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Expedition report

Surveying snow leopards and other animals in
the mountains of the Altai Republic, central Asia

Expedition dates: **20 June – 13 August 2004**

Report published: **February 2006**

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Abstract

This study was part of an expedition to the Altai mountains in the Kosh Agach region of the Altai Republic, run by Biosphere Expeditions from 20 June to 13 August 2004. The aim was to conduct a continuing 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, as well as relative abundance studies (SLIMS form 2), were conducted throughout the study period across the entire survey area (approximately 200 sq km). 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.

No evidence was found implying a resident animal and/or more than one snow leopard in the research area. The only finding of one rather old scat sample (very likely belonging to the species), shows that snow leopards recorded in the year before may have left the area, been poached or visit it only sporadically. However, surveys show that the habitat is varied and capable of sustaining a healthy prey base for snow leopard, 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. The survey area urgently needs protection but involving the local community 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 20 июня по 13 августа 2004 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). Интервью местных скотоводов также стало важной частью исследования.

Результаты предыдущего исследования данного района позволили сделать заключение о присутствии на этой территории, как минимум, одной взрослой особи. Находка лишь одного образца экскремента в 2004 г. позволяет предположить, что вид покинул рассматриваемую территорию или только временно ее посещает. Вместе с тем оценка подходящих для вида местообитаний (форма 2 SLIMS) показал, что имеется положительный потенциал для присутствия здесь снежного барса, чему способствует рельеф, растительность, слабая посещаемость мест скотоводами, пребывание потенциальных жертв (прежде всего, аргали и горного козла). Район исследования крайне нуждается в защите, однако, вовлечение в работу местного населения является необходимым условием для того, чтобы инициативы по созданию заповедника или национального парка могли быть реализованы.

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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 20 June to 13 August 2004. This expedition conducted a survey of snow leopards as well as their prey species like 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. Data collected by this expedition are important for the creation of a protected area, as the current lack of data on these flagship species is delaying any further action.

The Altai Republic sits in the very centre of central Asia between China, Mongolia, Kazakhstan, Russia and the Tuva Republic. The Altai mountains rise from 350 to 4500m 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 providing 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. As a result, the creation of a protected area has been much delayed for lack of data on important flagship species.

Little is known about the status and distribution of the globally endangered snow leopard in the area and its interaction with prey animals like the argali and Siberian ibex, and its reliance on smaller prey like marmots, ground squirrels and game birds. Information gathered by this expedition will provide data that can be used in the formulation of management and protection plans.

1.2. Research Area

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 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 Silugiem (3411 m), overshadow 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 steppe, 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.

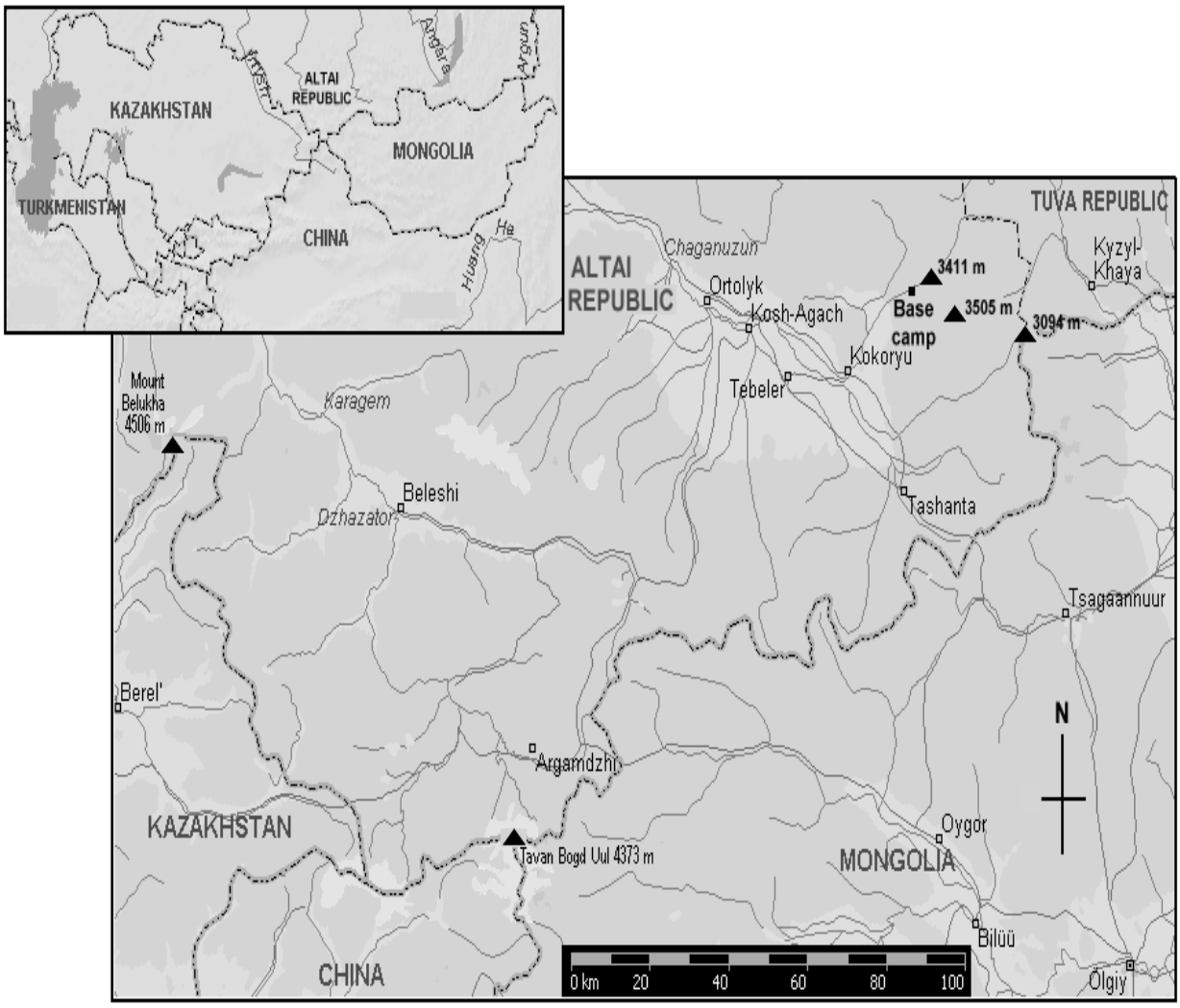

Fig. 1.2a. Map showing the Altai region and base camp.
The research area is within a 30 km radius of base camp.

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 climate is temperate continental with short, hot summers (during which the expedition will take place) and prolonged, cold winters. January temperatures range from -9°C to -31°C and July temperatures from +11°C to +35°C during the day, dropping to around zero during the night. The weather at base camp was very variable and in extreme cases turned from hot sunshine to a snow shower at temperatures below zero within the space of a few hours.

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

1.3. Dates

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

20 June - 2 July
4 July - 16 July
18 July - 30 July
1 - 13 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 and vegetarians were accommodated.

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, a radio mast and a GM950 base station were installed at base, and four Motorola GP320 hand-held and three GM340 mobile radios, all courtesy of Motorola, were used for communication. These worked extremely 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 dealer Avtoland of Novosibirsk, the expedition had the use of three Defender 110 Station Wagons and one Freelander.

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. Offroad 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 district hospital in the town of Kosh Agach (60 km from the camp). 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 were no major medical incidents. One person suffered a minor head injury.

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 & Scientist

Tessa McGregor was born in Paris and educated in England. She read biology at King's College, London and specialised in animal behaviour and ecology. Her life-long passion for wildlife and wild places motivated her personal and professional life. Tessa has worked in remote places as a wildlife biologist, environmentalist and in the media - TV, radio and journalism (including BBC Natural History Unit, Radio 4 and Discovery). She is an expert on tigers. Tessa joined Biosphere Expeditions in 2003 and currently lives in Scotland. Her other interests include horse riding, diving and photography.

1.7. Logistics Co-ordinators and Helpers

Sergey Kurgin of Sibalp, Novosibirsk, oversaw the setting up of base camp, recruited the Russian team and helped with registration in Gorno Altaisk.

The Asla Travel Group of Huntingdon, UK, provided important advice and logistical support in organising transport, transfers, visas, etc.

1.8. Expedition Team

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of all ages, nationalities and backgrounds.

20 June - 2 July

Ulrich Benker (Germany), Charlie Brock (UK), Ursula Dawson (UK), Robin Glegg (UK), Wendy Graham (UK), Brian Green (UK), Mike Hagen (Luxemburg), Franz Lerchenmueller (Germany), Sophia Miles (UK), Ute & Winfried Mohr (Germany), Michel Oellers & Angela van Etten (the Netherlands).

4 July - 16 July

Toril Andresen (Norway), Sarah Barrell (UK), Daniel Challender (UK), Katy Harris (UK), David Maisey (UK), Christine Newell (UK), Peter Pilbeam (UK), Georgina Treherne (UK).

18 July - 30 July

Chris Banks (UK), Roger Bunce (UK), Shelley Farrar (UK), Robert Kowalewski (UK), Leonid Kruglov (Russia), David Maisey (UK), Karen Neubert (Germany), Ulrich Niewind (Germany), Jane Orton (UK), Alexander Schwanz (Germany), Ian Wilson (UK).

1 - 13 August

Sally Atkinson (UK), Chris Banks (UK), Catherine Cassidy (UK), Graeme Down (UK), Eileen, Carlos & Todd Groth (USA), Poppy Ionides (UK), Robert Lynds (UK), Rachel Osborne (UK), Wolfram Schröter (Germany), Victoria Walker (UK).

Throughout the expedition

Olga Telinkova from Moscow and Anastasia Sevastyanova from Novosibirsk (translators). Andrei (driver and also unofficial archaeological advisor and fund of knowledge about the region). Oleg Shiryaev and Victor (camp helpers and mountain guides). Tolia (camp helper). Nadya Yanova (cook).

1.9. Expedition Budget

Each team member paid towards expedition costs a contribution of £1100 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	59,244	
Expenditure		% of which spent directly on project
Base camp and food includes all meals, base camp equipment	6,323	100
Transport includes fuel, vehicle maintenance	2,122	100
Equipment and hardware includes research materials, research gear	2,670	approx. 85
Biosphere Expeditions staff includes salaries, travel and expenses to Novosibirsk	7,140	100
Local staff includes salaries, travel and expenses, Biosphere Expedition tips, gifts	7,540	100
Administration includes bribes, registration fees, sundries, etc	2,654	100
Logistics & co-ordination Payment to Sibalp	6,733	100
Team recruitment Altai as estimated % of PR costs for Biosphere Expeditions	4,800	100
Income – Expenditure (unadjusted)	19,262	
Income – Expenditure (adjusted to % spent on project)	19,663	
Total percentage spent directly on project	67%	

1.10. Acknowledgements

This study was conducted by Biosphere Expeditions which runs wildlife conservation expeditions all over the globe. Without our expedition team members, who are listed above and who provided an expedition contribution and gave up their spare time to work as research assistants, none of this research would have been possible. The support team and staff, also mentioned above, were central to making it all work on the ground. Thank you to all of you and the ones we have not managed to mention by name (you know who you are) for making it all come true. Biosphere Expeditions would also like to thank Land Rover, Motorola, Buff®, Cotswold Outdoor, Globetrotter Ausrüstung and Gerald Arnhold for their sponsorship.

1.11. 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.

2. Snow Leopard & Prey Survey

Volodymyr Tytar
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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, Russia 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 Russia 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), 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 was chosen for several reasons including: (1) the area was as yet poorly surveyed for snow leopard; (2) map study suggested 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.

The study site totaled approximately 200 sq km and was delineated by geographical features (rivers 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 suffered from the lowest levels of human disturbance. The survey sites were accessed by Land Rover Defender (or on foot if near base camp). All surveys were conducted on foot. Base camp was situated in a valley, at the entrance to the core area, below the mountain of Silugiem. It afforded the necessary shelter and fresh water source needed by the expedition.

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. Methodology

2.3.1. Snow leopard presence-absence survey

Presence-absence surveys of snow leopard and prey (SLIMS Form 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 judgements 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 data forms to reach a judgement. 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 judgements 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. Over time, as survey conclusions are mapped out, trends will emerge. It is estimated that it will take at least three years for these trends to become clear for the Biosphere Expeditions Altai survey area.

Snow leopard presence can be detected by sign, i.e. pugmarks (tracks), scrapes, faeces (scat), urination and rock scent spray. 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.

2.3.2. 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, musk deer, marmot, pika, hare and game birds). The same search sites were used for snow leopard and for prey.

2.3.3. Interviews with semi-nomadic local herders

Interviews with local people played an important part in the research. Interviews were conducted at regular intervals throughout the survey period and over the whole survey area. The quality of information obtained varied with interviewees. Economic status and length of herding tradition within the family were particularly important factors. It was often not possible to conduct formal interviews and some families were questioned regularly throughout the expedition.

2.3.4. Additional surveys

Evidence of other carnivores sharing snow leopard habitat was also recorded as part of the SLIMS survey. These were wolf, fox, lynx and manul. Additional non-invasive methods planned for this study were camera trapping and faecal analysis.

2.4. Results

2.4.1. Snow leopard presence-absence survey

From 23 June to 9 August 2004 a total of 42 snow leopard presence-absence surveys were carried out. The average length of one survey route was 7.5 km, and an average of 6.5 hours was needed for making an inspection. Elevations ranged from 1984 m to 3172 m. The dominant landscape surveyed in the area consisted of steep and very steep slopes (SROL), narrow valleys (NVAL) and broken terrain (BTER) met, respectively, in 26.4, 25.3 and 24.3% of all cases.

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), but the wet weather and occasional snowfall made finding tracks "easier" than had been anticipated. Nevertheless, no tracks were discovered in 2004.

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 frequent snowfall throughout much of the survey period also reduced the possibility of finding scrapes. No scrapes were discovered in 2004.

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. One supposed snow leopard scat not associated with a scrape and dry (meaning it could be fairly old, possibly a few months) was found over the whole survey period in a rock-dominated habitat not far from the Talduair Summit (49^{o}57.599 N, 89^{o}19.039 E, 3202 m). This sample together with scat samples of other carnivores collected in the field were stored in sample tubes and preserved in ethanol. They were brought back to the UK (no CITES permits are needed for importing faecal samples) and sent to Brunel University for DNA analysis. Results are expected within a few years only, as funding for the analysis and laboratory time are scarce.

Urine: Urine can be deposited on scrape piles and is commonly deposited along regular paths or trails. No signs of urination were found during the survey period. Lack of trails and difficulty in finding scrapes were a contributing factor.

Scent spray: Snow leopards spray-mark the faces of upright or overhanging boulders and the base of cliffs. Some sites are periodically revisited and re-sprayed (mainly along trails). The majority of spray sites will have one or more scrapes within a distance of a few meters. No scent-sprays were found during the survey period. Lack of trails and suitable upright or overhanging boulders were a contributing factor.

Claw rakes: These are occasionally left on a rock face, log or upright tree trunk. No claw rakes were found during the survey period.

2.4.2. Threats to snow leopard

In the course of the presence-absence survey an account was taken of human-induced factors considered to be threatening to snow leopard presence in the area. Grazing activities turn out to be common and widespread, signs of grazing (primarily domestic livestock droppings, usually old and weathered) were recorded in 30 out of the 42 surveys (around 70%) up to an altitude of 2950 m, and although most of these records are confined to the lower mountains and valley floor, occasional horse droppings found at higher altitudes indicate sporadic human presence all over the area. Other signs of human presence and disturbance in smaller numbers included findings of bullet cases, trenches dug by hunters for shooting ibex, vehicle tracks and people coming in to harvest wild onions.

2.4.3. Snow leopard relative abundance survey

17 such surveys were carried out from 11 June to 9 August at elevations ranging from 2134 to 3172 m. The length of the survey routes varied between 171 and 3449 m (average of 745.1 m). Transect summaries are presented in Table 1 and Fig.1, allowing habitat evaluations to be undertaken.

Table 2.4.3a. Transect summary (in %) for relative abundance survey (terrain features and grazing status).

