## ISLT 2005 Small Grants Program

Final Report

## ISLT Small Grants Program -Summary Form

Project Title:
Snow leopards in the Dulan International Hunting Ground, Qinghai,

Country or Region where work will be done:

| China |
| :--- | :--- |
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## PROJECT TIME PERIOD

January, 2006- December, 2006
Amount Received From SLSS Small Grants Program:

## US\$5000

Support from other sources
30,000 Yuan RMB was allocated from a grant the applicant received from the Animal Behavior Overseas Innovative Partnership Project from the Chinese Academy of Sciences.

## Snow leopards in the Dulan International Hunting Ground, Qinghai,

## SUMMARY

From March to May, 2006, we conducted extensive snow leopard surveys in the Burhanbuda Mountain, Kunlun Mountains, Qinghai Province, China. 32 linear transect of 5~15 km each, which running through each vegetation type, were surveyed within the study area. A total of 72 traces of snow leopard were found along 4 transects ( $12.5 \%$ of total transects). The traces included pug marks or footprints, scrapes and urine marks. We estimated the average density of wild ungulates in the region was $2.88 \pm 0.35$ individuals $\mathrm{km}^{-2}(\mathrm{n}=29)$. We emplaced 16 auto-
trigger cameras in different environments and eight photos of snow leopard were shot by four cameras and the capture rate of snow leopard was $71.4 \%$. The minimum snow leopard population size in the Burhanbuda Mountain was two, because two snow leopards were phototrapped by different cameras at almost same time. Simultaneously, the cameras also shot 63 photos of other wild animals, including five photos are unidentified wild animals, and 20 photos of livestock. We evaluated the human attitudes towards snow leopard by interviewing with 27 Tibetan householders of 30 householders live in the study area. We propose to establish a nature reserve for protecting and managing snow leopards in the region.

Snow leopard (Uncia uncia) is considered as a unique species because it lives above the snow line, it is endemic to alpines in Central Asia, inhabiting in 12 countries across Central Asia (Fox, 1992). Snow leopard ranges in alpine areas in Qinghai, Xinjiang, Inner Mongolia, Tibet, Gansu and Sichuan in western China (Liao, 1985, 1986; Zhou, 1987; Ma et al., 2002; Jiang \& Xu, 2006). The total population and habitat of snow leopards in China are estimated to be 2,000~2,500 individuals and $1,824,316 \mathrm{~km}^{2}$, only $5 \%$ of which is under the protection of nature reserves. The cat's current range is fragmented (Zou \& Zheng, 2003). Due to strong human persecutions, populations of snow leopards decreased significantly since the end of the $20^{\text {th }}$ century. Thus, the snow leopards are under the protection of international and domestic laws.

From March to May, 2006, we conducted two field surveys in Zhiyu Village, Dulan County in Burhanbuda Mountain, Kunlun Mountains, China to determine the population, distribution and survival status of snow leopards in the area. The aim of the study was to provide ecologic data for snow leopard conservation.

## Study area

Zhiyu Village is located in the southern part of Dulan County, Qinghai Province in Burhanbuda Mountain, which is 153 km from the Dulan County Town. Total area of the study area is $560 \mathrm{~km}^{2}$ with an elevation of $4,000-4,700 \mathrm{~m}$. Climate of this area is typical plateau cold continental climate with indistinctive four seasons and a frost-free period of 80 days. Average annual temperature is -1.2 . Average temperatures in the coldest month (January) and the hottest month are -14.2 and 10.8 , respectively. Average annual precipitation is 296 mm and the annual solar hour is 2904 h . Average solar radiation is $658.5 \mathrm{KJcm}^{-2}$ (Dulan County Annals, 2001).

Vegetations in this area are alpine meadow, steppe and desert. The Salix oritrepha shrub is partly distributed on shaded mountain slopes. Carnivores include snow leopard, wolf (Canis lupus), Tibetan fox (Vulpes ferrilata), red fox (V. vulpes), brown bear (Ursus arctos), stone marten (Martes foina), lynx (Lynx lynx), and Pallas’ cat (Felis manul). Potential preys of snow leopard mainly consist of blue sheep (Pseudois nayaur), argali (Ovis ammon), Tibetan gazelle (Procapra picticaudata), red deer (Cervus elaphus), white-lipped deer (C. albirostris), marmot (Marmota himalayana), wolly hare (Lepus oiostolus) and plateau pika (Ochotona curzoniae, Liao, 1985; Schaller, 1991; McCarthy \& Guillaume, 2003). Bird species include Tibetan snow cock (Tetraogallus tibetanus), Przewalski's rock partridge (Alectoris magna), and Whiterumped snow finch (Montifringilla taczanowskii). Zhiyu is part of the Dulan International Hunting Ground which was established in 1985 and there are two hunting seasons in spring and autumn for international trophy hunting (Dulan County Annals, 2001).

