



Expedition report

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



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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 3 July to 26 August 2005. The aim was to continue a survey of snow leopard (*Uncia uncia*) in this area, as well as surveying the snow leopard's primary prey species, argali (*Ovis ammon*) and Siberian ibex (*Capra sibirica*), together with secondary prey species.

Using the Snow Leopard Information Management System (SLIMS) developed by the International Snow Leopard Trust (ISLT), presence/absence surveys (SLIMS form 1) of snow leopard and prey species, as well as relative abundance studies (SLIMS form 2), were conducted throughout the study period across the entire survey area (approximately 200 square kilometres). 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.

Fresh signs of snow leopard presence recorded this year are an indication that the core area is being repeatedly used, due, perhaps, to the tentative increase in the pool numbers of the primary prey species, particularly Siberian ibex. Continued 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 3 июля по 26 августа 2005 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 Опекі 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.

Сделанные в этом году находки отпечатков лап и мочевых меток указывают на возвращение в район снежного барса, что может быть связано с некоторым увеличением численности его потенциальных жертв, в первую очередь горного козла. 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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Please note: Each expedition report is written as a stand-alone document that can be read without having to refer back to previous reports. As such, much of this section, which remains valid and relevant, is a repetition from previous reports, copied here to provide the reader with an uninterrupted flow of argument and rationale.

1. Expedition Review

Matthias Hammer
Biosphere Expeditions

1.1. Background

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

This expedition report deals with an expedition to the Altai Republic from 3 July to 26 August 2005. 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.

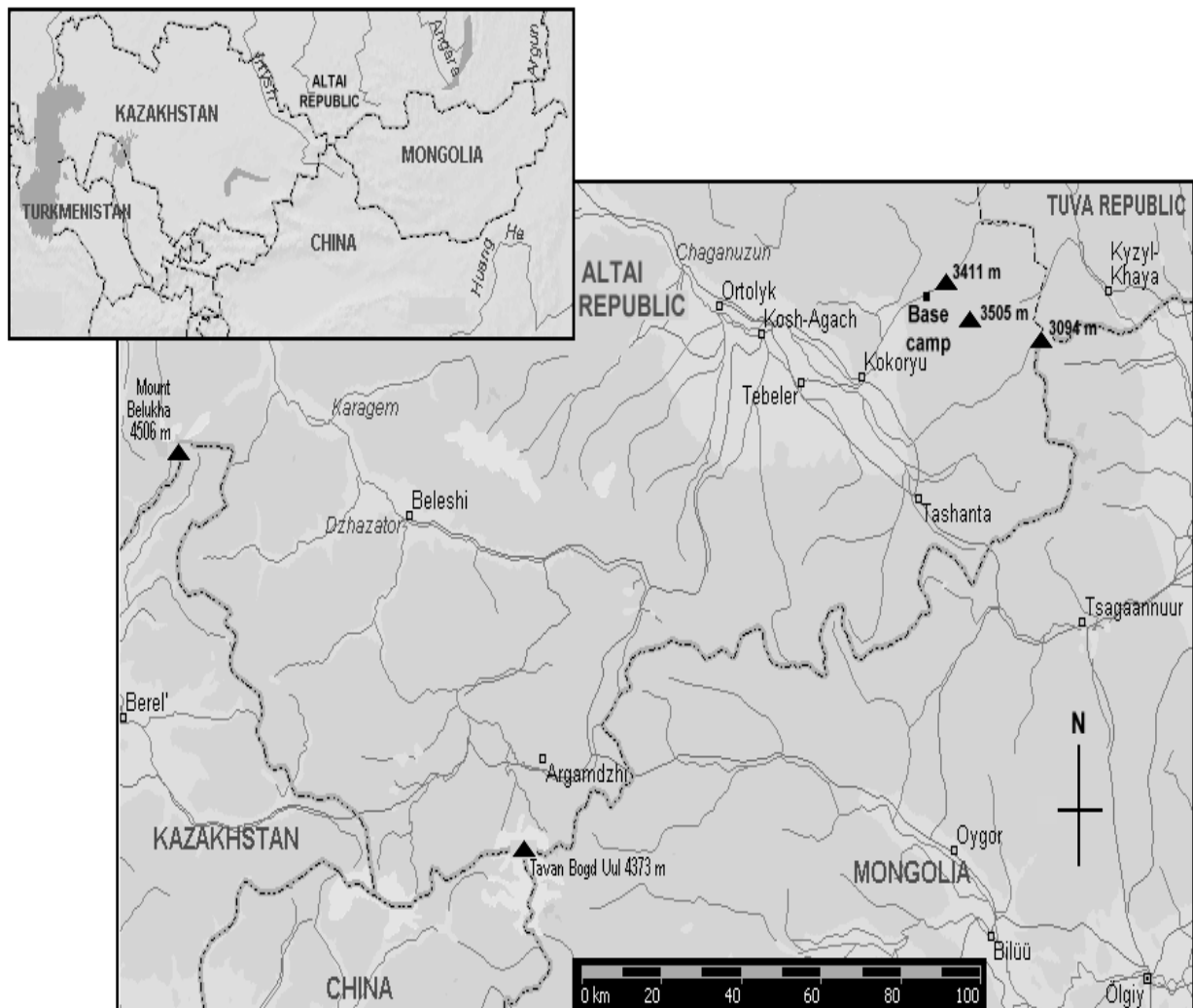


Fig. 1.2a. Map showing the Altai region and base camp. The research area is within a 30 km radius of base camp.

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

- 3 - 15 July
- 17 - 29 July
- 31 July - 12 August
- 14 - 26 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 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 four Defender 110 Station Wagons.

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, one person scolded their hand and one person suffered from abscesses. All injuries were treated at base camp.

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. Expedition Team

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

3 - 15 July

Toril Andresen (Norway), Helge Eek (Norway), Klaus Ender (Germany), Reinhard Langner (Germany), Hartmut Michel (Germany), Christine Newell (UK), Brendan O'Donovan (UK), Wilma Oehlenschläger (Germany), Peter Pilbeam (UK), Ulrich Rueger (Germany), Anja Monita Sparrer (Germany), Uwe Wenk (Germany).

17 - 29 July

Christop Berghaus (Germany), Simon Isenring (Switzerland), William Jones (UK), Daisuke Kawamura (Japan), Kathryn Milligan (UK), Boris Piekarek (Germany), Veronika Plaschke (Germany), Yvonne Raap (Germany), Kathleen Ryan (Ireland), Karin Schneider (Germany), Eva Wätzig (Germany). Also German film crew Fritz Jantschke, Florian Leo, Dirk Steffens.

31 July - 12 August

Nancy Blane (USA), James Freedman (UK), Jonas Hahn (Germany), Lars Hankammer (Germany), Sabine Herrmann (Germany), Colin Johnston (UK), Stephan Müller (Switzerland), Christian Rieth (Germany), Christian Sabatzki (Germany), Jens Warstat (Germany), Klaus Hermann Zoellner-Kojnov (Germany), Sabine Zok (Germany).

14 - 26 August

Roger Bunce (UK), Eva Dieter (Germany), Sergey Gruzdev (Russia), Stefanie Held (Germany), Colin Johnston (UK), Robert Kowalewski (UK), Thorsten Kühn (Germany), Neil Nubbart (UK), Jonathan Ord (UK), Alexander Schmoeller (Germany), Gillian Sloan (UK), Aude van Craeynest (France), Jens Warstat (Germany).

Throughout the expedition

Andrei (driver, jerboa whisperer, unofficial archaeological advisor and fount of knowledge about the region). Nastya (translator), Oleg and Roman (camp helpers and mountain guides), Ivan (camp helper). Nina (cook and heart and soul of kitchen and mess tent).

1.8. Expedition Budget

Each team member paid towards expedition costs a contribution of £1150 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	50,900
 Expenditure	
Base camp and food includes all meals, base camp equipment	4,980
Transport includes fuel, vehicle maintenance	2,840
Equipment and hardware includes research materials, research gear	1,104
Biosphere Expeditions staff includes salaries, travel and expenses to Novosibirsk	7,640
Local staff includes salaries, travel and expenses, Biosphere Expedition tips, gifts	7,990
Administration includes bribes, registration fees, sundries, etc	1,890
Logistics & co-ordination Payment to Sibalp	5,490
Team recruitment Altai as estimated % of PR costs for Biosphere Expeditions	3,950
 Income – Expenditure	 15,016
 Total percentage spent directly on project	 70%

1.9. Acknowledgements

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

1.10. Further Information & Enquiries

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

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

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2. Snow Leopard & Prey Survey

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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 the total 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 Tuva 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. Snow leopard relative abundance survey

Relative abundance surveys of snow leopard and prey (SLIMS Form 2) were conducted as well for purposes of identifying parts of the survey area that potentially support snow leopard numbers so that targeted prey species and habitat evaluations can be undertaken, which may lead to creating a new protected area.

2.3.3. Prey base survey

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

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

2.3.4. Additional surveys

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

Additional non-invasive methods planned for this study were camera trapping and faecal analysis.

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

2.4. Results

2.4.1. Snow leopard presence-absence survey

From 6 June and up to the 24 August, 41 snow leopard presence-absence surveys were carried out. The average length of one survey route was about 7.5 km, and an average of 7 hours was needed for making an inspection. Elevations ranged from 1984 m to 3505 m. The dominant landscape surveyed in the area consisted of broken terrain (BTER), narrow valleys (NVAL), steep and very steep slopes (SROL) met, respectively, in 32, 24 and 23% of the 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. This year the expedition was fortunate in two surveys (5% of the total) to encounter three sets of snow leopard tracks; all of these findings were made in the fourth slot and at fairly high altitudes. On one of the surveys (18.08.05) tracks were spotted from an observation location at 49°57.877 N, 89°18.136 E at an altitude of 3168 m. On the other survey (20.08.05) snow leopard tracks were recorded twice: at 50°00.468 N, 89°17.469 E (3294 m) and 50°00.605 N, 89°17.172 E (3176 m); of these two sets the former one was considered to be old, whereas the latter appeared to be relatively fresh.

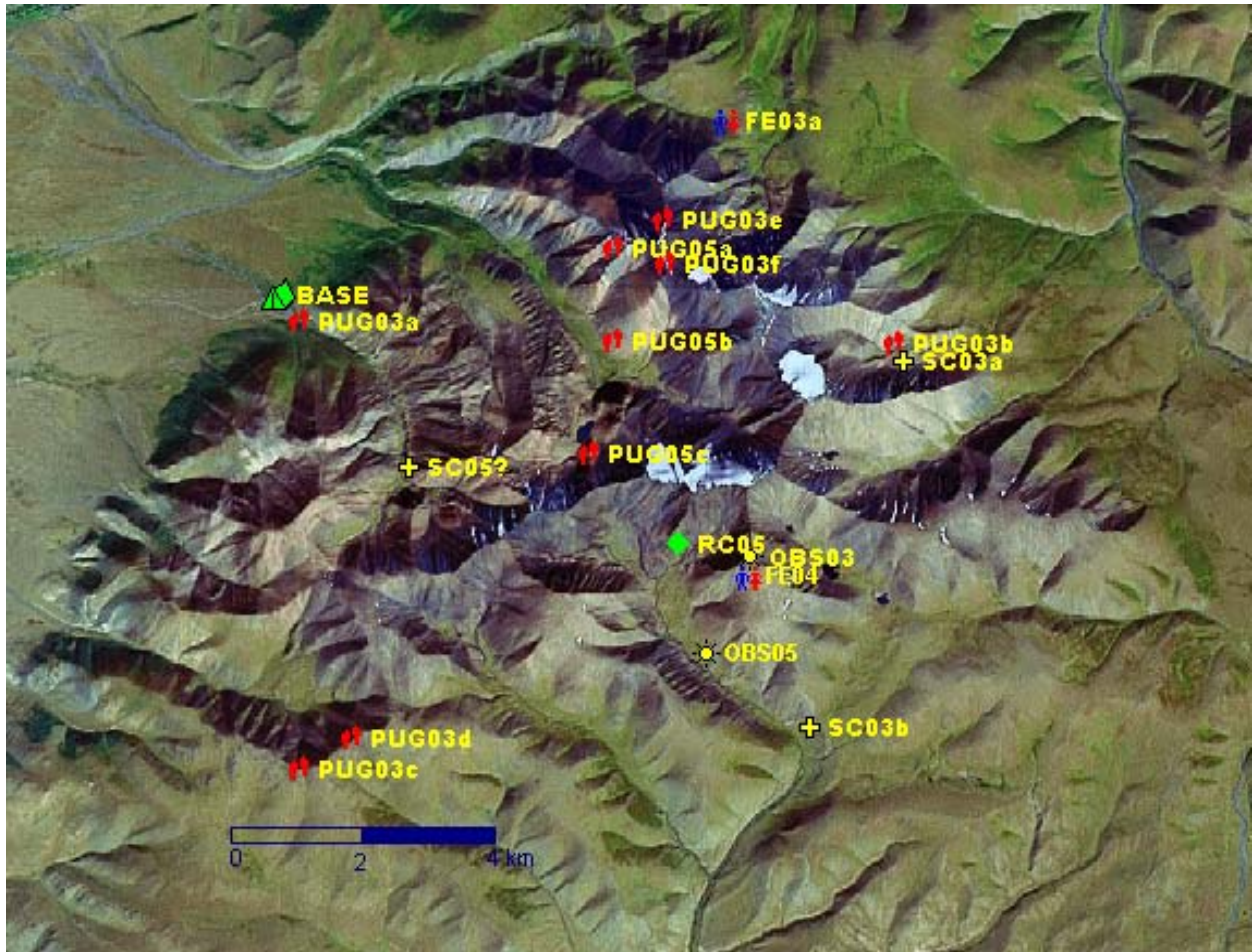


Figure 2.4a. Map showing snow leopard sign found 2003 – 2005. PUG = pugmark = track. SC = scrape. RC = scent spray. FE = faeces. OBS = observation. Figures indicate years and question marks tentative signs. The location of base camp is also shown.

Observation: One individual was seen through binoculars on 09.08.05 on ridge (3168 m) above valley at a distance of approx. 1 km from location 49°56.942'N, 89°18.522'E on an overcast, cool day with 100% cloud cover.

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. One dubious scrape (may have been done by ibex) was discovered this year on one of the relative abundance suveys (26.07.05): 50°00.452 N, 89°19.898 E (2837 m).

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. No faeces were discovered this year.

Urination: 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. One scent-spray was found during a survey conducted on 17.08.05. The sign was found (49°57.877 N, 89°18.136 E) on the east-face of a three meter high boulder (of a 10% incline) at 2940 m.

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 and were recorded in 22 out of the 41 snow leopard presence-absence surveys (around 54%, somewhat less than the year before). Signs of grazing (primarily domestic livestock droppings) are usually old and weathered (in 15 cases out of the 22 recorded) and most of these records are confined to the lower mountains and valley floor. Occasional horse droppings found in higher places indicate sporadic human presence all over the area; twice hunters were met by the team. Other signs of human presence and disturbance included findings of bullet cases and ammunition cartons, hides, steel leg-traps, campfires and various other rubbish left behind by visitors.

2.4.3. Snow leopard relative abundance survey

Only three such surveys were carried out on 10, 12 and 26 of June at elevations ranging between 2599 and 3280 m. The average length of the survey routes was about 1 km.

In general, the surveyed habitat is quite similar to the one surveyed last year and is characterized by a diverse topography consisting of a mosaic of hillsides and ridges cut across by numerous streambeds, 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.

Amongst the potential prey species, records (signs and observations) were made of the 'primary' prey species, argali and Siberian ibex.

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 45 signs of argali were recorded. These included faeces (20 cases), tracks (20), resting depressions ('beds') found in eight places. Argali were also seen between altitudes of 2442 and 2948 m five times in single and small groups, and even larger ones numbering up to 13 animals (in 2004 the largest number of argali seen together was six). Once again, 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 be as well that smaller groups gather to spend the night and/or bad weather in a single larger one. This year on one occasion 31 'beds' were found together in one place; on other occasions the numbers were 2, 5,6 and 20.

A total of 38 signs of Siberian ibex were recorded. These included faeces records (11), footprints (16), resting depressions, horns etc. In 10 cases animals were seen between altitudes of 2239 and 3002 m in single and small groups, and even larger ones numbering up to 15 animals (in 2004 the largest number of ibex seen together was 7). The pool of records spanned the altitudes of 2214 and 3085 m.

In pooled samples, as in the previous year, average elevations for findings of argali and ibex signs are quite similar, 2748 ± 34 and 2658 ± 36 m, respectively. From the statistical standpoint this difference is negligible ($t = 1.80$, $p = 0.08$), though the gap between the figures has increased due to more records of ibex sign made at lower altitudes in late August, a time not covered by the expedition in the year before. For instance, one sighting made on 17 August occurred just above the tree line. Together this may be an indication of ibex moving to lower altitudes for spending the winter. If so, argali may be coming down later in the season.

