EXPEDITION REPORT

Expedition dates: 20 June – 30 July 2011
Report published: August 2013

Mountain ghosts: snow leopards and other animals in the mountains of the Altai Republic, Central Asia.

BEST VOLUNTEERING ORGANISATION	BEST FOR GREEN-MINDED TRAVELLERS	TOP RESPONSIBLE HOLIDAY	BEST WILDLIFE VOLUNTEERING HOLIDAY	BEST IN SUSTAINABLE TRAVEL	ENVIRONMENT AWARD	TOP HOLIDAY FOR NATURE
UK	UK	UK	UK	USA	Germany	Germany

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Authors:
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Matthias Hammer and Adam Stickler (editors)
Biosphere Expeditions

Abstract

This study was part of an expedition to the Altai Mountains in the Kosh-Agach region of the Altai Republic, run by Biosphere Expeditions from 20 June to 30 July 2011. The aim was to continue a survey of the snow leopard *(Uncia uncia)* in this area, as well as surveying the snow leopard's prey species such as argali *(Ovis ammon)* and Siberian ibex *(Capra sibirica)*. Using the Snow Leopard Information Management System (SLIMS) developed by the International Snow Leopard Trust (ISLT), presence/absence surveys (SLIMS form 1) of snow leopard and prey species were conducted throughout the study period across the entire survey area. In 2011 surveys were undertaken mainly in the area of the Karaghem mountain pass. The expedition also collected data for extended mammal and bird inventories. Signs of snow leopard presence were recorded, indicating that the area is visited by snow leopards before people gain access to the passes after the winter. The relationship between the predator and prey species seems to be very fragile; perhaps the decline in the prey species (particularly argali) may be driving the snow leopard out of the area. In addition, human disturbance is considered to be severe and growing. The study area still retains its importance as a habitat for snow leopard and as a corridor between snow leopard habitat. The survey area urgently needs real protection involving the local community. In this context, raising public awareness is seen as a vital initiative if conservation efforts are to succeed.

Резюме

Данное исследование проводилось в рамках экспедиции в Кош-Агачском районе Республики Алтай РФ, организованной природоохранным агентством «Biosphere Expeditions». Исследования проводились в период с 23 июня по 29 июля 2011 г. Целью работы было изучение наличия снежного барса в данном регионе, а также учет животных, являющихся основной его добычей, среди которых, наряду с другими видами животных, следует отметить аргали и сибирского горного козла. Параллельно проводили инвентаризацию птиц, млекопитающих и высших растений. С помощью Системы Учета Информации о Снежном Барсе (SLIMS), разработанной Международным Обществом Опеки Снежного Барса (ISLT), исследование наличия (форма 1 SLIMS) снежного барса и его видов-жертв, проводилось на протяжении всего периода работы на всей территории, включенной в зону деятельности экспедиции. В этом году исследовали в основном окрестности Карагемского перевала. В 2011 г. обнаружены следы снежного барса. Можно предполагать что зверь использует изученную территорию до открытия доступа людей до горных перевалов. Отмеченные колебания численности поголовья главных потенциальных жертв не способствуют появлению тут снежного барса, но можно предположить, что главенствующее негативное влияние на зверя оказывают антропогенные факторы. Вместе с тем имеется положительный потенциал для присутствия здесь снежного барса, чему способствует рельеф, растительность, слабая посещаемость высокогорий скотоводами, пребывание потенциальных жертв (прежде всего, аргали, но его численность стремительно падает, и горного козла). Район исследования крайне нуждается в защите, однако, вовлечение в работу местного населения (в т.ч. проведение разъяснительной кампании) является необходимым условием для того, чтобы инициативы по созданию биосферного заповедника или национального парка могли быть реализованы.

Contents

Please note: Each expedition report is written as a stand-alone document that can be read without having to refer back to previous reports. As such, much of this section, which remains valid and relevant, is a repetition from previous reports, copied here to provide the reader with an uninterrupted flow of argument and rationale.

1. Expedition Review

Matthias Hammer and Adam Stickler
Biosphere Expeditions

1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Projects are not tours, photographic safaris or excursions, but genuine research expeditions placing ordinary people with no research experience alongside scientists who are at the forefront of conservation work. Expeditions are open to all and there are no special skills (biological or otherwise) required to join. Expedition team members are people from all walks of life and of all ages, looking for an adventure with a conscience and a sense of purpose. More information about Biosphere Expeditions and its research expeditions can be found at www.biosphere-expeditions.org.

This expedition report deals with an expedition to the Altai Republic from 20 June – 30 July 2011. This expedition conducted a survey of snow leopards as well as their prey species such as the argali (a mountain sheep with large ram horns and a close relative of the Marco Polo sheep) and the Siberian ibex. The expedition also surveyed other animals such as marmots, birds and other small mammals. The area is an important corridor of snow leopard movement between Mongolia and Russia and little is known about these movements and snow leopard numbers. Data collected by this expedition is crucial in the fight for wild snow leopard survival.

The Altai Republic sits in the very centre of central Asia between China, Mongolia, Kazakhstan, Russia and the Tuva Republic. In it, the Altai mountains rise from 350 to 4500 m and are one of the most beautiful, pristine and remote parts of the world. They were added to the list of natural World Heritage Sites in 1998 as an area of outstanding biodiversity of global importance and they provide the habitat for a number of endangered species, including the snow leopard and manul (a small cat). It is, however, also one of the poorest regions of the former Soviet Union, whose collapse has increased pressures on natural resources and deprived local scientists of precious funds for biodiversity conservation.

Little is known about the status and distribution of the globally endangered snow leopard in the area, or about its interaction with prey animals such as the argali and Siberian (or Altai) ibex, and its reliance on smaller prey such as marmots, ground squirrels and game birds. Biosphere Expeditions will provide vital data on these issues, which can then be used in the formulation of management and protection plans.

1.2. Research Area

Flag and location of the Altai and study site.

An overview of Biosphere Expeditions' research sites, assembly points, base camp and office locations is at Google Maps.

The Altai mountains are one of the most beautiful, pristine and remote parts of the world, stretching across the very centre of central Asia between China, Mongolia, Kazakhstan and Russia, and standing at the junction of several natural zones and cultures. Few foreigners get to this corner of the world. Those that do see a variety of stunning high mountain landscapes and immense expanses of open steppe framed by snow-covered peaks. Belukha, the region's highest mountain at 4506 m, rises just west of the research area.

The mountains are divided by several river valleys and there is a great variety of landscapes. There are hollows with semi-desert landscapes, alpine peaks, narrow river canyons and broad valleys, highland tundra and deep natural limestone gorges, open steppes, permanent snow and glaciers and tracts of forest, as well as 7000 lakes, wild rivers and waterfalls. Forests of larch, cedar, spruce and pine (but very few deciduous trees) cover more than a half of the mountain territory. Base camp itself is set amidst larch forest overlooking the Jyelo river with flower meadows, mountains, cliffs and glaciers all around.

Many threatened animal and plant species, many of them endemic, are present in the area, with a recent count showing at least 73 mammal species, 300 bird species, 44 fish species, 7 reptile species, a large number of invertebrates, and 1270 plant species.

The Altai Republic is very sparsely populated, with only about 200,000 people, 53,000 of whom live in the main city of Gorno-Altaisk. About 60% are Russians, 30% are native Altai people, and 5% are Kazakhs. The Altai, a Turkic-speaking people, are mostly village dwellers, but a few are still semi-nomadic, moving with their herds to different pastures, following the seasons and living in yurts in summer. Even today some settled families keep their yurts in their gardens as an extra room or kitchen for summer use. In the more remote areas the horse is still the main means of transport and the yurt the main type of residence.

The history of the Altai is that of a semi-nomadic horseback culture entwined in the power struggles of Central Asia between Mongolian and Turkic tribes. In 1756 the Altai became part of the Russian Empire and in 1905-1907 they were involved in the revolution, which ended in the establishment of Soviet power in 1917. During the era of the Soviet Union, the Altai people were integrated into the union as an autonomous district (oblast) and most of the semi-nomadic people were collectivised. With the end of the Soviet Union, the oblast was transformed into a republic in 1991, adopting the name Altai Republic in 1992. As a semi-independent member of the Russian Federation, the Altai Republic established its current constitution and state symbols, such as its flag and coat of arms, in 1997. Official languages of the Altai Republic are equal Russian and Altaian. More information on the Altai is at www.altai-republic.com.

1.3. Dates

The expedition ran over a period of six weeks divided into three two-week slots, each composed of a team of international research assistants, guides, support personnel and an expedition leader. Expedition slot dates were:

2011: 20 June - 2 July | 4 - 16 July | 18 - 30 July (12 nights).

1.4. Local Conditions & Support

Expedition base

The expedition team was based in a mountain camp consisting of mess, kitchen, shower and toilet tents. Each expedition team member had his/her own dome tent to sleep in and there was hot water from the fire for showers. All meals were prepared by the expedition cook and vegetarians were catered for.

Weather

The climate is sharp continental with short, predominantly hot summers (during which the expedition took place) and prolonged, cold winters. The weather at base camp was very variable, from hot sunshine to rain and occasional snow showers.

Field communications

There was no mobile or landline telephone connection at base. Instead the expedition used an Inmarsat BGAN satellite system with internet connection. Courtesy of Motorola, hand-held radios were used for communication. These worked well when within range. The expedition leader sent an expedition diary to the Biosphere Expeditions HQ every few days and this (text only) diary appeared on www.biosphere-expeditions.org/diary.

Transport & vehicles

Team members made their own way to the Novosibirsk assembly point. From there onwards and back to the assembly point all transport and vehicles were provided for the expedition team, for expedition support and emergency evacuations. Courtesy of Land Rover Russia, and their local dealers MAKS Motors of Novosibirsk, the expedition had the use of four Defenders.

Team members wishing to drive the Land Rovers had to be older than 21, have a full clean driving licence and a new style EU or equivalent credit-card sized driving licence document. Off-road driving and safety training was part of the expedition.

Medical support & insurance

The expedition leader was a trained first aider, and the expedition carried a comprehensive medical kit. Further medical support was provided by a small district hospital in the town of Kosh Agach (60 km from the camp) and a large hospital in Gorno Altaisk (500 km from camp). There was also a helicopter rescue service. All team members were required to be in possession of adequate travel insurance covering emergency medical evacuation and repatriation. Emergency evacuation procedures were in place and there were no major medical incidences during the expedition.

1.5. Expedition Scientist

Volodymyr Tytar was born in 1951 and his Master's Degree in Biology is from Kiev State University. At that time he first experienced the Altai mountains and wrote a paper on the ecology of the brown bear in the Altai. He then pursued a career as an invertebrate zoologist before shifting towards large mammals and management planning for nature conservation. He has worked with Biosphere Expeditions on wolves, vipers and jerboas on the Ukraine Black Sea coast and has been involved in surveying and conservation measures all his professional life.

1.6. Expedition Leaders

Andrew Stronach was born in Scotland, studied Engineering and then flew aircraft for the Royal Air Force before working in wildlife. Surveys of wild plants, birds and marine mammals led him into anti-wildlife crime work that has become his passion and taken him all over Britain and Cyprus. He has taken part in expeditions to Belize, Honduras and Sulawesi, surveying coral reefs and rainforest. Due to a rare allergy to offices, Andrew is almost always found outdoors, whether it is working in the highlands of Scotland, trekking in some remote national park on one of his many foreign travels, or dangling from a rope on a rock face.

Jiri Haureljuk was born in the Czech Republic and now lives in Australia. In his home country, Jiri studied forestry and after compulsory military service he worked for the regional forestry department as a forester and part-time ranger. His first long-haul trip abroad, to India and Nepal, turned out to be life-changing as Jiri was bitten by the travel bug. After a serious spell of globetrotting, he started leading groups in Kenya and the Middle East, before he eventually moved to Africa. There he spent five years, on and off, traversing almost the entire continent on an overland truck and safari guiding before finally moving to Melbourne. When not travelling around the world chasing elusive animals for Biosphere Expeditions and his ever-growing photo library, Jiri is running Melbourne-based wildlife tours, showing visitors the beauty of Victoria state. Jiri is also a published photographer and a keen sportsman.

1.7. Expedition Team

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of all ages, nationalities and backgrounds. They were (with country of residence):

20 Jun - 2 July

Samantha Davidson (USA), Chris Fitzgerald (UK), Sayan Mukherjee (USA), Peter Pilbeam (UK), Bertrand Plancon (China).

4 - 16 July

Margit König (Austria), Verena Lubini (Switzerland), Cassie Mercer (UK), Katrin Mueller (Switzerland).

18 - 30 July

Günter Elsner (Germany), Mary Lynn Engel (USA), Paul Engel (USA), Ludmila Espiaube (France), Ben Rees (UK), Lisa Stratton (UK), Deborah Westwood (UK), Albert Wierenga (Canada), Kimberly Yawn (USA).

Throughout the expedition

Oleg was our very competent and experienced mountain guide. Nina Taranova was our cook and Russian mother who looked after us very well.

1.8. Partners

This expedition worked with the Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine, WWF Russia, the Snow Leopard Conservancy, the Siberian Environmental Centre, the Foundation for Sustainable Development of Altai, the Altai Project, the Altai national government, as well as local authorities, communities, museums & schools. Land Rover, Swarovski Optik and Motorola also supported this expedition.

1.8. Expedition Budget

Each team member paid towards expedition costs a contribution of £1690 per two week slot. The contribution covered accommodation and meals, supervision and induction, a permit to access and work in the area, all maps and special non-personal equipment, and all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses like telephone bills, souvenirs, etc., as well as visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how these contributions were spent are given below.

Income	£
Expedition contributions	29,925
Expenditure	
Base camp and food includes all meals, base camp equipment, logistics & co-ordination	9,937
Transport includes fuel, vehicle maintenance	726
Equipment and hardware includes research materials, research gear	764
Staff includes salaries, travel and expenses, Biosphere Expedition tips, gifts, travel and expenses for local and international staff	10,059
Administration includes registration fees, sundries, etc.	102
Team recruitment Altai as estimated % of PR costs for Biosphere Expeditions	5,882
Income – Expenditure	2,455
Total percentage spent directly on project	92%

1.9. Acknowledgements

This study was conducted by Biosphere Expeditions, which runs wildlife conservation expeditions all over the globe. Without our expedition team members, who are listed above and who provided an expedition contribution and gave up their spare time to work as research assistants, none of this research would have been possible. The support team and staff, also mentioned above, were central to making it all work on the ground. Thank you to all of you and the ones we have not managed to mention by name (you know who you are) for making it all come true. Biosphere Expeditions would also like to thank the Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine, WWF Russia, the Snow Leopard Conservancy, the Siberian Environmental Centre, the Foundation for Sustainable Development of Altai, the Altai Project, the Altai national government, as well as local authorities, communities, museums & schools. Land Rover, Swarovski Optik and Motorola also supported this expedition. The support of all these is gratefully acknowledged.

