



WWF's mission is to halt the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

www.wwf.ru/altay

WWF Altai-Sayan Ecoregional Office

Address: Office 219, 89 Kirenskogo Street, Krasnoyarsk, 660041

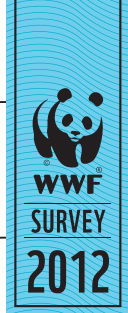
Phone: +7 (391) 291 35 65, Fax: +7 (391) 290 04 02



SNOW LEOPARD CONSERVATION IN RUSSIA



www.wwf.ru/altay



**M.Y. Paltsyn, S.V. Spitsyn,
A.N. Kuksin, S.V. Istomov**

SNOW LEOPARD CONSERVATION IN RUSSIA

**Data for Conservation Strategy
for Snow Leopard in Russia 2012-2022**

**Krasnoyarsk
2012**

Snow Leopard Conservation in Russia / M.Y. Paltsyn, S.V. Spitsyn, A.N. Kuksin, S.V. Istomov. – Krasnoyarsk: WWF Russia, 2012. – 100 pp.

This publication reviews potential actions for the long-term conservation of snow leopards and their habitat in Russia in conditions of anthropogenic influence and climate change in high elevation ecosystems. This edition is the result of many years of research conducted in the framework of WWF's "Ensuring the long term protection of biodiversity in the Altai-Sayan Ecoregion" (1998-2011) and the United Nations Development Program (UNDP) financed by the Global Environment Facility "Conservation of Biodiversity in the Russian portion Altai-Sayan Ecoregion" (2005-2010).

The publication contains materials needed to prepare a Russian Snow Leopard Conservation Strategy and was prepared for use by the Russian Ministry of Natural Resources to develop comprehensive priority conservation measures to protect this species. In addition, this publication is intended for protected area specialists and staff at federal and regional government agencies responsible for the conservation and monitoring of species listed in the Russian Federation Red Book.

Reviewer: B. Munkhtsog, Candidate in Biological Sciences, staff scientist at the Institute for Biology, Mongolian Academy of Sciences, and president of the Mongolian Snow Leopard Center.

Translation to English: J. Castner.

At full or partly coping of this publication reference to WWF is required.

This publication was made possible under financial support of MAVA Foundation's Protected Areas for Living Planet Program.

UNDP is the UN's global development network, an organization advocating for change and connecting countries to knowledge, experience and resources to help people build a better life.

This publication is available free of charge on request.

© United Nations Development Program, 2012.

© World Wildlife Fund, 2012.

CONTENTS

FOREWORD	4
CLASSIFICATION OF THE SNOW LEOPARD	
Russian, English, and Latin names	7
Taxonomic status	7
SNOW LEOPARD DISTRIBUTION AND POPULATION IN RUSSIA	8
SNOW LEOPARD BIOLOGY AND CONSERVATION PREREQUISITES	
Biology and reproduction	34
Habitat requirements	37
Diet and prey base	41
Response to humans	46
LIMITING FACTORS	47
Direct factors of influence	47
Snow leopard killing due to poaching	47
Snow leopard deaths due to livestock attacks	53
Live capture of snow leopards for captivity	54
Infectious disease	56
Indirect factors of influence	57
Decreases in snow leopard prey base populations	57
Development of economic infrastructure and habitat destruction	58
STATUS OF SNOW LEOPARD PROTECTION	
Legal basis for enforcement	60
Primary international conservation conventions and agreements	60
National laws	60
<i>Red Books</i>	60
<i>Legal and other regulatory acts in the Russian Federation</i>	61
Protected Areas	64
Raising snow leopards in captivity	71
HIGH PRIORITY SNOW LEOPARD CONSERVATION MEASURES	72
Developing international cooperation	72
Improvements in legal and regulatory sphere	75
Development of a network of protected areas	77
Increasing the effectiveness of snow leopard protection outside of protected areas	77
Scientific research	82
Monitoring the status of key snow leopard populations	84
Outreach and education activities	88
COLLABORATION FOR SNOW LEOPARD CONSERVATION	91
LITERATURE	92

FOREWORD

The snow leopard (*Uncia uncia* or *Panthera uncia*) is the only species of large cat capable of living in difficult mountain conditions. One of the rare cat species, it has persisted thanks to its habitat in the remote mountains of Central Asia. As a species, the snow leopard is relatively poorly known and has remained a mystery to researchers for many years. Even now little is known of the biology and ecology of this rare predator, and the animal's population in its current range is only broadly estimated. Few have the opportunity to glimpse snow leopards in the wild. Its invisible presence is more often indicated by the tracks of this cautious predator. Snow leopards are listed in the International Union for Conservation of Nature's (IUCN) Red Book and are classified as rare or endangered in all 12 of these countries within its current habitat range.

The snow leopard is at the top of the ecological pyramid in Central Asia's mountain ecosystem. For this reason, sustainable populations of snow leopard are directly connected to the conservation of mountain-steppe and mountain-tundra biomes, areas that have been inhabited by humans since ancient times and that are vital to the survival of Asian nomadic peoples. For many Asian peoples the snow leopard is a symbol of strength, nobility, and power. Its image can be seen on the coats of arms of a number of different Central Asian cities.

In Russia the snow leopard is at the northern edge of its modern range and has only a few sustainable groups of animals in optimal habitat areas – the mountains of the Altai-Sayan Ecoregion. Russia's population of snow leopards comprises just 1-2% of the total species population. Snow leopard survival in Russia depends to a significant degree on the preservation of spatial and genetic connections between Russian populations and the main population nucleus in western Mongolia and perhaps northwestern China. As in the other countries in its modern range, the main threats to snow leopards in Russia are deaths caused by poachers and herders, loss of prey base, and in some cases, loss of habitat related to the development of mining and transportation infrastructure. Snow leopard body parts are often used in traditional eastern medicine as a substitute for tiger parts, and the animal's fur is of great value for luxury seekers. The significant popularity of snow leopard products in illegal trade is a serious concern for the species' future. The preservation of this northernmost population of snow leopards living in Russia – animals that are well adapted to hostile environmental factors at

the edge of the species' range – is an important component of efforts to protect this species and its genetic diversity in Central Asia.

The necessity of snow leopard conservation in Russia is further strengthened by legislative and other regulatory acts. Snow leopards are inscribed in the Russian Federation Red Book. Legal regulation of its protected status is ensured by the federal laws “On the conservation of the environment”, “On the animal world”, and “On specially protected natural territories”, as well as by the international agreements “Convention on Biological Diversity” and “Convention on international trade in endangered species of wild fauna and flora” (CITES) to both of which the Russian Federation is a signatory. Moreover, conservation measures for snow leopards are also affirmed in a decree by the Russian Ministry of Natural Resources dated 6 April 2004 (#323), “Strategy for the protection of rare and endangered species of animals, plants, and mushrooms” as well as in other documents.

In 2002, the Ministry of Natural Resources of the Russian Federation approved the “Strategy for Snow Leopard Conservation in Russia”. This document was based on relatively limited expertise in the protection and study of snow leopards in Russia and it laid out general principles for the species' conservation in our country over the long term. That Strategy estimated the Russian snow leopard population at approximately 150-200 animals. However, further research conducted in snow leopard habitat between 2003-2011 has shown that the true population of the species in Russia is only half as large, possibly even smaller.

As a result of that Strategy's implementation over the course of 2002-2011, the distribution and population of key Russian populations of the species residing in Altai and Tuva Republics and southern Krasnoyarsk Krai were identified. A Snow Leopard Monitoring Program in Russia (2009) was developed with support from UNDP/GEF and WWF, and modern methods such as camera-trapping and DNA analysis began to be used in the study of key snow leopard populations. Anti-poaching activities aimed primarily at fighting illegal snare-trapping in snow leopard habitat were implemented. A series of new protected areas in snow leopard habitat was established including Sailyugem National Park, Ukok Quiet Zone Nature Park, and Ak-Cholushpa in Altai Republic, Shuysky Nature Park in Tuva Republic, and the federal Pozarym Nature Refuge in Khakasia Republic. A series of successful projects to reduce conflicts between snow leopards and herders in western Tuva took place. Small business development is underway, focusing mainly on ecotourism and rural tourism to employ local residents living in snow

leopard habitat as an alternative to poaching. Collaborative efforts between Russia and Mongolia were begun to study and protect transboundary populations of the species. As a result of these and other activities, key snow leopard populations in Russia have been kept at stable levels and even increased slightly in southwestern Tuva.

Thanks to more precise data on the location and numbers of snow leopards in Russia, significantly increased experience in protecting this species, and changes in socio-economic conditions in Russia, there is a need today for a new edition of the Strategy for Snow Leopard Conservation in our country. This publication summarizes snow leopard research and conservation in Russia and contains the necessary materials to develop an updated Strategy. It is the result of many years of study conducted within the framework of a Worldwide Fund for Nature (WWF) project (1998-2011) and UNDP/GEF (2005-2010) in the Altai-Sayan Ecoregion.

A number of Russian specialists participated in the preparation of this publication, working over a period of 8-10 years to monitor and protect key groupings of snow leopards in the Altai-Sayan region: M.Y. Paltsyn, WWF-Russia; S.V. Spitsyn, Altaisky Nature Reserve; A.N. Kuksin, Ubsunurskaya Kotlovina Nature Reserve; and S.V. Istomov, Sayano-Shushensky Nature Reserve. The authors would like to thank B. Munkhtsog (Institute for Biology, Mongolian Academy of Sciences), R. Jackson (Snow Leopard Conservancy), J. Gibbs (State University of New York), J. Castner (The Altai Project), T. McCarthy (Panthera); A.E. Subbotin (Safari Club Foundation), G.V. Kiselev (Altai-Sayan Ecoregion Association of Reserves and National Parks); I.V. Kalmykov, S.G. Denisov, A.N. Lotov, E.D. Veselovsky, A.K. Shamonaev (Altaisky Nature Reserve); A.G. Rassolov, B.P. Zavatsky, T.L. Sashko, V.K. Sashko, A.G. Sozykin (Sayano-Shushensky Nature Reserve); V.I. Kanzay, S.K. Salchak, B.D. Dongak, S.B. Dongak, S.B. Kular; M.K. Sagaan (Ubsunurskaya Kotlovina Nature Reserve); V.S. Oyun (Tuva Republic State Committee for Hunting and Fishing); N.I. Putintsev (Tuva State University); I.V. Usanov, Irbis Studio, and everyone else who participated in the planning, financing, and organization of projects for snow leopard conservation and study, as well as direct participation in expeditions to snow leopard habitat in the Altai-Sayan Ecoregion between 2000 and 2011.

CLASSIFICATION OF THE SNOW LEOPARD

Russian, English, and Latin names

‘Snezhniy bars’ or ‘irbis’; ‘Snow Leopard’, ‘Ounce’; *Uncia uncia* Schreber, 1775 (since 2006 *Panthera uncia* Schreber, 1775 (Johnson et al., 2006)).

Taxonomic status:

Class *Mammalia*

Order *Carnivora*

Family *Felidae*

Genus Snow leopards *Uncia* (In 2006 genetic analysis placed the species in the big cat family *Panthera* (Johnson et al., 2006).)

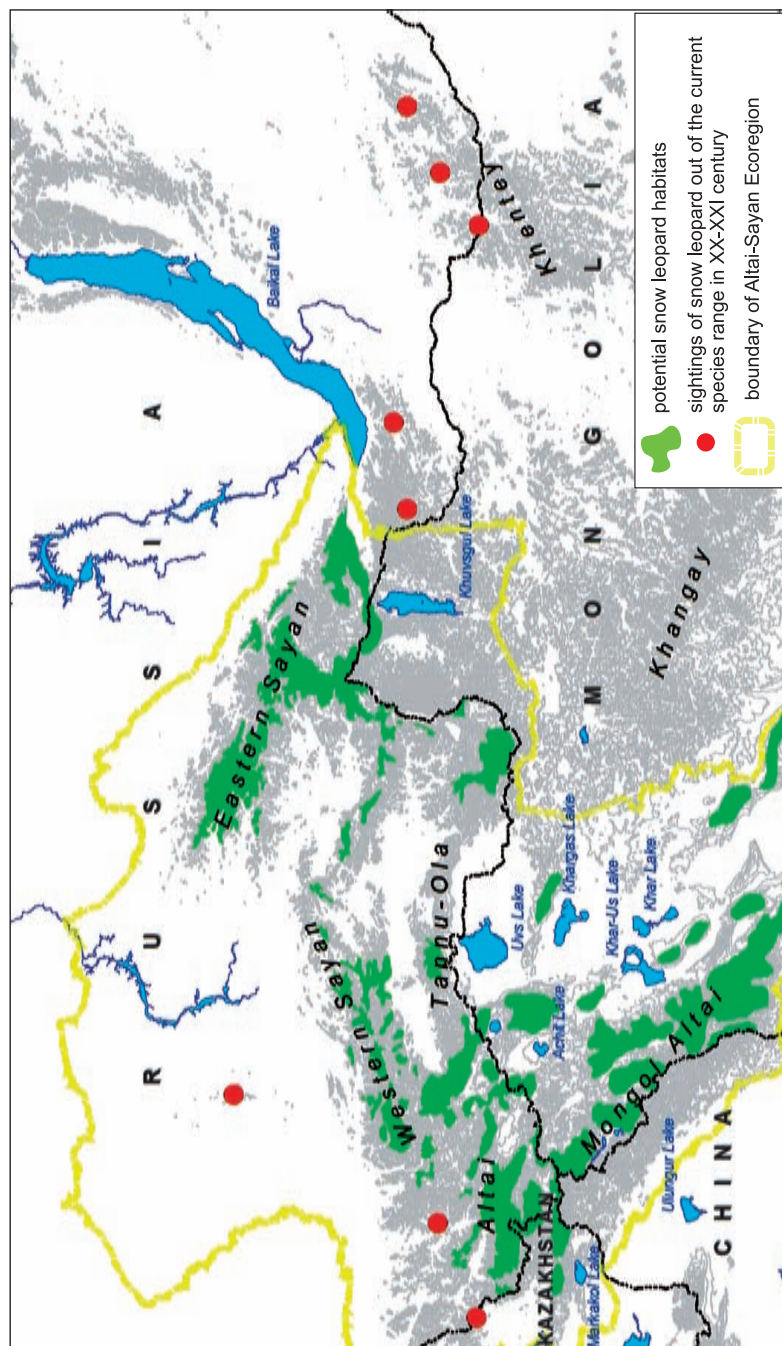
Species Snow leopard *Uncia uncia* (Since 2006 - *Panthera uncia*)

SNOW LEOPARD DISTRIBUTION AND POPULATION IN RUSSIA

The current snow leopard global range is limited to mountainous regions in Central Asia and includes the mountain ranges of Altai, Sayan, Tien Shan, Kun Lun, Hindu Kush, Himalaya, and Karakoram (McCarthy et al. 2003). According to evaluations by Hunter and Jackson (Hunter and Jackson, 1997), potential snow leopard habitat in Central Asia occupies an area of almost 3 million square kilometers, where the species is known to be present in an area of 1.8 million square kilometers with optimal habitat comprising just 550,000 km² (Hunter and Jackson 1997, McCarthy et al. 2003). The species' distribution encompasses 12 countries of the world: Afghanistan, Bhutan, China, India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, and Uzbekistan. The total worldwide snow leopard population is roughly estimated to be 4,080-6,590 animals (McCarthy et al. 2003).

Various sources report that 200-300 years ago snow leopard habitat in Russia stretched from the Altai Mountains to the headwaters of the Lena River (Smirnov et al., 1991). Modern snow leopard distribution in Russia is limited to the Altai-Sayan Ecoregion, where the species resides in the mountains of Altai, Western and Eastern Sayan, and Tuvan and Buryat mountain ranges. There are recorded instances of the passage (and perhaps possible habitation) of snow leopards along the Kuznetsky Alatau Ridge in the 1970s and 80s (Prokofyev, 1992) as well as along the southern edge of Lake Baikal (Matyushkin, 1981; Baranov, Boyko, 1988; Medvedev, 1998; Medvedev, Makulkin, 2000) (Map 1).

In Altai, potential snow leopard habitat is located in central, southeastern, and eastern Altai and includes the following mountains and ridges: Terek-tinsky (eastern), Katunsky, Northern and Southern Chuisky, Aygulaksky, Kuraysky, Abakansky, Kurkure, Chulyshman, Shapshalsky, Chikhachev, Sailyugem, and Tabyn-Bogdo-Ola (Sopin, 1977; Anchiforov, 1995; Anchiforov, 2006; Strategy..., 2002). According to recent research, known snow leopard habitat within the Altai Mountains is only ascertained to exist in the central and eastern Katunsky Ridge, Northern and Southern Chuisky Ridges, along the eastern Kuraysky Ridge, southern Shapshalsky Ridge, the Chulyshman highlands, and the Tabyn-Bogdo-Ola and Chikhachev Ridges (the latter mainly to the south). Snow leopards may temporarily venture into the western and northern parts of the range (Sopin, 1977; Anchiforov, 1995; Anchiforov, 2006; Strategy, 2002). Currently, only one stable population has been found in Altai on the Chikhachev Ridge at the border with Tuva Republic and Mongolia.



In Tuva, there are stable snow leopard populations on the eastern slopes of the Chikhachev Ridge, on Tsagan-Shibetu and Shapshalsky Ridges, on the western side of Western Tannu-Ola Ridge, as well as on Sengelen Ridge (Strategy, 2002; Paltsyn, 2004; Spitsyn, 2006; Spitsyn, 2008; Spitsyn et al., 2009; Kuksin, 2010; Kuksin, 2011). In addition, snow leopards have been noted on Mongun-Taiga, Alashsky, Khemchiksky, Eastern Tannu-Ola, Akademik Obruchev, Ergak-Targak-Taiga, and Udinsky Ridges (Smirnov et al., 1990; Smirnov, Zyryanov, Sokolov, 1992; Yanushevich, 1952; Ochirov, Bashanov, 1975; Shurygin, 1988; Smirnov, 1994; Strategy, 2002).

It is possible that snow leopards live near the headwaters of the Bolshoy and Maliy Abakan, Karasibo, Urten, and Kantegir Rivers in Khakasia (Prokofyev, 1992), however, the presence of a sustainable group of snow leopards has not yet been detected.

In Krasnoyarsk Krai, there is a stable population of snow leopards living along the shores of the Sayan Reservoir within Sayano-Shushensky Nature Reserve and its buffer zone (Khemchiksky and Kurtushubinsky Ridges). Periodic snow leopard appearances have been noted above the tree line along Western Sayan Ridge (Strategy..., 2002; Kalmykov, Zavatsky, 2003; Kalmykov, Zavatsky, 2004; Istomov, 2008; Subbotin, Istomov, 2009; Istomov, 2010; Istomov, 2011).

Snow leopard sightings have also occurred along the southern end of eastern Sayan ridge and at the headwaters of the Dzhuglym, Kara-Buren, and Barbitay Rivers in Irkutsk Oblast (Koshkarev, 1997; Medvedev, 2003).

In the Republic of Buryatia, E.P. Koshkarev and D.G Medvedev believe that snow leopards inhabit the Okinsky, Tunkinsky, and Kropotkinsky Ridges and that the animals periodically visit Primorsky and Khamar-Daban Ridges (Koshkarev, 1997; Medvedev, 1990; Medvedev, 2000, 2003; Baranov, Koshkarev, 2007).

Snow leopards have been sighted and tracks found in Chita Oblast in the upper reaches of the Chikoy, Khilok, Ingoda, and Onon Rivers in the Khentey-Daursky highlands (Matyushkin, 1981; Baranov, Boyko, 1988; Medvedev, 2000, 2003; Medvedev, Makulkin, 2000; Baranov, Koshkarev, 2007).

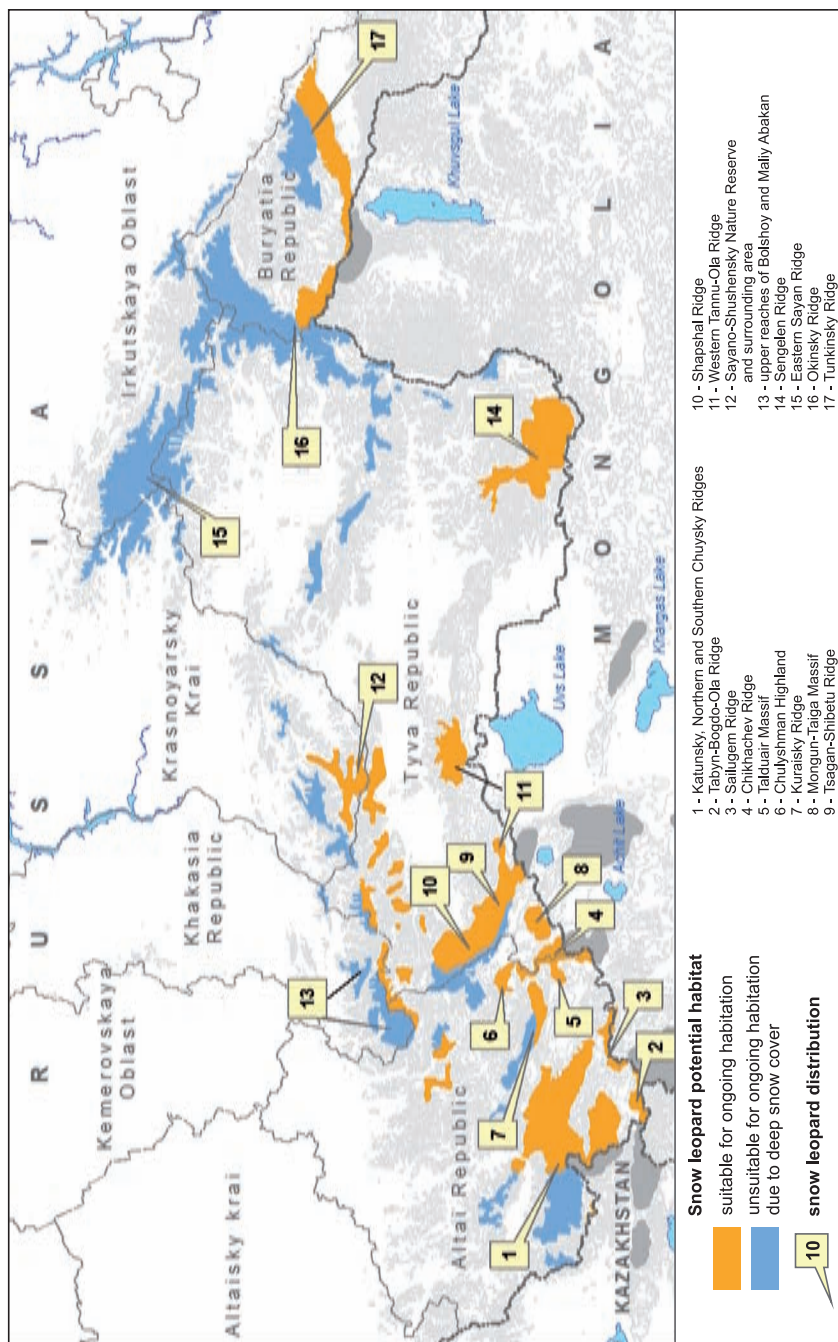
According to the 2002 Snow Leopard Conservation Strategy, total potential snow leopard habitat in our country is approximately 60,000 km², or just 2% of the current species' habitat (Map 1). According to the Strategy, the total snow leopard population in Russia is estimated to be 150-200 animals. Recent research conducted between 2000 and 2011 shows that the species'

population in our country is unlikely to exceed 70-90 animals. Below we will review the most recent data (gathered 2000-2011) on snow leopard distribution and population in various snow leopard habitats in Russia (Map 2).

Katunsky and Northern and Southern Chuisky Ridges. According to the 2002 “Strategy for Snow Leopard Conservation in Russia”, this area contains one of the largest populations of snow leopards in Russia in an area totaling 8000-9000 km². According to research conducted by the Strategy’s authors in 1998-1999, the total snow leopard population in this region was estimated to be 30-40 animals (Strategy..., 2002). Fieldwork in 2004-2011 indicated that the true snow leopard population is much lower.