Evidence from surveys and interviews indicates that the number of animals using the survey area continue to be relatively low. Fewer records (73 against 45) have been made of one of the 'primary' prey species, argali, however more have been made of the Siberian ibex (22 against 38, of which 10 have been direct sightings). For both species numbers of animals seen together in one group has doubled and more fresh signs of animal presence were encountered. More sign of ibex may indicate that estimates for the population in the survey area are around the figures of 30 or 40 (an increase, compared to the estimate figures for the previous year), whereas for argali the figures may have dropped below the previous estimate of 60 and now are around 40 or 50.

It remains difficult to give any statistical interpretation of these estimates. However, in general, the pool of the 'primary' prey species seems to have increased, particularly at the expense of the ibex population.

2.4.5. Additional surveys

Evidence of other carnivores sharing snow leopard habitat was also recorded. These were fox (10%), manul (7%), wolf and wolverine (each 2%).

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 leg-traps, a potential hazard for the snow leopard as well.

Video camera trapping equipment was carried by the expedition. A possible location was identified on top (2943 m) of one of the ridges in the back valleys (49°59.287 N, 89°21.680 E) and tested, but without success. Indeed, the chances of remote video capture (particularly if only one camera is in use) of snow leopard are very slim indeed until a definite trail or 'relic' scrape is found.

2.5. Conclusions

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

The field evidence from the first year (2003) had indicated that snow leopard is present in the area surveyed. This, together with evidence from local people, confirmed the importance of the study area as a habitat for snow leopard and as a corridor for snow leopard dispersal between Russia and Mongolia. Sign of snow leopard was found in the core area implying a resident animal and/or or more than one snow leopard in the research area. However, in the following year (2004) no other sign was found, besides one fairly old, possibly a few months old, scat presumably belonging to the species, showing that snow leopards may have left the area or are visiting it on an occasional basis. Although at that time 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 still remains a question of how adequate is the 'primary' prey base 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 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 supposed to be increased poaching of snow leopard and ungulates exacerbated by seriously diminished facilities to combat these problems.

On the other hand, repeated surveys have shown the habitat in the Talduair Massif to be sufficiently varied and capable of sustaining a healthy prey base for the snow leopard. Fresh signs of snow leopard presence recorded this year are an indication that the core area once again is being used, due, perhaps, to the tentative increase in the pool numbers of the 'primary' prey species. In the meantime the developed relationship between the predator and prey species seems to be very fragile, so any small (perhaps, even slight) decline in the prey species (namely argali and ibex) will drive the snow leopard out of the core area.

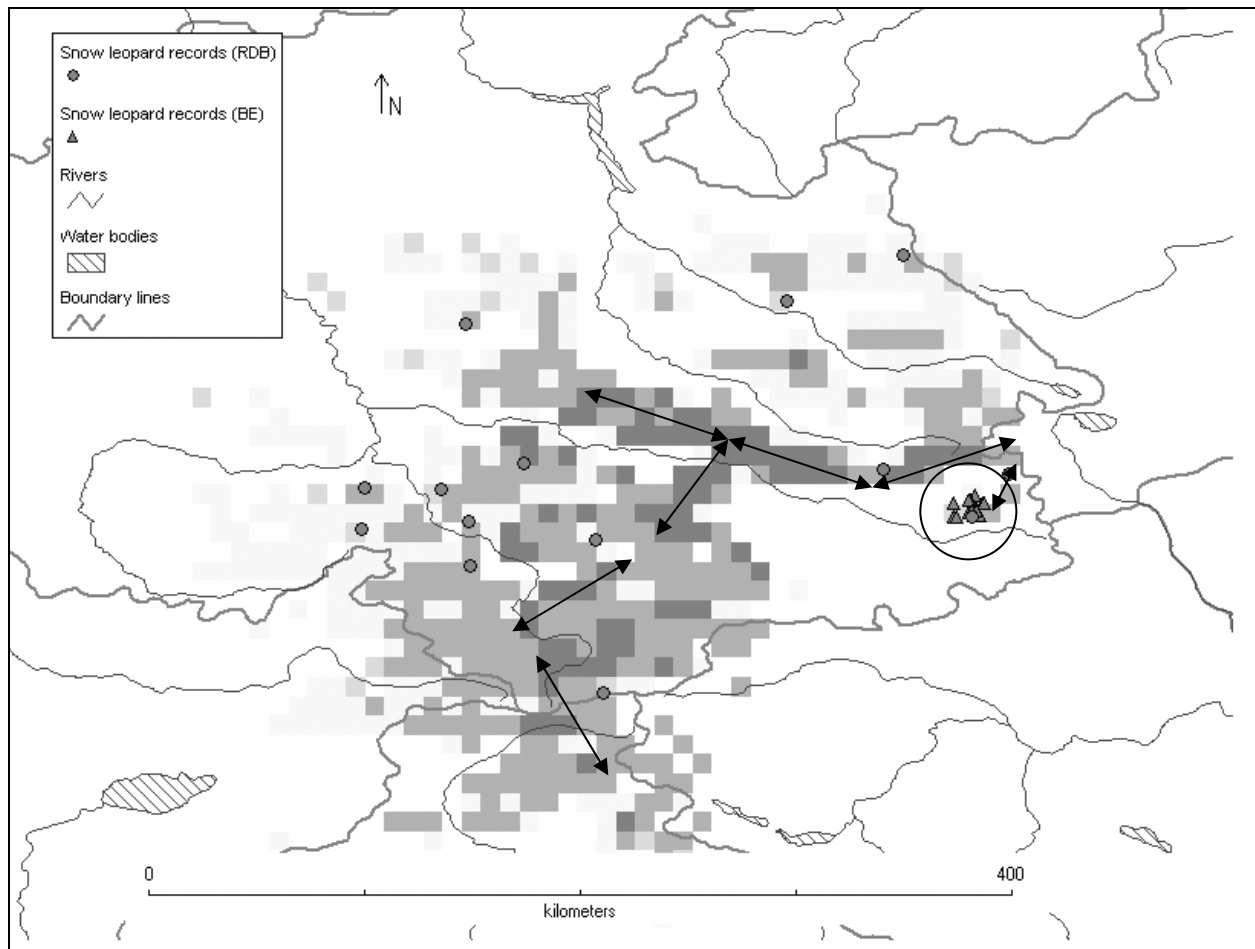


Figure 2.5a. Digital distribution model of the Snow leopard in the Republic of Altai (and some adjacent areas); areas within the darkest grey-shaded cells present the most favourable ('excellent') combination of ecological conditions required by the species; arrows indicate potential migration routes and corridors between areas of 'excellent' habitat. The circle encloses the Biosphere Expeditions survey area.

In this respect the corridor area located to the north beyond the Buguzun-Karagai-Tekelu boundary is of vital importance for animals recolonizing the considered core area. In some way the relationship between these two areas resembles the 'continent' and 'island' relationships in biogeography (MacArthur & Wilson 1967), a notion arising from the digital modeling exercise (Fig. 2.5a). Indeed, mountain ranges located north of the Talduair Massif together with the Kurayskiy Range form an extensive cluster of 'excellent' habitat area interconnected with similar areas in the northern Chuyskiy range favouring snow leopard presence. So, given a sufficient 'primary' prey population, the core area can be repopulated at any time from this neighbouring large 'corridor' area.

Unfortunately, the worrying decline in snow leopard and prey species numbers is affecting these areas as well, so, unless action is taken soon, chances for restoring the snow leopard may be thinning out.

Overgrazing by livestock 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.

In summary:

(1) Results from SLIMS data sheets confirm the fragility of the area for sustaining a viable snow leopard population and its temporary status as a snow leopard habitat, primarily depending on the presence and availability of prey.

(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 grazing pressure, human disturbance and proposed development (a through road to Tuva 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 argali 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 beyond, as indicated by the ecological niche modeling) and lower valleys (survey block 1). One winter survey (this would be of shorter duration), or extension of the expedition season into September, would enhance monitor snow leopard and prey population trends.

Outlook & future expedition work:

Further research is needed to monitor snow leopard and prey population trends in the survey area. Presence-absence surveys will be repeated in the following years and relative-abundance surveys will also be undertaken in the most suitable habitat areas. 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 must continue to play an important part in the research. Liaising with local people will also 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.

Заклучение

С 6 июля по 24 августа проведено обследование наличия снежного барса в районе горного массива Талдуаир и оценка подходящих для вида местообитаний. Вели поиск отпечатков лап, поскребов, экскрементов, мочи и мочевых меток. Исследования прошлых лет года дали основания считать, что в районе обитает по крайней мере одна особь. Находка лишь одного образца экскремента в 2004 году дало повод предположить, что вид покинул рассматриваемую территорию или только временно ее посещает. Сделанные теперь находки отпечатков лап и мочевых меток указывают на возвращение в район снежного барса, что может быть связано с некоторым увеличением численности его потенциальных жертв, в первую очередь горного козла.

Предполагается, что снежный барс проникает на территорию горного массива Талдуаир с массивов, расположенных севернее линии, образуемой реками Бугузун-Карагай-Текелю, и входящими с состав своеобразного миграционного коридора. Подобное предположение укрепляется полевыми наблюдениями и компьютерным моделированием экологической ниши снежного барса, выполненным с помощью ГИС-технологии.

Оценка подходящих для вида местообитаний, расположенных на высотах 2599-3280 м н.у.м., показал, что имеется определенный потенциал для присутствия здесь снежного барса, чему способствует рельеф, слабая посещаемость мест скотоводами (хотя в расположенных ниже угодьях выпасание домашних животных является обычной практикой), признаки пребывания потенциальных жертв (прежде всего, сибирского горного козла и аргали).

Вместе с тем, имеются признаки незаконной охоты на основных потенциальных жертв снежного барса, и снижение их численности может привести к полному исчезновению вида на рассматриваемой территории.

Необходимо ввести запрет и/ или строгий контроль на отстрел диких копытных и придание району Талдуаир природоохранного статуса. Улучшение благосостояния местного населения и экологическое просвещение могут стать составными элементами комплексной природоохранной программы, флагманской целью которой станет сохранение снежного барса.

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

3. Bird Survey

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3.1. Introduction

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

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

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

3.2. Methods

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

For the purpose of measuring and comparing bird diversity there are two broad groups of methods: those which generate a species list, perhaps with an approximation of abundance, and those which generate a species list with a quantifiable measure of abundance (for details see Bibby, Burgess & Hill, 1992) [Russian version published in 2000]. For birds, abundance is enormously difficult to measure with any precision. A key problem is the difference between observed and real abundance.

Various methods can yield data on distributions as well as abundance, but they differ considerably in the amount and types of data they produce in relation to the effort put into them. All quantitative methods are relatively time-consuming and cost-effectiveness is thus important. Using a combined measure of abundance and diversity is a widespread practice in bird surveys.

Typically, a survey consists of set of counts. The mean score for each species is regarded as an index of its abundance. Bibby et al. (2000) proposed a simple approach, in which abundance is indexed by the simple proportion of the counts in a survey in which a species is encountered. It is obvious that the commoner the species, the more likely it is to be recorded with higher frequency. For example, out of the total of 404 records of species being encountered on a particular day, 27 (or 6.68%) belong to the black-eared kite, one of the most common birds in the study area. On the contrary, rare species met only once (for instance, the bearded vulture) account only for about 0.25%.

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

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

Sampling units (i.e. transects) were spread over the whole study area and covered all habitat types. This network did allow for a relatively fair proportional coverage of habitat units, so we consider it to provide a representative sample of the area for a reliable estimate of bird diversity. The time to complete a transect varied around an average of about 6½ hours. Sampling time (in days) was used in our analysis as a measure of the sampling effort (Table 1).

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

Slots	Dates	Sampling effort
1	5.07-13.07	9
2	20.07-27.07	8
3	3.08-9.08	5
4	16.08-24.08	8
1-4	5.07-24.08	Total: 30

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

Data storage and access

Appendix 1 shows all individual species encountered during the expeditions.

Additional values were attributed to each species in order to facilitate investigation of the diet guild, feeding site guild, body size category, conservation category.

Data analysis

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

One way of assessing inventory completeness and 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 observed, number of samples, traps, trap-days or some other measure of area or time (Soberon & Llorente 1993, Colwell & Coddington 1994, Hayek & Buzas 1997, Longino & Colwell 1997). The curves of species accumulation models reach an asymptote when the probability of adding a new species to the list approaches zero.

Species accumulation models allow: (i) measures of inventory efficacy and completeness within a given study, and (ii) valid comparisons between studies based upon a standardized 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 fitted two asymptotic models (reviewed by Soberon & Llorente 1993) to our species accumulation data: the linear dependence model and Clench model.

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

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

where t is a measure of effort (in our case number of days), $S(t)$ is the predicted number of species at t , a represents the rate of increase at the beginning of the sampling, and b is species accumulation. Soberon & Llorente (1993) recommended this model for situations where the taxon is well known or the study area is relatively small and could theoretically reach an asymptote over an infinite period of time. We used Lamas, Robbins & Harvey's (1991) equation for estimating the time required to register a proportion of the total fauna as predicted by the asymptote (t_q):

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

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

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

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

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

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

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

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

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

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

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

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

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 50 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' ($Var H'$) can be used as a measure of statistical error, however the significance of differences in diversity between samples was preferably determined by bootstrap analysis with 1000 random permutations (Hammer et al. 2005).

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

3.3. Results

The methods used resulted in a presence-absence data set. A total of 93 species were recorded (belonging to 14 orders, 29 families, and 61 genera).

The following analyses of bird diversity were made:

Species richness & diversity.

Species accumulation curves were plotted to estimate inventory efficacy and completeness and allow valid comparisons in further monitoring studies applying the same or similar methodologies. The total simple species accumulation curve is presented in Fig.3.3a.

The rate at which the curve flattens is crucial to comparing such curves. 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 0.10 (O'Dea et al. 2004), however, in the last 10-sample interval it noticeably remains above this threshold and has a value of 0.19.

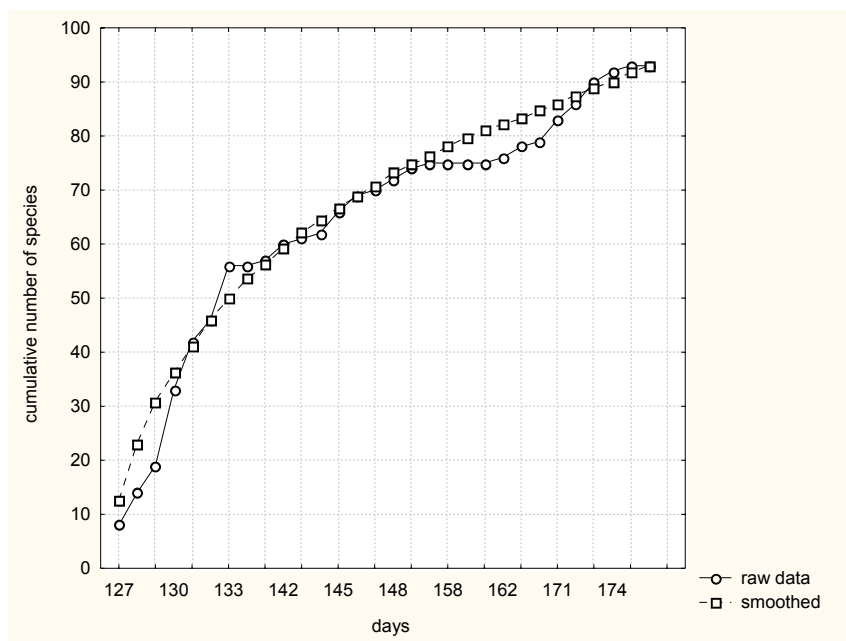


Figure 3.3a. The total simple species accumulation curve (smoothed curve produced by 50 random reorderings).

Theoretically the linear dependence model predicts that around 82 species are expected to be met in the area, whereas the Clench model envisages about 99 (see Table 3.3a). These figures are fairly similar to those estimated for the previous year, 80 and 108, respectively.

Table 3.3a. Number of species recorded, parameters and predictions of two species accumulation models fitted for the total data, where a is the slope at the beginning of the sampling, b is a parameter related to the shape of the accumulation of new species during the sampling, a/b is the asymptote (expected number of species), t_{90} is the expected effort (in days) for revealing 90% of the avifauna, and R is the correlation coefficient.

Number of species	a	b	a/b	t_{90}	R
Linear dependence model					
93	9.147±0.741	0.112±0.011	81.7	21	0.957
Clench model					
93	12.229±1.089	0.124±0.014	98.6	73	0.973

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 fell to below 5% of the estimated species richness (O’Dea et al. 2004). In our case standard deviations remain well above 5% of the estimated species richness, reaching the lowest value of 18.8% of an expected number of bird species in the study area ranging between 53 and 134. In the year before (2004) the lowest value reached was 8.26% of an expected 94.55 (or, approximately, 95) number of bird species in the study area. This figure almost concurs with the number of bird species (93) observed in 2005.

The overall diversity of the avifauna (assessed by the Shannon index, H') comprised 4.061 ($VarH' = 0.00189$). This diversity value 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. The bootstrap analysis detected no significant differences in diversity between samples collected in 2004 and 2005 ($p=0.003$), meaning the quantitative structure of the bird fauna in the area may be fairly stable.

