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EXPEDITION REPORT

Expedition dates: 8 July – 17 August 2007
Report published: May 2008

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

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

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Matthias Hammer (editor)
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 8 July to 17 August 2007. The aim was to continue a survey of snow leopard *(Uncia uncia)* in this area, as well as surveying the snow leopard's primary prey species, argali *(Ovis ammon)* and Siberian ibex *(Capra sibirica)*, together with secondary prey species.

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 (approximately 200 square kilometers). In 2007 surveys were extended to areas away from the Tapduair massif site to the valley and surrounding ridges of Irbistu mountain. Interviews with local, semi-nomadic herders also formed an important part of the research procedure. The expedition also collected data for extended mammal, bird and plant inventories.

The decrease in numbers of the primary prey species observed recently makes it very likely that food availability is not in favour of the snow leopard in the study area. This is supported by the fact that in 2006 there were no records of snow leopard sign in the core area and in 2007 only a few were found. Nevertheless, the study area retains its importance as a habitat for snow leopard and as a corridor for snow leopard dispersal. Unfortunately, privatisation of formerly common land is on the increase as is a lack of respect traditional land management practices, so the survey area urgently needs protection, but involving the local community and raising public awareness is vital if conservation initiatives are to succeed.

Резюме

Данное исследование проводилось в рамках экспедиции в Кош-Агачском районе Республики Алтай РФ, организованной природоохранным агентством «Biosphere Expeditions» в период с 8 июля по 17 августа 2007 г. Целью работы было изучение присутствия снежного барса в данном регионе, а также 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 (приблизительно 200 кв. км). В этом году исследовали также район долины реки Ирбисту и окружающие ее горные гряды. Интервью местных скотоводов также стало важной частью исследования, что фиксировалось в разработанной для этой цели анкете.

В 2007 г. найдены лишь старые следы и экскременты, а предположительное снижение поголовья главных потенциальных жертв не способствует появлению тут снежного барса. Можно предположить, что возрастающее негативное влияние на снежного барса оказывает и беспокойство со стороны людей. 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 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
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 8 July – 17 August 2007. 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 close relative of the Marco Polo sheep) and the Siberian ibex (a relative of the Alpine Steinbock). The expedition also surveyed other animals such as marmots, birds and other small mammals. The area is an important but unprotected corridor of snow leopard movement between Mongolia and Russia and next to nothing is known about these movements and snow leopard numbers. Data collected by this expedition will be 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 predator). It is, however, also one of the poorest regions of the former Soviet Union whose collapse has increased pressures on exploitation of natural resources and deprived local scientists of precious funds for biodiversity conservation.

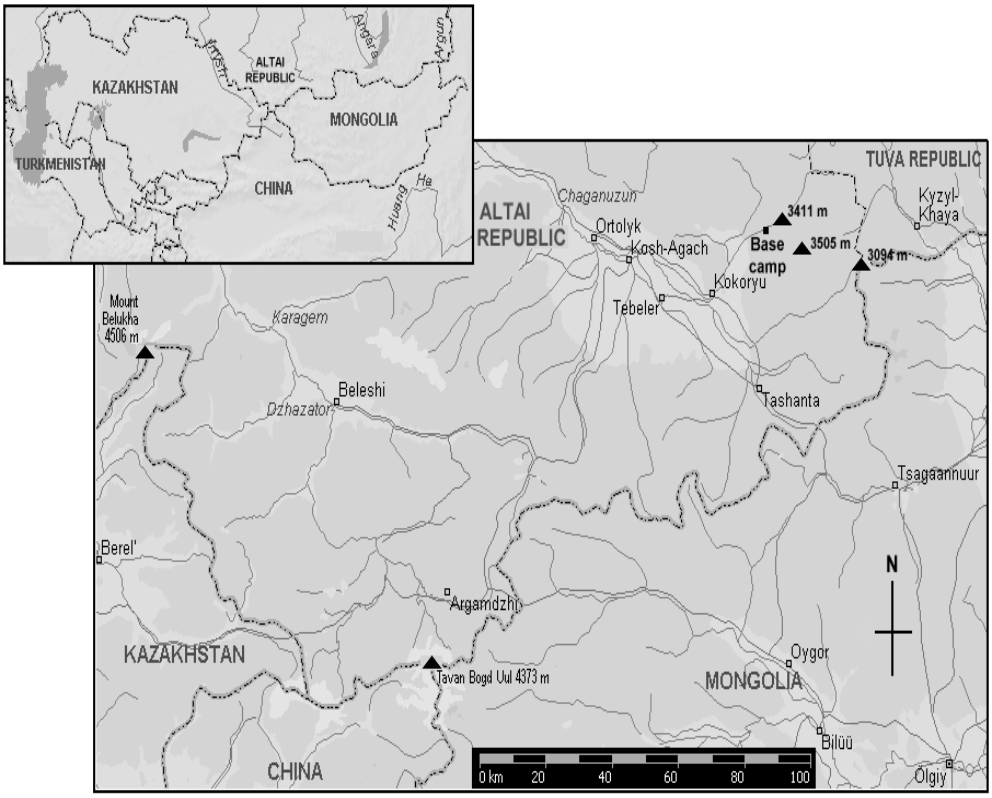
Little is known about the status and distribution of the globally endangered snow leopard in the area and its interaction with prey animals such as the argali and Altai ibex, and its reliance on smaller prey such as marmots, ground squirrels and game birds. Biosphere Expeditions will provide vital data 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.

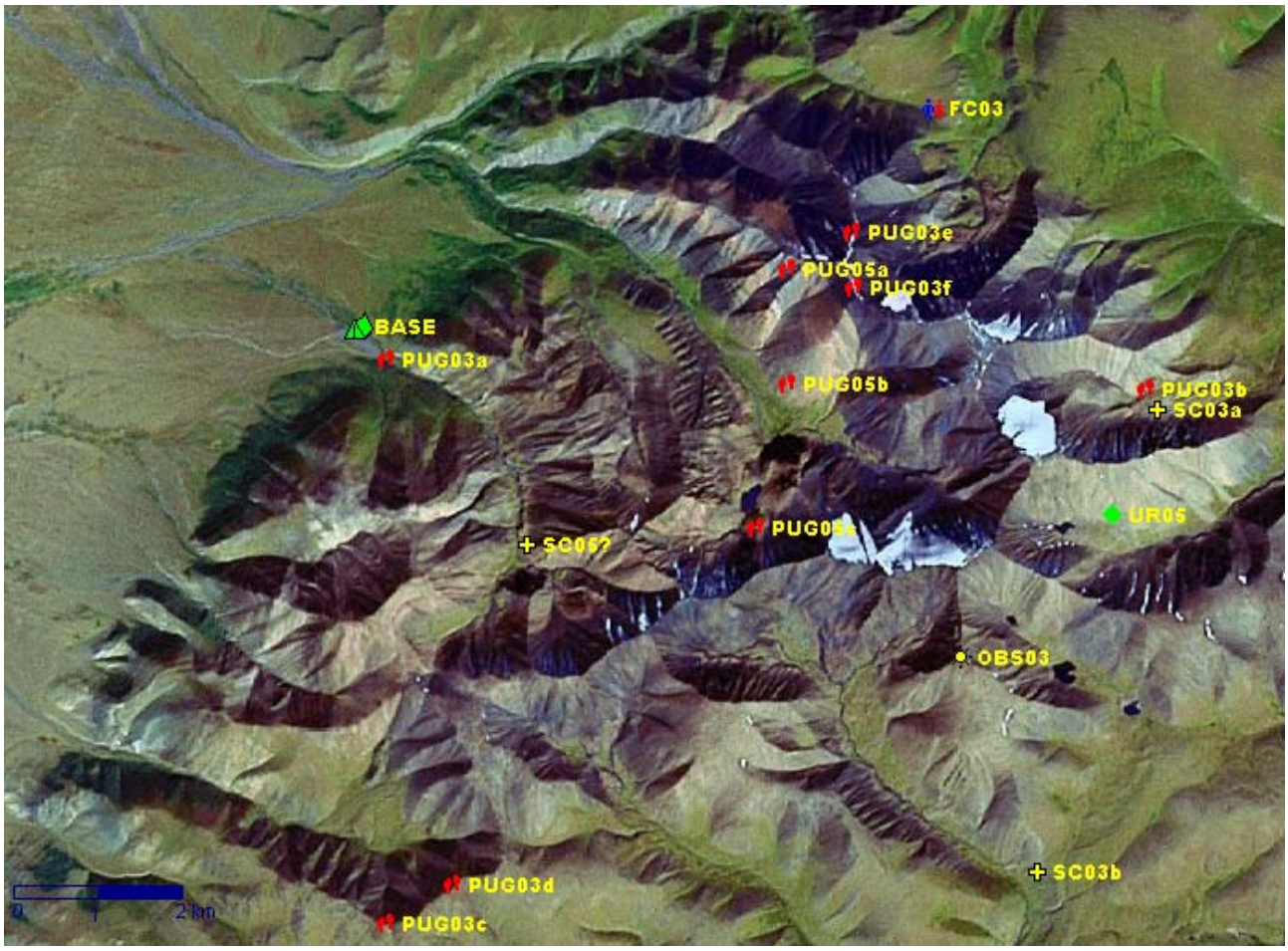
An overview of Biosphere Expeditions' research sites, assembly points, base camp and office locations is at Google Maps.

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 spaces of open steppe framed by snow covered peaks. Belukha, the region's highest mountain at 4506 m, rises just west of the research area and other mountain peaks, such as Tapduair (3505 m) and Sajlugem (3411 m), overshadow base camp.



Map showing the Altai region and location of base camp.

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 at the foot of Tapduair mountain and overlooking an area of open steppe.



Satellite map of the research area showing base camp and some sites of interest (PUG = snow leopard track found, SC = scratch mark, UR = urine mark, OBS = observation, FC = forward research camp. Numbers indicate years). Note that data points shown here are only up to 2005. Data points found in 2006 are further northwest of base camp.

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 just about 200,000 people, 53,000 of whom live in the main city of Gorno-Altajsk. 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 its 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

8 - 20 July
22 July - 3 August
5 - 17 August

1.4. Local Conditions & Support

Expedition base

The expedition team was based in a mountain tent camp of single and double dome, mess and kitchen as well as shower and toilet tents at approximately 2200 m altitude and 60 km from the nearest human habitation. All meals were prepared by the expedition cook.

Field communications

There was no mobile or landline telephone connection at base. Instead the expedition used an Iridium Motorola satellite telephone with internet connection. This worked fairly well and e-mail contact was available intermittently. Courtesy of Motorola and their local Novosibirsk dealer, Neman, four Motorola GP320 hand-held and three GM340 mobile radios were available for communication. These worked well and, when within range, the expedition research teams could communicate with each other reliably and easily at the press of a button.

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, and their local dealers Avtoland of Novosibirsk and Ekaterinburg, the expedition had the use of two Land Rover Defender and two Land Rover Discovery vehicles.

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.

There was one serious medical incident. Whilst surveying at around 3000 m on Tapduair, one team member feinted, collapsing to the ground. It is not clear what the cause of the collapse was, but dehydration or hypoglycaemia are likely and exertion during the day and throughout the expedition would have probably contributed. Base camp was informed of the incident and a Land Rover was dispatched to pick up the casualty at the base of the mountain, where the casualty was evacuated to by other members of the survey team. The casualty was given sweets, food and water and rapidly evacuated from the mountain to base camp, where a full recovery was made within 24 hours.

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 Leader

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.

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):

8 - 20 July

Julianne Adams (UK), Iain Buchanan (UK), Roger Bunce (UK), Robin Burns (Australia), Malika Fettak (Germany), Silvan Griffith (Germany), Stefan Lechner (Germany), Ute Poppenheger (Germany), David Smith (UK), Jennifer Tondu (USA), Marianne Watts (The Netherlands). Also Biosphere Expeditions Managing Director Matthias Hammer (Germany).

22 July – 3 August

James Cruickshank (Germany), Alan Franklin (UK), Guido Freis (Germany), Martin Haslam (UK), Gerald Keating (UK), Christine Newell (UK), Peter Pilbeam (UK).

5 – 17 August

Jean-Philipe Gaillard (France), Karen Hatch (UK), Katharine Muenzel (Germany), Christine Newell (UK), Kevin Restell (UK).

Throughout the expedition

Timofei Klimov (translator and all round fixer), Roman Rolin (mountain guide and camp helper), Nina Taranova (cook and our Russian mother who looked after us so well with wonderful food), replaced at the end of the expedition by Lisa, Ilya Dolgov (camp helper, wood chopper and starter of fires), replaced at the end of the expedition by Ivan.

1.8. Expedition Budget

Each team member paid towards expedition costs a contribution of £1290 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, 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	34,141
Expenditure	
Base camp and food includes all meals, base camp equipment	2,173
Transport includes fuel, vehicle maintenance	951
Equipment and hardware includes research materials, research gear	1,045
Biosphere Expeditions staff includes salaries, travel and expenses to Novosibirsk	3,110
Local staff includes salaries, travel and expenses, Biosphere Expedition tips, gifts	3,414
Administration includes bribes, registration fees, sundries, etc	1,483
Logistics & co-ordination Payment to Sibalp	6,626
Team recruitment Altai as estimated % of PR costs for Biosphere Expeditions	4,240
Income – Expenditure	11,099
Total percentage spent directly on project	67%

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. Thank you to Roger Bunce for comments on the draft. Biosphere Expeditions would also like to thank Land Rover, Motorola, Buff®, Cotswold Outdoor, Globetrotter Ausrüstung and Gerald Arnhold for their sponsorship.

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.

Enquires should be addressed to Biosphere Expeditions at the address given below.

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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). 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. They are still one of the least known big cats. Hardly a surprising fact when one considers their elusive nature and the remote and difficult habitats they occupy in the mountainous regions of central Asia. Their 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, which it borders onto, the Russian Federation has the second largest potential snow leopard habitat and together with Mongolia and other post-Soviet republics, it accounts for much of snow leopard habitat.

The amount of suitable snow leopard habitat in the Russian Federation totals about 131,000 sq km (Koshkarev 1994), with snow leopards being reported from the Altai and Sayan ranges bordering Mongolia. Smirnov et al. (1990) estimates 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 most 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 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) (Jackson & Hunter 1996), 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 followed SLIMS methodology.

2.2. Research Area & Timing of Survey

The area surveyed by Biosphere Expeditions is chosen for several reasons including: (1) the area was poorly surveyed for snow leopard before; previous expeditions to the area since 2003 suggest the fragility of the area for sustaining a viable snow leopard population and its temporary status as a snow leopard habitat, however, 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 to and from Mongolia; (3) the habitat is biodiverse, supporting a range of prey species and other carnivores; (4) the area lacks proper protection and is threatened by a proposed road to the Tyva Republic and a proposed gas pipeline. However, there is a potential here for establishing a protected area that would favour wildlife and accommodate local residents.

The study site around the Tapduair massif totaled approximately 200 sq km (in a square roughly between 50.10^{o} N, 89.20^{o} E and 49.85^{o} N, 89.48^{o} E) and was delineated by geographical features – rivers, in particular Buguzun and Bar-Burghazy, and mountain ranges. The site was divided into two survey blocks. As per SLIMS suggestions, the survey routes followed river valleys and landform edges wherever possible. Research was focused on the core area as it included the most important habitat for snow leopard and prey, and showed the lowest levels of human disturbance. The survey sites were accessed by Land Rover (or on foot if near base camp). All surveys were conducted on foot. Base camp (49.99^{o} N, 89.23^{o} E) was situated in a valley, at the entrance to the core area, below the mountain of Kunduyak (3399 m). It provided shelter and a fresh water source from Kunduyak stream.

In 2007 surveys were extended to areas away from the Tapduair massif site to the valley and surrounding ridges of Irbistu mountain (camping at the location of approximately 49.44^{o} N, 89.09^{o} E). One of the reasons for selecting this area was the digital modeling exercise (see below), which indicated the place as favourable for the snow leopard.

One survey was accomplished in the Kamtytyghem area (50,06^{o} N, 89.03^{o} E), a place adjacent to the Tapduair site and visited once before in 2006.

Snow leopard surveys are best undertaken when weather permits travel within the proposed survey area, when animals are most actively marking and when sign is most long-lived. These conditions rarely coincide, so trade-offs have to be made between logistical factors and biological ones. In this study, logistics and team recruitment by and large determined the survey period. On the one hand, summer is a difficult time to find snow leopard sign: marking activity is low, human disturbance is high and livestock grazing can soon obliterate sign. 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. Rain erodes sign rapidly. On the other hand, however, recruiting an expedition for a summer expedition is much more realistic, logistics are not nearly as prohibitive as 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 of sign and availability of "relic" sign (i.e. old sign that is not washed away or otherwise destroyed or removed).

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 sign 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 relative abundance surveys, there is no statistical basis for the conclusions. When snow leopard sign is absent, the analyst must rely on all other information on the datasheets 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 the 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 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 *(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 sign and by observation. Prey sign 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 sites were used for snow leopard and for prey.