Snow leopards only occasionally venture to the snowy western side of Katunsky Ridge near the headwaters of the Katun and Kuragan Rivers (Katunsky Nature Reserve Chronicles, 1999-2010). In March 2007, the Kucherla River valley and the area around Kucherlinskoye Lake were surveyed for snow leopard presence/absence and no animals were found. (This area has significant snow cover and very low Siberian ibex populations during the winter.) In November 2000, E.P. Koshkarev (Koshkarev, 2002) found evidence of 3 snow leopards at the Akkem River headwaters, near the tributary rivers of Yarlui, Tekelyu, and Kara-Oyuk. He estimated the snow leopard population density in the Akkem valley to be 0.7-1.3 animals per 100 km² and conveyed reports by local residents of the capture of a large male snow leopard in the Akkem valley in March 2000. Unconfirmed snow leopard encounters and tracks have been reported in the Akkem basin by federal Ministry of Emergency Situations and Karatyurek meteorological station staff between 2005-2009.

Many researchers believe that the most optimal snow leopard habitat in Altai is the Argut River basin, situated at the intersection of the Katunsky and Northern and Southern Chuisky Ridges (Koshkarev, 2002; Strategy..., 2002; Anchiforov, 2006; Paltsyn et al., 2006). Between 2000 and 2011, the lower and middle parts of the Argut basin and its tributaries (Sata-Kular, Lower and Upper Karasu, Soyengat, Shavla, Ak-Tyaryk, Terektyyul, Elo, Maliy, Sredniy, and Bolshoy Ary-Yul, Koir, Oroktoy, Yungur, Bartuldak, Iedygem, and Kulagash Rivers) were surveyed several times in winter months, with varying territories covered by 2 groups of researchers: E.P. Koshkarev’s group (2000, 2004) and Altaisky Nature Reserve staff (2004, 2005, 2007, 2008, and 2010-2011). No one in either group discovered evidence of snow leopard habitation in the lower portion of the Argut River, stretching from the river’s mouth to the Shavla River further upstream. According to local



Map 2. Snow leopard habitat suitable for ongoing and periodic habitation in Russia

residents, snow leopards have not been seen in this area since the mid-1990s (Paltsyn et al., 2006). It is likely that the leopards ceased regular transits from the Argut River to the eastern Terektinsky Ridge (Koshkarev, 2002; Dolgovikh, 2006).

E.P. Koshkarev found snow leopard tracks in the Argut valley in the area between the Shavla and Koir Rivers as well as in the Koir valley (near Kyzyl and Suluayry) and at the mouth of the Yungur River (Koshkarev, 2002; verbal communication). He estimated that the total snow leopard population along the middle Argut River was 11-21 animals over an area of 700 km² (Koshkarev, 2002). E.P. Koshkarev collected information from local residents about 2 encounters with female snow leopards with cubs in the Koir valley during the summer of 2000 (Koshkarev, 2002).

Between 2004 and 2008, a group led by Altaisky Nature Reserve staff discovered tracks belonging to large cats (assumed to be snow leopards) in the Terektyyul, Elo, Sredniy Ary-Yul, and Iedygem valleys, as well as in the Yungur valley (near Chushka-Oyuk, Kara-Oyuk, Upper and Middle Ak-Tyaryk) and in the Koir valley (near Karaayry and Baltyrgan, at the mouth of the Suluayry River, and near the mouth of the Koir). Clear snow leopard tracks unquestionably belonging to the cats were found once in February 2004 in the Iedygem valley. In the remaining 13 meetings, the tracks were not clear and could easily have been mistaken for the tracks of a large lynx, commonly found in these places. It is noteworthy that the research area contained not a single snow leopard scrape, claw rake, or scent marking. The total number of snow leopards along the middle Argut River basin and its largest tributaries (the Shavla, Elo, Koir, Bolshoy Ary-Yul, Yungur, Iedygem, and Bartuldak, and Kulagash) was estimated at no more than 10-15 animals, and the total optimal snow leopard habitat was calculated to be 600-800 km².

Between October 2010 and March 2011, staff from Altaisky Nature Reserve worked in partnership with local residents of Inegen over the course of 6 months to conduct a detailed survey of snow leopard habitat in the lower and middle portions of the Argut River with the help of 20 automatic camera traps. After surveying an area for 30-40 days, the cameras were moved to a new location. Approximately 260 km² were carefully surveyed during those field studies using transects and camera-traps (40% of optimal snow leopard habitat in the Argut valley): Lower and Upper Karasu, Ak-Tyaryk, Soyengat Rivers, near the mouth of the Shavla River, Terektyyul, Sulu-Koby, Elo, Besh-Tyt, Kain-Ary-Yul, Maliy, Sredniy and Bolshoy Ary-Yul,

Oroktoy, Pyukyun-Tyt, lower Yungur, and the Koir valley, with its Shaarash, Soen-Chadyr, Suluayry, Karaayry, Baltyrgan, and Muynok River tributaries. The cameras were in position for approximately 2,050 camera-nights and recorded 13,215 images of 21 species of mammals and birds. During these expeditions there was no evidence found of snow leopard activity (scrapes, prey carcasses, scent markings, tracks). Camera trapping reveals that all the discoveries of large cat tracks and scat as well as prey carcasses found between 2004-2010 very likely belonged to lynx. At least 7-8 lynx were identified in the survey area (74 photographic images were collected). As a result, presence of snow leopard in a significant portion of this area, considered until now to be the heart of the Argut snow leopard population with 10-20 leopards, cannot be confirmed. It is likely that the large cat tracks found within this area between 2000 and 2008 by various experts were lynx tracks rather than those of snow leopards. The complete lack of snow leopard activity (scrapes, claw rakes, and scent markings) in this area between 2004 and 2010 also point to the absence or extremely low population of snow leopards in the lower and middle Argut basin. The main reason for the absence of snow leopards in the research area is very likely to be intensive snare poaching that targets musk deer and other species.

According to local residents, the de facto eradication of snow leopards in Argut began in the 1960s and 70s, when 10-20 snow leopards were snared here each year. These reports are supported by data collected by E.P. Koshkarev (Koshkarev, 2000). At that rate, the eradication of the main Argut population (once Russia's largest) was likely concluded by the late 1990s, early 2000s. Although snares were no longer being set on mountain ridges in the Argut basin between the Shavla and Koir Rivers between 2004 and 2010, snow leopards did not reappear in the area. Snare poaching in the Koir valley continued right up until 2008, when one of the biggest poachers, a resident of Tyungur, who set several hundred snares every winter, was caught by anti-poaching brigade.

Hope remains that remnants of the once largest Russian snow leopard population will be found in the most distant reaches of the Yungur, Iedygem, Koksa, or Karagem Rivers. However, even as late as 2010, significant numbers of snares were being found on the Yungur River, set along mountain paths, cliffs, and ridges, and no evidence of snow leopard activity was found. Considering all of the above data, the total snow leopard population in the middle Argut basin is unlikely to exceed 5 animals today, with an additional 1-2 animals near the Akkem River headwaters.

In April 1999, V.S. Lukarevsky and A.D. Poyarkov encountered snow leopard tracks and scrapes along the Irbistu, Kokozeq, and Sebistey Rivers during surveys conducted along the northern slopes of the Southern Chuisky Ridge (Poyarkov, Lukarevsky, 1999). Snow leopard scrapes occurred at a rate of 6.3 per kilometer. In summer 2007, a Biosphere Expeditions team found 8 snow leopard scrapes in the Irbistu River valley (Expedition Report, 2007). Between 2008-2011, herders from Kosh-Agach District gave reports of occasional snow leopard encounters and snow leopard tracks on the eastern side of the Southern Chuisky Ridge and in the Kokozeq, Sebistey, Irbistu, and Chagan valleys. In September and October 2011, S.V. Spitsyn surveyed the eastern side of the Southern Chuisky Ridge (headwaters of the Kokozeq, Sebistey, Irbistu, Elangash, Kara-Oyuk, Akkol, Taldura Rivers) (Spitsyn, 2011), but no signs of snow leopard activity were identified in the survey area, despite the fact that this is suitable habitat for this species.

Staff from the glaciological station at the Aktru River headwaters report occasional encounters with snow leopards and snow leopard tracks. The most recent such report occurred in March 2011 when a caretaker at the station watched a snow leopard walk past the station at close range before heading up toward the glacier.

Although the evidence for evaluating snow leopard populations along the Katunsky and Northern and Southern Chuisky Ridges is extremely limited, even the existing data shows that their population is unlikely to currently exceed 7-8 animals.

Tabyn-Bogdo-Ola Ridge

Potential snow leopard habitat along the Russian part of this ridge equals approximately 250-300 km². Between 2000 and 2010, Altaisky Nature Reserve staff visited the Tabyn-Bogdo-Ola Ridge area just once to conduct an argali population survey in August 2004. Surveying took place at the headwaters of the Argamdzhi River, the Kara-Chad, Cholok-Chad, and Betsu-Kanas valleys. Snow leopard activity was not observed at that time. Ukok Nature Park staff collected accounts of snow leopard activity in the Kanas River valley in October 2010. In September 1999, V.S. Lukarevsky found several snow leopard scrapes on Tabyn-Bogdo-Ola Ridge (Lukarevsky, 1999). The snow leopard population is clearly very small on Tabyn-Bogdo-Ola, no more than 1-2 leopards, and this area is mainly used as a snow leopard migration corridor between Altai-Tavan-Bogd, Sailuygem, Southern Altaisky, and Southern Chuisky Ridges.



Lynx – the only cat species currently found in the middle Argut River basin. Credit: S.V. Spitsyn

Sailyugem Ridge

Potential snow leopard habitat is located on the western and central portions of the ridge (total area of 350-400 km²). Between 2000 and 2010, there were no snow leopard-focused surveys on Sailyugem Ridge, however, beginning in 2003, the area has been regularly visited by Altaisky Nature Reserve staff to conduct population surveys of argali sheep and Siberian ibex (November-December 2003, June 2004, November 2007, July 2010). Snow leopard tracks were found on Sailyugem Ridge just once, in November 2003, at the headwaters of the Uznoik River. Herders from nearby camps report occasional snow leopard tracks near the Bayan-Chagan and Sarzhematy headwaters. In August 2011, S.V. Spitsyn surveyed potential snow leopard habitat on the Russian side of Sailyugem Ridge (headwaters of the Kalguty, Argamdzhi, Uznoik, Kuruk, Kalanegir, Sarzhematy, Bayan-Chagan Rivers) and found only 1 older snow leopard scrape on the western side of the ridge (Argamdzhi River headwaters). Mongolian researchers have determined that snow leopards periodically visit the Sailyugem Ridge near the Khara-Dzhamat-Gol, Shara-Yamatyn-Gol and Shara-Nokhoytyn-Gol Rivers along the Russia-Mongolia border, but that the animal's population is low (1.3 scrapes/km of trail) (Beybit, 1999). As a result, it is unlikely that the snow leopard population on Sailyugem exceeds 1-2 animals. Perhaps animals only periodically visit this part of the range.

Chikhachev Ridge

The total potential range of snow leopards in this transboundary segment of snow leopard habitat is approximately 1,000 km² and is located in Altai Republic, Tuva Republic, and Mongolia. Snow leopard activity was observed by Altaisky Nature Reserve expeditions on Mount Chernaya (1 animal) in 1998 and at the Boguty River headwaters in 2001 (2 animals) (Altaisky Nature Reserve Chronicles, 1998-2001). In February 2004, E.P. Koshkarev also noted a single set of snow leopard tracks along the Boguty River valley (personal correspondence). On 3 November 2000, a snow leopard attack on livestock was recorded in the Aspayty River valley (on the Tuvan side of the ridge), and as a result the animal was shot (Kuksin, 2003). In January and February 2002, there were snow leopard attacks on yaks in the Ust-Yymaty River valley (Kuksin, 2003). In winter 2005, B.D. Dongak, a senior inspector for Mongun-Taiga Regional Inspection Service (of Ubsunurskaya Kotlovina Nature Reserve) reported the tracks of 2 snow leopards in the Aspayty valley (Spitsyn, 2006). In February 2006, a herder by the name of B.C. Irgit reported a snow leopard attack on cattle in the Aspayty valley (Spitsyn, 2006). In late November 2004, Ubsunurskaya Kotlovina Nature Reserve inspectors found tracks of a single snow leopard in the Bert-Adyr valley (a tributary of the Ust-Yymaty River) (Spitsyn, 2006). B. Salchak, a local hunter from Kyzyl-Khaia, reported that in October 2004 he encountered the tracks of a female snow leopard and 2 cubs in the Ust-Yymaty River valley (Vinokurova, 2005). In November 2007, tracks of a female snow leopard and with adolescent cubs were found in the Kara-Oyuk River valley (Altaian side of the ridge) (Spitsyn, 2007). In June 2010 snow leopard tracks were recorded at the headwaters of the Akkayalu-Ozek River during an argali population survey (Spitsyn, 2010). In 2010 scrapes and excrements were found on the slopes of Mount Malaya Mongun-Taiga in the Aspayty River area, and between October and December 2011 the tracks of 4 snow leopards were recorded (Kuksin, verbal communication). During an argali population survey in August 2011 S.V. Spitsyn found approximately 20 snow leopard scrapes on 2 transects totaling 5 km in length on the dividing ridges of the Boguty River (Spitsyn, 2011). During a survey of the southern portion of the Chikhachev Ridge in September 2011, snow leopard activity was recorded (64 scrapes and 7 scat) along the rock-strewn ridges dividing the Boguty, Khara-Magnay-Gol, left and right branches of the Boguty, Kara-Oyuk, and Naryn-Gol Rivers. The average frequency of snow leopard sign in this area equals 6.5 instances per kilometer. In November 2011, images of 2 snow leopards were recorded using 6 camera-traps along southern Chikhachev Ridge (Spitsyn, 2011). Upon consideration of the territorial distribution of these encounters, there are at least 5-7 individual snow leopards on the Russian side of Chikhachev Ridge.

In May 2011, numerous signs of snow leopard activity were noted by participants in a joint Russian-Mongolian expedition along southern Chikhachev Ridge on the Mongolian side. The highest concentration of snow leopard activity (scrapes, scent markings, claw rakings) on the Mongolian side was recorded in the Tsagan-Bulag gorge (51 sites per kilometer of route), on the gravelly right bank of the Naryn-Gol River (73.3 per kilometer of route) and in the Khuuray-Say River valley (23.5 per kilometer of route). Near Shar-Bulag (also on southern Chikhachev Ridge), snow leopard sign is significantly less frequent: 5.9 signs per kilometer of route. 50 snow leopard scats were collected to precisely count the local population using DNA analysis. In addition, on May 15, 2011, a snow leopard was recorded using a camera trap in the Khuuray-Say River valley (Spitsyn, Munkhtsog, 2011). Mongolian researchers believe that there are at least 8-10 snow leopards on the Mongolian side of Chikhachev Ridge (Munkhtsog, personal communication). Thus, the total transboundary population of snow leopard on Chikhachev Ridge is estimated to be at least 12-15 animals.

Talduair Massif

Members of the Biosphere Expedition program have noted occasional snow leopard tracks and scrapes on Talduair Massif during summers (2003-2010). In addition there was a sighting of a snow leopard (Expeditions Report, 2003). In the summer of 2003 there were reports of a snow leopard on Talduair Massif. Biosphere Expeditions program participants believe that there are no more than 1-2 snow leopards living on Talduair Massif. It is quite likely that snow leopards are not in permanent residence in this part of the range.

Chulyshman Highlands

Potential snow leopard habitat is mainly located in the southeastern part of the highlands, covering an area of approximately 500 km² where snow leopard activity is periodically noted. Prior to 1998, Altaisky Nature Reserve expeditions observed evidence of females with cubs on an almost annual basis in the eastern part of this massif (Altaisky Nature Reserve Chronicles, 1993-1998). In September 2001, snow leopard tracks were recorded in the headwaters of the Kalbakaya River as well. Currently, there are likely no more than 1-2 snow leopards in this area.

Kuraysky Ridge

Potential snow leopard habitat on this ridge is approximately 900-1,000 km². There are annual reports of snow leopard tracks on the eastern side of Kuraysky Ridge (headwaters of the Tokpak, Bashkaus, Uzun-



Snow leopard caught on camera
on Chikhachev Ridge in October 2011, S.V. Spitsyn



Snow leopard tracks in the Aspayty
River basin, A.N. Kuksin

Tytygem, and Kam-Tytygem Rivers) made by local residents in Kosh-Agach District. There have not been any scientific surveys for snow leopard on this part of the ridge.

Mongun-Taiga Massif

Total potential snow leopard habitat in this part of the range is approximately 500 km². During a survey of Mongun-Taiga Massif in 1998 by A. Poyarkov and V. Lukarevsky, they found 1 track and 3 scrapes belonging to snow leopards (Poyarkov, Lukarevsky, 1999). During joint Altaisky Nature Reserve and Arkhar NGO expeditions to this massif in October 2003 (an almost total survey of this mountain system was completed) and again in March-April 2004, no evidence of snow leopard activity was recorded. No evidence of the species was found during a survey of the southern portion of this range in February 2006 (Spitsyn, 2006). In 2002 there was a single report of a snow leopard attacking sheep and goats in the Mugur-Shegetey River valley but this is unconfirmed (Kuksin, 2003). It was only in November 2006 that the tracks of a single snow leopard were found in the Toolayty River valley (Spitsyn, 2006). In September 2008, a snow leopard attack on corralled sheep was recorded in the Oorta-Shegetey River valley. In November 2010, inspectors from Ubsunurskaya Kotlovina Nature Reserve encountered the tracks of 2 snow leopards near the Toolayty and Shara-Khargay Rivers, and in April 2011, a snow leopard was photographed using a standard camera in the Shara-Khargay gorge. Between May and December 2011, Ubsunurskaya Kotlovina Nature Reserve staff recorded images of 2-3 snow leopards in the Shara-Khargay valley (Kuksin, personal communication). Given the above data, there are an estimated 2-4 snow leopards on Mongun-Taiga Massif.

Tsagan-Shibetu Ridge

The total area of potential snow leopard habitat in the Russian portion of Tsagan-Shibetu Ridge is about 1,000 km², and it is home to a stable population of snow leopards. In 2001-2003 during a WWF campaign to protect livestock from snow leopard attacks on Tsagan-Shibetu Ridge, there were 7 instances of snow leopard attacks on livestock (Kuksin, 2003). In March 2003 snow leopard tracks were recorded by a survey expedition from Sayano-Shushensky Nature Reserve in the Khemchegeylik-Khem and Eldig-Khem river valleys (Kalmykov, 2003), and in October 2003 Altaisky Nature Reserve staff found the tracks of a single snow leopard on the dividing ridge between the Khemchegeylik-Khem and Barlyk Rivers.



**Snow leopard making a scrape.
Mongun-Taiga Massif, A.N. Kuksin**

In December 2004, staff from Arkhar NGO and Ubsunurskaya Kotlovina Nature Reserve conducted a detailed survey of Tsagan-Shibetu Ridge (the middle branch of the Barlyk River and its tributaries the Bolshoy and Maliy Ak-Khem Rivers; the Toolaylyg River watershed (the Balyktyg, Ak-Kara-Sug, Ulug-Terektig, Tumze, Chaylalyg Rivers; the Barlyk River headwaters including the Eldykhem, Khemchegeylyg-Khem, and Poshtuk-Beldyr river tributaries; and the Kargy River headwaters (Uzun-Khem, Unguluk-Khem, Oryk-Dyttyg-Khem, and Dyttyg-Khem Rivers). During this expedition, snow leopard tracks were found in the Ak-Kara-Sug River valley (2 tracks) and Ulug-Terektig (1 track), in the Eldygem River valley (5 tracks) and Khemchegeylyg-Khem River valley (3 tracks, 1 scrape) (Paltsyn, 2004). The total population of snow leopards in the Russian portion of the Tsagan-Shibetu Ridge is estimated to be at least 6-8 animals. In addition, in October 2004 herders found snow leopard tracks at the headwaters of the Ulug-Terektig River (Paltsyn, 2004). On November 16-17, 2004, a representative of the Kashpal Agricultural Cooperative found the tracks of a large snow leopard at the mouth of the Ulug-Kozh-Oy River (Paltsyn, 2004). In November of that same year, snow leopard tracks were also found at the headwaters of the Barlyk River by Ubsunurskaya Kotlovina Nature Reserve staff (Oyun, oral communication). In January 2003, passengers on a bus traveling between Sagly and Mugur-Aksy observed a snow leopard at the headwaters

of the Barlyk River (Kuksin, 2003). During fieldwork in December 2004, no evidence of a female snow leopard with cubs was noted. However, meetings of female snow leopards and cubs on the Tsagan-Shibetu Ridge were recorded in previous years. In October 1998, A.D. Poyarkov and V.S. Lukarevsky observed the tracks of a female and 2 cubs in the Tumze River valley (Poyarkov, Lukarevsky, 1998). In October 2002, L. Kaygal-ool, a herder, observed a female and 2 adolescent cubs near Buree not far from the mouth of the Ak-Kara-Sug River (Paltsyn, 2004). In December 2002, the herder Dongak Kyzyl-ool reported 3 snow leopard attacks on livestock near Oy-Bazhi (Kuksin, 2003).

In February 2006 tracks of 4 different snow leopards were found during a survey of Tsagan-Shibetu Ridge in the Eldig-Khem River valley, Arzayty-Despe, and the Ulug-Kozhay River valley (Spitsyn, 2006). One livestock attack by a snow leopard was documented near Arzayty-Despe during the expedition (Spitsyn, 2006). Another snow leopard attack on a sheep corral was recorded in January 2006 near Kozhechey in the Toolaylyg River valley (Kuksin, oral communication).

In November-December 2006, 4 sets of snow leopard tracks belonging to 2 animals were found on the ridge dividing the Arzayty and Eldig-Khem Rivers, on the ridge dividing the Ulug-Terektig and Aldy-Terektig Rivers, and in the Tumze River valley (Spitsyn, 2006).

In March 2007 during a survey of the southern Tsagan-Shibetu Ridge (headwaters of the Barlyk River along its tributaries, the Eldig-Khem, Khemchegeylik-Khem, Arzayty, Onachy, Ulug-Kozh-Oy, Toolaylyg rivers) researchers found 7 snow leopard tracks belonging to 4 different cats (Spitsyn, 2007). During this fieldwork, 2 cases of snow leopard attacks on livestock were also noted.

In September 2008, a joint expedition by Altaisky Nature Reserve and Ubsunurskaya Kotlovina Nature Reserve staff surveyed almost the entire Russian part of Tsagan-Shibetu Ridge (Toolaylyg River basin including the tributaries of the Kolash, Ak-Kara-Sug, Ulug-Terektig, Aldy-Terektig, Tumze, and Chaylalyk Rivers; the headwaters of the Barlyk River with the tributaries of the Eldig-Khem, Khemchegeylik-Khem, Kyzyl-Charyk, and Ulug-Kozh-Oy rivers) and found 13 signs of snow leopard activity (6 scrapes and 7 tracks) (Spitsyn, 2008).

In February-March 2010, during a joint expedition with staff from Ubsunurskaya Kotlovina Nature Reserve and the Mongolian Academy of Sciences Biology Institute, almost the exact same area of the ridge was

surveyed as was surveyed in 2008, resulting in the discovery of 14 tracks, 10 scrapes on trees, and 14 scent markings by snow leopards. There was also an encounter with a female snow leopard and 2 18-month old cubs resulting in the 3 animals being photographed (Kuksin, 2010). During this expedition, 43 scat were collected, 12 of which were determined by DNA analysis conducted by the Severtsov Institute for Ecology and Evolution (Russian Academy of Sciences) to belong to snow leopards (Zvychnaynaya et al., 2011). In 2011 Ubsunurskaya Kotlovina Nature Reserve staff again conducted field research in that same area and found 16 snow leopard tracks, including 2 females with 1 and 2 cubs, respectively. Surveyors saw a snow leopard on a slope above the Tumze River (Kuksin, 2011). DNA analysis conducted on scat collected during the expedition revealed the presence of at least 7 snow leopards in the survey area (Zvychnaynaya et al., 2011). Data gathered in recent years indicates that there are at least 9-10 snow leopards on the Russian side of Tsagan-Shibetu Ridge, a possible increase since 2004-2005 (6-8 animals).

