

Report on Snow Leopard (*Uncia uncia*) Surveys in Tomur, Xinjiang, China 2004

By MaMing , XuFeng , Mardan Turghan and Ying Shoujin



XINJIANG SNOW LEOPARD GROUP (XSLG/ISLT/XCF)
XINJIANG INSTITUTE OF ECOLOGY AND GEOGRAPHY (XIEG)
CHINESE ACADEMY OF SCIENCE (CAS)

No 40 Beijing Road, Urumqi, 830011, Xinjiang, P. R. of China

November 30th 2004

Abstract

The Snow Leopard (*Uncia uncia*) investigation in the Tomur area is the second step of the “Project of Snow Leopard Study in Xinjiang”. In this part of the project, we collected information on the distribution, abundance and population size of the snow leopard in this area. The investigation lasted for 3 weeks, between October 17 and November 7th, 2004. During the 22 days of field work, we surveyed 4 different places in Wensu County, Aksu District: e.g. Pochenzi and the Muzat River area, Bozdun and the Little Kuzbay River area, Yinyar and the Tomur River area, Taglak and the Qiong Tailan River area. The 4 main areas, along with a few other valleys, covered most of the Tomur National Conservation Zone. In total, we ran 42 transects. In 15 transects, we found signs left by snow leopards. We also collected 15 fecal samples for diet analysis. This time we interviewed nearly 90 local people from different nationalities: e.g. Han (Chinese), Uygur and Kyrgyz people, including herdsmen, geologists, mineworkers, drivers, veterinarians, businessmen, forest officials, soldiers and policemen. They provided us with an array of information on the historical and current distribution and abundance of the snow leopard in this area.

Key words: Snow Leopard, *Uncia uncia*, survey, distribution, abundance, population size, Tomur, Xinjiang, P. R. China

Preface

The Snow Leopard Research and Conservation Program in Xinjiang, China, is a large wildlife protection and research project. It was supported by the International Snow Leopard Trust (ISLT), Xinjiang Conservation Foundation (XCF), and the Chinese Academy of Sciences (CAS). From the results of this project we wanted to know the distribution, abundance and relative population size of the snow leopard *Uncia uncia* in Xinjiang, China. With this information, we can finally do something to increase snow leopard survival in Xinjiang. People involved in this project came from XSLG, XIEG/CAS, ISLT, XCF, other NGOs and institutes, and the Department of Forestry. In 2003, Prof. MaMing and Mr. Wei Shunde of XCF applied for an assistance to conduct this project through ISLT's Small Grant program. ISLT felt the project would be better served by a larger grant and assisted in securing the needed funds. In May 2004 this project started. From September 11 – 30, 2004, ISLT expert Mr. B. Munkhtsog arrived in Xinjiang and trained the members of Xinjiang Snow Leopard Group. This was the first step of the Snow Leopard Research and Conservation Program in Xinjiang. Our investigation in the Tomur area is the second step of the project. After this, we will continue our field survey at other areas in Xinjiang in the coming year.

I. Introduction of the Survey Area

Located in the southwest region of the Tian-Shan Mountains, the Tomur National Conservation Zone mainly includes the 4 villages of Pochenzi, Bozdong, Takhlak and Akqi. It is located in Wensu County, Aksu Prefecture (see Figure 1 and Figure 2). There are 15 mountain peaks above 6000m in this area, including 5 above 6800m. Mount Tomur, the highest peak in the Tian-Shan range, is 7435.3m above the sea level. Mountains 4000m above the sea level make up about 60% of the peaks in this area, and most of them are covered by permanent snow year-round.

Brief Introduction of Aksu Prefecture

Aksu means “white water”, or “the plain boiled water” or “the flowing limpid river” in Uygur. Aksu is a bright pearl inlaid on the Silk Road. It is located at the southern foot of the Tian-Shan Mountains of Xinjiang, north of the Tarim basin, and east of the Bayinguoleng Mongolia Autonomy State border, south of Hotan, and connects the Kashi and Kezilesu Kirghiz Autonomy State in the southwest. It is adjacent to the Ili Kazakh Autonomous State, and has a common boundary with Kazakhstan and the Kyrgyz Republic, separated by the Tian-Shan mountains. It is 989 kilometers away from Urumqi, and 466 kilometers from Kashi (Kashgar). There are 31 nationalities and 2,010,000 people living here. The land is broad, profound and mysterious, and encompasses an area of about 132,000 square

kilometers. Aksu has long been known as the “land of plenty;” the weather is pleasant, the grass and water are plentiful, and agriculture and livestock thrive.

The administrative division has jurisdiction over 1 city and 8 counties; Aksu City, Kuche County, Xinhe County, Shaya County, Baicheng County, Wensu County, Awati County, Wushi County and Keping County. In addition, there are about 20 groups which are administrated by the No. One Agriculture Army (Nong Yi Shi) of Xinjiang Production and Construction. (One group is equivalent to a county) The Tomur Nature Reserve is located in Wensu County of the Aksu area.

Brief Introduction to Wensu County

Wensu County is located at the southern foot of Tomur Mount in the western Tian-Shan Mountains, the northern fringe of the Tarim Basin, and shares its northwestern border with the Kyrgyz Republic and Kazakhstan (119 km total of national boundaries). The whole area is 14,600 km² with a width of 153 km from east to west, and a length of 167 km from north to south. There are 2 towns, 8 countrysides, 6 state-run farms, 5 state-run pastures, and 2 state-run forest farms dominated by Wensu County. The total population is 20.28 million, including 21 nationalities such as Uigur, Han (Chinese), Kirgiz, Hui etc..

Wensu County has a long history. It was under the administration of the Han Dynasty during the Shengjue second years (60 B.C.). In Zhenguan 22nd year of the Tang Dynasty (A.D. 648), they set up Wensu State and Gu Mo State which were both under the administration of the Qiuci governor palace of Anxi protect office. During the Ming Dynasty, Wensu County was part of the YerQiang Han Country. In Guangxu eighth year of the Qing Dynasty (A.D. 1882), Aksu Road and Wensu State were set up directly under the rulers' jurisdiction. In Guangxu 28th year of Qing Dynasty (A.D. 1902), Wensu County was created..

The terrain of Wensu County in the mountainous north is much higher than the southern plains area. The northern mountain area is the traditional stockbreeding region, and includes unique melted-ice physiognomies; a glacial gorge, and melted glacial ice converged into a river. The forests include high and low alpine meadows. The southern plain area accounts for 43.83% of the entire county, and contains two plains; the Kumarik River and Tushigan River alluvial plain in the west, and the Tailan river and Klyulegun river diluvian plain in the east. with different climates, soil and natural resources. It is the traditional production base of farming and herd husbandry.

Wensu County has a typical continental climate. The mountain area climate changes with elevation. The high altitudes are frigid, with perennial snow and glaciers, the mid-altitudes have a temperate climate, with spruce forests and meadows, and the low plains are hot and sunny. The average annual temperature of Wensu County is 10.2 degrees Centigrade, the maximum temperature is 37.6 degrees Centigrade, the minimum temperature is – 27.4 degrees Centigrade. The average annual sunny period is 2718.1 hours, and the frost-free period is 207 days. The average annual precipitation is 62.9 mm, and the average annual evaporation capacity is 1803.9 mm.

Wensu County land use is diverse, including 700,000 Mu of cultivated land, 4,000,000 Mu of unutilized land, 800,970,000 Mu of natural meadows, 13,980,000 Mu of wild forest and 450,000 Mu of artificial economic forest. The annual amount of livestock on hand ranges between 500,000 - 800,000 animals, which is 2-3 times larger than the human population.

Wensu County also has an abundance of water sources. Glaciers cover 1219.68 km² of the county's territory, storing a total of 158,229 million m³ of water. There are 43 rivers with a total length of 889 km, including the Kuarid,

Tushigan, Tailan, Kelayulg, and Muzat rivers. The total reserves of natural water sources are 9,640 million m³, and the groundwater reserves are 1,618 million m³.

The mineral resources in Wensu County are abundant. More than 20 kinds of ore have been discovered and utilized, such as coal, gypsum, rock salt, phosphorus, iron, uranium, graphite, clay, limestone, sulfur iron, potter's clay, lead, zinc, arsenic, copper, indium, silver, gold, cadmium, boulder, perlite and asbestos. The coal reserves are over 1 billion tons, and the reserves of rock salt are more than 40 billion tons, at the rare large-scale mineral deposits. Uranium and boulder ore form considerable reserves in the area, and can be exploited with high profit. Dongling jade, which is found in the upper reaches of the Muzat River, compares favorably in quality with the world-famous Hotan jade.