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

Order	No. of species	Family	No. of species
Passeriformes	48	Alaudidae	3
		Cinclidae	1
		Corvidae	9
		Emberizidae	3
		Fringillidae	3
		Hirundinidae	2
		Laniidae	1
		Motacillidae	8
		Paridae	1
		Sturnidae	1
		Sylviidae	6
		Turdidae	10
Charadriiformes	15	Charadriidae	14
		Laridae	1
Falconiformes	12	Accipitridae	9
		Falconidae	3
Galliformes	5	Phasianidae	2
		Tetraonidae	3
Anseriformes	3	Anatidae	3
Columbiformes	2	Columbidae	1
		Pteroclididae	1
Ciconiiformes	1	Ciconiidae	1
Coraciiformes	1	Upupidae	1
Cuculiformes	1	Cuculidae	1
Gruiformes	1	Gruidae	1
Pelecaniformes	1	Phalacrocoracidae	1
Piciformes	1	Picidae	1
Podicipitiformes	1	Podicipitidae	1
Strigiformes	1	Strigidae	1
Total: 14 orders		Total: 29 families	

A qualitative analysis of species diversity done by taxonomic unit (bird order and family) shows that the majority of species (48 out of 93, or 51.6%) belong, as one would expect, to passerine families (Table 3.3b). In terms of species numbers passerines are followed by waders (predominantly of the family Charadriidae) and raptors (families Accipitridae and Falconidae), composing respectively 16.1% and 12.9% of the local avifauna. More wader species were recorded this year as a consequence of a more intense birdwatching survey of the wetlands adjacent to the study area, particularly those located in the floodplains of the Kokorya and Baylukem rivers. In general, however, the distribution of species amongst the major bird orders for both years (2004 and 2005) remains stable as evidenced by the Chi-square statistical test ($p < 0.192$) (see Table 3.3c).

Table 3.3c. Distribution of species amongst the major bird orders for survey years 2004 & 2005.

Orders	2004	2005
Passeriformes	36	48
Charadriiformes	12	15
Falconiformes	14	12
Galliformes	6	5
Other (pooled)	10	13

Chi-square = 6.102, *d.f.* = 4;
 $p < 0.192$

Trophic diversity

Species recorded were divided into five trophic categories (carnivore, herbivore, insectivore, piscivore, and omnivore) on the basis of their primary food diets: carnivores include those bird 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 (for instance, seeds) to their diet; piscivores feed primarily on fish, but may pursue invertebrates etc.; omnivores usually rely on any kind of available food.

Table 3.3c. Summary of trophic diversity of recorded species.

Trophic category	insectivore	carnivore	herbivore	piscivore	omnivore
No. of species (2004)	46	13	10	5	4
%	59.0	16.7	12.8	6.4	5.1
No. of species (2005)	61	12	12	3	5
%	65.6	12.9	12.9	3.2	5.4

Chi-square = 4.230, *d.f.* = 3; $p < 0.238$

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 3.3c summarises the trophic diversity (diet guilds) of the recorded species. Generally speaking, figures in the table are in compliance with the species diversity analysis done by taxonomic unit. Indeed, passerines representing about a half (51.2%) of the species in the area are primarily insectivorous. So too are many of the wader species recorded. As in the previous year, carnivores in 2005 continue to make up a high-ranking diet guild, indicating a rich source of secondary production in the area capable of maintaining an array of raptor species and specialized scavengers. The Chi-square test shows that variations in the figures observed between the two consecutive survey years are statistically insignificant ($p < 0.238$).

Habitat diversity

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 approximately 2400 m altitude), mountain steppe, mountain tundra, open rock (including cliffs and barren scree fields), intrazonal habitats (such, for instance, as narrow mountain river valleys, gorges etc. quite often with different vegetation from the surrounding landscape), urban (places in and around human settlements, but in our case poorly investigated).

Table 3.3d. Summary of similarity of the avifauna of 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	197	x	x	x	x	x	x	x
Forest	133	226	x	x	x	x	x	x
Mountain steppe	036	292	213	x	x	x	x	x
Mountain tundra	042	000	100	457	x	x	x	x
Open rock	000	000	000	375	800	x	x	x
Intrazonal habitats	245	238	195	056	000	000	x	x
Urban	105	065	000	000	000	000	000	x
Total number of species met in: (data 2005)	34	27	26	21	14	11	15	4
Total number of species met in: (data 2004)	26	26	23	20	10	9	17	2

Chi-square = 4.986, *d.f.* = 6; $p < 0.546$

The upper part of Table 3.3d summarizes the similarity of the avifauna of various habitat types (assessed in % by the Sørensen qualitative measure) and the lower part shows the total number of bird species met in each particular habitat type. The Sørensen measure is a simple measure suitable for presence and absence data, and it treats all species as equal irrespective of whether they are abundant or rare (Magurran 1988).

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

In our case the fluvial floodplain area and the floor of the largest valleys house 34 and 27 species, respectively, whereas, on the other side of the spectrum mountain tundra and open rock habitats accommodate a respective 14 and 11 species. Forests, as an intermediate set of habitats, house 26 species, sharing around 20% of them with the mountain steppe above and another 20% with the steppe below. Intrazonal habitats, frequently found penetrating deeply into mountain massifs, or present in the form of patches, house 15 species, primarily of lowland origin: 24.5% are shared with the avifauna of the fluvial floodplain, 23.8% are found in the steppe, 19.5% are forests inhabitants, and only 5.6% of the species is shared with the composition of birdlife in the mountain steppe.

Although highlands in the study area are 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 about 38% up to 80% of the bird species. This notion is strongly supported by a principle component analysis (for details of the method see Ludwig & Reynolds 1988), showing a strong positive correlation for the species' composition of the highland habitats with the first principle component (PC1, which may be interpreted as "altitude"), whereas the rest are correlated negatively (Fig. 3.3b).

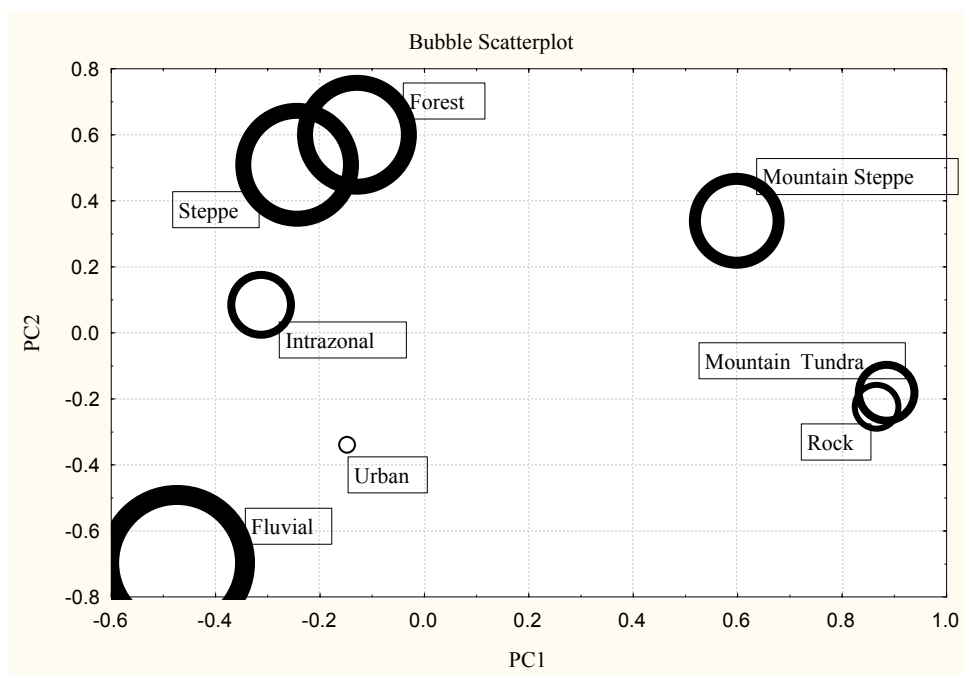


Figure 3.3b. Principle component analysis for avifauna of various habitat types (circles of varying sizes "bubbles" correspond to the total number of bird species met in a particular habitat).

Despite the observed variations in figures, the distribution of species amongst the major bird habitats in the study area for both years (2004 and 2005) remains fairly stable as shown by the Chi-square statistical test ($p < 0.546$).

Body size category.

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

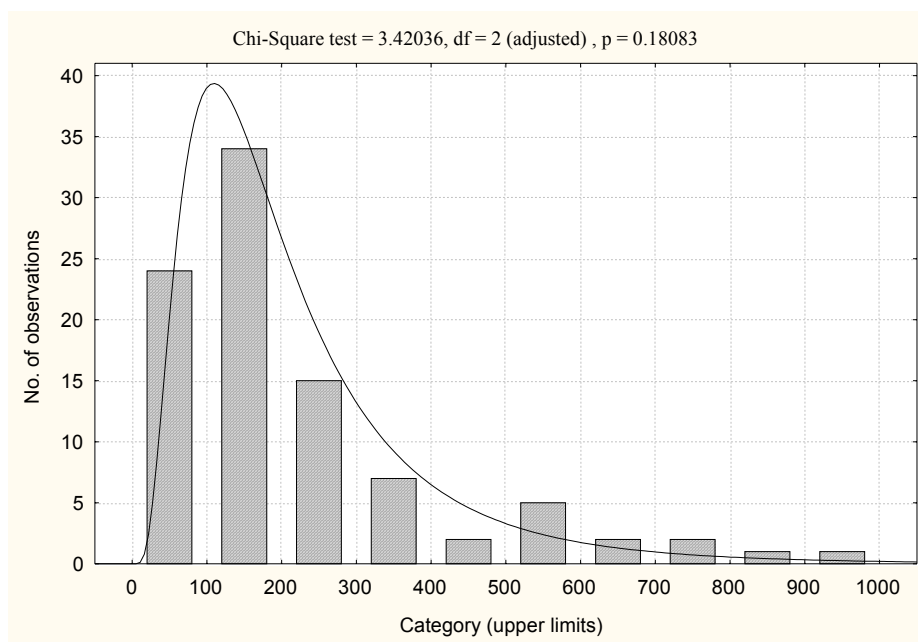


Figure 3.3c. The lognormal distribution of size classes in the recorded avifauna (columns present the raw data and the curve gives the predicted number of species in each size class according to the lognormal function).

Naturally bird communities, as communities of many other animals, particularly vertebrates, being more or less intact consist of many small-sized species and fewer ones of large size, and mathematically such a distribution of size classes is satisfactorily modelled by the lognormal function (Hemmingsen 1934). This general rule applies quite well to our data (see Fig. 3.3c), the mean (in the logarithmic form) being in our case 5.162 and the variance 0.464 (in 2004 the corresponding parameters of the lognormal function were 5.298 and 0.501, respectively). 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. However, variations in the figures observed between the two consecutive survey years are statistically insignificant ($p < 0.101$).

Local and regional rarity

Different methods have been proposed for defining abundance classes. Following Pesenko (1982), we use the logarithmic approach in which the upper boundary for each abundance class is defined as: $N^{a/k}$, ($a=1, 2, \dots, k$), so the upper boundary for the rarest category in a series of five abundance classes ($k=5$) will be set at $30^{0.2} = 1.97$ (rounded off to 2). This way the uniques (species that occur in only one sample) and duplicates (species known from two samples) fall into one abundance class, and in our case they comprise 52.7% of all the recorded species. Boundaries for the remaining four abundance classes (2 to 5) are presented in Table 3.3e.

Table 3.3e. Summary of abundances of recorded bird species

		Abundance classes				
		1 (rare)	2 (few)	3 (moderate)	4 (common)	5 (abundant)
<i>Data 2004</i>						
		1-2 records	3-4 records	5-8 records	9-16 records	16-31 records
uniques: 26 (33.3%) duplicates: 18 (23.1%)	<i>Total:</i> 44 (56%)		12 (15.4%)	8 (10.3%)	8 (10.3%)	6 (7.7%)
<i>Data 2005</i>						
		1-2 records	3-4 records	5-8 records	9-15 records	16-30 records
uniques: 38 (40.9%) duplicates: 11 (11.8%)	<i>Total:</i> 49 (52.7%)		13 (14.0%)	15 (16.1%)	12 (12.9%)	4 (4.3%)
Chi-square = 4.104, <i>d.f.</i> = 3; $p < 0.250$						

Amongst the most common birds (abundant) are the black-eared kite, hoopoe, northern wheatear and white (or pied) wagtail.

Next in abundance are the Demoiselle crane*(III), long-legged buzzard, golden eagle*(II), carrion crow, rock ptarmigan, common kestrel, steppe eagle, Isabelline wheatear, yellow-beaked chough, ruddy shelduck, Saker falcon*(III), Altai snowcock*(III)

Moderate records have been made of the Richard's pipit, snow grouse, tawny eagle*(III), raven, grey wagtail, ringed plover, common sandpiper, red-billed chough, pine bunting, Eurasian skylark, common redshank, stonechat, common cuckoo, imperial eagle*(II), common tern.

Fewer records have been made of the little ringed plover, sand martin, black-tailed godwit*(III), Guldenstad's redstart, lapwing, yellow wagtail, Siberian chiffchaff, meadow pipit, great cormorant*(II), black-billed magpie, tufted duck, snow bunting, dipper.

Eight 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). In 2004 there were nine such species.

Amongst the rarest found species 9 (in 2004 – there were 7) are listed in the Red Data Book of the Altai Republic: the lesser kestrel (I), solitary snipe (II), cinereous vulture (I), black stork (II), bearded vulture (I), white-tailed eagle (I), ruff (IV), black-necked grebe (III) and rose-coloured starling (III).

Together 17 species out of 67 (or about a quarter) listed in the Red Data Book of the Altai Republic have been spotted by the expedition team during the survey. In 2004 there were 16 such species.

The Chi-square test shows that variations in the figures concerning the distribution of bird species between the abundance classes observed between the two consecutive survey years are statistically insignificant ($p < 0.250$).

3.4. Conclusions

1. A repeated bird species inventory undertaken by Biosphere Expeditions in the Talduair area of the Altai Republic between 5 June and 24 August 2005, involving a total sampling effort of 30 days, yielded 93 species belonging to 14 orders and 29 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. In the meantime inventories undertaken here in 2003, 2004 and 2005 by Biosphere Expeditions have yielded 124 species in total (with the two last inventories sharing 71.3% of the species).

1. В районе горного массива Талдуаир в Республике Алтай РФ с 5 июля по 24 августа 2005 г. проводили повторную инвентаризацию фауны птиц и учет их численности. Работа велась силами четырех команд волонтеров, участников экспедиции, в среднем по 12 человек в каждой. Общее количество дней, потраченных на наблюдения, составляет 30. В итоге обнаружено 93 видов птиц (принадлежащих к 14 отрядам и 29 семействам; см. приложения).

2. Экстраполяционные методы, использованные для оценки полноты инвентаризации, указывают, что список видов предположительно был бы больше, если экспедиция была бы продлена на больший срок (соответственно, увеличилось бы количество дней наблюдений). Пока что усилиями трех экспедиций (2003, 2004 и 2005 гг.) здесь обнаружено 124 вида птиц (последние два фаунистических списка содержат 71,3% общих видов).

3. An analysis of species diversity done by taxonomic unit (bird order and family) shows that the majority of species belong to passerine families. As in the previous year, carnivores in 2005 continue to make up a high-ranking diet guild, indicating a rich source of secondary production in the area capable of maintaining an array of raptor species and specialised scavengers.

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 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. Variations in the figures observed between the two consecutive survey years (2004 and 2005) turned out to be statistically insignificant.

7. 49 (or 52.7%) of the recorded species can be considered rare; 9 of them are listed in the Red Data Book of the Altai Republic.

3. Анализ таксономического разнообразия птиц показывает, что большинство видов принадлежит к Воробьиным. Хищные птицы в 2005 г. продолжают составлять существенную по численности видов трофическую группу, что указывает на достаточные ресурсы вторичной продукции, способные содержать многих хищников и падальщиков.

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

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

6. Статистическое распределение птиц местной фауны по размеру тела удовлетворительно описывается логнормальной функцией, что указывает на относительную «укомплектованность» сообщества. Количественные показатели данного распределения могут быть использованы для длительного мониторинга возможных отрицательных последствий различных факторов на биоту в исследованном регионе. Различий между показателями 2004 и 2005 гг. не обнаружено.

7. 49 (или 52.7%) зарегистрированных здесь видов птиц следует считать редкими; 9 из них числятся в Красной книге Республики Алтай.

8. 44 species belong to other abundance categories, ranging from “few” to “abundant”; 8 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”, of such flagship species as the Demoiselle crane, the golden eagle, the saker falcon etc.

9. Comparisons between inventories of 2004 and 2005 seem to confirm no significant environmental change in the study area and the validity of the approaches we have chosen for biodiversity assessment based on bird species richness and functional (guild) type, especially in terms of replicability.

8. 44 вида принадлежат к другим категориям встречаемости (от «мало» до «очень много»); 8 из них числятся в Красной книге Республики Алтай. Радует тот факт, что среди них (даже принадлежащих к категориям «много») встречаются такие виды как красавка, беркут, балобан и др.

9. Сравнение результатов учетов 2004 и 2005 гг. указывает на относительную стабильность окружающей среды в исследованном районе и обоснованность методов, используемых для оценки биоразнообразия через структурные и функциональные особенности орнитофауны, особенно в аспекте получения стабильных повторных результатов.