Data from Mongolian researchers based on DNA analysis of snow leopard scat gathered on the Mongolian side of Tsagan-Shibetu Ridge indicates at least 9-10 snow leopards in the area (Galsandorj et al., 2011). Thus, the current transboundary population of snow leopards on Tsagan-Shibetu Ridge is at least 14-18 animals.



**Young snow leopard photographed on Tsagan-Shibetu Ridge.
A.N. Kuksin**

Shapshalsky Ridge

Potential snow leopard habitat on Shapshalsky Ridge is approximately 3,500 km², and the ridge is essentially a northern continuation of Tsagan-Shibetu Ridge. Together these ridges form the home range of Russia's largest snow leopard population.

In October 1998, A.D. Poyarkov and V.S. Lukarevsky found snow leopard scrapes and scat during a survey of the southern part of Shapshalsky Ridge, in the Uzun-Khem River basin (a tributary of the Shuy River) (Poyarkov, Lukarevsky, 1998).

In December 2004, during a joint expedition of Arkhar NGO, Ubsunurskaya Kotlovina Nature Reserve, and Tuva Republic's Game Management Department, researchers surveyed southern Shapshalsky Ridge where it meets Tsagan-Shibetu Ridge. Specifically, they worked in the Shuy River basin (along the Kara-Oyuk, Kyskash, Ak-Oyuk, Onguluk-Oyuk, Uzun-Khem, Saylyg-Khem, Magannatyg, and Tuztukhem Rivers) and on the middle branch of the Barlyk River and its tributaries the Bolshoy and Maliy Ak-Khem Rivers. They found 2 snow leopard tracks and scrapes in the Saylyg-Khem River valley and at the headwaters of the Magannatyg River. According to S.K. Monge, one of the expedition's participants and an experienced mountain climber, he regularly encountered them at the Shuy River headwaters (along the Ak-Oyuk, Kyskash, and Kara-Oyuk Rivers) between 1998-2003. A.K. Aymaa, a game specialist from Bay-Tayginsky District in Tuva Republic, reported meeting 3 snow leopards (probably a female with cubs) at the mouth of the Magannatyg River during summer 2002. There were numerous reports from herders (4-5 families) of snow leopard attacks on livestock in the area around Kara-Khol Lake at the northern end of Shapshalsky Ridge (Vinokurov, 2005). In addition, there were also reports of snow leopard attacks on livestock in the Khemchik River valley in 2002-2003 (Kuksin, 2003).

In September 2008, a joint expedition by Ubsunurskaya Kotlovina Nature Reserve and Altaisky Nature Reserve staff surveyed southern Shapshalsky Ridge (Shuy River basin and its tributaries the Kyskash, Kara-Oyuk, Ak-Oyuk, Uzun-Khem, Onguluk-Oyuk, Saylyg-Khem, and Magannatyg Rivers) for the presence of snow leopards. They found snow leopard scrapes and scat at the Kyskash River headwaters, in the Onguluk-Oyuk valley, in the Saylyg-Khem and Shuy valleys, and at the headwaters of the Magannatyg (Spitsyn, 2008). Local herders in the Onguluk-Oyuk valley reported 2 snow leopard

attacks on livestock in July-August 2009 (Spitsyn, 2008). Using the available data, the estimated snow leopard population in the Shuy River basin is at least 3-4 animals.

In 2010 Ubsunurskaya Kotlovina Nature Reserve staff visited Shapshalsky Ridge twice to gather information about snow leopards and attacks on livestock (in May and November). During fieldwork and surveys of local residents, they identified 4 areas occupied by snow leopards in the northern and central portions of the ridge (Kuksin, 2010):

Alashskoye Highland (Alash, Eldig-Khem, Deleg-Khol river basins), where snow leopard attacks on livestock were reported between 2003 and 2007. There have been no reports of snow leopard attacks or encounters in this area since 2007. It is likely this area is not regularly inhabited by snow leopards.

Kozer and Dashtyg-Khem river basins, where a snow leopard perished in a snare in 2007. In September 2009, local herders found snow leopard tracks at the Khorumnug-Adyr River headwaters (a tributary of the Dashtyg-Khem River). There is no evidence of ongoing snow leopard habitation in this area.

Headwaters of the Ulug-Oruk and Shindazyn Rivers, where snow leopard tracks are regularly encountered. Local herders report that 2-3 snow leopards reside here.

Headwaters of the Khemchik River and its tributaries the Chon-Khem and Chinge-Khem Rivers. There are regular encounters with snow leopards and their tracks here, and the cats attack livestock here at least annually. Local residents believe that at least 3 snow leopards live in the area.

In February 2011 while surveying southern Shapshalsky Ridge (Chinge-Khem Valley (tributary of the Khemchik), Shuy River basin and its tributaries Onguluk-Oyuk, Ak-Oyuk, Kara-Oyuk, Uzun-Khem, Saylyg-Khem, Magannatyg Rivers), a survey team from Ubsunurskaya Kotlovina Nature Reserve encountered 7 tracks and 3 claw rakes attributed to 3-4 different snow leopards (Kuksin, 2011).

Summarizing the data above, it can be concluded that key snow leopard habitat on Shapshalsky Ridge is concentrated in the southern part of the range (headwaters of the Khemchik and Shuy Rivers), where Tsagan-Shibetu Ridge intersects it. The data indicate that the total population of snow leopards on Shapshalsky Ridge is at least 6-8 animals.

Western Tannu-Ola Ridge

The total area for potential snow leopard habitat on western side of the Western Tannu-Ola Ridge is approximately 500 km². This area is immediately adjacent to Tsagan-Shibetu Ridge and together with the Shapshalsky Ridge system it forms one of the largest snow leopard habitats in Russia. In addition, there is potential snow leopard habitat at the intersection of Western and Eastern Tannu-Ola Ridges (approximately 1,300 km²).

Old tracks belonging to a single snow leopard were found on the ridge dividing the Sagly and Kogerim Rivers in November 2006 during a survey of the western portion of the ridge (Spitsyn, 2006).

State game management inspector V.N. Volkov informed us of a second snow leopard encounter on Western Tannu-Ola Ridge. In June 2006 during patrol activities in Ovyursky District in Tuva Republic, he saw 2 snow leopards at a distance of 200 m, not far from the Mongolian border.

Information about snow leopard encounters at the intersection of Western and Eastern Tannu-Ola Ridges is limited to a report of 2 snow leopard tracks at the Targalyk River headwaters (Poyarkov, Lukarevsky, 1999). It is not clear whether snow leopards regularly occupy this region today, or whether cats are simply passing through this part of the ridge.

Sayano-Shushensky Nature Reserve and adjoining portions of Khemchiksky and Kurtushubinsky Ridges

The total area of potential snow leopard habitat in this region, located at the border of Krasnoyarsk Krai and Tuva Republic, is 1,800-2,000 km². Interestingly, snow leopards in this area reside in an elevation band of 540-1,000 m above sea level, only rarely climbing to higher altitude areas (Istomov, 2008). Habitation by snow leopards at these elevations has only been recorded in Sayano-Shushensky Nature Reserve in a 130-150 km² area (Istomov, 2010).

Between 1978 and 2011 over 200 instances of snow leopard activity and encounters with the rare cat itself have been recorded in Sayano-Shushensky Nature Reserve (Kalmykov, Zavatsky, 2003; Kalmykov, Zavatsky, 2004; Istomov, 2008; Subbotin, Istomov, 2009; Istomov, 2010; Istomov, 2011). Systematic survey work of snow leopards within the nature reserve and its buffer zone began in 2003 (Kalmykov, Zavatsky, 2004).

In February 2003, a Sayano-Shushensky Nature Reserve survey team studied the shores of Sayan Reservoir and the valleys of rivers flowing into the reservoir between the mouth of the Malye Ury to the border of Krasnoyarsk Krai and Tuva Republic. Snow leopard tracks were found in the Malye and Bolshie Ury, Mezhel, Kurgol, Urbun, Khadanyk, and Skalistiy river valleys. Overall, they found 16 snow leopard tracks belonging to 9 different animals (Kalmykov, Zavatsky, 2003).

In February-March 2004, 11-12 tracks of snow leopards belonging to 7 different animals were found during population survey work in that same area (Kalmykov, Zavatsky, 2004). During snow leopard population surveys in February-March 2008 along the shores of Sayan Reservoir between the mouths of the Malye Ury and Urbun Rivers, tracks of this species were found in the Irgar, Chalbun-Mys, Bolshie Ury, Snezhniy, Khem-Terektyg, and Kolban-Mes river valleys within Sayano-Shushensky Nature Reserve. Not a single track belonging to the predator was found within the nature reserve's buffer zone. Based on the sizes of the tracks, researchers identified 7 different snow leopards, including 3 males, 2 females, and 2 animals whose gender could not be determined (Istomov, 2008).

In May 2008 during snow leopard population surveys of tracks found in sediments along the shores of the Sayan Reservoir, researchers studied the shoreline from the mouth of the Kara-Khem River to the southern border of Sayano-Shushensky Nature Reserve. During that survey, evidence of snow leopard activity (tracks, scrapes, prey carcasses) was found only on the reservoir's western shoreline in the area between the mouths of the Malye Ury and the Kolban-Mes Rivers. Snow leopard tracks were found in 10 places and belonged to 7 different snow leopards (determined by size) (Istomov, 2008).

In February-March 2010 during snow leopard population surveys almost all potential snow leopard habitat on the shores of Sayan Reservoir in Krasnoyarsk Krai were studied – from the mouth of the Kara-Khem to the border of Tuva Republic (with the exception of the middle and upper branches of the Bolshie Ury and Urbun Rivers). The total area surveyed was 850 km². Snow leopard activity was documented on the nature reserve side of the reservoir in an area stretching from the mouth of the Malye Ury River to the border with Tuva Republic. There was an interesting discovery of snow leopard tracks in the Malye Ury River valley, where the animal had not been observed for the previous 2 years. Tracks of 3 snow leopards were found near Taldy-Chel, at the border with Tuva, as well as on the right bank of the reservoir between the Burunyg and Khapynyg Rivers. The team found

20 snow leopard tracks during the survey period and identified 9 different snow leopards (3 males, 3 females, and 3 cubs) (Istomov, 2010). Materials gathered using camera-traps support snow leopard population surveys studying tracks in the survey area. Camera traps have been in ongoing use to study snow leopards in the nature reserve since 2008 (Subbotin, Istomov, 2009; Istomov, 2010).

During winter 2011, S.V. Istomov studied the southernmost reaches of Sayano-Shushensky Nature Reserve and its buffer zone (Taldy-Chel and the right side of the reservoir from the Urbun River to the border of Krasnoyarsk Krai and Tuva Republic), the adjacent area in Tuva along the Sayan Reservoir (from the border of Tuva Republic to Bedelig River valley and Yndy-Saryg-Khol, and the lower branch of the Khemchik River from its mouth to where the Kara-Art-Sayyr flows into it). This is an area of approximately 350 km². Only 3 snow leopard tracks were found in Krasnoyarsk Krai in the nature reserve's buffer zone at the mouth of the Khapynyng River (a male) and in the Maliy Shugur River valley (a female with a yearling cub). Despite the presence of potential snow leopard habitat, no snow leopard activity was discovered in the adjoining area in Tuva (Istomov, 2011).



**Snow leopard making a scent marking on a rock face.
Sayano-Shushensky Nature Reserve. S.V. Istomov**

In summary, despite the presence of potential snow leopard habitat totaling approximately 1,800-2,000 km² in a single area, today, snow leopards inhabit only a very limited part of that range inside Sayano-Shushensky Nature Reserve – an area no larger than 200 km², and the total population likely does not exceed 9-10 animals (Istomov, 2008; Istomov, 2010; Istomov, 2011). It is unlikely that snow leopards reside at higher elevations on the Western Sayan Ridge due to the presence of extensive snow cover in the winter months. However, it is somewhat likely that snow leopards can be found along the lower branch of the Khemchik River, in the Shom-Shum, Terektyg, Aldy, and Usty-Ishkin river basins (Istomov, 2011), and possibly along the Kholchuktug, Manchurek, Golshves, and Bayan-Kol Rivers (tributaries of the Khemchik River).

Headwaters of the Bolshoy and Maliy Abakan Rivers

The mountains situated at the headwaters of the Bolshoy and Maliy Abakan Rivers (Khakasia Republic) were surveyed several times by staff from Khakassky Nature Reserve between 2007-2010, however, no reliable evidence of ongoing snow leopard activity in the area was discovered.

Sengelen Ridge

The total area of potential snow leopard habitat in this area is approximately 2,000 km².

In June 2004, this area was surveyed during a joint expedition of Arkhar NGO and the Tuva Republic Game Management Department (headwaters of the Naryn, parts of the Balyktyg-Khem River valley, and the valley and ridges surrounding the Solbeldir River, the headwaters of the Chokhyrtay River, the area around Ulin-Khan Mountain, and the ridge dividing the Munguruk and Zhin-Khem Rivers). During this expedition, the team found evidence of snow leopard activity (scrapes) on 3 routes at the headwaters of the Chokhyrtay River and its tributary, the Munguruk River. One of these scrapes was found on a rocky slope of Mountain Ulinkhan (4 scrapes, at a frequency of 1.1 scrape/km of route), another was found on the ridge dividing the Munguruk and Zhin-Khem Rivers (6 scrapes, at a frequency of 1 scrape/km of route) (Paltsyn, 2004). At the northern end of the ridge, near the headwaters of the Balyktygkhem and Naryn Rivers, as well as in the Solbeldir River valley, there was no evidence of snow leopard activity. N.I. Baldan, a local herder, reported that snow leopards are regular inhabitants of the headwaters of the Chokhyrtay, Chik, and Munguruk Rivers.

According to him, the snow leopard population has increased recently in comparison to the 1980s and 90s. C. Ochur, another herder, says that there are snow leopards present in the Balyktygkhém River valley in the winter months and that they occasionally attack livestock. N.I. Saygalakov, another resident herder, reported that during the winter of 2003-2004 he saw the tracks of 3 snow leopards in the Munguruk River valley, where he also once saw a snow leopard that dogs had chased up a rock face. He told about encountering snow leopard tracks in the Zhin-Khem River valley in spring 2004 as well. There are also snow leopards in the Kundus River valley (a large tributary to the Balyktygkhém River). V.S. Lukarevsky found numerous snow leopard scrapes on ridges near the Tsagan-Gol River (a tributary of the Kundus River) and Kargure River headwaters in August 1999 (Lukarevsky, 1999). He also interviewed locals to learn of 2 encounters with snow leopards near Munguz, at the headwaters of the Naryn River in August 1999. There was an encounter with a snow leopard near Chinchalig (Erzin River basin) in May 1999 (Lukarevsky, 1999). M.B. Mongush, a game manager for Tere-Kholsky District, reported that in the 1980s and 90s snow leopards entered the northern part of Sengelen via the Tarbagatay River valley, a place known for snow leopard attacks on domesticated reindeer. G.S. Sunkuev, director of Kaa-Khémsky Game Cooperative, reported finding the tracks of a female snow leopard with 2 cubs in the Tarbagatay valley in 1989 (Paltsyn, 2004).

In September-October 2009, staff from Ubsunurskaya Kotlovina Nature Reserve surveyed Sengelen Ridge. They searched for signs of snow leopard activity in the following areas: Kundus River basin with its tributaries the Kucherik, Yamaady, Chummalash, Upper Kundus, Khoriynyg, and Cholta Rivers; the Balyktyg-Khem River basin below the Chokhyrtay River; the Lower and Upper Shinnyg-Khem, Saylyg-Khem, Zhin-Khem, and Solbeldir Rivers. During the expedition, they located signs of snow leopard activity along the Kucherik, Upper Shinnyg-Khem, Chik, Zhin-Khem, and Saylyg-Khem Rivers (2 tracks, 3 scrapes, 4 regular marking sites on rocks) (Kuksin, 2009). 21 feces samples were also collected, resulting in the identification of 13 samples, 2 of which turned out to be snow leopards (Zvychnaynaya et al., 2011). According to surveys of local residents, snow leopards and snow leopard tracks are regularly encountered in the following areas around Sengelen Ridge: the mountainous headwaters of the Tarbagatay, Solbeldir, and Erzin Rivers; in the Zhin-Khem, Chokhyrtay, Saylyg-Khem, Davady Bullu and Ustyú Bullu river basins; in the Tuskul and Upper and Lower Shinnyg-Khem river basins; the Kharkhuren-Gol and Kargure river basins; and the Kundus River basin. C. Ochur reported finding the tracks of 3 snow leopards at the Chik River headwaters in November 2001, meeting a female snow leopard

with 2 cubs on the right shore of the Upper Shinnyg-Khem River in November 2006, meeting a snow leopard at the Shoogey River headwaters in November 2007; and another leopard on a slope below the mouth of the Solbeldir River in May 2009. Based on this data, the snow leopard population on Sengelen Ridge is estimated to be at least 7-10 animals (Kuksin, 2009).

Okinsky and Tunkinsky Ridges

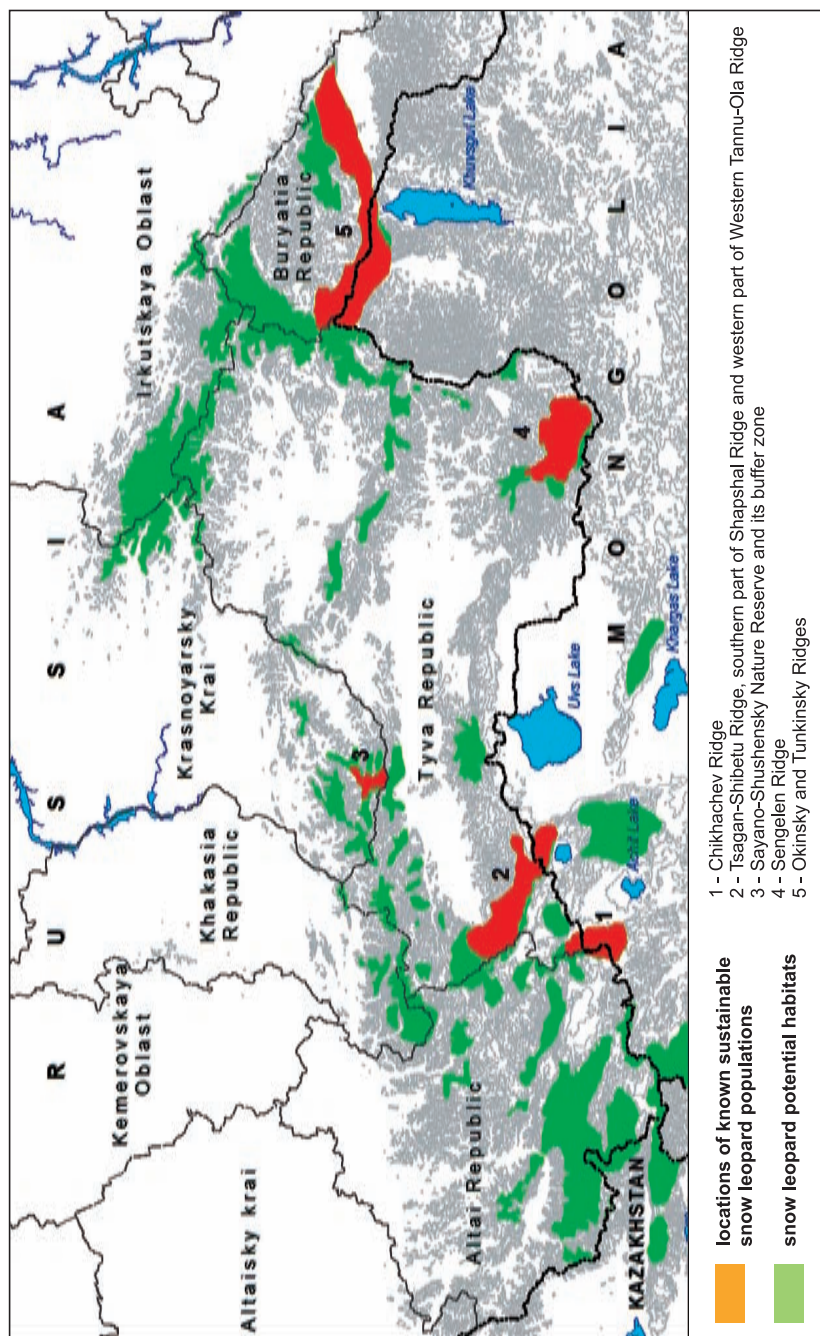
The total area of potential snow leopard habitat in this part of the Russian range is approximately 12,000 km², located at the intersection of Tuva Republic, Buryatia Republic, and Mongolia. In 1995, E.P. Koshkarev studied Munku-Sardyk Mountain and Tunkinsky Ridge and discovered 4 sets of snow leopard tracks and 7 scrapes (Koshkarev, 1997). During surveys he conducted in 1991 and 1995, he found 8-9 snow leopard tracks (Koshkarev, 1997). E.P. Koshkarev estimated that 20-30 snow leopards claim the Okinsky, Kropotkinsky and Tunkinsky Ridges as their home range (Koshkarev, 1996). The author noted that deep snow cover and level relief in the area of Okinsky and Kropotkinsky Ridges are atypical snow leopard habitat (Koshkarev, 1996; Koshkarev, 1997). D.G. Medvedev (Medvedev, 1990; Medvedev, 2000, 2003) is of the opinion that currently there are approximately 20-25 snow leopards living around Tunkinsky Ridge. It is worth noting that no specialized survey studies of snow leopards were conducted between 2000 and 2011, and it is very likely that the snow leopard population there is highly overstated. This region requires additional study.

As noted above, the total area of potential snow leopard habitat in our country is approximately 60,000 km². However, the areas regularly inhabited (no or little snow cover in winter months and adequate prey species populations) by snow leopards are much smaller, do not exceed 20,000-30,000 km², and are home to, in all probability, no more than 70-90 snow leopards (Map 2). The habitat area for known stable groupings of snow leopards in Russia is approximately 6,000 km² (possibly as much as 12,000 km² if Okinsky and Tunkinsky Ridges are included), and that area is home to no more than 50-65 snow leopards (Table 1)(Map 3).

Until recently it was believed that there was a stable snow leopard population in the Argut River basin (approximately 1,000-1,500 km² of optimal snow leopard habitat), but recent research do not support that belief.

Table 1. Areas of existing snow leopard populations in Russia

Location	Habitat area, km²	Estimate population (# of animals)	Notes
Chikhachev Ridge	1000	5-7	Total population of this transboundary group, including Mongolia, is 10-15 animals
Tsagan-Shibetu Ridge, southern Shapshalsky Ridge, western side of Western Tannu-Ola Ridge	2500	15-18	Total population of this transboundary group, including Mongolia, is 20-25 animals
Sayano-Shushensky Nature Reserve, its buffer zone, and adjacent parts of Khemchiksky and Kurtushubinsky Ridges	No more than 200-500	9-10	
Sengelen Ridge	2000	7-10	
Okinsky and Tunkinsky Ridges, possibly	5000-6000	15-20	This area requires additional research
TOTAL:	6000 (possibly 11 000-12000 if Okinsky & Tunkinsky Ridges are included)	36-45 (possibly 50-65 if Okinsky and Tunkinsky Ridge populations are included)	



Map 3. Locations of known snow leopard populations in Russia

SNOW LEOPARD BIOLOGY AND CONSERVATION PREREQUISITES

Biology and Reproduction

The snow leopard is the only large cat species capable of living in severe high-altitude conditions. Despite the species' wide habitat range, there are no snow leopard subspecies (Hemmer, 1972, Wildt et al., 1992). This predator is relatively small in size – the average weight of a male is 45-55 kg, while a female weighs 35-40 kg (Jackson, 1992). Snow leopards are 100-130 cm in length, and the tail stretches another 105 cm, or 75-90% of the body's length (Hemmer, 1972; Fox, 1989; Jackson, 1992). The snow leopard is wonderfully adapted to life in the mountains and has a thick coat with a developed undercoat that is grayish-white, sometimes with a yellow tinge, and dark gray rosetted spots. The big cat's coloring is ideal camouflage among rocks and cliffs, rendering the cats almost invisible in the mountains. Covered with thick fur, the long tail serves to balance the cat's movements across cliffs and rocky hillsides, as well as warming the cat at rest. Snow leopards have enlarged sinuses enabling them to warm the air before it enters their lungs. Short, strong paws and deep chests with well-developed chest muscles enhance their ability to climb cliffs.

