegetation structure can generally be differentiated into the tree layer, shrub layer, and herb layer comprises the ground vegetation and the young regeneration, related to the musk deer was.

3.5.1 The Blue pine Forest

This was the third dominant forest type in the study area.

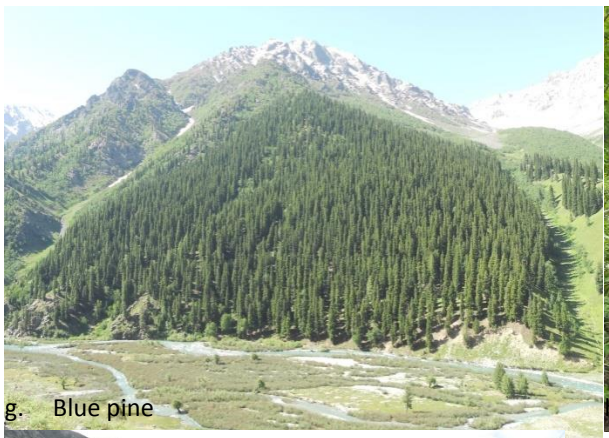
3.5.2 The Mixed Conifer Forest

This particular forest type was found to form a clear transition between the upper fir forest zone and the cool temperate broadleaf forest.

3.5.3 Fir Forest

Birch (*Betula utalis*) was dominant tree species at Kala Pani.

Figure 3.5: Floral characteristics of the study site



g. Blue pine

h. Mix conifer/broad leaf

i. Birch

j. Alpine pastures

4. DISCUSSION

This was the first ever camera trapping study focusing on musk deer in Pakistan, which provided the photo of musk deer in wilderness for the first time, capture through camera trap. Furthermore, having evaluated the results of the study, we recommend camera trapping as a method of choice for assessing the status of musk deer on scientific lines. However, before going for the camera trapping studies, we suggest sieving the study area to identify potential sites through the evaluation of local knowledge and sign surveys as preferred in the current study. Camera traps can provide useful information on the occurrence, distribution, relative abundance, and if properly designed population of musk deer, required for effective management of the species (Sheng *et al.* 2010).

A total of 6 Musk deer were trapped from an area of 223.69Km² (22369 ha) in this study with abundance of 0.02 animals per square kilometer. The results although corroborates to some extend with the status defined through questionnaire and sign surveys yet higher as compared to the densities (0.05) provided in similar studies (Kattet, 1992).

Musk deer population can improve if major anthropogenic threats i.e. poaching, habitat loss & fragmentation and uncontrolled grazing of livestock, reckoned during this study surveys are checked. We came across hundreds of nomad families visiting the fragile pastures of the Astore District with large herds of livestock during the study. The nomads from down country occupy the Kala Pani and surrounding valleys on lease and the GB Forest department settles the lease with each family. Major threat to the survival of musk deer in the district can be checked if ban is imposed on the nomads. Another adverse effect on the decline of musk deer population is poaching for the expensive musk (Green, 1986; Kattel, 1992; Sathyakumar, *et al.* 1993; Shrestha, 2012). We suggest enhancing the surveillance system by hiring additional guards.

4.1 RECOMMENDATIONS

- The local livestock herds require careful monitoring besides banning the visiting nomads.
- In areas with maximum Musk deer reports livestock should be ban.
- Deforestation for timber and fuel proposes should be checked in areas with high density of musk deer.
- Deployment of wildlife watchers/guards will help control poaching incidences.
- Extensive surveys of musk deer in the surrounding valleys using the protocols suggested in this study will help better understand the population dynamics of the musk deer.
- Kala Pani and surrounding valleys could be a candidate site for establishing musk deer National Park.
- Initiation of community based conservation and education programs will help develop sense of resource stewardship for wildlife in the communities.

