A SURVEY OF TIGERS AND PREY RESOURCES IN THE PAEKTUSAN AREA, LYANGAN PROVINCE, NORTH KOREA, IN WINTER, 1998

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Summary. *Over 700 km of survey routes were combined with interviews of local people to assess the status of tigers (Panthera tigris altaica), their prey and habitat in 6000 km^2 of Lyangan Province, North Korea. This high, mountainous region of North Korea, on the border of Jilin Province, China, and close to the Chinese Biosphere Reserve Changbaishan, was selected for initial surveys because it was believed to contain important tiger habitat. Eight tracks of tigers were reported on survey routes (including 5 accompanying photos) and 24 accounts of tigers came from interviews of local people who reported tracks, livestock depredation, visual sightings, and one attack on a man. One report of two leopards was filed in the southern portion of Lyangan Province. Both survey routes and information from interviews indicated that tigers occurred in all 5 districts of the Province surveyed. Three key areas that contain tigers and suitable tiger habitat were identified, as were two regions where tigers apparently move back and forth across the Chinese border. Reports on prey numbers suggest that the moderate prey densities may be sufficient to support tiger populations. Future collaborative efforts are needed.*

1. PREFACE (by Dale Miquelle)

Known as the Korean tiger in the Korean peninsula, and the Amur, Siberian, and Manchurian tiger elsewhere, *Panthera tigris altaica* is considered a traditional symbol of the Korean peninsula and its people. However, the status of the Korean population of tigers is poorly known. Long thought to be extinct in South Korea (although recent reports cast doubt on that assumption), the status of the tiger in North Korea is virtually unknown to the outside world.

However, there has been a growing interest in tigers of this region. A recent report from China (Shihe et al. 1998) indicates that there are some regions in Jilin Province, China where tigers could possibly travel into North Korea, and reports from Russia (Pikunov et al. 1997, Aramilev et al. 1998) indicate that tigers are found very close to the border of North Korea. Thus, existent information along its borders indicate that there exists the potential for exchange of animals between North Korea and adjacent countries, but whether tigers occur in North Korea, and whether there exists suitable habitat and prey, is unknown.

New opportunities for contact amongst these three countries - North Korea, China, and Russia, have arisen. Most prominent among them has been the UNDP-sponsored Tumen River Development Programme, an attempt to greatly increase trade in this region via development of a port complex in Russia, and concurrent development of transportation facilities with a reduction of trade barriers. This development project has provided both a threat and opportunity for the large cats of this tri-country region. While the planned development corridor could split the region permanently into separate, fragmented parcels of habitat, permanently rupturing linkages amongst animals across the three countries, early planning and a better understanding of the distribution of these animals may prevent such a loss.

New contacts between the sister Institutes of Geography (from the KPDR's Academy of Science and the Russian Academy of Science's Far Eastern Branch) provided an opportunity to broach the subject of cooperative survey work. Through a series of negotiations it was agreed upon that a first step in fostering this work would be an initial survey by North Korean specialists to confirm the presence of tigers in at least one region of the country. If successful, a second stage would be hopefully begin with an international team conducting more in-depth surveys.

The Wildlife Conservation Society has already demonstrated its interest in this region through its coordination and sponsorship of two surveys in southwest Primorye to better determine the status of tigers and the endangered Far Eastern leopard (*Panthera pardus orientalis*) (Pikunov et al. 1997, Aramilev et al. 1998), as well as co-sponsorship of the survey in Jilin Province, China (Shihe et al. 1998). In an attempt to develop a more complete picture of large cat distribution and status of this tri-country region, WCS provided support to insure that the collaborative work in North Korea be initiated.

Dimitry Pikunov and Anatoly Kachur were key figures from the Russian Far East Institute of Geography in Vladivostok who negotiated the first stages of this work. Pikunov made four trips to North Korea in the past year to negotiate, organize, and help implement the survey, as well as structure the report. This process led to a meeting between Dimitry Pikunov, Dale Miquelle and representatives of the KPDR Institute of Geography, including its Director, Kim Jin Rak, in August 1998, in Rajin, North Korea, to receive the report and exchange ideas for future collaborative efforts. The following is a edited version of the report that was originally submitted in Korean and Russian.

2. STUDY AREA AND METHODS

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1). Study Area

The Paektu mountain area, where the field survey for tigers was conducted, includes 5 districts of Lyangan Province (Samdzhien, Tdekhondan, Pochen, Unkhyn, and Pkhekam Districts) that total approximately 6000 km^2 (Figure 1). The region is situated between the 41st and 42nd meridians and 128th and 129th parallels. The total length of the area north to south is 108 km, while from east to west it is 81 km wide.

The area is a typical higher elevation region which borders on northeast China (Manchuria), the Amnok and Tumen rivers to the north; touches the edge of the Pudzhon Mountain Range in the south and Khamken Mountain Range in the northeast. Forest cover of the Khamken Range continues northeast to the border of Primorsky Krai, Russia. In the west there is a gradual transition into the Kama upland and the Ranlim Mountain Range, which is also one of the primary habitats for tigers in Korea.

Within the study area, Dzhangun Peak, at 2750 m, is the highest point, with mountains such as Nampkhotkhe, Pukpkhotkhe, Sobek, Kuesan, and Turu all reaching more than 2000 m. Many other 1000 m mountains and volcanic drift plateaus occur in the region. The Paektu Ioltusamchelly plateau is distinguished by unusually flat terrain.

Within the survey area there are a number of protected areas: Paektusan Special National Park for Protection of Military Monuments of the Revolution, whose territory coincides with Paektusan International Wildlife Biosphere Conservation Park; Tonges National Park for Fauna Conservation (Pkhekam District), Takhy National Park for Fauna Conservation (Pochen District) and Tongesu National Park for river mallow conservation (Pkhekam District). Species of this region which are federally registered in the Red Book as endangered include the Korean tiger (registration number 357), Pkhekam deer (registration number 362), Samdzhien deer (registration number 349), and Tdekhondan wild goat (registration number 356).

