EXPEDITION REPORT

Expedition dates: 9 June – 23 August 2014

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Mountain ghosts: protecting snow leopards and other animals of the Tien Shan mountains of Kyrgyzstan

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Biosphere Expeditions

Abstract

This study was part of an expedition to the Tien Shan Mountains (Kyrgyz Ala-Too range), run by Biosphere Expeditions and NABU from 9 June to 23 August 2014 with the aim of surveying for snow leopard *(Uncia uncia*) and its prey species such as argali *(Ovis ammon)* and Siberian ibex *(Capra sibirica)*. Using a cell methodology adopted by Biosphere Expeditions for volunteer expeditions, 77 cells of 2 x 2 km were surveyed and 22 interviews with local people were conducted. The surveys yielded no evidence of snow leopard (camera trap photos, tracks, scrapes, marking places, etc.), but the interviews indicated that snow leopard was present in the area and confirmed the importance of the area as a habitat for snow leopard. The surveys also showed that the area's habitat is sufficiently varied and capable of sustaining a healthy prey base for the snow leopard as well as for other carnivores such as the wolf. Prey species recorded were the ibex, marmot and argali, the latter in low numbers. Poaching, overgrazing and other disturbances, however, are serious issues that must be addressed in order to avoid habitat impoverishment and with it the local extinction of the snow leopard. To that end, Biosphere Expeditions will continue with its annual research expeditions to the area, seeking to conduct further surveys and involving local people in this as well as the search for economic benefits and incentives to maintaining habitat health and with it snow leopard presence.

Резюме

Это исследование является частью экспедиции в горах Тянь-Шаня (Кыргыз Ала-Тоо) организованного Биосферной экспедицией совместно с НАБУ с 9 по 23 августа 2014 года, с целью определения количества снежного барса и его кормовой базы, к которым относятся горный баран и сибирский козерог. Применив методику координатной сетки на карте, разработанной Биосферной экспедицией для проведения научно-практического исследования совместно с участниками экспедиции, было исследовано 77 сеток (2х2 км) и был проведен опрос у 22 местных жителей. Данные исследования не выдают никаких указаний по снежному барсу (по фотоловушкам, следам, следам царапин, урины и т.д.) Опросы у местного населения дают подтверждения о нахождении снежных барсов в окрестностях, и повышают значимость региона как ареала обитания снежных барсов. Исследования показали, что изученная область является биоразнообразной в которой водится кормовая база снежного барса - горные козлы, барсуки, архары. Стоит отметить, что архары наблюдаются в малом количестве. Браконьерство, уничтожение растительного покрова и другие разрушения являются серьезной проблемой в борьбе против вымирания снежного барса и уменьшения лучшей среды его обитания. В связи с этим, Биосферная экспедиция должна продолжить свои ежегодные исследовательские поездки в окружающую среду, для проведения дальнейших опросов определения численности диких животных и совместно с местным населением искать пути сохранения ареала снежного барса с учетом экономической пользы.

Резюме

Тянь-Шань тоолорундагы изилдөөлөр НАБУ коомдук уюму жана Биосфералык экспедиция тарабынан 9-23 августка чейин илбирстердин санын жана алардын тоют базасын (тоо эчки, кулжа) аныктоо максатында уюшулган .Биосфералык экспедиция илимий- практикалык изилдөө иштерин жүргүзүүдө картадан координаттык торчо методикасын иштеп чыккан, катышуучулардын жардамы менен 77 сетка (2х2 км) жана 22 адамдан интервью алышкан. Алынган маалыматтар илбирстер тууралуу так маалыматтарды бербейт (сүрөт капкандар, издери жана башка). Ал эми жергиликтүү калктан алынган маалыматтар илбирстин ошол аймакта бар экенин аныктап, жашоо ареалын кенейтет. НАБУ жана БЭ тарабынан изилденген аймак биотүрдүүлүккө бай келип, илбирстин негизги тамагы болгон аркар, тоо эчки жана суурлар байырлаган жер, бирок аркарлар кескин түрдө аз кездешкен. Браконьерчилик, жайыттардын такыр болуп, өсүмдүктөрдүн жоголушу жана башка кубулуштар илбирстердин жашоосунда чоң роль ойнойт. Ошондуктан, Биосфералык экспедиция Тянь-Шань тоолорунда изилдөө иштерин улантып, жергиликтүү калк менен биргеликте илбирстин ареалын жана жеген тамагын коргоосу зарыл.