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

4. Mammal Survey

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4.1. Introduction

Mammal species have long been far less popular than birds with naturalists, amateur and professional, and consequently their systematics and distributions are poorer known than any other comparable group of animals.

The basic objectives and methods used for the mammal inventory are much the same as for the bird inventory. Methods we employed consisted of different transect counts (car day and foot counts). The censuses were based on both direct sightings (encounters) and signs (tracks, faeces 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 totalled 29 days (between 6 July and 26 August). Records were entered into a datasheet after each survey in the evening of the same day.

4.2. Results

The methods used resulted in a presence-absence data set (appendix 2). A total of 26 species were recorded (belonging to 5 orders, 12 families, and 21 genera). The overall diversity of the mammal fauna (assessed by the Shannon index, H') comprised 2.88 ($VarH' = 0.00369$). The Shannon diversity t -test detected no significant differences in diversity between inventories performed in 2004 and 2005 ($t=0.72$, $p=0.469$), meaning the quantitative structure of the mammal fauna in the area is most likely to be stable. Qualitative similarities between them, as assessed by the Sørensen measure, is high as well and reaches 85.2% of the species composition.

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

Order	No. of species	Family	No. of species
Carnivora	10	Canidae	3
		Felidae	3
		Mustelidae	4
Rodentia	6	Sciuridae	4
		Cricetidae	1
		Dipodidae	1
Artiodactyla	5	Bovidae	2
		Cervidae	2
		Suidae	1
Lagomorpha	4	Leporidae	2
		Ochotonidae	2
Insectivora	1	Talpidae	1
Total: 5		Total: 12	

The fairly large proportion of carnivores (around 38.5%) 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: $N^{a/k}$, ($a=1, 2, \dots, k$), so the upper boundary for the rarest category in a series of five abundance classes ($k=5$) will be set at $29^{0.2} = 1.96$ (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 comprise 38.5% of all the recorded species. Boundaries for the remaining four abundance classes (2 to 5) are presented in Table 4.2b.

In general, the distribution of mammal species between the abundance classes observed between the two survey years of 2004 and 2005 is fairly similar, so, for instance, in 2004 uniques and duplicates comprised together 39.3 % of all the recorded species.

Table 4.2b. Summary of abundances of recorded mammal species.

Abundance classes				
1 (rare)	2 (few)	3 (moderate)	4 (common)	5 (abundant)
Data 2005				
1-2 records	3-4 records	5-8 records	9-15 records	16-29 records
uniques: 6 (23.1%) duplicates: 4 (15.4 %)	Total: 10 (38.5%) 4 (15.4 %)	4 (15.4 %)	2 (7.7 %)	6 (23 %)

Amongst the most common mammal species (abundant) are the grey or Altai marmot, argali sheep*(I), arctic ground squirrel, Siberian ibex, arctic or mountain hare and Northern pika.

Compared to the data of 2004 argali sheep in 2005 have maintained the frequency with which the species has been recorded, 0.84 and 0.62, respectively (the difference is statistically insignificant, $p=0.039$). On the other hand, more records have been made of the Siberian ibex (0.48 versus 0.586, $p=0.220$) and the species has shifted from the “common” category up to the “abundant”.

Next in abundance (common) are the wolf and wild boar.

These species have been recorded with a higher frequency in 2005, particularly the wolf (0.48 against 0.28 in 2004, $p=0.069$).

Moderate records have been made of the red fox, snow leopard*(I), manul*(II) and lynx.

Two species in this category are of particular interest, namely the manul and snow leopard. The first one has shifted down from the “common” category. However the frequencies with which the species has been recorded in 2004 and 2005 (0.48 and 0.21, respectively) are statistically indistinguishable ($p=0.021$). A pleasing fact may be the upgrading of the snow leopard from the “rare” abundance category to the “moderate” one. Compared to the data of 2004 the snow leopard in 2005 has raised the frequency with which the species (or signs of it) has been recorded, 0.04 and 0.17, respectively (the difference is statistically significant ($p=0.067$)). However, this is likely to be an effect of concentrating efforts on finding snow leopard sign.

Fewer records are made of the corsac or steppe fox,, wolverine, maral deer, Siberian chipmunk.

Three species marked with an asterisk are listed in the Red Data Book of the Altai Republic (I- II stand for their assigned nature conservation status). Amongst the rarest species, the Mongolian five-toed jerboa*(III), is listed in the Red Data Book of the Altai Republic. Fewer records of this species were made in 2005 (0.03 against 0.12 in 2004, $p=0.103$).

Together four mammal species out of 19 (or about 21%) listed in the Red Data Book of the Altai Republic have been spotted by the expedition team during the survey. In 2004 these were the same species.

4.3. Discussion & Conclusions

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.

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 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 Talduair massif, confirmed by the survey of the Biosphere Expedition research team, is the abundance here of the grey or Altai marmot, one of the most common mammal species in the area reaching a frequency of 0.79 (23 out of 29 cases). This is somewhat less than recorded in 2004 (0.88). However, the difference is statistically insignificant ($p=0.1911$), though, sadly enough, this may be the beginning of a negative trend due to a possible decline of the marmot population, one reason for which may be poaching of the animals. Whatever the reasons may be, burrow entrances on the hillside near base camp chosen for monitoring purposes were without any sign of marmot activity, although lower down the slope at the foot of the hillside several animals (up to nine animals, adults and pups, can be seen at once) continue to populate the place.

Continued relative abundance counts have been conducted for the arctic ground squirrel, another potential prey species for the snow leopard very common in the study area (0.79 frequency of records, 0.80 in 2004; $p=0.4640$). Visual records were made from cars moving between base camp and survey areas. The 31.2 km long trip into Tekelu valley from base camp (same as in 2004) yielded sightings of 120 ground squirrels (average of 3.85 ind./ km, somewhat less than in 2004); observations were made in the morning hours between 8.00 and 10.00. On the way to the survey site ground squirrels are met in decreasing numbers up to an altitude of 2192 m; one individual was spotted in the Tekelu valley at an altitude of 2246 m.

4.4. References

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Appendix 1

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

	English name	Scientific name	Русское название
1	Altai snowcock	<i>Tetraogallus altaicus</i>	алтайский улар
2	Asian/longbilled dowitcher	<i>Limnodromus semipalmatus</i>	азиатский бекасовидный веретенник
3	Bearded vulture	<i>Gypaetus barbatus</i>	бородач
4	Black grouse	<i>Tetrao tetrix</i>	тетерев
5	Black stork	<i>Ciconia nigra</i>	черный аист
6	Black-bellied sandgrouse	<i>Pterocles orientalis</i>	чернобрюхий рябок
7	Black-billed magpie	<i>Pica pica</i>	сорока
8	Black-eared kite	<i>Milvus lineatus</i>	черный коршун
9	Black-necked grebe	<i>Podiceps nigricollis</i>	черношейная поганка
10	Black-tailed godwit	<i>Limosa limosa</i>	большой веретенник
11	Blue rock thrush	<i>Monticola solitarius</i>	синий каменный дрозд
12	Brown-necked raven	<i>Corvus ruficollis</i>	пустынный ворон
13	Carrion crow	<i>Corvus corone</i>	черная ворона
14	Chough red-billed	<i>Pyrrhocorax pyrrhocorax</i>	клушица
15	Chough yellow-beaked	<i>Pyrrhocorax graculus</i>	альпийская галка
16	Cinereous vulture	<i>Aegypius monachus</i>	черный гриф
17	Citrine wagtail	<i>Motacilla citreola</i>	желтоголовая трясогузка
18	Common cuckoo	<i>Cuculus canorus</i>	кукушка
19	Common kestrel	<i>Falco tinnunculus</i>	обыкновенная пустельга
20	Common redshank	<i>Tringa totanus</i>	травник
21	Common sandpiper	<i>Actitis hypoleucos</i>	перевозчик
22	Common tern	<i>Sterna hirundo</i>	обыкновенная крачка
23	Crested lark	<i>Galerida cristata</i>	хохлатый жаворонок
24	Daurian jackdaw	<i>Corvus dauuricus</i>	даурская галка
25	Demoiselle crane	<i>Anthropoides virgo</i>	красавка
26	Dipper	<i>Cinclus cinclus</i>	оляпка
27	Dunlin	<i>Calidris alpina</i>	чернозобик
28	Eurasian skylark	<i>Alauda arvensis</i>	полевой жаворонок
29	Eversmann's redstart	<i>Phoenicurus erythronotus</i>	красноспинная горихвостка
30	Golden eagle	<i>Aquila chrysaetos</i>	беркут
31	Golden plover	<i>Pluvialis apricaria</i>	золотистая ржанка
32	Great cormorant	<i>Phalacrocorax carbo</i>	большой баклан
33	Greenish warbler	<i>Phylloscopus trochiloides</i>	зеленая пеночка
34	Grey partridge	<i>Perdix perdix</i>	серая куропатка
35	Grey wagtail	<i>Motacilla cinerea</i>	горная трясогузка
36	Guldenstad's redstart	<i>Phoenicurus erythrogaster</i>	краснобрюхая горихвостка
37	Hill pigeon	<i>Columba rupestris</i>	скальный голубь
38	Hooded crow	<i>Corvus cornix</i>	серая ворона

continued.

	English name	Scientific name	Русское название
39	Hoopoe	<i>Upupa epops</i>	удод
40	Horned skylark	<i>Eremophila alpestris</i>	рогатый жаворонок
41	Hume's leaf warbler (yellow browed)	<i>Phylloscopus humei</i>	алтайская пеночка
42	Imperial eagle	<i>Aquila heliaca</i>	могильник
43	Isabelline wheatear	<i>Oenanthe isabellina</i>	каменка-плясунья
44	Lapwing	<i>Vanellus vanellus</i>	чибис
45	Lesser kestrel	<i>Falco naumanni</i>	степная пустельга
46	Lesser sand plover	<i>Charadrius mongolus</i>	монгольский зуек
47	Little owl	<i>Athene noctua</i>	домовый сыч
48	Little ringed plover	<i>Charadrius dubius</i>	малый зуек
49	Long-legged buzzard	<i>Buteo rufinus</i>	курганник
50	Marsh tit	<i>Parus palustris</i>	черноголовая гаичка
51	Meadow pipit (?)	<i>Anthus pratensis</i>	луговой конек
52	Mistle thrush	<i>Turdus viscivorus</i>	деряба
53	Northern house martin	<i>Delichon urbica</i>	городская ласточка
54	Northern wheatear	<i>Oenanthe oenanthe</i>	обыкновенная каменка
55	Oriental plover	<i>Charadrius veredus</i>	восточный зуек
56	Pine bunting	<i>Emberiza leucocephalos</i>	белошапочная овсянка
57	Pipit (Richard's)	<i>Anthus richardi</i>	степной конек
58	Plain Mountain finch	<i>Leucosticte nemoricola</i>	гималайский вьюрок
59	Pochard	<i>Aythya ferina</i>	красноголовый нырок
60	Raven	<i>Corvus corax</i>	ворон
61	Redstart	<i>Phoenicurus phoenicurus</i>	обыкновенная горихвостка
62	Reed bunting	<i>Emberiza schoeniclus</i>	камышовая овсянка
63	Ringed plover	<i>Charadrius hiaticula</i>	галстучник
64	Rock pipit	<i>Anthus petrosus</i>	горный конек
65	Rock ptarmigan	<i>Lagopus mutus</i>	тундряная куропатка
66	Rock thrush	<i>Monticola saxatilis</i>	пестрый каменный дрозд
67	Rose-coloured starling	<i>Sturnus roseus</i>	розовый скворец
68	Rosefinch	<i>Carpodacus erythrinus</i>	обыкновенная чечевица
69	Ruddy shelduck	<i>Tadorna ferruginea</i>	огарь
70	Ruff	<i>Philomachus pugnax</i>	турухтан
71	Rusty rumped or Pallas's grasshopper warbler	<i>Locustella certhiola</i>	певчий сверчок
72	Saker falcon	<i>Falco cherrug</i>	балобан
73	Sand martin	<i>Riparia riparia</i>	береговушка
74	Shrike (sp.?)	<i>Lanius sp.</i>	сорокопут
75	Siberian chiffchaff	<i>Phylloscopus collybita tristris</i>	сибирская пеночка-теньковка
76	Siberian stonechat	<i>Saxicola maura</i>	сибирский чекан
77	Snow bunting	<i>Plectrophenax nivalis</i>	пуночка

continued.

	English name	Scientific name	Русское название
78	Snow grouse	<i>Lagopus lagopus</i>	белая куропатка
79	Solitary snipe	<i>Gallinago solitaria</i>	горный дупель
80	Steppe eagle	<i>Aquila nipalensis</i>	восточный степной орел
81	Stonechat	<i>Saxicola torquata</i>	черноголовый чекан
82	Tawny eagle	<i>Aquila rapax</i>	степной орел
83	Tree pipit	<i>Anthus trivialis</i>	лесной конек
84	Tufted duck	<i>Aythya fuligula</i>	хохлатая чернеть
85	Twite	<i>Acanthis flavirostris</i>	горная чечетка
86	Western jackdaw	<i>Corvus monedula</i>	галка
87	White (or Pied) wagtail	<i>Motacilla alba</i>	белая трясогузка
88	White-tailed eagle	<i>Haliaeetus albicilla</i>	орлан-белохвост
89	Whitethroat	<i>Sylvia communis</i>	серая славка
90	Willow warbler	<i>Phylloscopus trochilis</i>	пеночка-весничка
91	Wood sandpiper	<i>Tringa glareola</i>	фифи
92	Woodpecker (sp.?)	<i>Picidae gen., sp.</i>	дятел
93	Yellow wagtail	<i>Motacilla flava</i>	желтая трясогузка

Appendix 2

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

Order/отряд	Family/семейство	Genus/ род	Species scientific name	Species English name	Русское название вида
Artiodactyla	Bovidae	Capra	<i>Capra sibirica</i>	Siberian ibex	сибирский горный козел
Artiodactyla	Bovidae	Ovis	<i>Ovis ammon</i>	Argali sheep	горный баран, аргали
Artiodactyla	Cervidae	Capreolus	<i>Capreolus capreolus</i>	Roe deer	косуля
Artiodactyla	Cervidae	Cervus	<i>Cervus elaphus</i>	Maral deer	марал
Artiodactyla	Suidae	Sus	<i>Sus scrofa</i>	Wild boar	дикий кабан
Carnivora	Canidae	Canis	<i>Canis lupus</i>	Wolf	волк
Carnivora	Canidae	Vulpes	<i>Vulpes corsac</i>	Corsac or Steppe fox	корсак
Carnivora	Canidae	Vulpes	<i>Vulpes vulpes</i>	Red fox	обыкновенная лисица
Carnivora	Felidae	Felis	<i>Felis lynx</i>	Lynx	рысь
Carnivora	Felidae	Felis	<i>Felis manul</i>	Manul	манул
Carnivora	Felidae	Uncia	<i>Uncia uncia</i>	Snow leopard	снежный барс, ирбис
Carnivora	Mustelidae	Gulo	<i>Gulo gulo</i>	Wolverine	росомаха
Carnivora	Mustelidae	Martes	<i>Martes zibellina</i>	Sable	соболь
Carnivora	Mustelidae	Mustela	<i>Mustela altaica</i>	Mountain or Altai weasel	солонгой
Carnivora	Mustelidae	Mustela	<i>Mustela erminea</i>	Stoat	горноста́й
Insectivora	Talpidae	Talpa	<i>Talpa altaica</i>	Siberian mole	сибирский крот
Lagomorpha	Leporidae	Lepus	<i>Lepus timidus</i>	Arctic or Mountain hare	заяц-беляк
Lagomorpha	Leporidae	Lepus	<i>Lepus tolai</i>	Tolai hare	заяц-толай
Lagomorpha	Ochotonidae	Ochotona	<i>Ochotona pricei</i>	Mongolian pika	монгольская пищуха
Lagomorpha	Ochotonidae	Ochotona	<i>Ochotona alpina</i>	Northern pika	алтайская пищуха
Rodentia	Cricetidae	Alticola	<i>Alticola macrotus</i>	Large-eared or Altai vole	большеухая горная полевка
Rodentia	Dipodidae	Allactaga	<i>Allactaga sibirica</i>	Mongolian five-toed jerboa	тушканчик-прыгун
Rodentia	Sciuridae	Citellus	<i>Citellus undulatus</i>	Arctic ground squirrel	длиннохвостый суслик
Rodentia	Sciuridae	Eutamias	<i>Eutamias sibiricus</i>	Siberian chipmunk	бурундук
Rodentia	Sciuridae	Marmota	<i>Marmota baibacina</i>	Grey or Altai marmot	серый, или алтайский, сурок
Rodentia	Sciuridae	Sciurus	<i>Sciurus vulgaris</i>	Northern red squirrel	обыкновенная белка