1.10. Further Information & Enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and a copy of this report can be found on the Biosphere Expeditions website www.biosphere-expeditions.org.

Copies of this and other expedition reports can be accessed via www.biospereexpeditions.org/reports. Enquires should be submitted via www.biosphere-expeditions.org/offices.

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2. Snow Leopard & Prey Survey

Volodymyr Tytar
I.I Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine

2.1. Introduction

The estimated population of snow leopards *(Uncia uncia)* in the wild today is between 3000 and 7000 animals (unpublished manuscripts and Sunquist & Sunquist 2002: also see www.snowleopardnetwork.org). This is the same estimate as for tigers, but whilst tigers have received a lot of publicity and there is wide public awareness of their precarious status, the same cannot be said for the snow leopard. It is still one of the least known big cats. Hardly a surprising fact when one considers its elusive nature and the remote and difficult habitats they occupy in the mountainous regions of central Asia. Its geographical range spans twelve countries, many of which are politically unstable and all of which have sensitive borders. The snow leopard is classified as an Endangered species (Category I) by the IUCN and is disappearing from many parts of its formerly vast range.

After China, Russia has the second largest potential snow leopard habitat; together with Mongolia and other post-Soviet republics, it accounts for much of snow leopard habitat.

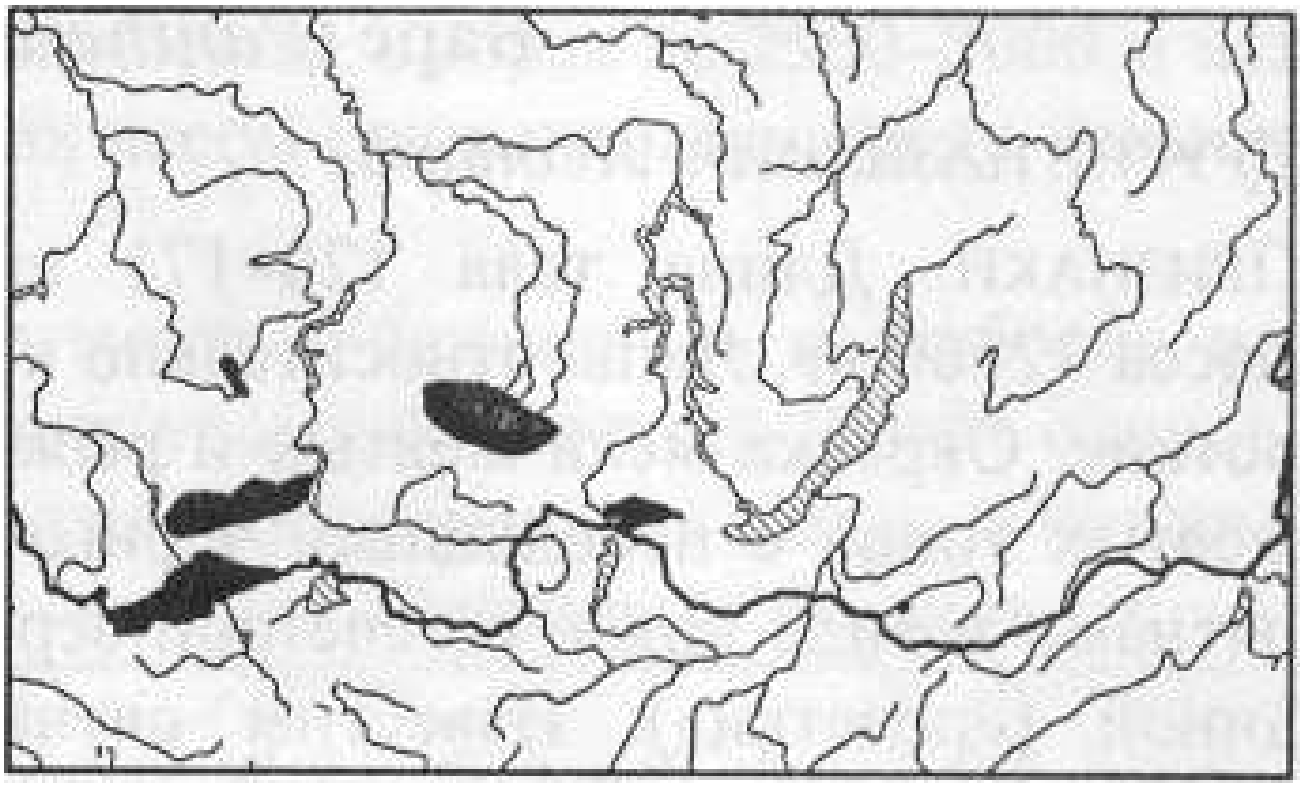

Figure 2.1a. Distribution of the snow leopard in Russia (from Павлинов И.Я. и др., 2002)

The suitable snow leopard habitat in Russia totals at about 131,000 square km (Koshkarev 1994) with snow leopards being reported from the Altai and Sayan ranges bordering Mongolia. Smirnov et al. (1990) estimate about 80 snow leopards reside in southern Siberia, including those animals that wander into Mongolian territory. Sopin (1977), cited in Fox (1989), estimates 0.75 to 1.5 snow leopards per 100 sq km in parts of the Altai mountains, giving a total population of about 40 (Jackson & Hunter 1996).

Rodney Jackson's four-year study (Jackson 1996) of radio-collared snow leopards in Nepal provided much of what is known about the species today, but while Nepal contains prime snow leopard habitat and has the highest percentage of protected area (26.7%) after Bhutan (57.4%), it also only accounts for a small proportion of snow leopard range (0.9%). It took another 10 years for a comparable study to be undertaken in a different habitat (Schaller et al. 1994). This study employed radio-collared animals (VHP & satellite transmitter radio-collars) and took place in the Mongolian part of the Altai Mountains, to the north of the Great Gobi National Park. Although this area is a stronghold of snow leopards in Mongolia, prey densities were found to be relatively low and probably representative of much of the snow leopard's range in central Asia (McCarthy et al. 2005). Results from this study have also revealed much larger snow leopard home ranges than previously recorded.

However, studies involving radio-collared snow leopards are difficult, time-consuming and expensive. Conducting surveys using the Snow Leopard Information Management System (SLIMS), on the other hand, is a more practical way of assessing snow leopard status and distribution in much of the snow leopard's range. Following this protocol ensures standard procedures are used and enables data gathered across any part of the snow leopard's range to make a valuable contribution to the International Snow leopard Trust's (ISLT) database and so help further knowledge and conservation efforts. The expedition therefore follows SLIMS methodology.

2.2. Research Area & Timing of Survey

The area surveyed by Biosphere Expeditions was chosen for several reasons, including: (1) the area was poorly surveyed for snow leopard; previous expeditions to the area since 2009 suggest (aided by a digital model, see below) the suitability of the area for sustaining a viable snow leopard population and its temporary status as a snow leopard habitat, but more evidence is needed before coming to a final conclusion; (2) a map study suggests that the area may be an important corridor for snow leopard dispersal connecting the Northern and Southern Chuya mountain ranges; (3) the habitat is diverse in biological terms, supporting a range of prey species and other carnivores; (4) the area lacks proper protection and is threatened by a growing economic interest in its mineral resources. However, there is a potential here for establishing a protected area that could favour wildlife and benefit local residents.

The chosen site focused on an area of the Northern and Southern Chuya mountain ranges centred around the Karaghem mountain pass (49.97^{o}N, 87.77^{o}E) (see fig.2.2.a).

For reasons of convenience the base camp was located in the valley of the Dzhelo stream (49.96^{o}N, 87.83^{o}E), some 7 km from the Karaghem mountain pass. From here overnight surveys were accomplished to the Karaghem glade (49.96^{o}N, 87.62^{o}E) and to the eastern portion of the Talduair massif (49.93^{o}N, 87.36^{o}E).

Figure 2.2a. Distribution of survey sites in 2011 (map composed in *Google Earth*); yellow pins – survey areas, blue pins – Gorno-Altaisk and Kosh-Agach.

Snow leopard surveys are best undertaken when weather permits travel within the proposed survey area, when animals are most actively marking and when signs are most long-lived. These conditions rarely coincide, so trade-offs have to be made between logistical factors and biological ones. Logistics and team recruitment factors by and large determined the survey period for this study.

On the one hand, summer is a difficult time to find snow leopard signs: marking activity is low, human disturbance is high and livestock grazing can soon obliterate signs. Suitability of tracking substrate is also poor (tracking is much easier in snow). Weather conditions also tend to be unpredictable and contribute to sign erosion and eradication, with rain eroding signs very rapidly. On the other hand, however, recruiting for a summer expedition is much more realistic, logistics are not nearly as prohibitive in winter and, most importantly for this study, human presence can be a valuable source of information, especially in the absence of other baseline data.

Summer is also the optimum time for accumulation and availability of "relic" signs (i.e. old signs that are not washed away or otherwise destroyed or removed).

As per SLIMS suggestions, the survey routes followed river valleys and landform edges wherever possible. Research focused on areas considered the most important habitat for snow leopard and prey, and suffered from the lowest levels of human disturbance. The survey sites were accessed by Land Rover (or on foot if near one of the base camps). All surveys were conducted on foot.

2.3. Methods

Snow leopard presence-absence survey

Presence-absence surveys of snow leopard and prey (SLIMS form 1, see appendix 1) were conducted throughout the survey area. Designed for ease of use, presence-absence surveys are a scientifically valid approach to determine the general status of snow leopards in broad geographical areas. The surveys rely on the presence of snow leopard signs at strategic search locations. Data analyses use survey block summaries to draw conclusions on: (1) the presence-absence of snow leopards and prey species; (2) major threats; (3) management recommendations.

These are qualitative methods that lead to personal judgments supported by physical evidence documented in the survey forms. Unlike with relative abundance surveys, there is no statistical basis for the conclusions. When snow leopard signs are absent, the analyst must rely on all other information from the data forms to reach a judgment. Prey species, habitat and local interview data may point to the presence of snow leopards, even though no sign was found during the survey.

The analyst uses the survey data to support qualitative judgments on snow leopards, prey species, threats and management recommendations for the survey area. The survey forms are a critical analytical unit and are stored for future reference.

Snow leopard presence can be detected by sign, i.e. pugmarks (tracks) (PUG), scrapes (SC), faeces (scat) (FE), urination (UR) and rock scent spray (RC). These signs tend to be left in relatively predictable places. For example, scrapes tend to be left at the base of cliffs, beside large boulders, on knolls and promontories, at bends in trails, or along other well-defined landform edges (Schaller 1977, Koshkarev 1984, Mallon 1988, Schaller et al. 1987, Jackson & Ahlborn 1988, Fox 1989). These factors are important when deciding where to survey.

Prey base survey

Surveying the prey base is another, essential component of the present SLIMS presence/absence survey. Argali and ibex are the main prey species. Their range closely parallels that of snow leopard. Siberian red deer or maral *(Cervus elaphus maral),* roe deer *(Capreolus capreolus)* and wild boar *(Sus scrofa)* are also taken by snow leopard in Russia (Jackson & Hunter 1996).

Prey species were surveyed by recording signs and by observation. Prey signs included tracks, faeces, hair/wool, and carcasses/bones. Prey species were divided into 'primary' (ibex and argali) and 'secondary' (maral, marmot, pika, hare and game birds). The same search sites were used for snow leopard and for prey.

Additional surveys

Evidence of other carnivores sharing snow leopard habitat was also recorded as part of the SLIMS survey.

Ultimately an attempt will be made to build a predictive model of the distribution of the snow leopard in the Altai based on ecological niche modelling and using Biosphere Expedition records together with published data summarized in the Red Data Book of the Republic of the Altai. *DIVA-GIS* software (http://www.diva-gis.org) was applied to process georeferenced primary occurrence data for the species, in combination with digital maps representing environmental parameters (namely, altitude and 19 bioclimatic parameters). The simplest *BIOCLIM* model (Nix 1986) was chosen, which itself involves tallying species occurrences in categories for each environmental dimension, trimming the extreme 5% of the distribution along each ecological dimension, and taking the niche as the conjunction of the trimmed ranges to produce a decision rule.

2.4. Results

2.4.1. Snow leopard presence/absence survey

From 24 June and up to 24 July, 17 snow leopard presence-absence surveys were carried out. The search effort took from 5 to 11 hours, an average of 7.2±0.5 hours. Elevations ranged from 1916 to 3301 m. The dominant landscape surveyed in the areas consisted of narrow valleys (NVAL) 44%, broken terrain (BTER) 37%, steep valleys (SROL) 5% and wide valleys (GROL) 4%. Other landforms included grass plateau, ridges, rock falls, glacial lake areas and woodland consisting of Siberian larch and sporadic Siberian pine stands.

Snow leopard signs searched for during this study included: pugmarks (tracks), scrapes, faeces (scat), urination, rock scent spray and direct observation.

Tracks (pugmarks): These are more easily found in sandy rather than gravelly places, but sandy areas were only present at lower elevations, away from preferred snow leopard terrain. Most of the area surveyed was unsuitable for tracking (scree, boulders, vegetation, etc.), so any conclusions are fairly dubious.

Special attention was drawn to snow patches. This opportunity was greatly enhanced by the early (compared to most of the previous years) start of the expedition (mid-June).

On the very first survey to the Karaghem pass (24 June) two fairly fresh (less than one month old) sets of snow leopard tracks were detected. One track was made by an animal moving uphill; distinct pugmarks sizing 8.3 x 8.0 cm were recorded in mud at the location of 49.96598^{o}N, 87.75047^{o}E and altitude of 2715 m. Somewhat less clear pugmarks were recorded at a lower altitude of an animal moving downhill, which had crossed a snow patch blocking the road over the pass; this occurrence was at the altitude of 2709 m and

located at 49.96355°N, 87.74799°E. These pugmarks without doubt belonged to a snow leopard; however, their contour had been blurred due to the melting of the snow, so accurate measurements could not be taken.

Scrapes: These can be found in sandy sites (short-lived) and gravel (longer-lived). Unfortunately, suitable substrates were not present in most of the survey area favoured by snow leopard, where the majority of substrate was vegetation-covered or broken terrain. Potential suitable substrate was subject to livestock grazing. Rainfall and occasional snowfall throughout much of the survey period also reduced the possibility of finding scrapes.

No scrapes of possible snow leopard origin were encountered.

Faeces: Faeces can be long-lived in areas with little rainfall and minimal insect activity - the survey area was subject to high rainfall and intense insect activity. Grasshoppers, for instance, were found at all but the highest elevations and are voracious consumers of faecal matter. Faeces can be deposited solitarily or with other scats of varying ages (Jackson & Hunter 1996). Faeces are most often found in association with scrapes.