2) Methods of data collection

Work was conducted during the 1998 winter.

There are 5 administrative subdivisions (Districts) in the research area (Figure 1); a work group was assigned to each of the districts, and a coordinator was assigned, as follows, to each of the Districts:.

Kim Ren Sen	Samdzhien District
Pak Dzhe Ung	Tdekhondan District
Kim Chen Kir	Pkhekam District.
Le Chzhon Sen	Pochen District
Le Dzhe Kil	Unkhyn District

Besides scientists, rangers and local citizens familiar with wildlife of the area took part in the surveys.

During the first stage of the survey, local people were interviewed about occurrences of tigers in the region, areas inhabited by tigers, livestock depredation and sign (tracks/signs) of their activity.

During the second stage, field routes were traveled and tracks of tigers and other large animals (mainly ungulates) were reported on topographic maps (scale 1:50,000 and 1:25,000)..

For adequate representation of routes throughout the entire study area, each district was divided into subunits, each of which included at least one route. A total of 28 routes were surveyed (Figure 2).

In the most cases routes were situated along river bottoms or ridges, where animal trails were most likely. The average length of survey routes was 25 km, and the combined length of all routes exceeded 700 km.

On survey routes great attention was paid to tiger tracks, and in most cases photos of tracks were taken (the five most distinct tiger tracks were photographed with a ruler, for scale, placed next to the track) (Figures 5-10). Photographs of tiger tracks were also taken to demonstrate pattern and direction of an animal..

The following track measurements were made:

width and length of paw;
width of pads;
stride length
bed length (where animals laid down in snow).

Results of measurements and observations were recorded in a field diary and mapped. Date and direction of a tiger's passage were determined and scats were identified. Depth of snow cover was measured in centimeters and information on date of last snow was collected at the place where tiger tracks were found.

Data on ungulates tracks, including species, number, and direction of tracks were reported. Intersections between tigers and other large animals were mapped and species were identified and recorded. The number of tracks/10 km of route and number of animals/10 km^2 are given as an index of tiger and ungulate habitat density. The results of interviews of local citizens, as well as information on tigers and ungulates were summarized in tables and separately on maps.

Each coordinator summarized findings separately in a report with figures for each of 5 districts. Later a summary report was drawn up on the basis of these reports. Existing and probable tiger habitats were defined, and those areas in need of protection both at national and international levels were delineated.

3. RESULTS

Samdzhien District

In the north and west this district borders on China with the Amnok and Tumen rivers; Pochen and Tdekhondan Districts are to the south and east. The district covers about 22% of the total survey area (1320 km^2), and 95% of the district (1254 km^2) is forest covered.

The Paektu volcanic mountain range lies in the middle of the district to the northwest, and drift plateaus spread in both directions down off the crest line with elevation gradually decreasing. Most of this district is included in the Paektusan International Wildlife Biosphere Conservation Park. This International Wildlife Park has good habitat for tigers, with comprehensive measures taken for conservation of the Korean tiger.

In this district four field routes were traveled (Figure 2) and tiger tracks were found in two places (Figure 3): at the foot of the Pkhote Mountain (route 2) and in the saddle between the Sobek and Sampkho Mountains (route 3) (Table 1).

According to information obtained from interviews of local citizens, there had been visual sightings of tigers as well as livestock depredations by tigers (Table 2). Two years ago a female tiger with two cubs was observed in their den at the foot of cliff. In the forest near the Mudubon and Sandubon hills local citizens observed seasonal movements of tiger between Korea and China in association with seasonal migration of deer, roe deer, and other prey.

Density of ungulates and large birds in Samdzhien District was as follows:

0.6 - 1.0 deer/10 km^2
1.5 - 2.0 musk deer/10 km^2
1.0 - 1.5 wild sheep/10 km^2
5 - 7 red deer / 10 km^2
2 - 2.6 wild boar/10 km^2
5 - 7 sika deer / 10 km^2
5 - 8 pheasant /10 km^2
2 - 3 black grouse / 10 km^2.

Tdekhondan District

This district is located in the northeast corner of Lyangan Province; Samdzhien District is to the west, Pkhekam District to the south, and Yensa District (Khamken northern Province) to the east, as well China and the Tumen River to the north. The district represents 11 % of the survey area (660 km^2) with 82% of the district forest-covered (541 km^2). Forest cover mainly consists of larch and birch. Part of the district is included in the Paektusan Wildlife Reserve for Korean tiger conservation.

From a geomorphologic perspective the district is a kind of drift plateau with volcanic cones of more than 1000 m elevation, including Chanchen (1526 m), Talown (1489 m), Chyn, and Purun Mountain, as well as others. The average elevation of the district is 1210 m.

Within the district there were 5 survey routes (Figure 2), and tiger tracks were found on one of the routes (route 4) near Chanchen Mountain (Figure 3, Table 1).

According to interviews in the last years 2-3 tigers have regularly inhabited the area next to Chanchen Mountain (Table 2). Not far from the Kuanmo and Purumbon Mountains tiger tracks were found on a peasant farm near a livestock pen. According to the report of a local citizen who walks 12-16 km daily along a remote area at the foot of Janum and Sanoun Mountains, tiger tracks in snow have been found every year for the last 5 years, and their winter migration from the Chinese taiga has also been noted.

The district is notable for an abundance of roe deer and wild boar: roe deer density is 3-5 individuals/10 km^2 and wild boar density is 2-3 individuals/10 km^2. Deer are distributed to the foot of Pukphota Mountain and here the density of ungulate is 0.2-0.5 individuals/10 km^2. Tkhakondan wild sheep, recorded in the Red Book, have a density in the district of 1.0-1.5 individuals/10 km^2.

Many bears occur in the forests of this district and they often go down to the Sotusu river for fishing. Suitable tiger habitat probably exists in the taiga forest covering Chanchonsan, Kuanmosan and Purunbon. In the area of the extinct volcanoes Taroun and Soroun, tigers are seasonally present.

