Flagship Species of the Pamir Mountain Range, Pakistan: Exploring Status and Conservation Hotspots

Final Report (January 2012 – July 2013)

SNOW LEOPARD FOUNDATION

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1. Executive summary:

This report outlines the findings of the project titled as “Flagship species of Pamir Mountain Range, Pakistan: Exploring Status and Conservation Hotspots” funded by Snow Leopard Conservation Grant Program of the Snow Leopard Network. The project duration was one and half years, commenced in January, 2102 and completed in July, 2013. Major goal of the project was to assess the status of the iconic and endangered large mammals including snow leopard and Marco polo sheep in particular and sympatric species like brown bear and Himalayan ibex in general, besides reckoning the prevailing human-wildlife conflict in the selected valleys i.e. Misgar and Chipursan of the Pakistan Pamir Mountain range. Sanitization of the local communities to conservation issues and building the capacity of the stakeholders in wildlife assessment tools was another important aspect of the project.

Pamir Range is one of the most potential biodiversity hotspots of northern Pakistan that stretched from Torkhow and Broghil Valleys of Chitral to Shimshal Valley of Gilgit-Baltistan, along the borders of Afghanistan (Wakhan Corridor), Tajikistan, and China, respectively. Geographers have divided Pamir into two parts i.e. Big Pamir and Little Pamir and the three mountain ranges of Hindu Kush, Pamir and Karakorum form what is called Pamir Knot or “bam-e-dunya” means “roof of the world” at Kilik-Mintaka pass of Misgar Valley, Gilgit-Baltistan. This rugged terrain forms an interface of Central and South Asia and has been used for trade for centuries. The narrow corridors (passes) also provide route for wildlife species of large home ranges to cross the international borders. The climate is distinctly alpine with harsh and long winters and short but pleasant summers. The heavy snowfall coupled with low temperatures has resulted glaciations and thus the northern Pakistan has largest glaciers found anywhere outside the polar region.

Snow leopard (*Uncia uncia*) and Marco Polo Sheep (*Ovis ammon polii*)) are endangered species and recognized as the flagship species of Pamir Mountain Range. More importantly, the presence of these two species has led the international conservation organizations to acquaint with the idea of establishing the biggest Trans-boundary Protected Area of the world in Pamir, encompassing Pakistan, Afghanistan, China, and Tajikistan, respectively. Despite of their global conservation importance, our knowledge about these flagship species is still fragmentary in the Pakistan Pamir side. This information dearth was the motivational force and set the rationale for the project reported.

The human-carnivore conflict surveys confirmed the occurrence snow leopard and other carnivores in the study sites. Wolf (n=95) was most reported species followed by snow leopard (n=45), Himalayan lynx (n=10), and brown bear (n=8), respectively. Livestock predation by carnivores was quite high i.e. 1.9 losses/household/year resulted in the increasingly negative attitude in the agro-pastoralist community towards predators especially snow leopard and wolf. Forty-eight percent of the respondents opted to reduce the population of snow leopard and 73% were in favor of decreasing wolf numbers from their respective pastures. Furthermore, the livestock predation rate was noticed to increase almost 32% during the last five years which reveals the large predators in the valleys are highly prone to persecution in the longer run unless proper conservation management measures are taken on priority basis.

The occupancy surveys revealed the occupancy estimate of snow leopard in valleys was 0.6000 ±0.1536SE. The probability of the detection of snow leopard sign was found to be influenced by habitat type and terrain brokenness, while distance of settlements from site affected occupancy of snow leopard. Besides, we also reckoned signs of brown bear (n=10) and wolf (n=18) during the surveys. Snow leopard was detected from 19 trap sites out of 59 during the 1770 trap night's camera trapping study. Having evaluated individual coat patterns we were able to identify 4 snow leopards (minimum population). Other species detected include brown bear, red fox, stone marten, ibex, and livestock, respectively.

We recorded 19 Macro Polo sheep from the Karchanai Nallah of Khunjerab National Park during the ungulate surveys in the Pamirs. No signs or sighting of the sheep was made in Misgar and Chipursan valleys, though 114 ibex were sighted during the surveys. Marco Polo sheep used to be the seasonal visitor in the Pakistan Pamir side and the local attribute the extinction of the Marco Polo sheep from most part of its historic range to the fencing that China has done along its borders with Pakistan. However, poaching and competition with livestock could be other factors for the depletion of this valuable species from Pakistan Pamir Mountain range.

During the surveys our teams kept close interaction with the communities to sensitize them to conservation issues and develop informed attitudes for wildlife in the area. We also involved various stakeholders in the surveys to help develop their assessment skills.

In nutshell, this study will help concerned quarters develop tangible conservation strategies focusing on the large mammals of Pamirs based on the recommendations and baseline set through this project in the longer run.