No sign of faeces was recorded.

Urination: Urine can be deposited on scrape piles and is commonly deposited along regular paths or trails.

No definite signs of urination were found during the survey period. Lack of trails and difficulty in finding scrapes were a contributing factor.

Scent spray: snow leopards spray-mark the faces of upright or overhanging boulders and the base of cliffs. Some sites are periodically revisited and re-sprayed (mainly along trails). The majority of spray sites will have one or more scrapes within a distance of a few meters.

No scent-spray was found during a survey conducted this year.

Claw rakes: These are occasionally left on a rock face, log or upright tree trunk.

No claw rakes were found during the survey period.

Direct observation: There were no direct observations of a snow leopard.

2.4.2. Threats to snow leopard presence

In the course of the presence-absence survey an account was taken of human-induced factors considered to be threatening to snow leopard presence in the area. Grazing activities turn out to be common and widespread and were recorded in 10 out of the 17 accomplished snow leopard presence-absence surveys (59%), and in most cases are confined to the foothills and valley floor. More grazing occurs in the Dzhelo area (lower down on the eastern side of the Karaghem mountain pass), where several herder summer stations are in place. However, most of the human impact occurs at lower altitudes.

In general, the grazing pressure in the area continues to remain fairly stable and considerably reduced from the communist era. Many areas suitable for grazing (as, for instance, lower down on the western side of the Karaghem mountain pass) have been abandoned by herders as they are no longer subsidised by the government. Today these areas are considered to be 'empty'. In the near future, however, they may once again be used by herders (or, for example, as hunting grounds or enclosures for keeping maral).

Occasional horse droppings and car tracks found in higher places indicate sporadic human presence all over the area. Other signs of human presence and disturbance included bullet cases, hides, campfires and various items of rubbish left behind by visitors. Fresh collection of firewood was recorded as well.

Quad bikes were recorded in areas of the Karaghem glade, indicating adventure tourism activities. This is a bad sign as it has nothing in common with local traditional land use and may become an additional factor of disturbance for wildlife.

Short-term disturbance is created by harvesters collecting pine cones, mushrooms, wild onions, berries (for instance, gooseberries) etc.

2.4.3. Prey base survey

Signs of prey species in both presence/absence and relative abundance surveys were found to be fairly abundant and widespread in a variety of terrain.

In 2011 argali were recorded in 3 surveys out of 17 (18%, meaning significantly fewer than in the year before – 25%). Signs of argali (faeces, hoof prints, skulls; one direct observation) were recorded between 2458 and 3012 m in altitude.

Siberian ibex were recorded in 16 surveys out of 17 (94%, higher than in the year before – 82%). These included records of faeces, hoof prints, 'beds', skulls, tufts of hair; in 7 surveys direct observations of the animals were made. Siberian ibex were seen between altitudes of 2355 and 3301 m.

Evidence from surveys and interviews indicates that the number of animals using the survey area is relatively low and subject to fluctuations from year to year. It is quite difficult to give any statistical interpretation of these estimates (solely based on the number of records originating, especially in recent years, from various differing areas). However, the general decline of argali seems to be progressing, whereas the Siberian ibex is still a common and in certain places abundant species.

Fig. 2.4.3a shows the records of the potential prey species. Only one fifth (about 22%) are records of the 'primary' prey species consisting exclusively of Siberian ibex (argali is in the category 'other'). Pika, mountain hare, game birds (Altai snowcock, grouse, etc.), maral, musk deer and elk make up 65% of the records. A small amount of records are of roe deer, wild boar, Arctic ground squirrel and Altai marmot (placed in the category 'other').

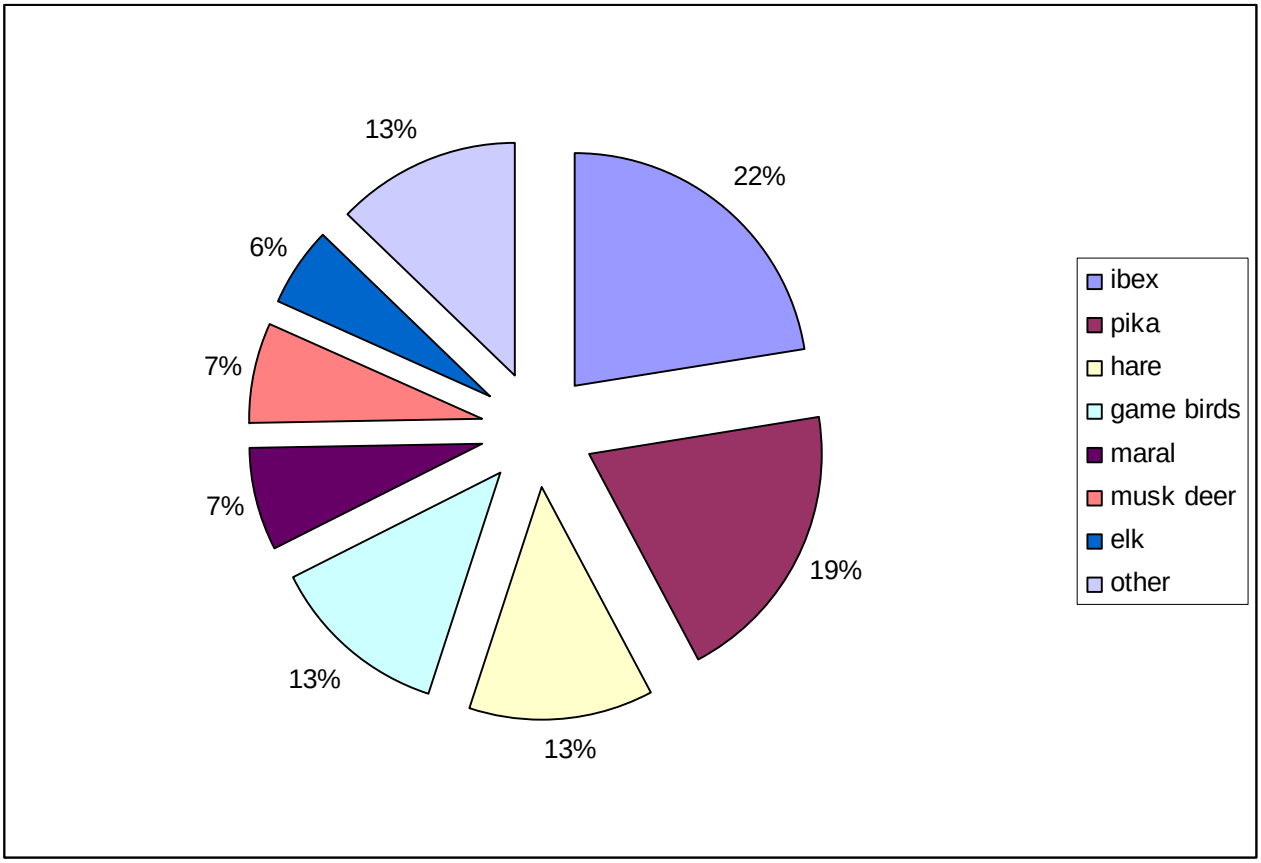

Figure 2.4.3a. Records of potential prey species.

2.4.4. Additional surveys

Evidence of other carnivores sharing snow leopard habitat was also recorded. These included wolf, red fox and in some cases the brown bear. Wolf signs were found at various elevations (up to 2998 m) in 29% of surveys (an increase compared to 2010 of 17%).

Wolf (apart from perhaps brown bear) is the only predator currently preying on domestic livestock in the area. Unfortunately, eradication measures for the wolf include poisoning and the use of traps, a potential hazard for the snow leopard.

No video or stills camera trapping was carried by the expedition in 2011. Previously, possible locations were identified and tested, but without success. A three-month experience in 2010 within the lower reaches of the Argut river in the southern Altai involving the use of 18 cameras has shown how difficult it is to camera trap a snow leopard (see also http://eco.rian.ru/nature/20101021/287965311.html?id, in Russian). Others, particularly Sergei Spitsin of Arkhar NGO (see for instance http://siberiantimes.com/ecology/others/news/were-coming-mama-unique-picture-of-snow-leopards-released/, http://zvercorner.com/?p=8648, http://www.altaiproject.org), have been more successful in camera trapping snow leopard on the Chikacheva Ridge, on the Russian-Mongolian border, proving the presence there of at least four animals in 2012. Today video images have been made of seven animals, including a pregnant female (see Fig. 2.4.4a below). So far, investigators there have installed 14 cameras that are operating all year round.

With the end of operations in the Altai in 2013, Biosphere Expeditions donated its camera traps to WWF, Arkhar NGO and Sergei Spitsin to aid these efforts.

Figure 2.4.4a. Picture of pregnant female © Sergei Spitsin / WWF, from http://ria.ru/eco/20130604/941256108.html.

2.5. Conclusions

On an expedition such as this, covering a large area of remote, rough and broken terrain, it is difficult to find signs of snow leopard and 'primary' prey species, especially during the absence of prolonged, continuous snow cover. Ungulates and carnivores favour higher ground and are more dispersed during the summer season and snow leopard signs are harder to find.

The first expedition in 2003 indicated that snow leopard was present in the surveyed area of the Talduair massif. This, together with evidence from local people, confirmed the importance of the study area as a habitat for snow leopard and as a corridor for snow leopard dispersal between Russia and Mongolia. The repeated surveys of the expeditions have also shown that the habitat in the Talduair massif is sufficiently varied and capable of sustaining a healthy prey base for the snow leopard. In 2003 signs of snow leopard were found in the core area of the Talduair massif, implying a resident animal and/or more than one snow leopard in the research area. However, in the following years no other sign was found, besides fairly old (perhaps a few months) scat samples presumably belonging to the species, showing that snow leopards may have left the area or were visiting it on an occasional basis.

Fresh signs of snow leopard presence recorded in 2009 were an indication that the core area once again had been visited and used. The relationship between the predator and prey species seems to be very fragile, so any decline (perhaps even slight) in the prey species may drive the snow leopard out of the core area. Indeed, poaching and disturbance may be the main factors for driving animals away.

Sightings by locals have decreased significantly since 1998. Snow leopard predation of domestic livestock occurred in the past, but there are no records of any incidents after 1993. The evidence from locals suggests the study area once held a healthy, breeding snow leopard population, which is now in steep decline. We hypothesise that the main cause for this is increased disturbance of snow leopard and poaching of ungulates (particularly argali, of which there were even dramatically fewer records in 2011) exacerbated by seriously diminished facilities to combat these problems.

The corridor area located to the north seems to be of vital importance for animals recolonising the Talduair massif. The relationship between these two areas resembles 'continent' and 'island' relationships in biogeography (MacArthur & Wilson 1967), a notion arising from the digital modelling exercise (Fig. 2.5a). Indeed, mountain ranges located north of the Talduair massif together with the Kurayskiy range form an extensive cluster of 'excellent' habitat area (coloured in red)*. These are interconnected with similar areas in the Chuya ranges which favour snow leopard presence and to which the expedition had moved in 2010 (green triangle on the map) and was based throughout the research season in 2011.

* According to a recent (2012) reconnaissance published by Sergei Spitsyn (see http://zvercorner.com/?p=8648), the Kurayskiy range is used by the snow leopard as a transit corridor. Presence of snow leopard there has been confirmed by the evidence coming from local people.

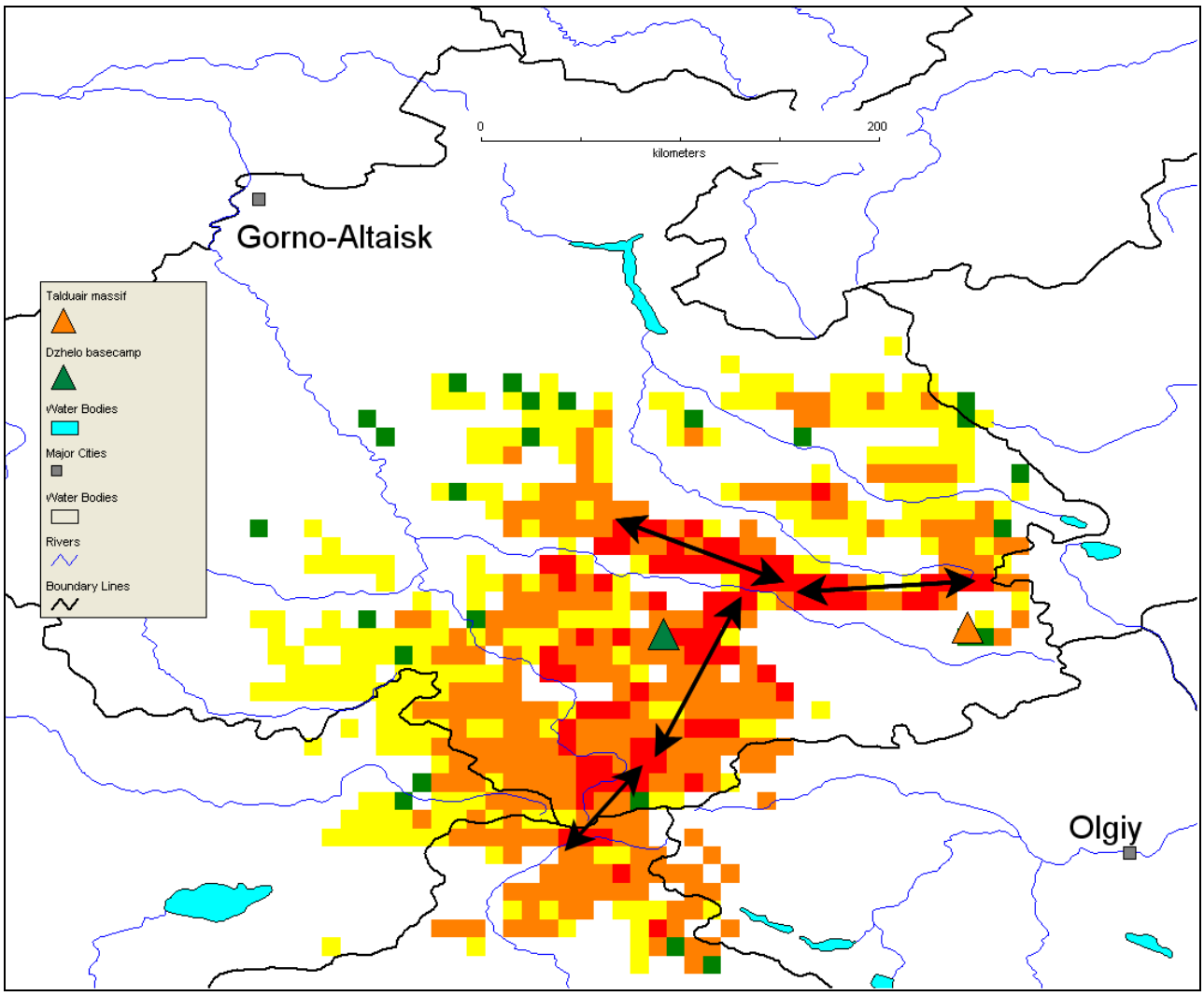

Figure 2.5a. Digital distribution model of the snow leopard in the Republic of Altai (and some adjacent areas); areas within the red-coloured cells present the most favourable ('excellent') combination of ecological conditions required by the species (composed in *DIVA-GIS*).