	Ridgeline	Hillside	Valley bottom	Terrace	Streambed	Barren	Grass	Shrub	Forest	Flat	Rolling	Slightly broken	Moderately broken	Very broken	Year-round	Seasonal	Non-grazing
Dominant topographic feature	**21**	**32**	5	5	**37**												
Primary habitat type						**59**	**22**	15	4								
Ruggedness										11	0	6	**39**	**44**			
Grazing status															0	28	**72**

As evident from the table above, habitat surveyed for snow leopard relative abundance is characterized by a diverse topography consisting of a mosaic of hillsides and ridges intersected by numerous stream beds, often blocked by large boulders and piles of rock debris. Much of the landscape is very broken and barren, patches of grass appear where areas are less broken and a soil layer may develop.

The relative inaccessibility and poor vegetation make the area uninteresting to herders, so livestock grazing, if any, is fairly sporadic and limited to seasonal.

Fig.2.4.3a shows records of potential prey species. 47% 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 Altai marmot make up another 47% of the records. Single records (grouped in the 'other' category) have been made of maral, wild boar and the Arctic ground squirrel.

2.4.4. Prey base survey

Signs of prey species in both presence/absence and relative abundance surveys were fairly abundant and widespread.

A total of 73 signs of argali were recorded. These included faeces (30 cases), tracks (20), pieces of wool (6), bone remains, horns etc. (4), resting depressions ('beds') found in five places. Argali were also seen between altitudes of 2351 and 3027 m for a total of eight times in single and small groups numbering up to six animals. However, the number of 'beds' in one place may be indicating that herds in some cases are consisting of a larger number of individuals; it may also be the case that individual smaller groups gather to spend the night in one larger group. On one occasion, for instance, up to 50 'beds' were found together in one place (49°57.111 N, 89°19.225 E, elevation 3065 m). The condition of the droppings left beside the 'beds' (animals seem to have been defecating while resting in these 'beds') indicate that the animals had been spending time being together. Of course, it is most likely that the real number of animals in this and similar cases is fewer than the number of recorded 'beds'. One indication of this may be that droppings were found only alongside 35 'beds'. The larger length of these were measured by a tape and showed an average of 92.6±2.0 cm, σ = 11.8. The normal distribution of the measured 'bed' size (*chi-square* = 4.28, *d.f.* = 2, *p* = 0.12) may indicate that all the animals were of one or closely related age groups.

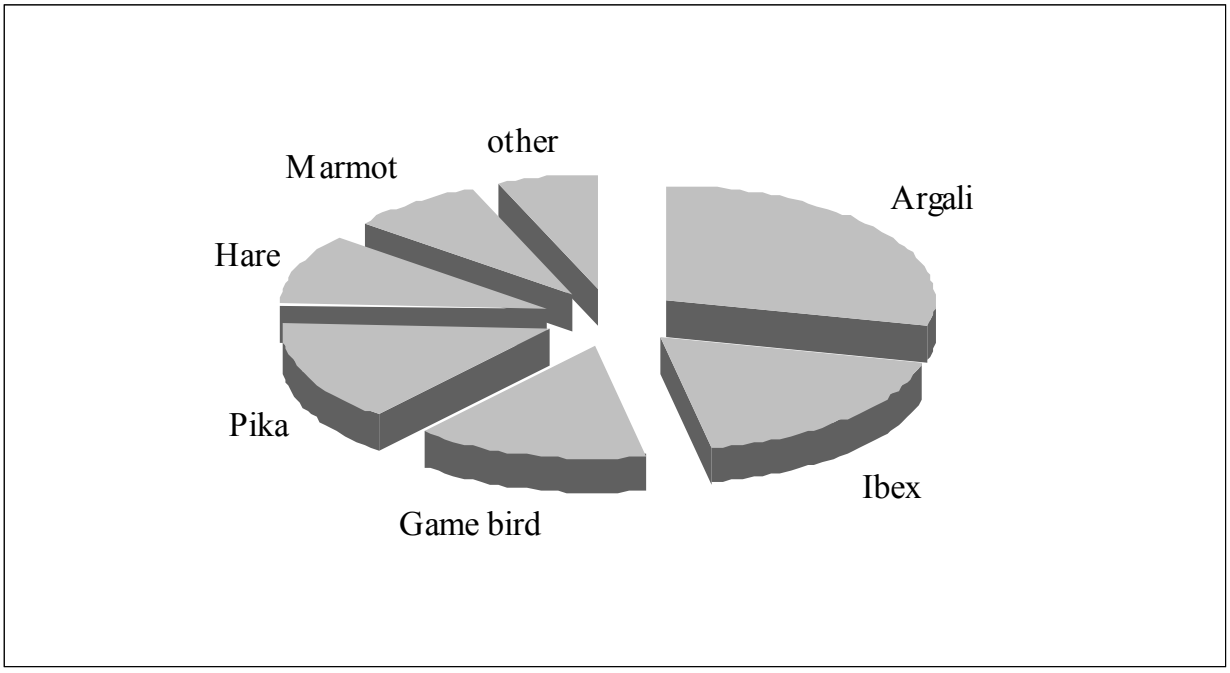

Figure 2.4.4a. Transect summary for the relative abundance survey (potential prey species).

Signs also indicate the altitudes at which the animals are met, highlighting the area as a potential habitat for the snow leopard. These (pooled with encounters of argali) occurred between 2167 and 3217 m (a vertical range of 1050 m). A separate account of old and fresh signs of argali (primarily faeces and footprints; encounters too considered as 'fresh signs') shows that animals at the time of the survey seem to have been occupying somewhat higher altitudes than some time before. Certain evidence for such a conclusion is the difference (t = 2.52, p = 0.015) between the average altitudes for the records of these categories of signs: fresh signs are found at an average altitude of 2827±46 m (between 2351 and 3217 m), whereas old signs are found at an average altitude of 2678±37 m (between 2167 and 3079); however that may be, the shift between the altitudes is not much, around 150 m.

A total of 22 signs of Siberian ibex were recorded. These included faeces records (12), footprints (5), resting depressions, horns etc. In three documented cases animals were seen between altitudes of 2452 and 2840 m in numbers between two and seven. The bulk of records were made between the altitudes of 2356 and 3066 m. As for argali, it is possible to make a separate account of old and fresh signs; however no difference (t = 0.14, p = 0.89) was revealed between the average altitudes for the records of these categories of signs, meaning the ibex at the time of the survey may have been using a wider scope of elevations than argali or perhaps their shifts around the time of the survey are not so profound.

In pooled samples average elevations for both argali and ibex records are in fact the same, 2723±31 and 2770±38 m, respectively (t = 0.88, p = 0.38).

Evidence from surveys and interviews indicates that the number of animals using the survey area is relatively low. Estimates for the ibex population in the survey area are around the figure of 20 (or, maybe, somewhat higher) and for argali the figure could be around 60. As yet it is difficult to give any statistical interpretation of these estimates.

2.4.5. Additional surveys

Evidence of other carnivores sharing snow leopard habitat was also recorded. These were wolf, fox, lynx and manul. Wolf, fox and manul sign (each in 14.3% of snow leopard presence/absence surveys) were found at various elevations. Sign of lynx (2.4%) was only found at lower elevations (in forest and in narrow valleys).

Wolf is the only predator currently preying on domestic livestock in the area. Unfortunately, eradication measures for the wolf include poisoning and the use of traps, a potential hazard for the snow leopard as well.

Video camera trapping equipment was carried by the expedition. A possible location was identified near one of the glacial lakes (49^{o}58.560 N, 89^{o}16.525 E, altitude 2735 m) 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 (Заключение)

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.

The field evidence from the previous year (2003) 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, the fact that no other sign was found, besides one fairly old, possibly a few months, scat presumably belonging to the species, shows that snow leopards may have left the area, been poached or visit it only sporadically.

Although sign of prey species was found throughout the survey area, observations were made, and sign found of, primary prey species in the core area (survey block 1) and in the corridor area (survey block 2), there is still a question of how adequate and varied the prey base is to sustain a healthy snow leopard population, as ibex and argali were only found in relatively small 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 in, the core area. Sightings have decreased significantly since 1998, even after taking into account the change in winter herding practices. Snow leopard

С 23 июня по 9 августа было проведено обследование горного массива Талдуаир, расположенного на территории Республики Алтай РФ, на предмет обнаружения снежного барса или следов его пребывания.

При этом (осознавая, что летний сезон не самое продуктивное время для подобного обследования) вели поиск, кроме самих животных, еще и отпечатков лап, поскребов, экскрементов, мочи и мочевых меток. В целом пройдено 42 маршрута (средней длины 7,5 км, расположенных в диапазоне высот 1984-3175 м н.у.м.)

Параллельно, по унифицированной методике SLIMS, осуществлена оценка подходящих для вида местообитаний в обследованном горном массиве, учитывая при этом характер рельефа и растительного покрова, посещаемость угодий скотоводами, наличие потенциальных «видов-жертв».

Опросы местного населения показали, что снежный барс в прошлом встречался здесь чаще и были случаи нападения на домашний скот; с 1993 г. подобные нападения уже не отмечались и с 1998 г. барсов стали видеть реже.

Исследования прошлого (2003) года дали основания считать, что в районе обитает по крайней мере одна особь. Находка лишь одного образца экскремента в 2004 году недалеко от главной вершины Талдуаира на высоте 3202 м н.у.м. позволяет предположить, что вид покинул рассматриваемую территорию или только временно ее посещает, чему могут способствовать близлежащие к северу горные массивы, которые вытянуты в широтном направлении и потенциально могут сыграть роль миграционного

predation of domestic livestock had occurred in the past, but there were 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 increased poaching of snow leopard and prey species coupled with seriously diminished facilities to combat these problems. The situation is exacerbated by economic and social problems caused by the political destabilisation of post-Soviet Russia. Unless action is taken soon, the primary prey population is likely to become further reduced.

Surveys show that the habitat is varied and capable of sustaining a healthy prey base for snow leopard, but there is a worrying decline in prey species (namely argali, ibex, maral and musk deer) due to poaching.

Overgrazing by livestock 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.

«коридора».

Оценка подходящих для вида местообитаний, расположенных на высотах 2134-3172 м, показал, что имеется определенный положительный потенциал для присутствия здесь снежного барса, чему способствует рельеф и распределение растительности, слабая посещаемость мест скотоводами (хотя в расположенных ниже угодьях выпасание домашних животных является обычной хозяйственной практикой), признаки пребывания потенциальных жертв (прежде всего, аргали и сибирського горного козла).

Вместе с тем, имеются признаки незаконной охоты как на снежного барса, так и его основных потенциальных жертв, и снижение численности последних 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.

In summary:

(1) Results from SLIMS data sheets show that the supposed in the previous survey of 2003 least one resident snow leopard within area may have left it, indicating its fragility for sustaining a viable snow leopard population or temporary status as a snow leopard habitat, meaning the animals may be visiting the area on a sporadic basis, particularly depending on the presence and availability of prey.

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

Management recommendations include:

(1) an immediate temporary ban on hunting any of the larger prey species. Ibex and deer numbers are not high enough locally to support hunting pressure and it is almost impossible to regulate what is shot once a licence is issued;

(2) improving the economic situation of local people in return for participation in wildlife monitoring and help with anti-poaching. This might be possible using the combination of ecotourism and marketing products made by herders. This aspect needs further investigation and consultation with herders;

(3) further research in the study area especially corridor area (survey block 2) and lower valleys (survey block 1). One winter survey (this would be of shorter duration) would enhance monitor snow leopard and prey population trends.

Outlook & future expedition work:

Further research is needed for at least two more years 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. Finding a trail and/or relic scrape(s) is a high priority. If either of these are found, remote camera-trapping will be included as a survey tool. Collecting scat for DNA analysis will continue to play an important part in the research. Liaising with local people will continue to play a key part in the research. Continued dialogue with herders is very important, not only to find out what has happened in between expedition periods but to involve them more fully in the research and explore possibilities of benefiting the local community.

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3. Bird Survey

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3.1. Introduction

The aims and objectives of this sub-study of the expedition were to provide baseline data for above-ground biodiversity assessment based on bird species richness and functional (guild) type.

This report presents an analysis and conclusions of the bird survey component of the Biosphere Expeditions base-line study of biodiversity in the Talduair area of the Altai Republic carried out June through August of 2004. The analysis is largely descriptive and aims to provide an overview of the data to facilitate comparisons with prior and future findings.

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 distribution 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.

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 increasingly valuable and 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 distribution 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 more common the species, the more likely it is to be recorded with higher frequency. For example, out of the total of 369 records of species being encountered on a particular day, 27 (or 7.3%) belong to the black-eared kite, one of the most common birds in the study area. On the other hand, rare species met only once (for instance, the white-tailed eagle) account only for about 0.3%.

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

The census methods 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 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 and covered all habitat types (ranging from Siberian larch stands to open snow fields). This network allowed 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 varied around an average of 6.65±0.45 hours (95% of the individual surveys lasting between 5.72 and 7.59 hours). Sampling time (in days) was used in our analysis as a measure of the sampling effort (Table 1).

Table 2.4a. Sampling effort (by slots and total).

Slot	Dates	Sampling effort (days)
1	24 June -29 June	5
2	6 July -14 July	9
3	21 July -28 July	9
4	4 August -11 August	8
Total	24 June -11 August	31

Records were entered into a datasheet after each survey in the evening of the same day (see appendices 1 & 2).

3.3. 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 standardizing 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 observing, 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: (i) measures of inventory effectiveness and completeness within a given study, and (ii) 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 a infinite period of time.

We used Lamas, Robbins & Harvey's (1991) equation for estimating the time required to register a proportion of the total fauna as predicted by the asymptote (*tq*):

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

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 *tq*:

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

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 nights were added to the total, the sample order was randomized 100 times using *EstimateS* software (Colwell 2005), for which either abundance data, or using summed incidence data (frequencies of occurrence, pooled among samples), are suitable.

This produces smoothed species accumulation curves (Fig.3.4a) 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. We used a non-linear regression (Statistica Package 1995) to fit the two models to the smoothed curves of the observed data.

The Chao2 (Chao, 1987) species richness estimator was also calculated (using *EstimateS* software) for the data:

$$S_{Chao} = S_{obs} + F_1^2/2F_2,$$

where S_{obs} is the number of species observed, F_1 is the number of species with exactly one individual and F_2 is the number of species with exactly two individuals. Several authors recommend Chao2 as the most robust estimator of species richness where most species are infrequent (Colwell & Coddington 1994, Chazdon et al. 1998). In our case more than half of the species were observed only once or twice.

Both species accumulation and species richness estimator curves represent the average values from 100 randomisations of sample order.

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'*) is used as a measure of statistical error, however the significance of differences in diversity between subsamples was by preference 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 ascertained using a restricted logarithmic scale (Pesenko 1982).

Finally, team performance (per slot) was estimated using regression analysis of the cumulative number of bird species encountered per day. Rarefaction was applied as well to ascertain how many taxa one would expect to find in a sample with a smaller total number of individuals (Hammer et al. 2005). With this method, it is possible to compare the number of taxa in samples of different size. Using rarefaction analysis on our pooled sample, we can read out the number of expected taxa (together with the 95% confidence intervals) for any smaller sized subsamples obtained by team members in the individual slots.

3.4. Results

The methods used resulted in a presence-absence data set. A total of 78 species were recorded (belonging to 11 orders, 26 families, and 50 genera). See appendices 1 & 2 for details.

From these data, the following analyses of bird diversity were made:

Species richness & diversity

Species accumulation curves were plotted to estimate inventory effectiveness and completeness and allow valid comparisons in further monitoring studies applying the same or similar methodologies. The total simple species accumulation curve is presented in Fig. 3.4a below.

The rate at which the curve flattens is crucial to comparing such curves, however even a visual analysis of the graph indicates that more species would have been encountered if the expedition period lasted somewhat longer (as far as it is obvious that the curve has not reached its “ceiling»). Formally a plateau in the species accumulation can be defined here as the point where the rate of species accumulation over a 10-sample interval falls below 0.100 (O’Dea et al. 2004), however in the last 10-sample interval it yet remains above this threshold and comprises a value of 0.117.