The wildlife are abundant in Wensu County, including some rare wild animals protected by the government; red deer, snow leopards, sweep-the-snow, dark storks, lynx, and swans. There are 19 orders, 40 families and 161 species of birds. There are more than 20 species of trees, including spruce, birch, Chinese insect wax, poplar, and *Populus euphratica* Oliv. Over 100 species of shrubs inhabit the area, such as alpine willow, Tian Mount Chinese *Zanthoxylum*, briar, and Xinjiang garden cypress. More than 200 species of wild plants in Wensu County have medicinal uses, including palm joining, root of *Codonopsis pilosula*, dangshen, astragalus, topaz, sealwort, licorice root, Chinese ephedra grass, wild celery, Chinese angelica, and snow lotus. The area also includes more than 200 species of herbs.

Many opportunities for tourism exist in Wensu County. The mysterious Wooden Garden of Tian Mountain is also called the Gobi Desert Emerald, the Expansion Oasis, and the Holy Land of Tourists. Tomur Mount is the highest peak of Tian Mountain with an altitude of 7,439m. TagLak platform are found near the blue mountain. These ancient tombs have been classified as a cultural relic for protection. Famous rock painting sites such as BoziDun, Qiong Kuzbay, KeqiKe Kuzbay occur here as well. The green virgin forests, vast natural pastures, and numerous waterfalls will also please the eyes of tourists. Mysterious scenes in the ice can be seen as one travels across the glaciers from Pechengzi, to Mucongda, to Zhaosu County of the Ili Prefecture.

Wensu is a county devoted to both agriculture and herding with a gross agricultural output of 684 million Yuan, including a gross output of 161,700 tons in grain which is centered around cotton. Wensu County was named the "Rice Township of South Xinjiang." Rice, wheat and maize are the main cereal crops grown. Wensu is one of the "green food" (high quality rice) centers in the country, and "dark pearl" rice sells well in and out of the district. The industrial crops are cotton, hops, beet, and flax; Wensu County is one of the hop and cotton export centers of the Aksu area.

Stockbreeding is one of the most important components of Wensu's rural economy. There are more than 10 varieties of livestock there, such as ox, horse, sheep, goat, and camel and the county ranks high as a producer of cashmere. With the permission of the National Agriculture Ministry, a meadow stockbreeding project has been implemented in Wensu County since 1990 with great success.

Wensu County has built a salt factory, cement plant, building materials factory, brewhouse, distillery, food factory, cold drinks corporation, desert beverage factory, mineral water factory, flagstone material factory, 5 collieries, and 15 water power stations in order to take advantage of the local resources. Other factories were built to process grain, cotton and oil. According to market demands, Wensu County has also set up such enterprises as a pharmaceutical factory, plastic factory, printing factory, carton factory, braided bag factory, pesticide factory, and a building and repair plant of agricultural machinery. The industrial system of energy sources, pharmaceuticals, building materials,

light chemical industry and agricultural byproducts processing has currently become the dominant industry of the county.

Brief Introduction to the Tomur Nature Reserve

Tomur Peak, which means "Iron Peak" in Uygur, is the highest peak in the Tian-Shan mountain range, at 7435.3 m above sea level. According to the Sino-Russian Nerchinsk Treaty, it is located at E 80.1 degrees by N 42 degrees, 20 km southeast of the Hantengeri Peak (6995m) which was the boundary peak between China and the former Soviet Union. Now it is the boundary between China and the Kyrgyz Republic. There are 15 mountain peaks near Tomur Peak over the altitude of 6000m, including Snow Lotus Peak, Arktshi Peak (which means white jade in Uygur), Qulebos Peak (tiger in Uygur), Science Peak, Tailan Peak, Keqkar Peak (buck in Uygur). Five of the peaks are over 6800m, and form the highest-peak group in the Tian-Shan mountain range (see Figure 1 and Figure 2).

Around the peaks, the development of land features has been heavily influenced by glaciers. There are about 509 modern glaciers with a total area of 2746.32 km² (about 350 billion stere ice per 1 km².) The glaciers are an important water source for the vast region encompassing the north and south Tian-Shan Mountains. The longest glacier, HantenGeri Glacier, is the eighth largest glacier in the world at 60.8 km long, and lies on the north side of the Tomur Peak. The glacier of the Tomur Peak Nature Reserve is the most important alpine solid reservoir for the oasis in the north and south of the Tian-Shan Mountains. The total volume of the glacier is 495429 billion m³, which is 4 times more than the glaciers of Everest. The area is the cradle of Aksu Muzhat river, which feeds into the Tarim and Tekesi rivers, which in turn are the main tributaries of the Ili River.

With the approval of the people's government of the Xinjiang Uygur Autonomous Region, the Tomur Nature Reserve (TNR) was created in 1980. The reserve is an alpine integrated conservation region which conserves the ecosystems of the modern glaciers, uplands, deserts, grassland and the forests. TNR was upgraded to a national conservation reserve in 2003. The confirmed area is 1000 km² between 80.00'E, 80.50'E, 41.30'N and 42.30'N. The North Slope belongs to Zhaosu County of the Ili Kazakh Autonomous State, and the south slope belongs to Wensu County of the Aksu Region. The South and North Muzhat river valley is one of the most important channels of the ancient Silk Road. To get there, one will pass through the Daban Plateau at an altitude of about 3600m. A 100km boundary along the west Plateau and high mountains, lies along the border of China, The Kyrgyz Republic, and Kazakhstan. To the north, is Alsan where there are five hot-springs in a beautiful forested area. In ancient times the area was used for bathing and recuperating the herds, and currently a sanitarium is located there.

There are numerous plants which thrive in the Tomur Peak area. According to the scientific investigation of the CAS, there are 670 species of advanced plants, including 28 species of moss, 8 species of ferns and 634 species of spermatophytes. Among them there about 20 species of trees (such as Tianshan spruce, birch, and mountain ash) 80 species of officinal plants (such as Fritillary, redroot gromwell, henbane, and rhubarb). It is also a gene pool for the grass family, e.g. *Festuca rubra*, *Avena* spp, *Secale cereale*, *Poa* spp., and *Elymus mutaus*. These grasses will be important for genetics and breeding. There are also valuable and rare plants which are protected, such as *Cireaeaster agrestis*, and *Helianthemum soongoricum*.

There are about 81 avian species, including 38 species of resident birds and 43 species of migratory birds. There are 31 species of mammals; and more than 408 species of hexapods. There also many rare animals which are protected, e.g. snow leopard, brown bear, lynx, ferret, red deer, *Lyrurus tetrix*, snowcock, *Gyps himalayensis*, *Capra ibex*, and argali.

In the nature reserve, the north and south slopes have numerous virgins peaks, which play an enormous role in

the natural ecology and future protection of the region. It is a unique area for research in zoology, botany, geology, geomorphology, glaciology, meteorology, hydrology and geography. International relations have been tense in the past in this area, and it didn't open to the outside world for scientific investigation, travel, and exploration until 1985.

Additional information: The history of exploration in the Tomur Area

In 1956, a Soviet expedition explored Tomur Peak along the northeast cliff of the North Slope. More than 2 decades later, in the July of 1977, 27 people from the Chinese Academy of Sciences scientific investigation team reached the summit of Tomur Mountain via the southeast ridge.

For 3 months in the spring of 1985, the research group of Mr. MaMing and Mr. Wei Shunde studied wildlife in the Tomur Area, including the Muzat River and the Tailan River. They collected about 400 specimens of animals in the Tomur Nature Reserve for the study.

In 1986, a mountaineering party of Japanese women encountered an avalanche three times in two days; the violent avalanches are the greatest difficulty of the peak. Several mountaineering parties in Japan attempted to climb this peak for the next ten years, but failed to reach the summit due to avalanches and bad weather, as well as paying a cost in lost lives.

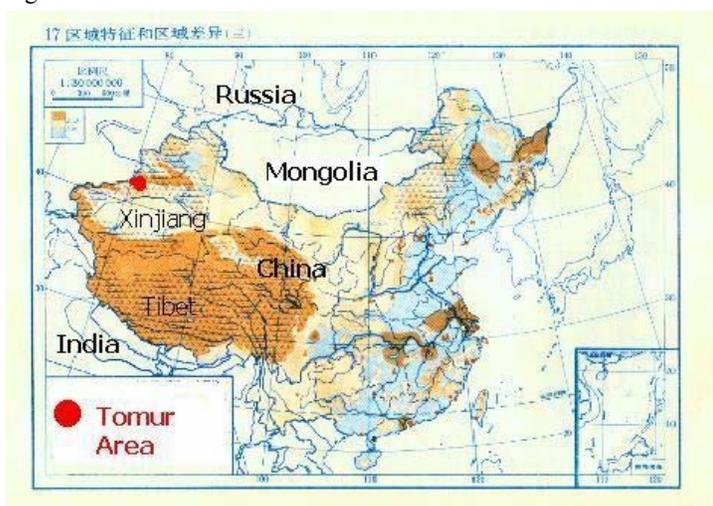


Figure 1. The survey area in China.