On the other hand, predicted 'excellent' habitat area from the standpoint of bioclimatic variables alone may not by favourable for the snow leopard due to human impact, a factor not assessed in the model due to the lack of corresponding digital data. The significance of this factor can be evaluated only by conducting the appropriate ground surveys. The absence of snow leopard signs in areas studied last year (2010) and pointed out by the model to be 'excellent' habitat can be considered as strong evidence of ongoing human disturbance. The findings from this year suggest that this disturbance has a seasonal component and increases as soon as the mountain passes can be accessed by humans. Records at the Karaghem pass of snow leopards apparently moving no more than a month ago away from the pass strongly indicate that the area is used by the animals in late spring and/or early summer when the pass is blocked by banks of snow; surely at this time human disturbance is at its minimum. At this time the animals have a chance to move from one range to another. Later in the season the pass becomes busy and most likely is avoided by snow leopards.

Overgrazing by livestock and erosion caused by vehicles is also a problem, particularly at lower altitudes. As a priority, improved anti-poaching control together with a temporary ban on hunting could have an immediate impact on halting the decline of prey species and, by inference, snow leopards.

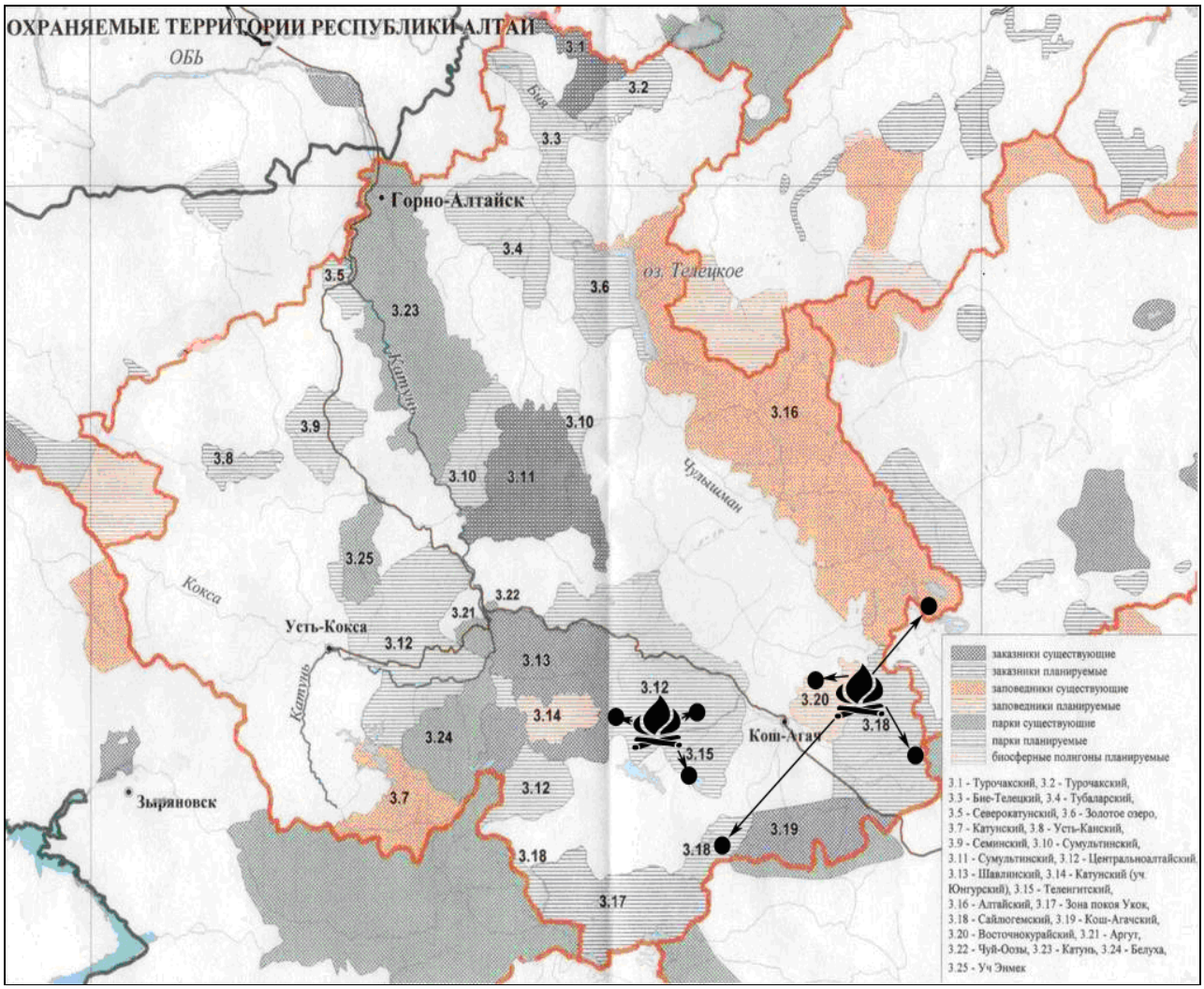

Figure 2.5b. Biosphere Expeditions base and major field camp locations mapped in relation to the present and planned network of protected areas in the Republic of Altai (source map http://www.al-tai.ru/tourist/gorny/ecolog/zapoved/): 3.16 – the Altai Nature Reserve; 3.17 – Ukok Quiet Zone; 3.19 – Kosh-Agach Wildlife Sanctuary; planned protected areas – 3.12 (Central Altai National Park, 3.15 – Telengit National Park, 3.18 – Sailughem National Park, 3.20 – Eastern Kurai Nature (or Biosphere) Reserve.

All the areas surveyed, including the Talduair massif, stretching from the Karaghem pass to the Karaghem glade urgently need proper protection involving the local community. Helping them to benefit as well as the wildlife is vital for any conservation initiative to succeed. Fig. 2.5b depicts Biosphere Expeditions locations and survey efforts in the context of the developing network of protected areas in the Republic of Altai.

Unfortunately, most of these plans are still on paper and NGOs such as the Siberian Environmental Center (http://www.sibecocenter.ru/), the Gebler Ecological Society, etc. are involved in a bitter struggle to implement them. Recent efforts have focused upon the establishment of the Sailughem National Park, an area equally interesting to Biosphere Expeditions. Initial plans were to have the park in two locations (see 3.18 in Fig. 2.5b), including a cluster "Argut" (in patch 3.13 of the map). Together the planned area of the national park would comprise about 117 thousand hectares. Up to now the Russian Government has adopted a resolution (№ 241-p, 27.02.2010) on declaring this a protected area, but matters seem to have gone no further. As yet there is no national park on the ground.

In summary:

- Results from SLIMS data sheets confirm the suitability of surveyed areas for sustaining a viable snow leopard population.

- The major threats facing the snow leopard and prey population within the study areas seem to be disturbance, habitat degradation caused by grazing pressure, human interference and proposed development. Development may exacerbate the existing problems and cause further damage to an already susceptible ecosystem that, as shown in this report, is already stressed (argali numbers in this case is the best indicator).

2.6. Summary & Management Recommendations

Management recommendations are in line with the Strategy for conservation of the snow leopard in the Russian Federation (2002) and include the following:

- Safeguarding the range structure – conduct further research in the study areas.

- Measures for conservation of major prey species and control over potential competitors – an immediate temporary ban on hunting any of the larger prey species. Ibex and argali numbers are not high enough locally (the latter seem to be drastically decreasing) to support hunting pressure and it is almost impossible to regulate what is shot once a licence is issued.

- Solutions to the conflict between snow leopards and local herders – improve the economic situation of local people in return for participation in wildlife monitoring and help with anti-poaching. In fact, interviews have shown that locals in their majority are not opposed to the snow leopard, so it might be reasonable for this purpose to use the combination of ecotourism and marketing products made by herders.

- Raising public awareness of snow leopard conservation – further investigation and consultation with herders is needed so they can reach an understanding of the snow leopard as a ‘flagship’ species not only for nature conservationists, but as a species benefiting them as well. More attention has to be drawn to the threat that encroaching modernisation is bringing to the area and to the understanding of protected areas as a tool for maintaining natural resource sustainability.

2.7. Outlook & Future Expedition Work

Further research is needed to monitor snow leopard and prey population trends in the survey area. Presence-absence surveys will need to be repeated for the most suitable habitat areas as pointed out in the digital modelling, and an account of human impact should be taken. For this purpose the expedition base camp should continue to operate from the place nearby the Karaghem mountain pass (Dzhelo). The possibility of initiating the expedition research at an earlier time should be explored, perhaps starting from the first days of June.

Finding a trail and/or relic scrape(s) is still a high priority. If either of these can be found, remote camera-trapping should be included as a survey tool. A vital question is how many cameras can be involved (at least 10 to 15 would comprise the minimum) and could they be left operating year-round (say, set in the current year and checked in the following one by the next expedition).

Collecting scat for DNA analysis must continue to play an important part in the research; for this purpose a search should be continued for an appropriate grant for processing the scat samples in a laboratory.

Liaising with local people will continue to play a key part in the research. Continued dialogue with herders is important, not only to find out what has happened in between expedition periods, but to involve them more fully in the research (for instance, maintenance of the camera traps) and explore possibilities of benefiting the local community.

The cancellation of the 2013 expedition mostly due to the repressive foreign NGO crackdown in Russia (see http://www.hrw.org/news/2013/05/21/russia-more-50-groups-targeted) in effect meant the end of Biosphere Expeditions operations in the Altai. Biosphere Expeditions' legacy for snow leopard conservation in the Altai includes playing its part in the creation of Sailughem National Park, training and employment of locals, including a placement programme for local students, as well as the creation of detailed flora and fauna inventories as a comprehensive baseline dataset for use by others working within conservation in the Altai. Although Sailughem National Park is as yet an under-resourced paper park, indications for the future are good and there are now many more organisations working in conservation in the area compared to when Biosphere Expeditions started its survey work back in 2003. The public profile of the area and the snow leopard is much higher now than it was 10 years ago and although there are setbacks (including the infamous 'Altaigate' scandal of 2009 – see http://en.wikipedia.org/wiki/Altaigate_Scandal), conservation now seems to be much higher on the political agenda than it was in 2003. Biosphere Expeditions' high public profile and the publicity generated by the expeditions have played their part in this and the power of PR in conservation must not be underestimated.

With the cessation of operations in the Altai, Biosphere Expeditions donated its camera traps and other equipment to local efforts co-ordinated by Michail Paltsyn of WWF Russia and Sergei Spitsin of Arkhar NGO. Through Jennifer Castner of the Altai Project, Biosphere Expeditions is also working on a local involvement and camera-trapping programme. This programme is a community-driven stopgap between long-term economic development and the critical short-term issue of poaching. It identifies snare-poachers, particularly those that are thought to target snow leopards, and approaches them. Along with a camera trap and a GPS unit, they are then encouraged to camera trap a previously unidentified snow leopard and provide verifiable GPS and other evidence of their camera trapping success, which is then rewarded by a $1,000 payout. Approximately one year later, if the poachers can photographically demonstrate the animal is still alive, they will receive another $2,500 payout. The assumption is that the poacher will not only not kill the animal himself, but will also work to stop his competitor poachers from killing it as well. This is obviously not a long-term solution, but with so few of the cats remaining, it is a short-term measure that buys time for the few remaining snow leopards until the long-term solutions can be found. Early indications are that this programme is working well.

2.8. Заключение

С 24 июня по 27 июля 2011 г. проведено обследование на наличие снежного барса в районе горного массива Талдуаир, Северо- и Южно-Чуйского хребтов (преимущественно в районе Карагемского перевала) и оценка подходящих для вида местообитаний. Вели поиск отпечатков лап, поскребов, экскрементов, мочи и мочевых меток. Исследования прошлых лет года дали основания считать, что в районе обитает по крайней мере одна особь. Находка лишь одного образца экскремента в 2004 году дало повод предположить, что вид покинул район горного массива Талдуаир или только временно ее посещает. Сделанные в 2005 г. находки отпечатков лап и мочевых меток указывают на возвращение в район снежного барса, что может быть связано с некоторым увеличением численности его потенциальных жертв, в первую очередь горного козла, но отсутствие подобных следов в 2006 г. (все находки были сделаны в другом районе – на СЗ от основного района исследований) позволяет предположить, что возрастающее негативное влияние оказывает беспокойство со стороны людей. В 2007 г. найдены лишь старые следы и экскременты, а предположительное снижение поголовья главных потенциальных жертв не способствует появлению тут снежного барса. В 2008 г. вообще не обнаружено каких-либо следов пребывания снежного барса, но в 2009 г. вновь обнаружены (на снежнике) отпечатки лап зверя. В 2010 году соответствующих следов и обнаружений не было. В 2011 году найдены относительно свежие следы барса на Карагемском перевале.

Предполагается, что снежный барс потенциально может проникать на территорию горного массива Талдуаир с массивов, расположенных севернее и входящими с состав своеобразного миграционного коридора. Подобное предположение подкрепляется полевыми наблюдениями и компьютерным моделированием экологической ниши снежного барса, выполненным с помощью ГИС-технологии. Отдельные признаки пребывания барса были отмечены в районе Карагемского перевала в 2009 г. В 2010 г. сюда будет перенесен базовый лагерь экспедиции, но и здесь поиски зверя дали отрицательный результат. Только в 2011 году результат оказался положительным.

Оценка подходящих для вида местообитаний показала, что имеется определенный потенциал для обитания снежного барса. Этому способствует рельеф, слабая посещаемость мест скотоводами (хотя в расположенных ниже угодьях выпас домашних животных является обычной практикой), признаки пребывания потенциальных жертв (прежде всего, сибирского горного козла и аргали, относительная численность последнего, однако, стремительно падает и эта тенденция продолжается).

Вместе с тем, имеются признаки незаконной охоты на основных потенциальных жертв снежного барса, и снижение их численности может привести к полному исчезновению вида на рассматриваемой территории. Вместе с тем, хотя численность аргали снижается, численность козла за этот период испытывала как падения, так и подъемы, но это, по-видимому, никак не отразилось на количество регистраций хищника. Тем не менее необходимо ввести запрет и/или строгий контроль на отстрел диких копытных и придание району Талдуаир, территории от Карагемского перевала до Карагемской поляны (включительно) природоохранного статуса. Кроме того, улучшение благосостояния местного населения и экологическое просвещение могут стать составными элементами комплексной природоохранной программы, целью которой станет сохранение такого флагманского для всей экосистемы вида как снежного барса.