2. Objectives:

Credible baseline on the status of the wildlife species is highly suggestive for putting together informed conservation management strategies. The former requires both expertise and resources, which often are lacking in Pakistan (Sheikh and Molur, 2005). Our knowledge about the biodiversity of the Pakistan Pamir range has been rudimentary and updated baseline is scarce since, the work of Schaller and Roberts in early 1970s besides being the important biodiversity hotspot and spotlight of the international conservation agenda (WCS, 2006). Having taking into account the socio-ecological diversity of the area and dearth of plausible baseline as for as the overall faunal diversity of the Pamir range in general and flagship species in particular, our project was aimed to accomplish the following objectives.

- Assessment of the distribution and population estimate of snow leopard and Marco Polo sheep
- Reckon the intensity of the human-carnivore conflict and identify conservation hotspots
- Capacity building and sensitization of local wildlife staff and students

3. Methods:

3.1. Human-Carnivore conflict surveys:

To encircle potential study sites for further elaborative surveys and have preliminary data on the status and conflicts with human, while focusing on large predators, we opted to link local wisdom with science through detailed questionnaire surveys. Questionnaires are taken useful for reckoning human behavior, for example, perceptions, attitudes and or level of tolerance towards wildlife management tools and strategies (Bouton and Frederick, 2003 & White et al, 2003). A very carefully designed questionnaire covering the required aspects of the study i.e. household demographics, source of livelihood, pastoralism practices, predation, perceived problem animals, economic losses, attitude, and tolerance towards predators was used. The potential informants included herders, hunters, village/valley conservation committee members, and wildlife guards. One adult person from each household was interviewed and overall 50 households in each valley were accessed. Utmost care was taken to avoid assigning depredation cases mistakenly either to snow leopard, wolf, or lynx (Bagchi and Mishra 2006). However, to minimize the likelihood of receiving inaccurate information, relevant Protected Area staffs, agriculture and livestock department officials were inquired about the key statistics.

3.2. Site Occupancy Surveys:

Occupancy surveys (MacKenzie and Nichols, 2002) were conducted in June-July 2012 in Misgar and Chipursan Valleys, respectively. GIS map of the area was developed and 5×5 km grid cells were plotted on the map (Fig. 1). These Grids were accessed by GPS and random points were searched for snow leopard and other carnivore species in 55 grids with 2-12 points in each grid, respectively. Snow leopard and other carnivore signs were searched in their preferred habitats. At each point GPS coordinates and elevation were recorded. Additional information like topography, terrain brokenness, vegetation, signs of other species and herbivore signs were also recorded. Whenever a sign was found information like age of sign and substrate type were also noted. Sign were categorized in three group; fresh= < 7 days, "old"= <30 days and "very old"= >30 days, respectively.

Detection or non-detection of carnivore signs on each of the point was recorded as 1s and 0s in a matrix of sites vs. replicates (points) (McKenzie et. al. (2002). Corresponding tables were prepared for survey covariates collected in the field. Site covariates were prepared using Geographical Information System. We used topography (valley, slope, ridgeline), terrain brokenness (1-4), and number of observers as survey covariates while elevation, slope, NDVI, distance to settlements, distance to roads were used as site covariates.

Having prepared data matrix for detection/non-detection and appropriate site and survey covariates, we analysed the data using software PRESENCE (Hines, 2006). Different combinations of site and survey covariates were compared to find the model that best explains the variation in probability of detection and markability, and occupancy of the snow leopards and other large carnivores at the site level. The best fitting model was determined using the Akaike Information Criteria (AIC). The model that has the best fit (likelihood) and minimum number of parameters obtains the minimum value of AIC value (Akaike 1985; Burnham and Anderson 2002).

3.3. Camera trapping:

We divided the study area into 8 watersheds based on the natural delineation of boundaries (Fig.1b). To ensure the coverage of entire study area, we set 3 (minimum) to 14 (maximum) trap stations with an average of 7 trap stations per watershed based on the total area of the watershed. Furthermore, we set one camera station at each site by keeping minimum distance

of about 1km in between the stations at the particular watershed. Camera stations were selected after evaluating and the status report coming from the questionnaire surveys and site occupancy surveys. Overall, we run each of the 59 stations for 30 days during the month of May-June, 2013 and revisited each station once in between the setting and take down period to change the SD cards, batteries, and re-bait the stations. We used 59 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). To enhance the capture probability and to supplement two camera traps and have both flanks of animals (Guil *et al*., 2010) we used skunk-based scent lure contained skunk (*Mephitis mephitis*) anal scent gland.

Trap-days were computed as the number of 24-h periods from deployment of camera until the film/memory card was used up or the camera was retrieved. Instances, where same species were captured by the same camera more than once within 1 h were excluded from trap rate calculation (Bowkett *et al.*, 2007). This was a compromise between scoring the same individual multiple times and missing individuals and is more conservative than other published studies (Rovero *et al*., 2005). We calculated capture rate (CR) as the number of trap nights required to obtain one photograph of a species. The Relative Abundance Index (RAI) was defined as the number of photo captures obtained per 100 trap nights (Henschel and Ray, 2003). Total number of trap nights was calculated as $\sum_{i=1}$, tn_i where i is a trap location and tn is a trap night at the i^{th} location. The relative abundance index (RAI) for each species was calculated as $RAI=\sum_{i=1}$, d_i X $100/\sum_{i=1}$ tn_i, where i is a trap location and d is a detection of the species at the i^{th} location (Kawanishi *et al.,* 199).