II. Study methodology

In the field survey, our main goal was to discover the signs left by the snow leopard *Uncia uncia*, such as scrapes, footprints (pug marks), claw ranks, feces and scent sprays. From the transect data, we can determine the distribution and relative abundance of snow leopard populations in each surveyed area. For this we used the standardized methods of SLIMS.

The first step when we arrived an area was to interview the local people. This information may be helpful to our future fieldwork. The local people - especially the herdsmen and forest personnel – can often give us the detailed news of snow leopard and ibex sightings in the area.

The second step of the survey was to choose the research place according to the habitat type and the interview results.

The next step was to run the transect and carefully record all sign data using the appropriate SLIMS forms transect (see Snow Leopard Field Guide by Ma Ming et al. 2004). The transect was done at any places that snow

leopards might leave their signs, such as ridgelines, cliff bases, valley bottoms, hillsides, stream beds and terraces. The snow leopard is most likely to leave signs at ridgelines and cliff bases. Care was taken to fill out the forms correctly and writing down a detailed description of the habitat, wildlife condition and so on. Data was then entered into a database for analyses.

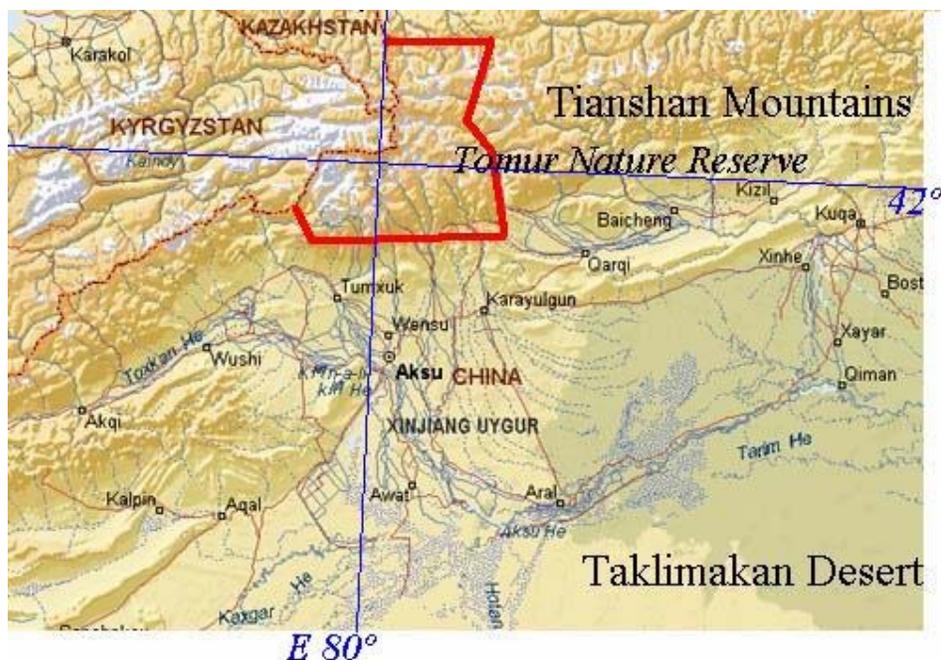


Figure 2. The Tomur Nature Reserve, WenSu County, Aksu Prefecture

Introduction to the Geography and Ecology of the Study Areas

1 Pochenzi and the Muzat River area

In this giant valley runs the Muzat River. It is more than 80 km long. Qiongaktag (5080m) is the highest peak in this valley. The elevation ranges from 2000 to 5000m. The Pochenzi coal mine is the biggest mine in Wensu County, with the staff numbering over 1200 people. The Muzat River valley has more mines than any other in the Tumor area, including mines to extract coal, jade, boulders, gold, and marble. The local herdsman population is about 1,000, and the livestock population is between 4,000 and 6,000 animals.

2 Bozdun and the little Kuzbay River area

This area is on the southern side of the Tian-Shan Mountains. The elevation changes dramatically from 1560m to 5000m. Six peaks are located here; the highest one, Karbaqaok, is 5325m. There are 8 rivers in the area, and the Aksu River is the longest one. The mines are very plentiful; one can find coal, copper, iron, marble, gypsum, pyrite, quartzite, uranium and argil in this area. There were more than 4,265 people and 4,464 livestock living in this area in 1999.

3 Yinyar and the Tomur River area

This area is on the north side of the Kumarik River, with the mean elevation at 1800 to 4000m. There are 9 peaks, 18 deep valleys, and 10 rivers in this region. The biggest valley in this area is Talke Valley, at 29.8 km long. The mines here are coal, uranium, iron, and graphite. There were 10,777 people and 6,853 livestock living in this area in 1999.

4 Taghlak and the Qiong Tailan River area

This region is also on the southern side of Tian Shan Mountains, and the elevation ranges from 2000m to 7300m. There are 8 main peaks in this area, including Tomur Peak. There are also 8 main rivers here, and 4 of them are more than 30 km long. The mines of this area extract aluminium, zinc, arsenic, copper, indium, cadmium, silver, marble, and coal. In 1999, there were 12,244 people and 6,923 livestock living in this area.

Detailed Survey Map

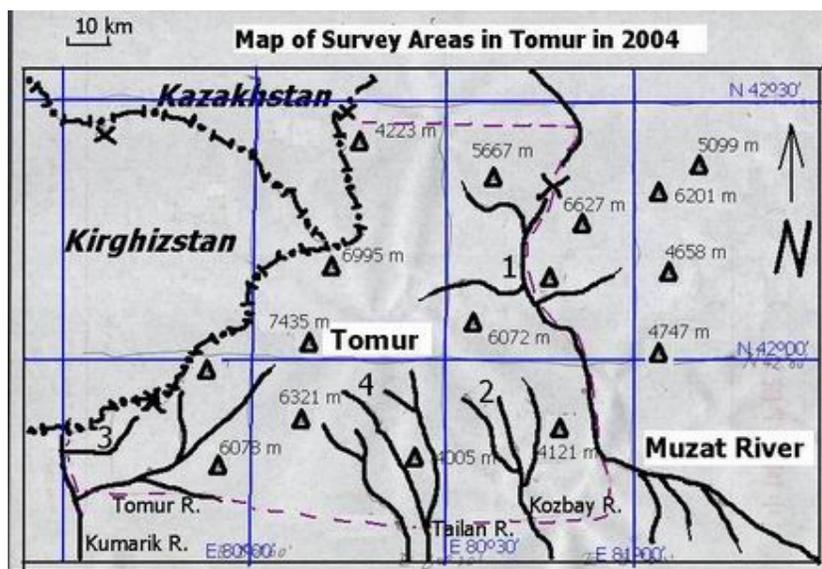


Figure 3. The 2004 survey areas in the Tomur Nature Reserve:

- 1 Muzat River Area
- 2 Bozdun and Kuzbay River Area
- 3 Yinyar and the Tomur River Area
- 4 Taghlak and Tailan River Area

III. Result of Investigation in Field

Survey Itinerary

Oct 17–18, 2004: The Xinjiang Snow Leopard Group (XSLG) left Urumqi, and arrived at Wensu county, Aksu Prefecture on the afternoon of Oct 18th. In two days, we journeyed 1000 km by Jeep.

Oct 19, 2004: We arrived at the first study area, Pochenzi, which belongs to the Muzat River area, and began our field survey.

Oct 20–22, 2004: We surveyed in the valley about 50 km to north with a total of 5 transects, and found some footprints in the core area of Tomur.

Oct 23, 2004: We moved to the next area of Bozdun and the little Kuzbay River. The road was damaged, and we had to get into the valley by foot.

Oct 24–25, 2004: We walked for 20 km on foot inside the valley, but found nothing except some birds, and the footprints of wolf, fox, wild boar and ibex on the snow in 7 total transects.

Oct 26, 2004: We went to the third study area in Korgan and Yinyar, the Tomur river area near the border.

Oct 27, 2004: We surveyed in Korgan. Prof. MaMing climbed up to 3888m, and badly injured his hand on a sharp stone, but he did not stop the survey.