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Please note: Each expedition report is written as a stand-alone document that can be read without having to refer back to previous reports. As such, much of this section, which remains valid and relevant, is a repetition from previous reports, copied here to provide the reader with an uninterrupted flow of argument and rationale.

3. Bird Survey

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3.1. Introduction

It is often asserted that birds are convenient indicators of biodiversity, at least at larger scales, and that they are useful for monitoring environmental change (as discussed by Furness & Greenwood 1993). One reason is that birds have long been popular with naturalists, amateur and professional, and consequently their taxonomy and distributions are better known than those of any other comparable group of animals.

A measure of species diversity is a meaningful complementary result of a wildlife count survey. It allows managers to document the ecosystem health with reference to similar ecogeographical areas and to evaluate the biological potential of an area managed with objectives of natural resource exploitation. Under a monitoring scheme, regular information on community composition and species assemblage, combined with a special focus on target species (harvested or flagship species, such as, for instance, the snow leopard), provides greater sensitivity to evaluate ecosystem responses to development of anthropogenic activities or to changes in management strategies (Kremen et al. 1994). Comprehensive ecological monitoring is therefore a crucial source of information to integrate both conservation and management objectives.

3.2. Methods

The abundance of birds and the diversity of their communities are difficult things to measure. The acquisition of quantitative data presents many problems, yet such data are becoming more necessary, for example in allocating categories of threat to the rarer species (Mace & Stuart 1994, Sisk et al. 1994, Bennun & Njoroge 1996).

For the purpose of measuring and comparing bird diversity, there are two broad groups of methods: those which generate a species list, perhaps with an approximation of abundance, and those which generate a species list with a quantifiable measure of abundance (for details see Bibby et al. 1992) [Russian version published in 2000]. For birds, abundance is enormously difficult to measure with any precision. A key problem is the difference between observed and real abundance. Various methods can yield data on distributions as well as abundance, but they differ considerably in the amount and types of data they produce in relation to the effort put into them. All quantitative methods are relatively time-consuming and cost-effectiveness is thus important. Using a combined measure of abundance and diversity is a widespread practice in bird surveys.

Typically, a survey consists of a set of counts. The mean score for each species is regarded as an index of its abundance. Bibby et al. (2000) proposed a simple approach, in which abundance is indexed by the simple proportion of the counts in a survey in which a species is encountered. It is obvious that the commoner the species, the more likely it is to be recorded with higher frequency. For example, out of the total of 561 records of species encountered during the expedition and recognised beyond dispute, 25 (or 4.5%) belong to the white (pied) wagtail, one of the most common birds in the study area. On the contrary, rare species recorded only once account for about 0.18%. The same can be assessed by using the number of surveys in which a particular species was encountered.

In general, the timing of the expedition survey and available logistics constrained our choice to presence-absence methodologies and those which could yield useable data in one day's sampling per transect.

The census methods employed consisted of different transect counts (car day and foot counts). The overwhelming majority of censuses were based on direct sightings. Animals detected were identified either by the naked eye or with binoculars. For analysis, car day counts and foot counts are pooled.

Sampling units (i.e. transects) were spread over the whole study area and covered all habitat types. This network did allow for a relatively fair proportional coverage of habitat units, so we consider it to provide a representative sample of the area for a reliable estimate of bird diversity. The time to complete one transect was between 5 and 11 hours and averaged 7.2 hours. The number of routes was used in our analysis as a measure of the sampling effort (as more than one route could be accomplished in one day, say by two separate teams). A total of 29 survey routes were accomplished between the 23 June and 28 July.

Records were entered into a datasheet after each survey in the evening of the same day.

Data analysis

The simplest and least controversial estimate of diversity is the number of species (S, species richness) in a defined area, such as a particular habitat (Magurran 1988). The total species richness of a site can only be approximated by exhaustive data collection. Even then, ‘new’ species can be added after thousands of hours in the field. However, species richness can be extrapolated in various ways from the numbers actually recorded.

Diversity was estimated by the Shannon index (entropy, *H'*), which takes into account the number of individuals (or its analogue) as well as number of taxa:

$$H' = - \sum n_i/n \ ln \ (n_i/n)$$

where n is the total number of individuals and n_i is number of individuals of taxon i. This index varies from 0 for communities with only a single taxon to high values for communities with many taxa, each with few individuals. The variance of *H'* (*Var H'*) can be used as a measure of statistical error; however, the significance of differences in diversity between samples was preferably determined by using the Shannon diversity *t*-test (Hammer et al. 2008).

Of course, it is only big differences in species richness which are likely to be useful as indicators of conservation value. However, when considering conservation priorities, species richness should, wherever possible, be combined with other measures, such as the presence of rare or restricted-range species (see, for example, Usher 1986). For the local avifauna, abundance categories have been asserted using a five-point logarithmic scale (Песенко, 1982).

3.3. Results

The methods used resulted in a presence-absence data set consisting of 561 records. A total of 107 species (including subspecies) were recorded (belonging to 15 orders and 37 families) (appendix 2).

The following analyses of bird diversity were made:

Species richness & diversity.

The overall diversity of the avifauna (assessed by the Shannon index, *H'*) was 4.252. The Shannon diversity *t*-test detected no differences in the diversity between samples collected in consecutive years (4.189 in 2010) (t=1.02, p>0.05).

A qualitative analysis of species diversity done by taxonomic unit (bird order and family) shows that over half of the species (60 out of 107, or 56%) are represented, as one might expect, by passerines (table 3.3b). In terms of species numbers, passerines are followed (as in previous years) by raptors (families Accipitridae and Falconidae) and waders (predominantly Charadriidae), composing 14% and 9.3% of the local bird fauna, respectively. In 2011 ducks (Anatidae) also comprised a noticeable portion of the avifauna (6%; 8.3% in 2010).

In general, the distribution of species amongst the major bird orders remains stable, as evidenced by the Chi-square statistical tests (p well above the 0.05 threshold) (Table 3.3a).

Table 3.3a. Distribution of species amongst the major bird orders for survey years 2010-2011.

Orders	Number of species in 2010	Number of species in 2011
Passeriformes	58	60
Falconiformes	16	15
Charadriiformes	9	10
Other (pooled)	25	22
Chi-square$_{2010/2011}$ = 0.306 *d.f.* = 3, p = 0.96		

Table 3.3b. Summary of species in each taxonomic unit (bird order and family).

Order	No. of species	Family	No. of species
Passeriformes	60	Turdidae	16
		Corvidae	7
		Motacillidae	5
		Fringillidae	4
		Hirundinidae	4
		Paridae	4
		Passeridae	4
		Prunellidae	4
		Sylviidae	3
		Alaudidae	2
		Laniidae	2
		Aegithalidae	1
		Cinclidae	1
		Emberizidae	1
		Sittidae	1
		Sturnidae	1
Falconiformes	15	Accipitridae	12
		Falconidae	3
Charadriiformes	10	Charadriidae	6
		Scolopacidae	2
		Laridae	1
		Sternidae	1
Anseriformes	6	Anatidae	6
Piciformes	3	Picidae	3
Ciconiiformes	2	Ardeidae	1
		Ciconiidae	1
Galliformes	2	Phasianidae	1
		Tetraonidae	1
Gruiformes	2	Gruidae	1
		Rallidae	1
Apodiformes	1	Apodidae	1
Columbiformes	1	Columbidae	1
Coraciiformes	1	Upupidae	1
Cuculiformes	1	Cuculidae	1
Pelecaniformes	1	Phalacrocoracidae	1
Pteroclidiformes	1	Pteroclidae	1
Strigiformes	1	Strigidae	1

Local and regional rarity

Different methods have been proposed for defining abundance classes. Following Песенко (1982), we use the logarithmic approach in which the upper boundary for each abundance class is defined as: $N^{a/k}$, (a=1, 2, ..., k), so the upper boundary for the rarest category in a series of five abundance classes (k=5) will be set at $29^{0.2}$ = 1.96, or approximately 2. In such a way the unique (occurring in only one sample) and duplicate (known from two samples) species fall into one abundance class, and in our case they together comprise 44.9% of all the recorded species. Boundaries for the remaining four abundance classes (2 to 5) are presented in Table 3.3c.

Table **3.3c.** Summary of abundances of recorded bird species (2010-2011).

	Abundance classes				
	1 (rare)	2 (few)	3 (moderate)	4 (common)	5 (abundant)
	Data 2010				
	1-2 records	3-4 records	5-8 records	9-16 records	17-31 records
uniques: 30 (27.8%) duplicates:21 (19.4%)	Total: 51 (47.2%)	17 (15.7%)	12 (11.1%)	18 (16.7%)	10 (9.3%)
	Data 2011				
	1-2 records	3-4 records	5-8 records	9-15 records	16-29 records
uniques: 33 (30.8%) duplicates:15 (14%)	Total: 48 (44.9%)	14 (13.1%)	21 (19.6%)	19 (17.8%)	5 (4.7%)
	$\text{Chi-square}_{2010/2011} = 4.52$, $d.f. = 4$; $p = 0.34$				

Amongst the most frequently encountered birds (‘abundant’ category) are the white (pied) wagtail, black-eared kite, northern wheatear, twite and red-billed chough.

Next in abundance (‘common’) are the greenish warbler, rufous-backed redstart, common kestrel, ruddy shelduck, common sandpiper, horned skylark, yellow-billed chough, citrine wagtail, grey wagtail, hoopoe, plain mountain finch, rufous-tailed rock thrush, steppe eagle*(iii), carrion crow, hill pigeon, bluethroat, common redshank, golden eagle*(ii) and upland buzzard*(iii).

Moderate records have been made of the common cuckoo, crag martin, black redstart, dark-throated thrush, house martin, little ringed plover, nutcracker, rock ptarmigan, Altai snowcock*(iii), common stonechat, desert wheatear, rock sparrow, bearded vulture*(i), Brant's mountain finch*(iii), brown accentor, cinereous vulture*(i), fork-tailed swift, imperial eagle*(ii), isabelline wheatear, rufous-tailed shrike and saker falcon*(iii).

Fewer records were made of the Altai accentor, black-billed magpie, black-headed gull, dipper, Eurasian nuthatch, Eurasian skylark, long-eared owl, tufted duck, Alpine accentor, barn swallow, common tern, demoiselle crane*(iii), Eurasian dotterel and merlin.

Ten species marked with an asterisk are listed in the Red Data Book of the Altai Republic (i-iv stand for their assigned nature conservation status[1]). In 2010 there were 7 such species.

Amongst the rarest species, 8 are listed in the Red Data Book of the Altai Republic: black stork*(ii), black-tailed godwit*(iii), black cormorant*(ii), grey heron*(iii), whooper swan*(iii), greater sand plover*(ii), rosy starling*(iii) and grey-necked bunting*(iii).

Altogether, 18 species out of 67 (or about one quarter) listed in the Red Data Book of the Altai Republic have been spotted by the expedition team during the survey. In 2010 there were 19 such species.

The Chi-square test shows that variations in the figures concerning the distribution of bird species between the abundance classes observed between the consecutive survey years (Table 3.3c) are statistically insignificant (*p* well above the critical value of 0.05).

In general, the entire period of observation (since 2003) has revealed 230 bird species in the south-eastern Altai (adding 15 this year), a total of 42 of which are listed in the Red Data Book of the Altai Republic (i.e. 62.7%). Records in 2011 added 15 species not seen before by the expedition.

The core of the avifauna may be considered to consist of species recorded repeatedly each year or which have been missing from the annual lists only once.

First and foremost these are the Altai snowcock*(iii), black-billed magpie, black-eared kite, cinereous vulture*(i), citrine wagtail, common cuckoo, common kestrel, common redshank, common sandpiper, common stonechat, common tern, demoiselle crane*(iii), dipper, Eurasian skylark, golden eagle*(ii), grey wagtail, Guldenstadt's redstart, hoopoe, imperial eagle*(ii), isabelline wheatear, long-legged buzzard, northern wheatear, red-billed chough, rock ptarmigan, ruddy shelduck, rufous-tailed rock thrush, saker falcon*(iii), sand martin, white (pied) wagtail and the yellow-billed chough.

Secondarily, the species are the Eurasian sparrowhawk, Richard’s pipit, steppe eagle*(iii), tawny eagle, upland buzzard*(iii), little ringed plover, black stork*(ii), carrion crow, Eurasian jackdaw, horned skylark, solitary snipe*(ii), bearded vulture*(i), willow grouse, black-tailed godwit*(iii), willow tit, greenish warbler and the lapwing.

[1] I – globally threatened, II – declining species, III – rare, IV – species at the edge of its home range and/or poorly known.