As a rule, the snow leopard leads a solitary lifestyle, but can sometimes be found in groups of up to 6 animals. These groups mostly consist of a female with her young, sometimes with a male as well (McCarthy and Chapron, 2003). In the Russian range we have noted encounters with up to 4 animals (Istomov, 2010; Kuksin, 2011) in Sayano-Shushensky Nature Reserve, Chikhachev Ridge, and Tsagan-Shibetu Ridge. Females reach sexual maturity between 2-3 years of age and reproduce once every 2 years (Geptner, Sludsky, 1972). Mating occurs between late January and mid-March. During this period, the cats actively mark their territories, indicating their movements with noticeable scrapes in the soil, scent markings on rock faces, and claw rakes on freestanding trees. Pregnancy lasts 93-110 days, and females give birth to 1 to 5 cubs in May-July, usually 2-3 cubs (Geptner, Sludsky, 1972; McCarthy and Chapron, 2003). Cubs remain with the female for 18 months to 2 years (Geptner, Sludsky, 1972; McCarthy and Chapron, 2003). Snow leopards can live in the wild up to 13-14 years and 21-28 years in captivity (Strategy..., 2002; MacDonald, 2007). Over their lifespans, female snow leopards will bear no more than 10-15 cubs each.

Thanks to its relatively late attainment of sexual maturity, low reproduction, and lengthy spacing between litters, the snow leopard is a relatively sensitive species incapable of rapid population increases in response to significant contractions brought about by intensive poaching or other factors. Nevertheless, in good conditions, reproduction can increase the population and gradually regenerate snow leopard populations.

Information about the sex and age structure of snow leopard populations within Russia is very limited. In 2010 S.V. Istomov observed the following structure for the snow leopard population within Sayano-Shushensky Nature Reserve: 33% (3 animals) – female, 33% (3 animals) – male, and 33% (3 animals) – cubs (Istomov, 2010). According to A.N. Kuksin in 2010-2011 the snow leopard population on Tsagan-Shibetu Ridge and the southern reaches of Shapshalsky Ridge were approximately as follows: 27% (4 animals) – male, 20% (3 animals) – female, 33% (5 animals) – cubs, 20% (3 animals) – unknown (Kuksin, 2011).

Data regarding the size of an individual snow leopard's home range are quite scarce. For example, the size of an individual home range for this predator varies between 12-40 km² in areas of high concentrations of ungulates and other prey species (for example, in Nepal and northern India) (Jackson, Hunter, 1996) to 1500 km² in areas with lower numbers of prey species (Gobi-Altai in Mongolia) (McCarthy, 2000; McCarthy et al., 2010). Moreover, the territories of specific animals can have significant overlap. S.V. Istomov has observed that in Sayano-Shushensky Nature Reserve the average home range of a male snow leopard is 50-130 km² and may overlap with 2-3 females' ranges, with territories averaging 25-40 km² (Istomov, 2010). According to observations by S.V. Spitsyn, in 2004-2007 the size of 5 individual cats' central ranges on Tsagan-Shibetu Ridge ranged between 25 to 50 km² (Spitsyn, 2007). As noted earlier, the size of individual home ranges depends on the density of ungulates and other prey species populations.

On an average day, a snow leopard can travel 1-7 km within its home range, but may make longer multi-day trips to other areas up to 200-600 km distant (Geptner, Sludsky, 1972; Koshkarev, 1990; McCarthy, 2000; McCarthy 2010). On these "hikes" animals can cover as much as 20 km or more in a day, crossing river valleys and wide intermountain basins. As a result of these long-distance trips, snow leopards can move into unoccupied areas, and this plays a major role in the animal's distribution and territorial expansion.

When moving within the boundaries of its home range, a snow leopard usually traverses clearly delineated geographic relief, such as mountain ridges, canyons, and along the base of cliffs. The cat travels regular routes, visiting established landmarks with territorial markings. During the winter, snow leopards may enter forests and travel along the paths established by musk deer and other ungulates. These traits render the predator susceptible to snares and traps – snow leopards are often victims of snares set for musk deer and other species.

Wolves, lynx, and bears are some of the snow leopard's competitors for food in the cat's Russian range. However, almost nothing is known of the inter-relationships between these predators. According to our observations, snow leopards and wolves can coexist within a shared territory (Sayano-Shushensky Nature Reserve and Tsagan-Shibetu, Chikhachev, and Sengelen Ridges).

Improved understanding of snow leopard mortality can support the establishment of an effective conservation plan. Our research shows that the majority of snow leopard deaths are related specifically to humans hunting them. Snares and traps set along key migratory routes for the species and in areas where regular territorial marking occurs are a particular hazard to snow leopards. Snow leopards often perish at the hands of herders due to attacks on livestock. This data clearly illustrates that one of the priority directions for snow leopard conservation must be the fight against poaching and decreasing herder - snow leopard conflicts.

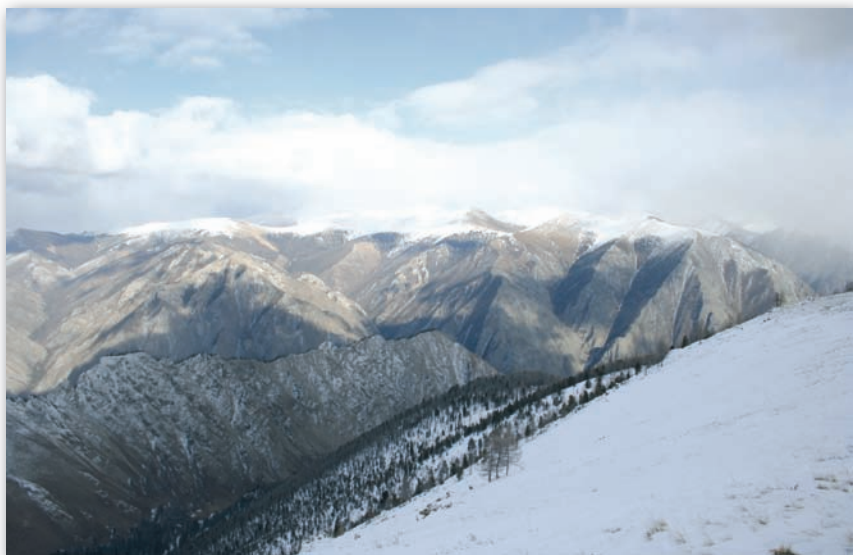


**Female snow leopard and 2 cubs.
Sayano-Shushensky Nature Reserve. S.V. Istomov**

Habitat Requirements

As a rule, optimal snow leopard habitat in the Russian part of the range is high-relief mountains with clearly defined rocky ridges and deep gorges, cliff massifs, and steep boulder fields. Steep mountain slopes with southern, eastern and western exposures in these areas are covered with steppe or tundra shrub vegetation, while northern slopes may contain a mosaic of forested areas. The degree of forest cover in optimal snow leopard habitat varies from 0 to 40-50%, depending on elevation. Snow leopards generally avoid gentle slopes without cliffs or level areas, as well as thick, dark coniferous forests. Optimal Russian snow leopard habitat is found along a wide range between 540 and 3500-3900 m above sea level. For example, in Sayano-Shushensky Nature Reserve, snow leopards live on the shores of the Sayan Reservoir at elevations of 540-1500 m, in the Argut River basin between 700-3800 m, on Tsagan-Shibetu and Sengelen Ridges between 1700 and 3500 m, on Chikhachev Ridge and Mongun-Taiga Massif between 2200-3700 m above sea level. As a rule, all good snow leopard habitat is distinguished by the absence or minimal presence of snow cover during the winter months. Such habitat is advantageous for Siberian ibex as well as other ungulates – the snow leopard's main prey. In addition to traversing open slopes, snow leopards pass through islands of forest cover. Optimal snow leopard habitat is also well suited for pasturing livestock, a fact that often results in conflicts between herders and this predator. In the best habitats, snow leopards form sustainable populations whose presence can be readily determined by noticeable evidence of marking activity. In the Russian portion of the range, such habitats are quite limited and comprise no more than 10-20% of the total potential habitat for this species. The irregular character of this habitat distribution determines the island-like nature of Russia's snow leopard population.

Snow leopards avoid mountain slopes and river valleys with extensive snow cover that may hinder their movements and limit their ability to hunt successfully. However, E.P. Koshkarev and D.G. Medvedev observed that snow leopards live in areas with deep snow cover on Tunkinsky, Okinsky, and Kropotkinsky Ridges, something that is unusual for this cat (Koshkarev, 1996; Koshkarev, 1997; Medvedev, 1990; Medvedev, 2000, 2003). It is also interesting to learn of snow leopards inhabiting the mountain conifer forest in the Zabaikalsky region, as described by D.G. Medvedev and R.N. Makulkin (Medvedev, Makulkin, 2000). These instances show that our knowledge of snow leopard biology, ecology, and distribution are quite incomplete and require further study.



Snow leopard habitat in the middle Argut River basin. M.Y. Paltsyn



Snow leopard habitat along the shores of Sayan Reservoir. S.V. Istomov



Snow leopard habitat along the southern Chikhachev Ridge. S.V. Spitsyn



Snow leopard habitat on Mongun-Taiga Massif. A.N. Kuksin



Typical snow leopard habitat on Tsagan-Shibetu Ridge. M.Y. Paltsyn



Snow leopards live in places like this on Sengelen Ridge. A.N. Kuksin

Diet and Prey base

Snow leopards are strong predators capable of bringing down hooved animals more than 3-4 times their own weight, such as red deer, argali sheep, reindeer, yaks, and horses (Schaller, 1977; Jackson and Ahlborn, 1988; Fox 1989; Filus, 1992; our data). In the Altai-Sayan Ecoregion, snow leopards' main food is Siberian ibex, whose distribution in Russia almost exactly overlaps that of the snow leopard. In addition, this predator also hunts roe deer and musk deer, as well as smaller animals such as rabbits, marmots, Altai snowcocks, ptarmigans, and pikas. In some areas, for example in western Tuva, snow leopard often attack livestock (most often sheep and goats), resulting in harassment by herders. Snow leopards are able to kill a fairly wide range of animals, a fact that increases its ability to survive in a variety of habitats and in conditions where numbers of one or another prey species may decline.

According to various assessments, over the course of a year a single snow leopard kills 12-30 hooved animals the size of a Siberian ibex (Jackson and Ahlborn, 1984; McCarthy, 2000). As a result, a single snow leopard requires a minimum population of 100-150 hooved animals of various species living in its home range. The majority of ungulates living in snow leopard habitat can sustain annual population losses of 15-20% without experiencing a population decrease. Because of this, ungulates hunting levels in snow leopard habitat should accounting for the prey base needs of this cat.

Below we review the current status of snow leopard prey species populations in the Altai-Sayan Ecoregion in Siberian ibex equivalents. We assume that the average weight of a Siberian ibex is 50-70 kg, red deer – 150-180 kg, (approximately 2.5-3 ibex), argali – 110-140 kg (approximately 2 ibex), musk deer – 12-18 kg (approximately 0.3-0.5 ibex). This information is far from exhaustive, as focused population surveys of species known to be snow leopard prey animals have not been conducted (Table 2).

Thus, according to these very approximate and incomplete calculations, even just the existing ungulate animal resources in potential snow leopard habitat in the Altai-Sayan Ecoregion are capable of supporting a population of at least 100-170 snow leopards in Russia. In certain areas, for example in western Tuva, livestock are a noticeable share of the predator's nutrition.

Difficult and high snowfall winters can have a significant negative influence on populations of mountain ungulates in snow leopard habitat. It seems that it is also difficult for the predator to hunt wild animals as well – during these types of winters that there is an observable increase in the number of snow leopard attacks on domestic livestock. In addition, decreased ungulate populations as a result of poaching are also cited among the traditional motivations for snow leopard attacks on livestock. In some cases,

Table 2. Estimated ungulate populations in Russian snow leopard habitat

Range	Prey species populations and ibex-equivalents	Total ungulate population, ibex-equivalents	Potential population of snow leopards able to be supported by ungulate prey
1	2	3	4
Katunsky, Northern and Southern Chuisky Ridge System	Siberian ibex – 4,300-4,800, Elk – 400-500 = 1,000-1,250 ibex, Musk deer – 500-800 = 150-240 ibex, Roe deer, Altai snowcock, Altai pika, mountain hare, white ptarmigan (Ptaltsyn, Spitsyn, 2006; Spitsyn, 2008; Spitsyn, 2011; Ptaltsyn, Spitsyn, 2004; Altai Republic Game Management Dept. data, 2008)	5,450-6,290	35-40
Tabyn-Bogdo-Ola Ridge (Russian portion)	Siberian ibex – 50-60, Altai marmot, Altai snowcock, mountain hare, Altai and Daurian pika, long-tailed ground squirrel, white and tundra ptarmigans (Ptaltsyn, Spitsyn, 2004)	50-60	No more than 1
Sailyugem Ridge (Russian portion)	Argali – 400-600 (summer) = 800-1,200 ibex 150-200 (winter) = 300-400 ibex, Siberian ibex – 230-250, Altai marmot, Altai snowcock, mountain hare, Altai and Daurian pika, long-tailed ground squirrel, white and tundra ptarmigans (Ptaltsyn et al., 2006; Spitsyn, Kuksin, 2007; Spitsyn, 2010; Spitsyn, 2011)	1,030-1,600 (summer) 530-650 (winter)	Possibly 3-4 animals long-term
Chikhachev Ridge	Argali – 220-250 = 440-500 ibex; Siberian ibex – 220-250 (Russia), 600-700 (Mongolia). Roe deer, red deer, Altai marmot, Altai snowcock, mountain hare, Altai and Daurian pika, long-tailed ground squirrel, white and tundra ptarmigans (Ptaltsyn, et al., 2006; Spitsyn, Kuksin, 2007; Spitsyn, 2010)	1,260-1,450	8-12

Продолжение таблицы 2

1	2	3	4
Taldauair Massif	Argali – 20-30 = 40-60 ibex, Siberian ibex – 100-150, Roe deer, red deer, Altai marmot, Altai snowcock, mountain hare, Altai and Daurian pika, long-tailed ground squirrel, white and tundra ptarmigans (Paltsyn, Spitsyn, 1999; Spitsyn, Kuksin, 2007)	140-210	1-2
Chulyshman Highlands	Argali – 20-30 = 40-60 ibex, Siberian ibex – 50-70, Elk – 40-50 = 100-125 ibex, Roe deer, Altai marmot, Altai snowcock, mountain hare, Altai and Daurian pika, long-tailed ground squirrel, white and tundra ptarmigans (Paltsyn, 2001)	190-255	1-3
Kuraysky Ridge	Siberian ibex – 200-350 Elk, musk deer, roe deer, Altai marmot, Altai snowcock, mountain hare, Altai and Daurian pika, long-tailed ground squirrel, white and tundra ptarmigans (Altai Republic Game Management Dept. data, 2008)	No fewer than 200-350	No fewer than 1-3
Mongun-Taiga Massif	Argali – 20-30 = 40-60 ibex, Siberian ibex – 100-150, Elk, roe deer, Mongolian marmot, Altai snowcock, mountain hare, Altai and Daurian pika, long-tailed ground squirrel, white and tundra ptarmigans (Paltsyn, 2003; Spitsyn, 2006)	140-210	1-2
Tsagan-Shibetu Ridge	Argali – 30-50 = 60-100 ibex Siberian ibex – 360-450 (Russia), 700-900 (Mongolia), Elk, musk deer, roe deer, Mongolian marmot, Altai snowcock, mountain hare, Altai and Daurian pika, long-tailed ground squirrel, white and tundra ptarmigans (Paltsyn, 2004; Onon, 2004; Spitsyn, 2008)	No fewer than 1,120-1,450	No fewer than 8-14
Shapshalsky Ridge	Siberian ibex – 400-500, Musk deer – 500-700 = 150-210 ibex, Elk, roe deer, Mongolian marmot, Altai snowcock, mountain hare, Altai and Daurian pika, long-tailed ground squirrel, white and tundra ptarmigans (Altai Nature Reserve Nature Chronicles 1970-1999; Kuksin, 2010)	No fewer than 550-710	No fewer than 4-7

1	2	3	4
Western Tannu-Ola Ridge (western side)	Siberian ibex – 50-60 Elk, musk deer, Mongolian marmot, Altai snowcock, mountain hare, Altai and Daurian pika, long-tailed ground squirrel, white and tundra ptarmigans (Spitsyn, 2006; Spitsyn, 2007)	No fewer than 50-60	No greater than 1-2
Sayano-Shushensky Nature Reserve and adjacent parts of Khemchiksky and Kurtushubinsky Ridges	Siberian ibex – 2,550-2,950, Musk deer – 1,000-1,500 = 300-450 ibex, red deer, roe deer, Altai snowcock, mountain hare, Altai pika, long-tailed ground squirrel, white and tundra ptarmigans (Lineytsev, 2008; Ubsunurskaya Kotlovina Nature Reserve Nature Chronicles, 2005-2010)	No fewer than 2,850-3,350	No fewer than 20-25
Headwaters of the Bolshoy and Maliy Abakan Rivers, Alashsky Ridge	Siberian ibex – 200- 300, Musk deer – 1,000-1,200 = 300-360 ibex, red deer, roe deer, Altai snowcock, mountain hare, Altai pika, white and tundra ptarmigans (Lineytsev, 2008; Okaemov, 2006; Sobanskiy, 2005)	No fewer than 500-660	No fewer than 4-6
Sengelen Ridge	Siberian ibex – 200-400, Musk deer – no fewer than 1,000-1,500 = 300-450 ibex, Elk, reindeer, roe deer, Altai snowcock, mountain hare, Altai pika, white and tundra ptarmigans (Cadaster materials VNIOZ, 1995-1996)	No fewer than 500-850	No fewer than 5-8
Okinsky and Tunkinsky Ridges	Siberian ibex – 1,000-1,500 Elk, reindeer, roe deer, Altai snowcock, mountain hare, Altai pika, white and tundra ptarmigans (Medvedev, 2006 http://nature.baikal.ru/text.shtml?id=163 ; Cadaster materials VNIOZ, 1995-1996)	No fewer than 1,000-1,500	8-15
Total:		No fewer than 15,000 – 19,000	No fewer than 100 – 170

(for example, in Nepal) snow leopards actively attack livestock even in areas where there are sufficient numbers of wild ungulates (Oli, 1991). In the Russian portion of the habitat range, practically all snow leopard attacks on livestock occur in western Tuva, which sometimes leads to the animal's killing by herders.

This affirms the importance of preventative measures targeting stabilization and increase of snow leopard prey species as well as decreasing in snow leopard-herder conflicts.



**Siberian ibex – the snow leopard's main food source
in the Altai-Sayan Ecoregion. S.V. Spitsyn**



Musk deer are also killed by snow leopards. S.V. Spitsyn



This young Siberian ibex male was killed and eaten by a snow leopard. Sayano-Shushensky Nature Reserve. M.Y. Paltsyn.

Response to humans

Snow leopards are, as a rule, not aggressive toward humans. There are only a few known instances of attacks on people by starved or rabies-infected cats (Strategy..., 2002; Medvedev, 2006, <http://nature.baikal.ru/text.shtml?id=163>). Even a snow leopard wounded by a person or surprised at a kill prefers to retreat than to actively defend itself or its kill. As a rule, upon encountering a person, snow leopards do not exhibit fear and instead calmly leave the area, often abandoning prey. Between 2000 and 2011 in western Tuva we recorded 11 encounters between snow leopards and herders involving livestock attacks: in 6 cases, the predator abandoned its kill calmly when a human appeared, and in 5 cases the snow leopard was chased away by yelling, throwing rocks, and firing shots. Sometimes snow leopards will attack livestock despite the presence of humans. In those cases, the cat does not exhibit any aggression toward people. In Mongun-Taiginsky District in Tuva Republic there was one case of a snow leopard being killed by herders using sticks and rakes inside a corral, but even then the leopard did not attack the herders (Spitsyn, 2007). The snow leopard's lack of fear of humans is often the cause of its death.

LIMITING FACTORS

A variety of natural and anthropogenic factors influence the condition of snow leopard populations. Limiting factors that influence snow leopards can be divided into 2 main groups: direct and indirect impacts (Map 4).

Direct impacts include the killing of snow leopards as a result of poaching or protecting livestock from this predator, taking snow leopards into captivity, and infectious disease.

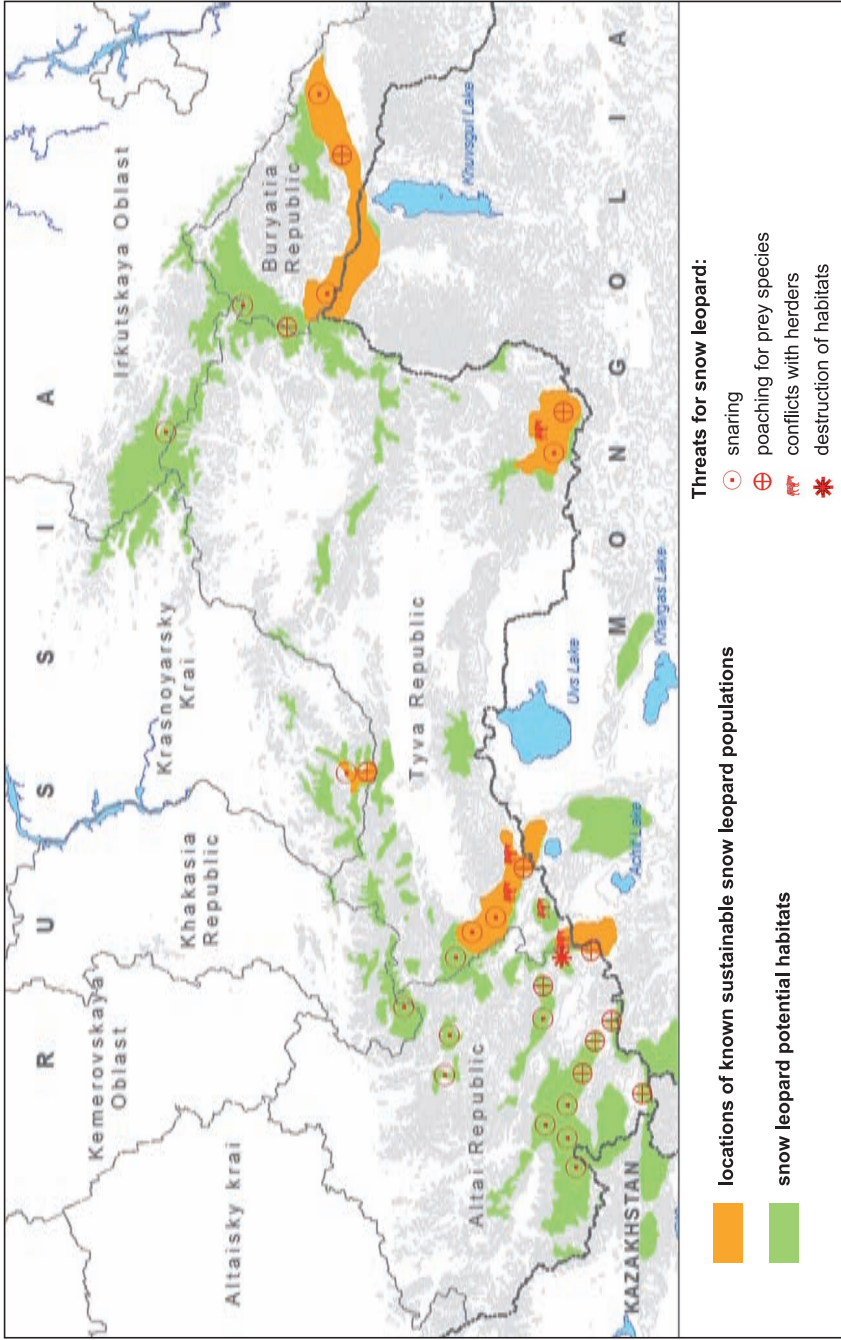
Indirect factors having the greatest influence on reducing snow leopard populations are decreased prey base, development of economic infrastructure, and habitat destruction.