Interviews

The social and economic crises of the 1990s in Russia strongly influenced the intensity and character of how the environment is used, which had a dual effect on the snow leopard. On one hand, due to a decreased number of livestock and related pressure on natural pastures, population numbers of major prey species, Siberian ibex and argali, have grown. On the other hand, due to the fact that the living standards of the locals have declined, pressure on biological resources has also increased. People who have lost their jobs have intensified their use of hunting grounds, including the introduction of poaching techniques highly dangerous for the snow leopard.

Grazing livestock in the highlands is part of traditional land use that directly affects the snow leopard, and herders, many of whom are hunters too, form part of the human population that is present in the snow leopard habitats and encounters them most often. The expedition found it instructive to interview these local people to find out about their attitudes to and sightings of snow leopards and other wildlife. These interviews were conducted in Russian and translated to the expedition team members as they happened. Their job was to make sure that all topics in a formalised questionnaire (see appendix 2) were covered and all questions were asked as far as possible. Datasheets were discussed in the evening with scientific staff as part of the activity of filling in datasheets.

Additional surveys

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

In the end an attempt is made to build a predictive model of the distribution of the snow leopard in the Altai based on ecological niche modeling 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

Snow leopard presence/absence survey

From 11 July to 15 August 29 snow leopard presence/absence surveys were carried out. The average length of one survey route was about 12 km, and an average of 7±0.5 hours was needed for making an inspection. Elevations ranged from approximately 2000 m (in the Buguzun floodplain) to 3505 m (top of the Tapduair summit). The dominant landscape surveyed in the area consisted of narrow valleys (NVAL), broken terrain (BTER), and steeply (SROL) and gently (GROL) rolling slopes met, respectively, in 29, 24, 10 and 10% of the cases; other landforms included grass plateau, ridges, rock falls, glacial lake areas, and even woodland consisting of Siberian larch and sporadic pine stands.

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

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 conclusions are fairly dubious.

In two of the surveys two sets of pugmarks likely left behind by the snow leopard were encountered; one these discoveries (two prints) was made on 13-14 July in the Irbistu area (49°46.201 N, 88°16.548 E) at the edge of a snow pack underneath a 3425 m peak, and the other (one print 73 mm wide, 85 mm long) in the Tapduair area (49°59.189 N, 89°20.999 E, 3216 m) on 9 August.

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

In one of the surveys a set of eight separate scrapes possibly belonging to the snow leopard was found in the Irbistu area in the same place where the pugmarks were recorded (see above). The scrapes were spread along a ridgeline and had an irregular placement, the approximate measurements were 25 cm long x 20 cm wide.

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 were found at all but the highest elevations and were voracious consumers of faecal, plant and other 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.

Three samples of faeces likely to be snow leopard were discovered this year, but all were considerably old and weathered, so there are doubts as to their correct identification. Two were found in the Tapduair area high up on a ridgeline between Mt. Kozhulyu and Mt. Kunduyak (the first in between expedition slots on 21 July by local staff, 49°57.843 N, 89°13.529 E, 3073 m; the second nearby on 26 July, 49°58.439 N, 89°13.578 E, 3128 m).

The third scat discovery was made in the Irbistu area (11 August, 49°43.534 N, 88°06.757 E, 3361 m).

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. One 'smelly' ibex skull was found in the Katytyghem area (13 August, 50°07.663 N, 89°00.334 E, 2948 m), but can hardly be regarded as a urine deposit of the snow leopard.

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.

There is a possibility that in one case the snow leopard was observed one kilometer from a vantage point (31 July, 49°58.099 N, 89°20.532 E, 3249 m, direction 040°N) by one of the team members, Guido Freis, who spent a night in an observation point there and was equipped with a nightscope (ZEISS VICTORY NV, magnification 2.0/125). Unfortunately, the animal was too far away to identify it beyond reasonable doubt.

Threats to snow leopard presence

During 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 12 out of the 28 snow leopard presence/absence surveys (around 43%) and are primarily confined to foothills and the valley floor. More grazing is obvious in the Irbistu area, where several herders' summer stations are in place and many dogs are kept. However, here as elsewhere most of the human impact occurs at lower altitudes.

In general, the grazing pressure in the whole area continues to remain fairly stable and is considerably reduced, according to locals, compared to the Soviet era. Many areas suitable for grazing (as, for instance, along the Tekelyu river) have been abandoned by herders, who are no longer subsidised by the government. Today these areas are considered to be 'empty', not meaning, of course, that in the near future they can once again be used by herders.

Occasional horse droppings and car tracks found at higher altitudes indicate sporadic human presence all over the area. Other signs of human presence and disturbance included tree felling, empty firearm casings, hides, remains of campfires and various bits of litter left behind. In previous years we also found trenches dug by hunters (for shooting ibex), steel leg-traps and snares.

This year it was very disappointing to find tracks of a quadbike in the fairly remote corridor area (north of the Tapduair area). This surely is a bad sign, has nothing in common with the local traditional land use and may become an additional factor of disturbance.

Short-term disturbance is created by harvesters coming in for pine cones, mushrooms, wild onions, etc.

Prey base survey

Signs of prey species in both presence/absence and relative abundance surveys were fairly abundant and widespread as far as they are usually met in a much greater variety of terrain.

In 2007 a total of 127 signs of argali were recorded. These included faeces (58 cases), footprints (12), pieces of wool (2), skulls, horns, etc. (2), resting depressions ('beds') found in 19 places (varying from 2 to 18 beds in one place). The animals themselves were spotted in places between altitudes of 2675 and 2827 m three times (each time two animals). The pool of records was made over the altitudes of 2134 and 3329 m.

A total of 123 signs of Siberian ibex were recorded. These included faeces (64), footprints (37), beds (16, varying from 6 to 17 beds in one place), skulls (2), tufts of hair (4). In four documented cases, animals were seen between altitudes of 2850 and 3216 m in numbers between 1 and 12 (average 5). The pool of records was made over the altitudes of 2134 and 3425 m.

In pooled samples average elevations for both argali and ibex records are in fact the same, 2850.6±30.4 and 2828.4±25.9 m, respectively ($t = 0.56 < 1.96$).

Signs indicating the altitudes at which the animals are met, highlight the area as a potential habitat for the snow leopard. These (pooled encounters of argali and ibex) occurred between 2134 and 3425 m (a vertical range of 1291 m, quite similar to the ranges recorded previously).

Evidence from surveys and interviews indicates that the numbers of animals using the survey area are perhaps relatively low and are 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). However, in general and intuitively, the pool of the primary prey species seems to have decreased. For instance, excluding sightings from the Irbistu area, there have been fewer direct observations of the animals: 4 for Siberian ibex against 13 in 2006 and 3 against 7 for argali.

Insofar as far as total count methods are difficult to apply in the area, a prudent option is to focus, for the current study at least, on relative abundance methods which produce indices reflecting the density of the prey species population. For example, given a standard technique, such as counting signs along a transect, it is possible to say that if area A has a higher frequency of signs than area B, then there must be more animals in area A, even if we do not know the exact numbers in either area. Similar logic is used to compare relative abundance in the same area over time.

One such approach is to analyse how fast (or rather at what rate) are we gaining our data, assuming that more animals in the area will be producing more signs. This can be assessed by plotting cumulated numbers of signs (or days when signs were recorded) against the dates from the beginning of the survey up to its end, and estimating the corresponding regression values. For this purpose dates have to be transformed into a continuous sequence of numbers (Zaitsev 1984) and days when signs were recorded considered. Regression lines and equations are summarised in Figs. 2.4a and 2.4b.

It is interesting to note that the cumulated number of day/signs versus the dates fits well into the linear regression model (*R*, the correlation coefficient, ranging between 0.98-0.99), indicating a fairly constant number of animals in the area and, perhaps, no migration of the animals into or out of the area, and mortalities too, perhaps, are very low.

Regression coefficient values for argali (*2007*: 0.373±0.014, n=25; *2006*: 0.521±0.012, n=30) indicate a possible 0.521/0.373 = 1.40 drop in the numbers of animals in 2007 compared to 2006.

Regression coefficient values for the Siberian ibex (*2007*: 0.451±0.015, n=25; *2006*: 0.614±0.008, n=30) also indicate a possible 0.614/0.451 = 1.36 drop in the numbers of animals in 2007 compared to 2006.

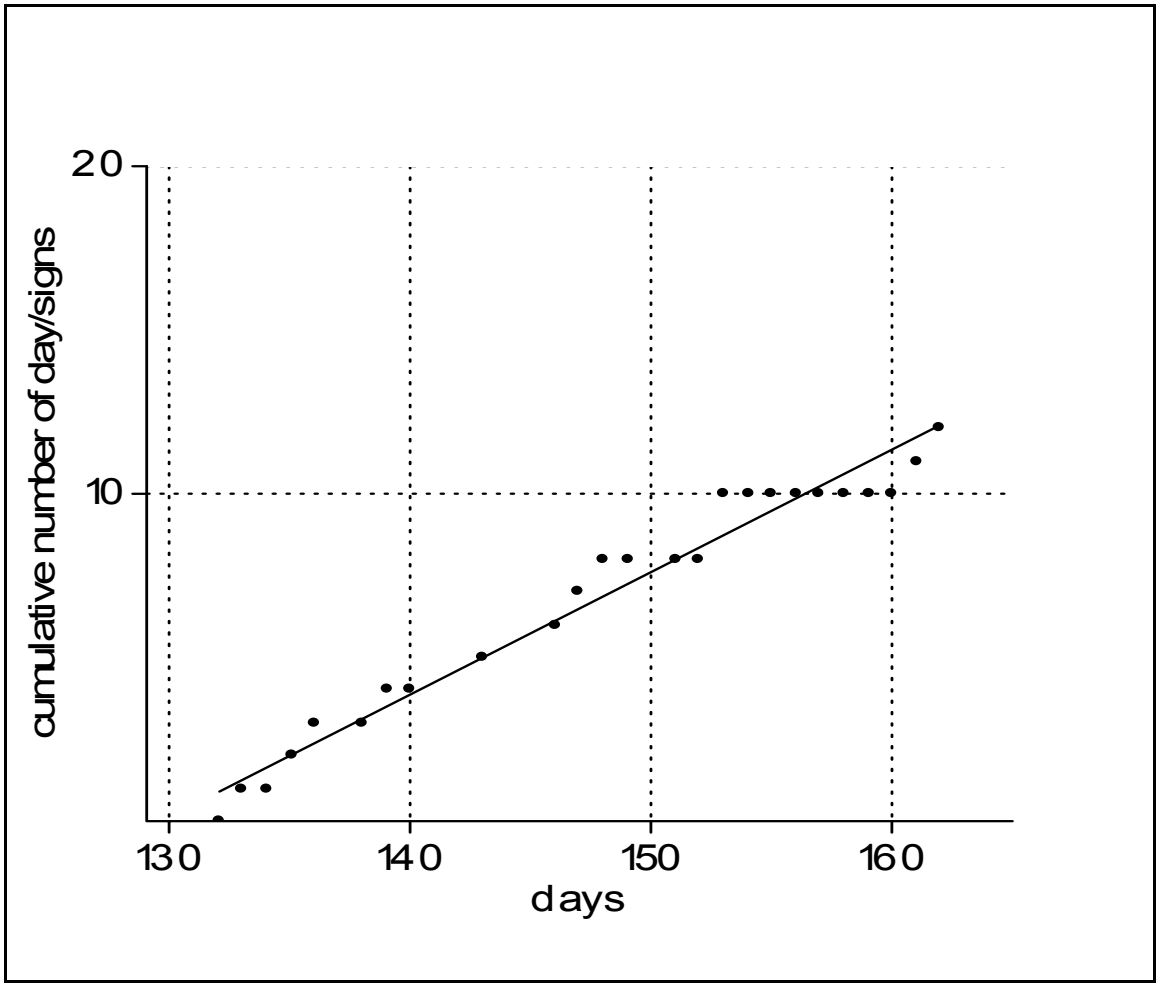

Figure 2.4a. Increase in the cumulative number of recorded day/signs for argali (2007).

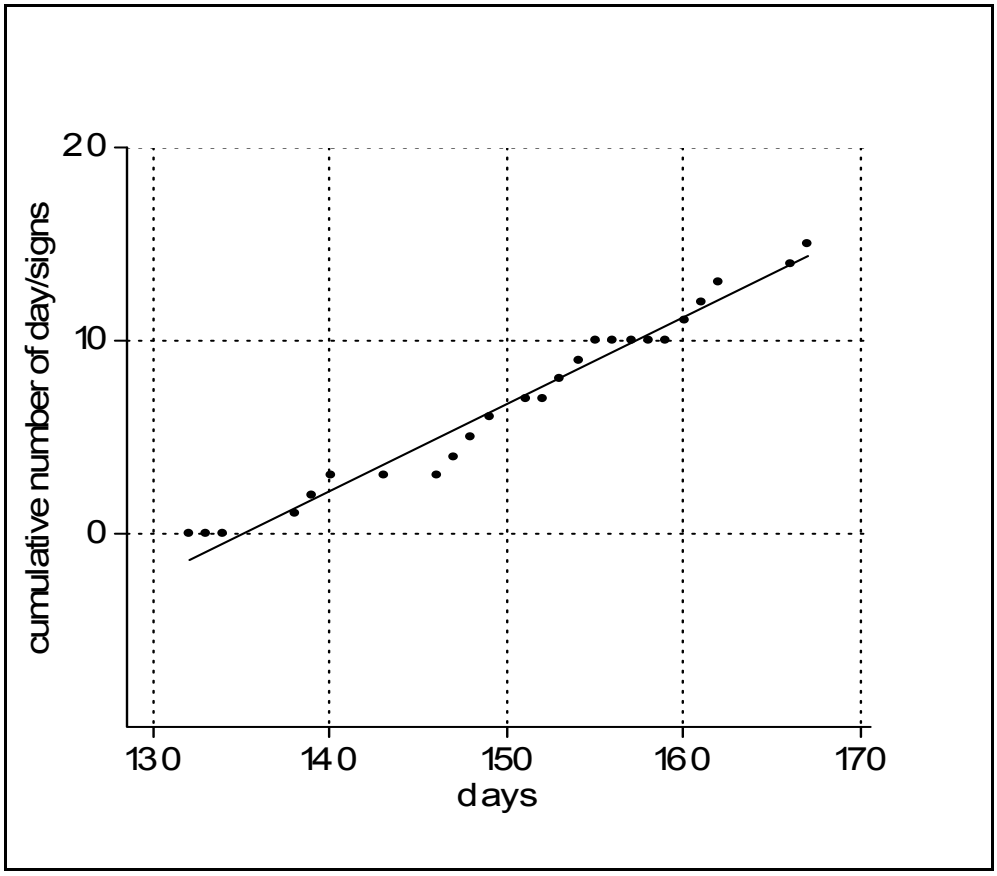

Figure 2.4b. Increase in the cumulative number of recorded day/signs for Siberian ibex (2007).

Fig. 2.4c presents the records of the potential prey species. About a third (32%) are records (signs and observations) of the primary prey species, argali and Siberian ibex. Game birds (Altai snowcock, grouse, etc.), Northern pika, mountain hare and the grey or Altai marmot together make up 59% of the records. Fewer records (grouped in the 'other' category and totaling 9%) were made of maral, roe deer, wild boar and the Arctic ground squirrel.

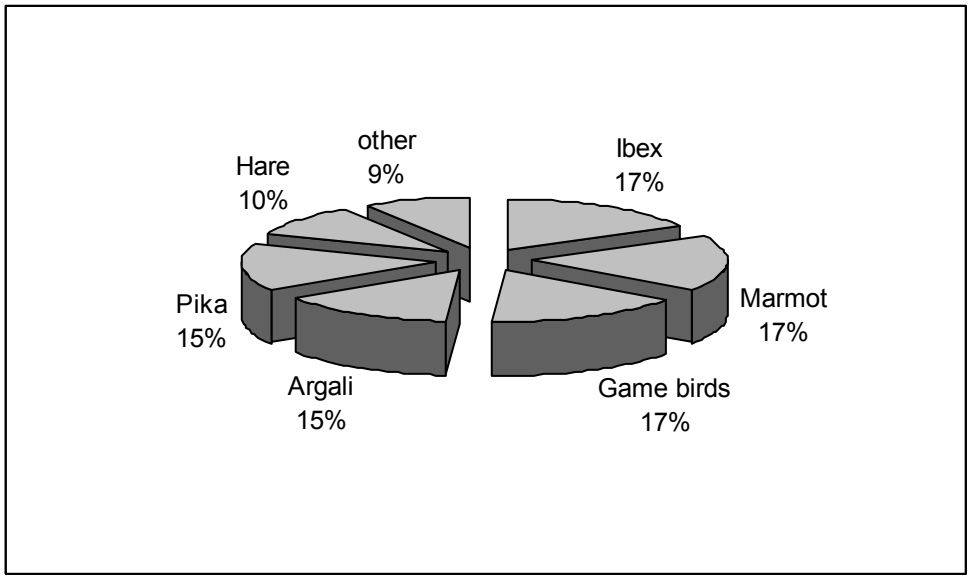

Fig. 2.4c. Potential prey species survey summary.