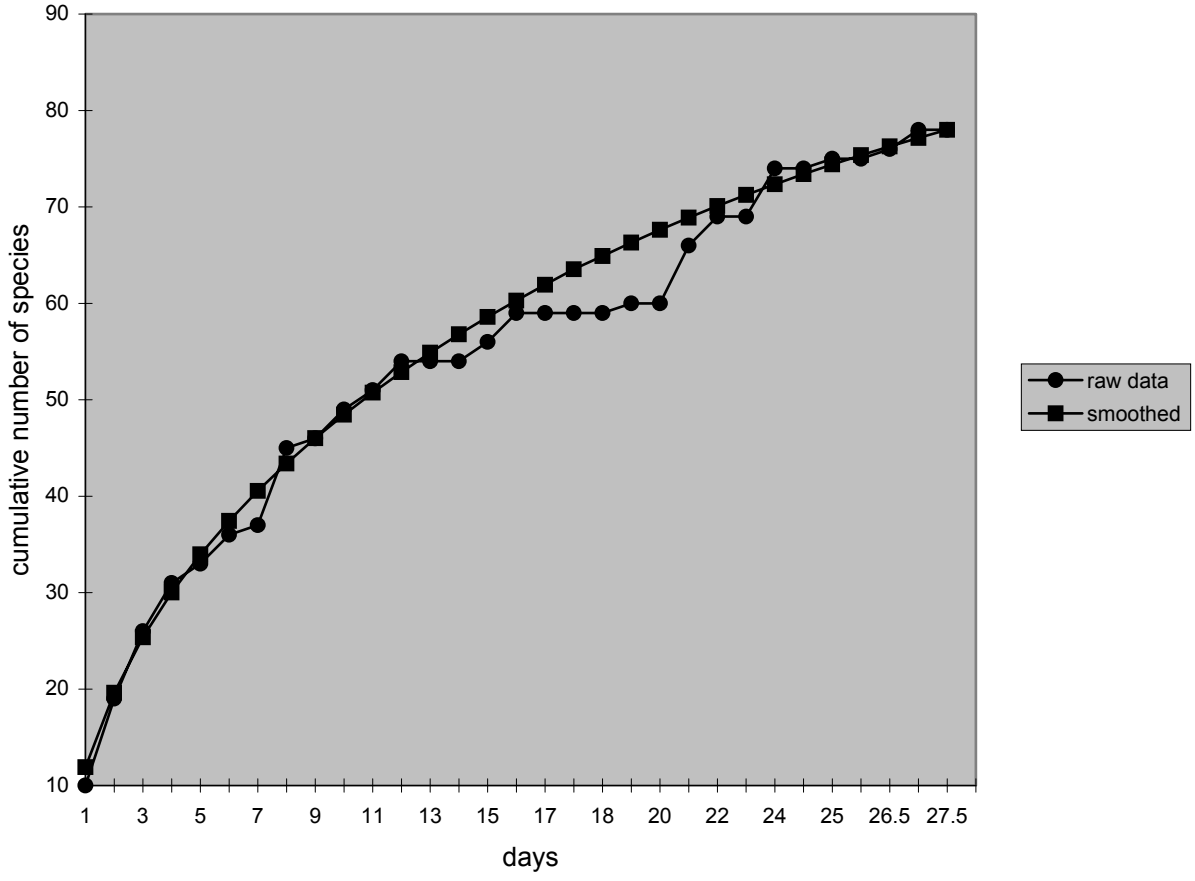

Figure 3.4a. Total simple species accumulation curve (smoothed curve produced by 100 random reorderings)

Theoretically the linear dependence model predicts that around 80 species are expected to be met in the area, whereas the Clench model envisages about 108 (see Table 3.4a).

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^2 is the coefficient of determination.

Number of species	*a*	*b*	*a/b*	t_{90}	r^2
		Linear dependence model			
78	7.738±0.285	0.097±0.005	79.8	24	0.990
		Clench model			
78	9.262±0.419	0.086±0.006	107.7	105	0.995

Changes occur in the estimation of total species richness calculated by the Chao2 estimator as sample size increases, however, as for the simple species accumulation curve, no plateau in the estimate of total richness was achieved, when standard deviations in the Chao2 estimate fall to below 5% of the estimated species richness (O'Dea et al. 2004). In our case standard deviations remain above 5% of the estimated species richness, reaching the lowest value of 8.26% of an expected 94.55 (or, approximately, 95) number of bird species in the study area.

The overall diversity of the avifauna (assessed by the Shannon index, *H'*) comprised 3.820 (*VarH'* = 0.00241). Alone this diversity value for a single sample has little meaning, but it can be used to assess differences between groups of samples (for instance, on a yearly basis), particularly if the sampling procedure and sample sizes are standardized.

An analysis of species diversity done by taxonomic unit (bird order and family) shows that the majority of species (36 out of 78, or 46.2%) belong, as one could expect, to passerine families (Table 3.4b). Quite surprisingly passerines are followed in terms of species numbers by raptors (families Accipitridae and Falconidae, together 14 species), composing almost 18% of the local avifauna.

Table 3.4b. Summary of species in each taxonomic unit.

Order	No. of species	%	Family	No. of species	%
Passeriformes	36	46.2	Corvidae	8	10.3
			Turdidae	8	10.3
			Motacillidae	7	9.0
			Alaudidae	3	3.8
			Paridae	2	2.6
			Sylviidae	2	2.6
			Cinclidae	1	1.3
			Emberizidae	1	1.3
			Fringillidae	1	1.3
			Hirundinidae	1	1.3
			Muscicapidae	1	1.3
			Sturnidae	1	1.3
Falconiformes	14	17.9	Accipitridae	11	14.1
			Falconidae	3	3.8
Charadriiformes	12	15.4	Charadriidae	9	11.5
			Laridae	3	3.8
Galliformes	6	7.7	Phasianidae	3	3.8
			Tetraonidae	3	3.8
Anseriformes	2	2.6	Anatidae	2	2.6
Columbiformes	2	2.6	Columbidae	2	2.6
Gruiformes	2	2.6	Gruidae	1	1.3
			Otididae	1	1.3
Ciconiiformes	1	1.3	Ciconiidae	1	1.3
Coraciiformes	1	1.3	Upupidae	1	1.3
Cuculiformes	1	1.3	Cuculidae	1	1.3
Pelecaniformes	1	1.3	Phalacrocoracidae	1	1.3
Total: 11			Total: 26		

Trophic diversity

Species recorded were devided 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 alos prey on invertebrates etc.; omnivores usually consume any kind of available food.

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

Trophic category	insectivore	carnivore	herbivore	piscivore	omnivore
No. of species	46	13	10	5	4
%	59.0	16.7	12.8	6.4	5.1

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 3.4c summarizes the trophic diversity (diet guilds) of the recorded species. Generally speaking, figures in the table are in agreement with the species diversity analysis done by taxonomic unit. Indeed, passerines representing almost a half of the species in the area are predominantly insectivorous. In the same way carnivores make up the second top ranking group.

Habitat diversity and use

The study area has been subdivided arbitrarily into the following eight 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 treeline at an altutude of approximately 2400 m), mountain steppe, mountain tundra, open rock (including cliffs and scree fields), intrazonal habitats (such as, for instance, narrow mountain river valleys, gorges etc. quite often vegetated differently from the surrounding landscape), urban (places in and around human settlements, but in our case poorly investigated).

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

Figures in the table confirm a common pattern: lowlands, as a rule, are richer in bird species than are highlands (Zlotin 1975).

Table 3.4d. Comparative table of avifauna in various habitat types (for convenience the decimal point in the Sorenson measure is omitted) 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	192	x	x	x	x	x	x	x
Forest	163	245	x	x	x	x	x	x
Mountain steppe	43	391	279	x	x	x	x	x
Mountain tundra	56	0	182	400	x	x	x	x
Open rock	0	0	0	276	737	x	x	x
Intrazonal habitats	233	279	300	54	0	0	x	x
Urban	71	71	0	91	0	0	0	x
Total	26	26	23	20	10	9	17	2

In our case the fluvial floodplain area and the floor of the largest valleys provide habitat for 26 species each, whereas, on the other side of the spectrum mountain tundra and open rock habitats accommodate 10 and 9 species, respectively. Forests, as an intermediate set of habitats, accommodate 23 species, sharing an approximate quarter (27.9%) of them with the mountain steppe above and another quarter (24.5%) with the steppe below. Intrazonal habitats, frequently found penetrating deeply into mountain massifs, or in the form of patches, accommodate 17 species, primarily of lowland origin: 23.3% are shared with the avifauna of the fluvial floodplain, 27.9% are found in the steppe, 30.0% inhabit forests, and only 5.4% of the species is shared with the composition of birdlife in the mountain steppe.

Although highlands in the study area may be poorer in species, similarity measures indicate the presence here of a unique fauna, fairly distinct from the fauna below, sharing between the specific habitats from 27.6% up to 73.7% of the bird species.

Body size category.

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

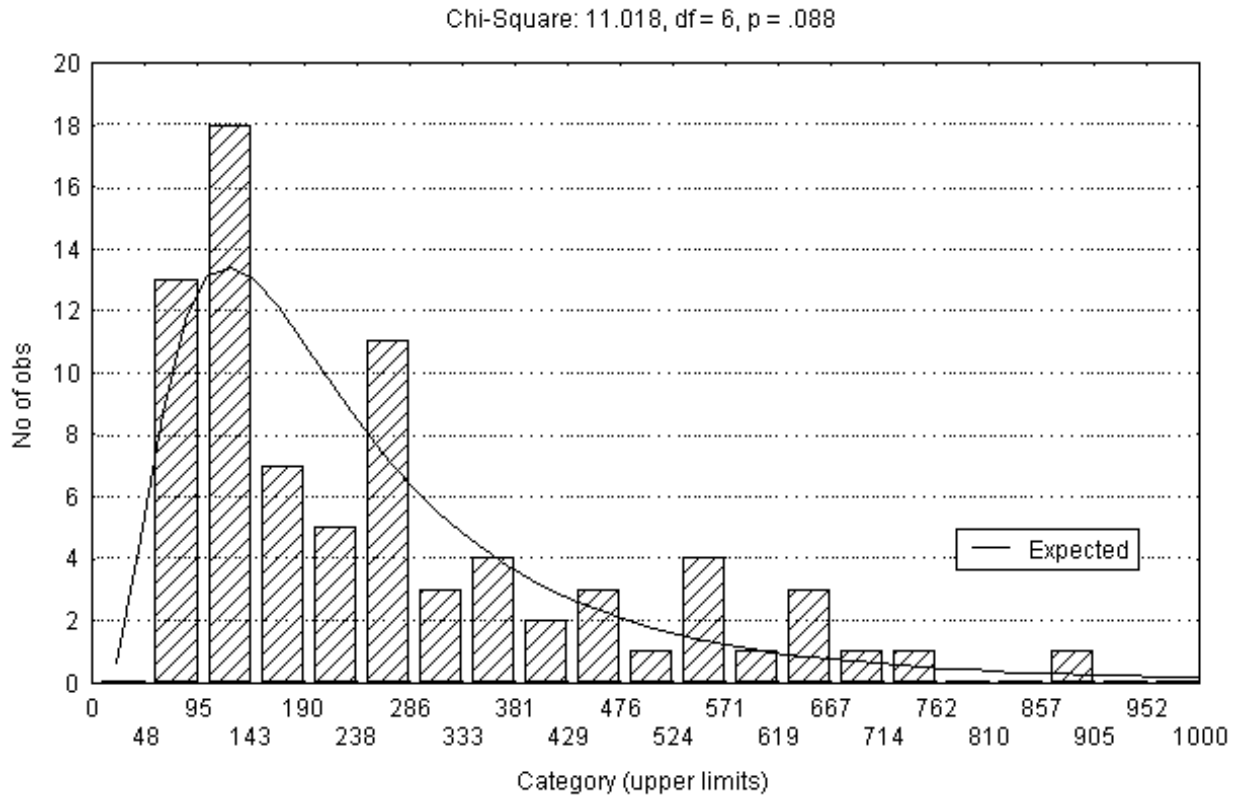

Figure 3.4b. The lognormal distribution of size classes in the recorded avifauna (columns present the raw data and the curve gives the predicted number of species in each size class according to the lognormal function).

Naturally bird communities, like communities of many other animals, particularly vertebrates, consist of many small-sized species and fewer 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 Fig. 3.4b), the mean being in this case 5.298 and the variance 0.501. In disturbed communities larger species usually are 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 to quit the model at all.

Local and regional rarity

Some species will be common in a dataset, and others will be rare. Terminology for rare species is important in some of the analyses of rarity. Singletons are species known from a single specimen, and doublets are species known from two. Uniques are species that occur in only one sample (regardless of their abundance within the sample), and duplicates are species known from two samples. Due to the character of our data, we, in fact, are dealing with the latter.

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 5 abundance classes (k =5) will be set at $31^{0.2}$ = 1.98 (rounded off to 2).

In such a way the uniques and duplicates fall into one abundance class, and in our case they comprise a total of 56.4% of all the recorded species. Boundaries for the remaining four abundance classes (2 to 5) are presented in Table 3.4e.

Table 3.4e. Summary of abundances of recorded bird species.

Abundance classes					
1 (rare)		2 (few)	3 (moderate)	4 (common)	5 (abundant)
1-2 records		3-4 records	5-8 records	9-16 records	17-31 records
uniques: 26 (33.3%)	Total: 44 (56.4%)	12 (15.4%)	8 (10.3%)	8 (10.3%)	6 (7.7%)
duplicates: 18 (23.1%)					

Amongst the commonest birds (most abundant) were the black-eared kite, yellow-beaked chough, white wagtail, Northern wheatear, grey wagtail and hoopoe.

Next in abundance (common) were the Isabelline wheatear, common kestrel, common sandpiper, rock partridge (chukar)* (III), Demoiselle crane* (III), Richard's pipit, sand martin, ruddy shelduck.

Moderate records made of the golden eagle* (II), Altai snowcock*(III), red-billed chough, steppe eagle, Eurasian skylark, tawny eagle* (III), Saker falcon* (III), snow grouse.

Fewer records were made of the little ringed plover, cinereous vulture* (III)[i], carrion crow, common cuckoo, imperial eagle* (II), horned skylark, rock ptarmigan, rosefinch, black-tailed godwit* (III), Eversmann's redstart, Eurasian dotterel, common redshank.

Nine species marked with an asterisk are listed in the Red Data Book of the Altai Republic (II, III stand for their assigned nature conservation status).

Amongst the rarest found species seven are listed in the Red Data Book of the Altai Republic: the upland buzzard (III), black stork (II), lesser kestrel (I), solitary snipe (II), great snipe (III), white-tailed eagle (I), and great cormorant (II).

Together 16 species out of 67 (or about 24%) listed in the Red Data Book of the Altai Republic were spotted by the expedition team during the survey.

[i] The cinereous vulture falls into the “fewer” abundance category as far as there was a total of 3 days on which the species had been recorded, but on one of the days (28th of July) a remarkable number of 54 individuals were seen together around a cow carcass competing for access to the food

Team performance

The estimation of team performance is an interesting exercise to see how standardized the methodology is, which is being applied to the bird inventory survey. Of course, how smoothly the inventory will proceed depends not only how it is planned, but also on an array factors some of which are impossible to control and/or unknown, including the number of skilled birdwatchers in each slot, weather conditions etc.
Nevertheless, despite the differences between the slots in terms of sampling effort (see Table 3.4a), the rate at which records were made and committed to the data sheets each day were fairly stable (see Fig. 3.4c). As revealed by regression analysis, this applies particularly to the first three slots, for which regression coefficients (*b*) of the growth of the cumulative number of bird species encountered per day are practically identical, ie 12.29±0.74, 12.10±0.77 and 13.94±1.25 for slots 1, 2 and 3 respectively.

For slot 4 there was a slowdown (*b* = 8.54±1.25) due, perhaps, to the fact that birds may have started to leave the area as summer was coming to an end.