Direct factors of influence

Snow leopard killing due to poaching

This is perhaps the most serious threat to the continued existence of snow leopards in Russia and other countries. Snare-hunting presents the greatest danger to this predator and it is commonly used throughout almost the entire species' range in Russia. Thanks to predictable behavior – snow leopards haunt the same trails and paths along ridges – the cats can easily be targeted by poachers and entrapped in snares set along mountain ridges and narrow trails. Snares are often set so densely that snow leopards have almost no chance of escaping alive. They can be hunted for their valuable pelts and other derivatives, but more often than not, they are just victims of snare-hunting targeting musk deer and other species. Snare-poaching of snow leopards is the main threat to their existence in the Argut River basin and in adjoining territories along the Katunsky, Southern Chuisky, and Northern Chuisky Ridges, as well as in Sayano-Shushensky Nature Reserve and its buffer zone, and on Sengelen Ridge. The risk of snares is lessened for snow leopards on the southern Shapshalsky, Chikhachev, and Tsagan-Shibetu Ridges, as well as Mongun-Taiga Massif.

Decreasing snow leopard populations in key habitat areas can be closely linked to the wide usage of snares in their range. According to E.P. Koshkarev, local herders caught 10-20 snow leopards annually in the Argut River valley in the 1960s and 70s (Koshkarev, 2002).



Direct and indirect trapping (during musk deer hunting) of snow leopards continued into the '80s and '90s in the Argut region, and by the early 21st century, the Argut population of snow leopards had been almost completely extirpated. Between 2004 and 2011, snares were no longer being set out in the Argut basin between the Shavla and Koir Rivers. Nevertheless, snow leopards did not reappear, despite high numbers of ungulates and the optimal habitat. Illegal snare-hunting continued in the Koir River basin for musk deer and other animals including snow leopards until 2008, when a resident of Tyungur was arrested for setting out several hundred wire and Capron snares on mountain ridges. During the winter of 2010-2011, S.V. Spitsyn discovered numerous snares on mountain ridges in snow leopard habitat along the lower branch of the Yungur (a large tributary of the Argut River).

There is also significant pressure due to illegal snare-hunting on the snow leopard population in Sayano-Shushensky Nature Reserve and its buffer zone. According to data collected by S.V. Istomov (Istomov, 2008), over the last 20 years the residents of Verkhneusinskoye alone caught at least 7 snow leopards in this area. The Nature Reserve's administration also noted the snaring of 2 snow leopards during the winter of 2004-2005 within the reserve (Istomov, 2008). In 2009, camera traps erected in snow leopard territory in Sayano-Shushensky Nature Reserve recorded images of a male snow leopard (known as Mongol) with a metal snare on his neck; the animal was entrapped but succeeded in tearing away (Istomov, 2010). It is quite clear that the small snow leopard population in Sayano-Shushensky Nature Reserve and its buffer zone persists thanks entirely to strengthened enforcement practices, but its growth is limited by the wide-scale use of snares to hunt musk deer and other species.

Ubsunurskaya Kotlovina Nature Reserve staff recorded the loss of a snow leopard in a snare in 2007 in the Kozer River valley on Shapshalsky Ridge (Bay-Taiginsky District, Tuva Republic). According to A.N. Kuksin, at least 1-2 snow leopards perish every year in snares set out for musk deer by local residents in the middle Barlyk River basin (Tsagan-Shibetu Ridge) (Kuksin, 2011).

D.G. Medvedev and R.N. Makulkin reported the death of a snow leopard in a musk deer snare in the Ungo River valley in Zabaikalsky region (Medvedev, Makulkin, 2000).

Local residents, mainly herders and hunters who overwinter in snow leopard habitat, are the main poachers, killing big cats and other species in snares. High prices for derivatives of snow leopards, musk deer, and other species

are the main reason for the mountain snaring industry and animal parts are one of the very few income sources for local residents living in snow leopard habitat in the Altai-Sayan Ecoregion. As a rule, enforcement agencies only very rarely notice snare poachers who work in difficult-to-reach snow leopard habitat. Give the high intensity of snare poaching, key groupings of snow leopard in Russia could be wiped out in just 10-15 years. Snare poaching of snow leopards is generally not occurring in the highest elevation habitats (for example, Chikhachev Ridge and Mongun-Taiga Massif, as well as at the highest parts of other ridges above the tree line).

There have also been infrequent instances of snow leopards being shot by local hunters using firearms, usually during chance encounters with this elusive predator in the mountains. Only a few of these cases are known. V.S. Lukarevsky told of a female snow leopard's death in 1998 in the Chokhyrtay River valley on Sengelen Ridge (Lukarevsky, 1999). A.N. Kuksin reported the deaths of 3 snow leopards when residents of Bay-Taiginsky District shot them in Tuva Republic at the Shuy River headwaters during a chance encounter in 2009 (Kuksin, 2011). D.G. Medvedev told of the shooting of 2 snow leopards at the headwaters of the Ekhe-Ukhgun River on Tunkinsky Ridge in 1997 and the Elingin-Gol River headwaters on Dzhidinsky Ridge in 1996 (Medvedev, 2000). There are also 2 known cases of snow leopard poisonings using barium fluoride acetate along the middle branch of the Shuy River in Bay-Taiginsky District and in the Ust-Yymaty River valley in Mongun-Taiginsky District in Tuva Republic in 1999-2000 (Paltsyn, 2004; Spitsyn, 2006). The majority of snow leopard shootings occur as a result of snow leopard attacks on livestock, a subject that will be thoroughly discussed in the next section.

It is illegal to trade in leopard pelts in Russia. Between 2003 and 2006, internet research identified 19 announcements of snow leopard pelts for sale, although the source of these pelts is not known (Smelyansky, Nikolenko, 2010). The majority of snow leopard pelts enter Russia from western Mongolia (on average, 3-5 pelts are seized every year by customs agents). Rough assessments by experts estimate that approximately 10 snow leopards are killed every year in Russia. Prices for snow leopard pelts in Russia range from \$500 to \$5,000-10,000 (Nikolenko, Smelyansky, 2011). In addition, snow leopard pelts and bones are in great demand in Southeast Asia for use in eastern medicine as a substitute for tiger derivatives. McCarthy and Chapron report that traders will pay several thousand dollars for a fresh snow leopard skeleton (McCarthy, Chapron, 2003).



**This snow leopard died in a poacher's snare.
Shapshalsky Ridge**



**Male snow leopard, named Mongol, with a snare on his neck.
Sayano-Shushensky Nature Reserve. S.V. Istomov**



**Snares seized from poachers in the Argut River basin.
S.V. Spitsyn**



**Snow leopard pelt, for sale.
Seized from smugglers in Altai Republic. I.A. Ivanitsky**

Snow leopard deaths due to livestock attacks

Persecution of snow leopards by herders due to attacks on livestock is a serious threat to the existence of snow leopards as well. In Russia, the problem is particularly relevant in western Tuva (Chikhachev Ridge, Tsagan-Shibetu Ridge, Shapshalsky Ridge, Mongun-Taiga Massif) and to a much lesser degree on the Sengelen Ridge (southeastern Tuva). Snow leopard attacks on livestock are almost entirely absent in Altai. As a rule, attacks occur when livestock are pastured directly in the big cat's habitat and/or the population of wild ungulates (the snow leopard's main prey base) is noticeably reduced due to poaching. Other reasons for snow leopard attacks on livestock include unsupervised livestock grazing and corrals that are poorly protected from predators. The majority of snow leopard attacks on livestock occur in the winter, particularly during difficult or high snow winters, although there are infrequent attacks at other times of year. Snow leopards may attack both small (goats and sheep) and larger animals – yaks and horses – attacking in pastures or in corrals where livestock are kept overnight. While a snow leopard will only kill 1-3 animals in a single attack in open landscape, in a corral the predator is capable of killing or wounding dozens of panicking animals (up to 80 head), resulting in tremendous losses for the herder. In turn, corrals become traps for the snow leopard itself, which is not always able to jump out again through the corral roof from among panicked sheep and goats. There are a number of known instances when herders killed snow leopards in corrals using rakes or old weapons. Facing the loss of large numbers of livestock as a result of an attack, herders may persecute the cat, setting out traps in areas near corrals or shooting them. Increasing numbers of livestock in snow leopard habitat will lead not only to increased conflicts with herders, but also to crowding out wild ungulates that form the natural prey base of snow leopards in mountain pastures.

Between 2000 and 2011, data were collected on over 100 instances of snow leopard attacks on livestock in western Tuva (Mongun-Taiginsky and Bay-Taiginsky Districts) resulting the killings of 465 head of livestock by snow leopards (367 sheep and goats, 98 large-horned livestock and horses). For the sake of comparison with data collected by A.N. Kuksin, wolves killed over 700 head of livestock over the course of 2010 alone on Shapshalsky Ridge (4.5 times more than snow leopard attacks in that same area over a 10-year period) (Table 3). The vast majority of attacks took place in pastures during livestock grazing (104 cases, 94%) and only 7 instances (6%) occurred in corrals. Snow leopards killed 205 livestock (44%) on pastures, while killing 206 animals in corrals in just a few attacks (56%).

When snow leopards kills dozens livestock in a corral it is a tragedy for the herder and often results in him immediately killing the cat. Between 2000 and 2011 we learned of 6 cases of snow leopards being killed by herders during livestock attacks, 4 of which took place inside corrals. There is no doubt that there are more such snow leopard killings by herders, but they carefully conceal these events for fear of being prosecuted for killing a Red-Book listed species. Table 3 below shows the main hotspots for snow leopard attacks in western Tuva on Tsagan-Shibetu and Shapshalsky Ridges, where cats have killed 329 head of livestock over the last 11 years (71% of the total livestock losses caused by snow leopards over the entire period).

Table 3. Data on snow leopard attacks on livestock in western Tuva, 2000- 2011

Habitat area	# of livestock attacks	# of animals killed by snow leopards			Of them	
		Small livestock	Large live-stock & horses	Total	Killed at pasture	Killed in corral
Tsagan-Shibetu Ridge	63	114	58	172	87	85
Mongun-Taiga Massif	2	86	0	86	1	85
Shapshalsky Ridge	40	122	35	157	67	90
Chikhachev Ridge	6	45	5	50	50	0
Total:	111	367	98	465	205	260

In 2004, local residents reported annual attacks by snow leopards on livestock in the Chokhyrtay and Kundus River valleys on Sengelen Ridge (Paltyn, 2004), however, in 2009, the herders surveyed stated that livestock attacks were now a very rare occurrence (Kuksin, 2009). It is possible that the reductions in snow leopard attacks occurred as a result of decreased numbers of snow leopards on Sengelen Ridge.

Live capture of snow leopards for captivity

Between 2000 and 2011 there have been only 3 reports of snow leopard cubs being captured in Altai Republic and Tuva Republic for the purposes of captivity by private persons in large cities (Barnaul, Krasnoyarsk). In 2004-2005, 2 snow leopard cubs captured in Altai were illegally kept in a private mansion in Barnaul. As a result, the cubs were transferred to the Kazan Zoo. In 2003, there was a report of snow leopard cubs captured in western Tuva for a private party in Krasnoyarsk. In 2011, there was an internet advertisement selling a snow leopard cub in Rubtsovsk, Altai Krai. Such instances are few and probably do not have a serious impact on the Russian snow leopard population as a whole.



**Corralled goats killed by a snow leopard.
Tsagan-Shibetu Ridge. S.V. Spitsyn**



Grazing goat killed by a snow leopard. Chikhachev Ridge. S.V. Spitsyn

There has never been any legal trapping of snow leopards for zoos within Russia.

Currently, the use of animals, including snow leopards, listed in the Russian Federation Red Book is regulated by 2 federal regulations: “On the affirmation of the Rules for hunting animals belonging to species listed in the Russian Federation Red Book, with the exception of biological water resources” (Decree #13, dated 6 January 1997) and “On the order of permit distribution (administrative licenses) for the trade of wild animals belonging to species listed in the Russian Federation Red Book” (Decree #156, dated 19 February 1996).

Russian federal Decree #156 (dated 19 February 1996) states, in part, that the possession and captivity of wild animals belonging to species listed in the Russian Federation Red Book are only permitted with the goal of conservation and reproduction of those animals in an artificial habitat, as well as for scientific or cultural education purposes, and their release into a natural environment is to be conducted with the goal of preserving and/or increasing their natural population.

Live animal capture requires a permit provided by the Russian Natural Resource Oversight Agency (RosPrirodNadzor) in accordance with the Administrative Regulations of the Federal Service for the Oversight of Natural Resource Use for the implementation of government issuing of permits for capturing plants and animals listed in the Russian Federation Red Book, as affirmed by a decree from the Ministry of Natural Resources (Decree #123, dated 30 April 2009) and registered at the Russian Justice Ministry on 22 June 2009 (Registration #14115).

There has been only one case of a snow leopard being captured with the permission of RosPrirodNadzor: in March 2011, a specialist from the Severtsov Institute of Ecology and Evolution captured a male snow leopard in Sayano-Shushensky Nature Reserve for collaring with a satellite-tracking collar.

Infectious Disease

Snow leopards can potentially be infected with various types of mange caused by commonly found scabies mites (*Sarcoptes scabiei* and *Choriptes* sp.) as well as bacterial infections (for example, bartonellosis) (McCarthy, Chapron, 2003). These diseases are found in many cat species as well as in other predators and ungulates (for example, blue sheep) and can lead to high mortality rates in snow leopards across the entire habitat range. There are data regarding mange infections in snow leopards in western Mongolia (McCarthy, Chapron, 2003). There are no data about infectious disease in snow leopards in Russia.

Indirect influencing factors

Decreases in snow leopard prey base populations

It is well known that predator population numbers depend directly on the population status of the species upon which it preys. As a result, a decreased numbers of ungulates– the snow leopard’s main prey – are one of the most important factors that determine a decrease in snow leopard populations. In most cases, this is also related to poaching. For example, in western Tuva the main reason for frequent snow leopard attacks on livestock is believed to be a sharp drop in wild ungulate populations in the mountains as a result of intensive hunting. According to local residents, following the construction of the road connecting Mugur-Aksy and Kyzyl, the number of Siberian ibex (the snow leopard’s main prey) on the southern Tsagan-Shibetu Ridge dropped severely due to poaching. Numbers of mountain ungulates remain relatively low in relatively accessible parts of snow leopard habitat such as the Southern Chuiskey Ridge, Chikhachev Ridge, Mongun-Taiga Massif, Tsagan-Shibetu and Shapshalsky Ridges, and Sengelen Ridge. Poaching affects the snow leopard population in the Argut River basin to a lesser degree, thanks to isolation and difficulty in accessing these areas. The same is true for Sayano-Shushensky Nature Reserve and its buffer zone thanks to ongoing enforcement efforts. We regularly see evidence of poaching and illegal hunting for ungulates in almost all known snow leopard habitats. Snare poaching for musk deer is very common in snow leopard habitat and severely reduces not just one of the snow leopard’s prey species, but also presents an extreme risk for the predator as well.

In Altai and Tuva Republics and southern Krasnoyarsk Krai, hunting is today the primary occupation (second to livestock farming) of many residents left unemployed after the collapse of Soviet collective farms and other enterprises. Many villages depend to a significant degree on hunting and gathering in the mountains and taiga forest. Local residents have significant numbers of illegal and unregistered weapons, a fact that is affirmed by the confiscation of dozens of such weapons every year. Illegal hunting is not infrequent in protected areas, including in snow leopard habitat (for example, in Altaisky, Sayano-Shushensky, and Ubsunurskaya Kotlovina Nature Reserves, Belukha and Ukok Nature Parks, and in Shavlinsky Refuge). Pressure by local hunters on wildlife is further increased by the arrival of hunting enthusiasts from neighboring regions and even other countries, many of which also hunt illegally. Certain tourism companies’ marketing materials openly advertise trophy hunting within protected areas (for example, within Shavlinsky Refuge in Altai Republic) where all hunting is forbidden.

Illegal hunting from helicopters (mainly in Altai Republic) taking place in snow leopard habitat (Chikhachev and Sailyugem Ridges, Argut River) remains a pressing issue for enforcement agencies. Over the last decade snowmobiles have come into common use for ungulate hunting in Altai and Tuva Republics. Snowmobiles allow poachers to penetrate the most remote areas and isolated snow leopard habitats during the winter, reaching the Southern Chuiskey, Sailyugem, and Chikhachev Ridges and Mongun-Taiga Massif to hunt for Siberian ibex, argali, red deer, and Siberian roe deer. This type of poaching is fairly difficult to monitor and interdict due to inadequate gear and equipment and insufficient numbers of enforcement agents in Altai and Tuva Republics.

In addition, decreases in wild ungulate populations facilitate the development of free-range livestock farming in snow leopard habitat. As a rule, livestock pasturing results in noticeable disturbances and crowds wild ungulates out of grazing habitat. Almost all herders are armed with firearms and will hunt wild ungulates given the opportunity. Wild ungulate populations are very low in almost all snow leopard habitats close to herder camps. Wild ungulate populations in snow leopard habitats can also be reduced by natural occurrences such as hard winters and epidemics.

Development of economic infrastructure and habitat destruction

Road construction in snow leopard habitat significantly increases access for poachers and herders, which generally results in decreased numbers of snow leopard prey and increased conflict between the cat and herders. One example of this is the construction of a road between Mugur-Aksy and Sagly by way of Tsagan-Shibetu Ridge that resulted in decreased numbers of Siberian ibex.

Construction of a natural gas pipeline and road across Russia's Ukok Plateau into China could also have a negative impact on snow leopard populations in the Argut River basin and Tabyn-Bogdo-Ola Ridge due to the potential disruption in wildlife corridors for this species between Russia, western Mongolia, and China.

Mining can also lead to the destruction of key snow leopard habitat in certain areas. Currently, there is a threat on the central Chikhachev Ridge where there are several polymetallic deposits planned for wide-scale development in immediate proximity to transboundary snow leopard habitat. Development of these deposits is linked not only to habitat destruction for snow leopards but also to increased disturbance factors and increased poaching with regard to ungulates and the snow leopard itself.



Construction of the Mugur-Aksy-Sagly road led to a sharp decrease in Siberian ibex numbers in snow leopard habitat on the southern Tsagan-Shibetu Ridge. A.N. Kuksin



Development of polymetallic mining deposits on Chikhachev Ridge may lead to the destruction of one of a key population of snow leopards in Russia. S.V. Spitsyn

STATUS OF SNOW LEOPARD PROTECTION

Legal basis for enforcement

Primary international conservation conventions and agreements

Snow leopards are listed in IUCN's Red Book as Endangered – a species whose population has been reduced by at least 20% over the course of 2 generations (16 years) due to poaching, persecution by herders, and decreased prey base.

In addition, snow leopards are included in CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora, dated 3 March 1973) Appendix I, which provides for the strict regulation of commercial export and import.

The Convention on Biological Diversity (Rio Di Janeiro, 5 June 1992) facilitates the conservation and recovery of species that are rare and threatened with extinction. Snow leopards are in this category.

The conservation of rare species and their habitat is one of the main tasks of an agreement (dated 15 February 1994) between the Russian and Mongolian federal governments for collaboration in the area of environmental protection.

National laws

Red Books

In 1974, the USSR's Supreme Soviet published a decree establishing the Red Book of the USSR. The snow leopard was one of the very first listed in the USSR Red Book when it was published in 1978.

Today, snow leopards are still inscribed in the Russian Federation Red Book and are members of Category I – threatened with extinction at the periphery of the species' habitat.

Hunting of animals belonging to species listed in the Russian Federation Red Book (including snow leopards) is regulated by Russian federal Decree #13 "On affirming the Rules for harvesting animals belonging to species listed in the Russian Federation Red Book, with the exception of water-based biological resources" (dated 6 January 1997).

According to the aforementioned Rules, snow leopard hunting is exclusively permitted for the purposes of the animal's conservation, monitoring of its population status, population regulation, public health enforcement, elimination of a threat to human life, and the prevention of mass infection of agricultural and other domesticated animals.

Snow leopards are listed in the Red Books of 7 Russian Federation subjects –the Republics of Altai, Tuva, Khakasia, and Buryatia, Irkutsk Oblast, and Krasnoyarsk and Zabaikalsky Krai.

Legal and other regulatory acts in the Russia Federation

In Russia, the key regulations concerning the conservation and use of animals, including snow leopards, and their habitats are contained in conservation laws, including these key acts:

- Federal law FZ #7 “On environmental protection” (dated 10 January 2002),
- Federal law FZ #52 “On the animal world” (dated 24 April 1995),
- Federal law FZ #33 “On protected areas” (dated 14 March 1995), and
- Other legislative acts, federal decrees, and departmental regulatory acts, and regulatory acts in other legal branches (civil, criminal, administrative laws).

The federal law “On the animal world” is the primary legislation in this arena. It regulates relationships between enforcement and use of the animal world overall, as well as in the framework of habitat conservation and restoration for the purposes of ensuring biological diversity, sustainable use of all components, establishing conditions for wildlife sustainability, conservation of the genetic fund for wildlife, and other protections for wildlife as an intrinsic part of the natural environment. The law defines the rights of government property to wildlife within the Russian Federation. The legislation determines wildlife conservation measures, including habitat protection for rare and threatened species by establishing protected areas, and it envisions the identification of protected landscapes and aquatic areas required for life cycles (reproduction, rearing young, feeding, rest, migration, and others) where specific types of economic activity are forbidden or regulated by the means and timing of the activity.

The law determines the authority of Russian federal agencies in the area of enforcement and use of wildlife, the authority of the Russian Federation conveyed to government agencies in Russian administrative regions for implementation, the specific authority of government agencies of a given Russian administrative region, and the authority of local self-governing agencies. The law determines the right of citizens and legal entities to conduct

community-based monitoring, conduct wildlife and habitat conservation, and to facilitate the realization of relevant government programs. The law defines the subjects conducting government management in conservation and wildlife use, wildlife habitat conservation and restoration, the primary principles of government conservation management, and sustainable use of wildlife.

In order to ensure enforcement and use of wildlife and habitat conservation and restoration, the law presumes requirements to conduct government surveys of wildlife and their use and a government cadaster of wildlife, to conduct government wildlife monitoring, and to implement government conservation programs for wildlife and wildlife habitat.

In addition, the law requires the government to protect wildlife by demanding a government environmental impact report (*expertiza*) to precede any economic decision with the potential to impact animals and their habitat. The law declares that rare and threatened species must be listed in the Russian Federation Red Book and the Red Books of Russian administrative regions. Activities that lead wildlife mortality, population decline, or habitat damage are forbidden, and legal entities or citizens conducting economic activity on lands or water bodies occupied by protected wildlife are responsible for their conservation and reproduction. The law also provides for a permitting process to regulate the use, trade, and captivity of listed animals as well as their release back into nature.