The use of camera-trapping to study population size of species with distinctive natural marks has become an important tool for monitoring rare and cryptic species, in a wide range of environments (Karanth & Nichols 1998; Carbone et al., 2001). We identified snow leopard from photographs by comparing their distinct pelage patterns as every individual feline has unique fur pattern (Sunquist and Sunquist, 2002). Independent dispersers (sub-adults) cannot be distinguished from resident animals (adults) using pictures, and hence the estimated minimum number of snow leopard refers to “independent snow leopard” (Zimmermann et al. in press).

3.4. Ungulate surveys:

We conducted ungulate surveys focusing on Marco Polo sheep and ibex in July 2012. Marco Polo sheep surveys were conducted in Misgar, Chipursan, and some valleys of Khunjerab National Park, while ibex surveys were restricted to the former two valleys only. For the assessment of Marco Polo sheep we used vantage point method while for the ibex count we tested double observer method, respectively.

Point count method (Jackson et al., 1996; Schaller, 1998) was employed to count ungulates. The study area was first explored and high vantage points were selected where from the whole area was possible to scan especially at water sources and grazing areas. Animals were identified on the basis of herd size by each observer and in the evening the teams sat together to minimize double counting on the basis of herd size individuals age and sex, time and location.

Double observer Method as described and modified by (Suryawanshi *et al.,* 2012) is a combination of vantage point method and line transect, is being used for population estimation of ungulates. The whole study area was divided into small blocks depending on the size and topography and higher ridges were considered boundaries where less possibility for animals to cross into next block. Tow observers surveyed these sites by moving on predetermined trails scanning the animals in the surrounding areas with the help of binoculars. Both observers were separated either by time or space. The animals were differentiated by size of group, sex classification of group members, location and time. Both the observers had match their data in the evenings to avoid double counting of a single group.

4. Results:

4.1. Human-carnivore interaction surveys:

We interviewed 100 respondents, 50 each from Misgar and Chipursan Valleys with an average age of 43 years ranging from 16-65 years, respectively. Fifty-one percent (n=51) of the respondents come from the pastoralist community with an average household size of 8.22. Average landholding per household was estimated to be 13.26c and average earning members per household was 1.42 ranging from 1(minimum)-9(maximum). Education level of the participants also varied significantly. Twenty-four percent (n=24) were illiterate, while 13%

(n=13) of the respondents have had basic education and 63% (n=63) were having high school certificate.

Maximum livestock owned per household was reckoned as 162 animals in Misgar and 172 animals in Chipursan valley with average livestock per household of 27 and 32 animals in Misgar and Chipursan Valleys respectively. Livestock marketing was higher in Chipursan Valley (n=278/year) as compared to Misgar Valley (n=115/year). A total revenue of 25429US$ was generated from livestock marketing in one year in the two valleys and average unit price fluctuated between 63-63US$.

Wolf was most reported predator (n=95/year) followed by snow leopard (n=45/year), Himalayan lynx (n=10/year), and brown bear (n=8/year), respectively. Majority of the informants reckoned Himalayan lynx as the rarest species, followed by brown bear, snow leopard and wolf (Fig. 2).

Livestock predation due to snow leopard was reported to occur frequently in the two valleys. Majority of the respondents (93%) experienced livestock predation due to wolf and snow leopard consecutively during the last five years (2007-11). A total of 1403 predation cases were reported, occurred due to snow leopard (n=706) and wolf (n=697) in the two valleys during the period of five years. Predation rate in Misgar Valley was higher (63%) as compared to Chipursan (37%). Similarly, predation due to wolf was higher in Misgar (n=486) as compared to snow leopard (n=396), while snow leopard was the major predator in Chipursan (n=310) followed by wolf (n=211).

Goats were found more susceptible to snow leopard predation (64.7%) followed by sheep (24.9%), cattle (6.4%), and yak (4.0%), respectively. Furthermore, 46.9% of the snow leopard predation cases occurred during the summer season, while 20.7% in spring, 15.0% in winter, and 7.4% in autumn season. Out of 124 predation incidences, snow leopard predated on livestock having both sexes on 55 occasions, while male animals were killed on 24 incidences, and female on 45 occasions, respectively. Livestock predation rate was found to have increased about 32% during the last five years i.e. 2007-11 (Fig. 3). Snow leopard and wolf (n=64 & 90) were considered more dangerous as for as predation livestock was concerned as compared to brown bear and Himalayan lynx (n=11 & 13) respectively. Consequently, the attitude of the people towards predators wasn't positive and majority of the respondents opined to reduce the population of predators especially wolf and snow leopard (Fig. 4).