Interviews

Ten interviews were conducted in the field, all of men, aged between 30 and 52, local residents coming from Kosh-Agach (4), Kokorya (3) and Ortolyk (2). Six of them were full-time shepherds, two others were part-time shepherds involved in hunting and farming, one was a tourist guide, and one was a shaman. Nine of them, with the exception of the shaman, keep livestock: sheep (numbers belonging to one owner between 500 and 1000), goats (30-1200), cows (10-300), horses (1-15) and yaks (15); in fact, a portion of the livestock belongs to other people (for instance, teachers, policemen etc.) for whom the shepherds keep the animals in the field for a fee. In general, the shepherds were fairly vague (or reluctant?) in their statements about the exact number of livestock under their supervision.

The overall feeling towards the snow leopards and other wildlife was 'indifferent' in six, 'like' in two, and 'strongly like' in two cases; one of the interviewees (a full-time shepherd) in the category 'strongly like' even characterized the snow leopard as a "holy animal".

On the question about the presence of the snow leopard, thought this was a 'good thing', seven were 'indifferent', but nobody regarded this to be a 'bad thing'.

Nine out the ten interviewees have seen a snow leopard in the wild between 1993 and last winter (2006/2007). Four of the sightings were in the Irbistu area, one in the Kurai Mountains, one each nearby Mt. Chornaya, Mt. Tabajoc and in the surroundings of Arzhan-Buguzun.

The question 'how many snow leopards do you think live in the region' was a puzzle to most of the interviewees: six could not say anything and four said there are several or few. Nine displayed a neutral attitude towards the question 'we already have enough snow leopards in the region', only one person disagreed stating there could be more. Most interviewees knew that the snow leopard is protected in Russia, only one was unaware of the fact.

Responses to questions related to the impact of the snow leopard on wildlife, particularly primary and secondary prey species, attacks on humans and domestic livestock depredation were distributed as shown in Table 2.4a below.

Table 2.4a. Interview results.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
snow leopards have a considerable impact on large game (argali, ibex, etc.)	1	1	6	2	-
snow leopards have a considerable impact on small game (marmots, susliks, etc.)	1	-	8	1	-
snow leopards reduce populations of argali and ibex to unacceptable levels.	2	4	4	-	-
snow leopard attacks on humans are more frequent in regions where snow leopards live in close proximity to humans.	4	2	4	-	-
In regions where snow leopards live in close proximity to livestock, they feed primarily on domestic animals.	2	5	3	-	-
Total	**10**	**13**	**34**	**3**	**-**

Most of the interviewees consider the impact of the snow leopard on primary and secondary prey species to be neutral, however, more or less disagree with the notion that snow leopards can reduce populations of argali and ibex to unacceptable levels or that snow leopard attacks on humans are more frequent in regions where snow leopards live in close proximity to humans. In general, local residents to whom we spoke considered the snow leopard not to be a threat to humans, however, as towards any large carnivore, there was always room for some fear.

Contrary to expectation, the interviewees, most of whose welfare is so dependent on the well-being of their livestock, did not agree that in regions where snow leopards live in close proximity to livestock, they feed primarily on domestic animals. Instead, they (six mentioned this) consider an aggravating issue the number of wolves, which are inflicting losses (one shepherd said he loses 15-60 sheep to wolves annually).

One of the shepherds uses dogs trained for guarding the animals and finds this to be an effective measure against wolves. One of the elder shepherds (a hunter in his spare time too) considers poor management to be one of the reasons for the losses inflicted by wolves or any other large carnivore species and blames some of his younger counterparts for ‘laziness’ and ‘irresponsible behaviour’. The shaman has gone even further in his reasoning of the issue, saying ‘ people should live in harmony with the snow leopard … if snow leopards feed on domestic animals, people are to blame for not keeping an eye on the livestock and for not observing the rules of nature … bad people are punished in this way’.

On the question concerning the attraction of more tourists to the region because the snow leopards are there, five interviewees said this would be a ‘good thing’ and five were ‘neutral’ to the issue, but nobody was against anticipating, perhaps, a new source of income by providing local products and services to visitors from outside (in fact, one of the interviewees, the tourist guide, a former forestry warden and hunter, already runs such a business). In general, people here are not against tourists, provided they are respectful of the environment.

Unfortunately, as the nation becomes richer after the economic crisis in the 1990s, more people are coming to the region and displaying aggressive behaviour towards the use of its natural resources. Privatisation of formerly common land is on the increase as is a lack of respect for time-honoured traditions, such as, for instance, hunting rules established by consensus. A remedy to this intrusion could be the establishment of a protected area, preferably a national park or a Biosphere reserve. However, people to whom we spoke do not think the whole area should be protected. So far the herders and people in the steppe have managed to prevent privatisation of the land and as yet do not regard the developments mentioned above as a real threat.

On the other hand very few are aware of modern nature conservation concepts, particularly those developed under the Seville strategy for Biosphere reserves (1995) and reconciling conservation of biodiversity and biological resources with their sustainable use, seeking greater integration of conservation and development through increasing cooperation among stakeholders and taking advantage of traditional lifestyles and indigenous uses of biodiversity. However, as noted at the conference “Global change research, biological diversity conservation and sustainable management of natural resources in the Russian mountain biosphere reserves” held in Teberda in 2006, “…The

realization of the strategy is possible only under active interaction between biosphere reserves and scientific, educational and public institutions, private sector, and other interested parties under coordination by state bodies of various levels…" Under these circumstances raising a public awareness campaign by local NGOs assisted by Biosphere Expeditions on the issue could be a good starting point for action towards protecting the area.

Additional surveys

Evidence of other carnivores sharing snow leopard habitat was also recorded. These were wolf, fox and manul. Wolf sign were found at various elevations (up to 3128 m).

The wolf appears to be the only predator currently preying significantly on domestic livestock in the area. Reprisals for this include poisoning and the use of traps, a potential hazard for the snow leopard as well.

No video camera trapping was carried by the expedition in 2007. Possible locations were identified and tested, but without success. Indeed, the chances of remote video capture (particularly if only one camera is in use) of snow leopard are slim until a trail or 'relic' scrape is found.

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 summer absence of prolonged, continuous snow cover. Ungulates and carnivores favour higher ground and are more dispersed during this season and snow leopard sign is harder to find.

Since 2003 the expedition's research work has indicated that snow leopard is present in the area surveyed. 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. Sign of snow leopard was found in the core area implying a resident animal and/or 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 are visiting it on an occasional basis. Although sign of prey species is found throughout the survey area, there still remains a question of how adequate the primary prey base is to sustain a healthy snow leopard population insofar as Siberian ibex and argali appear to be present in relatively low numbers.

Many older herders (as well as other people interviewed) had seen snow leopards (adults and cubs) and/or signs of their activity within survey blocks 1 and 2 and in the surrounding area. Sightings were most frequent adjacent to or inside the core area. Sightings have decreased significantly since 1998, even after taking into account the change in winter herding practices, although they do still occur in the proximity of the Tapduair area (for instance, mountains Chornaya, Tabajoc, surroundings of Arzhan-Buguzun). Snow leopard predation of domestic livestock had occurred in the past, but we have no records of any incidents after 1993. The evidence from interviews suggests the study area once held a healthy, breeding snow leopard population, which is now in steep decline, along with the

prey species on which it depends. The main cause is supposed to be increased poaching of snow leopard and ungulates exacerbated by seriously diminished facilities to combat these problems.

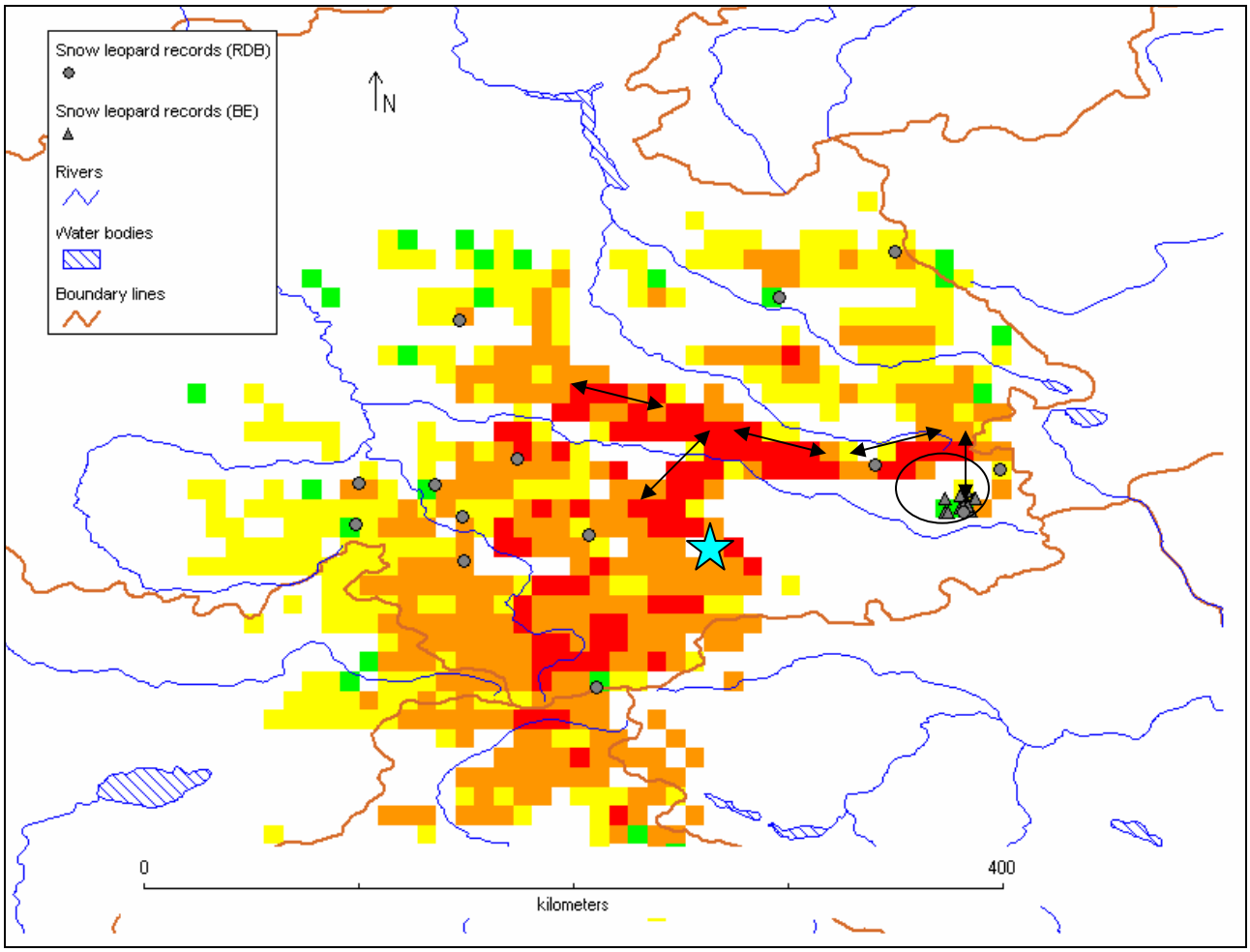

Figure 2.5a. Digital distribution model of the snow leopard in the Republic of Altai (and some adjacent areas). Areas within the red-coloured cells represent the most favourable habitat with an excellent combination of ecological conditions required by the snow leopard. Green indicates the least favourable conditions. Arrows indicate potential migration routes and corridors between areas of excellent habitat. The circle encloses the BE survey area; the blue star is placed in the Irbistu area.

On the other hand, our repeated surveys have shown the habitat in the Tapduair massif to be sufficiently varied and capable of sustaining a healthy prey base for the snow leopard. Fresh signs of snow leopard presence recorded in 2005 are an indication that the core area has been visited and used, due, perhaps, to the tentative increase in the pool numbers of the primary prey species. The developing relationship between the predator and prey species seems to be very fragile, so any decline (perhaps, even a slight one) in the prey species (namely argali and Siberian ibex) may drive the snow leopard out of the core area. Decrease in numbers of the primary prey species observed recently makes it very likely that food availability is not in favour of the snow leopard in the study area. This is supported by the fact that in 2006 there were no records of snow leopard sign in the core area and in 2007 only a few were found.

In this respect the corridor area located to the north beyond the Buguzun-Karagai-Tekelu boundary is of vital importance for animals recolonising the core area considered here. In some way the relationship between these two areas resembles the 'continent' and 'island' relationships in biogeography (MacArthur & Wilson 1967), a notion arising from the digital modeling exercise (Fig. 2.5a). Indeed, mountain ranges located north of the Tapduair massif together with the Kurayskiy range form an extensive cluster of excellent habitat area interconnected with similar areas in the northern and southern Chuyskiy ranges, favouring snow leopard presence (supported by our investigation this year of the Irbistu area). So, given a sufficient primary prey population and reduction of human disturbance (primarily illegal hunting), the core area in mind can be repopulated at any time from this neighbouring large 'corridor' area. Unfortunately, the worrying decline in snow leopard and prey species numbers is affecting these areas as well, so, unless action is taken soon, chances for restoring the snow leopard may be thinning out.

Overgrazing by livestock (though a decreasing factor) and erosion caused by vehicles is also a problem, particularly at lower altitudes. 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. The survey area urgently needs proper protection. Involving the local community and helping them to benefit as well as wildlife is vital for any conservation initiative to succeed.

2.6. Summary & Management Recommendations

Results from SLIMS datasheets confirm the fragility of the area for sustaining a viable snow leopard population and its temporary status as a snow leopard habitat, primarily depending on the presence and availability of prey and the absence of human pressure.

The major threat facing the snow leopard and prey population within the study area is poaching. Secondary threats come from habitat degradation caused by grazing pressure, human disturbance and proposed development (a through road to Tyva and a gas pipeline), and land privatisation. If development goes ahead it will exacerbate the poaching problem and cause further damage to an already fragile ecosystem.

Management recommendations are in line with the *Strategy for Conservation of the Snow Leopard in the Russian Federation* (Anon 2002) and the *Snow Leopard Survival Strategy* (McCarthy & Chaperon 2003) and include the following:

- III.1* *Safeguarding the range structure* – conduct further research in the study area especially corridor area (survey block 2 and beyond, as indicated by the ecological niche modeling) and lower valleys (survey block 1). One winter survey (this would be of shorter duration), or extension of the expedition season into September, would enhance monitor snow leopard and prey population trends.

- III.3. *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 and also because it is almost impossible to regulate what is shot once a license is issued.

* As numbered in the Strategy for Conservation of the Snow Leopard in the Russian Federation (Anon 2002).

- III.5. *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 have no hostile feelings to the snow leopard, so it might be reasonable for this purpose using the combination of ecotourism and marketing products made by herders.

- V. *Raising public awareness of snow leopard conservation* – further investigation and consultation with herders are needed to discuss with them the value 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 realising the threat that encroaching development is bringing to the area and to the understanding of the protected areas concept as a tool for keeping in check privatisation of land by non-residents and maintaining traditional sustainable nature resource use.

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 be repeated in the following years and relative abundance surveys will also be undertaken in the most suitable habitat areas as identified by digital modelling. Finding a trail and/or relic scrape(s) is still a high priority. If either of these can be found, remote camera-trapping will be included as a survey tool. Collecting scat for DNA analysis must continue to play an important part in the research; for this purpose the 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 and local people involvement will continue to be expanded. Continued dialogue with herders is very important, not only to find out what has happened in between expedition periods, but also to involve them more fully in the research and explore possibilities of benefiting the local community.

Conrete steps should be the recruitment of more local staff for the running of camp, involving local museum staff in the education of team members, inviting local herders into camp and onto surveys, as well as investigating the possibility of giving talks and lectures locally.

2.8. Заключение

С 11 июля по 15 августа 2007 г. проведено обследование на наличие снежного барса в районе горного массива Талдуаир 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 рассматриваемую территорию 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.
Предполагается, что снежный барс потенциально может проникать на территорию горного массива Талдуаир с массивов, расположенных севернее линии, образуемой реками Бугузун-Карагай-Текелю, и входящими с состав своеобразного миграционного коридора. Подобное предположение покрепляется полевыми наблюдениями и компьютерным моделированием экологической ниши снежного барса, выполненным с помощю ГИС-технологии.

Оценка подходящих для вида местообитаний, расположенных на высотах 2134-3329 м н.у.м., показала, что имеется определенный потенциал для присутствия здесь снежного барса, чему способствует рельеф, слабая посещаемость мест скотоводами (хотя в расположенных ниже угодьях выпасание домашних животных является обычной практикой), признаки пребывания потенциальных жертв (прежде всего, сибирського горного козла и аргали).

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.
Необходимо ввести запрет и/ или строгий контроль на отстрел диких копытных и придание району Талдуаир природоохранного статуса. 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.

2.9. References

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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 systematics and distributions are better known than any other comparable group of animals

A measure of the species diversity is a meaningful complementary result from 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 resources exploitation. Under a monitoring scheme, regular information on community composition and species assemblage, combined together with a special focus on target species (harvested or flagship species, such, for instance, as 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.

With this in mind, the aims and objectives of this study were to provide baseline data for terrestrial biodiversity assessment based on bird species richness and functional (guild) type.