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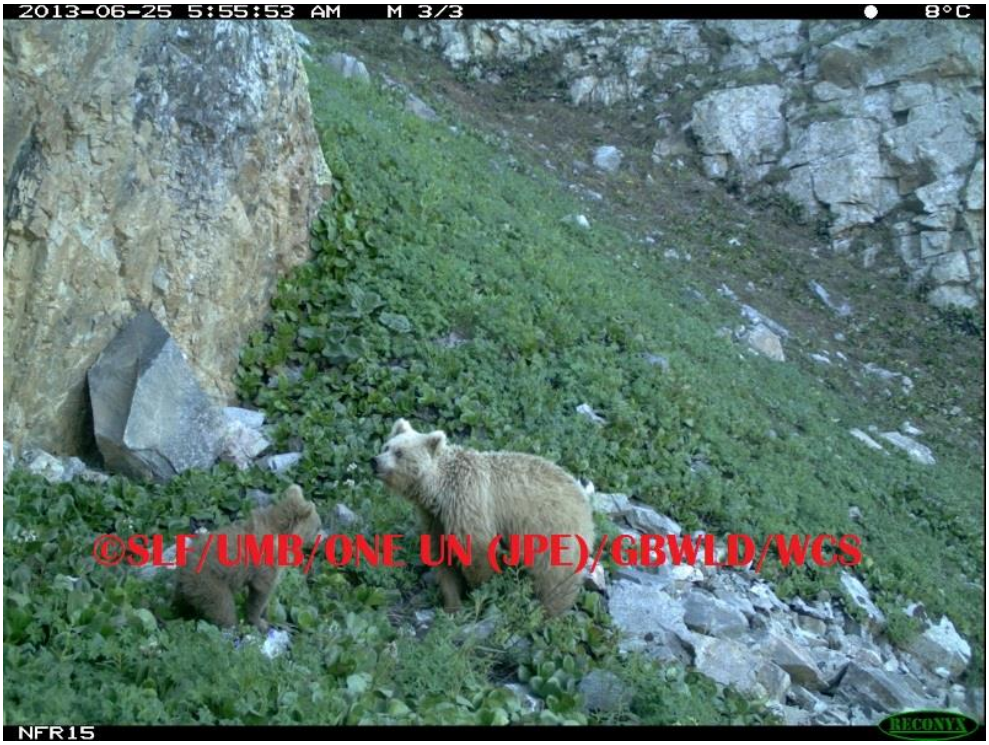
6. ACKNOWLEDGEMENTS

The major funding for this study was provided by **ONE UN JPE** under the project titled as "Integrated management of wildlife species and development of wildlife habitats in Gilgit-Baltistan". Cameras and related equipments come from the Panthera and Carnivore Guild Ecology Project- a joint venture of Snow Leopard Foundation and University of Life Sciences, Norway. Wildlife Conservation Society also supported the study by relieving and bearing the expenses of its community guards and field staff. Field team comprised staff of the Wild Department, Snow Leopard Foundation and Wildlife Conservation Society, respectively, led by the researchers of the Snow Leopard Foundation. The study team is grateful to local communities of Kala Pani Valley for their support and hospitality that they showed during the study.

ANNEXURE I: SELECTED PHOTOGRAPH

I.1 FEMALE MUSK DEER CAPTURED AT KALAPANI

I.2 MALE MUSK DEER CAPTURED AT KALAPANI



I.3 BRWON BEAR FAMILY CAPTURED THROUGH CAMERA TRAP

I.4 CAMERA IS BEING SET AT KALAPANI VALLEY

I.5 MUSK DEER LATERINE SITE AT CHORI KHONI, KALAPANI

I.6 DIVISIONAL FOREST OFFICER MR. AFTAB MEHMOOD WITH SURVEY TEAM

I.7 CAMERA TRAPPING STUDY TEAM

I.8 MUSK DEER HABITAT AT KALA PANI

I.9 MUSK DEER HABITAT AT KALA PANI

ONE UN JPE

Project title: "Integrated Management of Wildlife Species and Development of Wildlife Habitats in Gilgit-Baltistan"

The project aimed at; assessing the status and conservation issues relating to the two threatened wildlife species including Musk deer and Ladakh urial in Gilgit-Baltistan besides, implementing appropriate conservation measures and raising awareness for the long term management of the species in the region.

Study Partners:

The GB Parks and Wildlife Department is the custodian department aimed at improving the status of biodiversity of the region through research, monitoring, conservation, and awareness raising and law enforcement, respectively.

Dedicated to conserve viable populations of snow leopards and other wild carnivores as an integral part of landscape across Pakistan

WCS is committed to conservation of wildlife because it is essential to the integrity of life on Earth