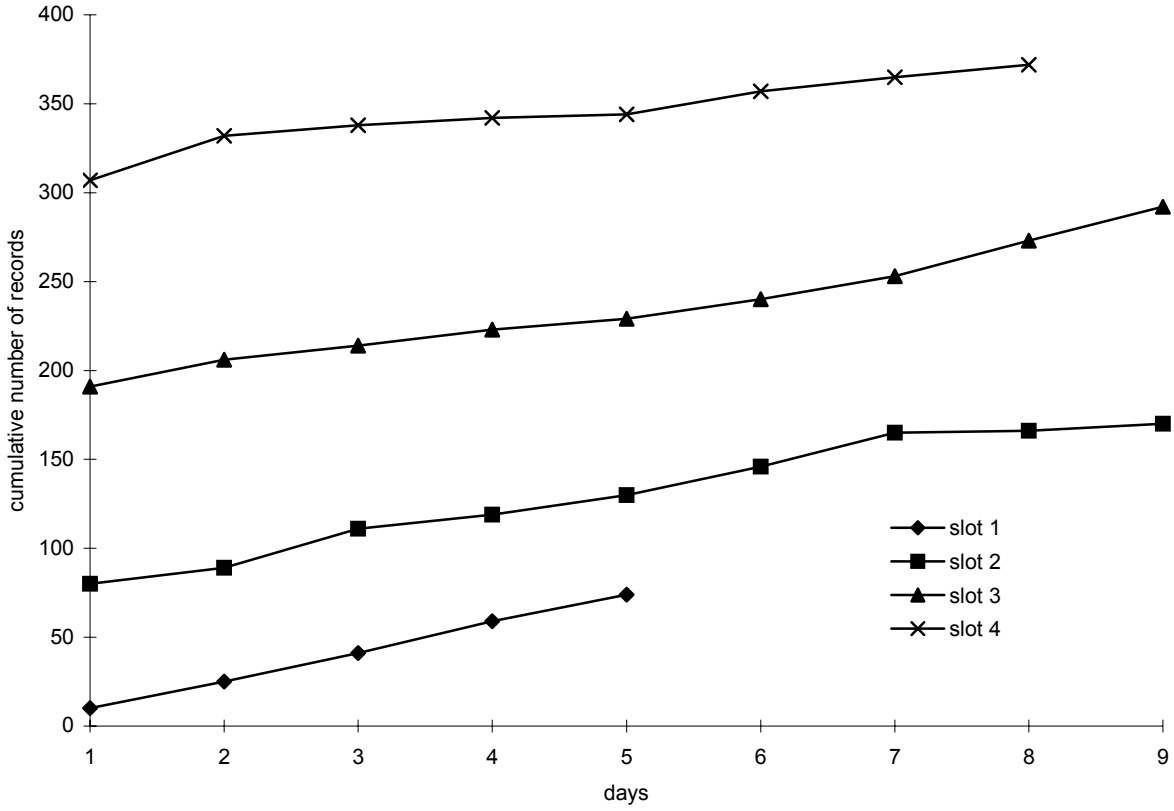

Figure 3.4c. Graph showing the increase in the cumulative number of records of birds obtained by each slot during the individual sampling efforts.

Using rarefaction analysis on our pooled sample (78 species), we have calculated the 95% confidence intervals of the expected number of species for smaller sized subsamples obtained by in slots 1 – 4 (Table 3.4f). As one can see, the empirical data fits well into the predicted limits, meaning all team members did a good job!

Table 3.4f. 95% confidence intervals of the expected number of species for smaller sized subsamples.

Slots	1	2	3	4
Recorded no. of species	33	39	45	41
95% confidence limits of expected no. of species	31.5-43.1	36.4-48.5	42.1-54.6	33.1-44.9

3.5. Conclusions (Заключение)

1. A bird species inventory undertaken by Biosphere Expeditions in the Talduair area of the Altai Republic in June to August 2004, involving a total sampling effort of 31 days, yielded 78 species belonging to 11 orders and 26 families.

2. Extrapolation methods used to assess the completeness of the inventory indicate that more species would have been encountered if the expedition period (consequently, the sampling effort) had lasted somewhat longer. It may be that there are around 107 species in the area (as predicted by the Clench model); in the meantime both inventories undertaken here in 2003 and 2004 by Biosphere Expeditions have yielded 95 species in total (with the two inventories sharing 71.6% of the species).

3. An analysis of species diversity done by taxonomic unit (bird order and family) shows that the majority of species belong to passerine families. Further, in terms of numbers species, raptors are the next most abundant group after passerines. This may be an indication of the complexity of the local community structure and diverse food webs, leading to a corresponding pattern of trophic diversity.

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

1. В районе горного массива Талдуаир в Республике Алтай РФ с 24 июня по 13 августа 2004 г. проводили инвентаризацию фауны птиц и учет их численности. Работа велась силами четырех команд волонтеров, участников экспедиции, по 8-13 человек в каждой. Общая сумма дней, потраченных на наблюдения, составляет 31. В итоге обнаружено 78 видов птиц (принадлежащих 11 отрядам и 26 семействам; см. приложения).

2. Экстраполяционные методы, использованные для оценки полноты инвентаризации, указывают, что список видов предположительно был бы больше, если увеличилось бы количество дней наблюдений. Возможно, что в исследованном районе обитает 107 видов птиц (как предсказывает модель Кленча); пока что усилиями двух экпедиций (2003 и 2004 гг.) здесь обнаружено 95 видов (полученные списки содержат 71,6% общих видов).

3. Анализ таксономического разнообразия птиц показывает, что большинство видов принадлежит к Воробьиным. Далее по количеству видов следуют Хищные, что, возможно, указывает на сложность структуры местного экологического сообщества и на разнообразие и разветвленность трофических связей.

4. Высокогорье в плане количества

specific habitats a considerable portion of the bird species.

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

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.

7. 44 (or 56.4%) of the recorded species can be considered rare; 7 of them are listed in the Red Data Book of the Altai Republic.

8. 34 species belong to other abundance categories, ranging from “few” to “abundant”; 9 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 “common” or “moderate”, of such flagship species as the Demoiselle crane, the golden eagle, the saker falcon etc.

9. The estimation of team performance shows that the methodology being applied to the bird inventory survey seems to be sufficiently standardized.

видов птиц оказалось беднее, чем прилежащие равнины и низкогорье, однако показатели сходства указывают на наличие здесь уникальной фауны, обособленной от аналогичной фауны расположенной ниже.

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. 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 мониторинга возможных отрицательных последствий различных факторов на биоту.

7. 44 (или 56.4%) зарегистрированных здесь видов птиц можно считать редкими; 7 из них внесены в Красную книгу Республики Алтай.

8. 34 вида принадлежат к другим категориям встречаемости (от «мало» до «очень много»); 9 из них «краснокнижных». Радует тот факт, что среди них (даже принадлежащих к категориям «много» и «средне») встречаются такие виды как красавка, беркут, балобан и др.

9. Оценка работы отдельных команд показала их слаженность и согласованность, что свидетельствует о достаточной степени стандартизации применяемой участниками экспедиции методики инвентаризации и учета численности птиц.

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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 less well understood.

The basic objectives and methods used for the mammal inventory are much the same as for the bird inventory (see above). 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 etc.). Animals detected were identified either by the naked eye or with binoculars. 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 25 days (between 24 June and 9 August 2004). Records were entered into a datasheet after each survey in the evening of the same day.

Altai marmot baseline study

The grey or Altai marmot is found high in the alpine areas of the Altai mountains of Central Asia and is active for approximately five months of the year. This marmot species is reported to mature very slowly and does not breed for the first three years. Even then only about half the adult females breed. Though each female produces around six pups per litter, they suffer an extremely high first year of mortality with only one pup born one year surviving to the next.

In the wild, populations of the Altai marmot are in serious decline, so distinguishing areas where colonies have survived is an important task for nature conservationists seeking to protect the species and ecosystem, where dozens of plant and other animal species (particularly carnivores) are dependent on marmots and their burrowing activity.

One of the outstanding features of the Tapduair massif, confirmed by the survey of the Biosphere Expedition research team, is the abundance here of the grey or Altai marmot, one of the commonest mammal species in the area reaching a frequency of 0.88 (22 out of 25 cases).

As there has been no quantified research of any marmot colony in the area a decision was made to set a baseline study of one colony located on a hillside in the immediate neighbourhood of the base camp. Christine Newell, a skilled botanist, kindly provided information on the vegetation of the site.

The hillside is located to the east of base camp rises steeply, after a low plateau area, and shows numerous marmot holes. The south-facing (133^{o}) slope towards base camp is steep, dry and stony with pale yellowish, finely particulate soil; this side has no trees. Further round towards the westward-facing slope there are damper patches up the hillside with deeper, less stony soil and the Siberian larch woodline extends for some

distance up the slope (to the elevation of 2417 m). Vegetation on the south-facing slopes, where the marmot holes are evident, is low-growing (mostly less than about 20 cm tall) but relatively continuous considering the dryness of the soil and the steepness of the slope. In some places water run-off has exposed bare soil with few or no plants. The low-growing vegetation is composed of a mixture of perennial species with no one in particular predominating over large areas. Where marmots have excavated their burrows, there is usually a pile of exposed bare, disturbed soil below the hole, especially in inhabited burrows. Species commonly found in the disturbed soil around the marmot holes include the grasses, *Agropyron* and *Avenastrum*, as well as *Thalictrum*, *Artemisia*, *Saussurea leucophylla* and *Potentilla sericea*. The rhubarb, *Rheum altaicum*, was also found occasionally, but only in the disturbed soil around marmot activity.

Marmot burrows were recorded in the sample area between 49°59.785 N, 89°13.655 E and 49°59.896 N, 89 °13.842 E (a distance of approximately 300 m), and between the altitudes of 2341 and 2434 m. GPS readings were made of locations of each burrow entrance, a measure was made of the height of the entrance (this was possible to do in 58 cases), an assessment was made of the use of the burrows by signs of marmot activity, including the presence of droppings (few, moderate, plenty; abundance classes distinguished using the logarithmic approach: $12^{0.33}$, as far as 12 was the maximum number of droppings found in one pile) and their freshness (presence or absence of coprophilous flies on the droppings). Each burrow entrance was assigned a number drawn in a conspicuous place on a rock surface by a black marker pencil. Records were made of a total of 62 burrow entrances.

4.2. Results

The methods used resulted in a presence-absence data set (appendices 2 & 3). A total of 28 species were recorded (belonging to 4 orders, 12 families, and 21 genera). The overall diversity of the mammal fauna (assessed by the Shannon index, *H'*) comprised 2.88 (*VarH'* = 0.00369).

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

Order	No. of species	Family	No. of species
Carnivora	9	Canidae	3
		Felidae	3
		Mustelidae	3
Rodentia	9	Cricetidae	4
		Sciuridae	4
		Dipodidae	1
Artiodactyla	5	Bovidae	2
		Cervidae	1
		Moschidae	1
		Suidae	1
Lagomorpha	5	Ochotonidae	3
		Leporidae	2
Total: 4		**Total: 12**	

The fairly large proportion of Carnivora (around 31.2%) may be (as in the case of the bird fauna) an indication of the complexity of the local community structure and diverse food webs, leading to a corresponding pattern of trophic diversity.

Local and regional rarity

As for the bird inventory 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 5 abundance classes (k =5) will be set at $25^{0.2}$ = 1.9 (rounded off to 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 together comprise 39.3% of all the recorded species. Boundaries for the remaining four abundance classes (2 to 5) are presented in Table 4.2b.

Table 4.2b. Summary of abundances of recorded mammal species

Abundance classes				
1 (rare)	2 (few)	3 (moderate)	4 (common)	5 (abundant)
Data 2004				
1-2 records	3-4 records	5-7 records	8-13 records	14-25 records
uniques: 8 (28.6%) duplicates:3 (10.7%) Total: 11 (39.3%)	5 (17.8%)	4 (14.3%)	4 (14.3%)	4 (14.3%)

Amongst the most common mammal species are the grey or Altai marmot, arctic ground squirrel, argali sheep*(I) and northern pika. Next in abundance (common) are the manul*(II), arctic or mountain hare, Siberian ibex and the large-eared or Altai vole. Moderate records have been made of the wolf, tolai hare, red fox and northern red squirrel. Fewer records were made of the maral deer, wild boar, Daurian pika, Mongolian five-toed jerboa*(III) and stoat.

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

The snow leopard (I) (recorded at a frequency of 0.04), is listed in the Red Data Book of the Altai Republic.

Altogether four mammal species out of 19 (or about 21%) listed in the Red Data Book of the Altai Republic were recorded by the expedition team during the survey.

Individual mammalian species (grey or Altai marmot, Northern pika, arctic ground squirrel) create an important part of the snow leopard diet. For instance, snow leopard diet during the summer season in adjacent Mongolian Altai consists of rodents, especially marmots.

Altai marmot baseline study

There are different types of burrows: hibernation burrows, secondary burrows and burrows which function as shelters. It is common that there may be more than one entrance to a burrow, so in fact the number of burrows is less than the number of entrances and the wide range of the height of the entrance (varying between 12 and 31 cm) allows us to assume that some of the burrows may not be belonging to marmots. Moreover, 46.8% of the entrances are without any sign of marmot activity, droppings were found nearby 43.5% of the entrances and only in 12.9% of the places droppings were fresh and attracting flies. Larger and fresher piles of droppings seem to be associated with larger burrow entrances (Table 4.2c), so they are perhaps used by marmots. It is quite likely that droppings features of the Altai marmot could be used for a quick assessment and monitoring of the relative abundance of the animals, particularly for a team on a foot survey.

Table 4.2c. Association of dropping features and burrow entrance height

Droppings	Average entrance height (cm)	Range (cm)		Number of entrances	Flies	
		Minimum	Maximum		Present	Absent
Absent	15.6	12	21	34	0	0
Few (1-3)	16.3	13	18	6	0	6
Moderate (4-6)	19.6	15	28	9	1	8
Plenty (7-12)	21.0	16	31	9	6	3

In another survey (devoted primarily to investigating argali presence) an incidental assessment was made of how high up into the mountains marmots ocurr. One reason for obtaining such information is to characterize potential snow leopard habitat. Marmot burrows were accounted for along a route (approximately 2.5 km long) heading down from a summit on a ridge (50°00.862 N, 89°26.229 E, 2893 m) located to the right of Tekelu River and ending up on the river valley floor (49°59.496 N, 89°25.770 E, 2356 m). Slopes on this side of the ridge are facing S and SW (the general bearing being around 190°), a preferred habitat feature for marmot in the area.

Moving downhill, the first marmot burrows were encountered at 2637 m. Further on burrows were seen all the way down on the slopes and almost reaching the valley floor (2368 m). In one place burrow entrances were in numbers between 1 and 12, a indication, perhaps, of marmot numbers and/or activity. These numbers negatively

correlate with altitude (r = -0.6825, p = 0.0013, n = 19), meaning marmots within the given topographical unit are likely to be preferring lower altitudes.

In general, the results from SLIMS data sheets recorded marmot presence in the study area in 15 cases between 2150 and 2820 m (the average being 2452±52 m).

Artic ground squirrel

Relative abundance counts were also made the arctic ground squirrel, another potential prey species for the snow leopard very common in the study area (0.80 frequency of records). Visual records were made from cars moving between base camp and areas destined for surveying. In one case (5 August) 47 animals were spotted along the road running along the southern slopes of the Tapduair massif and leading to the overnight camp (49°56.091 N, 89°21.301 E), an average of 1.37 individuals per kilometer (observations made in the morning hours between 9.00 and 11.00). In two other cases (8 August) a 31.2 km long trip into Tekelu Valley, following the Buguzun and Karagai rivers (i.e., following northern slopes of the Tapduair massif), yielded sightings of 168 and 174 ground squirrels (averages 5.38 and 5.58 individuals per km, respectively). The first of these two observations was carried out in the mid-day hours between 11.00 and 13.00, and the second one on the way back to base camp in the afternoon between 16.00 and 18.00; both results are fairly similar and support the replicability of the counting method.

4.3. Conclusions (Заключение)

1. A total of 28 species mammal were recorded (belonging to 4 orders, 12 families, and 21 genera).

1. Отмечено наличие в исследованном районе 28 видов млекопитающих (принадлежащих к 4 отрядам, 12 семействам, 21 роду).

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

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

3. Uniques and duplicates comprise together around 40% of all the recorded species.

3. Виды, которые наблюдались один или два раза, составляют примерно 40% фауны.