To a significant degree, numerous sub-legislative and agency-level regulatory acts are the working legal foundation of management and law enforcement agencies in conservation activities, regulate the use of rare and threatened species, protect habitat, and provide a regulatory mechanism with reasonably well-defined jurisdiction and distinctions between federal and regional government agencies.

However, the effectiveness of this working system for regulatory management is significantly reduced both by the absence of a sufficiently effective enforcement policy and the presence of regulatory, legal, and methodological loopholes in the system in a number of areas.

For example, the Russian federal “Code on administrative violations” establishes administrative responsibility for destruction of rare and threatened animal or plant species listed in the Russian Federation Red Book or protected by international agreements, for actions (or inaction) resulting in the death, population decrease, habitat violation of these animals or the death

of those plants, the harvest, gathering, capture, acquisition, or sale of derivatives without the required permits or in violation of the conditions set by that permit, or the violation of any other regulation.

There are no legal regulations for the prosecution of individuals advertising the sale of pelts on the internet or for the acquisition of personal property resulting from illegal hunting.

Between 2000 and 2011 there were almost no cases prosecuting poachers for killing snow leopards and during that entire period only 2 cases of illegal hunting of snow leopards were discovered. In the first case, a resident of Kyzyl-Khaya in Mongun-Taiginsky District shot a snow leopard in the Aspayty River valley following the animal's attack on livestock. However, for some unknown reason he was not criminally prosecuted. In the second case in 2007, a herder caught a snow leopard in a snare in the Kozher River valley in Bay-Taiginsky District in Tuva Republic. Inspectors from Ubsunurskaya Kotlovina Nature Reserve discovered this case and a criminal case was opened. The guilty party managed to escape culpability in this case as well. Between 2000 and 2011 there were a number of instances when contraband snow leopard pelts entered Russia (Altai Republic) from Mongolia. In spring 2004, Mongolian and Russian citizens were arrested for illegal transportation of 17 snow leopard pelts from Mongolia into Russia. The accused were sentenced to 9 months in prison and a fine of 450,000 rubles (approximately \$15,000). In April 2009 thanks to investigation work, staff from Altai Republic's Criminal Investigation Agency (Ministry of Internal Affairs) and the Gorno-Altaysk Customs Department made an undercover purchase of 3 pelts and a skull belonging to snow leopards from a resident of Altai Republic that had been illegally imported from Mongolia. Another 2 snow leopard pelts were seized by Altai Republic operatives from a concealed compartment in a Russian citizen's automobile bringing in contraband from Mongolia. In January 2010 another 2 snow leopard pelts were seized, having been illegally imported from Mongolia. All violators were prosecuted for criminal smuggling.

Article 20 of the federal law "On the animal world" establishes the government environmental impact assessment (*expertiza*) as a mandatory measure to protect wildlife. The assessment must precede finalizing any economic decisions with the potential to impact animals and their habitat. Article 24 states that actions resulting in death, population decrease, or habitat impacts to wildlife listed in the Red Book are not permitted.

However, in the event that economic activity resulting in environmental impacts takes place outside a protected area, the continental shelf, an exclusive economic zone, interior marine waters, or territorial seas or adjacent areas in the Russian Federation, or if such economic activity is not identified as an ear-marked program, then the government environmental impact report is not required under federal law #174 “On environmental impact reports” (dated 23 November 1995), nor is there a legal basis forbidding the activity, even if it has the potential to negatively impact snow leopard habitat.

Considering the requirements of the aforementioned federal law “On the animal world” it should be noted that project documentation for any capital development project in snow leopard habitat should undergo government environmental impact assessment to assess its compliance with environmental requirements.

Protected areas

Currently, an assortment of protected areas cover 23% of potential snow leopard habitat in the Russian part of the species’ range (Table 4). However, just 16% of known sustainable snow leopard populations habitat in Russia falls within a protected area (Map 5). It should also be noted that in many of these protected areas, snow leopard conservation enforcement is insufficient. A number of protected areas require a change in status, optimization of the lands, and a strengthened enforcement regime. Transboundary cooperation between Russian and Mongolian protected areas requires urgent improvements for the preservation of transboundary snow leopard populations.

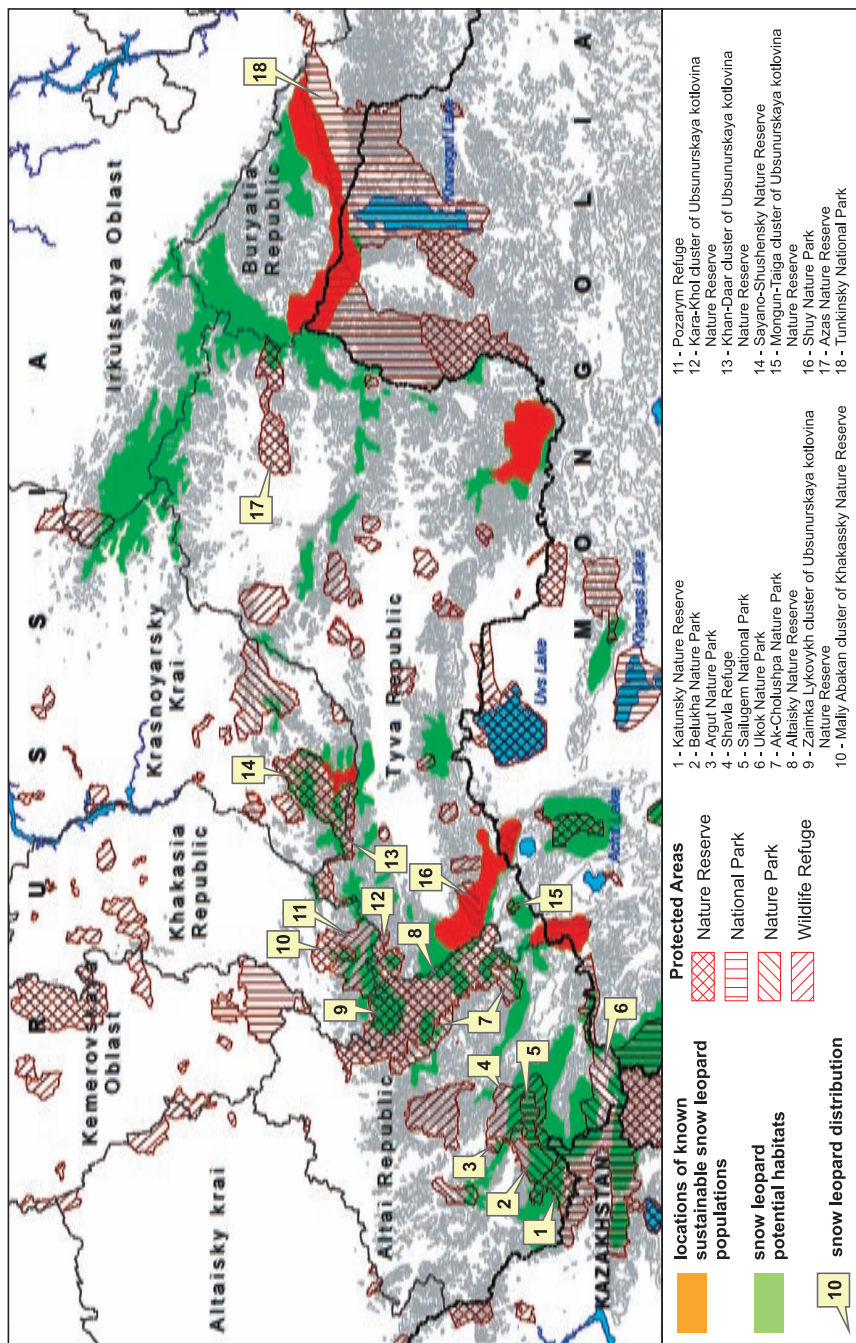
The following protected areas are of the most importance for snow leopard conservation in the Russian part of the ecoregion and are situated in optimal snow leopard habitat or are within the cat’s main migration corridors that connect a large population center in western Mongolia and smaller Russian groups: Sayano-Shushensky Nature Reserve, Ubsunurskaya Kotlovina Nature Reserve (Mongun-Taiga cluster and its buffer zone), Sailyugem National Park, Shavlinsky Refuge, Belukha Nature Park, Ukok Quiet Zone Nature Park, Shuysky Nature Park, and possibly, Tunkinsky National Park.

As mentioned earlier, Sayano-Shushensky Nature Reserve and its buffer zone encompass the northernmost snow leopard habitat in Russia, with an aggregate population of 9-10 animals (Istomov, 2010). The total area of potential snow leopard habitat within the nature reserve and its buffer zone is approximately 1,000 km², mainly along the shores of the Sayan Reservoir.

Table 4. List of protected areas containing potential snow leopard habitat in Russia

Name of protected area	Area, hectares	Administrative region
1	2	3
Nature Reserves:		
Altaiisky	881,238	Altai Republic, Ulagan District
Katunsky	151,637	Altai Republic, Ust-Koksa District
Mongun-Taiga, Kara-Khol, and Khan-Deer clusters in Ubsunurskaya Kotlovina Nature Reserve	251,258	Tuva Republic, Mongun-Taiginsky and Sut-Khol-sky Districts
Azas	300,390	Tuva Republic, Todzhinsky District
Zaimka Lykovykh and Maliy Abakan clusters in Khakassky Nature Reserve	246,500	Khakasia Republic
Sayano-Shushensky	390,368	Krasnoyarsk Krai, Shushensky and Ermakovsky Districts
Reserve Buffer zones:		
Mongun-Taiga, Kara-Khol, and Khan-Deer Buffer zones in Ubsunurskaya Kotlovina Nature Reserve	465,328	Tuva Republic, Mongun-Taiginsky, Bay-Taiginsky and Sut-Khol-sky Districts
Zaimka Lykovykh and Maliy Abakan Buffer zones in Khakassky Nature Reserve	45,200	Khakasia Republic
Sayano-Shushensky Nature Reserve Buffer zone	106,200	Krasnoyarsk Krai, Shushensky and Ermakovsky Districts
National Parks:		
Argut and Sailuygem clusters of Sailuygem National Park	115,130	Altai Republic, Kosh-Agach District
Tunkinsky National Park	1,183,662	Buryatia Republic

1	2	3
Nature Parks:		
Quiet Zone Ukok Plateau Nature Park	254,204	Altai Republic, Kosh-Agach District
Uch-Enmek Nature Park (Argut cluster)	34,441	Altai Republic, Ongudai District
Belukha Nature Park	131,337	Altai Republic, Ust-Koksa District
Ak-Cholushpa Nature Park	189,183	Altai Republic, Ulagan District
Shuyskiy Nature Park	98,000	Tuva Republic, Bay-Taiginsky District
Refuges:		
Shavlinsky	248,081	Altai Republic, Ongudai and Kosh-Agach Districts
Pozarym	253,743	Khakasia Republic, Tashtypsky District
Total in Altai-Sayan Ecoregion (hectares)	5,345,900	



Map 5. Protected areas in snow leopard habitat in Russia

One of the largest populations of Siberian ibex, approximately 2,500 animals, resides in this same region and is a good prey base for the snow leopard. The primary threat to snow leopards in Sayano-Shushensky Nature Reserve and its buffer zone is illegal snaring of musk deer and other species. It is clear that the current snow leopard population persists thanks only to the nature reserve's enforcement efforts. The Irbis Interagency Operations Team, established with the support of WWF, has been conducting enforcement patrols in snow leopard habitat in the nature reserve and its buffer zone since 2003.

On Mongun-Taiga Massif in southwestern Tuva there is an eponymous part of Ubsunurskaya Kotlovina Nature Reserve, occupying the highest part of the massif. It has an area of approximately 15,890 hectares and includes glaciers, snowfields, cliff massifs, and rubble and rock tundras that represent the highest elevations of snow leopard habitat. The buffer zone of this area is an additional 125,600 hectares, including snow leopard habitat on Mongun-Taiga Massif, the eastern macroslope of Chikhachev Ridge, and the southern Tsagan-Shibetu Ridge along the Mongolian border and is important for protecting snow leopards in southwestern Tuva. The snow leopard's main prey here are Siberian ibex, argali, Siberian roe deer, Altai and Mongolian marmot, Altai snowcock, and pika. Ungulate populations here are not large and do not exceed 200-300 animals. The main threat to snow leopards in this area is persecution by herders as a result of predator livestock attacks and a decreasing prey base due to poaching. The nature reserve involves other conservation agencies in enforcement (using an interagency anti-poaching brigade) and collaborates with local residents to reduce conflicts between herders and snow leopards. There is a need to expand the Mongun-Taiga cluster and also to incorporate additional areas of snow leopard habitat on Tsagan-Shibetu Ridge in the nature reserve in addition to increased protection measures.

Sailyugem National Park was established in Altai Republic in 2010 and consists of 3 parts: Argut, Sailyugem, and Ulandryk, with a total area of 118,380 hectares. There is potential snow leopard habitat within the Argut (80,730 hectares) and Sailyugem (34,400 hectares) areas. Despite the present of optimal habitat and a high density of prey species (up to 20 Siberian ibex per square kilometer), between 2004 and 2011, there was no evidence of ongoing snow leopard activity in the Argut area (in the Koir and Yungur River valleys). In all likelihood, this one-time largest center of Russian snow leopards (totaling 20-30 animals) was practically completely destroyed between the 1970s and '90s by snare-poachers. Poaching with snares continued in the Koir valley until 2008 and continues in the Yungur valley even today. In the event that snaring of snow leopards in the Argut region was to completely cease, the population could be restored in the next 15-25 years.

No evidence of an ongoing snow leopard presence has been found in the Sailyugem area of the national park. As of today, this national park has not yet begun operations.

In 1981, Shavlinsky Refuge, a regional protected area for the conservation of game species, was established in the Argut basin. In 1991, it was converted into a comprehensive biological refuge intended to expire in 2000. The refuge was reestablished in 2002 with that same status by a decree of the Altai Republic government. Today, Shavlinsky Refuge occupies 248,081 hectares and surrounds the Argut segment of Sailyugem National Park on 3 sides. Shavlinsky Refuge also includes optimal snow leopard habitat and a high density of Siberian ibex (up to 18 animals per square kilometer) in the Argut, Shavla, Karakem, and Bolshoy, Maliy, and Sredniy Ary-Yul Rivers. However, as in the Argut area of Sailyugem National Park, there is no known stable population of snow leopards in this area currently. Local residents report that snow leopards lived in this area until the end of the 1990s, at which time they were actively hunted with snares. Today, there are clearly only a very few animals remaining of the previous snow leopard population. As in the Argut case, in Sailyugem National Park the snow leopard population can only be restored with the cessation of snare hunting. All hunting is forbidden within the refuge, livestock grazing is limited, as is gathering medicinal plants. In reality, however, this refuge exists only on paper; there are essentially no ongoing enforcement activities, and poaching is a frequent occurrence.

Belukha Nature Park borders both the Argut area of Sailyugem National Park and Shavlinsky Refuge. There is potential snow leopard habitat within this protected area at the headwaters of the Akkem and Kucherla Rivers. 400-500 Siberian ibex reside within the park, as do musk deer and red deer. There are likely no more than 1-3 snow leopards in the park. There is intensive illegal snare hunting of musk deer and other species here, and there were cases of snow leopards caught in snares into the late 1990s. There is essentially no enforcement in the nature park, and park inspectors do not have the right to detain poachers or issue citations of environmental law violations.

Ukok Quiet Zone Nature Park includes potential snow leopard habitat on the western Sailyugem Ridge and the northern macroslope of Tabyn-Bogdola Ridge at the intersection of the borders of Russia, Kazakhstan, Mongolia, and China. There are few wild ungulates (argali, Siberian ibex, Siberian roe deer, red deer) within the park. There is no known population of snow leopards in the area, however this protected area is important as a connectivity corridor between snow leopard groups in Mongolian Altai, the Katunsky, Northern and Southern Chuisky Ridges, and Southern Altai Ridge.

Shuysky Nature Park includes important snow leopard habitat at the intersection of Tsagan-Shibetu Ridge and Shapshalsky Ridge in the Shuy River basin. 3-4 snow leopards live within the nature park. There have been instances of snow leopard attacks on livestock, and there are also accounts of local herders killing snow leopards. As of this moment, the nature park is being launched and is not yet providing any protection of snow leopards or snow leopard habitat.

Tunkinsky National Park includes a small amount of potential snow leopard habitat on Tunkinsky Ridge, along the Russia-Mongolia border. The snow leopard population is unknown.

Protected areas such as Altaisky Nature Reserve, the Zaimka Lykovykh and Maliy Abakan clusters of Khakassky Nature Reserve, the Kara-Khol and Khan-Deer parts of Ubsunurskaya Kotlovina Nature Reserve, Pozarym Federal Refuge, Ak-Cholushpa Nature Park, and the Sailyugem area of Sailyugem National Park are likely of secondary importance to snow leopard conservation in Russia and mainly include migration corridors between a few sustainable Russian groups.

Essentially, key habitats of known snow leopard populations on Chikhachev, Tsagan-Shibetu, and Sengelen Ridges are afforded no protection whatsoever.



Snow leopard cubs in Sayano-Shushensky Nature Reserve. S.V. Istomov

As of today, there is no comprehensive system to protect the entire Russian snow leopard population in recognition of the species' ecological significance.

Up until now, the importance of these habitats for the conservation of this species has only been considered in a few cases when determining a protection category and, as a result, when determining the enforcement regime to protect snow leopard habitat.

One of the key questions for snow leopard conservation is the optimization of natural resource use in snow leopard habitat outside of protected areas.

Raising snow leopards in captivity

Zoos play an important role in educating the general public about snow leopard conservation as well as the importance of protecting these animals in their natural habitats.

Zoos are a source of valuable scientific data and practical experience. New combinations of anesthesia are developed and tested in zoos, after which they can be used for field research on snow leopards in the wild. Zoos permit the study of parameters that can be used to determine the age of animals (condition of teeth), which can then be used to work with snow leopards in the wild. Photographs of spot patterns on snow leopard pelage and blood samples from captive snow leopards can be used in genetic research. The study of DNA-containing excrement from snow leopards living in zoos facilitates the development of research methodologies for animals in the wild. As of 2011, 438 snow leopards lived in 158 zoos around the world (192 males, 214 females, and 32 cubs, born in the last 12 months) (ISIS Species Holdings (<https://app.isis.org/abstracts/abs.asp>)). In Russia, 22 snow leopards (8 males, 11 females, and 3 cubs born in the last 12 months) live in 6 zoos in Moscow, Kazan, Novosibirsk, Perm, St. Petersburg, and Kaliningrad. As one can see from the statistics, the zoo snow leopard population is being significantly and regularly increased with animals born in captivity. If necessary, this population could be used to improve the gene fund of the natural population.

In Russia today, there is no need to reintroduce captive-born snow leopards to nature, but it may become desirable to increase the wild population in the future. Such actions are not a priority in the short-term for snow leopard conservation, but can be reviewed as an alternative in the event of a severe drop in the natural population.

HIGH PRIORITY SNOW LEOPARD CONSERVATION MEASURES

The conservation of key snow leopard populations in Russia can only be achieved by a set of comprehensive measures aimed at protecting the snow leopard itself as well as its habitat. The biological characteristics of the species living at the northern boundary of its range, as well as the last 10 years of experience in its conservation, should also be considered.

The main tasks for snow leopard conservation are the elimination factors decreasing snow leopard populations as well as minimizing negative factors that reduce or destroy suitable habitat. High priority measures for snow leopard conservation are required to complete these tasks in Russia.

Development of international cooperation

The preservation of transboundary parts of the snow leopard's range at the intersection of Russia, Mongolia, and China is of particular importance to overall snow leopard conservation in the animal's northernmost range. These areas connect large populations of the species in western Mongolia and northwestern China with sparse groups of snow leopards in Russia. The first order of priority is ensuring the effective conservation of 2 sustainable populations of snow leopard at the Russia-Mongolia border on Tsagan-Shibetu Ridge (15-20 animals) and Chikhachev Ridge (10-15 animals). An assessment is needed to determine the importance of other potential transboundary snow leopard corridors for the survival of Russian populations. These potential corridors are on the boundaries of Russia, Mongolia, China, and Kazakhstan: Tabyu-Bogdo-Ola Ridge, Southern Altai Ridge, and the mountain ridges around Khuvsgul Lake. Coordinated conservation efforts between our countries are of the utmost importance for preserving transboundary snow leopard populations. Organization of international cooperation primarily between Russia and Mongolia for conservation and scientific study of snow leopards in current conditions is affected by a range of factors – mainly anthropogenic – influencing key transboundary snow leopard populations.

It would be expedient to develop intergovernmental cooperation in this arena in the following areas:

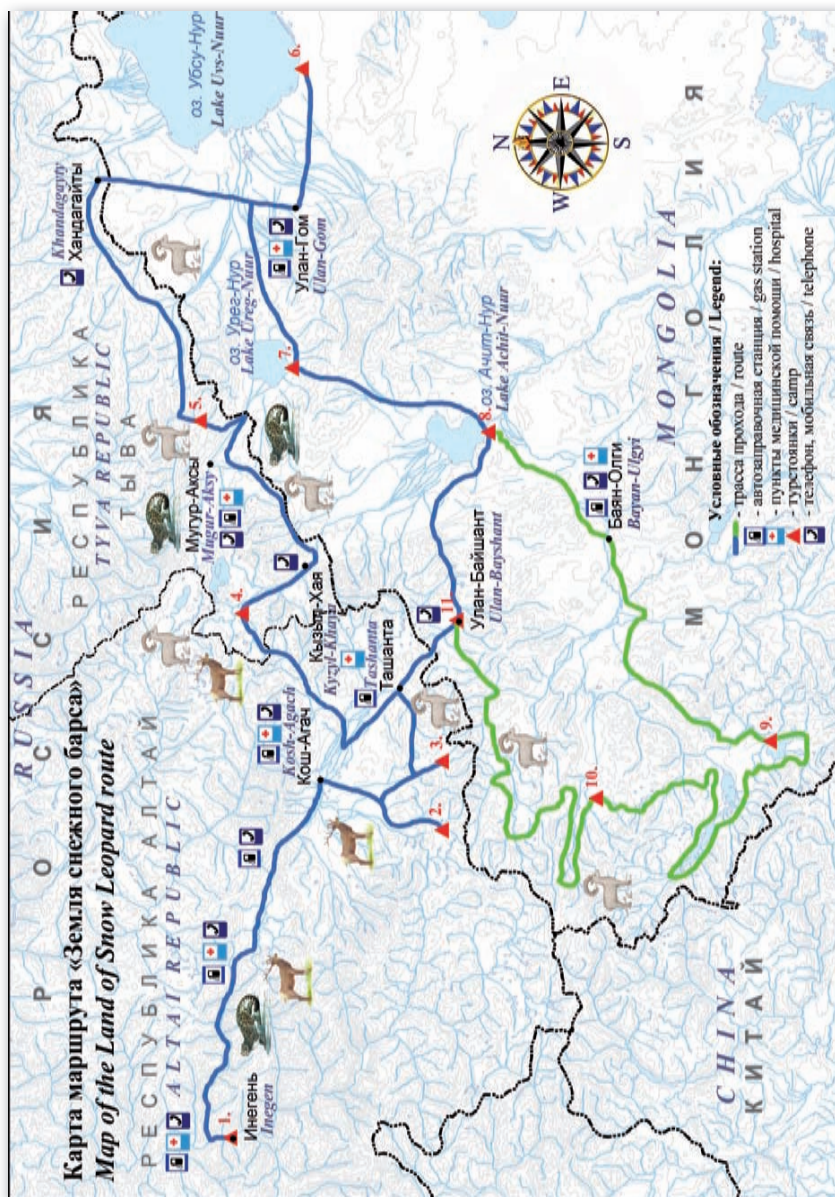
- Develop and approve a program of actions for snow leopard conservation in the Russia-Mongolia transboundary zone, as well as in Russia and Kazakhstan;

Develop and expand international transboundary Russian-Mongolian protected areas for the protection of snow leopards and other rare species on Chikhachev, Tsagan-Shibetu, Sailyugem, and Tunkinsky Ridges and the mountains around Khuvsgul Lake;

- Expand the “Golden Mountains of Altai” UNESCO World Heritage site in the transboundary area of Russia, Mongolia, China, and Kazakhstan;
- Coordinated actions between Russia, Mongolia, Kazakhstan, and China to interdict the movement and resale of contraband from illegal hunting of snow leopards and other rare species. This collaboration should be developed by coordination and information exchange among our countries’ customs agencies regarding the movements of illegal animal parts as well as information exchange between corresponding government structures monitoring illegal trade in our countries and internationally;
- Coordination of science programs and development of collaborations among specialists in Russia, Mongolia, China, and Kazakhstan to study snow leopards. Development of joint programs for snow leopard population monitoring in the Russia-Mongolia transboundary zone (beginning with Chikhachev and Tsagan-Shibetu Ridge) is of particular importance. Other important tasks include identification of primary snow leopard migration corridors connecting populations in Russia with the main population center in western Mongolia and northwestern China. A Russian-Mongolian collaboration for the study and monitoring of the transboundary snow leopard



Participants in a joint Russian-Mongolian expedition to monitor transboundary populations stand near a tree with the snow leopard claw rakes. Tsagan-Shibetu Ridge. S.V. Spitsyn



Map of the Land of the Snow Leopard ecotourism route

population on Tsagan-Shibetu and Chikhachev Ridges has been underway since 2010 with support from WWF;

- Develop transboundary ecotourism in the habitats of snow leopards and other rare species focused on protected areas and local communities in Russia and Mongolia. The first step in this direction was made by WWF and the UNDP/GEF “Biodiversity Conservation in the Russian Altai-Sayan Ecoregion”: the “Land of the Snow Leopard” project to develop ecotourism in local communities in snow leopard habitat in Altai, Tuva, and western Mongolia began in 2010.