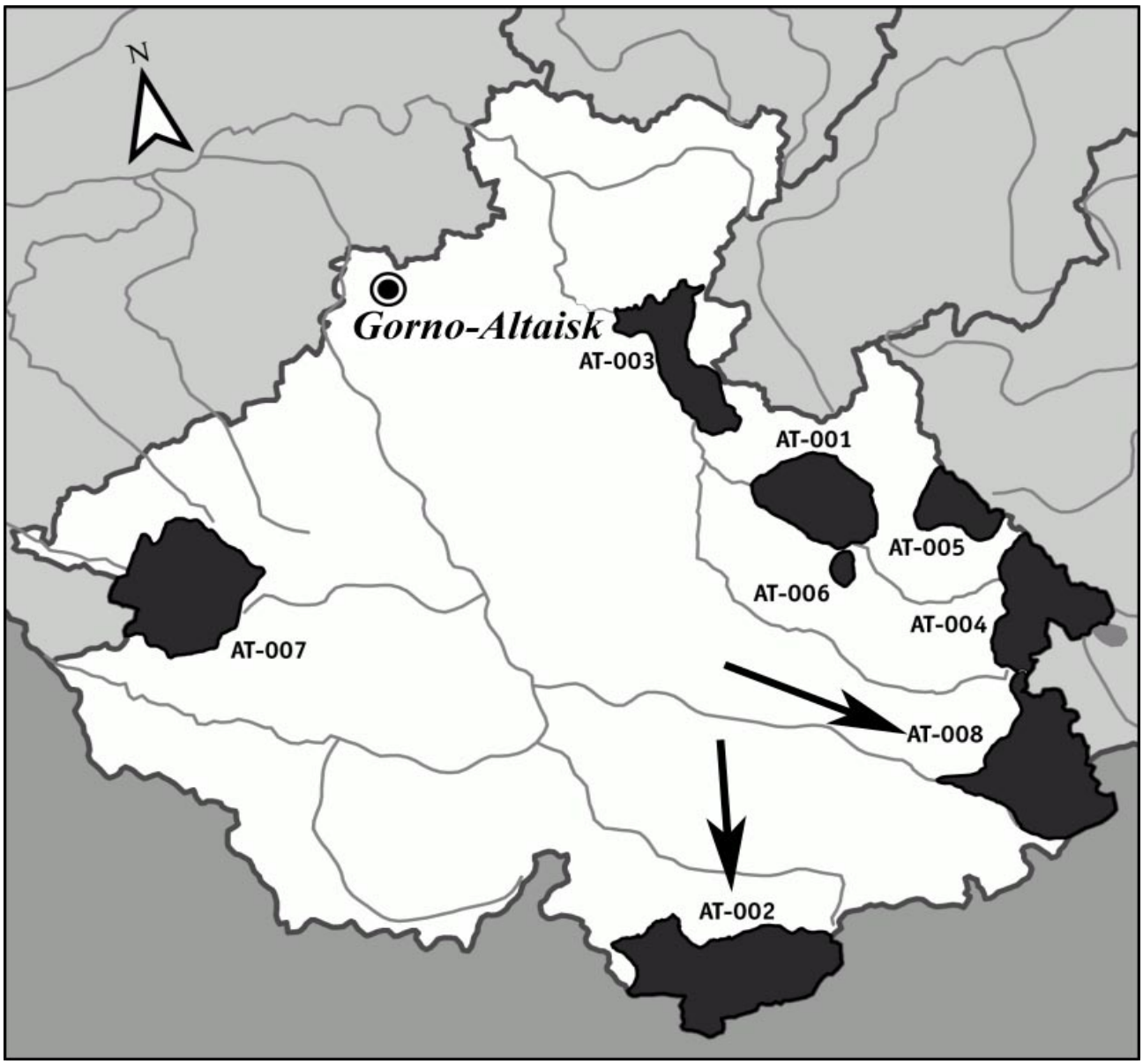

Figure 3.3a Important bird areas (IBAs) in the Altai Republic (source: http://gis-lab.info/projects/iba-ws-rus.html)

In total, this 'core group' consists of 47 species of which about a quarter are declared protected under the Red Data Book of the Altai Republic. Data collected by the expedition confirms the richness of birdlife in the area and the relevancy of distinguishing important bird areas (IBAs[2]) in the south-eastern Altai, in particular AT-002 and AT-008, which were covered in part by Biosphere Expeditions surveys (see Fig. 3.3a). These areas may play a vital role in preserving threatened species mentioned in the IUCN Red List, such as the bearded vulture (http://www.iucnredlist.org/apps/redlist/details/144346/0), and deserve further investigations that may be conducted jointly with local nature conservationists.

[2] An Important Bird Area (IBA) is an area recognised as being globally important habitat for the conservation of bird populations. Currently there are about 10,000 IBAs worldwide. The program was developed and sites are identified by BirdLife International. These sites are small enough to be entirely conserved and differ in their character, habitat or ornithological importance from the surrounding habitat (see also Ключевые 2006).

3.4. Conclusions / Заключение

1. A repeated bird species inventory in areas mainly around the Karaghem mountain pass of the Altai Republic undertaken by Biosphere Expeditions between 23 June and 28 July 2011, involving a total sampling effort of 29 survey routes (561 records), yielded 107 species belonging to 15 orders and 37 families.

1. Преимущественно в районе Карагемского перевала в Республике Алтай РФ с 23 июня по 28 июля 2011 г. проводили очередную инвентаризацию фауны птиц и учет их численности. Работа велась силами трех команд волонтеров, участников экспедиции. Общее количество маршрутов, потраченных на наблюдения, составило 29 (сумма наблюдений составила 561). В итоге обнаружено 107 видов птиц (принадлежащих к 15 отрядам и 37 семействам).

2. An analysis of species diversity done by taxonomic unit (bird order and family) shows that the majority of species belong to passerine families. As in previous years, carnivores continue to make up a high-ranking diet guild, indicating a rich source of secondary production in the area capable of maintaining an array of raptor species and specialised scavengers.

2. Анализ таксономического разнообразия птиц показывает, что большинство видов принадлежит к Воробьиным. Хищные птицы продолжают составлять существенную по численности видов группу, что указывает на достаточные ресурсы вторичной продукции, способные содержать многих хищников и падальщиков.

3. 48 (or 45%) of the recorded species can be considered rare; 8 of them are listed in the Red Data Book of the Altai Republic.

3. 48 (или 45%) зарегистрированных здесь видов птиц можно считать редкими; 8 из них занесены в Красную книгу Республики Алтай.

4. 59 species belong to other abundance categories, ranging from “few” to “abundant”; 10 of them are listed in the Red Data Book of the Altai Republic. A pleasing fact may be considered to be the increasing number of records of the bearded vulture (fortunately the species in terms of abundance has moved from the category ‘rare’ to ‘moderate’).

4. 59 вида принадлежат к другим категориям встречаемости (от «мало» до «очень много»); 10 из них числятся в Красной книге Республики Алтай. Радует тот факт, что в этом году довольно часто регистрировали бородача.

5. The core of the avifauna in the study region consists of 47 species, of which about a quarter are declared protected under the Red Data Book of the Altai Republic. Biosphere Expeditions data confirm the richness of birdlife in the area and the relevancy of distinguishing important bird areas in the south-eastern

5. Ядро орнитофауны региона состоит из 47 видов, примерно четверть из которых числится в Красной книге Республики Алтай. Данные экспедиции подтверждают правильность выделения ключевых орнитологических территорий ЮВ Алтая и их важную роль в сохранении, например, бородача.

Altai, especially in terms of preserving, for instance, the bearded vulture.

6. Comparisons between inventories of 2010/2011 seem to confirm no significant environmental change in the study area. The validity of the approaches we have chosen for biodiversity assessment were based on bird species richness, especially in terms of replication.

6. Сравнение результатов учетов 2010/2011 гг. указывает на относительную стабильность окружающей среды в исследованном районе, а также обоснованность методов, используемых для оценки биоразнообразия, особенно в аспекте получения стабильных повторных результатов.

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Please note: Each expedition report is written as a stand-alone document that can be read without having to refer back to previous reports. As such, much of this section, which remains valid and relevant, is a repetition from previous reports, copied here to provide the reader with an uninterrupted flow of argument and rationale.

4. Mammal Survey

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4.1. Introduction

Mammal species have long been far less popular than birds with naturalists, amateur and professional, and consequently their taxonomy and distributions are more poorly known.

The basic objectives and methods used for the mammal inventory are much the same as for the bird inventory. Methods we employed consisted of different transect counts (car day and foot counts). The censuses were based on both direct sightings (encounters) and signs (tracks, faeces, bones, etc.). Animals detected were identified either by the naked eye or using binoculars, while signs were associated with particular species using relevant field guides (Bang & Dahlstrøm 2001, Гудков, 2008, Долейш 1987, Руковский 1984, etc.). For the analysis, car day counts and foot counts were pooled. The sampling effort totalled 21 routes (accomplished between 23 June and 28 July). Records were entered into a datasheet after each survey during the evening of the same day.

4.2. Results

The methods used resulted in a presence-absence dataset (appendix 3). A total of 22 species were recorded (belonging to 4 orders and 12 families). In some cases (particularly *Muroidea gen. sp.* – 10 cases) it was impossible to identify the animals to the exact species.

The overall diversity of the mammal fauna (assessed by the Shannon index, *H'*) was 2.708 (2.572 in 2010). The Shannon diversity *t*-test detected no differences in diversity between inventories performed in 2010 and 2011 ($t_{2010/2011}$=1.28, p>0.05), meaning perhaps a stabilisation in the quantitative structure of the mammal fauna in the area. In 2010 there was a significant drop in the previously fairly large proportion of Carnivora (39.2% in 2009 and 23.8% in 2010); however, in 2011 an opposite trend was observed and Carnivora compose 38% of the species (Table 4.2a). This may be an indication of the resilience of the local community structure.

Table 4.2a. Summary of mammal species in each taxonomic unit.

Order	No. of species	Family	No. of species
Carnivora	8	Mustelidae	3
		Canidae	2
		Felidae	2
		Ursidae	1
Artiodactyla	7	Cervidae	3
		Bovidae	2
		Moschidae	1
		Suidae	1
Rodentia	4	Sciuridae	3
		Cricetidae	1
Lagomorpha	3	Leporidae	1
		Ochotonidae	2
Total: 4		Total: 12	Total: 22

Local and regional rarity

We follow Песенко (1982) in distinguishing the abundance classes using the logarithmic approach in which the upper boundary for each abundance class is defined as: $N^{a/k}$, (a=1, 2, ..., k), so the upper boundary for the rarest category in a series of five abundance classes (k=5) will be set at $21^{0.2,}$ which is 1.84 or approximately 2. In such a way the unique (occurring in only one sample) and duplicate (known from two samples) species fall into one abundance class, and in our case they together comprise 38.1% of all the recorded species. Boundaries for the remaining four abundance classes (2 to 5) are presented in Table 4.2b. In general, the distribution of mammal species between the abundance classes observed between the consecutive survey years is fairly similar (p well above 0.05).

Amongst the most abundant mammal species are the Arctic ground squirrel, northern pika, Siberian ibex and Arctic or mountain hare.

Next in abundance (common) are the red fox, wolf, Daurian pika, grey or Altai marmot and Siberian chipmunk.

Moderate records were made of the maral deer.

Fewer records were made of the brown bear, Siberian musk deer, argali sheep*(I) and wild boar.

Only one species marked above with an asterisk is listed in the Red Data Book of the Altai Republic (I stands for its assigned nature conservation status).

Table 4.2b. Summary of abundances of recorded mammal species

Abundance classes					
1 (rare)	2 (few)	3 (moderate)	4 (common)	5 (abundant)	
Data 2010					
	1-2 records	3-4 records	5-7 records	8-13 records	14-24 records
uniques: 7 (33.3%) duplicates: 1 (4.8 %)	Total: 8 (38.1%)	5 (23.8%)	1 (4.8%)	1 (4.8%)	6 (28.6%)
Data 2011					
	1-2 records	3-4 records	5-6 records	7-11 records	12-21 records
uniques: 6 (27.3%) duplicates: 2 (9.1%)	Total: 8 (36.4%)	4 (18.2%)	1 (4.5%)	5 (22.7%)	4 (18.2%)
Chi-square$_{2010/2011}$ =0.32, *d.f.* = 2*; *p* = 0.85					

*As some of the scores in the abundance classes are fewer than 5, neighbouring 2 and 3, 4 and 5 classes have been pooled into two; consequently the degrees of freedom (*d.f.*) is reduced to 2 (i.e. number of classes minus 1)

Eight of the mammal species recorded in 2011 are considered to be rare. Identified species in this category are the elk, manul*(ii), flat-headed vole, mountain or Altai weasel, roe deer, snow leopard*(i), stoat and wolverine.

Fortunately this year there have been records of the endangered felid species, including the snow leopard and particularly the manul. In the latter case the expedition was kindly aided by Ilya Smelyanski (Илья Смелянский) and Anna Barashkova (Анна Барашкова) of the Siberian Environmental Center (http://www.sibecocenter.ru/).

Altogether, 3 mammal species out of 19 listed in the Red Data Book of the Altai Republic were recorded by the expedition team during the survey.

In general, the period of observation (since 2003) has yielded 44 mammal species in the south-eastern Altai and a total of 5 are listed in the Red Data Book of the Altai Republic (i.e. 26.3%). This expedition added the flat-headed vole to the list.

The core of the mammal fauna may be considered to consist of species recorded repeatedly each year or which have been missing from the annual lists only once.

First and foremost these are the Arctic ground squirrel, Arctic or mountain hare, argali sheep*(i), grey or Altai marmot, large-eared or Altai vole, maral deer, northern pika, red fox, Siberian chipmunk, Siberian ibex, wild boar and wolf.

Secondarily, the species are the Daurian pika, manul*(ii), northern red squirrel, roe deer and stoat.

In total this ‘core group’ consists of 17 species of which two are protected under the Red Data Book of the Altai Republic. In terms of snow leopard habitat quality the ‘core group’ includes a broad prey base consisting of both ‘primary’ and ‘secondary’ prey species, and persisting records of these species support the potential for snow leopard presence in the area.

4.3. Conclusions/ Заключение

1. A total of 22 species of mammals were recorded (belonging to 4 orders and 12 families).

1. Отмечено наличие в исследованном районе 22 вида млекопитающих (принадлежащих к 4 отрядам, 12 семействам).

2. A previously fairly large proportion of Carnivora species (39.2% in 2009) had decreased to 23.8% in 2010. In 2011 an opposite trend was observed and Carnivora compose 38% of the species in what may be an indication of the resilience of the local community structure.

2. Снизилась прежняя относительно большая доля видов отряда Хищные (39.2% в 2009 г.) до 23.8% в 2010 г. В 2011 г. наблюдалась противоположная тенденция и Хищные составляли 38% состава фауны млекопитающих, что может быть показателем устойчивости местной экосистемы.

3. Unique and duplicate species together comprise a noticeable portion of the fauna (36.4%).

3. Виды, которые наблюдались один или два раза, составляють 36.4% фауны.

4. Persisting records of mammal prey species of the snow leopard support the potential for predator presence in the area.

4. Потенциальные жертвы снежного барса обычны в исследованном районе и отмечаются ежегодно, что создает определенные трофические условия для хищника.

5. Since 2004 the manul has shifted down to the “fewer” abundance category, but in 2009 it appeared in the category of rare species and the population seems to be in a steady decline. In 2011 signs of the felid were found and observations made, but the species continues to be rare.

5. Положение манула, вызывает тревогу. Этот вид до 2009 г. продолжал редко встречаться. В 2011 г. обнаружены его следы, а также были визуальные наблюдения, но вид продолжает оставаться в категории редких.

6. Three mammal species out of 19 listed in the Red Data Book of the Altai Republic were recorded.

6. В 2009 г. отмечено наличие 3 из 19 видов млекопитающих, внесенных в Красную книгу республики Алтай.

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Appendix 1: SLIMS form 1.