4. Together four mammal species out of 19 listed in the Red Data Book of the Altai Republic have been spotted by the expedition team during the survey.

4. Отмечено наличие 4 из 19 видов млекопитающих, внесенных в Красную книгу республики Алтай.

5. Relative abundance counts have been made for the Altai marmot and arctic ground squirrel, setting a baseline for further monitoring.

5. Проведено исследование относительного обилия алтайского сурка и длиннохвостого суслика для мониторинга их численности.

4.4. References

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Appendix 1
Inventory of birds (by species) seen during the expedition.

	English name	Latin name	Russian name	slot 1	slot 2	slot 3	slot 4
1	Eurasian sparrowhawk	*Accipiter nisus*	перепелятник	0	0	0	1
2	Common sandpiper	*Actitis hypoleucos*	перевозчик	2	2	5	4
3	Cinereous vulture	*Aegypius monachus*	черный гриф	1	0	2	0
4	Eurasian skylark	*Alauda arvensis*	полевой жаворонок	2	2	2	0
5	Chukar	*Alectoris chukar*	каменная куропатка, кеклик	0	6	4	1
6	Demoiselle crane	*Anthropoides virgo*	красавка	2	5	5	1
7	Rock pipit	*Anthus petrosus*	горный конек	0	0	1	0
8	Pipit (Richard's)	*Anthus richardi*	степной конек	4	4	2	1
9	Tree pipit	*Anthus trivialis*	лесной конек	0	1	0	0
10	Golden eagle	*Aquila chrysaetos*	беркут	1	1	4	2
11	Imperial eagle	*Aquila heliaca*	могильник	0	2	1	0
12	Steppe eagle	*Aquila nipalensis*	восточный степной орел	1	1	1	2
13	Tawny eagle	*Aquila rapax*	степной орел	2	0	3	0
14	Ferruginous duck	*Aythya nyroca*	белоглазый нырок	0	0	1	1
15	Upland buzzard	*Buteo hemilasius*	мохноногий курганник	1	0	1	0
16	Rough legged buzzard	*Buteo lagopus*	зимняк	0	0	0	1
17	Long-legged buzzard	*Buteo rufinus*	курганник	1	0	0	0
18	Rosefinch	*Carpodacus erythrinus*	обыкновенная чечевица	0	2	1	0
19	Little ringed plover	*Charadrius dubius*	малый зуек	2	0	0	2
20	Eurasian dotterel	*Charadrius morinellus*	хрустан	1	2	0	0
21	Black stork	*Ciconia nigra*	черный аист	0	0	2	0
22	Dipper	*Cinclus cinclus*	оляпка	1	0	0	0
23	Rock pigeon	*Columba livia*	сизый голубь	0	0	0	1
24	Hill pigeon	*Columba rupestris*	скальный голубь	0	2	0	0

…continued

	English name	Latin name	Russian name	slot 1	slot 2	slot 3	slot 4
26	Hooded crow	*Corvus cornix*	серая ворона	0	0	2	0
27	Carrion crow	*Corvus corone*	черная ворона	0	0	2	1
28	Western jackdaw	*Corvus monedula*	галка	0	0	0	1
29	Brown-necked raven	*Corvus ruficollis*	пустынный ворон	0	0	1	0
30	Common cuckoo	*Cuculus canorus*	кукушка	2	2	0	0
31	Yellowhammer	*Emberiza citrinella*	обыкновенная овсянка	0	1	0	0
32	Horned skylark	*Eremophila alpestris*	рогатый жаворонок	0	2	1	0
33	Saker falcon	*Falco cherrug*	балобан	0	2	2	2
34	Lesser kestrel	*Falco naumanni*	степная пустельга	0	0	2	0
35	Common kestrel	*Falco tinnunculus*	обыкновення пустельга	5	0	3	4
36	Red breated flycatcher	*Ficedula parva*	малая мухоловка	0	0	0	1
37	Crested lark	*Galerida cristata*	хохлатый жаворонок	0	1	1	0
38	Great snipe	*Gallinago media*	дупель	0	0	0	1
39	Solitary snipe	*Gallinago solitaria*	горный дупел	0	1	0	1
40	Pintail snipe	*Gallinago stenura*	азиатский бекас	0	0	1	0
41	White-tailed eagle	*Haliaeetus albicilla*	орлан-белохвост	0	1	0	0
42	Snow grouse	*Lagopus lagopus*	белая куропатка	2	2	0	1
43	Rock ptarmigan	*Lagopus mutus*	тундряная куропатка	3	0	0	1
44	Gull common	*Larus canus*	сизая чайка	1	0	0	0
45	Black-tailed godwit	*Limosa limosa*	большой веретенник	0	0	2	1
46	Black-eared kite	*Milvus lineatus*	черный коршун	5	7	9	6
47	Rock thrush	*Monticola saxatilis*	пестрый каменный дрозд	1	0	1	0
48	White (or Pied) wagtail	*Motacilla alba*	белая трясогузка	3	6	7	7
49	Grey wagtail	*Motacilla cinerea*	горная трясогузка	2	6	6	5
50	Citrine wagtail	*Motacilla citreola*	желтоголовая трясогузка	1	0	0	0
51	Yellow wagtail	*Motacilla flava*	желтая трясогузка	0	0	0	1

…continued

	English name	Latin name	Russian name	slot 1	slot 2	slot 3	slot 4
52	Isabelline wheatear	*Oenanthe isabellina*	каменка-плясунья	4	5	3	2
53	Northern wheatear	*Oenanthe oenanthe*	обыкновенная каменка	5	3	6	3
54	Willow tit	*Parus montanus*	буроголовая гаичка	0	2	0	0
55	Marsh tit	*Parus palustris*	черноголовая гаичка	0	1	0	0
56	Grey partridge	*Perdix perdix*	серая куропатка	0	1	0	0
57	Great cormorant	*Phalacrocorax carbo*	большой баклан	0	0	0	1
58	Guldenstad's redstart	*Phoenicurus erythrogaster*	краснобрюхая горихвостка	1	0	0	1
59	Eversmann's redstart	*Phoenicurus erythronotus*	красноспинная горихвостка	0	1	1	2
60	Redstart	*Phoenicurus phoenicurus*	горихвостка-лысушка	0	0	1	0
61	Hume's leaf warbler (yellow browed)	*Phylloscopus humei*	алтайская пеночка	1	0	0	1
62	Greenish warbler	*Phylloscopus trochiloides*	зеленая пеночка	0	0	1	0
63	Black-billed magpie	*Pica pica*	сорока	0	0	0	1
64	Chough yellow-beaked	*Pyrrhocorax graculus*	альпийская галка	5	3	6	4
65	Chough red-billed	*Pyrrhocorax pyrrhocorax*	клушица	0	2	2	3
66	Sand martin	*Riparia riparia*	береговушка	4	1	5	3
67	Stonechat	*Saxicola torquata*	черноголовый чекан	1	0	1	0
68	Common tern	*Sterna hirundo*	обыкновенная крачка	0	0	1	0
69	Arctic tern	*Sterna paradisaea*	полярная крачка	0	0	1	1
70	Starling	*Sturnus vulgaris*	скворец	1	0	0	0
71	Ruddy shelduck	*Tadorna ferruginea*	огарь	3	2	4	2
72	Black grouse	*Tetrao tetrix*	тетерев	0	2	0	0
73	Altai snowcock	*Tetraogallus altaicus*	алтайский улар	0	3	3	0
74	Little bustard	*Tetrax tetrax*	стрепет	0	1	0	0
75	Common redshank	*Tringa totanus*	травник	0	0	2	1
76	Black throated thrush	*Turdus atrogularis*	чернозобый дрозд	0	1	0	1
77	Hoopoe	*Upupa epops*	удод	3	3	8	3
78	Lapwing	*Vanellus vanellus*	чибис	0	0	1	1

Appendix 2
Inventory of birds (by taxon) seen during the expedition.

Order	Family	Genus	Latin name	English name	Russian name
Anseriformes	Anatidae	Aythya	*Aythya nyroca*	Ferruginous duck	белоглазый нырок
		Tadorna	*Tadorna ferruginea*	Ruddy shelduck	огарь
Charadriiformes	Charadriidae	Actitis	*Actitis hypoleucos*	Common sandpiper	перевозчик
		Charadrius	*Charadrius dubius*	Little ringed plover	малый зуек
			Charadrius morinellus	Eurasian dotterel	хрустан
		Gallinago	*Gallinago media*	Great snipe	дупель
			Gallinago solitaria	Solitary snipe	горный дупел
			Gallinago stenura	Pintail snipe	азиатский бекас
		Limosa	*Limosa limosa*	Black-tailed godwit	большой веретенник
		Tringa	*Tringa totanus*	Common redshank	травник
		Vanellus	*Vanellus vanellus*	Lapwing	чибис
	Laridae	Larus	*Larus canus*	Gull common	сизая чайка
		Sterna	*Sterna hirundo*	Common tern	обыкновенная крачка
			Sterna paradisaea	Arctic tern	полярная крачка
Ciconiiformes	Ciconiidae	Ciconia	*Ciconia nigra*	Black stork	черный аист
Columbiformes	Columbidae	Columba	*Columba livia*	Rock pigeon	сизый голубь
			Columba rupestris	Hill pigeon	скальный голубь
Coraciiformes	Upupidae	Upupa	*Upupa epops*	Hoopoe	удод
Cuculiformes	Cuculidae	Cuculus	*Cuculus canorus*	Common cuckoo	кукушка
Falconiformes	Accipitridae	Accipiter	*Accipiter nisus*	Eurasian sparrowhawk	перепелятник
		Aegypius	*Aegypius monachus*	Cinereous vulture	черный гриф
		Aquila	*Aquila chrysaetos*	Golden eagle	беркут

continued…

Order	Family	Genus	Latin name	English name	Russian name
			Aquila heliaca	Imperial eagle	могильник
			Aquila heliaca	Imperial eagle	могильник
			Aquila nipalensis	Steppe eagle	восточный степной орел
			Aquila rapax	Tawny eagle	степной орел
		Buteo	*Buteo hemilasius*	Upland buzzard	мохноногий курганник
			Buteo lagopus	Rough legged buzzard	зимняк
			Buteo rufinus	Long-legged buzzard	курганник
		Haliaeetus	*Haliaeetus albicilla*	White-tailed eagle	орлан-белохвост
		Milvus	*Milvus lineatus*	Black-eared kite	черный коршун
	Falconidae	Falco	*Falco cherrug*	Saker falcon	балобан
			Falco naumanni	Lesser kestrel	степная пустельга
			Falco tinnunculus	Common kestrel	обыкновення пустельга
Galliformes	Phasianidae	Alectoris	*Alectoris chukar*	Chukar	каменная куропатка, кеклик
		Perdix	*Perdix perdix*	Grey partridge	серая куропатка
		Tetraogallus	*Tetraogallus altaicus*	Altai snowcock	алтайский улар
	Tetraonidae	Lagopus	*Lagopus lagopus*	Snow grouse	белая куропатка
		Lagopus	*Lagopus mutus*	Rock ptarmigan	тундряная куропатка
		Tetrao	*Tetrao tetrix*	Black grouse	тетерев
Gruiformes	Gruidae	Anthropoides	*Anthropoides virgo*	Demoiselle crane	красавка
	Otididae	Tetrax	*Tetrax tetrax*	Little bustard	стрепет
Passeriformes	Alaudidae	Alauda	*Alauda arvensis*	Eurasian skylark	полевой жаворонок
		Eremophila	*Eremophila alpestris*	Horned skylark	рогатый жаворонок

continued…

Order	Family	Genus	Latin name	English name	Russian name
		Galerida	*Galerida cristata*	Crested lark	хохлатый жаворонок
	Cinclidae	Cinclus	*Cinclus cinclus*	Dipper	оляпка
	Corvidae	Corvus	*Corvus corax*	Raven	ворон
			Corvus cornix	Hooded crow	серая ворона
			Corvus corone	Carrion crow	черная ворона
			Corvus monedula	Western jackdaw	галка
			Corvus ruficollis	Brown-necked raven	пустынный ворон
		Pica	*Pica pica*	Black-billed magpie	сорока
		Pyrrhocorax	*Pyrrhocorax graculus*	Chough yellow-beaked	альпийская галка
			Pyrrhocorax pyrrhocorax	Chough red-billed	клушица
	Emberizidae	Emberiza	*Emberiza citrinella*	Yellowhammer	обыкновенная овсянка
	Fringillidae	Carpodacus	*Carpodacus erythrinus*	Rosefinch	обыкновенная чечевица
	Hirundinidae	Riparia	*Riparia riparia*	Sand martin	береговушка
	Motacillidae	Anthus	*Anthus petrosus*	Rock pipit	горный конек
			Anthus richardi	Pipit (Richard's)	степной конек
			Anthus trivialis	Tree pipit	лесной конек
		Motacilla	*Motacilla alba*	White (or Pied) wagtail	белая трясогузка
			Motacilla cinerea	Grey wagtail	горная трясогузка
			Motacilla citreola	Citrine wagtail	желтоголовая трясогузка

continued…

Order	Family	Genus	Latin name	English name	Russian name
			Motacilla flava	Yellow wagtail	желтая трясогузка
	Muscicapidae	Ficedula	*Ficedula parva*	Red breated flycatcher	малая мухоловка
	Paridae	Parus	*Parus montanus*	Willow tit	буроголовая гаичка
			Parus palustris	Marsh tit	черноголовая гаичка
	Sturnidae	Sturnus	*Sturnus vulgaris*	Starling	скворец
	Sylviidae	Phylloscopus	*Phylloscopus humei*	Hume's leaf warbler (yellow browed)	алтайская пеночка
		Phylloscopus	*Phylloscopus trochiloides*	Greenish warbler	зеленая пеночка
	Turdidae	Monticola	*Monticola saxatilis*	Rock thrush	пестрый каменный дрозд
		Oenanthe	*Oenanthe isabellina*	Isabelline wheatear	каменка-плясунья
		Oenanthe	*Oenanthe oenanthe*	Northern wheatear	обыкновенная каменка
		Phoenicurus	*Phoenicurus erythrogaster*	Guldenstad's redstart	краснобрюхая горихвостка
		Phoenicurus	*Phoenicurus erythronotus*	Eversmann's redstart	красноспинная горихвостка
		Phoenicurus	*Phoenicurus phoenicurus*	Redstart	горихвостка-лысушка
		Saxicola	*Saxicola torquata*	Stonechat	черноголовый чекан
		Turdus	*Turdus atrogularis*	Black throated thrush	чернозобый дрозд
Pelecaniformes	Phalacrocoracidae	Phalacrocorax	*Phalacrocorax carbo*	Great cormorant	большой баклан

Appendix 3
Alphabetic list of mammals (by species) seen during the expedition.

	Latin name	English name	Русское название
1	*Citellus undulatus*	Arctic ground squirrell	длиннохвостый суслик
2	*Lepus timidus*	Arctic or mountain hare	заяц-беляк
3	*Ovis ammon*	Argali sheep	горный баран, аргали
4	*Vulpes corsac*	Corsac or steppe fox	корсак
5	*Ochotona daurica*	Daurian pika	даурская пищуха
6	*Microtus agrestis*	Field vole	темная полевка
7	*Marmota baibacina*	Grey or Altai marmot	серый, или алтайский, сурок
8	*Alticola macrotis*	Large-eared or Altai vole	большеухая горная полевка
9	*Felis lynx*	Lynx	рысь
10	*Felis manul*	Manul	манул
11	*Cervus elaphus*	Maral deer	марал
12	*Allactaga sibirica*	Mongolian five-toed jerboa	тушканчик-прыгун
13	*Ochotona pricei*	Mongolian pika	монгольская пищуха
14	*Mustela altaica*	Mountain or Altai weasel	солонгой
15	*Microtus gregalis*	Narrow-skulled or narrow-headed vole	узкочерепная полевка

continued…

	Latin name	English name	Русское название
16	*Ochotona alpina*	Northern pika	алтайская пищуха
17	*Sciurus vulgaris*	Northern red squirrell	обыкновенная белка
18	*Vulpes vulpes*	Red fox	обыкновенная лисица
19	*Phodopus sungorus*	Russian dwarf hamster	джунгарский хомячок
20	*Martes zibellina*	Sable	соболь
21	*Eutamias sibiricus*	Siberian chipmunk	бурундук
22	*Capra sibirica*	Siberian ibex	сибирский горный козел
23	*Moschus moschiferus*	Siberian musk deer	кабарга
24	*Uncia uncia*	Snow leopard	снежный барс, ирбис
25	*Mustela erminea*	Stoat	горностай
26	*Lepus tolai*	Tolai hare	заяц-толай
27	*Sus scrofa*	Wild boar	дикий кабан
28	*Canis lupus*	Wolf	волк

Appendix 4
Inventory of mammal (by taxon) seen during the expedition.