Appendix 3

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	<i>Bupleurum</i>	<i>longiinvolucratum</i>	Kryl. (Tomsk)	Hare's ears	1 (16)	13/7/05 Back valley
	<i>Bupleurum</i>	<i>pusillum</i>	Kryl. (Tomsk)	Hare's ears	1 (16)	9/7/05 Steppe
	<i>Heracleum</i>	<i>dissectum</i>	Ldb. (LE)	Hogweed	1 (17)	12/7/05 Base camp 2200m
Asteraceae	<i>Achillea</i>	<i>asiatica</i>	Serg. (TK)	Yarrow	1 (26)	7/7/05 Base camp 2200m
	<i>Erigeron</i>	<i>elongatus</i>	Ldb. (LE)	Fleabane	1 (25)	7/7/05 Base camp 2200m
	<i>Erigeron</i>	<i>ericalyx</i>	(Ldb.) Vierh. (LE)	Fleabane	1 (25)	12/7/05
	<i>Senecio</i>	<i>resedifolius</i>	Less. (B)	Ragwort	1 (26)	7/7/05 Hillside north of base camp
	<i>Senecio</i>	<i>sumneviczii</i>	Schischk.et Serg. (TK)	Ragwort	1 (26)	7/7/05 Hillside north of base camp
	<i>Saussurea</i>	<i>glacialis</i>	Herder (LE)		1 (27)	12/7/05 Back valley
	<i>Waldheimia</i>	<i>tridactylites</i>	Kar.et Kir. (LE)		1 (26)	12/7/04 Ridge behind base camp
Boraginaceae	<i>Lappula</i>	<i>consanguinea</i>	(Fisch. et Mey) Gurke (LE)	Bur forget-me-not	1 (19)	5/7/05 Steppe edge near base camp
Brassicaceae	<i>Alyssum</i>	<i>lenense</i>	Adams. (Leningrad)	Alisons	1 (8)	6/7/05 River valley
	<i>Braya</i>	<i>rosea</i>	(Turcz.) Bge. (Leningrad)		1 (8)	10/7/05 Hillside 2800m
	<i>Draba</i>	<i>oreades</i>	Schrenk (Leningrad)	Whitlowgrass	1 (8)	13/7/05 Back valley
	<i>Erysimum</i>	<i>humillimum</i>	(Ldb.) N. Busch (LE)	Wallflower	1 (8)	6/7/05 River valley
	<i>Smelovskia</i>	<i>calycina</i>	(Steph.) C.A.M. (Leningrad)		1 (8)	10/7/05 Ridge behind base camp
Caprifoliaceae	<i>Lonicera</i>	<i>altaica</i> ?	Pall. (Leningrad)	Honeysuckle	1 (23)	5/7/05 Base camp 2200m
Ephedraceae	<i>Ephedra</i>	<i>distachya</i>	L. (London)	Joint pine	1	9/7/05 Steppe
Fabaceae	<i>Astragalus</i>	<i>australis</i>	(L.) Lam.	Milk-vetch	1 (12)	7/7/05 Base camp 2200m
	<i>Astragalus</i>	<i>laguroides</i>	Pall. Reise (London)	Milk-vetch	1 (12)	9/7/05 Steppe
	<i>Caragana</i>	<i>bungei</i>	Ldb. (Leningrad)		1 (11)	9/7/05 Steppe

continued...

Family	Genus	Species	Authority (Location of Type Specimen)	Common name	Source	Collection notes
Fabaceae	<i>Caragana</i>	<i>pygmaea</i>	(L.) DC (London)		1 (11)	9/7/05 Steppe
	<i>Oxytropis</i>	<i>ladyginii</i>	Kryl. (Leningrad)		1 (13)	7/7/05 Hillside north of base camp
	<i>Oxytropis</i>	<i>nivea</i>	Bge. (Paris)		1 (13)	6/7/05 River valley up to Mt. Saylyugem
	<i>Oxytropis</i>	<i>pumila</i>	Fisch. ex D.C. (LE)		1 (13)	9/7/05 Steppe
	<i>Oxytropis</i>	<i>recognita</i>	Bge. (Leningrad)		1 (13)	6/7/05 River valley up to Mt. Saylyugem
	<i>Oxytropis</i>	<i>tragacanthoides</i>	Fisch. (Geneva)		1 (13)	6/7/05 River valley up to Mt. Saylyugem
Fumariaceae	<i>Corydalis</i>	<i>inconspicua</i>	Bge. (Leningrad)		1 (7)	10/7/05 Ridge behind base camp 2900m
Geraniaceae	<i>Biebersteinia</i>	<i>odora</i>	Steph. (LE)		1 (14)	9/7/04 River valley up to Mt. Saylyugem
	<i>Geranium</i>	<i>affine</i>	Ldb. (Leningrad)	Crane's bill	1 (14)	12/7/05 Base camp 2200m
Grossulariaceae	<i>Ribes</i>	<i>graveolens</i>	Bge. (Leningrad)	Currant	1 (9)	11/7/05 Hills behind Lake Bailukem
Lamiaceae	<i>Dracocephalum</i>	<i>imberbe</i>	Bge. (LE)		1 (20)	10/7/05 Ridge behind base camp
Liliaceae	<i>Allium</i>	<i>clathratum</i>	Ldb. (LE)	Onion	1 (4)	9/7/05 Base camp 2200m
	<i>Allium</i>	<i>tenuissimum</i>	L. (?)	Onion	1 (4)	9/7/05 Base camp 2200m
	<i>Gagea</i>	<i>altaica</i>	Schischk. et Sumn.(Tomsk)	Star-of-Bethlehem	1 (4)	7/7/05
	<i>Veratrum</i>	<i>lobelianum</i>	Bernh. in Schrad. (Vienna)		1 (4)	11/7/05 Lake Bailukem
Orobanchaceae	<i>Orobanche</i>	<i>caesia</i>	Rchb. (Austria)	Broomrape	1 (23)	11/7/05 River bed at base camp 2200m
Polygalaceae	<i>Polygala</i>	<i>hybrida</i>	D.C. (Geneva)	Milkwort	1 (14)	7/7/05 Hillside to north of base camp
Polypodiaceae	<i>Cystopteris</i>	<i>fragilis</i>	(L.) Bernh. (London)	Bladder-fern	1 (1)	11/7/05 Rocky cliffs behind Lake Bailukem
	<i>Woodsia</i>	<i>ilvensis</i>	R.Br. (London)	Oblong woodsia	1 (1)	11/7/05 Rocky cliffs behind Lake Bailukem
Primulaceae	<i>Glaux</i>	<i>maritima</i>	L. (London)	Sea-milkwort	1 (18)	9/7/05 Grassland in irrigation area
	<i>Primula</i>	<i>sibirica</i>	Jacq. (London)	Primrose	1 (18)	5/7/05 Boggy ground near base camp

continued...

Family	Genus	Species	Authority (Location of Type Specimen)	Common name	Source	Collection notes
Ranunculaceae	<i>Aconitum</i>	<i>altaicum</i>	Steinb. (Leningrad)	Monk's-hood	1 (7)	11/7/05 Lake Bailukem
	<i>Aquilegia</i>	<i>sibirica</i>	Lam. (Paris)	Columbine	1 (7)	8/7/05 Streamside in woods near base camp
	<i>Delphinium</i>	<i>inconspicuum</i>	Serg. (Tomsk)	Larkspur	1 (7)	11/7/05 Lake Bailukem
	<i>Halerpestes</i>	<i>ruthenica</i>	(Jacq.) Ovcz.		1 (7)	9/7/05 Steppe
	<i>Oxygraphis</i>	<i>glacialis</i>	(Fisch.) Bge. (Leningrad)		1 (7)	9/7/05 Steppe
	<i>Ranunculus</i>	<i>altaicus</i>	Laxm.	Buttercup	1 (7)	7/7/05
	<i>Ranunculus</i>	<i>lasiocarpus</i>	C.A.M. (Leningrad)	Buttercup	1 (7)	9/8/03 #6 Small waterhole on hillside ca. 2758m
	<i>Thalictrum</i>	<i>alpinum</i>	L. (London)	Meadow-rue	1 (7)	5/7/05 Base camp 2200m
	<i>Thalictrum</i>	<i>minus</i>	L. (London)	Meadow-rue	1 (7)	11/7/05 Lake Bailukem
Rosaceae	<i>Alchemilla</i>	<i>altaica</i>	Juz. (Leningrad)	Lady's mantle	1 (10)	11/7/05 Shores of Lake Bailukem
	<i>Chamaerhodos</i>	<i>altaica</i>	(Laxm.) Bge.		1 (10)	9/7/04 Rocks on high mountain ridge
	<i>Potentilla</i>	<i>acaulis</i>	L. (London)	Cinquefoil	1 (10)	7/7/05 Base camp 2200m
	<i>Potentilla</i>	<i>bifurca</i>	L. (London)	Cinquefoil	1 (10)	7/7/05 Base camp 2200m
Rubiaceae	<i>Galium</i>	<i>boreale</i>	L. (LINN)	Bedstraw	1 (23)	7/7/05 Base camp 2200m
Saxifragaceae	<i>Bergenia</i>	<i>crassifolia</i>	(L.) Fritsch. (London)	Elephant-ear	1 (9)	11/7/05 Hills behind Lake Bailukem
	<i>Saxifraga</i>	<i>hieracifolia</i>	Waldst. et Kit. (Vienna)	Saxifrage	1 (9)	12/7/05 Hillside of back valley
Scrophulariaceae	<i>Pedicularis</i>	<i>arguteserrata</i>	Vved. (LE)	Lousewort	1 (22)	7/7/05 Damp hillside behind base camp
	<i>Pedicularis</i>	<i>uliginosa</i>	Bge.	Lousewort	1 (22)	6/8/03
	<i>Pedicularis</i>	<i>venusta</i>	Schangin ex. Bge (LE)	Lousewort	1 (22)	6/7/05 River valley
	<i>Pedicularis</i>	<i>violascens</i>	Schrenk (LE)	Lousewort	1 (22)	7/7/03
Tamaricaceae	<i>Myricaria</i>	<i>dahurica</i>	(Willd.) Ehrenb. (Berlin)	Tamarisk	1 (15)	12/7/04 Riverside on steppe
Valerianaceae	<i>Valeriana</i>	<i>petrophila</i>	Bge. (Leningrad)	Valerian	1 (23)	13/7/05 Back valley
Violaceae	<i>Viola</i>	<i>biflora</i>	L. (London)	Viola	1 (15)	7/7/05

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 4

Expedition diary by Tessa McGregor.

28 June

The start of the third expedition and so far all going too smoothly to be true. The vehicles are waiting for us in Novosibirsk (I'm told!) and I'm packing up at Biosphere HQ. Lots more to do before I leave so keeping this short. Flying tomorrow and will be at Hotel Central on Thursday "Transaero willing". Very much looking forward to meeting old friends and new team members. Plenty of work to do. My first toast of the season "to snow leopards".

30 June

Arrived with Volodya in Novosibirsk. Hot and sunny. Met by Sergey. He is in on very good form. It's good to see him again. Hotel Central hasn't changed except we are greeted not only by the chattering of sparrows but also warm smiles from the ladies at reception! Out to buy items of equipment. So much traffic! Cool Russian beer very welcome at the end of the day.

31 June

It's hot (29 degrees) and muggy. The swifts are in good voice. I never tire of watching their aerial displays over and around Hotel Central. Volodya and I have just returned from Autoland where we have seen the vehicles - yes they are all there!!! We have 4 new Defenders (2 silver, 1 black and 1 green) and they all have air conditioning! Most unnerving of all, I got a big smile from Pavel. We even have all the paperwork... but only for the first slot. I am assured the rest will follow soon. Now we are off to meet Nastya (our lovely translator). She has been working very hard (for Sibalp and at University) and has got her MA. Cause to celebrate!

1 July

Met most of the team members in the morning and immediately got three of them to help me collect the vehicles. All excellent drivers and vehicles now parked outside the hotel. Thank you Uwe, Klaus and Hartmut. The weather is even hotter. A storm stops the singing from bars below the hotel by 18:30. Some impressive thunder, lightening and heavy rain. The team all meet up as usual at 20:00 and we have a lively evening in the Russian restaurant.

P.S. Novosibirsk hotting up in all senses. Uwe, Klaus and Hartmut were propositioned by a 'professional' girl just outside the hotel when we met to collect the Land Rovers. I said they had other work to do. You also get phone calls in the rooms now, asking if you are interested in 'leisure' (it's put more crudely if you are not a Russian speaker. I get phoned in my room, but they hang up when they hear my voice.

2 July

Cool and overcast when we leave. There has been more heavy rain. Everyone very prompt and efficient. The sun comes out and in gets very hot. We stop at the usual place for lunch. The museum is open. I'm told there are more artifacts. It proves true. There is now a bear cub skin as well as a large adult one. The landscape gets more beautiful. So many flowers in the grasslands and along the roads. Sleek cattle graze, watched over by lone horsemen. We arrive at Anoz to find the gates locked and no one around.

Wilma and Hartmut enjoy scaling the entrance gates and letting us in. The house is locked but the banya is warm. Luckily Roman (from Anoz) arrives and lets us in. There have been more improvements. There are now two sofas on the landing and a (cold) outside shower. Sadly Vica is no longer here, but our expedition cook, Nina, rustles up a delicious meal in no time at all. The Katun is in spate so no swimming. Another very jolly evening with Altai vodka to toast the expedition.

3 July

Nastya and I leave early to do the registration in Gorno Altai. This Byzantine procedure drives me crazy. The office is very busy. We have to queue. Just when it's our turn the 'official' ladies tell us to go. They have a meeting. They leave the office, carrying their chairs. We're told to come back in an hour. An hour later we are back. Nastya rushes in, only to be pushed out again. It's floor-washing time. Finally we are let into the office. More queuing, but it's all worth it as everyone is registered successfully. Go back to Silver Springs to join the team. Nina needs more supplies and we only head off again at 14:30. The latest ever. We get to Tuvan Restaurant at 18:30. It has expanded. There is a new building and we don't get to sit in the wooden yurt. It's very busy. We drive on, and on. Dusk falls. The rain starts and by the time we reach Kosh Agach at 23:00 it's lashing down. Last re-fueling and final leg of journey to base camp. It's so wet. The tracks are treacherous and it's hard to keep traction in parts. We proceed very slowly. The sodden steppe is totally featureless in the dark. Even Andrei has to stop twice trying to find the right track. He is successful (as always). We see three jerboas, jumping off into the black. They must be flooded out of their burrows. We cross a river I never knew existed - that's because it has always been a dry gully, even in the wettest periods of

the previous expeditions. We get to base camp at 02:00. Everyone tired and relieved. The rain stops while we unload. Tea and biscuits in the tent. Everyone cheerful and positive. Rain pouring down again as we head for our tents. Base camp river roaring - in full spate.

4 July

Wake up to - no sound of rain! 09:30 breakfast. Sorry Matthias, we deserve it! Nina cooks Kasha (porridge) to die for! Hearty breakfast followed by risk assessment and introduction of Russian team. Everyone already knows Volodya, our scientist and Nastya, our translator. We also have Oleg, a brilliant mountain guide. He has been in charge of setting up base camp.

Sadly he can only be with us for the first slot this year. The second mountain guide is called Raman. We have Nina, the cook and her son Ivan as camp helper. Nina cooks a delicious and copious lunch after which two groups go out. One with Volodya to the forest and the second with Raman, up behind base camp. The weather is still unsettled with rain, making it difficult to cross rivers (the back valleys and Eastern section will be impassable until water levels subside) and the ground very slippery. Heavy rain comes down just after the teams return. Good timing! We go through the science and equipment before supper and fill in the first data sheet (bird tick list). Volodya's group saw steppe eagle and demoiselle cranes and Raman's group saw a golden eagle. Not bad for first day. Good camp fire rounds off the day.

Cloud cover breaks up and see stars. Temperature falling.

P.S. Please, please make sure you have the right 'Altai Registration Request Letter' letter stamped by your visa-issuing agency. The letter from Kraft Travel (the German agency) is perfect. All the others are not (we have to 'modify' them - time consuming and never sure it will work). For those of you not going through Kraft Travel, the letter must say:

We request you to register the presence of our tourist on the territory of the Altai Republic. A citizen of the ..(UK, Germany etc), Passport Number...who arrived with the visa number....

We request to register this person for the period of ..From:....To:....(dates of your time on the expedition). Aim of travel is tourism. The regions visited will be Chermal and Kosh Agach. The accommodating organization is Sibalp. The Visa supporting Agency is...

We request to do the registration in accordance with the rules of a foreigner being in the Russian Federation. We confirm all the information given is correct.

(The letter must be signed and stamped by the agency)

I can't stress how important it is to have all this paperwork as without it you cannot be registered in the Altai Republic and won't be able to proceed to base camp until the right paperwork is obtained.

5 July

The whole team out to survey valley and ridge past the forest. This is a chance to get familiar with the terrain, the gear and what to look for. It's very hot when the sun comes out. Mosquitoes and horseflies are out for blood and they get it! I'm using 50% DEET and it's not strong enough! Findings from first day include sign of manul, wolverine and maral! Everyone very positive and enthusiastic. Very good day.