Pkhekam District

This district is located in the eastern part of Lyangan Province and includes nearly the entire basin of the Sotusu River. Largest of the districts within the Province, it represents 35% (2100 km^2) of the study area. Forests cover 96 % (2016 km^2) of the district. The Sotusu River flows northward and divides the district area into nearly equal eastern and western parts.

The eastern half of Pkhekam District represents the western slope of the Khamken Mountain Range and its western half the eastern slope of the Paektu Range, which, being of volcanic origin, has rather gentle slopes, similar to a slightly sloping drift plateau. The average elevation of the district is 1550 m. Forest cover includes subtropical conifers and coniferous-broadleaved forests.

Within this district Tonges National Park for Fauna Conservation (199 ha) was established to protect more than 40 species of mammals, including wild boar and deer, and more than 100 species of birds, most important of which is the pheasant.

Seven routes were surveyed in the district (Figure 2) and tiger tracks were found in two places (routes 4 and 5) not far from the Tonges Reserve (eastern valley) near the crest of the mountain ridge along the Kuesanbon and Koesanbon peaks (Figure 3, Table 1).

On November 27th, 1997, Kim San Nam (age 64), a ranger who lives in Syanyan town of Pkhekam District, found a dead tiger with a rotten belly at the foot of Mantu Mountain in the Techagol valley, near the source of the Sotusu river (Table 2). Local citizens found three cubs in Kuesanbon and Mantabsan mountain areas in 1992. There were also cases where local citizens unexpectedly met a tiger while working in the forest, an incidence of livestock depredation by a tiger (Table 2).

Animal densities in the district are:

0.3-0.6 deer/10 km^2
0.5-0.9 moose/10 km^2
7-9 roe deer/10 km^2
1.5-1.0 wild sheep/10 km^2
1.5-2.0 musk deer/10 km^2

Additionally, in lowlands and at the foot of high elevations areas hares, badgers, wild boar and other animals can be found.

Within the Pkhekam District tigers regularly occur in the southern part of the Khamken Mountain ridge where Kuesanbon and Mantusan peaks are located.

Pochen District

Pochen District borders Samdzhien and Tdekhondan to the north, Pkhekam District to the east, the town of Khesan and Unkhyn District to the south, and in the west the border with China is formed by the Amnok river. The district covers 13% (780 km^2) of the study area, and 86 % (671 km^2) of the district is forested, primarily with subtropical conifers and coniferous-broadleaved forest types.

This district is comprised partly of the west slope of the Paektu Mountain Range and partly the Paektusan drift plateau. The average elevation is 1300 m.

In the district area Takhy National Park for Fauna Conservation was established to protect deer, musk deer, wild sheep and more than 100 birds that inhabit and breed in the region.

Three field routes were surveyed here (Figure 2), and tiger tracks were found in Sambesan valley near the town of Sambon, not far from Amusan Mountain (Figure 3, Table 1). According to information from local citizens tigers occurred in the Chenkhabon, Amusan and Nurynbon mountainous areas (Table 2). Depredation of (domestic) deer by tigers

occurred in a deer pasture in the valley of Samlyonry town in 1997. The same year a tiger appeared in a lonely peasant house and fear apparently drove its owner mad. Two years ago in the same valley an accountant of the local cooperative farm incidentally found a tiger cub and brought it home with him. However, soon after a female tiger came looking for its lost cub and the man had to return it.

Ungulate densities within the district were:

1.5-1.8 musk deer/10 km^2

6-7 roe deer/10 km^2

It is known deer live in upper basin of the Karimchon river.

Unkhyn District

This district is located in the Unkhyn river basin, a tributary of the Amnok river. The district has Pochen District as a northern border, Pkhekam District to the east, and Kapsan District and Tanchon town (north Khamken Province) to the west and south. The district covers 19 % (1140 km^2) of the total study area., and forests cover 90 % (1026 km^2) of the district.

The District occupies the southern part of the Paektu Mountain Range, and the average elevation in the district area is 1425 m.

Four survey routes (Figure 2) revealed the location of two tiger tracks (Figure 3, Table 1).

According to local eye-witnesses, in past years tigers have on several occasions come through the Seke pass not far from the town of Pukamnry in the area of Nurynbon Mountain. Tiger tracks can be found in the same area sometimes (Table 2). Tracks were also found in the area around Tedginpkhenry town which borders the above mentioned pass. A couple of leopards which appeared in the same pass inflicted depredation losses on a hut. Tigers have been reported around the Tondgemren pass area.

Within the district ungulates such as roe deer, deer, and wild boar mainly inhabit the Paektu Mountain Range slopes. Bears are found in the forest around the Tondgemren pass. Roe deer and moose inhabit the area around Nurynbon and Peksanbon Mountains and their densities range from 7-9 individuals/10 km^2 and 0.65-0.9 individuals/10 km^2 respectively.

Analysis of survey results

Based on results of all the surveyed districts it is possible to summarize tiger distribution and habitat, as well as their seasonal patterns of movement (migration) (Figure 4) for the Paektusan area.

Of the 6000 km^2 of the survey area, nearly 92% (5508 km^2) is forest covered. Eight tiger tracks were found on eight separate survey routes in all five districts of the Province, and there were 24 reports of tigers based on interviews of local people (Table 2, Figure 3).

Three regions are considered good habitat for tigers in the survey area:

1) The first of these high quality regions for tigers is in the area including the Photesan. Kuanmosan, Chanchonsan and Purunbon Mountains that represents the border zone between 4 of the districts (Samdzhien District, Tdekhondan District, Pkhekam District, and Pochen District) (Figure 4). The area coincides with the Paektusan International Wildlife Biosphere Conservation Park, is almost untouched by man's activity, and has dense forests, rocky cliffs, fragmented cliffs and caves. High densities of ungulate populations, key prey for tigers, are typical for this area.

2) The second quality tiger habitat is the south part of the mountain range which includes the Kuesanbon, Koesanbon and Mantusan mountains in Pkhekam District (Figure 4). This area is the last part of the Khamken mountain range, which is one of the most important tiger habitats that serves as a link between the Paektusan area and the Chilbosan mountainous country and its reserve for tiger conservation.