Order / отряд	Family / семейство	Genus / род	Species latin name	Species English name	Species Russian name
Artiodactyla	Bovidae	Capra	*Capra sibirica*	Siberian ibex	сибирский горный козел
Artiodactyla	Bovidae	Ovis	*Ovis ammon*	Argali sheep	горный баран, аргали
Artiodactyla	Cervidae	Cervus	*Cervus elaphus*	Maral deer	марал
Artiodactyla	Moschidae	Moschus	*Moschus moschiferus*	Siberian musk deer	кабарга
Artiodactyla	Suidae	Sus	*Sus scrofa*	Wild boar	дикий кабан
Carnivora	Canidae	Canis	*Canis lupus*	Wolf	волк
Carnivora	Canidae	Vulpes	*Vulpes vulpes*	Red fox	обыкновенная лисица
Carnivora	Canidae	Vulpes	*Vulpes corsac*	Corsac or steppe fox	корсак
Carnivora	Felidae	Felis	*Felis manul*	Manul	манул
Carnivora	Felidae	Felis	*Felis lynx*	Lynx	рысь
Carnivora	Felidae	Uncia	*Uncia uncia*	Snow leopard	снежный барс, ирбис
Carnivora	Mustelidae	Martes	*Martes zibellina*	Sable	соболь
Carnivora	Mustelidae	Mustela	*Mustela erminea*	Stoat	горностай
Carnivora	Mustelidae	Mustela	*Mustela altaica*	Mountain or Altai weasel	солонгой
Lagomorpha	Leporidae	Lepus	*Lepus timidus*	Arctic or mountain hare	заяц-беляк
Lagomorpha	Leporidae	Lepus	*Lepus tolai*	Tolai hare	заяц-толай

…continued

Order / отряд	Family / семейство	Genus / род	Species latin name	Species English name	Species Russian name
Lagomorpha	Ochotonidae	Ochotona	*Ochotona alpina*	Northern pika	алтайская пищуха
Lagomorpha	Ochotonidae	Ochotona	*Ochotona daurica*	Daurian pika	даурская пищуха
Lagomorpha	Ochotonidae	Ochotona	*Ochotona pricei*	Mongolian pika	монгольская пищуха
Rodentia	Cricetidae	Alticola	*Alticola macrotus*	Large-eared or Altai vole	большеухая горная полевка
Rodentia	Cricetidae	Microtus	*Microtus agrestis*	Field vole	темная полевка
Rodentia	Cricetidae	Microtus	*Microtus gregalis*	Narrow-skulled vole	узкочерепная полевка
Rodentia	Cricetidae	Phodopus	*Phodopus sungorus*	Russian dwarf hamster	джунгарский хомячок
Rodentia	Dipodidae	Allactaga	*Allactaga sibirica*	Mongolian five-toed jerboa	тушканчик-прыгун
Rodentia	Sciuridae	Citellus	*Citellus undulatus*	Arctic ground squirrell	длиннохвостый суслик
Rodentia	Sciuridae	Eutamias	*Eutamias sibiricus*	Siberian chipmunk	бурундук
Rodentia	Sciuridae	Marmota	*Marmota baibacina*	Grey or Altai marmot	серый, или алтайский, сурок
Rodentia	Sciuridae	Sciurus	*Sciurus vulgaris*	Northern red squirrell	обыкновенная белка

Appendix 5
Plants identified and/or collected by expedition team member Christine Newell.

Family	Genus	Species	Authority (Location of type specimen)	Common name	Source	Collection notes
Apiaceae	*Bupleurum*	*triradiatum*	Adams (Moscow)	Hare's-ears	1 (16)	5/7/04 #11 Base camp 2200m
Asteraceae	*Artemisia*	*borealis*	Pall. (?BM)	Mugwort	1 (26)	12/7/04 #10 Dry hillside behind base camp
	Artemisia	*frigida*	Willd. (B)	Mugwort	1 (26)	12/7/04 #8 Dry hillside behind base camp
	Artemisia	*glauca*	Pall. (?B)	Mugwort	1 (26)	12/7/04 #9 Dry hillside behind base camp
	Erigeron	*elongatus*	Ldb. (LE)	Fleabane	1 (25)	9/7/04 #3 River valley on way to Mt. Saylyugem
	Erigeron	*flaccidus*	(Bge.) Botsch. (LE)	Fleabane	1 (25)	7/7/04 #16 Hillside behind base camp
	Ligularia	*altaica*	DC. (P; iso-LE)		1 (26)	6/7/04 #3 Base camp 2200m
	Saussurea	*foliosa*	Ldb. (LE)		1 (27)	11/7/04 #2 Mountain slopes towards back valley
	Saussurea	*leucophylla*	Schrenk. (LE)		1 (27)	7/7/04 #7 Dry hillside behind base camp
	Saussurea	*schanginiana*	(Wydl.)Fisch. ex Herd. (LE)		1 (27)	8/7/04 #9 Hillside by back valley
	Senecio	*crispa-dilatata?*	Schischk. (TK)	Ragwort	1 (26)	6/7/04 #5 Base camp 2200m
	Senecio	*Pricei*	Simps. (?BM)	Ragwort	1 (26)	12/7/04 High ridge behind base camp
	Senecio	*sumneviczii*	Schischk. (TK)	Ragwort	1 (26)	6/7/04 #4 Base camp 2200m
	Tripleurospermum	*ambiguum*	(Ldb.) Fr.et Sav. (LE)	Mayweed	1 (26)	8/7/04 #3 Hillside by back valley
Boraginaceae	*Eritrichum*	*altaicum*	M. Pop. (London)		1 (19)	12/7/04 #15 Dry hillside behind base camp
Brassicaceae	*Clausia*	*aprica*	(Steph.) Korn (Berlin)		1 (8)	7/7/04 Hillside behind base camp
	Parrya	*exscapa*	C.A.M. (Leningrad)		1 (8)	8/7/04 #14 Hillside by back valley
Campanulaceae	*Campanula*	*glomerata*	L. (London)	Bellflower	1 (24)	10/7/04 #8 Steppe margin near base camp
	Campanula	*langsdorffiana*	Fisch. (Leningrad)	Harebell	1 (24)	9/7/04 #8 Base camp 2200m
Caryophyllaceae	*Arenaria*	*formosa*	Fisch. ex D.C. (Geneva)	Sandwort	1 (6)	8/7/04 #7 Hillside by back valley
	Cerastium	*cerastoides*	Britt. (London)	Mouse-ear	1 (6)	8/7/04 #5 Hillside by back valley
	Cerastium	*pusillum*	Ser.	Mouse-ear	1 (6)	14/7/04 #6 River valley behind base camp

…continued

Family	Genus	Species	Authority (Location of type specimen)	Common name	Source	Collection notes
	Minuartia	*verna*	(L.) Hiern. (London)	Sandwort	1 (6)	11/7/04 #5 Mountain slopes of back valley
	Silene	*chamarensis*	Turcz. (Leningrad)	Campion	1 (6)	7/7/04 #12 Hillside behind base camp
Crassulaceae	*Rhodiola*	*quadrifida*	(Pall.) Fisch. et Mey. (LE)		1 (9)	7/7/04 A Hillside behind base camp
	Rhodiola	*rosea*	L. (Leningrad)		1 (9)	8/7/04 #4 Hillside by back valley
Fabaceae	*Astragalus*	*alpinus*	L. (Leningrad)	Milk-vetch	1 (12)	14/7/04 #1 River valley behind base camp
	Astragalus	*frigidus*	(L.) Bge. (London)	Milk-vetch	1 (12)	7/7/04 #17 Hillside behind base camp
	Astragalus	*mongholicus*	Bge. (Leningrad)	Milk-vetch	1 (12)	9/7/04 #4 River valley up to Mt. Saylyugem
	Astragalus	*puberulus*	Ldb. (Leningrad)	Milk-vetch	1 (12)	12/7/04 #1 River valley across steppe
	Oxytropis	*alpina*	Bge. ((type?)		1 (13)	7/7/04 #9 Hillside behind base camp
	Oxytropis	*macrosema*	Bge. (Leningrad)		1 (13)	7/7/04 #13 Hillside behind base camp
	Oxytropis	*physocarpa*	Ldb. (Leningrad)		1 (13)	9/7/04 #6 River valley up to Mt. Saylyugem
Fumariaceae	*Corydalis*	*pauciflora*	(Steph.) Pers. (Berlin)		1 (7)	14/7/04 #3 River bank behind base camp
Gentianaceae	*Gentiana*	*grandiflora*	Laxm. (Leningrad)	Gentian	1 (18)	8/7/04 #2 Hillside by back valley
	Gentiana	*uniflora*	Georgi (Leningrad)	Gentian	1 (18)	
Geraniaceae	*Geranium*	*pseudosibiricum*	J. Mayer (?type)	Crane's-bill	1 (14)	6/7/04 #8 Base camp 2200m
Lamiaceae	*Dracocephalum*	*grandiflorum*	L. (London)		1 (20)	6/7/04 #6 Base camp 2200m
	Dracocephalum	*nutans*	L. (London)		1 (20)	12/7/04 River valley across steppe
	Dracocephalum	*origanoides*	Steph. Ex Willd. (Berlin)		1 (20)	7/7/04 #14 Stony hillside behind base camp
	Lagopsis	*flava*	Kar. et Kir. (Leningrad)		1 (20)	8/7/04 #1 Dry steppe
	Nepeta	*sibirica*	L. (London)	Cat-mint	1 (20)	12/7/04 #3 River valley across steppe
Orchidaceae	*Coeloglossum*	*viride*	(L.) Hartm. (London)	Orchid	1 (14)	7/7/04 #10 Hillside behind base camp

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Family	Genus	Species	Authority (Location of type specimen)	Common name	Source	Collection notes
Poaceae	*Agropyrum*	*cristatum*	(L.) Gaerth. (Leningrad)		1 (2)	12/7/04 #12 Dry hillside behind base camp
	Avenastrum	*asiaticum*	Roshev. (Leningrad)		1 (2)	12/7/04 #13 Dry hillside behind base camp
	Festuca	*kryloviana ?*	Reverd. (Tomsk)	Fescue	1 (2)	11/7/04 Mountain slopes of back valley
	Festuca	*tristis*	Kryl. Et Ivanitzk (Tomsk)	Fescue	1 (2)	11/7/04 Mountain slopes of back valley
	Ptilagrostis	*mongholica*	(Turcz) Griseb (Leningrad)		1 (2)	11/7/04 #4 Mountain slopes of back valley
Polygalaceae	*Polygala*	*tenuifolia*	Willd. (Berlin)	Milkwort	1 (14)	14/7/04 #10 Valley hillside behind base camp
Polygonaceae	*Oxyria*	*digyna*	(L.) Hill. (London)	Mountain sorrel	1 (5)	14/7/04 #5 Valley hillside behind base camp
	Polygonum	*alpinum*	All. (type?)	Knotgrass	1 (5)	12/7/04 #11 Stony hillside behind base camp
Primulaceae	*Androsace*	*Fedtschenkoi?*	Ovcz. (Leningrad)		1 (18)	8/7/04 #8 Hillside by back valley
	Androsace	*septentrionalis*	L. (London)		1 (18)	10/7/04 #4 Steppe along margin by tree line
	Primula	*algida*	Ad. (no type)		1 (18)	7/7/04 #1 Hillside by base camp
Ranunculaceae	*Anemone*	*sylvestris*	L. (London)	Anemone	1 (7)	10/7/04 #7 Steppe, near wood margin
	Atragene	*sibirica*	L. (London)	(Clematis-like)	1 (7)	7/7/04 #15 Rocky hillside above camp
	Pulsatilla	*ambigua*	(Turcz) Juz. (Leningrad)	Pasque flower	1 (7)	9/7/04 #11 Base camp 2200m
	Pulsatilla	*campanella ?*	Fisch. (Zeyher Herbarium)	Pasque flower	1 (7)	9/7/04 #10 Base camp 2200m
	Ranunculus	*pulchellus*	C.A.M. (Leningrad)	Buttercup	1 (7)	10/7/04 #3 Steppe, near wood margin
	Ranunculus	*pseudohirculus*	Schrenk. (Leningrad)	Buttercup	1 (7)	
	Thalictrum	*foetidum*	L. (London)	Meadow-rue	1 (7)	9/7/04 #9 Base camp 2200m
	Trollius	*asiaticus*	L. (London)	Globe flower	1 (7)	6/7/04 #7 Base camp 2200m
Rosaceae	*Alchemilla*	*cyrtopleura ?*	Juz. (Leningrad)	Lady's mantle	1 (10)	8/7/04 #11 Stream bank in back valley
	Dryadanthe	*tetranda*	(Bge.) Juz. (Leningrad)	(High alpine)	1 (10)	12/7/04 Mt. Saylyugem 3000m
	Potentilla	*multifida*	L. (London)	Cinquefoil	1 (10)	11/7/04 #4 Back valley
	Potentilla	*nivea*	L.	Cinquefoil	1 (10)	6/7/04 #10 Base camp 2200m
	Spiraea	*alpina*	Pall. (Leningrad)	Bridewort	1 (9)	8/7/04 #6 Hillside by back valley
	Spiraea	*chamaedryfolia*	L. (London)	Bridewort	1 (9)	14/7/04 #11 Stony hillside behind base camp

…continued

Family	Genus	Species	Authority (Location of type specimen)	Common name	Source	Collection notes
Saxifragaceae	*Saxifraga*	*cernua*	L. (London)	Saxifrage	1 (9)	14/7/04 #4 Alongside river behind base camp
	Saxifraga	*melaleuca*	Fisch. (Leningrad)	Saxifrage	1 (9)	11/7/04 #1 Mountain slopes by back valley
	Saxifraga	*oppositifolia*	L. (London)	Saxifrage	1 (9)	7/7/04 #10 Hillside by back valley (also 3000m)
	Saxifraga	*setigera*	Pursh. (? type)	Saxifrage	1 (9)	8/7/04 #10 Hillside by back valley
Scrophulariaceae	*Euphrasia*	*tatarica*	Fisch. (LE)	Eyebright	1 (22)	14/7/04 #8 Hillside behind base camp
	Linaria	*vulgaris*	Mill. (LINN)	Toadflax	1 (22)	12/7/04 #6A River valley across steppe
	Pedicularis	*abrotanifolia*	M.B. ex Stev. (LE)	Lousewort	1 (22)	7/7/04 #3 Base camp 2200
	Pedicularis	*verae ?*	Vved. (LE)	Lousewort	1 (22)	7/7/04 A Base camp 2200m
	Pedicularis	*verticillata*	L.	Lousewort	1 (22)	7/7/04 #11 Base camp 2200m
	Scrophularia	*incisa*	Weinm. (Siberia)	Figwort	1 (22)	10/7/04 #2 Gravel river bed at base camp 2200m
	Veronica	*macrostemon*	Bge. (LE)	Speedwell	1 (22)	14/7/04 #2 River valley behind base camp
	Veronica	*pinnata*	L. (LINN)	Speedwell	1 (22)	8/7/04 #2 Hillside by back valley
Valerianaceae	*Patrinia*	*sibirica*	(L.) Juss. (LINN)		1 (23)	7/7/04 #4 Hillside behind base camp
	Valeriana	*capitata*	Pall. ex Link. (?B)	Valerian	1 (23)	14/7/04 #3a River valley behind base camp

Sources

1. Flora of the USSR - Initiated by VL Komarov. Israel Program for Scientific Translations, Jerusalem 1967
2. Plant Species - Oleg Kosterin (http://pisum.bionet.nsc.ru/kosterin/planta.htm)
3. Common name of genera: Stace, C. New Flora of the British Isles. 2nd. Edition 1997
4. LE: Botanical Institute of the Academy of Sciences of the USSR

Appendix 6
Expedition diary by Tessa McGregor.