6 July

Again, whole team goes out. We go up 'lost valley'. It's still one of the richest valleys for flora and fauna. There are so many flowers - many we have not seen before. Christine (our plant scientist) has her work cut out. This is her third year on the expedition together with Toril and Peter and we are very lucky to have such experienced team members. Plenty of evidence of wild boar diggings. Some quite fresh. We ascend scree slopes near the head of the valley to access the glacial lake from above. At about 2700 m we hear rock falls above us and after some searching with binoculars spot a herd of ibex about 50 m below the ridge line. They are on the steepest imaginable bit of broken terrain. One large male, 9 adults (too hard to tell if they are all females or if there are also younger males from this distance) and one young. We watch them. Even lit by sun they are almost the same colour as the rocks. They jump a gully and ascend up to the ridge where some turn back to look at us before disappearing down the other side. So exciting! The sighting lasts about 10 minutes. We then go to the glacial lake to set up the hide. The lake is still mostly frozen over. Only the edges are clear. Oleg and Raman jump in as does Wilma. She must be impervious to cold!

Hide erected in excellent place above lake. Return feels very long. Mosquitoes in valley are hungry! Back to base camp weary but delighted with such a productive day. Plenty of data to input after another feast from Nina.

8 July

Four team members go out with Volodya, Oleg and Raman for first overnight stint in corridor area. Helge is the first to go to the hide. I take another group with Andrei and Nastya to marsh and lake for bird list. Mosquitoes unbearable but bird list increasing! Then to interviews in the afternoon. We meet Compe Petrovich. He says there is a wolf with young not far from base camp. He also says he saw a snow leopard last year (early October) on the remains of an ibex kill half way up the valley we were in yesterday. It has been a very cold winter and the wolves have been a big problem with livestock. After Compe we go to look for Abai and Gulinara. The rivers are full and fast flowing but crossable. We meet up with Abai, Gulinara, Masha and her husband. Lots to catch up on (sadly, Gulinara's father, Nicholi - he of the metal teeth, died this year. He died in his sleep; of blood pressure I'm told. Is that a euphemism for fatal hangover?). They also complain of the long cold winter. It lasted so long they ran out of fodder and the livestock got thin, but the herds are regaining condition fast with the grazing. I arrange a riding survey for next week and hiring a yurt.

After several toasts we head back to base camp with Abai and Masha's daughter. Back at base camp, team members enjoy Nina's cooking. I go off with Andrei, Nastya, Abai and niece to Tibilir, a village past Kokaria. We drop the niece off for a wedding and then drive to another village to arrange yurt hire from a distant relative of Abai's. More toasts. Then off to see Ascir, Abai's father to arrange transport of yurt to base camp. Luckily we are only offered tea this time. All is settled and a yurt should go up at base camp next Wednesday if all goes to plan (and that's always a big if!). Long drive back (Andrei driving!) to drop Abai off home. We get back to base camp at midnight.

9 July

Mosquitoes biting before breakfast. It's the price we are paying for this warm weather. Many team members out with Andrei and Nastya to see burial mounds and standing stones in the 'valley of a thousand stones'. They are so diligent they can't stop surveying so I've got some data sheets to go over soon. Helge back from the hide this afternoon delighted. He was woken at 5 am by an Altai snowcock and got great sightings and footage. As if that wasn't good enough, he also got really good and close views of ibex (9 in total - 5 adults and 4 young) and was able to record lots of behaviour. No wonder he and Ivan tripped down the valley in record time (1 hour and 20 minutes with heavy packs!!!). I just want to go to the hide right now. The overnight group is due back this evening. Who knows what they will have found? Will let you know.

10 July

Overnight group surveyed new part of corridor area. Interesting and potentially good habitat but lots of signs of human disturbance and evidence of poaching. The area is close to the Tuvan border and looks as if it's only being used by poachers at present. I take group for overnight camp to one of the valley's (and ridges) behind Tapuair. Stunning drive. Glaciers and snow on the tops of Silugiem and Tapduair. This is my third year in Altai and these drives are familiar, but I get the same sense of awe. It's so beautiful, so vast, so..bloody difficult to find any sign of snow leopard in!! But that's the challenge! The stony riverbeds are filled with flowers. I'm not sure I've ever seen such intense colours or so many flowers. We get to the valley. Brilliant driving by Oleg and steep learning curve for Raman (he does very well). We set up camp and split into two groups for surveying. I go with Oleg, Helge and Ulrich. The start of every survey is the same - exhausting! It's very hot and despite reeking of DEET, mosquitoes and every other biting insect seem to find me irresistible.

As we start getting our breath and are ready to ascend the ridge, we notice two horses - unusual for this valley as there is no grazing. Then we notice two dogs, two men, two guns...we look through binoculars. They look at us through binoculars. Oleg feels it's not safe to leave our temporary camp unattended. I think this is a great opportunity to speak to hunters. We all go down. They are friendly and we have long, circuitous conversations. Considering my Russian and Oleg's English (much better than my Russian I hasten to add!) we do very well. The hunters certainly know the law (even if they are probably breaking it). They say they are out to shoot wolves. I believe this is true (but I also believe that's not all they are out to shoot!). We talk a lot about snow leopards. One of them saw a snow leopard and two half-grown cubs not far from our base camp late August 2003, in a place we found pugmarks earlier, but have not seen one since. This matches our results. I arrange to meet the hunters next slot. I think there is a lot more to learn...

Give up ridge survey as too late. Hunters saddle their horses and move away. We get back to camp just before spectacular rain and hail (it rains briefly but heavily every afternoon) - poor Raman, Uwe and Klaus get soaked, but they see beautiful rainbow over Chikachova (mountain range on Mongolian border). Good evening. Smoky fire controls mozzies a little. Distant sighting of two ibex/argali on far slopes. Hear partridge. See Saker falcon mobbing black-eared kite. Wild call of vixen just before we turn in. New moon. Silence. Space.

11 July

Cooler morning. Off in two groups again. Raman's group to survey adjacent valley and glacial lake. My group to survey steep ridge. Find signs of ibex, argali (so many trails!) and Altai snowcock. Find good trail to set up trail master next slot. Survey right up the summit of ridge. Amazing!

Helge and Ulrich feel they are in 'Mordor' (Lord of the Rings land). Helge may be a professional photographer, but how he manages to carry 15 kg of equipment up these slopes is beyond me. I struggle with less than 5! We go down steep scree to valley and find about 40 argali/ibex resting depressions half way, plus more tracks. This is wonderful habitat, but the poachers know that too and they were here before us. Plenty of evidence of wild boar diggings in valley (sorry Roger - never found your hat. Tilly hats may pass through elephant guts unharmed, but stand no chance with Altai wild boar, marmot and ground squirrels!). Both groups back at camp by 16:30. Pack up and long, difficult but unforgettable drive back (beautiful bird of prey sightings and many marmots), circumnavigating core area, in order to show Raman before Oleg leaves. Back at base camp find Abai and pile of sticks, rush matting and wooden circle - it's the first part of the yurt! The rest will follow on Wednesday and we will have a yurt at base camp at last!

Volodya's group surveyed ridges near base camp and Volodya saw an argali (female) yesterday. Today they went to Silugiem lakes (an area out with our research area). I recced this place in 2003. It was wild and difficult of access with no sign of human activity. It's still a long, drive and not the easiest place to get to - but lots of sign of human activity this year. The bird list is growing and as for the plant list - there is no end to it! Christine is in severe danger of botanical burnout! Very jolly evening sharing information, vodka and data. Brilliant starry sky. Temperature falls in the night to zero.

12 July

Another brilliant sunny morning. I've never know such a run of warm weather at base camp. Volodya off for last overnight camp this slot with Christine, Peter, Toril, Hartmut and Raman. Oleg leads group up left ridge behind base camp. I catch up on admin and things that need doing at base camp (hate this bit - want to be out surveying, especially when horseflies are so bad during the day here). Uwe is off the spend night in hide. Hope he has better luck than Wilma (she saw nothing - experienced a storm at night and was still as positive as ever!

Warm showers, river-cooled beers and data sheets round off the day. t feels surreal to be here in this warmth. 'Bathing suits' very much in evidence as many team members are river bathing.

13 July

Off to meet some herders (our dear friends Abai and Gulinara) and take Wilma and Anja riding. Abai joins us and we ride out up a mountain behind his yurt that gives great views over a great sweep of our survey area. The riding is very steep and we have to lead the horses down. Helge still busy photographing when we get back. We are invited to lunch (a whole sheep's head, soup and boursak) after which Abai, Guilinara and Masha (their neighbour) come back to base camp with us to put up a yurt. Nastya wonderful at coping with being spoken to in Altai, Kasakh, Russian, English, German..sometimes all at the same time! Piles of felt are unfolded and shaken, bundles of sticks untied and hand-embroidered straps unraveled.

Team members sit, watch and take photos as lattices are unfolded, sticks tied, a wooden door nailed in place and then the top round piece of wood is held up high on a pole while the supporting sticks are tied and positioned to hold it. We all join in to help, but it's skilled work and poor Abai and Oleg keep getting hit by falling sticks (will have to add that to the risk assessment!), but once it's all tied it looks like a work of art. Then the felt is tied. Thunder, lightening and rain send most of us scuttling to shelter, but our herder friends keep going with the Russian team and by 17:00 we have the first yurt at base camp! It's wonderful. We toast it with vodka. The overnight team comes back delighted with their time in the field and then the sun comes out, just on cue for team photos and Russian champagne. It turns into a glorious evening. Abai, Gulinara and Masha stay for supper but can't stay late as they have cows to milk. We savour the last moments of this perfect day. Sadly the last for this slot. It's gone by too fast.

14 July

Many team members very sad to leave base camp. We stop for lunch at Chuya Ouzi as usual. This time we have the wooden yurt. Make good time to Anos. Weather beautiful. The usual heaven of banya and birch bundles. The new couple Lena and Genya) running Anos are lovely and Lena is a wonderful cook. Multa, the new dog is very friendly and dying to play with everyone - trouble is, she's built like a tank and already as heavy as some of us, and she's not yet fully grown!

15 July

We leave Anos early - thank goodness as one of the Defenders' decided to break down at our first fuel stop. The coolant pipe is completely split, but we are very lucky as Klaus is an engineer and Hartmut, Uwe and Reinhart are also pretty hot on engines. Amazingly the garage sells a few items and the team manage an excellent and professional repair which holds all the way to Novosibirsk!! We get in just after 19:00. And had the usual fruit blinny and shashlik stops. Everyone in celebratory mood at the Russian restaurant and the waiters can hardly keep up with the cold beer orders. This has been a great team, hard-working, very positive and great fun. We have already achieved good results and I will miss you all!

16 July

Nastya and I spend most of our day in Autoland, sorting out Defender repair. Doesn't leave much time for anything else but Autoland are very helpful. I meet the new group in the evening and we are joined by Helge, Brendan, Klaus, Uwe, Toril, Christine, Peter and Reinhart - never has the Russian restaurant been so full of Biosphere team members!

17 July

The drive to Amos with new team goes well and we arrive in good time. Team members really enjoy Anos and I love it. Sergey there to greet us again. Crickets are in full voice.

18 July

Sergey and Nastya go to do the registrations in Gorno Altaisk. I go to Silver Springs with team members. Nearly fall over with shock when Nastya is back before 11:30 - registrations done!!! We leave at 11.30 am. Late lunch at Chuya Ouzi. Beautiful light for much of journey. Arrive base camp 10.00 pm. Mess table ready with candles and beautiful bunches of flowers from Roman and an equally beautiful borsch made by Volodya. What multi-talented men they are! It's so good to be back at base camp.

19 July

Another fine day. Cooler than last slot but still warm. Introductions to gear and science as usual followed by off-road course and washing the vehicles in the river (very low level but still just as cold). All excellent drivers (and car washers). The first slot was lucky not to have to wash dishes. We are back to a washing up rota. Nina gave us all a demonstration. Never knew it was so complicated and needs 6 people!!

Volodya took group off for survey on foot from base camp. Andrei went off with both Ivans (we have two, now Oleg has gone) to get a stove and they have installed it. Ceremonial first lighting with "big shit" as Roman calls the dried cow dung. Its toasty - so more toasts (vodka of course) followed by singing. Eva is a professional singer and the Russian team never let us down. I also sang (the 'Biosphere Song') but had to improvise as could only remember the first verse. Another late night. Sleep deficit quotient already used up and we're not even half way through the expedition.

20 July

First survey as a group in back valleys. Stunning as always. Group very quick to pick up sign and we find sign of argali, manul, wolf, sable and wild boar + many small mammals and game birds. Great eagle sightings (golden and steppe). Back in camp hot showers are waiting. Yvonne, Glyn and Simon still have spare energy and play frisbee (is that how you spell it?). I go to meet Valeri in Kokoria (the hunter from last slot) with Andrei, Volodya, Nastya & Roman. We get eaten alive by mosquitoes while conversations go round in circles about wildlife and poaching, but Valeri knows his stuff (don't all poachers?). He offers to take me to good area for snow leopard (just outside our research area) - only trouble is it has to be tomorrow. So I'm off with Roman (as he can ride) as security. Three days in the saddle and sharing a tent. Will make my fishing outing with Yuri and Oleg in 2003 look tame.

21 July

Another beautiful day. Volodya takes group to survey lost valley and glacial lake. Bo is the first from this slot to spend a night in the hide. Raman and I pack clothes, food, tent, GPS, binoculars, sample tubes (in the hope of finding snow leopard scat), small camera, sleeping bags. How will it all fit in the saddle bags (it won't!). We'll have to tie most of it to the horses and ourselves. Go to meet Valeri at 13:30 but no sign of him.

Wait, look...Andrei has to go to Kosh Agach so leaves a message with another herder. We go back to base camp. Gives me the chance to catch up with diary while the others go to Kosh Agach. At 16:00 Nina hears shots. We go out to look and find Valeri with 3 horses, but without Roman, we have to wait. So I'll be setting off this evening. Looks like even less sleep than I had anticipated, but the horses look good. They are grazing by the yurt as I write. I'll try and send this now. Some of the team is surveying Silugiem tomorrow while the others will go to the lakes and then to meet herders. Saturday is the day off, so Andrei will take people to the Valley of a Thousand Stones. There is also jerboa counting planned so team will be busy. I'll try and send this now over the satellite uplink. Wish me luck!

21 July (continued)

Things didn't quite go to plan (due to Altai timing) so finally left base camp just before 20:00. Roman and Valeri told me to go ahead as they were still packing up their saddle bags. I rode out alone on a big bay horse and a storm hit just as I reached the steppe. Thunder, lightening and pouring rain. Made it to Compe Petrovich's yurt soaked but luckily was invited in to wait for Roman and Valeri. Had tea and fermented-milk vodka (went very easy on the latter). Roman and Valeri arrived 30 minutes later and we all rode out into the filthy night - galloping across the straw-coloured, stony steppe against the rain, and then trotting fast in the night. Roman put up tent in the dark. Valeri tethered the horses and used the felt saddle blankets as sleeping mats. All crawled into tent, relieved to have stopped. Roman's cry of "Oh, my arse!" sums up how we felt! Horses really good but hard paces, and as for the saddles - let's not even go there!!! I was happy to share a tent with Roman and Valeri but less happy to share with Valeri's loaded gun. "Insurance for bear" Roman assured me. Moon appeared briefly behind cloud and saw a night rainbow - monochrome, mysterious. Never knew they existed. Vixen called in the night. Love that wild cry.

22 July

Woke up to no rain! No water either so used the dew to wash. Sun, resting horses, Valeri's white dog called Bim curled up. Packed up tent. Breakfast of kvass, black bread, cheese, ham, cucumber and tomato. Tacked up horses. Then disaster - one horse bolted (spooked by a magpie) and the other two followed. Valeri and Roman left me and gun and ran after the horses. They came back two hours later and we set off. Bare steppe, views of our research area disappeared as we dropped down into a valley (descent so steep horses slipping as we led them down) and headed for a yurt where a herder, Tania, offered us tea and 'chegen' (a type of yogurt) with smitana (cream) so fresh it tasted grassy. Quite delicious. We rode on, past Bilugiem lakes. Breeding redshank, turns, ruddy shell duck (looking as big as geese and calling) and the lonely cry of common sandpiper. Shoals of small fish at the lake edge. Awesome scenery. Rain. Left signs of human activity behind us. Vegetation higher. Wild boar diggings fresh. Bim running on ahead. Valeri stopped frequently to scan rocky outcrops.

This is a good area for ibex, wild boar, maral and snow leopard, but we had no sightings. Rode on, and on, and on. It's tough terrain for horse and rider. We dismounted when slopes got so slippery and steep that I had trouble keeping a foothold. My horse (number 49 - they don't have names) sure-footed and kept going. Valeri found old maral antler (naturally shed) and tied it to his grey horse. Made him look like a stalker on the hill in Scotland! More rain, lightening and thunder and finally on the last ridge got views over the Buguzun Valley and countless ridges and mountain ranges.

Dramatic shafts of light illuminated the vast surrounding lands. Felt I was on the roof of the world. We dropped down to our resting place - a small plateau with a dewpond. Horses untacked and tethered/hobbled. Tent unpacked and spread out to dry. We went off to survey the lower slope before dark. Rain stopped. Evening light beautiful as temperature dropped.