Oct 28, 2004: We were obliged to get permission from the police and the local army to research near the border. We went to Wensu and Aksu City again, and then back to Kurgan in the night. We spent the whole day traveling about 250 km, and the whole schedule was postponed by obtaining the permission.

Oct 29-Nov 1, 2004: We finally arrived at Yinyar on horse back. During the 4 days of work, we found snow leopard footprints and dead yaks eaten by the cats. One 2-year-old yak was eaten just one day before we got there. There were a total of 18 transects in Korgan and Yinyar.

Nov 2, 2004: We went back to Wensu and found our local cooperater Mr Wei Shunde. Together we planned the next step of the survey in Taglak and the Qiong Tailan river area.

Nov 3-5, 2004: We went to the core area of the Tomur National Conservation Zone -Taglak. There we found many signs left by snow leopards. We took a total of 12 transects on horseback in the Tailan Valley.

Nov 6-7, 2004: We ended our 22 days of field investigation and returned to Urumqi.

Analysis of the Transect Result

During the 22-day field survey, we conducted studies and completed 42 transects in mountainous areas near the 4 villages of Pochenzi, Bozdong, Akqi and Taghlak (Figure 3), covering nearly all of the Tumor Natural Protection Zone. Snow leopard sign was observed on 15 (35.7%) of the transects (see Table 1). Mean sign density per kilometer of transect varied between areas from a high of near 5 per km in Yinyar to a low of 0 in both Bozdun and Kurgan.

All together we surveyed 4 valleys in the Tomur area, and in 3 of them we discovered fresh signs such as recent footprints and fresh feces left by snow leopards. So now we can confirm that Pochenzi and Muzat valley, Kurgan - Yinyar valley and Taglak - Tailan valley all harbor snow leopards.

In Yinyar and Korgan, we found 5 sets of snow leopard pug marks and 8 dead yak bodies that had been killed and eaten by snow leopards (see Table 3). In the Qiong Tailan River area, we found 3 different places with fresh footprints; they were all far away from each other (nearly 6-8 kilometers) so we estimate that in this valley there are at least 3 snow leopard adults. The surveyed area of these three places is nearly $20 \times 5 \text{ km}^2$, so the estimated snow leopard density in Qiong Tailan may be as high as 3 adults per 100 km^2 . However, these are very preliminary findings.

Population Size

The total land area of the Tomur Area is about $4500 - 6000 \text{ km}^2$. If the density is 3 (see Table 3), then the population size will be $0.03 \times 4500 = 135$. Mr. Wei Shunde estimated that the snow leopard density in the Tomur area is 3-5 per 100 km^2 . So a tentative estimate of the snow leopard population in the Tomur area might be between 120 ~ 150.

Table 1. The list of the transect result in Tomur

Trans. #	Date	Length (m)	Latitude Start			Longitude Start			Elev. (m)	Valley name	Sign:	Sign/km
			Deg	Min	Sec	Deg	Min	Sec				
1026	10-21-04	1008	42	4	39	80	45	58	2381	Pochenzi	2	1.98
1027	10-21-04	506	42	5	36	80	45	15	2444	Pochenzi	0	0
1028	10-21-04	1812	42	3	4	80	47	58	2422	Pochenzi	0	0
1029	10-21-04	685	42	3	3	80	48	19	2389	Pochenzi	0	0
1030	10-22-04	406	42	2	37	80	47	30	2437	Pochenzi	1	2.46
1031	10-23-04	737	41	48	58	80	38	11	2471	Bozdun	0	0
1032	10-23-04	442	41	49	14	80	38	7	2462	Bozdun	0	0
1033	10-23-04	542	41	48	40	80	38	7	2631	Bozdun	0	0
1034	10-23-04	485	41	48	36	80	38	22	2452	Bozdun	0	0
1035	10-24-04	727	41	50	26	80	37	54	2595	Bozdun	0	0
1036	10-24-04	772	41	51	32	80	37	8	2757	Bozdun	0	0
1037	10-24-04	574	41	52	7	80	36	29	2846	Bozdun	0	0
1038	10-27-04	523	41	45	16	79	49	26	3385	Kurgan	0	0
1039	10-27-04	300	41	45	29	79	49	36	3654	Kurgan	0	0
1040	10-27-04	702	41	44	9	79	46	12	2712	Kurgan	0	0
1041	10-27-04	612	41	43	38	79	46	34	3065	Kurgan	0	0
1042	10-30-04	311	41	50	11	79	46	4	3307	Yinyar	5	16.07
1043	10-30-04	238	41	50	45	79	45	6	3599	Yinyar	1	4.20
1044	10-30-04	499	41	50	54	79	44	31	3821	Yinyar	4	8.01
1045	10-30-04	688	41	50	33	79	42	51	3372	Yinyar	1	1.45
1046	10-30-04	1120	41	49	12	79	39	54	2631	Yinyar	3	2.67
1047	10-31-04	203	41	48	11	79	38	36	2847	Yinyar	0	0
1048	10-31-04	692	41	48	2	79	38	18	2681	Yinyar	8	11.56
1049	10-31-04	520	41	48	13	79	36	4	3000	Yinyar	3	5.76
1050	10-31-04	372	41	48	32	79	38	25	2852	Yinyar	7	18.81
1051	10-31-04	675	41	48	16	79	38	56	2944	Yinyar	0	0
1052	10-31-04	850	41	47	56	79	37	22	2468	Yinyar	5	5.88
1053	11-01-04	603	41	49	47	79	41	22	2801	Yinyar	0	0
1054	11-01-04	402	41	50	24	79	42	10	3165	Yinyar	0	0
1055	11-01-04	774	41	49	42	79	46	26	3140	Yinyar	1	1.29
1056	11-03-04	551	41	45	7	80	24	30	2512	Taklak	0	0
1057	11-04-04	820	41	49	22	80	22	1	2407	Taklak	0	0
1058	11-04-04	553	41	50	32	80	21	0	2541	Taklak	10	18.08
1059	11-04-04	1094	41	51	49	80	20	8	2652	Taklak	0	0
1060	11-04-04	330	41	52	34	80	19	33	2803	Taklak	0	0
1061	11-04-04	561	41	45	41	80	24	17	2562	Taklak	0	0
1062	11-04-04	1251	41	45	47	80	23	43	2725	Taklak	0	0
1063	11-04-04	264	41	46	15	80	24	27	2220	Taklak	0	0
1064	11-05-04	293	41	52	38	80	20	8	2855	Taklak	0	0
1065	11-05-04	237	41	52	39	80	20	25	2864	Taklak	2	8.43
1066	11-05-04	1157	41	49	4	80	22	9	2386	Taklak	4	3.45
1067	11-05-04	371	41	47	36	80	23	32	2250	Taklak	0	0

Table 2. Estimated snow leopard density in the Tumor Feng Area

Place	Center of the survey		Area W × L (km ²)	Estimate Numbers	Density (Numbers /100 km ²)	Based on
	Latitude	Longitude				
Muzat R.	42°05'	80°46'	5 × 100	8-10	2 (estimated 3-5 by Mr. Wei Shunde)	see Fig 4 of pug marks
Kuzbay R.	41°52'	80°36'	5 × 20	0		
Korgan to Yinyar	41°48'	79°36'	5 × 50	8-12	3-5	5 sets and 8 yak corpses
Tailan R.	41°53'	80°19'	5 × 20	3	3	3 sets of the pug mark

Collection of Feces Samples for future genetic analyses

We collected a total of 15 fecal samples for future analysis. Three of them were collected during transects, and others were collected by our cooperater Mr. Wei Shunde. Compared with the last investigation, we found fewer feces than in the Altai mountains. The reason for this is that most of the surveyed area in the Tomur area was covered by snow.

Feces were often found near a scrape or within several meters from sites where prey was consumed. For example, this time we found a lot of feces near a dead 2-year-old yak. Our local guide told us that he saw a snow leopard eating the yak only one day before (Oct. 30, 2004) we were there.

Analysis of the Footprints

In some limited cases, ougmarks (footprints) can give us some information on the sex, age, family size, population size, and sometimes the activity pattern of the snow leopard who left them.



1. Sex and age

Estimating the sex and age of a snow leopard from the size of the footprints is difficult, requiring experience. This time in Yinyar, we discovered three sets of footprints, one big and two small. We can say that this is a female adult with two offspring (Table 4). This is the only case in which we can be sure of the age and sex of the snow leopard from the footprints.