17 June

It's hot in Novosibirsk with violent rainstorms from time to time. 'Cotton-tree' seeds shower us with white fluff. The city is as vibrant as ever and the centre is very trendy. Olga and I have been in Novosibirsk for a week and preparations for the expedition are keeping us busy. Our scientist, Vladimir Titar, joined us yesterday and we have been discussing fieldwork. He is trying to find Russian field guides. Base camp is being set up and will be ready by this evening. I have been meeting Russian scientists in Novosibirsk and we have had very interesting discussions. Land Rover is holding a press conference this afternoon so I better go and spruce up. The team here is very much looking forward to meeting you all and working with you over the weeks to come.

18 June

After a meeting earlier this week with the assistant director of Novosibirsk zoo I went back, as arranged, to collect snow leopard scat and urine. Sadly the keeper had misunderstood and cleaned the cages, but I got one good fresh scat and a sample from a recent scrape. The zoo has 4 snow leopards (1 male and 3 females). The male is a very handsome specimen (unlike the old one from last year. He died earlier, aged 17). Vladimir, Olga and I took the opportunity to look at other animals found in the Altai. A wolverine scent marked just inches from my nose, so there is another smell to remember for the field (not one that I could easily forget!)

19 June

The team members have all arrived and I even had two volunteers to help me collect the vehicles from Autoland. We all met in the evening at the familiar Russian restaurant. Everyone fit and keen.

20 June

Russian state TV filmed the expedition departure - delayed us a little but still left at 08:15. Sergey Kurgin with us as he is accompanying us to base camp for a few days. The road was very clear and we made it to Anoz by 19:10 despite driving more slowly than usual (as we are running in the new vehicles). Anoz has been upgraded since last year. There is now an indoor shower and flushing lavatory - but still no plumbing. Give me the Banya and the long drop any day! Vica there and as welcoming as ever. Her cooking wonderful. Everyone enjoyed the cool night air. Nightingale singing outside the window in the evening. P.S Three team members bathed in the Katun river. Base camp showers will be too hot for them!

21 June

Long drive today. Office in Gorno Altai doesn't open until 09:00 now so we can't leave Silver Springs (where we meet the team members) until 11:00 at the earliest, but at least everyone was registered. We got to the Tuvan restaurant after 4pm. The temperature dropped and by Kosh Agach it was cold, windy and wet, but the drive to base camp was beautiful with dramatic light effects. Arrived at base camp after 22:00. Mercifully the rain stopped and we could unload without getting soaked. It's cool. People wearing their down jackets.

23 June

Yesterday was blazing hot. Base Camp has been well prepared. The solar showers make a big difference I'm told although I'm happy with the cold ones in this heat. Team members even bathed in the river. After going through gear, the science etc Volodya (Vladimir) took one group up behind Base Camp to an observation point and I took the other off-road driving. All went very well. It was even warm in the night. A first at base camp. There are not as many flowers as in July, and mercifully not as many grasshoppers. Surveying has begun with a ridge and a valley survey behind base camp. Sergey has left. We have the same Russian team as last year except for old Oleg. Instead we have Victor from Anoz as a second mountain guide and a young helper called Tolia.

26 June

The Altai hasn't changed – it's as unpredictable as ever. We've had wind, rain, sleet and sun over the last three days and last night temperatures went down to below freezing, but surveying is continuing apace. Team members are very fit. Two team members and Oleg saw 2 female ibex two days ago at about 3000 m. It was a brief sighting, but close (less than 100 m). We put up the hide and a tent in the survey area (back valleys). Uli and Franz were the first do an overnight observation stint. It was a tough one with sleet showers and then cold wind in the night, but they loved it and want to do more! Four more people want to do this and of course, so do I... The changeable weather means lots of dramatic light effects over the steppe and in the mountains. Charlie has experimented with the trail master at base camp. Everyone is working hard and we're having a great time. The sense of humour is wicked!

I took a group interviewing yesterday and caught up with some old herding friends (as well as trying a new horse) and by chance, bumped into (not literally - Defenders still pristine!) the deputy head of Altai Republic Hunting Concession. He was driving a bigger 4WDrive than us with tinted windows and had more gear in it than our expedition has in total. He was looking for poachers and gave me a lot of information. Poaching of snow leopards is a big problem. I will meet up with him again in Gorno Altai later on.

30 June

Time has flown by. More surveying behind Tapduair (ridges and valley) and new survey in corridor area (survey block 2). Very exciting. Saw two female argali and evidence of herd using the area. Also found a scrape. Not snow leopard, but possibly lynx. This is a very fit group and we have covered a lot of ground. The weather has been pretty good. Interviews with herders are yielding more information. Last night had a party at base camp to celebrate Argali sightings. Everyone had a go at reeling (Scottish dancing before anyone gets the wrong idea). Must be a first in the Altai. Already packing up to leave tomorrow morning. I hate leaving base camp. The flowers are just astounding and we are really enjoying the bird life. This has been such a good group with a wide range of skills. Only drawback is that they are all fitter than me.

2 July

Safely arrived in Novosibirsk. Made good time on both days. Ursula and Sophia have stayed at Anoz for a couple of days before flying home. It was very sad to say goodbye. The vehicles felt strangely empty driving back today. We are going out this evening to celebrate the end of an excellent first slot. I will be very sorry to see this team go.

3 July

It was too good to good to be true. Parking spaces for all three vehicles outside the hotel doors. I had to move the cars this morning as the whole pavement is being dug up and asphalted. Mess, noise, mud. Not only off road driving in the field, but off-road walking in the city. It is pouring with rain in Novosibirsk and cool.

4 July

Good journey to Anoz despite much rain. Arrived under a downpour that lasted the whole night. The banya was so welcome and I tried the birch leaves for the first time. Team members already getting on. It is lovely to have Christine, Toril and Peter back again this year. Katie is also a great addition as she speaks fluent Russian and is an expert in Siberian cultures.

5 July

Stopped at Silver Springs as usual. Berry blinis wonderful (wild strawberry fillings). Sadly many musk deer teeth, bear claws and other bits of wildlife for sale among the trinkets and souvenirs. Made good time on the road and arrived at base camp at 20.10. Mercifully it only rained lightly as we unpacked, but was raining heavily by the time we were in the mess tent. Very good to see Volodya again. Not only had he surveyed the marmot colony close to base camp while I had been away, but he had prepared the most delicious soup for our arrival. Everyone tired and glad to collapse into their tents.

6 July

Overcast morning and more rain, but the sun came out at lunch and we were able to observe ibex from base camp! Three males were spotted with binoculars on the ridge just behind camp. We had the spotting scope out immediately and the whole team was able to observe the ibex. Although we were observing them at a range of about 1.8 km, we could pick out a lot of detail (colour, condition, and activity). We observed them for 30 minutes until they went over the ridge. As if this wasn't exciting enough, we saw them again (we assume they were the same animals) three hours later and observed them for another 30 minutes. Only two males were visible this time - both adult, one paler, smaller and in poorer condition (it was moulting). We observed them graze, rest and walk along the ridge. Everyone was really thrilled. Also enjoyed good marmot observations (adults and young) on the adjoining slope. There is a good colony above base camp. Sadly Boris (a very laid back marmot named and photographed by the last team) was not out and about, so no real photographic opportunities. The weather changed very abruptly and we had lashing wind and rain by 18.00 that turned into sleet and snow by 19.00. Base camp was soon white and Victor even made a snowman. The vodka came out and the temperature plummeted. A cold night. Tents covered in snow and stiff with ice.

7 July

Bitterly cold morning. Beautiful moon visible over snow covered mountain behind base camp. Large, grey vole in mess tent before breakfast. Rodents keen to share our facilities in this cold weather! Most of the group went out to survey ridge behind base camp to search for signs of ibex. Christine and I stayed with the spotting scope and did observation all day. Turned into a beautiful day - strong sun with cold wind. All the snow had melted by the afternoon. Survey group came back in the afternoon. Despite observing all day, Christine and I saw nothing (no large mammals). The flora is so diverse and beautiful. Wild onions and rhubarb are plentiful near base camp and they are a delicious addition to the meals. Boris made an appearance after supper and was photographed from all angles.

8 July

Bright, crisp morning. We surveyed an area three hours drive away. Stopped at the winter station, an hour's drive from here (it's becoming a tradition) and saw flock of hill pigeons and very close views of a family of choughs - parents still feeding the fledged young. They were using the dung-covered roof of one of the buildings. Interestingly they were red-billed choughs (we usually see yellow-billed). On the way to the survey site we saw a wolf (running hard across a slope, about 800m away) and a huge concentration of eagles (6 imperial, 1 white-tailed and 4 steppe) near a shallow lake. There were ruddy shell duck on the lake (5) and 11 smaller diving ducks. They were too far to be able to identify. We all enjoyed great views of eagles. The survey yielded evidence of argali using the area. Immense horizons and views into Mongolian and Tuva. Mosquitoes were really fierce. The flora so beautiful. So glad we have Christine with us to document it. Unexpected sight of 10 Bactrian camels at the winter station on the way home. No sign of any herders and the winter station is deserted in summer. Camels nervous when we got out to take photographs. Left in a flurry of dust and left very fresh droppings (always interesting!). Most beautiful (warm!) evening back at base camp. Filling in the data sheets after supper as usual - always interesting discussing the day's findings. Volodya a fund of information. Dan and Dave looking forward to overnight stint in hide tomorrow.

9 July

Cool and overcast today. All team members go to survey the valley below Silugiem ridge and we put up hide and tent in good area (visibility up and down large portion of valley plus ridges). Find fresh signs of argali. Weather turns really unpleasant (strong wind, rain and cold), so we turn back. Take some team members interviewing in the afternoon. See two pairs of demoiselle cranes with half grown young. A really good sighting. They are such elegant birds. It’s always thrilling to see them. The weather improves - hope Dan and Dave have an interesting time.

10 July

Day off for people to relax, wash clothes etc. The river at base camp is nearly dry. Only small pools remain (just enough to chill the Russian champagne for this evening). Hot day. Flies and mosquitoes active! Andrei takes group of team members to see burial mounds in the steppe. Very successful outing. Dan and Dave collected from hide in the afternoon. They didn't see anything, but enjoyed the experience. Have left hide and tent up for next stint. The Russian staff very busy preparing a temporary banya (a Russian sauna / wash room). Stones collected from the river. A huge fire lit and finally the food tent transported to the banya site (below the shower tents). Bunches of larch (instead of birch). The results amazing and enjoyed by everyone. Then a party at base camp with shashliks cooked on the fire (prepared by Andrei). The black-eared kite making really low passes over the river, looking for scraps). A really fun evening that goes on late into the night.

11 July

Very hard getting up, not to mention surveying. Take Peter and Toril to the hide. The rest of us do the first relative abundance surveys around and above glacial lake in back valleys. Very hot day. Mosquitoes are murder - clouds of them envelop us as soon as we stop. Not much fresh sign of argali/ibex but fresh manul tracks (+ fox and marmot). The area around the glacial lake studded with yellow poppies and other alpines. The long drive to and from the survey site a beautiful as ever. Great sightings of little ringed plovers in river bed and demoiselle cranes displaying (courtship) on the steppe. Magical. Also hear them call as they fly off. Two pairs of black-eared kites also treat us to dramatic displays. Everyone really tired. Data sheets and an early night (unusually warm).

12 July

Another warm day. Two groups out surveying. Volodya took one group to survey river bed; Oleg went with Katie and George up to survey ridges behind base camp. They found evidence of ibex and manul. I collected Toril and Peter. They enjoyed their time in the hide and observed a range of marmot behaviour. The afternoon was spent bird watching on the steppe and I took people out for more interviews. We were welcomed by a lovely family and gathered more useful information. Olga did a wonderful job as always, helping me gather information. Andrei took a group out to do some night viewing of jerboas on the steppe. Jerboas were seen and even stoked (yet another of Andrei's skills - he has now been dubbed the Jerboa Whisperer).

13 July

An early start to climb and survey Silugiem (3419m at the summit according to out GPSs). Another very hot day. Nadia with us. Man-eating mozzies and horseflies mean we are all covered in deet (and still they bite us!). Dave taking no chances and wearing head net. Beautiful up the approach valley and steep hot climb up Silugiem. Virtually no snow and hot even at the top - unbelievable.Hard but magnificent survey. Sign of argali and ibex trails. Magnificent views (and able to see more argali and Ibex trails across the valley). Tapduair still has impressive glacier and snow patches - red in parts due to summer algae. Very steep scree descent and long walk back down the valley, where Toril finds large carnivore scat on rock (probably wolf, but it will be sent off for analysis). Thunderstorm and heavy rain as we walk. Luckily it stops just after we get to the vehicles. Back at base camp Nastya has prepared a magnificent supper and a cake - all beautifully presented. Is there no end to this girl's talents? Andrei takes second group out night watching - again very successful with jerboa, hamster and hare sightings (captured on video).

14 July

It's even hotter. I try to record the heat on the compass thermometer but it shoots off the scale (says it's over 50 degrees Celsius). Dan ready to defeat the biting insects by wearing 1½ pairs of thick woolly socks (other half eaten by voles), a jersey, hat head net and ski gloves. I am worried he will collapse with heat exhaustion before he even begins surveying, but he's smiling and ready to go. Volodya leads a survey. I take a group for last interviews in the prostrating heat. Half the herders are absent or asleep. But a family we know welcome us with open arms and we have an unforgettable afternoon with lively conversation, tea, bread, wild rhubarb preserve and as if that were not enough, fried dried lamb chunks - all washed down with vodka which George, Katie and Sarah decline as they say they are driving and I accept (out of good manners of course!). I'm just able to take some photographs on the way back and amazingly they are sharp! Hearty supper at base camp. Summarise survey routes done so far and what we have found. It is very hard to find evidence of large mammals or to have any sightings in this heat as they will have moved as high as possible and may be using different areas.

15 July

Up early and leave base camp by 08.00. Heat coming off the steppe - vehicles disappear in clouds of dust. Volodya and Dave with us. Dave wants to see snow leopards in Novosibirsk zoo (that's his story). Nadya and Victor staying at base camp this time. Very hot and hazy drive. Usual Tuvan restaurant has a power cut so sadly can't eat there. We travel on past Ongoudai and stop at a roadside café. Travel on and on as the landscape changes and becomes increasingly alpine. Weather change at Sminsky Pass (low cloud which stays with us for the rest of the journey). Usual stop near Anoz to buy beer. Thin little girl selling "cedar nuts" (seeds from Siberian pine cones) - Sarah, Katie George and I spend the rest of the journey trying to eat less shell than kernel. Drive in to Anoz over the old bridge. Very atmospheric with the fast flowing Katun turbulent under a brooding sky. Always thankful to reach Anoz - lush, scents of foliage and grass, the sound of the Katun river, cowbells and when night falls, cicadas. The blissful banya and Vica's cooking. It's heaven. A lovely evening followed by catatonic sleep.

16 July

Very hot drive to Novosibirsk but make excellent time. Stop for coffee and fresh fruit blinis at roadside market and then great shashliks later. In Novosibirsk we finally get the third Defender and papers!!! Supper in the Russian restaurant. Very sad to say goodbye to this group, but at least we've got Dave for the next slot - so head nets will still be all the rage.

19 July

Arrived base camp yesterday evening after long and beautiful drive. It was raining when we refueled at Kosh Agach at dusk - seems to be the pattern this year. Drove across the steppe to base camp in the dark. We arrived after 10.00pm. Nadia and Victor very relieved to see us. Wonderful supper in candlelit mess tent waiting for us. Despite the rain, everyone really glad to be at base camp.

20 July

Rain stops and first day spent going through the science, equipment, off road driving etc. Volodya takes a group out in the afternoon. It's sunny but the wind is cold. Marmots seen and all. The team is fit and rearing to survey. We are visited by a Russian botanist from Tomsk University doing field work in our survey area for the next few days. He is very surprised to find Biosphere Expeditions working in this remote region.