Lichen dense and ghost-like, covering rocks and earth. Creeping birch. Wild, wild place. Valeri called me. He had found a snow leopard skull! In the last rays of the sun, we carefully examined it. It was 3 or 4 years old and belonged to a young animal, just over a year old. Intensely poignant moment - holding the skull of a young snow leopard in this wild, remote place. Looked for more bones but found none. It's unlikely that this snow leopard was a victim of poaching as poachers wouldn't have left the skull (or any other part that could be sold). Who knows how it died? Natural causes? Poison (put down for wolves)? We will probably never know, but it's an important find and will contribute to the DNA work (once the CITES paperwork is cleared). Valeri elated to have found the skull. Roman also thrilled. Back to put up tent up at 21:30 and light fire. Roman brewed tea and we ate raw fish (caught by the herders this morning) with salt, pickle, boursak and vodka. A full moon rose in the South and we talked (Roman translating), lying on the damp ground, about wildlife, snow leopards and many other things until the rain made us turn in; but not before admiring another night rainbow. Felt saddle blankets slightly damp and smell of horse. Bliss.

23 July

Woke up to no rain again! Beautiful, clear morning. Went with Valeri to look for more sign but didn't have time to look long. Saw a maral (adult female) grazing on opposite side of valley. Packed everything back into the saddle bags (wrapping the snow leopard skull very carefully in my hat). Ride back stunning, but so many horseflies and mosquitoes! The ridges and valleys felt as remote as yesterday but far less threatening as lit by sun. It was hot. Stopped occasionally to look for ibex. No sightings but quite fresh tracks. Lots of very fresh wild boar diggings. Stopped at about 14:00 by river for rest and some food. Then rode on. Very tiring for horses and riders. Even Valeri said he was tired. Stopped at Tania's yurt again for more 'chosen' and short rest. All the family there this time. The boys all fishing and admiring Valeri's gun (plus firing it into the air). Last push for home. Horses and us exhausted, but rode into camp at 20:00. Pretty good timing! Team members there to welcome us. Lovely to see them again. The film crew has also arrived with Sergey so base camp very full. Valeri and horses left us after we had unpacked and untied our belongings. Snow leopard skull intact.

24 July

Another beautiful day. I've never know a spell of weather like this. Off to a valley behind Tapduair with all team members and film crew. Filming of landscape, setting up overnight camp and surveying. Find signs of argali (faeces and tracks) but don't make it far into the valley. About 40 cattle grazing so human disturbance a factor. Very close view of tawny and steppe eagles. Drive back unforgettable - dramatic landscape and light. Sky dark and threatening yet intense luminosity and the dry grass glows. Herders with livestock. Florian, the cameraman has to keep stopping to film. We get back late, expecting the heavens to open, but again, the weather is kind and no rain at base camp where Oleg Zigarev (who was in the Russian team in 2003) is waiting with the black Land Rover, having driven it from Novosibirsk. The coolant pipe is mended but there still seems to be a problem with transmission. I love the Defenders - except when they go wrong!

25 July

I go to yurts with film team and team members. We have hired horses from Abai and Gulinara. Filming of riding survey followed by lunch of pasta, meat, boursak, butter and cheese with tea. Enmira sings two traditional songs for us. Her voice as lovely as ever. Eva and Roman go riding while the crew film in the yurt. Eva is a fast rider (and luckily so is Roman)! She has so much energy it's amazing. Back at base camp in the afternoon. Fire lit. Ivan does a brilliant job - making sure there is warm water for the showers in the evening and that the fire is lit, chopping wood, taking people to the hide and carrying the gear, driving (he's a very good driver) plus a hundred and one other things. He's always calm and totally reliable. We are lucky to have such a great Russian team. The overnight team comes back. Had amazingly close and long sighting of eight golden eagles. All very pleased. Data sheets then chat around the fire. Stars. Lovely evening.

26 July

Can hardly write after today. Made it to the top of Tapduair from base camp with seven team members (Eva, Yvonne, Karin, Simon, Christophe, Glyn, Daiske) with Nastya, Roman and Oleg. Hard and exhausting don't even begin to describe what it was like, but Roman led us expertly and set a perfect pace. Oleg's experience was also much appreciated and helped me make it to the top (as did Eva's energy I'm sure). The views over glacial lakes and our research area incredible. Could see so much of it. The ridges leading to Tapduair mountain vertiginous and very high. Once on the summit (3503m) eagles were flying below us. Sign of wildlife was scarce but found some sign of argali, Altai snowcock and ptarmigan, only the latter was fresh.

Team photos on the top. Everyone elated. The way down makes us doubly aware of the climb. All this effort and no wildlife sighting is hard. I keep scanning with binoculars, but nothing, until finally, just as we drop down to the valley behind base camp I spot them - argali! Lit by the early evening sun, way above us: 3 females and 2 young. Everyone gets to see them before they disappear over the ridge. Karin finally believes the wildlife does exist and that I'm not just making it up! I'm on a high. We are back at base camp at 19:45 - exactly 12 hours after leaving. Must have walked for 11 hours. Have large blister but am so happy! Congratulations team. Tapduair summit has only been reached once in 2003 (by two team members) and in 2004 (by one team member and he was a fell runner!). Volodya's group also had a pretty strenuous survey day. They surveyed a high ridge in the back valleys and Bo found a possible snow leopard scrape (non-relic) - we're not sure but the measurements fit. We'll monitor it next slot. Film team also had a good day so everyone highly satisfied.

27 July

Early start and off to hide with film team and Veronica plus Big Ivan and Oleg. 'Lost Valley' as beautiful as ever. Filming up the valley. Big Ivan carries the 15kg tripod but, Dirk, the presenter also helps. More filming at the hide and then the long walk down. River crossings tricky with the gear, but Oleg carries camera, Veronica and me across the worst bit. What a gentleman! We get back to base camp just before Gulinara and Abai arrive with Aikun (their son) and Ursulan (nephew) in the Land Rover with team members, Nastya and Roman. Everyone has had a good day. Daisuke plays football again with Aikun and Usulan. Gulinara looks very glamorous in long dress and jacket. Sky ominous. Group photos and champagne followed by feast in the mess tent (prepared by Nina and Andrei) with any toasts. The heavens open - fantastic hail shower that lasts for ages. Ground white. Many of us go and dance in the rain before all piling into the yurt where Oleg sings and plays the guitar as does Roman and Eva sings again - fantastic! And we drink Karin's 'mean' vodka and champagne punch. It's one hell of a party!

28 July

Early start. Grey and drizzling. Subdued breakfast. I'm staying at base camp between slots for the first time which is wonderful for me, but I'm torn as I don't want to see the team go. Thank you all for your hard work and great company. Everyone leaves except Nina, 'little' Ivan and me. Clear up camp, air tents etc. All so quiet. Ground squirrels very bold now everyone's gone. Day turns beautiful. Spend it cleaning and sorting gear and catching up with 101 things. Hope to go into the hide tomorrow.

29 July

Had planned to go in hide but Sergey came to camp, so had interesting discussions and decided to go and meet hunters near Tabajoc instead (other side of steppe past marshy lake). These hunters also have horses and want to show me another very good area for wildlife. I may do another recce next slot. The rivers are full of fish ('halose' in Russian) and herders fishing everywhere. The steppe bleached. Geological camp near Tabajoc. Pass burial mound where ancient human and horse bones have come to the surface. The weather is breaking and heavy rain sets in.

30 July

Heavy cloud - more rain and maybe snow on the way. Ground squirrels outrageous. They are shredding the base of the yurt - stuffing felt in their mouths and tearing off when I shout at them. They are unrecognizable - no longer the shy, skinny creatures of a month ago. They are now sleek, glossy and double the size (and attitude!). I'm going to have to borrow Bim if this goes on. Not worth going to hide in this weather. Hope it clears by tomorrow.

1 August

Decided to go into hide after all, despite unsettled weather, as it's probably my only chance. Ivan helped me carry the gear and I stayed for 48 hours. The glacial lake as eerie and beautiful as ever. Arrived under late afternoon sun. I got into hide at 17:00 and Ivan left. Very windy and cold but rain held off. Pika alarm calls and nothing else. It rained in the night so uncomfortable and cold awakening, but excited by hearing rock falls - then less excited by one huge rock fall - an avalanche. No wildlife. Weather deteriorated - heavy rain, dripping into hide. Sleeping bag, rucksack etc getting wet. Worst of all, binoculars fogging up. Luckily rain stopped afternoon, but cold and grey. No sign of wildlife.

Spent a second cramped night in hide in hope of seeing something this morning, but nothing except one ground squirrel, the sound of pikas and choughs. Makes me even more certain that the ibex population in our research area is very small and mobile. Today turned lovely and it was good to walk down the valley back to base camp. Ivan told me he heard wolves in the forest near base camp yesterday. He was walking near the burnt area when he heard them howl (he thinks about three wolves were calling). It was between 17:00 and 18:00. Hoped to hear them this evening, but they haven't called (yet). Sometimes I think the wildlife is taunting me. Have been reviewing data sheets and being in the hide gave me plenty of time to think about the next month of surveying.

Base camp blissful today. After a shower went to pick flowers for the mess tent table and Nina has also added larch branches and balloons to welcome new group. We are waiting for them eagerly and hope they won't arrive too late.

2 August

The new team arrived in good time last night. Perfect weather. Fantastic night sky and many shooting stars. I think you all know my wish! All would have been perfect, but the minibus had broken down at Sminsky Pass and had all our food supplies! Andrei and Ivan left to rescue supplies in Defender that same evening. Today we go through the usual introductions to gear, off-road driving etc. It is hot. Fewer mozzies, but horseflies still fierce. As for the grasshoppers!! Nothing is safe. The ground squirrels continue to try and raid felt from the yurt. New team activity is 'suslik watch' (and chase away) in yurt area. Maybe we should add it to data sheets!

3 August

Group survey in corridor area - looking particularly for signs of argali. The weather breaks and we get rain and hail. Do find sign, some fresh (resting depressions, faeces and tracks) but not many animals (probably fewer than ten). Primary prey species sadly definitely in decline in this area. Not yet sure of cause (but probably poaching). Needs more investigating.

Much work left to do and feels like time is running out already. Will also recce another area to north of Tabajoc. Wind and rain this evening - weather very unsettled. Hope it doesn't deteriorate too badly - unless it brings snow and fresh tracks! As Oleg Zigarev used to say (in Russian) "rain good - rain means snow".

4 August

Plenty of rain in the night and grey drizzly morning, but first overnight group out with Volodya to corridor area (even closer to the Tuvan border).

I take other team members to meet herders. We visit Tarbia, but it is very sad to see her still grieving for Nicholi (her husband - he of the gentle smile, metal teeth). He died 9 months ago and she misses him badly. Luckily she is surrounded by family and Gulheart lives with her. We all have tea and then go and see Masha who feeds us wonderful soup. Back to base camp and team members go out with Ivan to survey up behind Manul rock. More rain late afternoon and thunderstorm, but team return glowing with lots of scat. Data sheets lively.

5 August

Up before 5:00 and leave at 6:00. I'm off for 3 days with a different hunter called Marat, to recce area behind Tabajoc. It's grey and cold. Raman and I have packed food, tent, map and not much else (no room in saddlebags). Team members accompany us. Altai timing takes over again. No horses ready when we arrive, but Marat's son gallops and rounds up a group of wild-looking horses, driving them into a corral. Then he lassoes a couple. They are tacked up (with some difficulty!) - our belongings stuffed into saddlebags and tied to the wooden saddles. Tea in the 'ail' (wooden yurt) and we're off. Marat's son, Gena decides to come too. The tent will be cosy! Sun comes out and we head off into wild country. Horses are great. Loose track of how many kilometers we cover. Stop and observe frequently. Weather changes from hot to bitter winds. We ascend and descend steeper and steeper slopes - riding or leading our horses. See distant ibex (group of five including female and young). Takes all Marat and Gena's self control not to shoot them. Get to place where we will spend the night. Wild, silent and sheltered - in a pass. As soon as we dismount, mosquitoes attack from all quarters. Untack horses, put up tent, make fire and hurried meal before going up the slopes to observe until dark. Torture with the mozzies, but we do see another group of ibex (including a big male) but again, very distant sighting.

Long and memorable day. Have seen great snow leopard habitat, but so inaccessible and looks impossible to survey without ropes and specialist equipment.

6 August

Up 4:30 for morning observation shift with Marat. Cool but mozzies still biting! Clamber over rocks treacherously slippery with dew. Watch, and watch and watch...nothing. Gena has gone to a different ridge. Back to camp at 8:00 and brew up tea. Marat disappointed that we didn't see anything but I'm interested just to see the habitat. Gena comes back having spotted some ibex (probably same group as yesterday). Pack up and tack up. Ride on. Scenery very alpine. More steep ascents to rocky plateau.

There's a thunderstorm and my horse freaks, but it's worth it to see the men's faces when I just shrug and say "normalno". Torrential rain. Very steep and slippery descent. Dismount - hard to keep up, horse sliding behind me. The valley seems an impossible way down but find first ripe bilberries and Raman and I stop to eat some - very welcome! The rain get worse and worse. We keep riding - completely soaked now. Stop at 3:00 by river to rest horses, eat and fish. Never a wasted moment with the hunters. Gena gets out his fishing rod - Raman and Marat make a fire and brew tea - within seconds Gena 's caught the few first 'halose'. We huddle under a dripping larch to share tinned beans, bread and tea (a lifesaver!). It's not only wet, it's cold.

More fish caught and we ride on - fording rising rivers, riding through sodden forests redolent with sign of wild boar and maral. Ride and ride until dusk. Relieved to reach camping place - an abandoned 'ail' by the Bashkaus River. It's filthy and part of the roof is missing, but it's heaven. The men chop wood, I start lighting a fire and Marat prepares fish.

We drape our sodden effects around the 'ail'. Fire smoky and hot. 'Halose' boiling in pot. Eat boiled fish and chat. I'm in a different world and can only admire the hunters' skills and endurance. If only we could find a way to work cooperatively, so much can be achieved. Rains all night.

7 August

Still raining hard. No point even trying to look for wildlife in this. Rivers in spate. Low cloud. Marat decides to stay as he wants to do more fishing and he gives me his fast black horse to ride back. I'm honoured. Gena sets a fast pace and we ride and ride. See so much new habitat - ever changing and very different from our survey blocks. Then the descent past brimming lakes and to lower valleys by Tabajoc. Gallop across plain. We are at the 'ail' at 20:00. I'm heartbroken to give up my horse. Drive back to base camp difficult with the steppe a quagmire and water levels in rivers very high, but Andrei's ace driving skills make light work of it. We have great wildlife sightings - 32 demoiselle cranes, many jerboas (including one that dives head first into a burrow - long legs sticking up in the air and squeezes itself in jerkily - very funny to watch). Then near the forest by base camp see young wolf running - great views before it runs back into trees. Back at base camp late but Nina, as usual looks after us so well, and has food waiting. We exchange experiences with Volodya.

Things at base camp have been busy with James going into hide overnight (bad weather, no wildlife sightings and a big landslide) then going straight on with group to set up trailmaster on ridge in back valleys. Sadly more evidence of poaching on that survey (cartridges and tracks of hunter tracking argali). Team members have also been bird monitoring at the marshy lakes, they saw about 50 ducks, partridge with 20 young but fewer demoiselle cranes. Jens saw two male ibex on ridge behind base camp. There has also been more jerboa watching and the team saw an owl in the valley of a thousand stones. Genya and Maxim (from Novosibirsk) are back with us. Genya got bitten by a ground squirrel - he was waiting with his hat over a burrow and actually caught an emerging 'suslik'. He succeeded but it bit him hard! That's what happens when you mess with the wildlife.

8 August

I take overnight group to valley behind Tapduair. We have James, Nancy, Jens, Stephan, Ivan and Roman.

Beautiful day and beautiful place. Cattle and people no longer here. We split up for first survey. I go with Ivan, Nancy and James. James spots bear faeces - it's so fresh it's steaming! Interestingly the bear has used the same spot to defaecate regularly (fresh scat sits on two older piles of scat - found similar sign in 2003). The others survey one of the ridges and are still out in the rain and hail shower, but they are rewarded by the most intense rainbow over glacial lakes looking towards the Mongolian border.

Ivan and Roman rustle up great 'Land Rover camp' supper and then we sit by the fire. Nancy and I even sing. James not only cleans and polishes his boots in the field, but also declines tent and prefers to use his bivy bag despite the rain. Hard man!

9 August

Dry morning. Heavy mist but sun. I survey the valley with Nancy. The rest of the group survey the other ridge. We find lots of sign (marmot, argali, ibex, wolf and fox). Stop frequently to observe, hoping to see ibex or argali. As I scan a ridge over a perfect round plateau, my heart misses a beat - I recognize the posture of a big cat - watching..but it is very distant and I tell myself it must be a rock. Look intently - infuriatingly, cloud comes down and obscures everything. Tell Nancy and we walk closer to get a better view. The cloud lifts and I see the 'rock' is no longer there.

I'm very excited now and then I see movement and it disappears over the ridge. I hardly dare believe it! Snow leopard!!!! I'm so happy!!!! Wish I had time to get up to the ridge but it would take too long. More rain but we get back to vehicles just before downpour. Pack up the tents and wait for others who return soaked but happy to have found lots of ibex/argali tracks, trails and resting depressions. The feeling of excitement builds up all the way home and when we reach base camp I can hardly contain it.