Table 3. The measurements of snow leopard footprints in the Tomur Area

Place	Date	Size (cm) length × width	Step (cm)	Sex and age
Muzat R.	21 st Oct., 2004	10 × 11		Adult
Korgan – Yinyar	30 th Oct., 2004	11.4 × 9.4	50	Adult (♀)
		10.6 × 9.7		Adult
Korgan – Yinyar	30 th Oct., 2004	5.3 × 4.8	28 – 29	Young, 1 st year
		4.8 × 4.5	35 – 37	Young, 1 st year
			23 – 25	Young, 1 st year
Su-bu-ta-shi	4 th Nov., 2004	11.5 × 9.0		Adult
Tailan R.	5 th Nov., 2004		37 – 42.5	Adult

2. Family size and population size

In the last example of Qiong Tailan, we were able to estimate that the family or population size of the snow leopard in that area was three individuals. Similarly in Taglak, we found 3 sets of footprints in different areas. They were all far away from each other (nearly 8-10 kilometers), so we estimated that in Taglak there are at least 3 families of snow leopards.

3. Activity pattern

We found that the fresh footprints range between the elevations of 2330-3878m. This may reflect the diverse altitudes that the snow leopard inhabits during this particular area and season. Although most fresh sign was found between the elevations of 2330m and 2500m. This may indicate that in winter snow leopards are lower on the mountain.

Deep in the valley, we found snow leopard footprints several times near a herdsman's house. And from interviewing locals in this area, we know that the livestock are often attacked by snow leopards. This may show that in winter the snow leopard likes to spend time near herding families during times when natural prey is scarce.

We also noticed that in some places there were a lot of footprint sets heading both directions, possibly indicating frequent use of common travel routes..

Analysis of Other Signs

Besides the feces and the footprints we mentioned above, this time we also discovered some other signs of Snow Leopard such as blood stains, scent sprays, hair, scrapes and claw rakes.

1. Blood stains

Near the dead body of yak killed by a snow leopard, we discovered several blood stains on a rock. We found dead yaks in 8 different places, and in 2 of them we saw bloodstains. They are all on the side of giant stone some meters away from the dead yak. Where did the blood come from? Was it the blood of the snow leopard or the dead yak? We estimated that the blood came from the dead yak. Maybe after eating, the snow leopard wiped the blood off on a stone.

In the field survey, we also saw some blood stains on snow leopard footprints near a cliff. We think that the blood was from the snow leopard's prey.

2. Scent sprays

We found 3 scent sprays in the survey area, but they were not in the transects. We noted the results in a separate notebook, rather than filling them into the transect form. Unlike footprints, scent sprays are difficult to distinguish.

We could only be sure of snow leopard scent sprays that appeared near scrapes or footprints. During the training trip, we only found 1 scent spray, and at this time we still don't have enough experience to find them. How long does the scent spray last? Where does the snow leopard like to mark with its scent spray? We don't know exactly, but in future surveys we will try to determine the answers to these questions.

3. Hair

We collected the hair near one dead yak for future genetic analysis. It was 15 meters away from the dead yak body and on the ground.

4. Scrape

On our previous survey trip to Beitay Mountain in the Alati range we discovered a lot of scrapes, but this time in Tomur we only discovered 12 scrapes in 5 transects. The reason for lack of scrapes is the snow. As we mentioned several times before, that region of Tomur Area was covered by snow. We can find the footprints on the snow easily, but to find the scrapes is very difficult.

5. Claw rakes

No claw rakes were found on any transects in the Tomur region..

Introduction of Mr. Wei Shunde and his field survey results

Mr. Wei Shunde is a 66-year-old man living in Wensu county, Aksu district. He is the former director of the TNR. After 20 years of field work in the conservation zone, he knows it very well. He co-authored with Ma Ming the original proposal for this study in 2003. He was unable to participate in the SLIMS training in northern Xinjiang, but he has always cared deeply about this project. From Oct 9th to 30th, 2004, he did field surveys deep inside Pochenzi Valley for WWF-China (see Figure 4). For this reason, he was unable to take part in the our survey in Tomur this time..

From the results of his field survey (Table 5), he estimated the distribution and abundance of snow leopard in the Pochenzi Valley, and the following map will tell us the detailed information (see Figure 4). He estimated that the density of snow leopards in the Tomur Area is 3-5 per 100 km², and the total population is 150-180.

Table 4. Survey on footprints of Snow Leopard in Tomur Area by Mr. Wei Shunde in 2004

Place	Date	Days	Footprint & Feces	Other
Qiong Tailan R.	June, 2004	9	Yes	
Keqik Tailan R.	Aug., 2004	8	Yes	
Qiong Kuzbay R.	Sept., 2004	9		Goat killed by SL
Muzat R.	Oct., 2004	22	Yes	SL cry in night

Survey of ungulates and other prey

In the investigation, we saw wild animals such as ibex, snow cocks, chukar, murine, rabbit, wild boar, chough, and titmouse. From the signs left on the snow, we could also confirm that the wolf and fox also live in this area. And from the interviews, we know that argali and bear can also be found here.

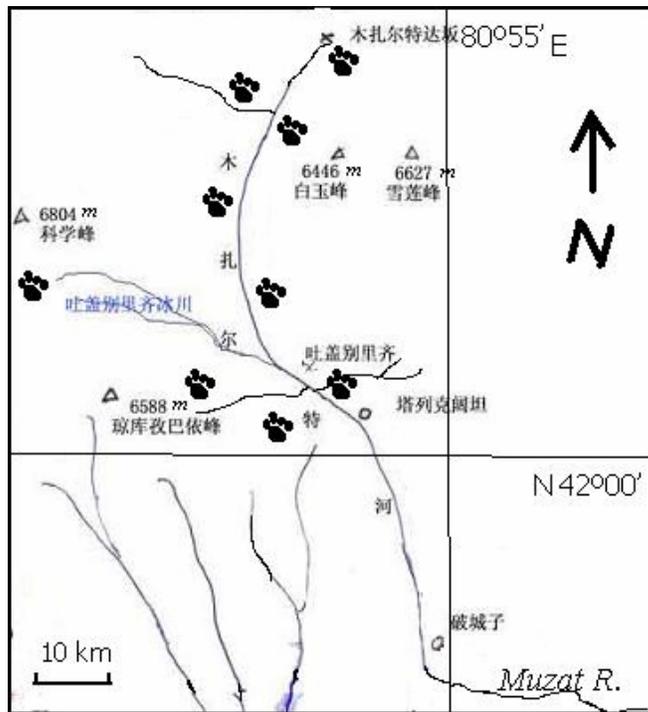


Figure 4. 2004 Survey of Snow Leopard Pug Marks in the Muzat R. Area

Ungulate prey

We seldom saw ibex during our surveys, and then only in Taglak Valley. We observed 7 groups and found old horns (the ages were 6-7 years old) with the help of our local guide, but it was very far away. The group size was between 2 to 35 individuals; e.g. 35, 10, 4, 7, 24, 18, 2.

It is said that 3-5 years ago, the ibex was a very common species in this area. But in recent years, many ibex died of an epidemic, possibly Foot and Mouth Disease or Bovine Spongiform Encephalopathy (BSE). We know that many local livestock died from Foot and Mouth Disease in 2004.

We saw no argali, but from the interviews we know that they did exist in this area. And it is said that the population of argali is smaller than the ibex population.

We found a lot of scrapes from wild boar on the grassland in all four surveyed valleys. And in the Qiong Tailan River area, we saw a wild boar.

Avian prey

We noted many chukar in the Tomur area, especially in Korgan. In this area we found the feces and footprints of snow cocks on the ground, but to see them was too difficult. We saw three birds flying over our heads only once.

IV. Analysis of the interview results

We interviewed more than 90 local people in the Tomur Area from Uygur, Kirkiz and Han nationalities, including herdsmen, miners, drivers, veterinarians, doctors, businessmen, policemen, military officers, officers of the forestry bureau, and forest guards. We asked them many questions and got a lot of information about the past and present conditions of snow leopards and their prey within those 4 areas.

Among these local people, about 20.4 % of them had personally seen snow leopards in the field (Table 6), and about 64.5 % of them had heard stories about the snow leopard. Only 22.6 % of them had encountered cases of conflict between the snow leopard and the local people (for example, the snow leopard killed some yaks and goats), and 81.7 % gave us information on the ungulates, e.g. ibex and argali sheep.