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 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 465 records of species being encountered on a particular day, 30 (or 6.5%) belong to the black-eared kite, one of the most common birds in the study area. On the contrary, rare species met only once account only for about 0.2%.

In general, the time horizon 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 we 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 the analysis car day counts and foot counts were pooled.

Sampling units (i.e. transects) were spread over the whole study area (this year including sites around Irbistu mountain in the southern Chuya range) 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 a transect took time between 3 and 11.5 hours and varied around an average of 7 ± 0.5 hours. The number of routes was used in our analysis as a measure of the sampling effort (as far as more than one route could be accomplished in one day, say by two separate teams). Around 18% of the surveys were carried out by expedition team members, who devoted their spare time between the slots for recording bird species within the proximity of the base camp (Table 3.2a).

Table 3.2a. Sampling effort (by slots, between slots and total)

Slots	Dates	Sampling effort
1	10.07-18.07	12
2	24.07-01.08	9
3	07.08-15.08	6
1-3	10.07-15.08	**Subtotal: 27**
Surveys undertaken between slots	19.07-23.07, 02.08-06.08	6
		Total: 33

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

Data storage and access

The dataset in the appendix of this report shows a total species list. This dataset is a combined and agreed record taken from the datasheets and field notebooks of the group of observers in each slot. Additional values were assigned to each species in order to facilitate investigation of trophic diversity, habitat diversity, body size category and conservation category.

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.

One way of assessing inventory completeness and standardising the comparisons of different inventories is through the use of species accumulation models fitted to species accumulation curves (Soberon & Llorente 1993), in which the cumulative number of species is plotted against some measure of the effort it took to obtain that sample (Hayek & Buzas 1997). The measure of effort can be the number of individuals observed, number of samples, traps, trap-days or some other measure of area or time (Soberon & Llorente 1993, Colwell & Coddington 1994, Hayek & Buzas 1997; Longino & Colwell 1997). The curves of species accumulation models reach an asymptote when the probability of adding a new species to the list approaches zero.

Species accumulation models allow: (1) measures of inventory efficacy and completeness within a given study, and (2) valid comparisons between studies based upon a standardised measure of sampling effort. The use of species accumulation functions can result in better planning and sampling protocols by providing reliable estimates of the minimum effort required to obtain an efficient inventory, and, consequently, can result in notable savings in time and field expenses (Soberon & Llorente 1993).

To assess the completeness of the inventory method relative to the sampling effort invested, and to project species accumulation curves, we fit two asymptotic models (reviewed by Soberon & Llorente 1993) to our species accumulation data: the linear dependence model and Clench model.

The linear dependence model is based on the concept that the number of species collected decreases linearly as sampling effort increases:

$$S(t) = a/b[1-exp(-bt)],$$

where t is a measure of effort (in our case number of days), $S(t)$ is the predicted number of species at t, a represents the rate of increase at the beginning of the sampling, and b is species accumulation. Soberon & Llorente (1993) recommended this model for situations where the taxon is well known or the study area is relatively small and could theoretically reach an asymptote over an infinite period of time.

We used Lamas et al.'s (1991) equation for estimating the time required to register a proportion of the total fauna as predicted by the asymptote (t_q):

$$t_q = - 1/b \ ln(1-q),$$

where q is the desired proportion of the total fauna for which the required time is estimated.

The Clench model assumes that the probability of adding species to the list decreases with the number of species already recorded, but increases over time:

$$S(t) = at/(1+bt).$$

Soberon & Llorente (1993) recommend this model for larger areas than those where the linear dependence model would be applied, or for taxa for which the probability of adding new species will increase as more time is spent in the field, until an upper limit is reached. For this model, we applied Soberon & Llorente's (1993) equation for t_q:

$$t_q = q/[b(1-q)].$$

For both models the predicted asymptote is calculated as a/b.

Moreno and Halffter (2000) reported for bat sampling that the linear dependence model best predicted the 'lower limit' asymptote and that the Clench model best predicted the 'upper-limit' asymptote, with the true relationship lying between these two curves.

The species accumulation curves were obtained by taking the number of survey days as sampling effort. To eliminate the influence of the order in which days were added to the total, the sample order was randomized 50 times using *EstimateS* software (Colwell 2005), for which either abundance data, or using summed incidence data (frequencies of occurence, pooled among samples), are suitable.

This produces smoothed species accumulation curves (Fig. 3.3a) by repeated random reordering of the samples (Longino & Colwell 1997). We fitted the asymptotic models to these smoothed curves.

We assessed the completeness of our bird inventory by calculating the proportion of the maximum number of species (asymptote) registered at the end of sampling. By definition, reaching 100% richness would require an infinite effort, and the rate of species recorded per effort invested decreases markedly as the curve approaches the asymptote (Soberon & Llorente 1993). Thus, the effort required to register a species increases substantially as the proportion of species encountered approaches the total number of species present. We selected 90% of the total fauna as a conservative, but satisfactory, level of inventory completeness for the purpose of making valid comparisons, and estimated the effort required to reach this level. Non-linear regression (Statistica Package 1995) has been used to fit the two models to the smoothed curves of the observed data.

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 bootstrap analysis with 1000 random permutations (Hammer et al. 2005).

Of course, all methods have weaknesses, but 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 ascerted using a restricted logarithmic scale (Pesenko 1982).

3.3. Results

The methods used resulted in a presence/absence data set consisting of 465 records. A total of 97 species (or 98 if counting for subspecies) were recorded (belonging to 13 orders and 32 families). In 44 additional cases species were not identified (about a third of these were pipits, *Anthus*) or there are doubts about how accurate the identification was, particularly if only feathers were found (for instance, on one occasion feathers were found that could have been belonging to the bar-headed goose, *Anser indicus*).

Up to now a total of 170 bird species were recorded by Biosphere Expedition teams in the area since the surveys commenced in 2003 and 13% of additional species (i.e., not seen before) were recorded in 2007.

The following analyses of bird diversity were made:

Species richness & diversity.

Species accumulation curves were plotted to estimate inventory efficacy and completeness and allow valid comparisons in further monitoring studies applying the same or similar methodologies. Both the total simple species accumulation curve and theoretical (smoothed) curve together with its upper and lower 95% confidence boundaries are presented in Fig.3.3a. From the graph a conclusion can be made that around as many species have been encountered as could be theoretically expected: points representing the raw data barely overstep the lower 95% confidence boundary of the smoothed curve.

The rate at which the curve flattens is crucial for estimating inventory efficacy and completeness. A visual analysis of the graph indicates that perhaps more species would have been encountered if the expedition period had lasted longer (as far as it is quite obvious that the curve has not reached its ‘ceiling’).

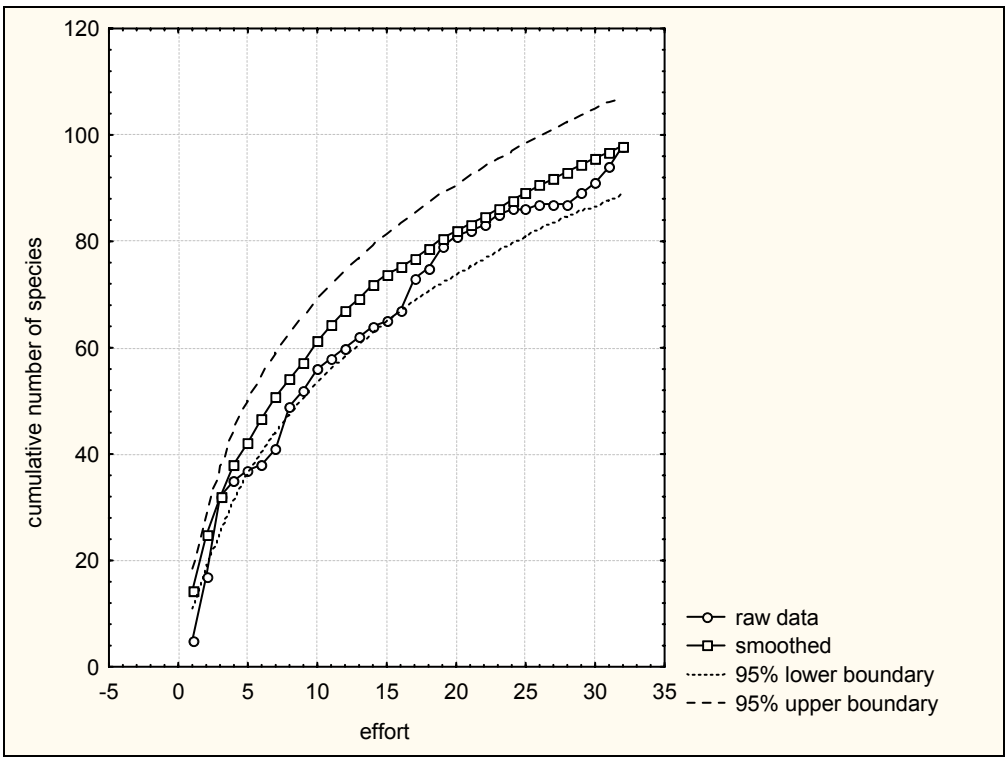

Figure 3.3a. The total simple species accumulation curve (smoothed curve produced by 50 random reorderings).

Theoretically the linear dependence model predicts that 99 species are expected to be met in the area, whereas the Clench model envisages about 136 (see Table 3.3a). In fact the real number of species recorded in one year is likely to be between these estimates.

Table 3.4a. Number of species recorded, parameters and predictions of two species accumulation models fitted for the total data, where *a* is the slope at the beginning of the sampling, *b* is a parameter related to the shape of the accumulation of new species during the sampling, *a/b* is the asymptote (expected number of species), t_{90} is the expected effort (in days) for revealing 90% of the avifauna, and *R* is the correlation coefficient.

Number of species	*a*	*b*	*a/b*	t_{90}	*R*
		Linear dependence model			
98	8.032±0.279	0.081±0.004	99.2	28.4	0.990
		Clench model			
98	9.362±0.374	0.069±0.005	135.7	130.4	0.993

In view of the fact that each year of inventory is a somewhat unique event (because of varying weather conditions, varying numbers of keen birdwatchers, reconnaissance studies of new areas, etc.), it would be unrealistic to expect the resulting bird species lists to be identical and share 100% of common species. In reality they overlap to a considerable extent, ranging from 60.6% (inventories accomplished in 2003 and 2006) up to 71.8% (2004 and 2005) of common species.

More reconnaissance visits accomplished this year (particularly moving out to the Irbistu area) have yielded more species not sighted before, so eventually the total number of species recorded in the area since 2003 has reached 170. However, this also meant that the resulting bird lists of 2006 and 2007 share only 51.5% of the species.

The overall diversity of the avifauna (assessed by the Shannon index, *H'*) was 4.048. The bootstrap analysis detected no significant differences in diversity between samples collected in the previous year and 2007 (t=1.48<1.96).

Table 3.4b. Summary of species in each taxonomic unit (bird order and family).

Order	No. of species	Family	No. of species
Passeriformes	51	Turdidae	12
		Corvidae	7
		Motacillidae	6
		Fringillidae	5
		Alaudidae	3
		Hirundinidae	3
		Passeridae	3
		Prunellidae	3
		Sylviidae	3
		Emberizidae	2
		Apodidae	1
		Cinclidae	1
		Laniidae	1
		Paridae	1
Falconiformes	16	Accipitridae	12
		Falconidae	4
Charadriiformes	13	Charadriidae	9
		Sternidae	3
		Laridae	1
Anseriformes	5	Anatidae	5
Galliformes	2	Phasianidae	1
		Tetraonidae	1
Gruiformes	2	Gruidae	1
		Rallidae	1
Ciconiiformes	2	Ciconiidae	1
		Threskiornithidae	1
Columbiformes	1(2)	Columbidae	1(2)
Podicipitiformes	1	Podicipitidae	1
Strigiformes	1	Strigidae	1
Coraciiformes	1	Upupidae	1
Cuculiformes	1	Cuculidae	1
Caprimulgiformes	1	Caprimulgidae	1
Total: 13 orders		**Total: 32 families**	**Total: 97(98) species**

A qualitative analysis of species diversity done by taxonomic unit (bird order and family) shows that more than a half of the species (51 out of 98, or 52%) belong, as one would expect, to passerine families (Table 3.4b). In terms of species numbers, passerines are followed (exactly as in previous years) in almost equal proportions by raptors (families Accipitridae and Falconidae) and waders (predominantly Charadriidae) composing respectively 16.3% and 13.3% of the local avifauna.

In general the distribution of species amongst the major bird orders for the years 2004-2007 remains stable as evidenced by the Chi-square statistical tests (all *p* above the 0.05 threshold) (see Table 3.4c).

Table 3.4c. Distribution of species amongst the major bird orders for survey years 2004-2007.

Orders	2004	2005	2006	2007
Passeriformes	36	48	47	51
Charadriiformes	12	15	14	13
Falconiformes	14	12	17	16
Other (pooled)	14	15	19	18

$\text{Chi-square}_{2004/2005} = 1.06$, *d.f.* = 3, $p = 0.79$;
$\text{Chi-square}_{2005/2006} = 1.12$, *d.f.* = 3, $p = 0.77$;
$\text{Chi-square}_{2006/2007} = 0.25$, *d.f.* = 3, $p = 0.97$

Trophic diversity

Species recorded were divided into five trophic categories (carnivore, herbivore, insectivore, piscivore and omnivore) on the basis of their primary food diets: Carnivores include raptors and species that feed on carrion; herbivores consume herbaceous food, however may occasionally pick up insects and other non-insect prey; insectivores (a fairly conditional category) too may feed on non-insect invertebrates, include herbaceous food items to their diet; piscivores feed primarily on fish, but may also prey on invertebrates etc.; omnivores usually consume any kind of available food.

Table 3.4d. Summary of trophic diversity of recorded species.

Trophic category	insectivore	carnivore	herbivore	piscivore	omnivore
No. of species (2004)	59	15	20	6	5
%	56.2	14.3	19.0	5.7	4.8
No. of species (2005)	59	18	16	4	6
%	57.3	17.5	15.5	3.9	5.8
No. of species (2006)	59	15	20	6	5
%	56.2	14.3	19.0	5.7	4.8

$\text{Chi-square}_{2006/2007} = 1.19$, *d.f.* = 4; $p = 0.88$

In most cases there are hardly any clear-cut rules for assigning a species to a certain category and the food composition of species belonging to different categories may overlap, so there will always be room for some uncertainty.

Table 3.4d summarizes the trophic diversity (diet guilds) of the recorded species. Generally speaking, figures in the table are in compliance with the species diversity analysis done by taxonomic unit. Indeed, passerines represent more than half (52%) of the species in the area are primarily insectivorous. So too are many of the recorded wader species.

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. The Chi-square tests (summarized in Table 3.4d) show that variations in the figures observed between the two consecutive survey years (2006 and 2007) are statistically insignificant.

Habitat diversity

The study area has been subdivided arbitrarily into the following 8 large habitat units: fluvial lowland (including the Buguzun River floodplain and adjacent lake areas), steppe (in fact, the floor of the largest valleys), forest (primarily Siberian larch stands, reaching the tree line at the altitude of approximately 2,400 m), mountain steppe, mountain tundra, open rock (including cliffs and barren scree fields), intrazonal habitats (such, for instance, as narrow mountain river valleys, gorges etc. quite often vegetated differently from the surrounding landscape), urban (places in and around human settlements).

Table 3.4e. Summary of similarity of the avifauna of various habitat types and number of species met in each particular habitat type.

	Fluvial lowland	Steppe	Forest	Mountain steppe	Mountain tundra	Open rock	Intrazonal habitats	Urban
Fluvial lowland	x	x	x	x	x	x	x	x
Steppe	0.053	x	x	x	x	x	x	x
Forest	0.102	0.167	x	x	x	x	x	x
Mountain steppe	0.038	0.239	0.133	x	x	x	x	x
Mountain tundra	0.028	0.000	0.065	0.214	x	x	x	x
Open rock	0.000	0.000	0.000	0.152	0.429	x	x	x
Intrazonal habitats	0.111	0.130	0.179	0.044	0.000	0.000	x	x
Urban	0.000	0.083	0.000	0.030	0.000	0.000	0.036	x
Total number of species seen in: (data 2006)	39	34	29	21	10	10	22	6
Total number of species seen in: (data 2005)	29	31	25	26	8	12	21	8
Total number of species seen in: (data 2004)	x	x	x	x	x	x	x	x

$\text{Chi-square}_{2006/2007} = 2.79$, $d.f. = 7$; $p = 0.90$

The upper part of Table 3.4e summarises the similarity of the avifauna of various habitat types (assessed in by the Jaccard measure). The lower part shows the total number of bird species met in each particular habitat type. The Jaccard measure is a simple measure suitable for presence and absence data, and it treats all species as equal irrespective of whether they are abundant or rare (Magurran 1988).