BIOSPHERE EXPEDITIONS

Datasheet: **Altai**

SLIMS form 1: snow leopard presence/absence survey: snow leopard

Observer names		Date		Survey Block Number	

Summary of snow leopard sign observed in this survey block

Column 1 Search site number	Column 2 Type and amount of sign	Column 3 Search effort (km^2 and time)	Column 4 Dominant landscape
This is the number of the search SITE within the survey BLOCK. You should be given this number before you set out. If not, ask. Fill in one sheet for each search site.	A simple list for each discrete sign. Take GPS reading for each sign and note approximate age (new or old) into your notebook. On completing the search, total the number of each type of sign and enter below. If no sign is found enter 0 below. Sign types: PUG = pugmark (track). SC = scrape. FE = scat or feces. UR = urination. RC = rock scent spray. Age of sign: OLD = old or very old sign (> 1 month). FRE = fresh or very fresh sign (1 day to 1 month).	Note the approximate size of the area searched and the time it took to do this. Remember to note down your search start and end time!	Note the dominant landscape at each search site. PLA = plain. GROL = gently rolling (low hills and valleys without distinct ridgelines). SROL = steeply rolling (steep or very steep slopes of more than 30 m). BTER = broken terrain (land surface broken by irregular slopes, cliffs, rocky outcrops, gullies). WVAL = wide valley (wide, level floor more than 1 km wide). NVAL = narrow valley (steep sides with floor less than 1 km wide). GORG = gorge (extremely steep-sided and deep valley with cliffs and bluffs along its edges). OTH = other (describe).
	PUG		
	SC		
	FE		
	UR		
	RC		

Threats to snow leopard

Comments

SLIMS form 1: snow leopard presence/absence survey: prey species

Information on prey species is obtained in two ways: Interviews with locals and noting all species observed or their sign. Because animals may be disturbed while searching for snow leopard sign, a separate morning or afternoon should be devoted to searching for prey animals. If at all possible the same groups should search for snow leopard sign *within the same search site* and then for prey species and use this one form to record results for both searches. From prominent ridges or hill tops, but well-hidden from view, scope the area with binoculars. When using the same search site, be aware that prey species use less rugged terrain such as a wide valley or gently rolling hill slopes.

Observer names		Date		Survey Block Number	

Summary of prey species and their sign observed in this survey block			
Column 1 Prey species	Column 2 Type and amount of sign	Column 3 Relative abundance	Column 4 Threats
Ibex, Argali, Red deer, Musk deer, Wild boar, Marmot, Pika, Hare, Rabbits, Game birds (including Altai snowcock).	Kind of evidence and amount. Kinds of evidence are INT = interview (describe). OBS = observation by researchers (describe numbers, behaviour etc.). SIG = sign (describe what kind of sign and deductions made from sign).	Record, for example, the number of herds seen at the search site or the number of days a particular species or sign was seen. Also note your observations and opinion on whether the prey species populations are low, average or high and give reasons.	Is there evidence of poaching? If so, how widespread is it, who is involved and where are products sold? Also record information on livestock that may be competing with prey species. If possible, interview locals to learn how much predation there is on prey species and livestock (but exercise caution when asking questions and interpreting responses).
Comments			

Appendix 2: Bird species recorded by Biosphere Expeditions in the Altai (2011).

English name	Scientific name	Русское название	Nature conservation status in the Red Data Book of the Altai Republic. Природоохранный статус в Красной книге Республики Алтай
Alpine accentor	*Prunella collaris*	альпийская завирушка	
Altai accentor	*Prunella himalayana*	гималайская завирушка	
Altai snowcock	*Tetraogallus altaicus*	алтайский улар	III
Barn swallow	*Hirundo rustica*	деревенская ласточка	
Bearded vulture	*Gypaetus barbatus*	бородач	I
Black redstart	*Phoenicurus ochruros*	горихвостка-чернушка	
Black stork	*Ciconia nigra*	черный аист	II
Black woodpecker	*Dryocopus martius*	желна	
Black bellied sand grouse	*Pterocles orientalis*	чернобрюхий рябок	
Black-billed magpie	*Pica pica*	сорока	
Black-eared kite	*Milvus lineatus*	черный коршун	
Black-headed gull	*Larus ridibundus*	озерная чайка	
Black-tailed godwit	*Limosa limosa*	большой веретенник	III
Black-throated accentor	*Prunella atrogularis*	черногорлая завирушка	
Blue rock thrush	*Monticola solitarius*	синий каменный дрозд	
Bluethroat	*Luscinia svecica*	варакушка	
Brant's mountain finch	*Leucosticte brandti*	жемчужный вьюрок	III
Brown accentor	*Prunella fulvescens*	бледная завирушка	
Carrion crow	*Corvus corone*	черная ворона	
Chiffchaff	*Phylloscopus collybita*	пеночка-теньковка	
Cinereous vulture	*Aegypius monachus*	черный гриф	I
Citrine wagtail	*Motacilla citreola*	желтоголовая трясогузка	
Coal tit	*Parus ater*	московка	
Common buzzard	*Buteo buteo*	обыкновенный канюк	
Common cuckoo	*Cuculus canorus*	кукушка	
Common goldeneye	*Bucephala clangula*	гоголь	
Common kestrel	*Falco tinnunculus*	обыкновення пустельга	
Common redshank	*Tringa totanus*	травник	
Common redstart	*Phoenicurus phoenicurus*	обыкновенная горихвостка	
Common rosefinch	*Carpodacus erythrinus*	обыкновенная чечевица	
Common sandpiper	*Actitis hypoleucos*	перевозчик	
Common snipe	*Gallinago gallinago*	обыкновенный бекас	
Common stonechat	*Saxicola torquata*	черноголовый чекан	
Common teal	*Anas crecca*	чирок-свистунок	
Common tern	*Sterna hirundo*	обыкновенная крачка	
Coot	*Fulica atra*	лысуха	
Crag martin	*Ptyonoprogne rupestris*	скалистая ласточка	
Dark-throated thrush	*Turdus ruficollis*	темнозобый дрозд	
Daurian jackdaw	*Corvus dauuricus*	даурская галка	
Demoiselle crane	*Anthropoides virgo*	красавка	III
Desert wheatear	*Oenanthe deserti*	пустынная каменка	
Dipper	*Cinclus cinclus*	оляпка	
Eurasian dotterel	*Charadrius morinellus*	хрустан	

English name	Scientific name	Русское название	Nature conservation status in the Red Data Book of the Altai Republic. Природоохранный статус в Красной книге Республики Алтай
Eurasian jackdaw	*Corvus monedula*	обыкновенная галка	
Eurasian nuthatch	*Sitta europaea*	обыкновенный поползень	
Eurasian skylark	*Alauda arvensis*	полевой жаворонок	
Eurasian sparrowhawk	*Accipiter nisus*	перепелятник	
Eurasian wryneck	*Jynx torquilla*	вертишейка	
Fork-tailed swift	*Apus pacificus*	белопоясный стриж	
Golden eagle	*Aquila chrysaetos*	беркут	II
Great cormorant	*Phalacrocorax carbo*	большой баклан	II
Great tit	*Parus major*	большая синица	
Greater sand plover	*Charadrius leschenaultii*	большеклювый зуёк	II
Greenish warbler	*Phylloscopus trochiloides*	зеленая пеночка	
Grey heron	*Ardea cinerea*	серая цапля	III
Grey wagtail	*Motacilla cinerea*	горная трясогузка	
Grey-necked bunting	*Emberiza buchanani*	скальная овсянка	III
Guldenstadt's redstart	*Phoenicurus erythrogaster*	краснобрюхая горихвостка	
Hill pigeon	*Columba rupestris*	скальный голубь	
Himalayan vulture	*Gyps himalayensis*	кумай	
Hodgson's bushchat	*Saxicola insignis*	большой чекан	
Hoopoe	*Upupa epops*	удод	
Horned skylark	*Eremophila alpestris*	рогатый жаворонок	
House martin	*Delichon urbicum*	городская ласточка	
House sparrow	*Passer domesticus*	домовый воробей	
Imperial eagle	*Aquila heliaca*	могильник	II
Isabelline wheatear	*Oenanthe isabellina*	каменка-плясунья	
Lapwing	*Vanellus vanellus*	чибис	
Lesser whitethroat	*Sylvia curruca*	славка-завирушка	
Little ringed plover	*Charadrius dubius*	малый зуек	
Long-eared owl	*Asio otus*	ушастая сова	
Long-legged buzzard	*Buteo rufinus*	курганник	
Long-tailed tit	*Aegithalos caudatus*	длиннохвостая синица	
Marsh tit	*Parus palustris*	черноголовая гаичка	
Merlin	*Falco columbarius*	дербник	
Mistle thrush	*Turdus viscivorus*	деряба	
Northern wheatear	*Oenanthe oenanthe*	обыкновенная каменка	
Orange-flanked bush robin	*Luscinia cyanurus*	синехвостка	
Pied wheatear	*Oenanthe pleschanka*	каменка-плешанка	
Plain mountain finch	*Leucosticte nemoricola*	гималайский вьюрок	
Pochard	*Aythya ferina*	красноголовый нырок	
Red-backed shrike	*Lanius collurio*	обыкновенный жулан	
Red-billed chough	*Pyrrhocorax pyrrhocorax*	клушица	
Rock ptarmigan	*Lagopus mutus*	тундряная куропатка	
Rock sparrow	*Petronia petronia*	каменный воробей	
Rosy starling	*Sturnus roseus*	розовый скворец	III
Ruddy shelduck	*Tadorna ferruginea*	огарь	
Rufous-backed redstart	*Phoenicurus erythronotus*	красноспинная горихвостка	

English name	Scientific name	Русское название	Nature conservation status in the Red Data Book of the Altai Republic. Природоохранный статус в Красной книге Республики Алтай
Rufous-tailed rock thrush	*Monticola saxatilis*	пестрый каменный дрозд	
Rufous-tailed shrike	*Lanius isabellinus*	буланый сорокопут	
Saker falcon	*Falco cherrug*	балобан	III
Sand martin	*Riparia riparia*	береговушка	
Spotted nutcracker	*Nucifraga caryocatactes*	кедровка	
Steppe eagle	*Aquila nipalensis*	восточный степной орел	III
Tawny pipit	*Anthus campestris*	полевой конек	
Temminck's stint	*Calidris temminckii*	белохвостый песочник	
Three-toed woodpecker	*Picoides tridactylus*	трёхпалый дятел	
Tree pipit	*Anthus hodgsoni*	пятнистый конёк	
Tree sparrow	*Passer montanus*	полевой воробей	
Tufted duck	*Aythya fuligula*	хохлатая чернеть	
Twite	*Acanthis flavirostris*	горная чечетка	
Upland buzzard	*Buteo hemilasius*	мохноногий курганник	III
White (pied) wagtail	*Motacilla alba*	белая трясогузка	
White-winged snowfinch	*Montifringilla nivalis*	снежный вьюрок	
Whooper swan	*Cygnus cygnus*	лебедь кликун	III
Willow tit	*Parus montanus*	буроголовая гаичка	
Yellow-billed chough	*Pyrrhocorax graculus*	альпийская галка	

Appendix 3: Mammal species recorded by Biosphere Expeditions in the Altai (2011).

English name	Scientific name	Русское название	Nature conservation status in the Red Data Book of the Altai Republic. Природоохранный статус в Красной книге Республики Алтай
Arctic ground squirrel	*Citellus undulatus*	длиннохвостый суслик	
Arctic or Mountain hare	*Lepus timidus*	заяц-беляк	
Argali sheep	*Ovis ammon*	горный баран, аргали	I
Brown bear	*Ursus arctos*	бурый медведь	
Daurian pika	*Ochotona daurica*	даурская пищуха	
Elk	*Alces alces*	лось	
Flat-headed vole	*Alticola strelzowi*	плоскочерепная полевка	
Grey or Altai marmot	*Marmota baibacina*	алтайский, сурок	
Manul	*Otocolobus manul*	манул	II
Maral deer	*Cervus elaphus*	марал	
Mountain or Altai weasel	*Mustela altaica*	солонгой	
Northern pika	*Ochotona alpina*	алтайская пищуха	
Red fox	*Vulpes vulpes*	обыкновенная лисица	
Roe deer	*Capreolus capreolus*	косуля	
Siberian chipmunk	*Eutamias sibiricus*	бурундук	
Siberian ibex	*Capra sibirica*	сибирский горный козел	
Siberian musk deer	*Moschus moschiferus*	кабарга	
Snow leopard	*Uncia uncia*	снежный барс	I
Stoat	*Mustela erminea*	горностай	
Wild boar	*Sus scrofa*	дикий кабан	
Wolf	*Canis lupus*	волк	
Wolverine	*Gulo gulo*	росомаха	

Appendix 4: Interview datasheet.

DATASHEET: RECORDING INTERVIEWS

ALTAI

You will be visiting local people to find out about their attitudes to and sightings of snow leopards and other wildlife. These interviews will be conducted in Russian and translated to you as they happen. It is your job to make sure that all topics on this sheet are covered and all questions asked as far as possible.

However, interviews will be conducted in a very informal, "chatty" way as formal interviews with datasheets tend to result in inaccurate information. This is because as soon as an interviewee sees a formal datasheet and is asked questions in a very rigid way, he or she is likely to become tense and will attempt to second-guess what answers the interviewer would like to hear, rather than give his or her true opinion. This effect can be avoided by having a very informal chat which nevertheless covers all the topics.

Guidelines

1. Be relaxed, friendly, chatty.
2. Take pictures only after asking for permission and then only a few.
3. Keep the datasheet out of sight as much as possible.
4. You can glance at the datasheet or record the questions in your notebook beforehand to make sure they are all covered. If necessary, prompt the interviewer to make sure this is done.
5. Immediately after the interview and out of sight of the interviewee, discuss the datasheet and record the answers, using your judgment.
6. Discuss the datasheet in the evening with scientific staff as part of the filling in datasheet activity and make changes as necessary.

INTERVIEW CONDUCTED BY: **DATE OF INTERVIEW:**

PERSONAL INFORMATION ABOUT THE INTERVIEWEE

Sex:

Age:

Place of residence (name of community):

Place of birth (region):

Occupation:

If you are a livestock owner/raiser, what kind of animals do you have?

Sheep Goats Cows Horses Other

INFORMATION ABOUT SNOW LEOPARDS AND OTHER WILDLIFE

Which of the following statements best describes your feeling towards snow leopards?

Strongly dislike Dislike Indifferent
Like Strongly like

The presence of snow leopards for you is

A good thing
A bad thing
You are indifferent

Have you ever seen a snow leopard?

No
Yes, when _____ and where _____

How many snow leopards do you think live in the region?

_____ number

Are snow leopards protected in Russia?