Table 5. The data analysis of interview with local people in Tomur Area from Oct. to Nov. 2004

Place	Date	Days	Number of Had Seen		Had Heard	Livestock killed	Had Seen
			Interviews	S L	about SL	by SL	Ibex/Agali
Muzat R.	19-23 Oct.	5	31	5	17	7	28
Kuzbay R.	23-25 Oct.	3	11	1	7	2	8
Yinyar / Korgan	26-31 Oct.	5	29	9	21	6	26
Tai-lan R.	2-5 Nov.	4	22	4	15	6	14
Total		18	93	19	60	21	76
%				20.4	64.5	22.6	81.7

V. Conservation Issues

The problems of the wildlife conservation

We spent 22 days conducting the field survey in the Tomur area. Most of our study area belongs to the Tomur National Conservation Zone. During the investigation, we discovered some problems that are not good for wildlife survival in this area.

1. Mining

There are a lot of mines in this area for coal, gold, jade, and marble, especially in Pochenzi and the Muzat River area. Furthermore, except for the coal mine, all of the other kinds of mines are just inside the conservation zone.

Among those mines, the coal mines are the most common one. We can find them in both Pochenzi Valley and also in Bozdun Valley. There are at least 6 coal mines in this area.

The marble mine is maybe the most destructive one to wildlife. On just one day, we saw 15 trucks transporting huge 15-20t stones outside the mountains to Urumqi. Not to mention that miners use explosives to quarry the marble. That can lead to disaster for the wildlife in this area.



2. Deforestation

The conservation zone was founded in the 1980s, and after that most of the deforestation stopped. But a small amount of deforestation is still occurring in this area. On our way to Yinyar, we discovered that some of the trees were cut.

3. Illegal hunting

Some years ago, a Kyrgyz man named Mr. Baktu Zumash captured a snow leopard with a trap. He was put into jail for 10 years. Nearly all of the local people know of this case, but still some people hunt protected animals in this area. In Kurgan, we found 80 traps on the hillside to catch birds such as the snowcock and chukar.



4. Overgrazing

As time has passed, the population of livestock in Wensu has obviously increased. The following chart shows that in 40 years, the population increased from 211,000 to 514,000 (Fig. 4). And from our personal investigation, in some areas the ecosystem has already degenerated. The habitat left for snow leopard and other wild animals such as ibex is very limited now. We don't know if there still is enough space for snow leopards and other wild animals to live.

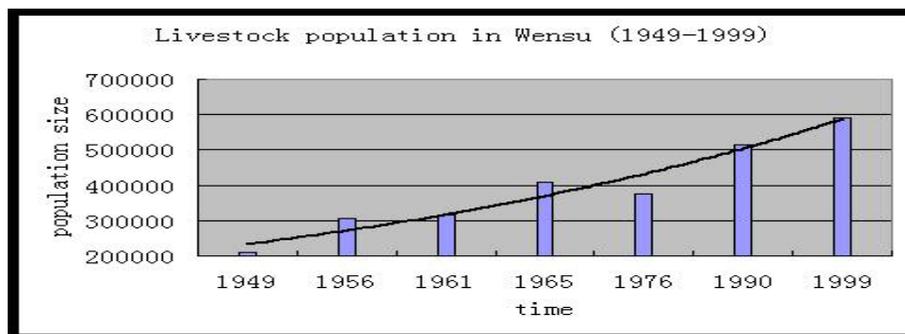


Figure 5. The livestock population in WenSu County from 1949 to 1999

5. Disease

At the time we stayed in the Tomur area, an extensive epidemic had broken out among the animals. It is said that a lot of wild animals such as ibex were dead of the epidemic in recent years. And the livestock were also infected by this epidemic. The local government killed large amounts of livestock for this reason.

The cause of this epidemic is unknown, but possibilities include Foot and Mouth Disease, Avian Influenza, and Bovine Spongiform Encephalopathy. Whatever it was, the epidemic was really a disaster for the animals of this area. We know that many local livestock died from Foot and Mouth Disease in 2004.

The epidemic killed large amounts of wild animals, likely leading to a lack of prey for the snow leopard. The snow leopards subsequently changed to attacking livestock such as yaks, goats and sheep. Hence, the tensions between snow leopards and local people has become even worse, especially in 2003 and 2004.

6. Geologic Reconnaissance

Inside the protected area we met several geologic reconnaissance groups. These men often stay in the mountains, and from an interview we know that they like to collect and hunt wild animals. They like to collect ibex horns and

hunt birds with traps. We observed them using 80 traps to catch snow cocks at one point.

7. New Road Construction

As mentioned, there are several mines in the Tomur area. The miners also built roads to meet their needs. These activities greatly changed the original ecosystem and have a tremendous effect on the local wild animals.

8. Human Population Growth

Just as the livestock population has increased in this area, the size of the human population has also grown dramatically in recent years. For example, the population was 84,000 in 1949, and about 210,000 in 2001. The following chart illustrates the population growth in more detail..



Figure 6. Growth of the Wensu human population from 1600 to 2000

9. Tourism

In recent years, tourism has developed rapidly in Tomur. There are resorts in Little Kuzbay Valley and near the Tailan River. It should be mentioned that the so-called “Tian-Shan Holiday Village” is inside the Tomur National Conservation Zone. From an interview, we know that from May to September the resort receives 150–200 people per day, on average. Large amount of tourists swarming into Tomur could greatly affect distribution and habitat use by wild animals.

10. Legal hunting

There are many kinds of wild animals such as ibex, argali, snow cocks, red deer, gazelles and red foxes in Tomur. To profit from the wildlife resources, the local government gives limited permission to hunt legally. Most hunters come from the USA and Europe to hunt for sport. For example, the argali is often chosen for this kind of hunting. This activity has a far-reaching effect on wild animal survival in this area.



11. Wildlife Park in Urumqi

The government helped to build the Urumqi Wildlife Park, including a Beast of Prey Center constructed in 2004. The department of the Forest Bureau plans to catch some animals to add to the park, such as the snow leopard, wolf, bear, ibex, argali, red deer, gazelle and red fox. They captured 3 young snow leopards from Pamir in 2004.



VI. Suggestions for conservation in the Tomur area

From our investigation, we discovered some problems of wildlife protection such as mining, deforestation, illegal and legal hunting, overgrazing, population growth, road-building, epidemics and Geologic reconnaissance. Now we try to give some suggestions of solutions from our own points of view.

1. Do more to decrease the scale of mining in the Tomur area; at the least, mining should be eliminated inside the protected area. The best solution would be to completely cease all mining activities there.

2. Start additional intensive research on the wildlife of this area. We need to know what animals live in the conservation zone, how their populations are faring, and what conservation measures are needed. 3. Educate the local people who live in this area. Make them understand that the animals should be protected in the conservation zone. Also, we should help them improve their living conditions, and try to resolve the conflict between local people and wild animals.

Acknowledgement

The snow leopard field investigation in the Tomur National Conservation Zone has been successfully completed. In 22 days of field work, we came to know the snow leopard's distribution and quantity in great detail. During the survey, we received help from many people; for example, local guides, forest officials, stablemen, the personnel in the protection station and so on. We feel obligated to give our sincere thanks to them and to all the people who cared about this project.

First, we have to say thanks to the International Snow Leopard Trust (ISLT) and to Dr. Thomas McCarthy. ISLT gave us the technique guide and continuous funding for the field survey. Dr. Thomas McCarthy initiated the cooperation between ISLT, the Xinjiang Conservation Fund (XCF), the Xinjiang Ecology and Geography Institute (XEGI), and the Chinese Academy of Sciences (CAS) and also gave other practical help for this snow leopard investigation.

Also we have to express our thanks to XCF members such as Mrs. ChengYun, Mr. Wenbo, Mrs. Baiyunwen and Zhang J. S. They gave us the chance to do the snow leopard field investigation in Xinjiang.

Mr. Wei Shunde is an experienced wildlife explorer, and he helped us to plan the investigation. He also gave us a lot of useful information about snow leopards and the Tomur Conservation Zone. We should express our sincere thanks to him.

In the 22 days of field work we were also helped by many other people, and we have to say thanks to them. Mr. Hu-da-bai-di took us to see the dead yak preyed upon by a snow leopard only one day before. Mr. Tu-ni-ya-zi and Mr. Ku-er-ban Maola are good local guides and stablemen, and with their help we finally arrived at Yinyar. Yu-su-pu is a good director of the protect station. He helped us to hire a horse and provided us with room and board in Taglak. Mr. Niu Yulin is the director of the conservation zone. He gave us permission to do the snow leopard study within the protected area, and also gave us some very useful information about distribution of the snow leopards in this area.

The local government, bureau of the conservation zone, frontier defense army, police station, forest police center, state forest bureau, Tian-Shan forestry center and pasture station all gave us a lot of help. We should say thanks to all of them.