Figures in the table confirm a common distributional pattern: lowlands, in general, are richer in bird species than are highlands (Zlotin 1975). In our case (for 2007) the fluvial floodplain area and the floor of the largest valleys contain 29 and 31 species, respectively, whereas, on the other side of the spectrum mountain tundra and open rock habitats accomodate 8 and 12 species respectively. Forests, as an intermediate set of habitats, contain 25 species, sharing around 13% of them with the mountain steppe above and 17% with the steppe below. Intrazonal habitats, frequently found penetrating deeply into mountain massifs, or present in the form of patches, have 21 species, primarily of lowland origin: some 11% are shared with the avifauna of the fluvial floodplain, around 13% are found in the steppe, approximately 18% are forests dwellers, and only about 4% of the species is shared with the composition of the mountain steppe birdlife.

Although highlands in the study area are noticeably poorer in species, similarity measures indicate the presence here of a unique fauna, quite distinct from the fauna below, sharing between the specific habitats up to 43% of the bird species. This notion is distinctly supported by a principle component analysis (for details of the method see Ludwig & Reynolds 1988), showing a strong separation for the species' composition of the highland habitats from the rest along the axis of the first principle component (PC1), which may be interpreted as 'altitude'. PC2 most likely characterises the "wetness of the habitat type", clearly separating the bird fauna of the fluvial lowlands from the fauna of the dry steppe (Fig. 3.4b).

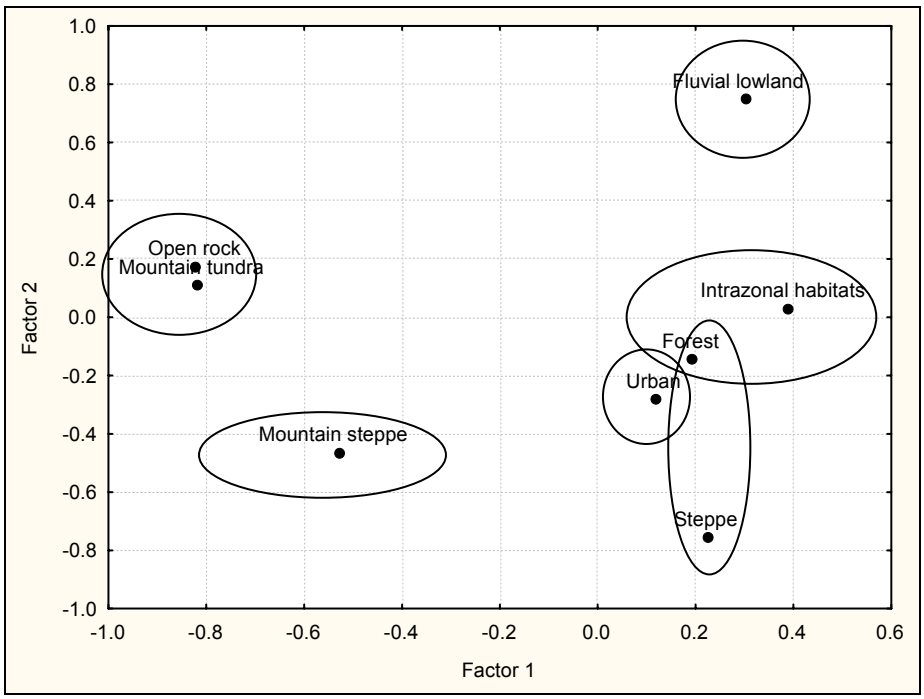

Figure 3.4b. Principle component analysis for avifauna of various habitat types.

Despite the observed variations in figures, the distribution of species amongst the major bird habitats in the study area for two consecutive survey years (2006 and 2007) remains fairly stable as evidenced by the Chi-square statistical tests (see Table 3.4e).

Body size category.

Together with diet guilds and foraging habitat, guild body size classes are important for the assessment of functional diversity and community completeness. Wing length was taken as an index of the overall body size of a bird (Ivanov & Shtegman 1978).

Naturally bird communities, as communities of many other animals, particularly vertebrates, being more or less intact consist of many small-sized species and fewer ones of large size, and mathematically such a distribution of size classes is satisfactorily modelled by the lognormal function (Hemmingsen 1934). This general rule applies quite well to our data (see reports for 2004-2006).

In disturbed communities, larger species are usually the first to be affected by negative influences and their chances to disappear are higher. Statistically speaking, this will distort the distribution by shifting the parameters of the mean and variance of the lognormal function or force one to quit the model totally. However, variations in the figures (note: size data have been log-transformed) observed between the consecutive survey years are statistically insignificant ($Mean\ size_{2006}$ = 5.300±0.069, $Variance_{2006}$ = 0.499; $Mean\ size_{2007}$ = 5.203±0.069, $Variance_{2007}$ = 0.467; $t_{2006/2007}$ = 0.99, p = 0.32, $F_{2006/2007}$ = 1.069, p = 0.74).

Local and regional rarity

Different methods have been proposed for defining abundance classes. Following Pesenko (1982), we used 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 $32^{0.2}$ = 2. In such a way that the uniques (species that occur in only one sample) and duplicates (species known from two samples) fall into one abundance class, and in our case they together comprise 56.1% of all the recorded species. Boundaries for the remaining four abundance classes (2 to 5) are presented in Table 3.4d.

Table 3.4d. Summary of abundances of recorded bird species (2006-2007).

Abundance classes					
1 (rare)		2 (few)	3 (moderate)	4 (common)	5 (abundant)
Data 2006					
1-2 records		3-4 records	5-8 records	9-16 records	17-31 records
uniques: 37 (35.2%) duplicates:19 (18.1%)	*Total:* 56 (53.3%)	15 (14.3%)	18 (17.1%)	10 (9.5%)	6 (5.7%)
Data 2007					
1-2 records		3-4 records	5-8 records	9-16 records	17-32 records
uniques: 37 (37.8%) duplicates:18 (18.4%)	*Total:* 55 (56.1%)	12 (12.2%)	16 (16.3%)	8 (8.2%)	7 (7.1%)
Chi-square$_{2006/2007}$ = 0.52, *d.f.* = 4; p = 0.97					

Amongst the most common birds (abundant) were black-eared kite, chough red-billed, Isabelline wheatear, Northern wheatear, common kestrel, white (or pied) wagtail and steppe eagle *(III), considered in the Red Data Book of the Altai Republic as *Aquila rapax nipalensis*.

Next in abundance were Demoiselle crane *(III), hoopoe, carrion crow, common sandpiper, grey wagtail, Altai snowcock *(III), horned skylark and ruddy shelduck.

Moderate records were made of the Eurasian skylark, rough-legged buzzard, rock ptarmigan, citrine wagtail, black-billed magpie, Mongolian finch *(III), long-legged buzzard, Saker falcon *(III), herring gull, Guldenstad's redstart (or white-winged redstart), rufous-backed redstart, cinereous vulture * (I), golden eagle *(II), Arctic warbler, stonechat and common tern.

Fewer records were made of twite, little-ringed plover, common cuckoo, bearded vulture *(I), white-faced wagtail, sand martin, common redshank, black-throated thrush, house martin, bluethroat, yellow-beaked chough and dark-throated thrush.

Eight 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 2006 there were seven such species. Amongst the rarest species, nine are listed in the Red Data Book of the Altai Republic: imperial eagle (II), lesser kestrel (I), black stork (II), upland buzzard (III), red-breasted merganser (III), spoonbill (II), grey-necked bunting (III), solitary snipe (II), black-tailed godwit (III).

Altogether 17 species out of 67 (or about 25%) listed in the Red Data Book of the Altai Republic were spotted by the expedition team during the survey. In 2006 there were 21 such species. Since 2003 a total of 33 species listed in the Red Data Book of the Altai Republic have been recorded.

The Chi-square tests shows that variations in the figures concerning the distribution of bird species between the abundance classes observed between the consecutive survey years (Table 3.4d) are statistically insignificant (*p* above the critical value of 0.05).

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

3.5. Conclusions / Заключение

1. A repeated bird species inventory undertaken by Biosphere Expeditions in the Talduair area of the Altai Republic (this year including sites around Irbistu mountain in the Northern Chuya range) between 10of July and 15 August 2007, involving a total sampling effort of 32 days, yielded 97(98) species belonging to 13 orders and 32 families; in 44 additional cases, species were not identified or there were doubts on how accurate the identification was.

1. В районе горного массива Талдуаир в Республике Алтай РФ (а в этом году еще в районе горы Ирбисту) с 10 июля по 15 августа 2007 г. проводили очередную инвентаризацию фауны птиц и учет их численности. Работа велась силами трех команд волонтеров, участников экспедиции, в 5-12 человек в каждой. Общее количество маршрутов, потраченных на наблюдения, составило 32. В итоге обнаружено 97(98) видов птиц (принадлежащих к 13 отрядам и 32 семействам); в 44 случаях нужны дополнительные данные для надежного определения птиц.

2. Extrapolation methods used to assess the completeness of the inventory indicate that more species would have been encountered, if the expedition period (and therefore the sampling effort) had lasted longer. The real number of species recorded in one year is likely to be between the estimates of 99 and 136 species. A total of 170 bird species has been recorded by Biosphere Expedition teams in the area since the surveys commenced in 2003.

2. Экстраполяционные методы, использованные для оценки полноты инвентаризации, указывают, что список видов предположительно был бы больше, если экспедиция была продлена на дольший срок (соответственно, увеличилось бы количество дней наблюдений). Возможно, что число видов обнаруженых в течении одного полевого сезона составило б 99-136 видов. Усилиями экпедиции за 5 полевых сезона (начиная с 2003 г.) обнаружено 170 видов птиц.

3. 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 a variety of raptor species and specialized scavengers.

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

4. Highlands in the area appear to be poorer in bird species than lowlands, but similarity measures indicate the presence there of a unique fauna, fairly distinct from the fauna below, sharing between the specific habitats a considerable portion of the bird species.

4. Высокогорье в плане количества видов птиц оказалось беднее, чем прилежащие равнины и низкогорье (что является общей экологической закономерностью), однако показатели сходства указывают на наличие здесь уникальной орнитофауны, обособленной от аналогичной фауны расположенной ниже.

5. Intrazonal habitats accommodate primarily species of lowland origin and offer them “corridors” leading into the highlands.

5. Интразональные биотопы населены преимущественно птицами, которые встречаются обычно на равнине или в низкогорних местообитаниях; интразональные биотопы служат этим видам своеобразными «коридорами», ведущими вглубь горных массивов.

6. The distribution of body size classes of birds in the area is satisfactorily modelled by the lognormal function, indicating an undisturbed avian community. Quantifications in this respect may be of use for monitoring long term disturbances that may affect the biota. Variations in the figures observed between the consecutive survey years (2006 and 2007) are statistically insignificant.

6. Статистическое распределение птиц местной фауны по размеру тела удовлетворительно описывается логнормальной функцией, что указывает на относительную «укомплектованность» сообщества. Количественные показатели данного распределения могут быть использованы для длительного мониторинга возможных отрицательных последствий различных факторов на биоту в исследованном регионе. Различий между показателями 2006-2007 гг. не обнаружено.

7. 55 (or 56.1%) of the recorded species can be considered rare; nine of them are listed in the Red Data Book of the Altai Republic. Since 2003 a total of 33 species listed in the Red Data Book of the Altai Republic have been recorded.

7. 55 (или 56,1%) зарегистрированных здесь видов птиц можно считать редкими; 9 из них занесены в Красную книгу Республики Алтай. Начиная с 2003 г., отмечено 33 вида птиц, занесенных в Красную книгу Республики Алтай.

8. 43 species belong to other abundance categories, ranging from “few” to “abundant”; seven of them are listed in the Red Data Book of the Altai Republic. A pleasing fact may be considered the presence, even amongst birds the abundance of which has been categorized as “abundant” or “common”, of such flagship species as the Demoiselle crane, or the Steppe eagle, etc.

8. 43 вида принадлежат к других категориям встречаемости (от «мало» до «очень много»); 7 из них числятся в Красной книге Республики Алтай. Радует тот факт, что среди них (даже принадлежащих к категориям «много» и «обычные») встречаются такие «знаковые» для природоохраны виды как красавка, степной орел и др.

9. Comparisons between inventories of 2006-2007 seem to confirm no significant environmental change in the study area and the validity of the approaches we have chosen for biodiversity assessment based on bird species richness and functional (guild) type, especially in terms of replicability.

9. Сравнение результатов учетов 2006-2007 гг. указывет на относительную стабильность окружающей среды в исследованном районе, а также обоснованность методов, используемых для оценки биоразнообразия через структурные и функциональные особенности орнитофауны, 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 systematics and distributions are poorer known than any other comparable group of animals.

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 with binoculars, and signs were associated with particular species using relevant field guides (Bang & Dahlstrøm 2001; Dolejš 1987; Rukovskiy 1984, etc.). For the analysis car day counts and foot counts were pooled. The sampling effort totaled 31 routes (accomplished between 10 July and 14 August). Records were entered into a datasheet after each survey in the evening of the same day.

4.2. Results

The methods used resulted in a presence/absence data set (appendix 4). A total of 26 species were recorded (belonging to five orders and 12 families). In 13 cases it was difficult to identify the animals to the level of the species (this applies especially to the numerous vole species, *Microtinae*). Since 2004 the total number of recognized mammal species has reached 33.

The overall diversity of the mammal fauna (assessed by the Shannon index, *H'*) comprised 2.93. The Shannon diversity *t*-test detected no significant differences in diversity between inventories performed in 2006 and 2007 ($t_{2006/2007}$=1.19, p=0.235), meaning the quantitative structure of the mammal fauna in the area is most likely to be in a steady condition. Qualitative similarity between these inventories, assessed by the Jaccard measure, is high as well and reaches the level of 64.5% of the species' composition.

The fairly large proportion of Carnivora (31%) (Table 4.2a) may be an indication of the complexity of the local community structure and diverse food webs, leading to a corresponding pattern of trophic diversity.

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

Order	No. of species	Family	No. of species
Carnivora	8	Canidae	3
		Felidae	2
		Mustelidae	3
Rodentia	7	Sciuridae	4
		Cricetidae	2
		Dipodidae	1
Artiodactyla	5	Bovidae	2
		Cervidae	2
		Suidae	1
Lagomorpha	5	Leporidae	2
		Ochotonidae	3
Total: 5		**Total: 12**	

Local and regional rarity

We follow Pesenko (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 $32^{0.2} = 2$. In such a way the uniques (species that occur in only one sample) and duplicates (species known from two samples) fall into one abundance class, and in our case they comprise together 24% 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).

Table 4.2b. Summary of abundances of recorded mammal species (including unidentified taxa)

Abundance classes					
1 (rare)		2 (few)	3 (moderate)	4 (common)	5 (abundant)
Data 2006					
1-2 records		3-4 records	5-8 records	9-15 records	16-30 records
uniques: 3 (12%) duplicates: 3 (12 %)	*Total:* 6 (24%)	7 (28%)	4 (16%)	2 (8 %)	6 (24%)
Data 2007					
1-2 records		3-4 records	5-8 records	9-15 records	16-32 records
uniques: 5 (17%) duplicates: 3 (11 %)	*Total:* 8 (28%)	5 (17%)	7 (24%)	6 (21 %)	3 (10%)

Chi-square$_{2006/2007}$ =0.09, *d.f.* = 2*; p = 0.95

*as some of the scores in the abundance classes are fewer than five, neighbouring classes have been pooled into two: one made up of abundance classes 1-2, and the second made up of abundance classes 3-4; therefore the degrees of freedom (*d.f.*) is reduced to 2 (i.e., number of classes minus 1).

Amongst the most abundant mammal species are Arctic ground squirrell, grey or Altai marmot, Siberian ibex.

Next in abundance are Arctic or mountain hare, Argali sheep *(I), Northern pika, red fox, Daurian pika, voles (*Microtinae gen., sp.*).

Moderate records have been made of Tolai hare, large-eared or Altai vole, snow leopard *(I), Northern red squirrell, roe deer, Siberian chipmunk, wolf. The snow leopard has fallen into this category, however, one should bear in mind that this conclusion is based upon indirect signs, which unfortunately in the majority of cases are questionable.

Fewer records are made of manul *(II), maral deer, Mongolian five-toed jerboa *(III), Siberian or Altai mole, stoat. For the manul too conclusions are based upon indirect signs, so, as for the snow leopard, there is room for uncertainty.

Four species marked above with an asterisk are listed in the Red Data Book of the Altai Republic (I- III stand for their assigned nature conservation status).

Eight of the mammal species recorded this year are considered rare. Species in this category are the corsac or steppe fox, Northern red-backed vole, wild boar, Mongolian pika, Mountain or Altai weasel and common otter (III). There is some doubt about the common otter, as it has not been recorded by any team member in the wild, but fur of the animal was seen furnishing a traditional hat of a shaman interviewed at the Arzhan-Buguzun Springs. M.V.Sergeev in the essay on the species in the Red Data Book of the Altai Republic states that the common otter is absent in the SE Altai. However, the person interviewed insisted that the otter was hunted in the lower reaches of the Buguzun River.

Altogether five mammal species out of 19 (or about 26%) listed in the Red Data Book of the Altai Republic were spotted by the expedition team during the survey.

4.3. Conclusions / Заключение

1. A total of 26 species of mammals were recorded (belonging to 5 orders and 12 families). Since 2004 the total number of species recorded in the study area has reached 33.