3) The third area with suitable tiger habitat is the Nurynbon Amusan mountains in the Chenhanbon area, administratively situated within both Pochen and Unkhyn Districts. All these regions are situated in middle portions of river basins punctuated with high relief.

Seasonal tiger movements are observed in Sampkhosan-Sobeksan and Teroynsan-Sambon areas (Figure 4). These movements occur along the frontier because ungulates seasonal migrate back and forth across the border. Tiger movements were also observed in the Tondgomlen area. This area is connected with the Puchonlen Mountain Range by means of a forested mountain range and further with the Ranlim Mountain Range and its Vagalbon Reserve for tiger protection.

Tigers of this region probably range widely. In the survey area tigers inhabit areas that range from 800 to 1600 m above sea level, seasonally migrating down in winter then up in the summer. In this elevation range coniferous-broadleaved and subtropical coniferous forests prevail. Prey of the Paektusan area also seasonally migrate. With deep snows in winter roe deer and wild boars inhabiting the Sobeksan, Photesan, Tekhondan, Khantubon and other mountains of Paektu Mountain Range migrate to the feet of these mountains or to their southern slopes. Tigers follow these seasonally migrating ungulates. Moose, deer and roe deer inhabiting the Kanbeksan, Sanpkhosan, Mudubon and Sinmusan mountains migrate to China in winter when the area is totally covered with deep snow, and come back with thawing of the snow in spring. Thus migrations of these ungulates lead to migrations of tigers.

4. CONCLUSIONS

Results of this research have elucidated the present distribution and status of the tiger and its preys in the Paektusan area. The survey verified the existence of tigers, and suitable tiger habitat in the area. In spite of the short and late field season (20 days in March), sufficient numbers of tiger tracks were found in the area to conclude that a large number of tigers inhabit this region.

Survey results (along with already existing data on prey density) showed an abundance of prey resources for tigers in this area and extensive suitable habitat. Information from interviews suggest that reproduction is occurring. Existing information suggests that tigers move long distances in winter, when they travel into the Chinese frontier zones and make long passages into Sonkhasky Krai, returning in the spring to the Paektusan area.

We thank D. G. Pikunov and I. G. Nikolaev for their assistance in making our mutual work successful, and hope for a further expansion and deepening of this cooperation.

5. LITERATURE CITED

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Table 1. Reports of tiger tracks on survey routes in Lyangan Province, North Korea, March 1998.

Track #	Route		Location of observation	Track measurements					Name of field worker who identified track
	District	# Date		Age of tracks	Pad width (cm)	Total track length (cm)	Total track width (cm)	# animals	
1	Samdzhien	3 March 21	Samphosan Mt.	< 2 weeks	9	15,5	15	1	Kim Len Sen
2	Samdzhien	2 March 25	Pukphotasan Mt.	< 2 weeks	9,6	16,6	16	1-2	Han Chan Num
3	Tdekhondan	3 March 19	Chanchonsan Mt.	< 1 week	8,5	14,7	14,2	1	Pak Zae Un, Chen Chan
4	Pkhekam	4 March 20	Samyan village	> 1 week	7,5	16,1	15,9	1	Kim Chen Kil, Chen En Su
5	Pkhekam	5 March 24	Tachakol valley	> 5 days	9,3	14,2	14	1	Kim Chen Kil, Chen En Su
6	Pochen	2 March 18	Sombonry town, foot of Sambesan Mt.	< 1 week	8,7	15,2	14,5	1	Le Dzhon Sen, Le Bon Nam
7	Unkhyn	1 March 22	Tandginpenry town, foot of Murynbon Mt.	< 1 week	8,9	15,3	14,4	1	Le Dzhae Kil, Chen Hek Sam
8	Unkhyn	3 March 23	Lenamry town, Sinzensu River	< 1 week	10,1	17	16,9	1	Le Dzhae Kil, Chen Hek Sam

Table 2. Information gathered from interviews of local people on tiger sign, visual sightings, and depredations in Lyangan Province, North Korea in winter, 1998.

District	Route	Date	Location of observation	Interviewee			Type of information
				Name	Age	Occupation	
Samdzhien	5	Nov-96	West slope of Santubon Mt	Kim Chel Su	55	Ranger in Sinmusen town	Tracks in Muson hill direction
	4	Oct-95	Kanbeksan Mt	Kim Ben Nam	46	Ranger	Visual sighting during patrol
	3	Nov-95 Feb-97	Sampkhosan Mt	Han Bok Man	56	Logger, timber enterprise	Livestock depredation caused by tiger
	2	Jun-95	West slope of Kuanmobon	Le Dok Ku	61	Forester	Female tiger with cubs occured at cliff precipice
	1	Nov-96	South slope of Namphotasan	Pak En Chel	57	Ranger from Photery town	Tracks of 2 tigers
	2	Nov-97	North slope of Pukphotasan Mt	Nak Yen Chel	57		Tracks in upper Photachon River
Tdekhondan	4	Mar-94	Chenchonsan Mt	Kim Yen Chel	39	Worker in seed-fund conservation,Tahanry town	Tracks along forest path
	4	Feb-97	Chanchonsan Mt, Tehyn town	Le Kil Su	55	Worker, Tehyn	Tracks along upper Sohondansu River
	3	Jun-96	Uonbon town, Sodonsukol valley	Sin Chen Su	46	Worker, timber enterprise	2 sheep killed
	1	1990-1995	Tenounsan Mt	Yun Chan Su	49	Teacher, agricultural college	Tracks seen on way to work and back
Pkhekam	6	Nov-97	Sandory town, upper Satusu R.	Kim San Nam	64	Pensioner, Sanyan town	Dead tiger in forest
	5	Apr-96	Sanyan town	Kim Chol Nam & Han Chol Hun	39, 52	Pakam timber enterprise	Visual sighting on river bank
	5	Sep-95	Kuesanbon Mt, Lyanhun town	Kim Ken Ho	57	Lyanhun town	3 cubs in forest
	2	Sep-97	Sindgenry town	Le Ben Sen	52	Farmer, agricultural coop	Livestock depredation
	3	May-96	Upper Tonkesu river	Sin Sen Lok	39	Reviewer, district committee	Attack on man
	7	Apr-97	Tokrim town	Sin Men Ke	62	Pensioner, Tokrim town	Tracks near pond
Pochen	1	Feb-98	Tepkhenry town	Kan Yen Su	61	Forest guard	Tracks at foot of mountains
	2	Oct-97	Amusan Mt, Sanlyonry town	Hon Lak Ken	42	Accounter, farm	Meeting with cub, deer farm depredation
	3	Feb-97	Purynbon Mt, Taphenry town	Pak Ton Su	47	Ranger, Tahyn reserve	Tracks twice
	2	Nov-97	Chenhabon and Amusan Mts, Lendokry town	Ben Chan Hak	48	Guard, Lendok forestry unit	Tracks on river banck
Unkhyn	1	Feb-98	Tendzhinphenry town	Sin Men Chol	45	Worker, timber enterprise	Tracks on plateau
	2	1995	Pomdon town, Sokkery town	Kim Kuk Chel	53	Superviser,Land Protection Administration	Visual sighting on Sekkelen pass
	2	Mar-97	Namdon and Sokkery towns	Lo Eu Su	57	Farmer	Tracks in Sokkelen pass, evidence of A pair of leopards near a pasture hut
	3	Nov-96	Lenam , upper Lenphochen R.	Kim Chel Hun	61	Forest guard,Lenphory town	Tracks on river shore