There are 30 households and a population of 172 people in the Zhiyu Village. All of the inhabitants are Tibetans and believe in Tibetan Buddhism. Economy is mainly pasture livestock husbandry. There are 2,838 yaks, 3,880 sheep, 68 goats and 58 horses in the Zhiyu Village in 2005. Local people practice a pastoralist grazing regime. Summer pastures are located in higher altitude (with an average altitude of $4,500 \mathrm{~m}$ ) while winter and spring pastures are located in terrains and river valleys of lower altitude (with an average altitude of $4,000 \mathrm{~m}$ ), which is consistent with the seasonal traveling pattern of snow leopard (Ma et al., 2002; McCarthy \& Guillaume, 2003).

## Methods

Snow leopard is crepuscular animal, which is active at dawn and dusk. On the other hand Snow leopard is timid animals, making it rather difficult to found in the field. We used linear transect method, plus camera trapping and interviewing the villagers in this study area.

The linear transect method was used to survey the signs of snow leopard and ungulate density. Transects covered almost all the ecological zones and terrains in the study area. Snow leopard has relatively large home range (Liao \& Tan,1988; Koshkarev,1998). Thus the linear transect was 5~15 km long and the interval between those transects were $1 \sim 2 \mathrm{~km}$. The observers rode horses at a speed of 2.5 km per hour, recording signs of snow leopard within a width of 5 m along the linear transect. When found a sign of snow leopard, the observers will stop and get off the horses, recorded the sign's geographical coordinates with a GPS receiver, additional information such as elevation, topography, vegetation and level of human disturb are recorded. The observer also recorded the species, sex, population and habitat of ungulate and other wildlife along the transect. The density of ungulate (D) is calculated with the formulae:

$$
\begin{aligned}
& D=W_{i} / 2 X_{i} Y_{i} \\
& \bar{D}=\sum D_{i} / N
\end{aligned}
$$

Where: $W$ represents the population of ungulate observed in the linear transect $i, X i$ represents the single side width of linear transect $i$, Yi represents the length of linear transect $i$, and $N$ represents the transect number. Pika is predated by many carnivores living in Tibetan Plateau and its range covers river valley and gentle slopes of mountain terrain. We used snow-track survey method (D’Eon, 2001; Gusset \& Burgener, 2005) to determine the number of pika holes, namely the number of holes in different habitats encountered by the investigators walking along the line transect at 9 am after snowing.

The least population of snow leopard was estimated by auto-triggered camera (Jackson et al., 2005). We used 'Hawk Eye 'auto-triggered camera which with a built in infrared detectors to detect any objects radiating heat within a sector $0.5-3 \mathrm{~m}$ in front of the camera, once the autotriggered camera detects a moving object which it will take photo along with the date and time of the photos recorded. The cameras were placed in mountain pass, ridgelines, ravines, cliff bases, rocks and open shrubs. The cameras were first set up outside for 2 to 3 days before used. Gloves were worn when setting up the cameras which were fixed on rocks or on a specially designed iron shelves which set the camera 0.5 to 0.8 m above the ground, a little taller than the height of snow leopard. Cameras worked all day and took photos every 15 seconds. Cameras were oriented at north or south avoiding straight facing the cliffs or rocks in case of non-target
images. Films of ISO 200 were used and changed every 7 days. The number, time of checking, GPS of site and habitat of the each film were recorded. Films were developed in a studio in Beijing.

We interviewed local villagers with questionnaires, and investigated the attitudes of the community towards snow leopard. According to the traditions and cultures of Tibetans, we chose the head of each family (all of them were males) as respondents. Tewnty-seven households were interviewed while 3 were not surveyed due the families were out for visiting relatives.

The footprints of lynx, another felid sympatric with snow leopard, could be easily mistaken for those of snow leopard in the study area. Body length ( $0.85-1.3 \mathrm{~m}$ ) of adult lynx is shorter and body weight ( $18-32 \mathrm{~kg}$ ) of adult lynx was light than that of adult snow leopard (Zhou, 1987). Thus, any footprints (length $\times$ width) that were less than $(5 \times 5 \mathrm{~cm})$ and that could not be identified were excluded for analyses (though it is possible that the footprints might belong to sub-adult snow leopards); the footprints of other carnivores such as wolf and brown bear could be clearly distinguished since they belong to different families (Ma et al., 2001).

## Results

## Linear transect

We surveyed three linear transects in 2005 and 29 linear transects in 2006 with the total number of 32 linear transects and a total length of 440 km .

Because the snow melt, transects were set near human residences as well as lack of survey experience, no signs of snow leopards were found during the survey in 2005. But 72 signs of 5 types were discovered during the survey in 2006 (Table 1). There were snow leopard signs in four transects, amounts to $12.5 \%$ of the total number. The melting snow resulted in the incompleteness of footprint (Plate I-4). A cluster of footprints within a distance of 100 m was considered as one individual. Scrapes were common snow leopard sign and they commonly occurred in single scrap or in number of 4~11 scraps. No snow leopard traces were found on ridgelines. Urine, a possible scent-marking, was discovered on the scrapes but only in small amount and snow leopard used to spray urine over a larger area. Feces and prey remains were not counted since they might belong to sympatric carnivores such as lynx and wolf, although this could probably decrease the estimate of snow leopard population in the area.