4.2. Occupancy surveys:

Both fresh and old signs of carnivores (snow leopard and brown bear) were encountered during the site occupancy surveys. We report the analysis of the occupancy data (based on fresh scrapes) of snow leopard in this report. Proportion of site occupied by snow leopard, was calculated in PRESENCE, at0.6000 ±0.1536SEin Misgar and Chipursan which was quite higher than other carnivore species. Snow leopard sign detection was influenced by habitat type and terrain brokenness as well as distance of settlements from site also affected occupancy of snow leopard (Table 1).

Only 10 signs (pugmarks) of brown bear were found which were old and did not provide any proportion of sites occupied by brown bear. Wolf sign detection was better than brown bear and 18 signs were recorded during the study.

4.3. Camera trapping in Misgar Valley:

Each of the 59 trap stations were operative for 30 days resulting in a 1770 trap days in total. We got more than 34000 photos of various species including snow leopard, brown bear, red fox, stone marten, weasel, marmot, cape hare, ibex, and snow cock besides livestock and humans, respectively. However, our cameras didn't capture wolf, though it occurrence was confirmed by the village men during the questionnaire surveys.

Among carnivores, snow leopard was detected at 15 stations, brown bear at 10, red fox at 27, and stone marten at 7 stations respectively. Relative abundance of red fox was higher (8.7) as compared to other carnivores i.e. snow leopard 4 (Plate 1), brown bear 3.7 (Plate 2), and stone marten 4 (Table 2).

We identified 4 individual snow leopards based on the coat patterns and this is the minimum population of cat in the entire study area. We will run capture mark recapture analysis once the entire area is surveys through camera traps. Furthermore, snow leopard was detected from all the major pastures/watersheds of the valley, where livestock predation was reported frequently (Fig. 5).

4.4 Ungulate surveys:

We scanned all areas (Misgar, Chipursan, and Khunjerab National Park) where Marco Polo sheep was reported previously in Pakistan. However, we were only able to count 19 individuals

(Plat 3) in the Kurchanai Nallah of Khunjerab National Park and didn't find any sign of the species from other sites surveyed.

Himalayan ibex were in Chipursan and Misgar Valleys (Table 3). A herd of 10 individuals were observed in Shakdara and two herds of 4 and 5 individuals were observed in YarzYarz. While in Misgar herds of 40 and 24 individuals were observed in Dilsung Nallah and a herd of 19 individuals were observed in Wadtiwash Nallah, respectively (Plate 4). However, we were unable to detect ibex in Kilik and Mintika Nallahs during these surveys. We also come across large herds of ibex during the camera trapping study. Furthermore, ibex were detected at 15 trap stations.

5. Discussion:

We for first time were able to undertake a comprehensive assessment of snow leopard, other carnivores, and major prey base in Misgar and Chipursan valleys which fall in the famous Pamir Mountain Range. Besides, we also assessed the prevailing human-carnivore conflict in the area, which together set a complete baseline for developing informed conservation strategies focusing on Pamir landscape in the longer run.

The predation rate was found to increase significantly (32%) during the study period which possibly due to the human population explosion leading to the increase in livestock numbers. Human population augmentation not only adds to the overall livestock stock but also causes duel threat to the wildlife in general and carnivores in particular thereby enhancing resource competition between livestock and wild ungulates and poaching of ungulates for food and killing of predators in retribution, respectively. The non acceptance of large predators in this case like wolf and snow leopard is the outcome of the livestock predation losses as livestock constitutes the backbone of mountain economy. Majority of the predation cases reported from the pastures where snow leopard was detected through camera traps and thus can be treated as the conservation hotspots. We also reckoned huge losses (2.5/household/year) of livestock due to preventable diseases which is comparatively higher than the predation losses (1.9/household/year). We suggest taking this an opportunity to conserve predators and other wildlife through a well defined conservation model that helps community to tackle livestock mortality due to diseases in a sustainable manner and in return helps develop sense of stewardship for the predators in the masses.

Despite, underlying threats snow leopard density in the Misgar Valley seems high as we identified 4 individual snow leopards in an area of 1085 square kilometers. However, in contrast to the questionnaire reports of sighting and livestock predation by wolf, we didn't detect wolf during the camera trapping surveys, tough we came across numerous wolf scats during trekking. Furthermore, wolf was taken as the most unaccepted predator during the questionnaire surveys and consequently majority of the public was in favor of reducing wolf population from the valley. Under the circumstances, it could be assumed that wolf is under great threat and persecuted by the herdsman as and when encountered, though we weren't able to unveil any wolf persecution case during this study.

Among ungulates, the Marco Polo sheep- the flagship species of Pamir seems dwindling from the Pakistan Pamir range as we were able to detect only 19 individuals from the Khunjerab National Park and didn't cite the species from rest of its former potential range (Schaller, 1975) like Kilik and Mintika in Misgar Valley, though the locals claimed that the species do visit the aforesaid pastures off and on during the month of July. However, all these areas are heavily grazed by large herds of livestock for most part of the year. The uncontrolled grazing coupled with hunting could have caused the extirpation of the species from most part of its historic range in Pakistan as also mentioned by Hess et al., in 1997. Another important consideration associated with the dwindling population of the species could be the border fencing by the Chinese government (Fox and Dorji, 2009).