Volodya and team as thrilled as me. We are all on a high and toast the event. Wonder if the snow leopard is resident or just passing through. To cap it, all have great wildlife sightings while driving at dusk/night - 32 demoiselle cranes, many jerboas (including another head diving one). Then near the forest by base camp we see another young wolf running - again great views before it runs back into trees. Deluge sets in again.

10 August

Wake up to roar of our river. It's in full spate - higher than I ever thought possible - careering down and lost all clarity. The rain just doesn't stop. Had planned riding for some team members from Abai and Gulinara's and decide to try and reach their yurt anyway. Rivers roaring and very high but the Land Rovers make it. Roman takes Lars, Sabine and Jonas out. River crossing with horses impressive and riders' boots have no chance of getting dry. The rest of us wait and chat in the yurt and watch Gulinara make cheese (Sabine helps - and she speaks Russian so able to chat at same time).

Many cups of tea. Riders come back and I take out second group (Nancy, Sabine and Jonas again). I'm on Masha's crazy horse this time. Enjoy the river crossing! Then go up opposite mountain. View over back valleys magnificent.

Agree burst of speed on way back with Jonas who is itching to gallop. Rivers seem even higher and faster on way back.

Amazingly little Lada with half the ground clearance of the Land Rovers roars through one river ahead of us. However the second river is even deeper and the Lada gets stuck three quarters of the way across and blocks our route home. James volunteers to ford the river and run back to base camp to get the Land Rover with a winch. He crosses very professionally and to say we are impressed is an understatement - then radio contact! Volodya and Ivan were worried about us and are on their way with Maxim and Genya who demonstrate perfect winching technique. The Lada safely on the other side and whole family emerges, very shaken but safe. Andrei and Roman expertly drive our Land Rovers across.

It's nearly party time by the time we get back to base camp. The rain stops!!! We do team photos outside the yurt and then crack open the champagne. The snow leopard sighting and evidence of other wildlife means this slot much to celebrate. See James out of his combats/camouflage for the first time! Abai, Gulinara and Tarbia with us (the stove in our yurt is from her). Everyone in party mood!

10 August

Wake up to roar of our river. It's in full spate - higher than I ever thought possible - careering down and lost all clarity. The rain just doesn't stop. Had planned riding for some team members from Abai and Gulinara's and decide to try and reach their yurt anyway. Rivers roaring and very high but the defenders make it. Roman takes Lars, Sabine and Jonas out. River crossing with horses impressive and riders' boots have no chance of getting dry. The rest of us wait and chat in the yurt and watch Gulinara make cheese (Sabine helps - and she speaks Russian so able to chat at same time).

Many cups of tea. Riders come back and I take out second group (Nancy, Sabine and Jonas again - he is a natural and really enjoying it. I'm on Masha's crazy horse this time. Enjoy the river crossing! Then go up opposite mountain. View over back valleys magnificent. Agree burst of speed on way back with Jonas who is itching to gallop. Give Masha's horse his head. Big mistake!!! Only just manage to stop at the yurt. Rivers seem even higher and faster on way back. Amazingly little Lada with half the ground clearance of the defenders roars through one river ahead of us.

Amazing! However the second river is even deeper and the Lada gets stuck three quarters of the way across and blocks our route home. James volunteers to ford the river and run back to base camp to get the defender with a winch. He crosses very professionally and to say we are impressed is an understatement - then radio contact! Volodya and Ivan were worried about us and are on their way with Maxim and Zhenya who demonstrate perfect winching technique. The Lada safely on the other side and whole family emerges, very shaken but safe. Andrei and Roman expertly drive our defenders across. It's nearly party time by the time we get back to base camp. The rain stops!!! We do team photos outside the yurt and then crack open the champagne. The snow leopard sighting and evidence of other wildlife this slot means much to celebrate. See James out of his combats/camouflage for the first time! Abai, Gulinara and Tarbia with us (the stove in our yurt is from her). Everyone in party mood!

11 August

Andrei gets stuck in river trying to get Abai, Gulinara and Tarbia home and we have to pull the Defender out of the raging waters. Again, James very helpful. Defender has to stay at base camp with Volodya, Irene, Roman and Jens and Colin who are staying for two slots. Despite delayed departure we make very good time to Anoz. The rivers are so high with all this rain. Anoz as soothing and comfortable as always. Lena and Zhenya run it so well.

12 August

Fewer and fewer team members in vehicles as we leave Nancy, Sabine and Lars at Anoz. Again, excellent drive to Novosibirsk. We go to Chinese restaurant for farewell dinner. Always sad to see team members go.

13 August

Usual admin and trip to Autoland to get vehicle papers. They are now issuing them each slot so Nastya and I have to go every time. Meet new group in Russian restaurant as usual. It's lovely to see Roger and Bob back again this year. Very dynamic. Look forward to working with them. We also have a Russian journalist called Sergey with us this slot, writing an article for an off-road motoring magazine.

14 August

Perfect driving weather. Very good drive to Anoz. New team very enthusiastic and lively. Up chatting till late. Nastya, as always, has the unenviable job of filling in all the registration forms in Russian.

15 August

Usual stop at Silver Springs while Andrei and Nastya do the registrations in Gorno Altaisk. It all goes very smoothly!!! We are off 11:30 and have great drive. Have wonderful view of black storks flying low at 'ice cream' stop (no ice creams this time as the freezer is broken). Make Chuyi Oozy restaurant by early afternoon. Then the most beautiful drive to base camp I have ever experienced. We reach Kosh Agach by 19:00. Lorries laden with hay. After re-fuelling we drive on. Haymaking going on all around. People scything, raking, pitching new hay in to lorries. The steppe dotted with small tents. The light extraordinarily beautiful. It's cold. The snow-covered peaks of the Mongolian border glowing pink in the setting sun and then indescribable colours of dusk - our survey area dusted in snow.

Everything sparkling under brilliant stars and a half moon. Arrive base camp at 21:00. Greeted by Volodya, Irene, Roman, Colin and Jens as well as Maxim and Zhenya who are very helpful - keeping the stove going in the yurt. It's very cold. The mess tent is propped up with wooden stakes. It collapsed under the weight of snow. The weather has been very cold in our absence and ibex came down to slope behind base camp (males, females and young - 12 in total) so good sightings! New team allocated tents and hot soup waiting in mess tent. So good to be back!! See brightest shooting star of my life.

16 August

We are lucky. It's a sunny day! Usual risk assessment etc. and Volodya leads a survey along the river bed to check fresh tracks after all the heavy rain. Very good atmosphere in camp and new team raring to go. I prepare for tomorrow's overnight camp then go and bathe in the river. It's wonderful (but only because it's a hot afternoon - I don't know how Jens manages it early in the morning when it's freezing!)

17 August

Roman and I take a group of team members out on overnighter (Thorsten, Eva, Alexander, Stephanie, Bob, Colin and Sergey). We camp at the valley behind Tapduair as I want to look for snow leopard sign there after last week's sighting. Survey the valley - right up to the head. I survey an area of steep scree and rock bluffs - full of ibex/argali resting depressions, in lighter, gravelly patches. Go up to the rocks. Wonderful. Ledges, boulders and a tiny path. The call of ravens. Big flock of snow buntings.

Smell a perfect overhanging boulder and the pungent scent of snow leopard rock spray sends a shiver of excitement through me. Check it thoroughly and it is definite!! I'm thrilled. Go back down to meet the others who have found sign of ibex. We all walk back the valley. That last slope up to the camp is a killer. Very cold wind. Zhenya has joined us again in his Defender. Light fire and very jolly evening with vodka from Sergey and Altai balsam from Roman (for the cold of course!)

18 August

Another beautiful morning and we split into two groups. One to survey landform edges and other side of valley - the other to survey the bowl and ridge of snow leopard sighting. Fast pace and then ascent up steep side of bowl. Ominous cloud fast approaching from Mongolia - the sky dark. Raman, Thorsten, Eva and I decide to continue. Survey bowl and up to ridge. Stand in spot where saw snow leopard and find pugmarks in the fine gravel! We are on a high (quite literally) and despite thunderstorm, lightening and rain, continue surveying ridges up to 3340m.

Amazing to see so much of the core area - Tapduair, Sailugiem and Kunduyak plus valleys. Fresh snow-falls on Sailugiem. Roman leads a fast pace back to the camp. Then the magnificent drive back to base camp. Fantastic survey and results. Looks like there is a resident snow leopard back in our research area!

19 August

Volodya, Irene, Nastya and Jens off to survey new area with both Sergey's, Maxim and Zhenya for two days. They are going into Tuva. They leave in the morning. Rest of group go to see archaeological remains. Roman and I go to say goodbye to Marat and Zhenya. Only Zhenya there, but good to see him again. Also come with photos (including snow leopard scat and scrapes - so hope they will start keeping records for us). See Demoiselle cranes. Long-legged buzzard and five cinereous vultures on way back to base camp. Team members great. Everyone getting on and really mucking in. Nina continues to excel in every way. A lovely day.

20 August

Early breakfast and then off to survey Sailugiem with team members. Beautiful cool morning. The heavy rain and rivers in spate mean that the valley is different - new channels carved and even more river crossings. Roman spots steppe viper (first we have ever seen here) - it's using the morning sun to heat up in rock near river. All team members get a good look. Weather changeable. Sun, cloud, rain. The valley beautiful and lush changes to rock and the forbidding slopes that mark the ascent. Roman takes us up a different way - following boulders and river, then scree and snow. Tough but beautiful. Whole team makes it to the summit (over 3400m!) by 13:00. Light perfect and no wind. No wind. Team photos and observation.

See one large male ibex (another distant sighting). Survey ridges. Find sign of ibex/argali, manul, hare and game birds and then - snow leopard tracks!!! One set old and one set much fresher. Again the tracks are in fine gravel. I just can't believe it!!! This is as good as it gets. All team thrilled. More sign of primary prey and walk back to vehicles in perfect afternoon light and temperature. Back at the vehicles by 17:30 and then collect firewood. Whole team brilliant - make light work of collecting and stacking as much as the Defender can carry. Make it back to base camp with the load. Colin and Roger have already got hot water for showers on the go. Camp fire warm and perfect place for celebratory vodka (thanks to Bob and Neill). Volodya and co. come back from reccee, so much excitement as we hear about their time away. Very difficult terrain. Had to use the winch 15 times! (thank goodness for Zhenya and Maxim!). Sergey very happy as he got lots of good photos. Great day.

21 August

Another beautiful day. I'm up early, but Jens is already coming back from the river when I get up (and there is ice on the tents - arghh!!). Volodya leads survey with half of the team. I take the others to see Abai and Gulinara. They are packing up. Most of the other families have gone or are packing up. We catch up with news. This is always a sad time for me - the herders leaving the steppe and the expedition ending, but the friendships we have made and the work we have done is something I treasure. Sergey gets lots of good photos and we enjoy precious last moments. New team experience great hospitality. Things get even better when I get a last ride on no.88! We then all go to see carved stone (one I have never seen before). Abai and Aikun galloping to show the way. Photos - then race with Roman. Back to base camp just in time to set up camera for team photos followed by brilliant party. Perfect weather. Ivan and Roman are the most professional openers and dispensers of champagne! Wonderful food. Dancing and finally arm wrestling in mess tent. Perfect day.

22 August

Very sad day for me. The yurt is dismantled in the morning. It comes down and is packed into/onto the minibus in record time. Then leaves with Andrei and Abai. Volodya leaves with half the team for overnight survey in corridor area. The rest of us pretty tired after heavy surveying of high ridges + party, so everyone takes it easy. Enjoy the sunny afternoon - river bathing is popular (especially as we are about to lose it - it's disappearing fast).

23 August

Rain in night and morning. Cool and damp, but decide to survey whole ridge system to left of base camp. Bitter wind. The colours are changing and autumn is close. Our group starts off, but only Bob, Thorsten and Eva continue with Roman and me. Survey whole ridge area. Find very fresh ibex tracks and trails plus areas where they have been digging for salt/minerals.

The ridge gets very narrow and slopes either side as steep as they get, but we all make it to 'Roman's Peak' - we name it in his honour. He deserves it. Fantastic place. Views onto so much of survey area. We are at 3300m - 3rd time this week for Thorsten, Eva, Roman and me! Back along difficult ridge before dropping down 800 m of scree to valley below. I couldn't have wished for a better last survey and team. Volodya and group back from overnighter with close view of 13 argali. Ivan even filmed them! Makes up for the trailmaster malfunctioning, so no footage from that this year.

24 August

Today is Gulinara's birthday and I promised to see her. I know it's mad with packing up and so much to do at base camp on the last day, but the friendships I have made with herders are too precious to take for granted and birthdays are important here, so we (Nastya, Roman, Sergey G and me accompanied by Aude and Jens) set off. Abai and Gulinara's yurt deserted, so we go looking for them in Tibilir. It all turns out to be quite an adventure and we end up at the winter station (guided there by Enmira). It is as beautiful and difficult to find as I remember. After all that effort, Gulinara isn't there! (Don't ask - we were assured she was). The good news is that Ascir (Abai's father) and other family are there, so we are able to say our goodbyes and leave our presents for Gulinara. We are treated to a feast of boiled lamb, boursak and tea, and I know none of you will believe this but we end up, and make our toasts with... water! It's special water from sacred springs. Long drive back towards base camp, then, as we get close, we meet little red car with Abai and Gulinara!!! Abai's brother, 3rd wife and two year old Mohamed also there. Much happiness

all round and they come back to base camp to celebrate. It's a short time together, but very happy and we toast Gulinara with something stronger than water! She is a very special person and if she has another child, she wants me to be godmother. I'm close to tears when we say goodbye, but 'expeditions leaders don't cry' (unless tequila is involved and that is one drink I won't ever touch again!!!). Camp is dismantled and team members do a wonderful job helping me pack and label the last boxes. It's very cold. Big camp fire. Andrei leaves in green Defender. If all is fine, he will be at Anos before us. If not, contingency plans kick in. I end the day with Russian team in red truck with cigarette smoke, bawdy Russian songs (Nastya says to me "Tessa, you're so lucky you don't understand the lyrics" then I remind her I do, as Yuri Petrovich mimed the actions for me in 2003!) and the best company I could wish for.

25 August

Early breakfast on small tables. Our mess table and benches have been dismantled. Minibus and remaining Defenders leave. The two Romans and Zhenya from Anos stay back with the red and grey trucks to finish dismantling tents etc. I hate this bit – leaving the mountains and the steppe behind and knowing that as autumn turns the hills red, the wildlife will come lower. As always there is just one more (I lie – many more!!!) survey I desperately want to do before leaving. But it will have to wait....

The drive to Anos goes well. At Chuya Ouzi we meet a couple of British guys who need to change money in order to eat! They have driven a Citroen 2CV all the way from London for charity and it's only taken them 25 days! Amazing! Their final destiny is Ulan Bataar, the capital of Mogolia. Even more amazing is that the car is still in one(ish!) piece. If the 2CV had 4WD, Defenders might have serious competition! Sergey G (journalist) is in heaven and all the team fascinated. Many photos and find space to add signature for Biosphere Expeditions. We arrive in Anos in good time. Green Defender and Andrei there and all fine. What a relief. Sergey Kurgin there to greet us. New banya being built at bottom of garden. Foundations laid. Will be huge! But I like the old one and Sergey has promised to keep it for me. Multa is now very well behaved and even more beautiful. Lena has cooked lovely meal again. The trees are laden with crab apples – deep red and delicious. Everyone dashing for banya. Both Sergeys have vodka to toast end of expedition - serious! Red and grey truck with rest of equipment arrive. Final sorting and repacking of equipment. Crickets calling, Katun racing. I love this place.

26 August

Last drive back to Novosibirsk. Blinis and shashliks as good as ever. Have to stop Roman and Thorsten from racing! Am very strict and remind them of the Dr Hammer 'no testosterone driving' rule. All team members, Sergey G, Volodya and Irene to Russian restaurant with Roman and Oleg S (both wearing shirts and ties!), Nina and Nastya (looking very glamorous). Zhenya and Maxim also join us. Brilliant evening which ends with vodka and arm wrestling (Thorsten and Roman again!). Thank you everyone. It's been a fantastic expedition. We found sign of snow leopard and had a sighting – but even more importantly the work really progressed. Ties with, and knowledge gained from local people deepened. We have learnt so much more. I want to say a special thank you to my brilliant Russian team for all their hard work and loyalty. Andrei, Nastya and Oleg have been with us for three years. I can't praise them enough. They are outstanding at their respective jobs and ensure a precious continuity. Volodya, the best field scientist anyone could hope to work with and Irene for her lovely presence and help. Nina for excelling not only as a cook, but for looking after us all so well. Roman and Ivan for being so much more than mountain guide and camp helper. They are total stars. Never has camp run so smoothly or has such a perfect pace been set for surveys. Special thanks to Roman for helping me recce new areas with the hunters and for being so interested and good at surveying! Also big thank you to Roman, Lena and Zhenya of Anos for all their contribution. Last but not least I make a toast to the 'big men' Sergey Kurgin and Matthias Hammer, and all team members. Without you and Biosphere Expeditions this research would not be possible. This has been the best expedition yet. Spasiba Balshoi!