2. Отмечено наличие в исследованном районе 26 видов млекопитающих (принадлежащих к 5 отрядам, 12 семействам. Начиная с 2004 г., отмечено 33 вида.

2. A fairly large proportion of Carnivora species (31%) may be an indication of the complexity of the local community structure and diverse food webs.

2. Относительно большая доля видов отряда Хищные (31%) может быть показателем сложности структуры местной экосистемы и разнообразия пищевых цепей.

3. Uniques and duplicates comprise together a noticeable portion of the fauna (28%).

3. Виды, которые наблюдались один или два раза, составляют примерно 28% фауны.

4. Potential mammal prey species of the snow leopard (Siberian ibex, Argali sheep, grey or Altai marmot, Arctic or mountain hare, Northern pika, Arctic ground squirrell, maral deer) are either relatively abundant or common in the area, some even being recorded relatively frequently (as, for instance, the Siberian ibex).

4. Потенциальные жертвы снежного барса (горный козел, аргали, серый сурок, заяц-беляк, алтайская пищуха, длиннохвостый суслик, марал) относительно многочисленны и обычны в исследованном районе, а некоторые (например, горный козел) довольно часто встречается на маршрутах.

5. The snow leopard has fallen into the category “moderate”, however, one should bear in mind that this conclusion is based upon indirect signs, which unfortunately in the majority of cases are questionable. Of serious concern is another felid species, the manul. Since 2004 this species has shifted down to the “fewer” category and still remains there.

5. Снежный барс оказался в категории «умеренной численности», однако надо иметь ввиду, что подавляющее большинство регистраций основаны на непрямых доказательствах, которые вызывают определенные сомнения. Положение другого представителя семейства кошек, манула, вызывает тревогу. Этот вид продолжает редко встречаться.

6. A total of five mammal species out of 19 listed in the Red Data Book of the Altai Republic have been spotted by the expedition team during the 2007 survey.

6. В 2007 г. отмечено наличие 5 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: 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 disagree
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 3: Bird species recorded by Biosphere Expeditions in the Altai (2007). Names and classification following Cramp, S and Simmons, K E L (eds.) (2004), BWPi: Birds of the Western Palearctic interactive (DVD-ROM). BirdGuides Ltd, Sheffield.

Scientific name	English name	Русское название	Nature conservation status in the Red Data Book of the Altai Republic. Природоохранный статус в Красной книге Республики Алтай
Acanthis flavirostris	Twite	горная чечетка	
Accipiter gentilis	Northern goshawk	тетеревятник	
Accipiter nisus	Eurasian sparrowhawk	перепелятник	
Actitis hypoleucos	Common sandpiper	перевозчик	
Aegypius monachus	Cinereous vulture	черный гриф	I
Alauda arvensis	Eurasian skylark	полевой жаворонок	
Anas platyrhynchos	Mallard	кряква	
Anthropoides virgo	Demoiselle crane	красавка	III
Anthus godlewskii	Blyth's pipit	конек Годлевского	
Apus apus	Swift	черный стриж	
Aquila chrysaetos	Golden eagle	беркут	II
Aquila heliaca	Imperial eagle	могильник	II
Aquila nipalensis	Steppe eagle	восточный степной орел	III
Athene noctua	Little owl	домовый сыч	
Aythya fuligula	Tufted duck	хохлатая чернеть	
Bucanetes mongolicus	MongolianTrumpeter finch	монгольский снегирь	III
Buteo buteo	Common buzzard	канюк	
Buteo hemilasius	Upland buzzard	мохноногий курганник	III
Buteo lagopus	Rough legged buzzard	зимняк	
Buteo rufinus	Long-legged buzzard	курганник	
Caprimulgus europaeus	Nightjar	козодой	
Carpodacus erythrinus	Scarlet rosefinch	обыкновенная чечевица	
Charadrius dubius	Little ringed plover	малый зуек	
Charadrius hiaticula	Ringed plover	галстучник	
Charadrius morinellus	Eurasian dotterel	хрустан	
Chlidonias leucopterus	White-winged Black tern	белокрылая крачка	
Ciconia nigra	Black stork	черный аист	II
Cinclus cinclus	Dipper	оляпка	
Columba livia domestica	Feral pigeon	домашний голубь	
Columba livia	Rock Dove	сизый голубь	
Corvus corax	Raven	ворон	
Corvus corone	Carrion crow	черная ворона	

Scientific name	English name	Русское название	Nature conservation status in the Red Data Book of the Altai Republic. Природоохранный статус в Красной книге Республики Алтай
Corvus dauuricus	Daurian jackdaw	даурская галка	
Corvus frugilegus	Rook	грач	
Cuculus canorus	Cuckoo	кукушка	
Delichon urbicum	House martin	городская ласточка	
Emberiza buchanani	Grey-necked bunting	скальная овсянка	III
Emberiza hortulana	Ortulan bunting	садовая овсянка	
Eremophila alpestris	Shore lark	рогатый жаворонок	
Falco cherrug	Saker falcon	балобан	III
Falco columbarius	Merlin	дербник	
Falco naumanni	Lesser kestrel	степная пустельга	I
Falco tinnunculus	Kestrel	обыкновення пустельга	
Fulica atra	Common coot	лысуха	
Galerida cristata	Crested lark	хохлатый жаворонок	
Gallinago solitaria	Solitary snipe	горный дупель	II
Gypaetus barbatus	Lammergeier	бородач	I
Ptyonoprogne rupestris	Crag martin	скальная ласточка	
Lagopus mutus	Ptarmigan	тундряная куропатка	
Lanius isabellinus	Isabelline shrike	буланый сорокопут	
Larus argentatus	Herring gull	серебристая чайка	
Limosa limosa	Black-tailed godwit	большой веретенник	III
Loxia curvirostra	Crossbill	клест-еловик	
Luscinia svecica	Bluethroat	варакушка	
Mergus merganser	Goosander	большой крохаль	
Mergus serrator	Red-breasted merganser	длинноносый крохаль	III
Milvus lineatus	Black-eared kite	черный коршун	
Monticola saxatilis	Rock thrush	пестрый каменный дрозд	
Monticola solitarius	Blue rock thrush	синий каменный дрозд	
Montifringilla nivalis	Snowfinch	альпийский снежный вьюрок	
Motacilla alba	Pied/White wagtail	белая трясогузка	
Motacilla cinerea	Grey wagtail	горная трясогузка	
Motacilla citreola	Citrine wagtail	желтоголовая трясогузка	
Motacilla flava	Yellow wagtail	желтая трясогузка	
Motacilla personata	White-faced wagtail	маскированная трясогузка	

Scientific name	English name	Русское название	Nature conservation status in the Red Data Book of the Altai Republic. Природоохранный статус в Красной книге Республики Алтай
Oenanthe isabellina	Isabelline wheatear	каменка-плясунья	
Oenanthe oenanthe	Wheatear	обыкновенная каменка	
Poecile montanus	Willow tit	буроголовая гаичка	
Passer domesticus	House sparrow	домовый воробей	
Passer montanus	Tree sparrow	полевой воробей	
Phoenicurus erythrogaster	Guldenstad's redstart	краснобрюхая горихвостка	
Phoenicurus ochruros	Black redstart	горихвостка-чернушка	
Phylloscopus borealis	Arctic warbler	пеночка-таловка	
Phylloscopus collybita tristris	Siberian chiffchaff	сибирская пеночка-теньковка	
Phylloscopus trochilus	Willow warbler	пеночка-весничка	
Pica pica	Magpie	сорока	
Platalea leucorodia	Spoonbill	колпица	II
Podiceps auritus	Slavonian grebe	красношейная поганка	
Prunella collaris	Alpine accentor	альпийская завирушка	
Prunella himalayana	Altai accentor	гималайская завирушка	
Prunella montanella	Siberian accentor	сибирская завирушка	
Pyrrhocorax graculus	Alpine Chough	альпийская галка	
Pyrrhocorax pyrrhocorax	Chough	клушица	
Rhodopechys sanguinea	Crimson-winged finch	чечевичник краснокрылый	
Riparia riparia	Sand martin	береговушка	
Saxicola rubetra	Whinchat	луговой чекан	
Saxicola torquata	Stonechat	черноголовый чекан	
Sterna hirundo	Common tern	обыкновенная крачка	
Sterna paradisaea	Arctic tern	полярная крачка	
Tadorna ferruginea	Ruddy shelduck	огарь	
Tetraogallus altaicus	Altai snowcock	алтайский улар	III
Tringa glareola	Wood sandpiper	фифи	
Tringa totanus	Common redshank	травник	
Turdus atrogularis	Black-throated thrush	чернозобый дрозд	
Turdus philomelos	Song thrush	певчий дрозд	
Turdus ruficollis	Red throated thrush	темнозобый дрозд	
Upupa epops	Hoopoe	удод	
Vanellus vanellus	Lapwing	чибис	

Appendix 4: Mammal species recorded by Biosphere Expeditions in the Altai (2007).

Scientific name	English name	Русское название	Nature conservation status in the Red Data Book of the Altai Republic. Природоохранный статус в Красной книге Республики Алтай
Citellus undulatus	Arctic ground squirrel	длиннохвостый суслик	
Lepus timidus	Arctic or mountain hare	заяц-беляк	
Ovis ammon	Argali sheep	горный баран, аргали	I
Lutra lutra	Common otter	выдра	III
Vulpes corsac	Corsac or steppe fox	корсак	
Ochotona daurica	Daurian pika	даурская пищуха	
Marmota baibacina	Grey or Altai marmot	серый, или алтайский, сурок	
Alticola macrotis	Large-eared or Altai vole	большеухая горная полевка	
Felis manul	Manul	манул	II
Cervus elaphus	Maral deer	марал	
Allactaga sibirica	Mongolian five-toed jerboa	тушканчик-прыгун	III
Ochotona pricei	Mongolian pika	монгольская пищуха	
Mustela altaica	Mountain or Altai weasel	солонгой	
Ochotona alpina	Northern pika	алтайская пищуха	
Sciurus vulgaris	Northern red squirrell	обыкновенная белка	
Clethrionomys rutilus	Northern red-backed vole	рыжая полевка	
Vulpes vulpes	Red fox	обыкновенная лисица	
Capreolus capreolus	Roe deer	косуля	
Eutamias sibiricus	Siberian chipmunk	бурундук	
Capra sibirica	Siberian ibex	сибирский горный козел	
Talpa altaica	Siberian or Altai mole	сибирский крот	
Uncia uncia	snow leopard	снежный барс, ирбис	I
Mustela erminea	Stoat	горностай	
Lepus tolai	Tolai hare	заяц-толай	
Sus scrofa	Wild boar	дикий кабан	
Canis lupus	Wolf	волк	

Appendix 5: Plants identified and/or collected by expedition team member Christine Newell (2007). See also summary plant list in 2006 expedition report.

Family	Genus	Species	Authority (Location of Type Specimen)	Common name	Source	Collection notes
Apiaceae	*Archangelica*	*decurrens*	Ldb. (LE)		1 (16)	8/8/07 Hillside, back valley
	Aulacospermum	*anomalum*	Ldb. (LE)		1 (16)	4/8/07 Hillside east of base camp
	Angelica	*tenuifolia*			1 (16)	High meadows, back valley
	Libanotis	*condensata*	(L.) Crantz (London)		1 (16)	3/8/07 Edge of steppe near base camp
	Stenocoelium	*athamantoides*	(M.B.) Ldb. (LE)		1 (16)	4/8/07 Hillside east of base camp
Asteraceae	*Artemisia*	*macrocephala*	JacQ. (P)	Mugwort	1 (26)	29/7/07 Shale banks along Bugazon River
	Crepis	*bungei*	Ldb. (LE)	Hawk's beard	1 (29)	5/8/07 Woods near base camp
	Crepis	*crocea*	(Lam.)Babc. (UC?)	Hawk's beard	1 (29)	4/8/07 Hillside scree east of base camp ~2600m
	Crepis	*karelinii*	M.Pop.et Schischk. (LE)	Hawk's beard	1 (29)	31/7/07 Mt Tapduair, 3223m
	Crepis	*nana*	Richardson (Canada)	Hawk's beard	1 (29)	9/7/04 #7 River valley on way to Mt. Saylyugem
	Erigeron	*altaicus*	M.Pop.(LE?)	Fleabane	1(25)	1/8/07 Meadow, back valley
	Erigeron	*petiolaris*	Vierh. (LE)	Fleabane	1(25)	11/8/07 Hillside, Ir Bestu
	Heteropappus	*distortus*	(Turcz.)Tamamsch (LE)		1 (25)	28/7/07 Steppe
	Saussurea	*amara*	(L.) DC		1 (27)	30/7/07 Lakes area in steppe
	Saussurea	*glacialis*	Herd. (LE)		1 (27)	11/8/07 Ridgetop, Ir Bestu, ~3000m
	Saussurea	*pricei*	Simps. (LE)		1 (27)	28/7/07 Hillside, Ir Bestu
	Saussurea	*salicilifolia*	(L.) DC (LE)		1 (27)	5/8/07 Stony bank at base camp
	Saussurea	*stubendorffii*	Herd. (LE)		1 (27)	3/8/07 Woods near base camp
	Saussurea	*sukaczevii*	Lipsch. (LE)		1 (27)	7/8/03 #2 Hillside by base camp
	Scorzonera	*radiata*	Fisch. (LE)		1 (29)	8/7/05 Edge of steppe near base camp
	Taraxacum	*altaicum*	Schischk. (LE)	Dandelion	1 (29)	26/7/07 Hillside behind base camp
	Tragopogon	*orientalis*		Goat's beard	1 (29)	12/7/06Winter station river valley
	Youngia	*diversifolia*	(Ldb.) Ldb. (LE)		1 (29)	3/8/07 Dry river bank in woods near base camp
	Youngia	*tenuicaulis*	(Babc.&Steb.)Czer. (UC)		1 (29)	29/7/07 Steppe, standing stone burial grounds

Family	Genus	Species	Authority (Location of Type Specimen)	Common name	Source	Collection notes
Brassicaceae	*Draba*	*sibirica*	(Pall.) Thellung (LE?)	Whitlowgrass	1 (8)	1/8/07 Hillside, back valley
Campanulaceae	*Campanula*	*rotundifolia*	L. (London)	Harebell	1 (24)	8/8/07 Hillside, back valley
Caryophyllaceae	*Cerastium*	*arvense*	L. (London)	Field Mouse-ear	1 (6)	3/8/07 Steppe edge near base camp
	Gypsophila	*desertorum*	(Bge.)Fenzl. (LE)	Baby's breath	1 (6)	10/8/07 Chuya steppe
	Stellaria	*bungeana*	Fenzl. (LE)	Stitchwort	1 (6)	6/8/07 Stream valley near base camp
	Stellaria	*petraea*	Bge. (LE)	Stitchwort	1 (6)	30/7/07 Lakes area in steppe
	Stellaria	*peduncularis*	Bge. (LE)	Stitchwort	1 (6)	3/8/07 Steppe edge near base camp
Convolvulaceae	*Convolvulus*	*ammanii*	Descr. (Paris)	Bindweed	1 (19)	30/7/07 Lakes area in steppe
Crassulaceae	*Rhodiola*	*algida*	(Ldb.)Fisch.et Mey. (LE)		1 (9)	11/8/07 River valley, Ir Bestu
Fabaceae	*Astragalus*	*dilutus*	Bge. (LE)	Milk-vetch	1 (12)	12/8/07 Stony steppe near Kosh Agach
Juncaginaceae	*Triglochin*	*palustre*	L. (London)	Marsh arrowgrass	1 (1)	30/7/07 Marshland in lakes area in steppe
Lamiaceae	*Dracocephalum*	*bungeanum*	Schischk.et Serg. (LE)		1 (20)	31/7/07 Hillside, Mt Tapduair
Liliaceae	*Allium*	*schoenoprasum*	L.	Chives	1 (4)	11/8/07 River bank, Ir Bestu
Poaceae	*Roegneria*	*schrenkiana*	(Fisch. et Mey.)Nevski (LE)		1 (2)	28/7/07 Hillside, Ir Bestu
	Poa	*alpina*	L. (London)	Alpine meadowgrass	1 (2)	26/7/07 Hillside above base camp
Potamogetonaceae	*Potamogeton*	*praelongus*	Wulf.	Pondweed	1 (1)	30/7/07 Lake, lakes area in steppe

Family	Genus	Species	Authority (Location of Type Specimen)	Common name	Source	Collection notes
Ranunculaceae	*Aconitum*	*altaicum*	Steinb. (LE)	Monk's-hood	1 (7)	7/7/06 Wood edge near base camp
	Aconitum	*anthora*	L. (London)	Monk's-hood	1 (7)	8/8/07 Stream valley, back valley
	Batrachium	*mongolicum*	(Kryl.)V.Krecz	Water crowfoot	1 (7)	30/7/07 River, lakes area in steppe
	Batrachium	*trichophyllum*	(Chaix)van der Bosche	Water crowfoot	1 (7)	30/7/07 River, lakes area in steppe
	Halerpestes	*salsuginosa*	(Pall.)Green (LE)		1 (7)	30/7/07 Lakes area in steppe
	Ranunculus	*pedatus*	Waldst.et Kit (Budapest)	Buttercup	1 (7)	10/7/04 #3 Steppe margin near wood, base camp
	Ranunculus	*pulchellus*	C.A.M. (LE)	Buttercup	1 (7)	28/7/07 River valley, Ir Bestu
	Ranunculus	*radicans*	C.A.M. (LE)	Buttercup	1 (7)	30/7/07 Lakes area in steppe
Rosaceae	*Cotoneaster*	*uniflora*	Bge. (LE)	Cotoneaster	1 (9)	13/8/07 River valley opposite Tabajoc
Salicaceae	*Salix*	*Turczaninowii*	Laksch. Schedae (LE)	Willow	1 (5)	28/7/07 Hillside, Ir Bestu
Saxifragaceae	*Saxifraga*	*caespitosa*	L. (London)	Saxifrage	1 (9)	26/7/07 Hillside above base camp
Scrophulariaceae	*Pedicularis*	*longiflora*	Rudolph (LE)	Lousewort	1 (22)	29/7/07 Marshland along Bugazon River

Sources

1. Flora of the USSR - Initiated by VL Komarov. Israel Program for Scientific Translations, Jerusalem 1967
2. Common name of genera: Stace, C. New Flora of the British Isles. 2nd. Edition 1997
3. LE: Botanical Institute of the Academy of Sciences of the USSR

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Pictures of selected plants © Christine Newell.