Collaboration with international conservation organizations, charitable foundations, and other non-governmental organizations engaged in snow leopard conservation and study is also of importance. This includes Snow Leopard Network, Snow Leopard International Trust, Snow Leopard Conservancy, and Panthera. This cooperation can attract additional funding as well as the exchange of ideas and the latest experience and technology and can result in joint projects with Russian and foreign experts on snow leopard conservation and science across the species’ entire range. For example, current work to identify the precise distribution of snow leopards within the species’ entire range is of the utmost importance.

Improvements in the legal and regulatory sphere

In order to increase the effectiveness of Russian conservation legislation and enforcement practices in the area of snow leopard conservation, the following steps are recommended:

- Strengthen Russian laws and regulations to prosecute individuals who process illegally harvested pelts of snow leopards and other rare and threatened species;
- Develop legal regulations for prosecuting individuals advertising in the media and on the internet for the sale of pelts and other snow leopard derivatives, for acquiring personal property of products produced by illegal hunting for that species, as well as prosecuting the people lodging those advertisements;
- Strengthen the administrative responsibility for destroying snow leopards and other species listed in the Russian Federation Red Book by amending article 8.35 “Destruction of rare and threatened species of animals and plants” of the Russian Federation “Code on administrative violations” by including the storage and transportation of Red Book species, their parts and derivatives in the list of punishable offenses as well as increasing the administrative penalty for citizens (replacing “from 1,500 to 2,500 rubles” with “from 2,500 to 5,000 rubles”) and providing for confiscation of the vehicle used for transportation;

- Strengthen the penalty for destruction and illegal transportation of species listed in the Russian Federation Red Book and their derivatives over the customs border of the Russian Federation by making the necessary changes and additions in the Russian federal Criminal Code:

- ◊ In Part 2, Article 188 of the Russian federal Criminal Code, expand the definition of “contraband” and the list of items forbidden for transport across the customs border by including in Part 2, Article 188, following the words “strategically important raw materials or cultural valuables in connection with which there are special rules for transport across the Russian Federation customs border” the phrases “animals and plants listed in the Russian Red Book, their derivatives, and products made from them”.

- ◊ In Article 258 of the Russian federal Criminal Code, equate culpability for illegal transport of protected wildlife, their parts, or derivatives with illegal hunting itself. This change would completely meet the requirements laid out in Part 2, Article 57 “Responsibility for legal violations with respect to hunting and conservation of hunting resources” of federal law #209 “On hunting and the conservation of hunting resources and on amendments to certain legislative acts of the Russian Federation” (dated 24 July 2009).

- ◊ Presume criminal culpability for illegal trade or captivity of snow leopards and other species listed in the Russian Federation Red Book.

- In federal law #174 “On the environmental impact assessment report” (dated 23 November 1995), change and amend the text to require project documentation of any capital construction projects occurring in the habitat of snow leopards and other Red Book-listed species to undergo a government environmental impact report (*expertiza*);

- Make changes to the regulations for harvesting of hunting resources within the boundaries of key snow leopard habitat, taking in consideration the need for supporting stable ungulate populations and other species that serve as key prey species for this predator;

- Develop and approve Rules for trade in products derived from hunting species and species listed in the Russian Federation Red Book;

- Establish criminal responsibility for illegal trade in derivatives of musk deer and other hunting species;

- Completely ban the use of snares as a hunting method in snow leopard habitat;

- Amend Russian federal laws to provide nature park inspectors with the rights of government inspectors;

- Enable further improvements in laws at the federal and regional levels as well as the development of agency documentation with regard to snow leopard conservation.

Development of a network of protected areas

One of the more effective measures for preserving snow leopard populations and other rare species in Russia is the creation of special protected areas (PAs). As mentioned earlier, today approximately 23% of potential snow leopard population falls within PAs of various status. However, the habitats of the known stable snow leopard populations falling within protected areas do not exceed 16%. It is precisely these habitats that require the establishment of PAs for snow leopard protection (Chikhachev, Tsagan-Shibetu, Mongun-Taiga, and Sengelen Ridges, the area adjacent to Sayan Reservoir, and possibly, Okinsky and Tunkinsky Ridges). In addition, the protection of snow leopards and their habitats are inadequate within many PAs. In order to optimize the PA system for snow leopards in Russia, the following actions are required:

- Begin work activities within Sailyugem National Park, a PA established in February 2010, for the protection of snow leopards and other rare species within its boundaries, by allocating funding from the federal budget for operations. The Argut segment of the park should receive the greatest attention, where despite optimal habitat and a high concentration of ungulate prey animals, the restoration of snow leopards in this area has been limited by illegal snare-hunting;
- Development of a management and development plan for Sailyugem National Park.
- Raise the official status of Ukok Quiet Zone Nature Park and incorporate its territory into Sailyugem National Park;
- Create a transboundary Sailyugem National Park based on Sailyugem National Park (Altai Republic, Russia) and Silkhemin Nuruu National Park (Bayan-Olgii Aimak, Mongolia);
- Establish an international “Golden Mountains of Altai” UNESCO World Heritage Site based on Ukok Quiet Zone Nature Park, Sailyugem National Park, and Katunsky Nature Reserve in Russia, the national parks of Silkhemin Nuruu and Altai Tavan Bogd in Mongolia, Kanas National Park in China, and Katon-Karagaisky National Park in Kazakhstan;
- Establish a buffer zone around the Argut segment of Sailyugem National Park within the boundaries of Shavlinsky Refuge; and
- There is great need for the establishment of a series of PAs in areas with stable snow leopard populations within Russia, a total area of at least 300,000 hectares (Table 5).

Increasing the effectiveness of snow leopard protection outside of protected areas

The effectiveness of snow leopard protection outside of PAs, including the effectiveness of preventing and interdicting poaching, depends to a significant degree on the support of the state, federal executive agencies,

Table 5. Protected areas necessary for protecting stable snow leopard populations in Russia

Name of prospective protected area	Area, hectares	Administrative region
Nature Reserves		
Expansion of the Mongun-Taiga cluster of Ubsunurskaya Kotlovina Nature Reserve (inclusion of the Sharakhgairi River headwaters)	10,000	Tuva Republic, Mongun-Taiginsky District
Eldig-Khem cluster of Ubsunurskaya Kotlovina Nature Reserve on Tsagan-Shibetu Ridge (headwaters of the Barlyk, Khemchegeylik-Khem, and Eldy-Khem Rivers)	20,000	Tuva Republic, Mongun-Taiginsky District
Malaya Mongun-Taiga cluster of Ubsunurskaya Kotlovina Nature Reserve on Chikhachev Ridge	10,000	Tuva Republic, Mongun-Taiginsky District
Sengelen cluster of Ubsunurskaya Kotlovina Nature Reserve on Sengelen Ridge (Tszaigal-Gol, Saygal, and Kargure Rivers)	20,000	Tuva Republic, Tere-Kholsky District
National Parks:		
Western macroslope of Chikhachev Ridge in Altai Republic (on the Mongolian border), a part of Sailyugem National Park	80,000	Altai Republic, Kosh-Agach District
Nature Parks:		
Nature park in the Toolaylyg River basin on Tsagan-Shibetu Ridge	50,000	Tuva Republic, Mongun-Taiginsky District
Refuges:		
Urbunsky Refuge (Urbun, Kurgol, and Maliy Shugur Rivers in the area adjacent to Sayan Reservoir)	50,000	Krasnoyarsk Krai, Ermakovsky District
Shanchy Refuge in the areas adjacent to Sayano-Shushensky Nature Reserve	60,000	Tuva Republic, Chaa-Kholsky District
Total:	300,000	

and regional executive agencies in the Russian Federation, as well as the active participation of community associations.

Measures to strengthen snow leopard protection outside of PAs can be effective if they ensure that Russian federal laws are enforced on the ground and that these measures are based on the coordinated joint actions of the Ministry of Natural Resources and Ecology, the Federal Agency for Oversight of Natural Resource Use and its regional offices, the Federal Security

Bureau (including the FSB Border Service), transportation police, authorized agencies in the Russian Federation's regional governments, other interested agencies, and local residents.

In order to increase the effectiveness of snow leopard protection and ensure conservation of its habitat outside of PAs it is advisable to:

- Develop and implement a comprehensive system for protecting snow leopard habitat that recognizes the ecological significance of the Russian population;
- Limits economic activity (particularly mining) in the most important habitats of existing stable groups of snow leopards;
- Strengthen monitoring and oversight of executive authority delegated to the regional level for wildlife protection;
- Develop and implement long-term federal and regional programs for the restoration of wild ungulate populations in snow leopards key habitats (particularly relevant for Chikhachev and Southern Chuisky Ridges, Mongun-Taiga Massif, and Tsagan-Shibetu and Sengelen Ridges);
- Ensure effective work by regional wildlife protection agencies in the fight against poaching in snow leopard habitat by allocating additional funding from the federal budget. In doing so, enforcement staff must first and foremost be focused on the fight against illegal snare-hunting in snow leopard habitat. Is it also necessary to devote more attention to the fight against illegal trade in products and derivatives of musk deer and other hunting species;
- Develop cooperation with conservation and enforcement agencies to fight illegal trade in snow leopards and other rare species, as well as hunting species. WWF and UNDP/GEF's extensive experience in creating and supporting interagency anti-poaching brigades can be used to advance this work;
- Develop strategies and plans to develop hunting lands in Altai and Tuva Republics, as well as in southern Krasnoyarsk Krai;
- Improve conditions for economic development of hunting lands in which snow leopards are present, including attracting investments and other extra-budgetary funds;
- Practice thorough monitoring of the condition of wild and domesticated animal populations and screen dead or captured snow leopards and other carnivores for disease;
- Development a free-range livestock system that uses sustainable pasture management and accounts for the needs of wild ungulate species in snow leopard habitat;
- Track the condition of livestock corrals in snow leopard habitat and strengthen and improve them in timely fashion to prevent large losses of livestock due to predator attack. Protection of corrals from snow leopards is an extremely effective measure for reducing conflicts between herders and snow leopards;



**Patrol by an interagency antipoaching brigade in Altai Republic
in snow leopard habitat in the Argut valley. I.A. Ivanitsky**

- Minimize the unmonitored pasturing of livestock in snow leopard habitat; Develop and implement a system to compensate herders for livestock killed by snow leopards in open pastures in western Tuva;
- Develop and implement a system to encourage herders to protect snow leopards;
- Ensure the data collection on illegal trade in pelts and other parts and derivatives of snow leopards by engaging, among others, local residents in this work;
- Identify the transportation of illegally collected pelts and other snow leopard derivatives, monitor markets, and identify offers of pelts to be sold on the internet and by other public means;
- Significantly increase the penalties for transport and storage of snow leopard derivatives as well as illegal captivity of snow leopards;
- Significantly increase the penalties for illegal trade in derivatives of musk deer and other hunting species;
- Educate local residents about the protected status of snow leopards in the Russian Federation Red Book and the penalties for illegally hunting this species;
- Create and implement community-based inspection teams to protect rare species by engaging local residents residing in snow leopard habitats.



In 2007-2008 as part of the UNDP/GEF and WWF program, more than 70 herders in Tuva Republic were trained in the simplest means of strengthening corrals with the use of metal mesh, and more than 40 corrals were protected from snow leopard attack on Chikhachev Ridge, Mongun-Taiga Massif, Tsagan-Shibetu and Shapshalsky Ridges. Since then there has not been a single case of a snow leopard gaining access to a corral in western Tuva (prior to this 56% of all livestock killed by snow leopards in western Tuva died in corrals).

Inspectors should focus their efforts primarily on fighting snare-hunting snow leopard habitat;

- Attract additional funding to develop tourism, small business, manufacturing, and jobs creation with the goal of ensuring local employment and providing alternatives to poaching.

In preparing socio-economic development programs in these regions, priority should be given to programs and projects that have minimal impacts on the environment and snow leopard habitats. Such projects and programs include development programs for ecological and rural tourism, the implementation of which directly depend on the degree to which mountain ecosystems remain intact and accessible for viewing large animals such as Siberian ibex, argali, and red deer. There is a great deal of opportunity to develop collaborations with such internationally known organizations as Biosphere Expeditions and Earthwatch that involve tourists and volunteers in monitoring rare species, including the snow leopard. Implementation of multi-year ecotourism programs in snow leopard habitats in collaboration with such organizations in Altai and Tuva permits the active engagement of local residents in servicing tourists and volunteers traveling to the region to learn about snow leopards. In this way, snow leopards can become a building



Volunteers from State University of New York help staff from Altaisky Nature Reserve to conduct surveys for snow leopards and argali sheep on Sailyugem and Chikhachev Ridges. S.V. Spitsyn

block of the herding community's local economy living in this predator's habitat. It is also very important to develop other mechanisms to increase the interest of the local population in snow leopard conservation.

Scientific research

The conservation of biological diversity including that of rare and threatened species requires current basic science and analysis. Today, only very limited data has been gathered about snow leopard biology and ecology. In developing a phased program for the scientific study of snow leopards in Russia, the following areas should be considered:

- Study the snow leopard's current range, populations, and other dynamics, and create improved maps of the species' habitat distribution. Research of all potential snow leopard habitat in the Russian part of range using presence/absence surveys is needed. It would be of particular interest to study potential snow leopard habitat in the Eastern Sayan Mountains and Zabaykalsky region;
- Study the roles of natural and anthropogenic factors in population dynamics and changes in snow leopard habitat;
- Identify key sites for snow leopard reproduction;
- Clarify snow leopard population structure by using genetic analysis and other advanced techniques;

Study the sex and age structure and demographic indicators of the population as well as the specific spatio-temporal distribution of animals relative to sex, age, and environmental factors (study snow leopard population spatial structure, including their movements and characteristics of their use of space);

- Study genetic relationships and the degree of genetic isolation of various snow leopard populations;
 - Identify potential migration corridors between snow leopard populations in Russia and western Mongolia, evaluate their significance for species conservation in Russia;
 - Study the interrelationship of snow leopards with other mammal predator species;
 - Study snow leopard nutrition, assess the prey base and prey base distribution and population dynamics in various parts of the range;
 - Study snow leopard reproductive biology and offspring survival rates;
- Zoological and veterinary research on snow leopards in various populations;
- Develop programs for the restoration of snow leopard groupings or reintroduction of this species in habitats where poachers previously eradicated the cat (for example, this measure could be necessary in order to restore the snow leopard population in the Argut basin).

Soft tissue samples should be collected from any deceased snow leopards or cats captured in the wild for genetic and other analysis. It is reasonable to collect the reproductive organs of recently deceased animals as well as *inter vivos* collection of gametes (spermatozoa and oocytes), skin tissues, and muscles. In order for this to occur, development and advances in minimally-invasive sampling methods (endoscopy, electro-ejaculation, biopsy), establishment of centralized storage facilities, and stable funding to support the data base are needed.

Particular attention must be paid to applied science for the development and implementation of measures aimed at preserving viable snow leopard populations in conditions of regional socio-economic development. The study of snow leopards and other rare species should be priority topics in nature reserve programs and in higher education. A system of international partnerships (particularly between Russia and Mongolia) should form the basis for effective scientific research. This will ensure the exchange of scientific ideas and the most current international experience, joint scientific research efforts, and a certain degree of financial support.

Monitoring the status of key snow leopard populations

Study of key groupings of snow leopards in Russia requires a long-term monitoring system to track distribution, population, and other parameters as well as the condition of habitat in order to promptly identify, analyze, and predict potential changes against a background of natural processes and the influence of anthropogenic factors.

In accordance with existing legislation in the Russian Federation government population surveys and government monitoring of species within the Russian Federation, with the exception of flora and fauna located within federal-level protected areas, are to be conducted by Russian regional government agencies responsible for the protection and use of wildlife.

Effectively, beginning in 2004, monitoring of the status of key snow leopard populations in the Altai-Sayan Ecoregion (Argut basin, Shapshalsky and Tsagan-Shibetu Ridges, Chikhachev Ridge, and Sayano-Shushensky Nature Reserve and its buffer zone) has been done by staff from Altaisky, Sayano-Shushensky, and Ubsunurskaya Kotlovina Nature Reserves, with support from WWF and UNDP/GEF ("Conservation of Biodiversity in the Russian Altai-Sayan Ecoregion"). In 2009, the "Snow Leopard Monitoring Program in the Russian Federation" was published using data from these studies (Spitsyn et al., 2009).

The snow leopard monitoring program comprises activities needed to preserve this species in the Altai-Sayan Ecoregion.

The goal of the program is to ensure the annual collection of accurate information on the condition of key populations of the species in Russia as the basis for developing practical measures for long-term conservation.

The monitoring program's tasks include:

- Annual calculation of populations and populations dynamics of key meta-populations of snow leopards;
- Data collection on structure and changes in the species' habitat, spatial, sex, and age structures of populations, reproduction and mortality levels, condition of habitat, and anthropogenic factors.

Snow leopard monitoring includes:

- Annual winter surveys on fixed transects within key habitats;
- Monthly winter surveys of certain transects within key habitats;
- Spring survey for tracks on mud deposits (along the shores of the Sayan

Reservoir in Sayano-Shushensky Nature Reserve and its buffer zone; and

- Year-round collection of reports of human encounters with snow leopards in the Altai-Sayan Ecoregion and outside its borders.

Annual winter surveys during winter months are conducted by trained expert surveyors during expeditions to key snow leopard habitat areas to seek out tracks in the snow on fixed routes. Monthly winter surveys take place between November and February.

Monthly winter surveys are conducted within key snow leopard habitats. Surveyors seek tracks in the snow on 4-5 separate transects located in the immediate vicinity of protected area outposts or PA staff housing (occasionally, local residents are recruited for this work). These counts take place between November and February, when each month 1-2 surveyors travel selected routes over a short period (3-5 days).

The spring snow leopard survey for tracks on mud deposits is conducted on an annual basis along the shores of the Sayan Reservoir May 1-20 by staff from Sayano-Shushensky Nature Reserve.

Nature reserve staff involved in the species monitoring program collect reports on snow leopard encounters year-round. A special snow leopard encounter card has been developed in order to collect information about snow leopards from local residents living in or nearby snow leopard habitat.

The monitoring program was evaluated over the course of 2 years and overall, it has been effective for collecting objective information about the status of key snow leopard populations and for developing adequate practical measures for long-term conservation. At the same time, experience has shown that the program requires some improvements to incorporate the latest monitoring methods that can provide more precise information regarding the condition of cat populations (camera-trapping, DNA analysis of scat). Cumulative experience in this area indicates that in order to further improve the snow leopard population monitoring system, it is advisable to:

- Improve survey methodologies within the boundaries of key snow leopard habitats by incorporating new techniques to collect more precise data on snow leopard populations (mainly by implementing camera-traps and scat collection for future DNA analysis) within the region's PAs. Field experience indicates that in order to identify the species of the animal producing a given excrement, it is beneficial to involve specially-trained dogs.

This permits the on-site separation of snow leopard excrement from excrement belonging to other species, a process that results in savings for laboratory DNA analysis. Comprehensive methodologies using camera-traps and scent-dogs for snow leopard monitoring are discussed in this book published by the UNDP/GEF project: R. Jackson, D. Rowe, R. Wangchuk, D. Hunter. *Surveying Snow Leopard Populations with an Emphasis on Camera-Trapping: A Handbook*, Russian edition, Krasnoyarsk, 2010; L. Kerley. *Scent-dog training and snow leopard scat collection for evaluating population by DNA analysis*, Russian edition, Krasnoyarsk, 2010. **SIDEBAR;**

- In some cases, telemetry methods could be used to study the sizes of individual cats' ranges in a variety of conditions and movement ranges (satellite and GPS collars);
- Add new monitoring parameters such as the overall health of a population grouping and genetic structure to the monitoring system; and
- Provide for internet accessibility of certain monitoring data.



Participants use camera traps to survey snow leopard habitat in the middle range of the Argut basin: S. Spitsyn, A. Beletov, and R. Jackson. M.Y. Paltsyn



Painstaking measurement of snow leopard tracks can provide valuable information about individual animals. M. Sagaan



Erik is the first search dog trained to find and identify snow leopard scat in the Altai-Sayan Ecoregion. S.V. Spitsyn

Despite the use of advanced snow leopard monitoring techniques, traditional methods for studying this species based on counts of signs of snow leopard activity on transects within their habitat (SLIMS methodology) (Jackson, Hunter, 1996) are still relevant. This simple methodology permits the study of potential snow leopard habitat during snow-free periods, identifies areas occupied by the species, and can be used to determine the relative density of habitation. In this way, a comprehensive set of methods is best used for snow leopard monitoring as a means of obtaining the most objective information. Moreover, it is very important to involve local residents (herders) in the snow leopard monitoring process, as this permits not just the opportunity to collect regular information about this rare predator, but also actively engages local residents in its conservation.

Outreach and education activities

Educating Russians about the status of snow leopards as a national asset and unique animal of global importance and the importance of consciously bidding by recommendations and limitations and encouraging individuals to get personally involved in conservation activities are of the utmost important for snow leopard conservation in Russia.

Effective public outreach can be assessed by measuring public opinion on snow leopard conservation and a willingness to support such activities. Results such as reduced snow leopard poaching, growth in the number of people involved in volunteer conservation activities, public support for protected areas, and improved compliance with limitations on resource use affecting snow leopards will all be a testament to effective public outreach.