Table 3. Ungulates and other mammal tracks identified on survey routes in Lyangan Province, March 15-30, 1998.

				Number of tracks								
District	Route #	Date surveyed	Name	Roe deer	Deer	Mt. hare	Moose	Bear	Mt. sheep	Badger	Hare	Raccoon dog
Samdzhien	1	March 16-18	Kim Len Sen	6	2	2	1	1	2			
	2	March 19-21	Le Chel Han	7	3	2	2	2	3			
	3	March 22-24	Han Chan Nam	4	2	4	3	2				
	4	March 25-29	Kim Ku Num	5	1	3	2	3				
	5	March 29-30		3		1	2	1				
Tdekhondan	1	March 17-18	Pak Zae Un	4	2	1	2		3			
	2	March 20-21	Chen Te Uon	5	3	2	1	2	2			
	3	March 22-24	Chen Chan Il	6	1	1	2	2	3			
	4	March 25-27		4		1		3	2			
	5	March28-30		3	3	1		2	4			
Pkhekam	1	March 15-18	Kim Chen Kil	4	1	2	1		2	1		
	2	March 19-20		4	1	1	1	1	2	2	2	
	3	March 21	Son Chan Il	9	2	3		1	3	4	6	2
	4	March 22	Chen En Su	8	3	4		2	4	3	4	2
	5	March 24-26		5	2	1			3	5		1
	6	March 27-28		3	1	1		1	2	4	6	2
	7	March 29-30		3	2	1	1		2			
Pochen	1	March 18-20	Le Chon Sen & Han Chen I	5	3	1	2	1	2	1		
	2	March 23-25	Le Bon Nam	7	3	2		1	2	2		
	3	March 26-28	Kim Chon Sik	6	2	1	1		2	1		
Unkhyn	1	March 17-19	Le Zae Kil	5	2	2			3	4		5
	2	March 19	Chen Hak San	6	1	1			4	2		4
	3	March 21-22	Son Lyu Il	4	3	2		2	3	5		2
	4	March 24-27		7	2	4		3	4	3		5

Figure 1. Location of Lyangan Province and 5 districts surveyed for tiger distribution and abundance in North Korea, during the 1998 winter