The ibex population we report here may not reflect the actual abundance of the species in the valleys as our surveys were primarily focused on the status of Marco Polo sheep and thus we undertaken during the months of June and July, 2012. Whereas the best season for reckoning the population status ibex is winter, when animals aggregate into larger groups and tend to decent down to low altitudes. Therefore, we suggest surveying ibex again during the month of December.

6. Other activities:

We conducted the following activities vis-à-vis the aforesaid deliverables.

6.1. Capacity building:

We involved local stakeholders during the surveys as part of the capacity building measures. Two field staff of Wildlife Conservation Society (WCS), 4 staff members of the Gilgit-Baltistan

Parks and Wildlife Department, and up to 8 members of the local communities were involved in the surveys (Plate 5).

6.2. Awareness raising:

Understanding the importance of wildlife resource and related conservation issues in the local communities is prerequisite for effective conservation and management of the resource. We interacted with the local communities during the studies to sensitize them to conservation issues and inculcate sense of resource stewardship at local level. The highlight of the conservation awareness measures was the celebration of world environment day (June 05, 2013) in the Pamir. We partnered with the community of Chipursan Valley, which lies in the Hindu Kush-Pamir Mountain range bordering with Wakhan Corridor of Afghanistan to celebrate World Environment Day. The highlights of the event were walk, drawing & speech contest, and model development among the schoolchildren. The event was attended by more than 600 people including community elders, women, youth, and schoolchildren, respectively (Plate 6).

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Table 1. Site occupancy estimates of snow leopard showing various models tested

Model	*AIC*	*Delta AIC*	*AIC wgt*	*Model Likelihood*	*No. Par.*	*-2*LogLike*
psi(Q.sett1+Q.sett123),p(Habi+Terr)	183.28	0	0.3893	1	8	167.28
psi(NDVI+Q.sett1),p(Habi+Terr)	186.06	2.78	0.097	0.2491	9	168.06
psi(NDVI+Q.Sett123),p(Habi+Terr)	186.18	2.9	0.0913	0.2346	9	168.18
psi(Q.sett1),p(Habi+Terr)	186.84	3.56	0.0657	0.1686	7	172.84
psi(Q.Sett123),p(Habi+Terr)	186.96	3.68	0.0618	0.1588	7	172.96
psi(Q.Road),p(Habi+Terr)	187.38	4.1	0.0501	0.1287	7	173.38
psi(NDVI),p(Habi+Terr)	188.4	5.12	0.0301	0.0773	8	172.4
psi(.),p(Habi+Terr)	188.45	5.17	0.0294	0.0754	6	176.45
psi(.),p(Terr)	188.62	5.34	0.027	0.0693	3	182.62
psi(Q.Road+Q.sett1),p(Habi+Terr)	188.65	5.37	0.0266	0.0682	8	172.65
psi(Sett),p(Habi+Terr)	188.66	5.38	0.0264	0.0679	8	172.66
psi(Sett123),p(Habi+Terr)	188.76	5.48	0.0251	0.0646	8	172.76
psi(.),p(Habi)	189.17	5.89	0.0205	0.0526	5	179.17
psi(Road),p(Habi+Terr)	189.58	6.3	0.0167	0.0429	8	173.58
psi(Elev),p(Habi+Terr)	190.17	6.89	0.0124	0.0319	8	174.17

Table 2. Capture rate and relative abundance indices of carnivores

Species	**No. of stations/detections**	**Total ICs***	**Capture rate**	**RAI****
Snow leopard	15	24	25	4
Brown bear	10	11	27.3	3.7
Red fox	27	77	11.4	8.7
Stone marten	7	10	24	4

***Independent captures** ***Relative abundance indices*

Table 3. Detail of the Himalayan ibex and Marco Polo sheep census

Himalayan ibex (*Capra ibex sibirica*)								
Site	*Nallah*	*Females*	*Young*	*Males*				*Total*
				Class I	Class II	Class III	Class IV	
Misgar	Watish Bar	10		0	5	2	0	19
	Dilsung	14	14	-	2	24	6	60
	Kilik Pass	14	0	0	0	0	0	14
	Mintika	0	0	0	0	0	0	0
Chipursan	Shakdara	15	4	00	0	2	0	21
Total								*114*
Marco Polo sheep (*Ovis ammon polii*)								
Site	**Valley**	**Females**			**Males**			
KNP		Female	Young		Adult	Young		
	Karchanai	8	7		4	0		19
Misgar	Kilik-Mintika	0	0		0	0		0
Chipursan	Chiligi-Irshand	0	0		0	0		0
Total								*19*

Figure. 1a. Occupancy survey map of Misgar and Chipursan Valleys showing sampling units