21 July

The team out to survey "lost valley" and glacial lake. The trail master is put up near the glacial lake, near an area used by argali to rest. Wonderful pika sightings and photos by team members. Long day in the field and everyone tired in the evening. I recce area across the steppe with Leonid (the Russian journalist from Geo magazine) and sort out horses for a survey tomorrow. Data sheet time very lively - everyone very interested and much discussion of findings (faeces, tracks, argali wool).

22 July

Heavy rain and low cloud in the morning. I go with Leonid, Olga, Tolia and team member Karen (she is a good rider and willing participant) to the back valley to meet our herding friends, Abai and Gulinara. They have arranged four horses for us. It is a good photo opportunity for Leonid and enables us to survey a useful area in a short time. Tolia wants me to race him, but I refuse (I don't do competitive, especially against an 18 year old built like a jockey and riding a flasher horse than me), but that doesn't stop a couple of fast gallops. We take the horses high up to a plateau from which we have a 360 degree view of so much of our survey area. It's amazing. Really worth coming back with the spotting scope and spending time observing. Enjoy sighting of red fox and chukar partridge plus find argali and hare faeces. Ride horses down and enjoy last gallop home. Olga is waiting for us at the yurt, making cream with Gulinara. We are treated to a feast of meat and pasta (a sheep was killed while we were out - not a scrap of it is wasted and I'm shown every bit, now in plastic bowls). Back at base camp the sun has come out and we find the rest of the team observing ibex from just above base camp. Shelley pulls me up the slope (she's a fell runner and I'm not!) and I look through the spotting scope. See a female argali with young below the ridge line and then a female ibex on the ridge line. The team has had several sightings during the day (some obscured by low cloud and rain). Oleg has finished the frame for the new mess tent and it's up. He is putting the finishing touches as I write and has proudly parked "his" silver Defender in it.

23 July

Heavy rain in the night but stops in the morning. Volodya, Oleg, Dave and Bob leave to spend 36 hours surveying the far side of Tapduair. They take a vehicle, tents and half the kitchen with them. The rest of the group and I go to check the Trailmaster video trap and do a relative abundance survey in the area around the glacial lake. The approach up the valley is so lush and filled with flowers. No domestic stock grazing it at present. Day turns very hot and the team find lots of sign of argali and some sign of ibex plus abundant signs of Altai snowcock. The Trailmaster was triggered but no footage, so it has been re-set. Leonid takes lots of photographs and is very happy with his last expedition day. He leaves early tomorrow morning.

24 July

Day off and it's a lovely sunny morning. Everyone makes the most of it to catch up with clothes washing, reading and generally relaxing. Andrei takes a group out to see the 'Kurgans' in the valley of 1000 standing stones. Olga and I go out with Roger, Karen and Ulrich to see herders and end up joining a felt-making party (to patch the yurts). This takes some time (and energy). Felt-making is followed by a large lunch of boiled mutton and fresh bread. Roger is treated to sheep's eyes and other bits of head. He's a brave man! I stick to the meat and home made wild-onion relish. After this we take the herders to sacred springs. A fierce wind comes up out of nowhere and then rain.We arrive to witness part of a three day celebration being held in honour of grandmothers (who have born in excess of 10 children). They have come from many districts. There are yurts, tents, trucks - men eating 'boursak' and meat sitting around low round tables in the rain. Some venerable looking old women come out of their yurt for photos. The men are eating outside. We are given some arak (a drink made from fermented mare's milk). It is very sour but a new experience. Back at base camp in the evening. Volodya and his group had a great survey and saw argali as well as 60 argali resting depressions. Nadia has made a cake and the men have made another 'banya', despite the pouring rain. The men go first this time and by the time they have finished it's dark, but Shelley, Nadia, Nastya and I brave the elements and it's well worth it. Nadia even swims in the river! And I thought I was half way to being a Siberian - I've still got a long way to go.

25 July

Heavy rain in night - clears temporarily in the morning. Volodya and Oleg take a group out surveying back valleys. Shelley, Ian and Jane go out with Victor to survey up past the forest (near base camp) in the morning. They come with me and Bob to do interviews in the afternoon. Rain comes back again. Too wet to survey. Pass trucks offloading relatives at yurts after the party at the springs. Drive to back valleys and interview Masha and family (they of the felt-making yurt adventure). Interesting, as relatives from the village there (past Kakaria) including Masha's sister - a school teacher (and very pretty daughters. Bob looks very interested!). She tells me there are many snow leopard skins in the village but can't or won't say how old they are. She also talks about ibex and argali, so it turns out to be a very productive interview, not to mention pleasurable, as Masha's hospitality is as large and warm as she is. We also interview a young couple in the same valley and drop in on Abai and Gulinara as we're passing, so team members get a real taste of yurt life. Back at base camp the river is in spate and roaring over the rocks.

26 July

Heavy rain continues in the night. Early morning it's still drizzling. The whole team goes out to survey new area behind Tapduair. Rivers swollen. Muddy tracks. Black earth patches around yurts where stock are kept. Dramatic drive through back valleys to survey site. Out surveying in all our waterproofs. Weather improves slightly. Flowers and butterflies in abundance. Most of group surveys up the valley. Only Ian, Shelley and Oleg go and survey the ridge as weather and conditions tricky, but they are experienced and can get down fast if the weather gets worse. Fascinating valley. Many argali/ibex tracks across the scree and valley plateau areas. Sun comes out. Mushroom season has begun. Find evidence of argali and wolf (plus usual marmot etc). On way back Nastya, Olga, Victor and some team members pick mushrooms (Boletus). Nastya and Olga so engrossed in their task that they almost bump into a wild boar. It bolts and runs across the valley and up the opposite slope - we all get fantastic sighting - an adult male in his prime with good tusks. Very exciting - as is watching Oleg, Ian and Shelley's descent - running down so fast (and in Shelley's case so elegantly). Amazing. Everyone thrilled with the day. But another great sighting on was back in the vehicles, of a wolf (Ian spots it) - on a ridge overlooking the valley. We stop to observe and by its behaviour, it looks like a female hiding cubs nearby. We are able to observe it for about 10 minutes before it vanishes from sight. Everyone on a high. Great day and good data.

27 July

Beautiful morning. Whole team surveys Silugiem except Oleg and Ian who not only survey Silugiem., but the whole ridge system (Silugiem - Tapduair - Base Camp) - quite a feat. Silugiem always a testing and uplifting day. Survey ridges well beyond. During observation period (looking down on the glacial lake) we have distant sightings of argali (five in total). Maybe we will have some footage of them on the Trailmaster? Also watch Ian and Oleg through binoculars. Keep in radio contact. As we finally drop down towards valley Olga spots a deer and we get wonderful sighting of three young maral deer. Long sighting and able to observe them feeding. They are very wary and eventually see us and run away. We all get back into camp after 19.00 - Ian and Oleg walk into camp just after we get out of the Land Rovers. Phenomenal! They saw a small group of ibex. Fantastic day. Everyone exhausted and exhilarated.

28 July

Another beautiful day. We all go to see a cow carcass on the steppe (Andrei found it yesterday). We arrive to find 54 cinereous vultures feeding on and around the carcass. I can hardly believe it. Spend time observing and making sure we have identified them correctly (these are rare birds and to see so many is almost unbelievable). They are wary and disperse. We then go to try and visit the museum in Kakaria - but as usual, the director (who has the keys) is away. Then on to lake area in the steppe (visible in the distance from base camp). See so many demoiselle cranes (well over 50 - on marshy ground and by river bed). They are the most beautiful and elegant birds. Everyone enjoys great sightings. The lake area is also a magical experience. To step out of the vehicles and hear the call of many waders (including lapwing, redshank, dotterel) and terns - and to see them…we are all entranced as we observe through binoculars and spotting scope and pour over bird guides. Good views of black stork, usual ruddy shell duck plus ferruginous duck (with ducklings). I could stay here forever (despite the mozzies). Back to base camp for very late lunch and out again for second look at vultures. Fewer than in the morning and even warier, but a few so gorged that they are reluctant to fly so get great sightings and photos. A perfect end to a perfect day.

29 July

Leave base camp in the morning. Voldya, Chris, Victor and Nastya staying this time. Drop Volodya off by Winter Station as he is taking catnip to Trailmaster site. Get to Anoz in very good time. It's hot and team members head straight for the Katun to swim. I observe! Karen and Ulrich leave us as they are doing a five day horse trail from Anoz. Olga and I dash off to Gorno Altaysk to try and see the confiscated snow leopards skins, but no luck. Back late, but still in time for Raman's birthday. Hear Vica sing (at last!!!). It was worth the wait. She has a great voice. Collapse in the early hours to the sound of crickets, the odd cowbell and the Katun.

30 July

Olga and I leave early to try again (to see the snow leopard skins). More success this time, but we need to make an official written request to different person, so will go again next slot (third time lucky?). Hot drive to Novosibirsk with usual coffee, and shashlik stops. As good as ever. All go out to celebrate end of very successful slot - Lebanese restaurant, excellent food accompanied by loud music and sultry belly dancers (they all make a bee line for Bob and he doesn't complain one bit).

31 July

Petr (director of Avtoland, our local Land Rover partner) comes to collect us in the morning and we spend the day outside Novosibirsk for Land Rover challenge. Team member Alexander is with us as he doesn't leave until tomorrow. We take a Discovery and a Defender around the course and Petr takes us round in a very flash Range Rover (feels more like being in plane than a car). Interesting and fun day. Meet half the new group in the evening (other half don't arrive until tomorrow morning)

1 August

Rest of group arrive on time ad we're all away by 08:00. Petr is with us as well. Another hot journey and again, all team members head straight for the river on arrival. They also get straight into birch twigs and banya habit. Vica excels with another wonderful meal.

2 August

Usual stop at Silver Springs and wait while Olga and Sergei sort out registration in Gorno Altaysk. Berry blinis outstanding. Good journey down to Kosh Agach. Stunning scenery never fails to impress. It's sunny this time and the evening still beautiful when we arrive at base camp. Nastya has prepared a delicious supper. Camp fire going. Everyone happy to be here.

3 August

Heavy rain in the night and still raining in the morning. Usual introductory day. Weather clears in time for off-road driving. River crossing practice followed by washing the vehicles in the river. Everyone getting on fine and with a range of complementary skills.

4 August

Beautiful drive through back valleys to survey site. Rain has stopped. Cool bright morning. Pass smoking yurts - the smell of burning cow dung similar to peat smoke. Cattle drinking in the river. Excellent bird of prey sightings (including pair of golden eagles and pair of steppe eagles). No fresh sign of argali since the area was surveyed in the first slot, but nearly step on young fledged grouse - see 6 in total, calling to each other. Cold night

5 August

Beautiful morning, but cold. One group (including Petr) out with tents to survey glacial and dried lake area over the next 36 hours with Volodya and Oleg. I take other team members back to lakes to see birds (no black stork this time and fewer waders, but still magical). Mozzies terrible, but it's a small price to pay for observing and recording. See large number of demoiselle cranes (more than 50 in total). Afternoon spent in the yurts - one actually - where we are welcomed and new team members meet the herders we have become friends with. I try a Russian jeep this time as no horse handy - quite an experience! I'm definitely sticking to LR Defenders.

6 August

Temperatures well below zero in the night. Tents hard with frost in the morning, but the sun comes up we're all keen to survey. Go and do the ridges behind base camp. Steep walk up through forest magical and find fresh signs of maral (plus signs of wild boar). Much small mammal activity. Voles, squirrels - everything feeding and dragging bedding into holes. Do relative abundance surveys above the tree line and alond ridge/saddle and find sign of ibex and argali (including resting depressions) but none of it fresh. Also abundant sign of Altai snowcock. Back at base camp late afternoon. Volodya's group back 19.30. Really enjoyed their 36 hour stint and had an amazing encounter with a young male argali - so close (about 30 meters they got excellent photos and to cap it all the argali even followed them before running of! The encounter lasted about 15 minutes. Volodya thinks it had got separated from the herd/group. Heavy rain in the night.

7 August

Mild, windy and overcast - turns cold and wet. Day off. Andrei takes group out to see burial mounds (kurgans) and standing stones. I go and collect some of our herding friends as we have invited them to repay them for their wonderful hospitality to so many team members. Heavy rain but spirits undampened. Gulinara helps prepare a big dish of pasta and meat, Nadia excellent with yet another wonderful cake. There is singing and dancing (the weather lifts late afternoon) - so more Scottish reeling and general dancing. Andrei's super-loud speakers have their uses! Very jolly. Abai must be king of the dance floor in Kosh Agach - everyone joins in. Eileen is fantastic - an inspiration to us all. She's 72, never complains and always looks great. I don't know how she does it. Our herding friends leave

before dark as they have cows to milk. Almost forgot. There are fish in the rivers here after all - Tolia caught two grayling and Oleg caught one!

8 August

Always hard getting up after a party, but we do. The mountains covered with snow and it's cool. I take a group for overnight stint in back valleys for long survey. Oleg and Nadia with us. We camp at the entrance to "wild boar valley" (where the sighting took place). After setting up the tents we survey ridges and glacial lake. The air so cold and pure after snow. Back at 19.00. Nadia's warming soup most welcome. We build a fire. Very cold. Everyone in all their layers (I've got 4 + down jacket). Snow flurries as we sit by fire in this wild place. Stars come out. Wonderful.

9 August

Luckily no fresh snow in the night so getting up OK. Pack up tents etc and off to survey. Oleg takes group up ridges. Chris and Sally survey valley. I take Graham and Poppy with the intention of surveying valley but we end up surveying higher and higher and end at a series of jagged peaks and vertiginous ridge. So many ibex/argali trails and perfect snow leopard habitat. Find the first really good and regularly used trail (at last!). Snow and bitter winds. Winter is already hard on the heels of summer. Steep scree descent and back at vehicles just in time (thunder hail and sleet). Drive back quite something. Water levels have risen so much in the last 24 hours and a large part of the way is driving along river beds. Good test of Land Rover off-road capabilities! They don't let us down. Snowing hard when we get back to base camp in the evening. Shower in brief interlude between snow showers. Bitter but water warm. Team members and Russian team have snowball fights. Heavy snow and sleet put an end to that and many data sheets to fill means we're up late.

10 August

Very cold morning with snow still lying thick. Luckily it’s sunny. Wait until conditions are not so slippery before setting off to survey. Volodya leads survey up ridge behind base camp. I take other group to yurts. Victoria and Sally go off riding. Sad goodbyes to the herders. They have not only helped by sharing information about wildlife, poaching and their way of life, but welcomed us into their yurts and become friends. We go from one yurt to another and end up at Tarbia and Nicholai’s yurt. Tarbia wants Rachel for one of her sons and offers me five dowry chests for her! She also wants Chris instead of her husband and is most put out he is not with us. We take back a big piece of cheese to give him with the message that she wants him in her yurt and has lost her heart to him. Beautiful drive back. Stop for photos. Two trucks arrive to take away all base camp effects.Many stars. Poker playing in the mess tent – betting with stones.

11 August

Beautiful hot, sunny day. Team members walk and survey around base camp. I pack up with the rest of the team. Victoria finally gets her date with Boris – he makes a late afternoon appearance and poses beautifully. Walk up above base camp after supper (how we will miss Nadya’s cooking) and look out onto ink coloured mountains surrounding golden steppe as the sun goes down. Snow capped peaks rise behind me. It is utterly peaceful. The sense of space, the play of light - so much one just wants to hold on to. It is lovely to join everyone around a particularly good fire. We all share drinks and our feelings for this very special place. A perfect end to the last day in base camp.

12 August

Leaving is always hard especially on a sparkling day – cool air and snow-capped mountains. Beautiful drive to Anoz. Some expedition members swim in the Katun again. I head straight for the banya. My last one this year. It is very hot. Warm evening. Share cranberry vodka with Peter, Volodya and team members sitting under the stars and listening to crickets.

13 August

Hot, fast drive to Novosibirsk with wonderful stops at the market (for coffee and fruit blinis) and later, shashliks. We all go out to the Russian restaurant for last meal together. The expedition has sped past and has been a great success. Thank you all for your hard work and invaluable contribution. We have learnt a lot and gathered valuable data. Now comes the time for analysis and conclusions. It has been wonderful working with you all.