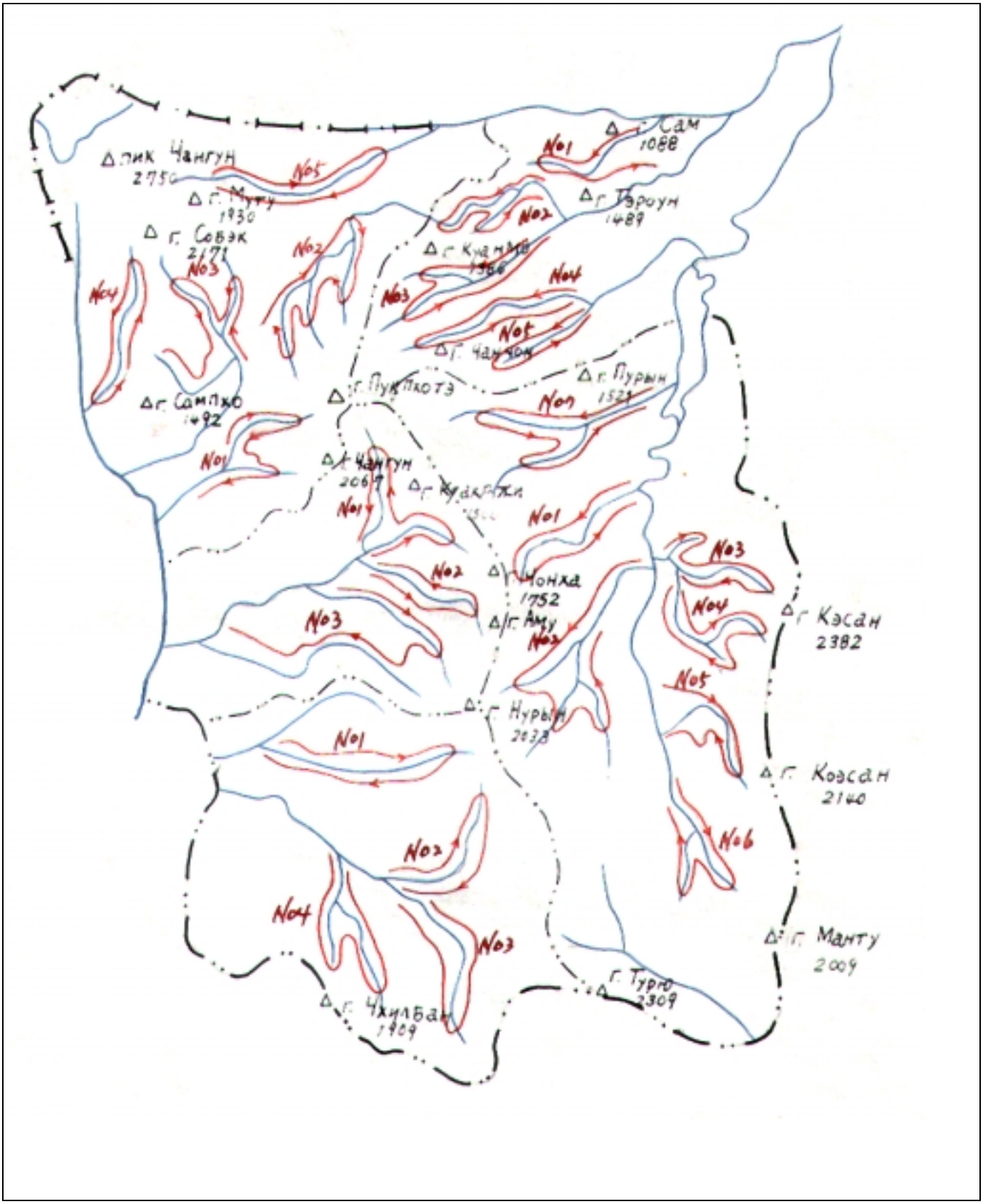

Figure 2. Delineation of routes traveled in 5 Districts of Lyangan Province to assess tiger distribution and abundance in North Korea, in 1998

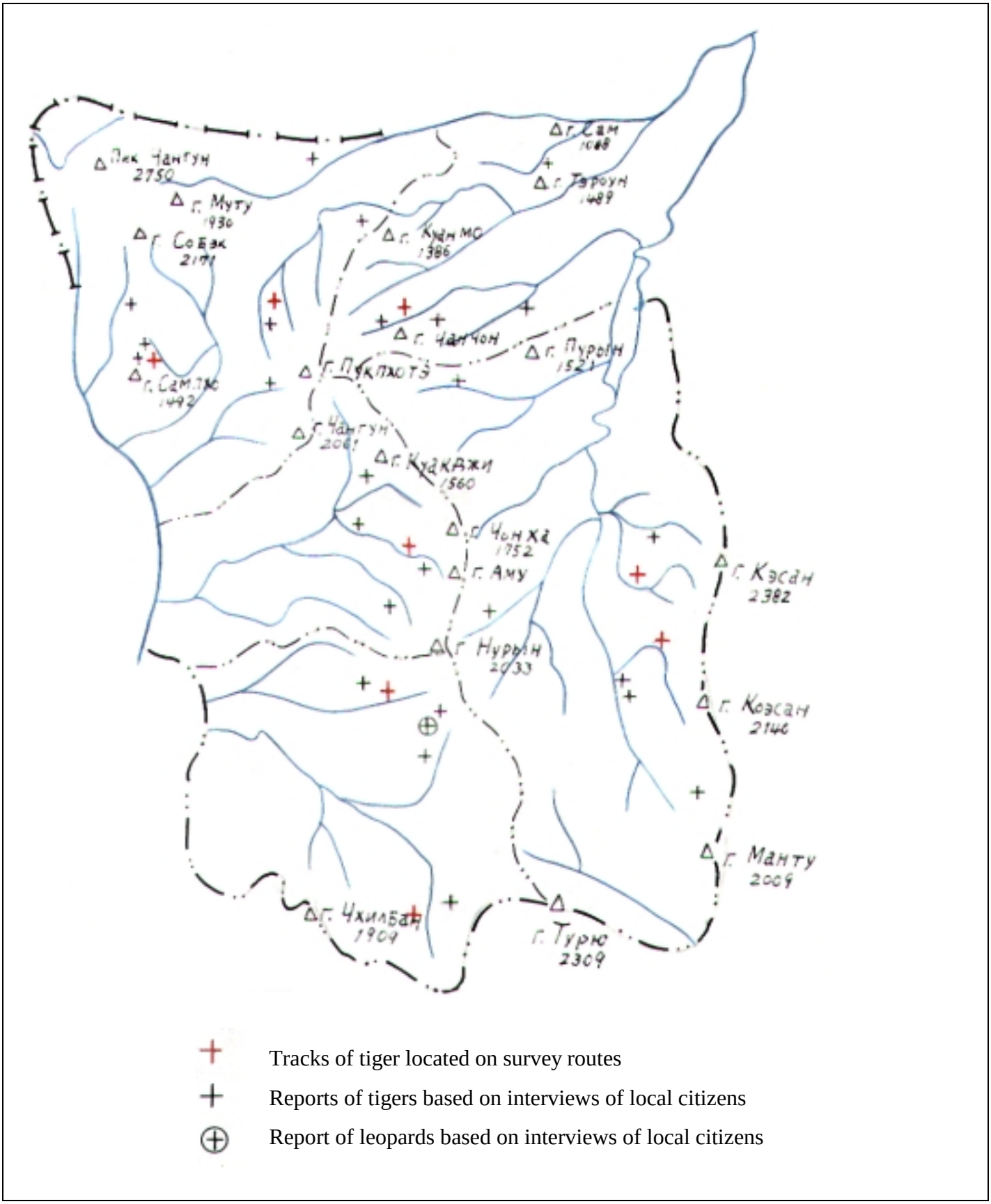

Figure 3. Locations of tiger tracks identified along survey routes, reports of tigers by local citizens, and report of leopards in 5 Districts of Lyangan Province, North Korea