Effective long-term snow leopard conservation in Russia requires:

- Educating the public about Russia's role in snow leopard conservation. It is particularly important to address this in Altai and Tuva Republics, as well as in southern Krasnoyarsk Krai – all places that are home to stable snow leopard populations;
- Encourage people living within the snow leopard's range to relate to the cat as a part of their natural and cultural heritage and to understand the necessity of its preservation. It is particularly important to work with regional media to ensure regular coverage in the local press about the value and importance of snow leopard conservation;
- Develop and implement targeted information campaigns for various populations living within the snow leopard's range with the goal of establishing a positive image of the animal as a symbol of Altai and Sayan. One such campaign could be the annual Snow Leopard Day festival, organized with

support from WWF in Altai and Tuva Republics. Active engagement of Buddhist leaders and other respected public figures in snow leopard conservation outreach among local residents is another method;

- Restore traditional worship of this species by indigenous peoples in the Altai-Sayan region;
- Facilitate increased professional expertise among decision-makers and resource management experts;
- Facilitate the preservation of spiritual culture, traditional customs, traditional knowledge, and rituals and customs related to conservation and a respectful relationship with snow leopards;
- Facilitate public understanding of the need to conserve and sustainably use mountain ecosystems for snow leopard conservation as well as the leading role of protected areas in protecting this and other unique species in the Altai-Sayan Ecoregion and creating societal intolerance for poaching;
- Engage the local population in monitoring transboundary snow leopard populations (particularly using camera-traps), ecotourism development in snow leopard habitats, and in the fight against poaching. Such projects are currently underway with WWF and UNDP/GEF support in Altai and Tuva Republics – there are community-based patrol brigades in Kosh-Agach District in Altai Republic and in the Mongun-Taiga area of Ubsunurskaya Kotlovina Nature Reserve; and
- Popularize recent scientific research on snow leopard ecology.



Members of the Kosh-Agach District Community Ecological Inspection Team for the Protection of Natural and Cultural Heritage, established with the support of WWF and UNDP/GEF. C.D. Almashev



With WWF support, Snow Leopard Day has become a traditional holiday in the Altai-Sayan Ecoregion. C.D. Almashev

COLLABORATION FOR SNOW LEOPARD CONSERVATION

In order to work effectively toward snow leopard conservation in Russia, it is necessary to develop conservation collaborations with government agencies, science research institutions, wildlife protection and exploitation agencies, community organizations, and initiatives that actively involve public participation. The development of conservation collaborations between Russia, Mongolia, and Kazakhstan are of particular importance to preserve Russian snow leopards. A multilateral partnership system allows for the effective implementation of national and international conservation initiatives in snow leopard conservation and science.

LITERATURE

Anchiforov, P.S. (1995). “Новые сведения об архаре-аргали и некоторых редких видах сообщества аргали // Материалы к Красной книге Республики Алтай (животные)” [“New data regarding argali and several rare species of the argali community // Materials for the Altai Republic Red Book (Animals)”]. Gorno-Altaiisk: Gorno-Altaiisk State University. Pp. 23-33.

Anchiforov, P.S. (2006). “К ареалогии, биологии и сохранению снежного барса в Алтае-Саянском экорегионе // Редкие животные Республики Алтай” [“Snow leopard habitat, biology, and conservation in the Altai-Sayan Ecoregion” // Rare animals of Altai Republic”]. Materials for preparation of the Altai Republic Red Book, 2nd ed. Gorno-Altaiisk. Pp. 242-263.

Baranov, P.V., Boyko, A.I. (1988). “Редкие виды млекопитающих Читинской области // Редкие наземные позвоночные Сибири” [“Rare mammal species of Chita Oblast // Rare land-based vertebrates of Siberia”]. Novosibirsk: *Nauka*. Pp.13-20.

Baranov, P.V., Koshkarov, E.P. (2007). “Изменение экологической обстановки на Байкало-Амурском водоразделе и расселение редких видов кошек на рубеже XX – XXI веков” [“Changes in the ecological situation on the Baikal-Amur Divide and the distribution of rare cat species at the turn of the 21st century. Habitat status and hunting fauna.”] Proceedings of the All-Russian Applied Science Conference. Moscow 21-22 February 2007 / Russian Association of Hunting and Fishing Community Organizations; Moscow Oblast Ministry of Ecology and Natural Resource Use; (Federal State Education Institution for Higher Professional Education) Russian State Agrarian University Extension. Moscow: 2007.

Beybit, K. (1999). “Характерные черты следов ирбиса Сайлюгемского хребта” [“Characteristics of typical snow leopard tracks on Sailyugem Ridge”]. Global change and Uvs Nuur International conference. Ulaangom, Mongolia. Pp. 208-212.

Vinokurov, V.A. (2005). Report “Разработка плана мероприятий по сохранению ирбиса в Юго-Западной Тыве” [“Development of planned snow leopard conservation activities in southwestern Tuva”]. WWF Archive.

Geptner, V.G., Sludsky, A.A. “Млекопитающие Советского Союза” [“Mammals of the Soviet Union”]. Moscow: Higher School, 1972. Vol. 2: Pt. 2. 552 pp.

Dolgovykh, S.V. (2006). “К материалам о мануле (*Felis manul*) и снежном барсе (*Uncia uncia*) // Редкие животные Республики Алтай” [“Materials on manul cat (*Felis manul*) and snow leopard (*Uncia uncia*): Rare animals of Altai Republic”]. Preparatory materials for the Altai Republic Red Book, 2nd Ed. Gorno-Altai. Pp. 263-264.

Zvychnayaya, E.Y., Kuksin, A.N., Poyarkov, A.D., Rozhnov, V.V. “Апробация метода молекулярно-генетической идентификации ирбиса (*Uncia uncia*) // Териофауна России и сопредельных территорий” [“Evaluation of a method for molecular genetic identification of the snow leopard (*Uncia uncia*) // The-riofauna of Russia and Adjacent Territories”]. Proceedings of an international meeting, 1-4 February 2011. P. 180.

Istomov, S.V., (2008). Working group report on the results of winter fieldwork “Оценка численности снежного барса в Саяно-Шушенском заповеднике и его охранной зоны” [“Evaluating the snow leopard population in Sayano-Shushensky Nature Reserve and its buffer zone”]. UNDP/GEF in the Altai-Sayan Ecoregion. Archive of the Association of Nature Reserves and National Parks in the Altai-Sayan Ecoregion.

Istomov, S.V., (2010). Report “Оценка численности снежного барса в Саяно-Шушенском заповеднике и его охранной зоны” [“Results of the winter snow leopard survey in Sayano-Shushensky Nature Reserve and its buffer zone in 2010”]. WWF Archive.

Istomov, S.V., (2011). Report “Обследование местообитаний снежного барса в южной части Саяно-Шушенского заповедника и его охранной зоны, а также на сопредельной территории Республики Тыва” [“Study of snow leopard habitats in southern Sayano-Shushensky Nature Reserve, its buffer zone, and in adjoining areas of Tuva Republic”]. WWF Archive.

Kalmykov, I.V., Zavatsky, B.P. (2003). “Отчет рабочей группы Саяно-Шушенского государственного природного биосферного заповедника по мониторингу и охране снежного барса по берегам Саяно-Шушенского водохранилища и на массиве Монгун-Тайга” [“Sayano-Shushensky Nature Reserve Working group report on snow leopard protection and monitoring on the shores of the Sayan Reservoir and on Mongun-Taiga Massif”]. WWF Archive.

Kalmykov, I.V., Zavatsky, B.P. (2004). “Отчет рабочей группы Саяно-Шушенского государственного природного биосферного заповедника по мониторингу снежного барса в Западных Саянах” [“Sayano-Shushensky Nature Reserve Working group report on snow leopard monitoring in the Western Sayan”]. WWF Archive.

Kuksin, A.N. (2003). “Отчет о результатах проекта по страхованию скота от нападений ирбиса в Западной Туве” [“Report on the results of a project to protect livestock from snow leopard attacks in western Tuva”]. WWF Archive.

Kuksin, A.N. (2010). Ubsunurskaya Kotlovina Nature Reserve Report on a WWF grant “Разработка рекомендаций для сохранения снежного барса на хр. Цаган-Шибету, Юго-Западная Тува” [“Developing recommendations for snow leopard conservation on Tsagan-Shibetu Ridge in southwestern Tuva”]. WWF Archive.

Kuksin, A.N. (2009). “Отчет рабочей группы заповедника «Убсунурская котловина» о результатах полевых работ на нагорье Сенгелен (бассейн р. Балыктыг-Хем) в сентябре-октябре 2009 г.” [Ubsunurskaya Kotlovina Nature Reserve working group “Report on the results of fieldwork on Sengelen Ridge (Balyktyg-Khem River basin), September-October 2009”]. Ubsunurskaya Kotlovina Nature Reserve Archive.

Kuksin, A.N. (2010). Ubsunurskaya Kotlovina Nature Reserve report “Проведение осенне-зимних учетов численности снежного барса и сибирского горного козла на Шапшальском Хребте (Республика Тыва), октябрь-ноябрь 2010 г.” [“Conducting fall and winter snow leopard and Siberian ibex population surveys on Shapshalsky Ridge (Tuva Republic), October-November 2010”]. Ubsunurskaya Kotlovina Nature Reserve Archive.

Kuksin, A.N. (2011). Ubsunurskaya Kotlovina Nature Reserve report on the WWF grant “Разработка рекомендаций по сохранению ирбиса в южной части Шапшальского хребта и на хр. Цаган-Шибету” [“Development of recommendations for snow leopard conservation on southern Shapshalsky Ridge and Tsagan-Shibetu Ridge”]. WWF Archive.

Koshkarev, E.P. (2002) “Главное ядро популяции ирбиса в России и проблемы вокруг него” [“The main population center of snow leopards in Russia and related issues”] // *Zapovednoe Delo of Eastern Kazakhstan*, №2: pp. 13-20.

Altaysky Nature Reserve Natural Chronicles, 1993-2003.

Lukarevsky, V.S., (1999). “Технический отчет о полевых работах на юге Алтая” [“Technical report on fieldwork in southern Altai”]. WWF Archive.

Lukarevsky, V.S., (1999). “Отчет о полевых работах на юго-востоке Тувы (хр. Сенгелен)” [“Report on fieldwork in southeastern Tuva (Sengelen Ridge)”]. WWF Archive.

MacDonald, D. (2007). *Млекопитающие* [The Encyclopedia of Mammals]. Omega. Russian ed.: 464 pp.

Matyushkin, E.N. (1981). “Ирбис в юго-западном Забайкалье” [“The snow leopard in southwestern Zabaikalsky Region”]. Biol. Moscow Society of Natural Investigators. Vol. 86, Issue. 2: pp. 14-18.

Medvedev, D.G., Makulkin, R.N. (2000). “Снежный барс в Забайкалье” [“The snow leopard in Zabaikalsky region”]. *Irkutsk State Agricultural Academy Bulletin*. Irkutsk. Issue 20: pp. 30-34.

Medvedev, D.G. (2000). “Снежный барс в восточной Сибири” [“The snow leopard in eastern Siberia”] // Proceedings of a conference dedicated to the 50th anniversary of the Game Management Department. Irkutsk, 2000. Pt. 1: pp. 163-165.

Medvedev, D.G. (2003). “Распространение и миграции ирбиса в Байкальской регионе // Териофауна России и сопредельных территорий” [“Snow leopard distribution and migration in the Baikal region” // *Mammals of Russia and adjoining areas.*] Moscow. Pp. 218.

Ochirov, Y.D., Bashanov, K.A. *Млекопитающие Тувы [Mammals of Tuva]*. Kyzyl: Tuvan Book Publishing, 1975. 140 pp.

Paltsyn, M.Y. (2003). “Отчет рабочей группы Алтайского заповедника об учетах численности аргали на массиве Монгун-Тайга и хр. Цаган-Шибету, октябрь 2003” [Altaiisky Zapovednik working group report “Argali Population Surveys on Mongun-Taiga Massif and Tsagan-Shibetu Ridge, October 2003”]. WWF Archive.

Paltsyn, M.Y. (2004). Akhar NGO report “Организация антибраконьерского рейда и сбора информации для выявления основных локалитетов снежного барса (*Uncia uncia* Schreber) в пределах хр. Цаган-Шибэту. Разработка конкретных проектов по сохранению ирбиса в Юго-Западной Туве” [“Work in western Tuva as part of the ‘Organizing antipoaching patrols and information gathering to identify the main snow leopard (*Uncia uncia* Schreber) localities near Tsagan-Shibetu Ridge area’ project”. “Developing concrete snow leopard conservation projects in southwestern Tuva”]. WWF Archive.

Paltsyn, M.Y. (2004). “Отчет о полевых работах на хр. Сенгелен, Юго-Восточная Тува, июнь 2004” [“Report on fieldwork on Sengelen Ridge, southwestern Tuva, June 2004”]. WWF Archive.

Paltsyn, M.Y., Spitsyn, S.V., Sergeev, M.V., Kokulev, E.V., (2006). “Материалы для оценки состояния аргутской группировки снежного барса // Редкие животные Республики Алтай” [“Materials for evaluating the status of the Argut snow leopard population // Rare animals of Altai Republic”]. Preparatory materials for the Altai Republic Red Book, 2nd Ed. Gorno-Altai. Pp. 228-242.

Poyarkov, A.D., Lukarevsky, V.S. (1998). “Отчет о работе экспедиционного отряда по изучению ирбиса в Юго-Западной Туве” [“Report on the work of the expeditionary team to study snow leopards in southwestern Tuva”]. WWF Archive.

Poyarkov, A.D., Lukarevsky, V.S. (1999). Report “Состояние популяции ирбиса (*Uncia uncia*) в российской части Алтае-Саянского экорегиона” [“Status of snow leopards (*Uncia uncia*) in the Russian part of the Altai-Sayan Ecoregion”]. WWF Archive.

Poyarkov, A.D., Lukarevsky, V.S., Subbotin, A.E., Zavatsky, B.P., Prokofyev, S.M., Kelberg, G.V., Malkov, N.P., (2002). “Стратегия сохранения снежного барса (ирбиса) в России” [“Strategy for snow leopard conservation in Russia”]. WWF. Moscow.

Prokofyev, S.M. (1992). “Фауна и состояние численности промысловых животных Сибири” [“Fauna and the population status of commercial species in Siberia”]. Krasnoyarsk: Krasnoyarsk State University. Pp. 20-37.

Smelyansky, I.E., Nikolenko, E.G. (2010). “Анализ рынка диких животных и их дериватов в Алтае-Саянском экорегионе - 2005 - 2008 гг.” [“Analysis of the market for wild animals and their derivatives in the Altai-Sayan Ecoregion – 2005-2008”]. Krasnoyarsk. 150 pp.

Smirnov, M.N., Sokolov, G.A., Zyryanov, A.N. (1991). “Распространение и состояние численности снежного барса на юге Сибири” [“Distribution and status of the snow leopard population in southern Siberia”]. Biol. Moscow Society of Natural Investigators. Vol. 96, #1: pp. 27-34.

Smirnov, M.N., Zyryanov, A.N., Sokolov, G.A. “Распространение, численность и черты экологии снежного барса (*Uncia uncia* Schreber, 1776) в Сибири // Снежный барс” [“Distribution, population and ecological characteristics of snow leopards (*Uncia uncia* Schreber, 1776) in Siberia” // *Snow Leopard*]. Almaty: Kaynar, 1992. Pp. 69-85.

Smirnov, M.N. “Крупные промысловые млекопитающие Южной Сибири (история формирования видового состава, ресурсы, экологические основы использования и охраны)” [“Large commercial species of southern Siberia (History of the formation of species composition, resources, and ecological basis of use and conservation)”]. Doctor of Sciences dissertation. Moscow, 1994. 68 pp.

Spitsyn, S.V., (2006). “Отчет о научно-исследовательской работе по теме ‘Ведение мониторинга видов животных, внесенных в Красную книгу РФ на территории Республики Тыва. Снежный барс’” [“Report on scientific research on the topic of ‘Monitoring species listed in the Russian Federation Red Book in Tuva Republic’. Snow Leopard”]. Ubsunurskaya Nature Reserve Archive.

Spitsyn, S.V. (2007). “Отчет рабочей группы по мониторингу редких видов проекта UNDP/GEF ‘Сохранение биоразнообразия Алтае-Саянского Экорегиона’ о результатах исследований группировки снежного барса на

хр. Цаган-Шибету, март 2007 г.” [“Rare Species Monitoring Working Group report on the results of a UNDP/GEF project to study the snow leopard population on Tsagan-Shibetu Ridge, March 2007”]. Altaisky Nature Reserve Archive.

Spitsyn, S.V. (2007). “Отчет рабочей группы по мониторингу редких видов проекта UNDP/GEF ‘Сохранение биоразнообразия Алтае-Саянского Экорегиона’ о результатах исследований трансграничных группировок аргали на российской части ареала in октябре - ноябре 2007 г.” [“UNDP/GEF Biodiversity Conservation in the Altai-Sayan Ecoregion Rare Species Working Group report studying transboundary populations of argali on the Russian side in October-November 2007”]. Altaisky Nature Reserve Archive.

Spitsyn, S.V. (2008). “Отчет рабочей группы заповедников «Алтайский» и «Убсунурская котловина» о результатах полевых работ на хребте Цаган-Шибэту и in южной части Шапшальского хребта (бассейн р. Шуй) in сентябре 2008 г.” [“Altaisky and Ubsunurskaya Kotlovina Nature Reserves Working Group report on the results of fieldwork on Tsagan-Shibetu Ridge and on southern Shapshalsky Ridge (Shuy River basin) in September 2008]. UNDP/GEF Altai-Sayan Ecoregion project. Association of Nature Reserves and National Parks of the Altai-Sayan Ecoregion Archive.

Spitsyn, S.V., (2010). “Результаты летнего учета алтайского горного барана на территории республик Алтай и Тыва. Отчет о полевых работах” [Results of summer argali sheep surveys in Altai and Tuva Republics. Report on field work”]. Archives of Altaisky Nature Reserve.

Spitsyn, S.V., Paltsyn, M.Y., Istomov, S.V., Kuksin, A.N., Kalmykov, I.V. (2009). “Программа мониторинга снежного барса в Российской Федерации” [“Snow leopard monitoring program in the Russia Federation”]. Krasnoyarsk, 2009.

Spitsyn, S.V., (2011). Report “Результаты обследования восточной части южно-чуйского хребта на предмет обитания снежного барса, октябрь 2011 г.” [“Results of a survey of the eastern Southern Chuisky Ridge for the presence of snow leopard activity, October 2011”]. WWF Archive.

Spitsyn, S.V., (2011). Report “Состояние группировки снежного барса на хр. Чихачева, октябрь-декабрь 2011 г.” [“Status of the snow leopard population on Chikhachev Ridge, October-December 2011”]. WWF Archive.

Spitsyn, S.V., Munkhtsog, B. (2011). “Материалы обследования местообитаний снежного барса монгольской части хр. Цаган-Шибету и Чихачева, май 2011” [Report “Materials relating to research on snow leopard habitat on the Mongolian side of Tsagan-Shibetu and Chikhachev Ridges, May 2011”]. WWF Archive.

Sopin, L.V. (1977). “Снежный барс на Алтае // Редкие виды млекопитающих и их охрана” [“The snow leopard in Altai // Rare mammal species and their conservation”]. Moscow: *Science*. Pp. 143-144.

Shurygin, V.V. “Редкие виды млекопитающих Тувы и их охрана // Редкие наземные позвоночные Сибири” [“Rare mammal species in Tuva and their conservation // Rare land-based vertebrates of Siberia”]. Novosibirsk: *Nauka*, 1988. Pp. 277-283.

Filus, I.A. (1992). “О нападении ирбиса на марала // Охрана и изучение редких и исчезающих видов” [“On snow leopard attacks on red deer // Conservation and study of rare and endangered species”]. Moscow. Pp. 74-76.

Yanushevich, A.I. “Фауна позвоночных Тувинской области” [“Vertebrate fauna in Tuva Oblast”]. Novosibirsk: Western Siberian Branch of USSR Academy of Sciences Publishing, 1952. 142 pp.

Biosphere Expeditions Reports, 2003-2010. “Surveying snow leopard and other animals in the mountains of the Altai Republic, Central Asia”.

Fox, J.L. 1989. A review of the status and ecology of the snow leopard (*Panthera uncia*). Unpublished Report. International Snow Leopard Trust, Seattle, Washington, 40 pp.

Galsandorj N., Munkhtsog B., Janecka J. 2011. Population structure and genetic diversity of snow leopards in Mongolia and implications for conservation. Final Report. Snow Leopard Conservation Grants. Snow Leopard Network.

Hemmer, H. 1972. “*Uncia uncia*”. *Mammalian Species* 20: pp. 1-5.

Hunter, D.O. and R. Jackson. 1997. “A range-wide model of potential snow leopard habitat”, pp. 51-56 in: R. Jackson and A. Ahmad (editors). Proceedings of the 8th International Snow Leopard Symposium, Islamabad, November 1995. International Snow Leopard Trust, Seattle and WWF-Pakistan, Lahore.

Jackson, R. and G.G. Ahlborn. 1984. “Preliminary habitat suitability model for the snow leopard *Panthera uncia* in west Nepal”. *International Pedigree Book of Snow Leopards*, 4: pp. 43-52.

Jackson, R. and G.G. Ahlborn. 1988. “Observation on the ecology of snow leopard (*Panthera uncia*) in west Nepal”. Pp 65-87. in H. Freeman, editor, Proceedings of the 5th International Snow Leopard Symposium. International Snow Leopard Trust and Wildlife Institute of India, Seattle, Washington.

Jackson, R. 1992. “Snow leopard”. Unpubl. data sheet, IUCN/SSC/Cat Specialist Group, Bougy-Villars, Switzerland.

Jackson, R. and D.O. Hunter. 1996. *Snow Leopard Survey and Conservation Handbook*. International Snow Leopard Trust, Seattle, and U.S. Geological Survey, Biological Resources Division. 154 pp. and appendices.

Koshkarev E.P. 1990. "On the environment-related stability of snow leopard (*Uncia uncia*) populations in connection with their distribution in the natural habitats and changes for spread within the USSR". *International Pedigree Book of the Snow Leopard*. 6: pp. 37-50.

Koshkarev E.P. 1996. "The snow leopard in its northeastern range". *Cat News*. 6: p. 10.

Koshkarev E.P. 1997. "Has the Snow leopard disappeared from Eastern Sayan and Western Hobsogol?" // 8th International Snow leopard Symposium Proceedings (Islamabad, Pakistan. 12-16 November 1995).

Medvedev D.G. 1990. "Snow leopard in the Eastern Sayan Mountains". *International Pedigree Book of the Snow Leopard*. 6: pp. 17-19.

McCarthy, T.M. 2000. "Ecology and conservation of snow leopards, Gobi brown bears and wild Bactrian camels in Mongolia". Ph.D. Dissertation, University of Massachusetts, Amherst. 133 pp.

McCarthy, T.M. and G. Chapron (editors). 2003. *Snow Leopard Survival Strategy*. International Snow Leopard Trust and Snow Leopard Network, Seattle, USA. 105 pp.

McCarthy, T., Murray, K., Sharma, K., Johansson, O. (2010). "Preliminary results of a long-term study of snow leopards in South Gobi, Mongolia". *Cat News*. Vol. Autumn. Issue 53: pp. 15-19.

Oli, M.K. 1991. "The ecology and conservation of the snow leopard (*Panthera uncia*) in the Annapurna Conservation Area, Nepal". University of Edinburgh, Scotland. Phil. Thesis.

Schaller, G.B. 1977. *Mountain monarchs: wild sheep and goats of the Himalaya*. University of Chicago Press, Chicago. 426 pp.

Subbotin, A.E., Istomov, S.V. (2009). "The population status of snow leopard *uncia uncia* (felidae, carnivora) in western Sayan Mountain ridge". *Doklady biologicheskikh nauk*, 2009, vol. 425: pp. 183–186.

Wildt, D. E., J. D. Mellen, and U. S. Seal. 1992. "Felid Action Plan, 1991 and 1992: AAZPA Felid Taxon Advisory Group Regional Collection Plan and IUCN Captive Breeding Specialist Group Global Felid Action Plan". CBSG Species Survival Commission: pp. 1-205.

***Data for Conservation Strategy
for Snow Leopard in Russia 2012-2022***

**M.Y. Paltsyn, S.V. Spitsyn,
A.N. Kuksin, S.V. Istomov**

**SNOW LEOPARD
CONSERVATION IN RUSSIA**

Designed by *D.V. Gusev*
Photo on the front cover: *A.N. Kuksin*

Gorod Publishing House, format A5 (60x84/16),
enameled paper, 120 g/m², circulation is 100 copies