In 2006, we used 10 auto-triggered cameras, of which six worked. Altogether 16 cameras were placed in different habitats in 2006 and 16 rolls of films and 259 photos were obtained with an average 16.2 photos per roll. There are 8 images of snow leopard (Plate I-1) (two were shot at dawn and 6 at dusk) with an average target captures of $71.4 \%$. The Hawkeye I Cameras also captured 55 photos of other wildlife. Among which 29 were birds of three species belong to three families, 21 were mammals of three species belong to three families (14 Tibetan fox, six blue sheep and one stone marten) and five images that can not be distinguished. The camera also shot 20 photos of livestock).

Among the eight photos of snow leopards, one captured by camera No. 2 was taken at 00:18 on 22nd, March, 2006, one captured by camera No. 7 at 00:20 on 22nd, March, 2006. The two
cameras were set up 5 km apart from each other and thus we suppose the two images are two individuals and the least snow leopard population may be two cats in the area (Jackson et al., 2005a, 2005b).

During the survey, all respondents of the questionnaires except one local grocery seller had seen live snow leopard or their signs, of which six people (22\%) eyewitness live snow leopard in the field. all respondents think the population of the snow leopards is significantly decreased compared with that of 20 years ago, due to (1) hunting and trapping during the past years (18 questionnaires, 67\%); (2) fragmented habitat resulted from increasing human population and livestock populations (seven questionnaires, 26\%) and (3) due to competition from wolf (two questionnaires, 7\%). When asked if they encountered any illegal hunting of snow leopard, 20 respondents (74\%) chose to stop and check the poacher immediately, seven (26\%) would report to the Tibetan Buddhist temples and the local government. All those surveyed reported no case of wildlife killing, including snow leopard killing, occurred during the past five years. As to livestock loss, 23 people ( $85 \%$ ) believe it is wolf rather than snow leopard leading in predation of livestock, and only four people (15\%) think snow leopard predates on livestock. Local people have a rather mild attitude towards depredation of livestock by carnivores like wolf and snow leopard. Most local people (85\%) perceived it as natural as those species hunt preys and they have never taken any retaliation.

Our photo of the snow leopard in field was published in the many news website, with acknowledgement of the financial support from ISLT. The snow leopard photo stimulated the interest of conservation and public awareness of the snow leopards.

During the field survey, we also printed about 500 conservation posts (the sample copies of the posts were mailed to the headquarters of ISLT), and distributed those posts to local herdsmen, governmental officers, NGOs, researchers and citizens. The posts were welcomed and valued by the local herdsmen and greatly improved the conservation consciousness in the local community.

Financial report

| Income |  | Expenditures | RMB (Yuan) | USD |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| ISLT | UDS 5000 | Transportation | 15000 | 1948.052 |  |
| CAS | RMB 30000 <br> (Equivalent <br> toUSD3896) | Horse rental | 8000 | 1038.961 |  |
|  |  |  | Field per diem | 8000 | 1038.961 |
|  |  | Posts | 5000 | 649.3506 |  |
|  |  | Stipends | 15000 | 1948.052 |  |
|  |  | Consumables | 18000 | 2337.662 |  |
| Total |  |  | 69000 | 8961.039 |  |



1, Cliff-base; 2, Rocks in river valley; 3, Gaps in shrub; 4 Ridgeline.
Figure 2 Percentage occurrence of snow leopards’ scrapes in different habitats in Burhanbuda Mountain, Kunlun Mountains, from March to May, 2006

Plate I Distribution and conservation of snow Leopard in Burhanbuda Mountain,
Kunlun Mountains, China


1, A photo of snow leopard shot by auto-trigger camera; 2, One of the habitats of snow leopard; 3, Urine marks of snow leopard; 4, Footprints of snow leopard; 5, A blue sheep shot by auto-trigger camera in Shiwulong; 6, A livestock (yak) shot by auto-trigger camera on a mountain pass.

Table 1 Snow leopard signs in Burhanbuda Mountain, Kunlun Mountains, from March to May, 2006

| SN of Transects $(n=29)$ | Location | Urine | Footprint | Scrape | Feces | Prey corpse | Total | \% |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Shiwulong (east) | 1 | 3 | 30 |  | 1 | 35 | 48.6 |
| 2 | Shiwulong (west) | 1 | 2 | 11 |  |  | 14 | 19.4 |
| $1+2$ | Shiwulong (total) | 2 | 5 | 41 |  | 1 | 49 | 68.0 |
| 6 | Jiawulong |  | 1 | 8 |  |  | 9 | 12.6 |
| 25 | Taomubo |  | 1 | 11 | 1 | 1 | 14 | 19.4 |
|  | total | 2 | 7 | 60 | 1 | 2 | 72 | 100.0 |