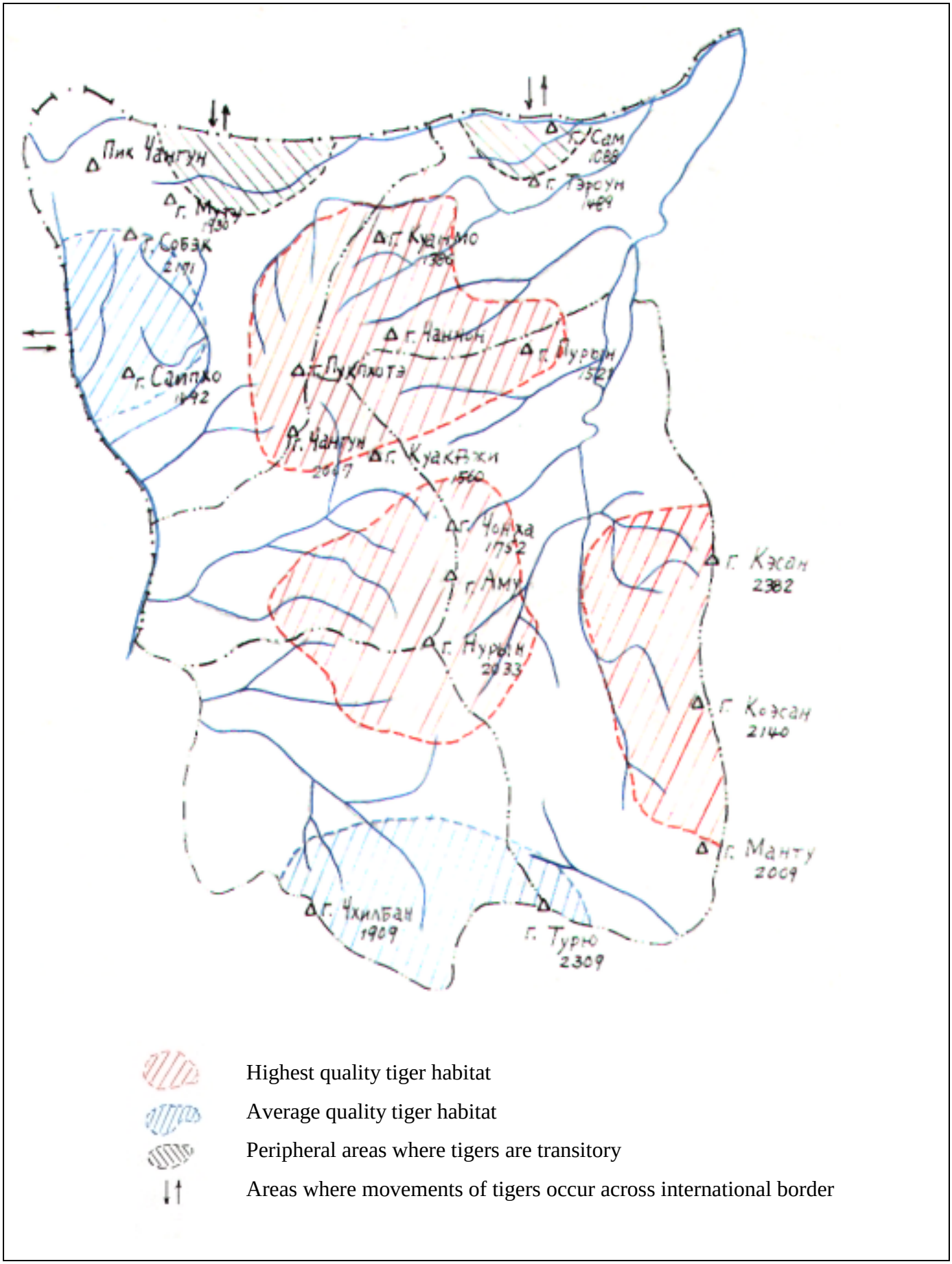

Figure 4. Suitable tiger habitat in the Paektusan Area of Lyangan Province, North Korea

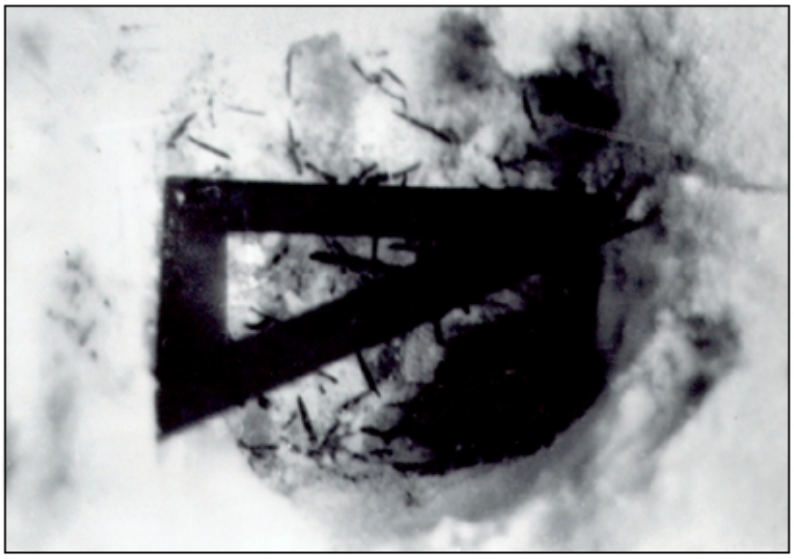

Figure 5. Tiger track located in Samdzhien District (Route 2)
Рис. 5. След тигра, найденный в уезде Самджиен (маршрут № 2)