Crepis bungei

Crepis crocea

Archangelica decurrens

Aulacospermum anomalum

Crepis nana

Heteropappus distortus

Saussurea salicilifolia

Saussurea stubendorffii

Saussurea pricei

Stenocoelium athamantoides

Saussurea amara

Saussurea glacialis

Batrachium mongolicum

Astragalus dilutus

Aconitum anthora

Campanula rotundifolia

Convolvulus ammannii

Cotoneaster uniflora

Dracocephalum bungeanum

Pedicularis longiflora

Libanotis condensata

Angelica tenuifolia

Saxifraga caepitosa

Appendix 6: Expedition diary by Andrew Stronach

1 July

This is the first entry for the 2007 expedition to Altai. Yesterday, I travelled to Germany from Scotland, meeting with Matthias (Biosphere Expeditions' director) in England. We spent today, packing all sorts of things. GPS and binoculars, mist nets for catching birds which will allow us to identify many birds we have probably not even seen before. Jackets for the Russian staff as it will almost certainly snow on occasion during the expedition; it's usually lovely summer weather but we all need to be properly equipped – sunscreen and waterproofs, hot and cold, sunshine and snow – you name it! We have also been sorting out paperwork as the Russian authorities are very particular about that. Tomorrow, we both fly to Moscow and then on to Novosibirsk to prepare the vehicles and supplies for those of you joining us for the first slot. I very much look forward to meeting you, both first timers and old hands so we can do some great research work and see some amazing sights. Can't wait….

Andy Stronach
Expedition leader

3 July – Moscow

At Moscow's Shermetyevo airport, Matthias and I got the free transfer bus to the other terminal for our domestic flight to Novosibirsk. There are lots of taxi drivers offering "special rates" for the transfer, special for them that is, but if you go just outside the arrivals hall you will find the free "avtobus transfer".
The Moscow – Novosibirsk flight passed very uneventfully in our somewhat comatosed sleep-deprived state and the renovated airport made baggage claim a delight compared to the stampede and crush that was baggage claim of old. We were met at the airport by Tim; for the second time in barely ten minutes, I was again delighted, this time because his English was very good, which is really lucky as he is our interpreter for the expedition!

4 July – Novosibirsk

Spent all day at the Land Rover dealer in Novosibirsk, where all four of our vehicles were there waiting for us; two brand new Discoverys and two almost new Defenders – yes, you guessed it, I was delighted. Spent ages going through the mountain of paperwork making sure everyone has authorisation and insurance to drive the vehicles, that they are properly registered, "MOTed" and that they are free from defects – it's all looking good. All of the vehicles have CD players and as we have a 1000 km drive to base camp near the Mongolian border, it might be an idea to take a few CDs so that you can embarrass yourself with your choice of music! Matthias is into opera, but luckily does not have any CDs with him, as I can't stand the screeching. So do please bring some CDs of your own. Having said that, there's no real need as I've got my Mongolian throat singing CD that we can play the whole way there to get us in the groove ;-)))

6 July – Novosibirsk

Spent some more time on the vehicles today and we now have all four prepped, full of diesel and ready to go. I'm looking forward to meeting team members tomorrow at 20:00 in the lobby of Hotel Central to go for an informal dinner (we'll do the same for slots 2 and 3).

If anyone needs to get in touch my mobile phone number for the duration of the expedition is +7 913 4540878. Please remember that this is for emergency communication only (such as missing a flight and being late for assembly or emergency information from home). Whilst I am at base camp, you will not be able to phone me. Instead send an SMS, which I can pick up at times when in the right place in the study site, so expect any reply to take a few days.

Anyway, really looking forward to getting out of hot and sticky Novosibirsk now and into the mountains. You probably won't hear from me again until we're back in Novosibirsk in two weeks time.

Wish us luck for the surveys.

7 July – Novosibirsk

Many of the expedition team members arrived early in the morning, all others by the end of the day; the greeting they received was, a little unusual. Today in Novosibirsk, there is a pagan festival in honour of Ivan Copal, the god of water, where people's right to wash, be clean and free from disease is celebrated. This very solemn and important festival is played out in a very practical manner; basically everyone in Novosibirsk gets soaked! Gangs of kids wander around ambushing innocent pedestrians with buckets of water, drivers squirt other drivers with water pistols if they have been foolish enough to leave their windows down and anyone else quick enough to dodge that falls victim to water balloons.

In the evening, the expedition team got together for a meal in “Jelly Belly” restaurant; it does not translate very well, but does serve great local food. It was good to have a chat and begin to find out a little about everyone. After that, we all squelched our way back to the hotel for a sleep before the long drive to Anoz.

8 July - Novosibirsk to Anoz

We all (almost all!) got up early and had our bags packed into the vehicles for 07.00 when the breakfast buffet opened in Hotel Central. After breakfast, we all sang happy birthday to Marianne, who was duly embarrassed and then jumped into our vehicles and headed off. The 500 km drive to Anoz was over mostly flat agricultural land, but the massive roadside verges filled with wild flowers were a delight to look on as we trundled along. Lunch stop was at a roadside honey market where dozens of stallholders sold every conceivable kind of honey, all stacked up high on groaning benches. “Bleenies” - fresh blueberries, strawberries or raspberries wrapped in a crepe and kartoshka – potato or cabbage “pasties” were the order of the day; afterwards we all rolled back to the vehicles and were on our way again.

Arriving at Anoz, it was great to see Roman (our mountain guide) and especially Nina (cos she’s the cook!) again. Nina promptly outdid herself, after dinner, presenting Marianne with a delicious birthday cake. Marianne later said this day spent with us, had been her best birthday ever; poor girl!

9 July - Anoz to basecamp

Where yesterday had been flat and agricultural today was mountainous and wild. It seems we have now crossed some kind of line on the map, yesterday people had European features, now the locals look decidedly Mongolian and we no longer blend in. Mountains have larch trees, cliffs, scree, wildflower meadows or glaciers. Rivers are crossed on wooden bridges. As the day passes, we gain height reaching high arid steppe late afternoon and finally base camp at 20.00. It’s good to be back…...

10 July

Today is spent sorting kit, explaining the camp set up, going through and making sure everyone understands the risk assessment, doing some training and enjoying the fresh mountain air as eagles soar high above.

11 July

The drivers amongst the expedition team were subjected to a physics lesson covering such exciting subjects as the difference between static and dynamic friction, momentum and slip, and they thought they were going to be surveying snow leopards! Eventually I decided to let them loose with our Land Rovers and everyone got on great climbing steep slopes, descending steep slopes, crossing rivers and crawling over boulders. Marianne was understandably a little nervous never having driven off road before, but did great with no problems or mistakes whatsoever – what a star.

Matthias thought the physics had not been taken seriously enough, so got stuck into a lecture on geostationary satellites, caesium clocks and transverse mercator projection mapping. He tried to disguise this as GPS, navigation, map reading practice for the surveys, but I doubt if anyone fell for it.

Volodya, our scientist, got in on the act too, but being a nice guy taught something useful; how to identify animal tracks and signs. By the end of the day everyone was well and truly ready to go anywhere and do some great survey work, but most importantly to do it all safely.

12 July

Matthias went exploring to “snow leopard valley”, a three hour drive, with Ute and Robin thinking it might be a good place for a snow leopard expedition to spend some time - pure genius!

Meanwhile, everyone else went out on their first proper survey, driving half an hour across the steppe and through a small river before walking up a valley. Where we parked the vehicles, there were dense woods of Siberian larch, full of vocal but well hidden birds, any open areas being filled, and I do mean filled, with a great profusion and variety of flowers. As we progressed up the valley the trees thinned, the flowers changed and we passed through an area jam packed with dark throated thrushes – beautiful birds with striking russet throats. The high point of the survey (in both senses) was the saddle at the valley end at 2700 m with great views of the surrounding mountains; or maybe it was finding a beautiful Siberian viper, only the third record for the expedition; or maybe it was finding sign of wolf. Lots of great sights and experiences and lots of practice and learning in sign identification – a good day.

13 July

Volodya with Jules, Marianne, Roman, Ute, Iain, Silvan and Tim set off on an overnight trip to carry out surveys in “snow leopard valley” whilst Matthias with Malika, Stefan and Jennifer went alpine, climbing and surveying the surrounding mountains.

When we finally got rid of them from base camp, Robin, David, Roger and myself set up four mist nets which we have never done on the expedition before, hoping to catch some elusive bird species that we have not recorded before. Having spent hours untangling mist nets, we missed the best part of the day and ended up only catching one bird – however, it was the first record of the species for the expedition, an Arctic warbler. In the afternoon, we went looking for a couple of lakes that looked very interesting, but due to the very large scale and possibly inaccurate maps, we could not fine the track we were looking for to lead us there; however, on our alternate route we did see a dead cow (slightly interesting) and 13 rare cinereous vultures (very interesting!).

14 July

Robin, David, Rodger and I got up early to be greeted by a beautiful sunny morning, clear of cloud and with views across the steppe of snow clad mountains to the north west in the far distance. Two of the mist nets we had got up to use were unusable as they were on the far side of the stream, which had risen dramatically in the night, but with the two remaining, we caught two arctic warblers and a beautiful yellow wagtail. After a lovely breakfast of omelette from Nina (I’m sure we are her favourites) we drove to Bugazon river in the middle of the steppe and set up our mist nets in the flood plain forest by its banks. We had an early success, catching in our nets a serlik; a very impressive animal, shiny black and weighing in at around a ton – yes we managed to catch a yak/cow cross! No worries about running out of food any more I guess.

15 July

The overnight survey troupe returns with tales of torrential rain, a Land Rover bogged down to its axle and recovered, beautiful mountain valleys and vistas, yurt interviews of herders who have heard snow leopard roar in the valley and seen ibex and argali, two of its main prey species. Matthias’ alpine group climbed a 3425 m peak and could look all the way into China, Mongolia and Kazakhstan. They may even have found the first sign of snow leopard this year in the form of two tracks in a snow field high up and underneath the peak. The tracks were old and the sun had melted them a few times already, so they were pretty undefined, but they are down on our datasheets as “snow leopard track ?”.

Down in the valley Volodya’s group conducted interviews with local herders and surveyed a couple of valleys, which look very promising – so plenty of work to do for the next couple of groups. When exiting the valley they managed to get the Land Rover buried up to its axles, but dug it out in a good team effort to arrive somewhat late and covered in mud at the meeting point!

16 July

Matthias gets himself into trouble with the border guards when trying to explore the other side of the snow leopard valley range in the Land Rover. Apparently he is in the wrong area for his permit. He only gets two hours down the road and then has to spend the rest of the day and night explaining to various officers what he was doing “out of area”. He ends up with a “border violation warning” and a fine. Serves him right for wanting to go for a drive looking at spectacular mountain scenery on a beautiful clear day.

Meanwhile us law-abiding folk have a great day surveying some glacial lakes where we find lots of sign of argali and ibex.

17 July

We’re off again on an overnight survey, breaking camp in the morning. This survey takes us close to the Mongolian border to the other side of the Sailugiem range that our base camp is in. It’s an area of spectacular wide open steppe grasslands and high mountains with great views of Chikachova ridge, which is the border to Mongolia. Put some antelopes and zebras on the steppe grasslands and it could almost be the African savannah – not what you would expect from Russia/Altai at all.

We set up our camp high on the mountainside and split up into two groups, but not without having conducted some more interviews on our way there. One group stays low and one goes high. The low group surveys glacial lakes and the high group heads towards Tapduair at 3500 m. Signs of argali and ibex abound including sleeping/resting depression high on one of Tapduair’s ridges.

The excitement of it all makes one member of the high group push herself hard on the ridge until she eventually collapses into a heap just below the summit. The rest of her group stay calm and execute a perfect rescue plan, bringing her down to a point where one of the Land Rovers can recover her and drive her back to base camp. In a dazed state our casualty is fed chocolates, glucose tablets, sweet tea and a hearty dinner until she comes back to life with a splitting headache and a great story to tell (at least the parts that she can remember!). Well done everyone for executing such a model mountain rescue mission!

18 July - Tapduair

After the excitement and exertion of the rescue last night, Iain, Malika, Stefan and myself had a long lie-in until 0800 before getting up to a beautiful morning by the three emerald glacial lakes to the east of Tapduair. The rain stopped as we got up and the air was wonderfully rich and earthy. After a breakfast of very squashed cheese and tomato sandwiches, we headed up a broad ridge towards Tapduair. Our first find of the day was an Altai accentor, a small rare bird only found in Altai that sang as we passed. As we climbed, we found lots of sign of animals; there was scat from argali, ibex, hare and Altai snowcock. However, the most exciting finds were four different groups of resting depressions where ibex or argali had scraped out small holes in the ground to sleep; these depressions ranged in number from 12 to 18, giving us a good idea of the size of groups of these animals. At the top of the ridge, the views opened out - the ridge we had climbed the day before to the right, a knife edge ridge in front of us leading to Tapduair summit with its hanging glaciers in front of us and to the left, a huge valley system surrounded by rocky ridges and summits – under the sun and blue sky, we all just sat and looked, the most fantastic of views.

On exploring the ridge leading to Tapduair, we found many, many ibex and argali trails. A kestrel approached and landed a little further along the ridge whilst being mobbed by Mongolian finches, a lovely high altitude bird only seen around the peaks. Two years previously, Tessa, the expedition leader and scientist had seen a snow leopard in the area, so we spent a long time searching the many cliff ledges with our binoculars, but to no avail.

Having descended to our camp, we packed, returned to our vehicles and then drove the two and a half hours back to base camp. After some Russian champagne and a lovely last dinner prepared by Nina our expedition cook, we retired to our yurt and partied the night away – a fantastic last day.

19 July - basecamp to Anoz

After a 0700 breakfast, we set off for Anoz, leaving Nina, Volodya and Ilya at basecamp. Lunch was at the Tuvan restaurant and we spent a little time looking at the petroglyphs carved into the rock nearby. Deer, men with bow and arrows and what is probably mammoths were all there.

On getting back to the big city of Anoz (!) first stop was the ice-cream shop; it tasted so good, I just had to have a second one. The banya (Russian sauna) we had later was fantastic and made the skin feel wonderfully clean and fresh.

20 July - Anoz to Novosibirsk

As we left Anoz, we also left the mountains behind, driving through agricultural land with massive fields. However, the roadside verges were awash with blue vipers bugloss flowers, apparently a little later than last year. As we neared Novosibirsk, the traffic got heavier, towns and villages more frequent and the comments about people wishing they had just stayed at basecamp rained down constantly – maybe you'll all be back next year, I hope so……

21 July - Novosibirsk

Did some shopping and prepared a few things for the second slot. I'm looking forward to meeting everyone on slot two tonight; meeting in the Hotel Central lobby at 2000 before going for a meal. See you all there!

22 July Novosibirsk – Anoz

The 500 km drive took us about 8 hours, during which time we saw three crashes including a fatality; the drivers here are nuts.

23 July Anoz – basecamp

We got to the office in Gorno Altaisk just before it opened; the registration process took a while, so it was almost 11.00 before we left. We then had to get to Aktash before 1700 to obtain permissions to operate in various areas from another office there; we got there at 1630 but still did not get the permissions – Tim will have to go back to get them tomorrow, Russian bureaucracy is a wondrous thing.

24 July

Went through the risk assessment, the off-road driving course, how to use GPS and how to use the radios. All went well, not bad for one day!