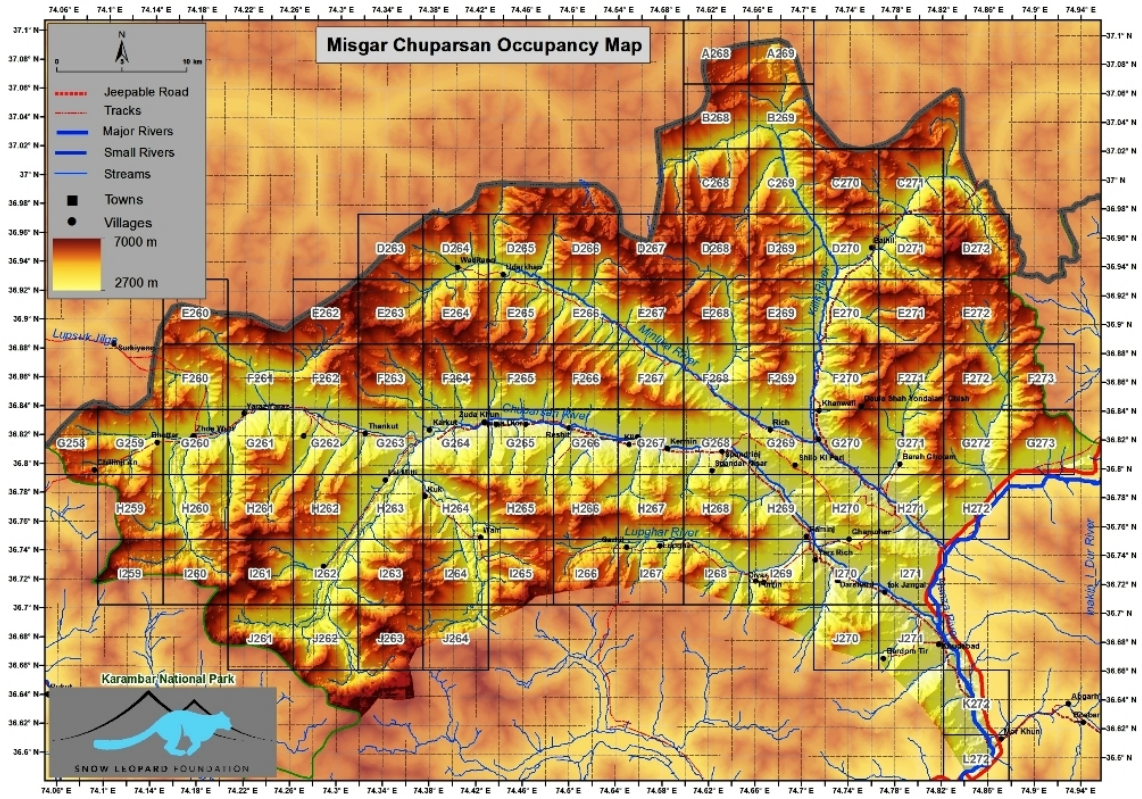
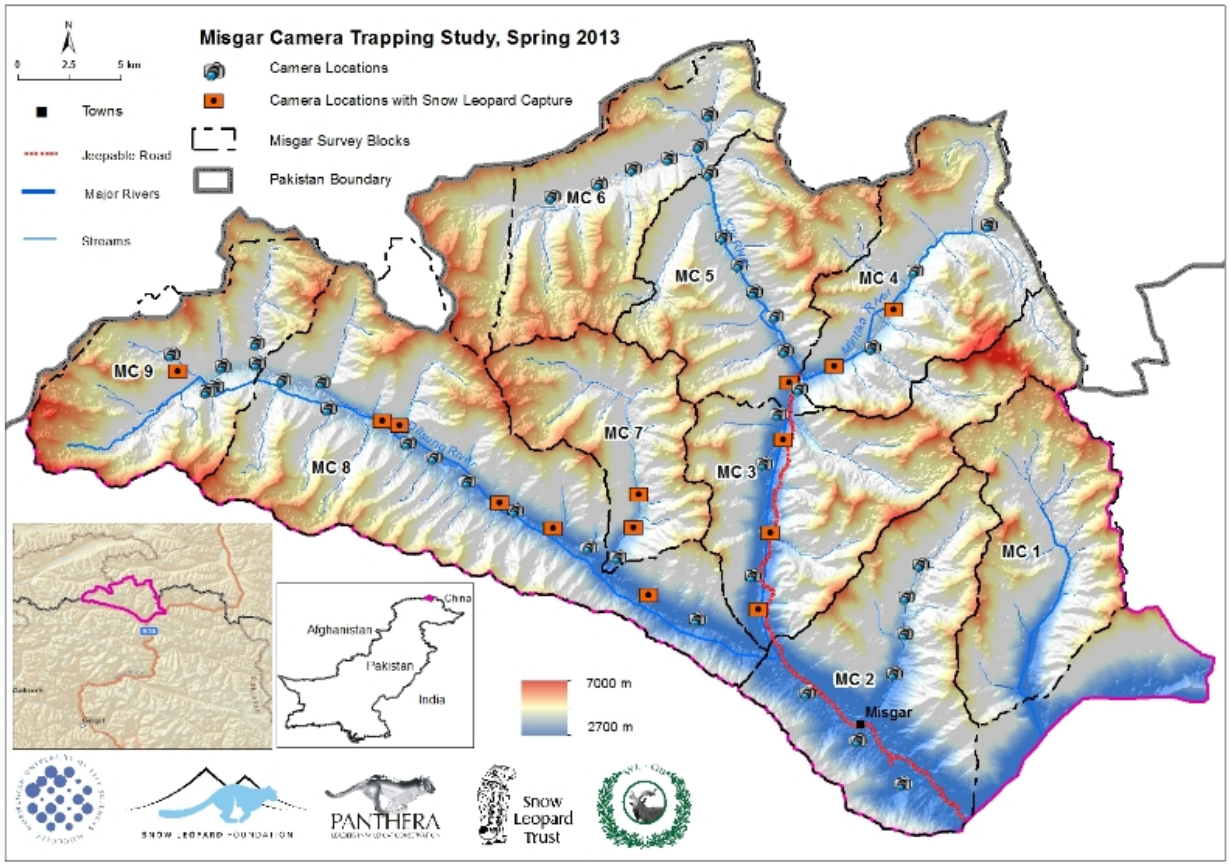