Yes
No
Don't know

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
snow leopards have a considerable impact on large game (argali, ibex, etc.)	1	2	3	4	5
snow leopards have a considerable impact on small game (marmots, susliks, etc.)	1	2	3	4	5
snow leopards reduce populations of argali and ibex to unacceptable levels.	1	2	3	4	5
snow leopard attacks on humans are more frequent in regions where snow leopards live in close proximity to humans.	1	2	3	4	5
In regions where snow leopards live in close proximity to livestock, they feed primarily on domestic animals.	1	2	3	4	5
We already have enough snow leopards in the region.	1	2	3	4	5

If snow leopards attracted more tourists to the region, this would be

A good thing
A bad thing
You are indifferent

Comments (record any other useful/interesting information here)

Appendix 5: Expedition leader diary

15 June

Welcome everyone to the 2011 Biosphere Expedition to The Golden Mountains of Altai where we will be searching for the Mountain Ghost - The Snow Leopard. I am Andrew Stronach, the expedition leader, and this is my first diary entry.

Well, I'm sitting in Moscow airport, waiting for my flight to Novosibirsk and I'm now travelling considerably lighter than planned as my big bag full of all sort of goodies didn't arrive. I've got all the essentials with me in my hand baggage though: toothbrush, driving licence, binoculars, camera, waterproofs, fleece, woolly hat and sunscreen, so all should be well.

I'm really looking forward to getting back to the mountains and I can't wait to show you all the fantastic Altai and its many wonders. It will be great to meet you all in Novosibirsk (and hopefully being re-united with my bag!).

Andy

P.S. My mobile phone number is +7 923 154 1130. Remember that this is for emergency purposes only (such as being late for assembly) and that for most of the time I will be out of range as there is no network at base.

19 June

Everyone in slot 1 has arrived safely and is ready to go. Four brand new shiny Land Rovers sitting outside the hotel, full of diesel and ready to go. Breakfast at 7 tomorrow morning, then off we go, at last, to the Golden Mountains of Altai. I wonder what adventures await us?

23 June

We have all made it to base camp safely and everything is looking great. We have finished all the training, everyone is driving well, through mud, up and down hills and through rivers; ready for action now! There is a little snow on the mountain tops, the trees are green and the flowers are just starting to bloom; looks like it's going to be a great summer.

28 June

Our first day of fieldwork got off to a great start. With Chris and Bertrand driving our Land Rovers and making a great job of the very muddy conditions, we went to the top of Kara Gyem pass. It started off cold and wet, but then turned snowy. Well, after only about an hour of surveying, we found a very clear trail of guess what - snow leopard! The trail was around 10 days old and there were perhaps 40 individual tracks in the mud, mostly very clear. Not content with this, our intrepid team then found a second snow leopard trail in the snow, and fresher, much fresher, probably made the night before we arrived; fantastic! Lunch amongst an amazing display of flowers and then watching two groups of Siberian ibex rounded off the day.

Doesn't get any better than that!

On the second day, we went high along a ridge from Kara Gyem pass towards stunning mountains and glaciers. On the way, the wild flowers were spectacular; probably the best I've ever seen, anywhere; huge swathes of hillside were a riot of colours: orange, yellow, and blues. On the way back we found the trail of two wolverine in the snow, another fantastic find of a very rare animal.

During the last three days, we moved to a temporary camp near the Mongolian border with fantastic views across the border to spectacular mountains. Lots of birds on the way, loads of sign of Siberian ibex on the mountain where we ascended to 3350 m and lots of rain and hail on the way back. Heading for base camp and a big feed now :-)

2 July

Slot 1 team headed off to Novosibirsk yesterday. Chris and Bertrand had spent the second-to-last last night out alone high on a mountain and were rewarded with a great display of stars in the inky black night sky. In the morning they saw a big group of over 20 Siberian Ibex, some butting heads, a rare and dramatic sight. Later, Peter and I joined them and headed up another mountain with fantastic views along a superb alpine valley, massive hanging glaciers to the south and Mount Belucha, Altai's highest peak, to the western horizon, cloaked in white. Sam, Sayan and Volodya meanwhile surveyed a nearby valley. Whilst they didn't see much in the way of animals, the flowers were outstanding. Lines of bright yellow buttercup family flowers marked wet areas and purple showed where the ground was drier, whilst in between were huge swathes of orange globe flowers.

Our trusty Land Rovers did a great job of getting us home, through some long stretches of mud, and as it was our last night, we decided to eat out. After driving up the valley for about a mile, we got to a yurt where a very friendly family had cooked a sheep for us (vegetarians catered for by Nina!). We had liver, meat, salad, ayran, tea, broth and of course, Swiss roll. The evening's entertainment included: dancing; trying to avoid being set up for marriage; and watching a pair of White Wagtails flying in and out of a hole in the roof, bringing food to their brood of chicks in a nest in the corner. That was a very special evening.

Well, team one will take a lot of beating, lets see what you've got team two! Volodya will meet you in Hotel Sibir Sunday evening at 19:00 and then depart for base camp at 07:30 Monday morning. I look forward to meeting you all.

16 July

Team two have all just arrived back safely in Novosibirsk at the end of a successful second slot where we surveyed many new areas.

During her time here, Verena certainly opened up a whole new dimension to the expedition with her expert knowledge of water insects; fascinating. Margit gave Oleg, our mountain guide, a good run for his money one day, running some kilometres back to camp after a long survey walk in the mountains - fit as a fiddle! Cassie has been spotting all sorts of birds which has boosted our records and Katryn has been a demon behind the wheel of the Land Rovers, making easy work of some challenging off road driving - excellent.

Weather during slot 2 has been amazing, blue skies, hot and sunny most days, so that the ice which was filling the Taldura river valley near base camp has almost all melted now. One day, Cassie and I drove all the way up to the end of that spectacular valley, where many massive glaciers feed the river that rises and falls in height dramatically throughout the day with changes in temperature and hence melting of the ice; this was a reconnaissance trip, so maybe we'll go there with team three to survey the high ridges and valleys around the glaciers; it looks fantastic. :-)

So, Team 3, I will be in the reception area of Hotel Sibir at 19:00 on Sunday evening to brief you on the trip to base camp and then we can all go for dinner together if you would like. On Monday morning, we will leave for base camp at 07:30; it's going to be great. At base camp, the big swathe of bluish purple Acanites are starting to open their flowers, so should be quite a welcome for us when we get there.

19 July

What a lovely morning we woke up to. Sun already high up and pleasantly warm. With a big day ahead, we wasted no time and started polishing the camp before the team's arrival. Oleg made the last bench for the mess tent and Volodya made us another of his heavy duty egg/meat omelettes. I was really starting to look forward to Nina's return and her healthy porridge. We then left Dzelo shortly after 15:00 and met the team in Kosh Agash, some two hours later. I think they were quite relieved, after spending nearly two days crammed into two Land Rovers, after Anja and Ilja's Suzuki broke down in Gorno Altaisk.

Nina, Ania and Lisa drove back with me, while Debbie and Albert skilfully negotiated the first sections of dirty, dust roads leading into Beltir and beyond. We didn't make it to the camp until 20:30 and Volodya was already waiting with his signature meal, Ukrainian bortsch. Nina was very pleased with her new 'cow-proof' kitchen and almost immediately started ordering us around. Nice to have her back. The team enjoyed their first dinner and their first starry night by the fire. With Andy in retirement, it was also my first night as a new expedition leader.

20 July

Earthquake! Quite an experience to wake up to a slight earth tremor. All tents shook and even ever-cool Nina jumped out of the kitchen, when her pots came off the bench. After breakfast I went through important health and safety procedures and Andy was nice enough to do the Land Rover training. Everyone then learnt how to use the GPS, compass, had their first look through the spotting scope and fired the flare gun - always the most favourite part of the training. Later in the afternoon Volodya took us through the scientific part of the expedition, how we will be collecting data, how will we recognise one scat from another and what it is all going to be used for. Ilja and Anja from the Siberian Ecological Centre then told us about their research into Pallas's cats and their raptor monitoring techniques.

21 July

Rain, rain, rain. The plan to split into three groups and explore the surrounding valleys was over the very moment we opened our tents. Dark sky, heavy clouds and heavy rain. Yet it was clear no one was interested in staying at the camp. With rain easing and Nina's cheerful predictions, we jumped into the Land Rovers and headed over to the waterfall. Andy's various attempts to cross the river failed and he had no choice but to abandon the climb to the falls and head straight up to Karagem pass. Lisa, Kim, Ben, Paul, Mary Lynn and our two Russian scientists Anja and Ilja and I stayed in the valley and went to the glacier. After two hours of rather pleasant strolling, we came across a river too deep to cross and, hampered by rain, we decided to turn around. To cheer us up, eagle-eyed Ania spotted a herd of four ibex, all males, directly above. They were staring right at us, all carrying impressive sets of curvy horns. We made it back to camp in a cheerful mood, finding the rest of the team just about to head out with Volodya for a river walk. They made it up to Karagem, but found only clouds and had to turn around. Volodya's team got back later on and even with such bad weather throughout the day, we all managed to record nearly 30 bird species, including steppe and golden eagle.

22 July

With three cars loaded to the roof, we set off early in the morning, heading yet again to the infamous Karagem valley. Morning drizzle made the track very slippery and we were all sliding from side to side, struggling to keep the cars straight and on the road. The intended journey to the glacier was off due to high water. Luckily, we found a great spot for the camp and soon everyone headed out for an afternoon walk. Andy took Debbie, Albert and Ben to the forest; Volodya headed along the main road, with Paul, Mary and Mila.

The first mini survey proved to be quite a success, with 19 recorded bird species, one almost complete bear scull, found by Andy, and wolf droppings, full of bone fragments and hair. What a great start to our Karagem adventure!

23 July

We couldn't have wished for a better start to the day - sunny, with no clouds, at least for the moment. Andy immediately organised his first bivi adventure this year, taking along Debbie, Kim, Lisa and Ben. Their aim was to climb up above the valley, close to the base and stay up the night, high in the saddle, armed with spotting scopes and dreams of ibex. Volodya and the rest of the team headed up into to the valley. Going proved to be difficult from the very start and we had to slow down significantly. Yet, we still managed to find plenty of fresh signs around, particularly those of elk, maral and musk deer. Birds were plentiful and our list was filling up fast. Back at the car later with Mila, we spotted two maral deer directly above us, both carrying enormous antlers. Their presence on the ridge was constant and we could even see them from the camp later on.

Volodya did make it as far as the treeline. It was a great day of surveying with some good results. Andy meanwhile made it to the top of the saddle late in the evening and we watched from the camp with our telescope as they were settling down for the night. Shame they missed out on the bottle of beer Jana pulled out of nowhere, which we all shared. Well done Paul, Mary Lynn, Gunter and Albert, you deserved it!

24 July

No rest for us on Sunday. Cheered up by the morning sun, we left the camp early and crossed the river, hoping to explore the other side of the valley. Volodya went up to the road with Mila, Paul and Mary Lynn, while Albert, I and the ever intrepid Gunter. At 70, hats off! But yet again, it was the weather which got the better of us and halted our ambitious plans. Heavy rain and dark clouds looked set for the day and we had no choice but to turn back. Andy was having better luck with ibex. From what we could hear from their radios, there seemed to be plenty of them up on the mountain. Volodya, judging by his silence on the radio, was determined to push on and we could only hope they found a nice dry spot to hide from the rain. Andy got back late in the afternoon, with tales of ibex and maral deer. It was great to hear how much everyone enjoyed their 'night out'. A herd of 15 ibex came over the horizon on a distant hill and Mila, Albert and Gunter finally got to see their first Siberian ibex. This brought our daily ibex count to well over 40 strong. Plus six maral deer, plus last night in Karagem, there was no excuse to leave two bottles of champagne unopened. What an adventure!

25 July

The river level had gone up about a foot in the past few days, but Andy's experience expertly guided us through all the tricky driving bits and the Land Rovers sailed easily out of the valley, yet again, in record time. With a cloudless day and the sun high above us, we had no reason to rush back to the camp and lingered around Karagem valley for a bit longer. Volodya was determined to survey one of the last valleys he has not been in and Gunter, Albert, Ben and I came along. The glacier at the end of the valley was spectacular as ever and the flower display was amazing. Sadly no ibex and fresh horse droppings indicated why - poaching! The rest of the group remained either with the cars or headed with Ilja to look for raptors. After so many days without the sun, we all got decently sunburnt on this sunny day. It was also the first time, after three trips up to Karagem pass, that we had some great views from the top and not just thick clouds. But to be honest, no one was very interested in views. Showers were a much bigger draw. After four days, it was only understandable. And Oleg didn't disappoint, showers were superb and hot water plentiful. Paul's comments of how great it is being back in the Ritz were more then fitting.

26 July

Today was the day to fulfil our promise to Ania and Ilja. Before leaving for Karagem, we agreed to do two full day surveys of their favourite environment, the steppe. Andy took two cars along with both scientists, Paul, Mary Lynn, Kim, Albert and Debbie and headed off to Beltir, shortly after breakfast.

Volodya was keen to check for more marmot signs around the waterfall area and Gunter with Lisa volunteered to go along. The raptors, Ilja's main study subject, were not keen to take to the air until the sun came back up but when they did, the team was in for a treat.

Only meters away from both cars, a Saker falcon killed a squirrel and didn't seem to be awfully bothered by everyone watching while it ate it. Eagles were plentiful and the team have even managed to spot a rare and endangered black stork, right behind an old brick factory in Beltir. But the biggest highlight and first ever Biosphere sighting came a little bit later, when Kim decided to stop the cars and take a few pictures of Bactrian camels.

Ilja and Nina, being locals, wandered off in the opposite direction and while everyone was photographing camels, they nearly stepped on a Pallas's cat, hiding in a little depression. The sighting was heavily celebrated over the fire - a great opportunity to introduce the team to some local brew Nina bought in Kosh Agash.

27 July

Volodya was determined to see a Pallas's cat too and headed over to the Beltir steppe, along with Andy, Mila and Kim and both excited scientists. Albert, Debbie, Lisa, Ben and I decided to conquer the glacier above the camp. We discovered a long valley by the lake, leading to Karagem pass and couldn't help ourselves but climb to the very top, reaching an altitude of 3124 metres. The views into Taldura valley below us were spectacular, as were the distant glaciers. Our surveying found plenty of evidence of pikas in the area; we also spotted a ptarmigan and watched steppe eagles soaring around us. For dinner we all packed into a yurt belonging to one of our neighbours, where we enjoyed the local produce. Nina then welcomed us back in the camp with two bottles of champagne and homemade cake. What a great and tasty day!

28 July

Our last day in the camp was declared a semi-free day. Volodya headed with most of the team members to check out the petroglyphs, while Albert decided to climb up to the waterfall. Mila spent most of the day around the camp with her camera. Kim and Paul drove back later on and we celebrated our last night in the camp in style.

Albert enjoyed his day out and brought us back an impressive set of ibex horns. Volodya thanked everyone for their contribution they made towards his research and we went again through both mammal and bird lists, which were impressively long.

Well done team, you made quite an impact on our research here in Altai.

Thank you for all your patience and thank you for making my first leading experience such fun. Good luck everyone and a safe journey home!