Last of all, we have to say thanks to of the members of the Xinjiang Snow Leopard Group. Prof. MaMing is a good leader who has worked hard in the field. When Prof. MaMing climbed to the top of a 3888 m mountain on October 27th in Korgan, his hand was broken by a sharp stone. His clothes were soaked with blood, but he did not stop the survey for one minute. We all respected him. And Mr. Xufeng, Mr. Yinshoujin and Mr. Mardan worked together and helped each other. They all did a good job. Mr. Wangxinhe is an experienced driver from the Outdoor Club and also a good cook sometimes. With all of them participating, the field survey was finally able to succeed.

Thanks for the support of the Xinjiang Ecology and Geography Institute and the Chinese Academy of Sciences. Thanks to all the people caring about this project.

Appendix I

1. List of wildlife in survey area

The List of Birds and Mammals in the Tomur Protected Area

Mammals		(Birds Continued)	
English name	Latin name		
Long-eared Bat	<i>Plecotus auritus</i> Linnaeus	Cinereous Vulture	<i>Aegyptius monachus</i> Linnaeus
Wolf	<i>Canis lupus</i> Linnaeus	Eurasian Griffon	<i>Gyps himalayensis</i> Hume
Fox	<i>Vulpes vulpes</i> Linnaeus	Lammergeier	<i>Gypaetus barbatus</i> subsp
Brown Bear	<i>Ursus arctos</i> Linnaeus	Saker Facon	<i>Falco cherrug milvipes</i> Jerdon
Stone Marten	<i>Martes foina</i> Erxleben	Eurasian Hobby	<i>Falco subbuteo subbuteo</i> L.
Stoat	<i>Mustela erminea</i> Linnaeus	Common Kestrel	<i>Falco tinnunculus tinnunculus</i>
Asiatic Alpine Weasel	<i>Mustela altaica</i> Pallas	Himalayan Snow Cock	<i>Tetraogallus himalayensis himalayensis</i>
Masked Polecat	<i>Mustela eversmanni</i> Lesson	Chukar	<i>Alectoris graeca pallida</i>
Eurasian Badger	<i>Meles meles</i> Linnaeus	Daurian Partridge	<i>Perdix dauuricae</i> subsp
Asiatic Wild Cat	<i>Felis libyca</i> Forster	Common Sand Piper	<i>Tringa hypoleucos</i> Linn.
Pallas's Cat	<i>Felis manul</i> Pallas	Ibis-bill	<i>Ibidorhyncha struthersii</i> Vigors
Lynx	<i>Felis lynx</i> Linnaeus	Blue Hill Pigeon	<i>Columba rupestris turkestanica</i>
snow leopard	<i>Panthera uncia</i> Schreber	Rock Pigeon	<i>Columba livia neglecta</i> Hume
Wild Boar	<i>Sus scrofa</i> Linnaeus	Oriental Turtle Dove	<i>Streptopelia orientalis meena</i>
Red Deer	<i>Cervus elaphus</i> Linnaeus	Common Cuckoo	<i>Cuculus canorus subtelephonus</i>
Roe Deer	<i>Capreolus capreolus</i> Linnaeus	Little Owl	<i>Athene noctua</i> subsp
Ibex	<i>Capra ibex</i> Linnaeus	Hoopoe	<i>Upupa epops epops</i> Linnaeus
Mongolian Hare	<i>Lepus capensis</i> Linnaeus	Three-toed Woodpecker	<i>Picoides tridactylus tianschanicus</i>
Grey Mouse-hare	<i>Ochotona macrotis</i> Gunther	Crested Lark	<i>Galerida cristata magna</i> Hume
Common Squirrel	<i>Sciurus vulgaris</i> Linnaeus	Horned Lark	<i>Eremophila alpestris</i> (Linnaeus)
Mongolian Marmot	<i>Marmota bobac</i> Muller	House Swallow	<i>Hirundo rustica</i> Linnaeus
Tian-Shan Suslik	<i>Citellus relictus</i> Kaschkarov	House Martin	<i>Delichon urbica urbica</i> L.
Common House Mouse	<i>Mus musculus</i> Linnaeus	Grey Wagtail	<i>Motacilla cinerea robusta</i>
Wood Mouse	<i>Apodemus sylvaticus</i> Linnaeus	White Wagtail	<i>Motacilla alba personata</i> Gould
Grey Hamster	<i>Cricetulus migratorius</i>	Tree Pipit	<i>Anthus trivialis</i> Linnaeus
Pallas		Water Pipit	<i>Anthus spinoletta coutellii</i> Audouin
Mole-Vole	<i>Ellobius talpinus</i> Pallas	Red-backed Shrike	<i>Lanius cristatus phoenicuroides</i>
Tian-Shan Forest Vole	<i>Clethrionomys frater</i> Thomas	Common Starling	<i>Sturnus vulgaris porphyronotus</i> Sharpe
Royle's High Mountain Vole	<i>Alticola roylei</i> Gray	Common Magpie	<i>Pica pica bactriana</i> Bonaparte
Steppe Lemming	<i>Lagurus lagurus</i> Pallas	Nut Cracker	<i>Nucifraga caryocatactes rothschildi</i> Hartert
Common Field Vole	<i>Microtus arvalis</i> Pallas	Red-billed Chough	<i>Pyrrhocorax pyrrhocorax brachypus</i>
Singing Vole	<i>Microtus gregalis</i> Pallas	Rook	<i>Corvus frugilegus frugilegus</i> Linn.
		Carrion Crow	<i>Corvus corone orientalis</i>
		White-throated Dipper	<i>Cinclus cinclus subsp</i>
		Brown Accentor	<i>Prunella fulvescens fulvescens</i>
		Wren	<i>Troglodytes troglodytes</i>
		Himalayan Accentor	<i>Prunella himalayana</i>
		Blue-throat	<i>Luscinia svecica saturator</i>
		Himalayan Rubythroat	<i>Luscinia pectoralis</i>

Birds

English name	Latin name
Grey Heron	<i>Ardea cinerea</i> subsp
Northern Goshawk	<i>Accipiter gentilis schvedowi</i>
Long-legged Buzzard	<i>Buteo rufinus</i>
Golden Eagle	<i>Aquila chrysaetos</i> subsp

(Birds Continued)

Eversmann's Redstart	<i>Phoenicurus erythronotus</i>	Azure Tit	<i>Parus cyanus tianschanicus</i>
Blue-capped Redstart	<i>Phoenicurus coeruleocephalus</i> Vigors	Coal Tit	<i>Parus ater rufipectus</i> Severtzov
Black Redstart	<i>Phoenicurus ochruros phoenicuroides</i>	Willow Tit	<i>Parus montanus songarus</i> Severtzov
Red-bellied Redstart	<i>Phoenicurus erythrogaster grandis</i>	Tree Creeper	<i>Certhia familiaris tianschanica</i> Hartert
Isabelline Wheatear	<i>Oenanthe isabellina</i>	House Sparrow	<i>Passer domesticus bactrianusv</i>
Northern Wheatear	<i>Oenanthe oenanthe oenanthe</i> (Linnaeus)	Tree Sparrow	<i>Passer montanus dilutus</i> Richmond
Desert Wheatear	<i>Oenanthe deserti</i>	Rock Sparrow	<i>Petronia petrpnia intermedia</i> Hartert
Pied Wheatear	<i>Oenanthe (pleschanka) pleschanka</i>	Brambling	<i>Fringilla montifringilla</i>
White-backed Rock Thrush	<i>Monticola saxatilis</i> (Linnaeus)	Gold-fronted Serin	<i>Serinus pusillus</i>
Blackbird	<i>Turdus merula</i>	Goldfinch	<i>Carduelis caniceps paropanis</i> Kollibay
Red-necked Thrush	<i>Turdus ruficollis atrogularis</i> Jarocki	Twite	<i>Carduelis flavirostris</i> (Linnaeus)
Mistle Thrush	<i>Turdus viscivorus bonapartei</i> Cabanis	Linnet	<i>Carduelis cannabina bella</i> (Brehm)
Greater Whitethroat	<i>Sylvia communis icterops</i> Menetries	Plain Mountain Finch	<i>Leucosticte nemoricola altaica</i>
Desert Lesser Whitethroat	<i>Sylvia minula minula</i> Hume	Brandt's Mountain Finch	<i>Leucosticte brandti</i>
Greyish Willow Warbler	<i>Phylloscopus griseolus</i> Blyth	Mongolian Finch	<i>Rhodopechys githagineus mongolicus</i>
Yellow-browed Warbler	<i>Phylloscopus inornatus humei</i>	Great Rose-finch	<i>Carpodacus rubicilla kabdensis</i>
Greenish Warbler	<i>Phylloscopus trohiloides viridanus</i> Blyth	Common Rose-finch	<i>Carpodacus erythrinus roseats</i> Blyth
Severtzov's Tit Warbler	<i>Leptopoeile sophiae</i>	Grey-necked Bunting	<i>Emberiza buchanani neobscura</i> Paynter
		Rock Bunting	<i>Emberza cia decolorata</i> Sushkin