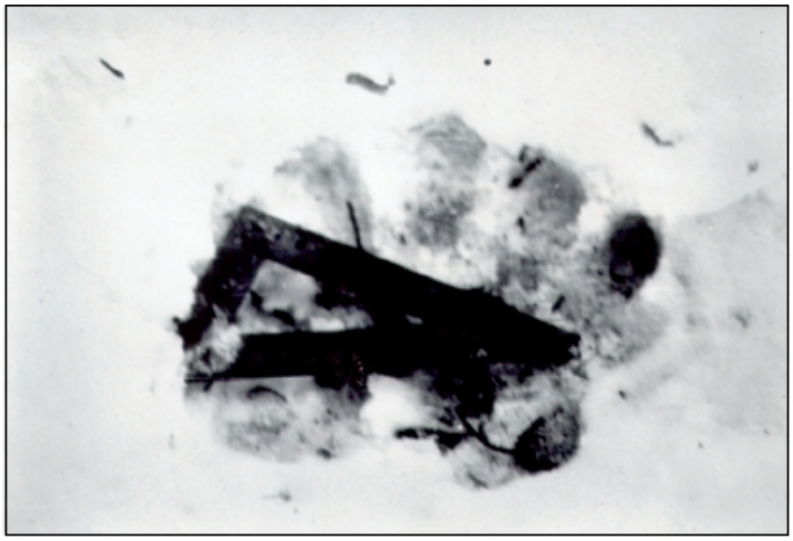

Figure 6. Tiger track located in Tdekhondan District (Route 3)
Рис. 6. След тигра, найденный в уезде Тэхондан (маршрут № 3)

Figure 7. Tiger track located in Pkhekam District (Route 5)

Рис. 7. След тигра, найденный в уезде Пхэкам (маршрут № 5)

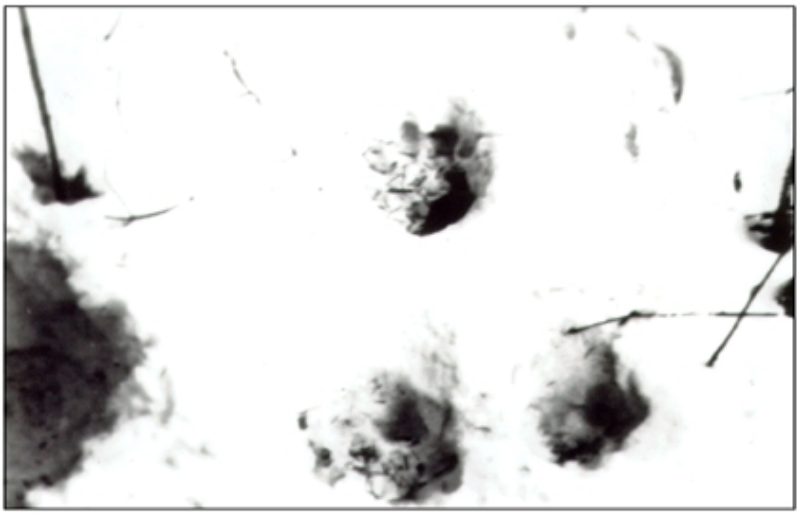

Figure 8. Tiger track located in Pochen District (Route 2)

Рис. 8. След тигра, найденный в уезде Почен (маршрут № 2)

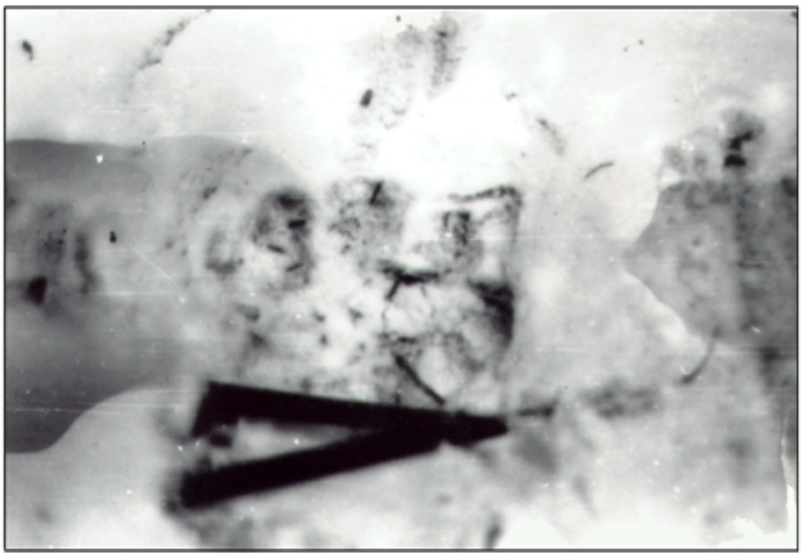

Figure 9. Tiger track located in Unkhyn District (Route 1)
Рис. 9. След тигра, найденный в уезде Унхын (маршрут № 1)

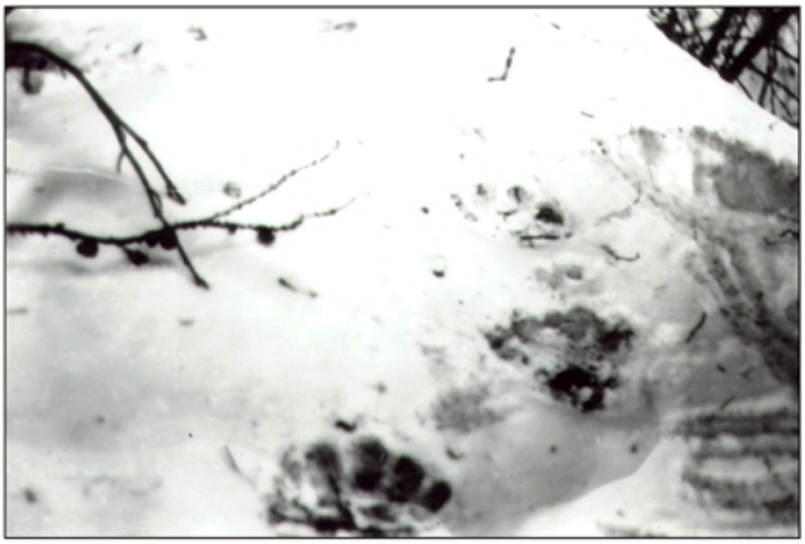

Figure 10. Tiger track located in Pkhekam District (Route 4)
Рис. 10. След тигра, найденный в уезде Пхэкам (маршрут № 4)