Figure 1b. Misgar camera trapping map.



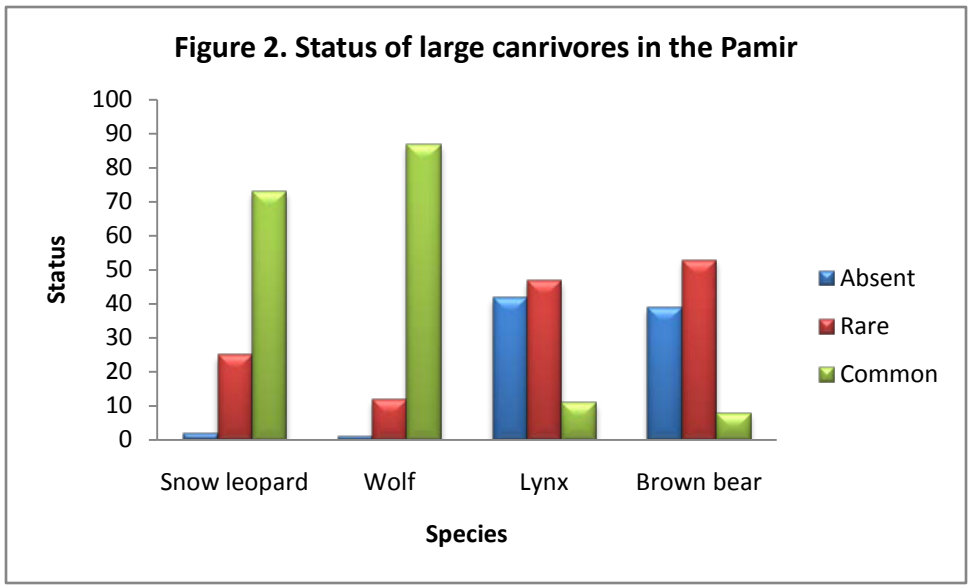


Figure 2. Status of large canrivores in the Pamir
100
90
80
70
60
50
40
30
20
10
0
Status
Snow leopard
Wolf
Lynx
Brown bear
Species
Absent
Rare
Common

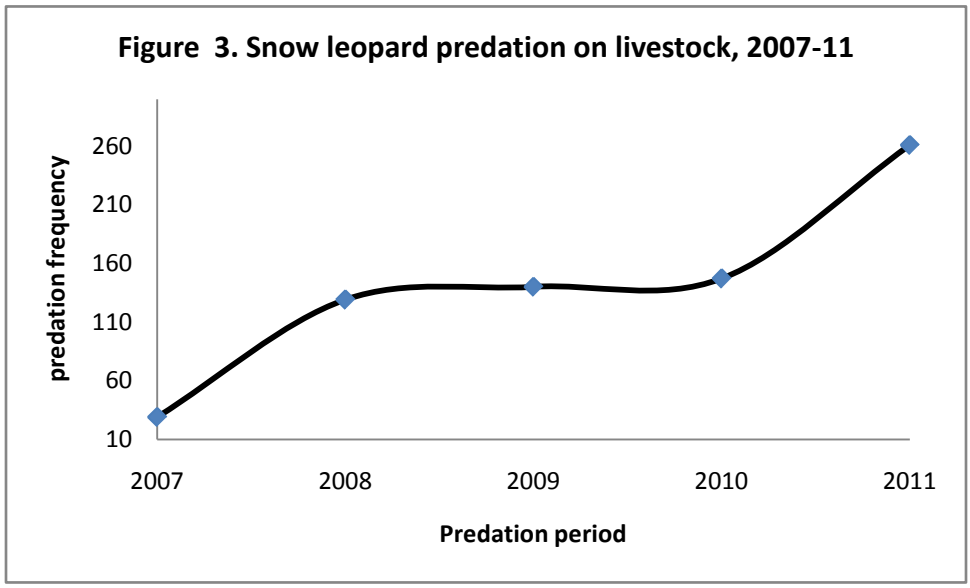


Figure 3. Snow leopard predation on livestock, 2007-11
260
210
160
110
60
10
predation frequency
2007
2008
2009
2010
2011
Predation period