2. Members of the Xinjiang Snow Leopard Group in the field survey

No.	Name	Department	Telephone
01	Ma Ming	Xinjiang Institute of Ecology & Geography, Chinese Academy of Science	86- 991 - 7885363
02	Xu Feng	Xinjiang Institute of Ecology & Geography, Chinese Academy of Science	86-13565 885973
03	Yin Shoujing	Xinjiang Institute of Ecology & Geography, Chinese Academy of Science	86-13565 880601
04	Mardan Turghan (Uyгур)	Xinjiang Institute of Ecology & Geography, Chinese Academy of Science	86- 991 – 7836 406
05	Dr. Hu-da-bai-di	A Kyrgyz guide of from Korgan, Sha-wapu-qi	
06	Wang Hexing	A jeep driver of the Desert Wind Club (Da-mo-feng Ju-le-bu) (member of NGOs)	
07	Tu-er-di You-nu-si	A young Kyrgyz guide in Yinyar	
08	Tu-ni-ya-zi Da-Wu-ti	A Uyгур guide from Korgan	
09	Kurban Maola	A Uyгур groom from Korgan	
10	Yu-su-pu-jiang	A Uyгур guide from the Taghlak and Tailan Rivers	

References

1. Cai Dai, Gu Z Q and MaMing. 1993. Ecological study on Argali population in Sai-ri-mu area of Tianshan Mountains. *Acta Zoological Arid Inland*, (1): 33-37.
2. Cai Dai, Ma Ming and Zhao J H. 1993. Wildlife resources in Bayinbuluk area. *Acta Zoological Arid Inland*, (1): 109-111.
3. Cai Dai, Ma Ming and Gu Z Q et al. 1995. Study on biology of Argali *Ovis ammon* in Bayinbuluke of Tianshan. *China Mammals Research*. China Forestry Publishing House, Beijing, 296-305.
4. Contributed Papers to the Snow Leopard Survival Strategy Summit. 2002. International Snow Leopard Trust. 1-210.
5. Feng Z-J. et al. 1986. The mammals of Xizang. Science Press, Beijing.
6. Gao Y-T et al. 1987. *Fauna Sinica: Mammalia*. Vol. 8: Carnivora. Science Press, Beijing.
7. Gvozdev, E. V., Aliev, Sh. J. et al. 1978. Red data book of Kazakh SSR (Part 1. Vertebrates). Publishing House <Kainar>, Alma-Ata.
8. Hairet Tursun, Ye Wenhui and Meng X-H. 2000. Great exploitation of the west and the basic thoughts of the great development strategy of Xinjiang. *Arid Land Geography*, 23(3): 193-198.
9. Helen Freeman. Proceedings of the fifth international Snow Leopard symposium.1988. International Snow Leopard Trust and Wildlife Institute of India. 1-269.
10. Hu Ruji. 2004. Physical geography of Tian-Shan Mt., China. China Environmental Science Press, Beijing, pp. 420-430.
11. ISLT ed. 2003. ISLT Website, SLSS Small Grants Program, ISLT E-news and Snow Leopard Information Management System (SLIMS).
12. ISLT, Fox, J. L., Gretchen Dailer and Feng Ling et al. 2002. Snow Leopards. International Snow Leopard Trust, pp. 1-18.
13. Joseph L. Fox. A review of the status and ecology of the Snow Leopard,1989. International Snow Leopard Trust 1-40.
14. Li De-hao et al. 1989. Economic fauna of Qinghai. Qinghai People's Publishing House, Xining, 624-625.
15. Li Du and Ma Ming et al. 2000. Wildlife in Xinjiang. Xinjiang Juvenile Publishing House, Urumqi.
16. Liao Y-F. 1985. The geographical distribution of Ounces in Qinghai Province. *Acta Theriologica Sinica*, 5(3): 183-188.
17. Liao Y-F. and Tan B. 1988. A preliminary study on the geographical distribution of Snow Leopards in China. *Proc. 5th Int. Snow Leopard Symp.*, pp. 51-63.
18. Lin Y-L. 1985. The mammals from Mt. Tuomur in Tianshan. Xinjiang People's Press, Urumqi , pp. 1-19.
19. Ma J-Z. and Jia J-B. 1990. Wildlife management. North-eastern Forestry Univ. Press, Harbin, pp. 1-320.
20. MaMing . 1985. The report of wildlife survey in Tomur Area. Paper of Xinjiang Agri. Univ., 1-17.
21. MaMing *et al.* 2004. Study on Snow Leopards in Xinjiang. The Training Guide Supported by ISLT & XCF, pp.1-24.
22. MaMing. 1985. Expedition to Murzat River Valley (Vols.1-4). Urumqi Evening Paper, 20th-24th Dec., 1985.
23. MaMing. 2001. The problems about conservation of wildlife animals in Xinjiang. *Arid Land Geography*, 24 (1) : 47-51.
24. Nowell, K. and P. Jackson. 1996. Wild Cats - Status Survey and Conservation Action Plan. IUCN/SSC Cat Specialist Group, IUCN, Gland, Switzerland, pp. 91-95.
25. O'Brien, Stephen J. 2003. Tears of the Cheetah: And Other Tales from the Genetic Frontier. Thomas Dunne Books/St. Martin's Press, New York.
26. Primack, R. and Ji W-Z. eds. 2000. A primer of conservation biology. China Forestry Publishing House, Beijing, pp. 1-267.
27. Qian, Y. W., Zhang, J., Zheng B. L. and Wang, S. 1965. The birds and mammals in the south of Xinjiang. Science Press, Beijing. (In Chinese)
28. Schaller, G. B. , Li Hong et al. 1988. The Snow Leopard in Xinjiang. *Oryx*, 22(4): 197-204.
29. Schaller, G. B. , Qiu M-J., Li H. and Tarlipu et al. 1985. The survey of Snow Leopard in Taxkorgan Area, Xinjiang. pp.1-18.
30. Schaller, George B. 1998. Wildlife of the Tibetan Steppe. The University of Chicago Press, Chicago.
31. Shang Y-C. 1998. Behavioral ecology. Beijing University Press, Beijing.
32. Snow Leopard Tracks. 2004. International Snow Leopard Trust 1-6.
33. Stephanie Theile. 2003. Fading Footsteps: The killing and trade of Snow Leopard. TRAFFIC International. 1-72.
34. Wang Sung ed. 1998. China Red Data Book of Endangered Animals: Mammalia. Science Press, Beijing, pp. 132-135.
35. Wang Ying-xiang. 2003. A complete checklist of mammal species and subspecies in China, a taxonomic and geographic reference . China Forestry Publishing House, Beijing, 103.
36. Xu H-F., Zhang E-D. and Song H-G. eds. 1998. Wildlife conservation and management principles and techniques. East China Normal Univ.

- Press, Shanghai, pp. 1-352.
37. Yang Q-S. 1992. Further Study on the geographical distribution of Snow Leopards in Qinghai, China. Proc. 7th Int. Snow Leopard Symp., Xining, China.
 38. Yang Q-S. and Feng Z-J. 1998. Snow Leopards *Uncia uncia*. In : China Red Data Book of Endangered Animals: Mammalia. Science Press, Beijing, pp. 132-135.
 39. Yuan G. et al. 1991. Vertebrates fauna Xinjiang. Xinjiang People's Press, Urumqi.
 40. Yuan G-Y. 1998. Natural environmental protection and nature reserves in Xinjiang. Sci., Tech. and Hygiene Publishing House of Xinjiang, Urumqi, pp. 110-119.
 41. Zhang W. and Zhang F. 2000. Beast of Prey. North-eastern Forestry Univ. Press, Harbin, pp. 1-148.
 42. Zhang Yongzu et al.. 1997. Distribution of mammalian species in China. China Forestry Publishing House, Beijing, pp. 108.
 43. Zheng Du, et al. 1994. Proceedings of International Symposium on the Karakorum and Kunlun Mountains. China Meteorological Press, Beijing, pp. 1-376.
 44. Zhou Yongheng et al. 1990. Birds and mammals of forest in Xinjiang. In: Lu and Yan eds. Forest of Xinjiang. Xinjiang People's Publishing House, Urumqi; China Forestry Publishing House, Beijing, pp. 401-446.