25 July

Got up and just made it to the mess tent without drowning – wettest I've ever seen it here, hmmmmm. Volodya gave the introductory science talk after breakfast and as the weather had not improved and looked set for the day, we decided to do yurt interviews, but with a difference – no yurt! We all set off for Arzhan-Buguzun stopping to record mammal and bird sightings on the way. Today rapidly turned into 'Eagle Day', with many sightings of both imperial and steppe eagles, both soaring above us and sitting on a huge stick nest on a big crag; the birds golden crown glowing in the sun. On arrival at Arzhan–Buguzun where there are a number of sacred springs we were greeted by locals who were visiting the springs for a few days, camping, rejuvenating themselves in the sacred waters and socialising with friends and other visitors. We talked to many of the people there, asking them whether they had seen snow leopard and other animals and what they thought about them. When asked what he thought about snow leopard predating livestock such as sheep and goats, the local shaman said 'that's what happens to bad people!'. After much more talking, it became clear that everyone there valued wildlife and 'the old ways' where man and wildlife existed in some sort of balance. Many too, expressed a sense of frustration at being powerless to ensure wild places and wildlife were properly protected – kindred spirits indeed.

The long drive back to base camp was broken with a short stop at a carved standing stone marking a Turkic burial tomb from the 5th – 8th century, the carving of a man's face was probably that of the man buried there.

26 July - Mt. Kawshawlyou

After breakfast, we all set off together, walking west from base camp on our first full day out learning how to identify sign as well as carrying out a survey. Initially, we went through a Siberian larch forest full of birds singing in the beautiful morning sun that was such a contrast from yesterday's monsoon. Before emerging above the tree line, we had seen red squirrel and chipmunk as well as signs of other mammals. Above the tree line, we found fresh sign of Siberian ibex, less than a day old; scat, tracks, trails and wool; this was very good as we have not seen any ibex this year - yet. On reaching the top of the first ridge, the views out over the steppe opened up past the Buguzun river and towards Tapajok.

Further up, we heard what sounded like cow bells, but was in fact falling rocks! On close inspection of the cliffs where the sound had come from, we saw five ibex – at last! It was fantastic seeing them breeze up the crags and onto the horizon before they disappeared. After lunch, Alan and Gerald headed down from just over 3000 m and back to basecamp, everyone else headed up hill. We found old scat from what was wolf or snow leopard; we collected it for further investigation… We then climbed a little further to the top of Mt. Kawshawlyou where the views were really stunning; to the east, the glacier clad Chicachova range in Mongolia, to the west, our steppe, the Kosh Agash steppe and beyond the snow clad Chunsky range. Having managed to tear ourselves away from the views, we found lots more sign of ibex as we started our descent. On the way, I saw another ibex as it disappeared over a ridge; unfortunately no-one else saw it. We picked some wild onion leaves for Nina to use in salads, but the quality was not up to standard….everything had been going so well until then ;-)

27 July

Packed up the vehicles with tents, food and excitement and headed off to Irbestu's Snow Leopard Valley for Biosphere's first survey into uncharted territory. Stopped for lunch on the way near Ortelek by a small river where James spotted a cuckoo with what I'm sure was a cheese and onion wotsit in its beak; others thought it was a worm or grub – what do they know. With Peter at the wheel, we crossed the Kosh Agash steppe, which was very different from basecamp steppe – very stony and seemingly endless. Snow Leopard Valley's entrance was beautiful with lush green vegetation by the river and high cliffs either side. Just as we were arriving at our camp site, we saw 14 ibex on the cliffs, quite a welcome! We set up our tents whilst two rare lammergeyer vultures soared on the crags high above and three herders rode in on their horses with tales of snow leopard tracks seen in the winter.

28 July

After breakfast off a perfectly polished beautiful rock by the river, we split into two groups. Volodya with James, Martin, Peter, Christine, Alan and Guido headed up Tyesta (3861m) whilst Gerald, Tim and myself drove further up the Irbestu river (literally!) in the Defender. Guido spotted ibex on a ridge a little further up the valley from where Gerald, Tim and myself were. I've no idea how he saw them, they must have been 4 km from where he was! Having told us about them on the radio, we set off to investigate. We got to the cliffs and gave them a thorough check, Gerald on the telescope and me with my binoculars, but to no avail, they were gone. Further along the valley, we met a herder Victor; he had been totally alone, living in a small log cabin with only his dog for company for a month. He should have been relieved by his boss long before and wondered if he'd been forgotten about; it was his birthday the next day so I gave him my bar of chocolate. We talked to him about wildlife and he said he'd seen a group of ibex cross the valley 30 min earlier – must have been the ones Guido saw. Further up the river, we headed south west up a side valley as far as the Defender would take us – a long way. A half hour walk took us past a mixed group of sarlik (cow yak cross) and horses to glaciers and then back down along a small valley.filled with white-winged redstart and Mongolian finch. Unfortunately, due to the poor weather, Volodya's group had to abandon their survey.

29 July – "Day off"

Woke up to a monsoon! Our small stream by base camp had transformed into a raging torrent that was dragging boulders along with it, grinding and cracking. Venturing out for a walk or sightseeing did not appeal (!). However, on showing Christine (our botanist from Cambridge University) photos of a yellow flowered plant, she got very excited and had us at the site by the Buguzon river (which was surprisingly a bit lower than usual) in no time at all. The plant was still in flower and Christine identified it as a lousewort – much more beautiful than its name suggests. We spent some time by the river watching birds before lunch. Among the many birds we saw were six rough-legged buzzards, which should only be in our area in the winter; good bit of new information.

In the afternoon the risk of drowning when venturing out had reduced a little so a few brave souls went to have a look at some 7th century Turcic stone circles, carved stelae and burial tombs; there are a surprising number of these around and they add a whole other fascinating dimension to this lovely area.

30 July

Low cloud and rain this morning so we shelved our plans for the overnight trip to Tapduair, instead deciding to survey birds in the lakes on the steppe. On arrival at the Buguzon river that we had to cross, we were confronted by a raging torrent so took a detour to Kokorea where there is a bridge. Two new species for the expedition were white-winged tern that Christine saw and spoonbill that Guido spotted. On the lake we normally survey, the pair of Slavonian grebes that I had seen two weeks ago with tiny black and white chicks were now accompanied by juveniles that were in beautiful plumage like their parents; rusty ochre and black with a piercing red eye and yellow stripe on the head. After the birds, we headed to Marat's Isle; Marat is a local hunter/herder with whom last year's expedition leader, Tessa, went exploring/surveying on horseback for four days; an isle is a wooden version of a yurt built form round logs. We had planned to do our standard interview about snow leopards and their prey etc. but the conversation wandered off into many interesting directions over tea, bread and cheese in the course of an hour, actually two hours, or was it three??

31 July - Overnight trip to Tapduair

Weather glorious today, so packed the vehicles with tents and a big box of food and headed off for Tapduair. On arrival, we set up our tents; Volodya and Gerald headed off for one ridge, everyone else headed for another. Straight away we were finding lots of sign of animals, carnivore scat, argali tracks and more. Eagle eyed Alan spotted a fox running across the hill and out of sight. I set off to look for it and almost immediately, was confronted by two argali fewer than 150 m away. I looked at them, they looked at me; eventually, they ran off and the fox re-appeared, not a bad start to the day! We worked our way up Tapduair's south-east ridge line abreast, covering a huge amount of ground and finding a huge amount of sign: tracks, scat and resting depressions of both argali and ibex, a mountain hare ran off in front of us leaving its footprints in a patch of snow. The last saddle on the ridge at around 3200 m was a veritable motorway for ibex and argali, their tracks everywhere. Looking west across the valley with three turquoise glacial lakes, we could see Volodya and Gerald, little black specks on the bright white snow; I hope that when I'm 77 I can make it to 3300 m like Gerald – amazing! The last part of the ridge was more exposed with a steep scree slope to the west and a broken rocky cliff to the east (and a lammergeier vulture above). The way to the top was blocked by hanging glaciers, but we reached the summit 'plateau' at 3450 m (50 m below the summit) and had fantastic views all around of our core area, Chicachova mountain range on the Mongolian border and just about everywhere else too it seemed.

Having photographed ourselves and the views from every conceivable angle, we started to carefully pick our way back down. From about 3100 m on the ridge, Guido had a very tantalising sighting of an animal, the observation conditions were poor and it was a long way away so he was not at all sure what he had seen, something like wolf or snow leopard! We can't be sure, but it's a great result and certainly made for a very exciting day out!

1 August - Tapduair to basecamp

After the exertions of yesterday, we split into three groups and did short survey walks, again finding much sign of the snow leopards main prey species – ibex and argali. My mission for the day was to identify which species of snipe was in the area – there are four possible species and they all look pretty much identical, so I took lots of photos of them and will study them later, watch this space. On the drive back to base camp, the skies were amazing: deep blue with bits of wispy cirrus clouds and cumulus clouds. After an age filling in datasheets for the last two days, we set about the feast that Nina had prepared for us; thought I was going to explode. Later, in the yurt we had a number (!) of bottles of Russian champagne fresh from our cooler (the stream) as we chatted into the night about our adventures, past and future.

2 August - basecamp to Anoz

The weather decided to give us a send off of blue skies and sunshine; it always makes it more of a wrench to leave, the hills looked wonderful.

3 August - Anoz to Novosibirsk

A long drive today, filled with diary writing….

Looking forward to meeting everyone on the third slot 20.00 Saturday in the entrance lobby of the Hotel Central before dinner together if you wish.

4 August - Novosibirsk

Met all the team members for the third slot at 8 pm and then went for a fantastic Russian meal at Jelly Belly.

5 August - Novosibirsk to Anoz

Apart from myself falling asleep at the only junction on the 500 km drive and hence missing it (not driving at the time – only supposedly navigating!) we had an uneventful drive – just the way I like it.

6 August Anoz – Base

A familiar long drive through beautiful scenery, now with the addition of many people out cutting hay with scythes; great to see that industrialisation is not everywhere.

7 August - Base: Training Day

Did the off road driving course in which Jean Phillipe excelled having done a lot of driving in muddy conditions already. Also went over the use of GPS, map and compass and radios.

8 August - Argali hills and overnight camp to the back valleys

Decided to do the animal sign training ‘on the job’ so headed for the Argali hills by the back valleys. Working our way up a river, a boat might have been the natural choice for the journey, but our two Land Rover Defenders did a great job. Straight away on the survey Karen and Kevin found sign of argali and ibex as well as marmot, pika and other rodents. Unusually, the hills were gentle and rolling covered with a profusion of wild flowers indicating that grazing is not a problem here. Near the top Roman found a wonderfully clear and detailed fossil of a mollusc shell, later Katherine and I found brachiopods and marine mollusc – this at 2800 m in central Asia, about as far as it is possible to get from the sea on this planet.

9 August - Horseshoe ridge

After spending the night by a small stream underneath the horseshoe that was our objective for today, we had breakfast and set off. We climbed the ridge that got progressively steeper, rougher and more exposed. The views into the valley in the horseshoe where Volodya, Katherine, Karen and Kevin were wonderful with a turquoise glacial lake, hanging glaciers and rugged cliffs. As we picked our way up the ridge, we found lots of sign of argali whilst in the valley, the other group found sign of ibex. At dips in our ridge, natural crossing points, there were very well worn animal trails with sign such as resting depressions and wool. Then, suddenly, after one well used crossing point, there was no more sign at all, we were now really high at around 3100 m. After a slow climb to the summit under a blue sky and hot sun we had our lunch and enjoyed being in what was instantly my favourite spot in the whole of Altai; I'm afraid my grasp of English is inadequate to describe how beautiful it was.

10 August - Travel to Irbestu

After the rigours of yesterday and getting back late, we hade a late breakfast, discussed and recorded all the findings of the previous day and then set off for Irbestu. By far the most important part of the day was stopping at Kosh Agash on the way for ice cream – everyone attended to their duties most diligently! The Kosh Agash steppe on the way to Irbestu was a far more colourful place than two weeks ago, the recent rains having tempted out a host of purple and yellow flowers. Rivers, mud, ruts, rocks and steep slopes entertained us and our Land Rovers all the way to our camp site at the head of a side valley at 2700 m. Arriving at 8pm, we set up our tents, had dinner and then went to sleep in preparation for the next day.

11 August - Irbestu

Split into three groups, we surveyed three different areas around the head of our valley. Christine and Katherine went with me and we headed for the high peaks and glaciers. Accessing the high ground via a narrow rocky ridge we found lots of sign of ibex as well as many beautiful crimson-winged finches. Climbing over rocks the whole way we reached the high point of our survey at 3450 m to be greeted by endless views. Mount Belucha, covered with a thick rounded dome of ice, Altai's highest peak to the west, Mongolia, China and Kazakhstan around the south and everywhere peaks, glaciers and turquoise jewels of glacial lakes.

Each mountain range that we survey is very different, each with its own geology and its own flora and fauna. One example in Irbestu was a bird that we were very lucky to see and had not seen in Altai before, a nightjar that very obligingly sat in front of us for a while before whipping off at speed in the strong mountain winds. Shortly before getting back to camp, we turned a corner to be met by a group of 12 ibex; we froze and were very privileged to be able to watch them causally wander off up the hill only 150 m away from us, a fantastic way to end the day.

12 August - Run Away!

Got woken up at around 5am by very heavy rain, I had a look out of my tent and did not like the look of the weather, not only heavy but also set for the day. I decided it was time to leave before the rivers rose too high and impassible. Packed up quickly and left what were now snow covered mountains; we had no problems leaving the valley. Driving away across the steppe, Irbestu in the rear view mirror was hidden under a big black cloud.

13 August - Kamtytygem

A mountain area, west across the steppe from base camp, this area was first visited by Biosphere's Tessa and Roman last year when Tessa found a snow leopard scrape. Splitting into three groups, Katherine and myself headed up a very steep slope to access the ridge above. Having just passed the peak we got to a small crag at the bottom of which I noticed a skull and horns – ibex, these were very big horns and counting the ridges on the back of the horns the animal must have been about 11 years old when it died, perhaps a month before. There was a very strong smell by the horns, Katherine thought it smelt like her cat…… The only predators likely to kill such an animal are wolves, snow leopard and humans. Wolves normally defecate by their kill; we had a good look around but could see no such scat. Teeth marks on the skull can give clues to the identity of the killer, but the only clear marks were those of rodents gnawing the skull after the predator had finished its meal. A very intriguing find that may with further investigation conclusively identify the predator but for the moment is uncertain.

Revived by the excitement of our find, we headed off and straight away bumped into a group of about 20 Altai snowcock, an endemic bird species that are almost turkey sized. One of the birds displayed its tail feathers, spread out fan shaped it looked fantastic. Reaching the valley floor, we saw dipper in the stream, a new species for the expedition, lammergeyer vulture and lots of very bold Northern pika squeaking at us from the rocky slopes as we passed by.

14 August - Arzhan Buguzon sacred springs

As all our work this slot has been surveying in the mountains looking for animals and their sign, we decided to do some interviews today, this being important to get information on animals and also to gauge local opinions on wildlife and conservation. Arzhan Buguzon Sacred Springs is a holy place where locals go for a few days at a time to benefit from the healing springs there, to appreciate nature and to socialise, as such it was the perfect place for us to go and talk to lots of people about wildlife. One slight flaw in our plan was failing to appreciate that hay making activities would occupy the time of many people at this time of year; when I say many, I mean every man and his dog, and his cat, budgie, hamster and favourite cactus named Cyril. There was no-one there, the place that is usually full of people was totally deserted. Plan B; have a walk, go home, have dinner and pretend it never happened.

15 August - Packing Up

Christine, Katherine, Kevin, Volodya and Roman went surveying on Kosholu, finding much fresh Ibex sign as well as a few fossils before a snow shower persuaded them back to the shelter of base camp. Karen helped me with the packing in our mess tent as a few bold ground squirrels helped themselves to tea bags and other goodies out of our bins – got some great photos. Jean Phillipe and Tim arrived with Gulinara and set about dismantling our yurt – very sad to see it come down as it has been great chatting and warming up around its stove. Took the yurt back to its owner in Tobeler where lots of black-eared kites were loitering, looking for something to eat. On the way back, we picked up Boutagoss, Gulinara's niece whose name apparently means 'baby camels eyes' – aptly named. Lisa had prepared some lovely food for our last night at base camp, after which we had some champagne around the best camp fire we've ever had and under a star filled inky black sky; what better way to end our time here.

16 August - Base to Anoz

Having packed our belongings and dismantled the tents, we breakfasted on cake and other goodies left over from the previous night's festivities before heading off from base camp fro the last time. The weather has definitely changed in the last couple of days and though the weather was lovely on our departure it felt like it could change at any moment. The leaves on the dwarf birch are starting to turn brown, hay making will end soon and yurts are being taken off the steppe, even during the long drive to Anoz, all the road works that had been an inconvenience for the last six weeks, were now all completed in preparation for the winter.

17 August - Anoz to Novosibirsk

Set off from Anoz in heavy rain that soon became torrential; everyone glad that we were not out on top of a mountain surveying. Stopping at the honey market, we had piroshkies and delicious cherry bleenies for one last time. Loaded with all kinds of honey we set off again.

This concludes this year's expedition and I would like to say a big thank you to everyone involved. All this is only possible through your commitment and enthusiasm and I think we should all be proud of what has been achieved. We'll be back – as they say!

Andy Stronach.