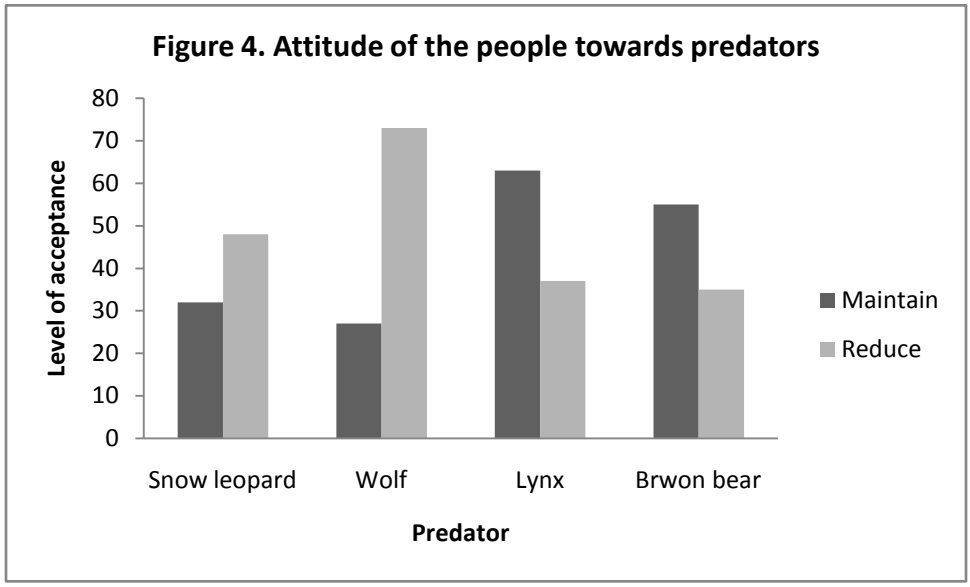


Figure 4. Attitude of the people towards predators
Level of acceptance
80
70
60
50
40
30
20
10
0
Snow leopard
Wolf
Lynx
Brwon bear
Predator
Maintain
Reduce

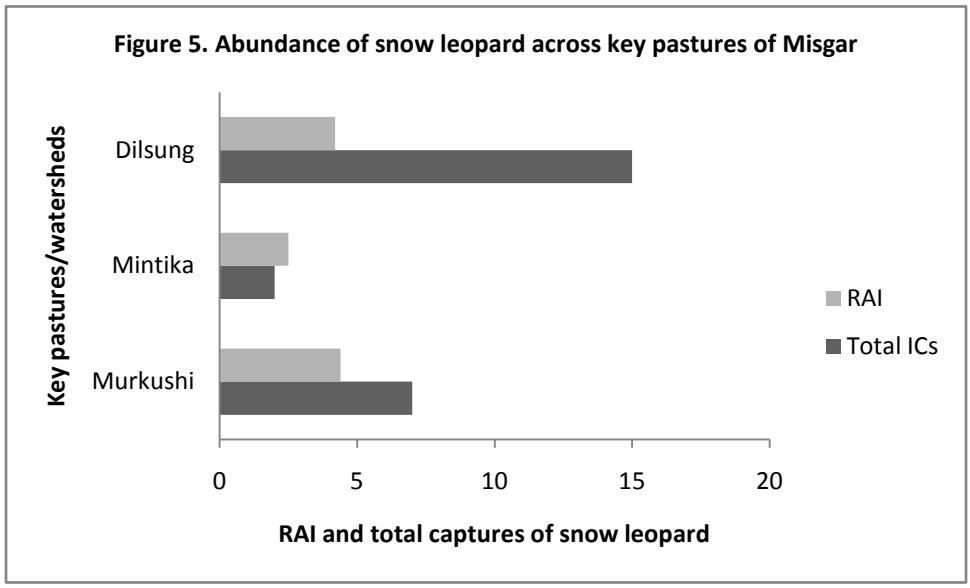


Figure 5. Abundance of snow leopard across key pastures of Misgar
Key pastures/watersheds
Dilsung
Mintika
Murkushi
0
5
10
15
20
RAI and total captures of snow leopard
RAI
Total ICs

Plate 1. Snow leopard captured in Misgar Valley. Photo ©SLF/UMB/WCS

Plate 2. Brown bear captured in Misgar Valley. Photo ©SLF/UMB/WCS

Plate 3. Marco Polo sheep photographed from Khunjerab National Park © Hussain, SLF

Plate 4. Ibex photographed in Misgar © Siraj, SLF

5. Plate 5. Some members of the survey team © Siraj-SLF

Plate 6. World Environment Day in Pamir. © Younus-SLF