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1. Expedition Review

M. Hammer (editor)
Biosphere Expeditions

1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Our 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. Our expeditions are open to all and there are no special skills (biological or otherwise) required to join. Our expedition team members are people from all walks of life, 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 project report deals with an expedition to the Tien Shan mountains of Kyrgyzstan (Kyryz Ala-Too range) that ran from 9 June to 23 August 2014 with the aim of surveying snow leopards as well as their prey species such as argali (a mountain sheep) and the Central Asian ibex. The expedition also survey other animals such as marmots, birds and small mammals, and worked with the local anti-poaching patrol “группы барс” (snow leopard group “Grupa Bars”) and other local people on capacity-building and incentive creation projects.

Little is known about the status and distribution of the globally endangered snow leopard in the area and its interaction with prey animals such as the Tien Shan argali and Central Asian ibex, and its reliance on smaller prey such as marmots, ground squirrels and game birds. Biosphere Expeditions will provide vital data on these issues, which can then be used in the formulation of management and protection plans. The expedition also worked with locals in an effort to build capacity, educate and involve local people in snow leopard conservation and generate income through responsible tourism activities.

1.2. Research area

Kyrgyzstan is a country located in Central Asia and often referred to as the "Switzerland of Central Asia". Landlocked and mountainous, Kyrgyzstan is bordered by Kazakhstan to the north, Uzbekistan to the west, Tajikistan to the southwest and China to the east. Its capital and largest city is Bishkek.

Kyrgyzstan is further from the sea than any other country and all its rivers flow into closed drainage systems, which do not reach the sea. The mountainous region of the Tien Shan covers over 80% of the country, with the remainder made up of valleys and basins. The highest peak is Jengish Chokusu (Pik Pobedy) 7,439 m and more than half the country is above 2,500 metres. Steppe and alpine vegetation dominate the landscape; glaciers and eternal snow cover over 3% of the country’s total area. The climate in Kyrgyzstan is continental with a small amount of rainfall.

The Kyrgyz Ala-Too (Кыргыз Ала-Тоосу, also Kyrgyz Alatau, Kyrgyz Range) is a large range in the northern Tien Shan mountains. The range is situated just south of the capital city of Bishkek and the views from the city itself are stunning and form a backdrop that is unique in the world. The Kyrgyz Ala-Too range stretches for a total length of 454 km from the west end of Issyk-Kul to the town of Taraz in Kazakhstan. It runs in an east-west direction, separating into the Chuy, Kochkor, Suusamyr and Talas valleys. The western part of Kyrgyz Ala-Too serves as a natural border between Kyrgyzstan and Kazakhstan. The range's highest mountain is Alamyudyun Peak at 4855 m.

Figure 1.2a. Map and flag of Kyrgyzstan with study site.

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

The mountains are divided by several river valleys and there is a great variety of landscape. There are hollows with semi-desert landscapes, alpine peaks, narrow river canyons and broad valleys, highland tundra and deep natural limestone gorges, open steppes, permanent snow and glaciers and tracts of forest, as well as a multitude of 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.

Many threatened animal and plant species, a great number of them endemic, are present in the area with a recent count showing at least 70 mammal, 376 bird, 44 fish species and over 3000 insect species.

The Kyrgyz people are descendants of several different nomadic Turkish ethnic groups in Central Asia and were first mentioned in writing in 201 BC. Kyrgyzstan is one of the active members of the Turkic Council and the TÜRKSOY community. Kyrgyzstan's history is one of Turkish and Mongol, and more recently Soviet and Russian domination. Independence from the Soviet Union was declared on 31 August 1991 and Kyrgyzstan became, and has stayed, a unitary parliamentary republic.

1.3. Dates

The project ran over a period of two and a half months divided into two one-week slots, each composed of a team of international research assistants, scientists and an expedition leader. Slot dates were:

9 - 21 June | 23 June - 5 July || 14 -26 July | 28 July - 9 August | 11 - 23 August 2014

Team members could join for multiple slots (within the periods specified).

1.4. Local conditions & support

Expedition base

The expedition team worked from a mobile base camp, set up in various valleys on the southern side of Kyrgyz Ala-Too (see Fig 2.2.3b). Base camp consisted of an assortment of dome, mess and kitchen, as well as shower tents (see Figure 1.4a). All meals were prepared by the expedition cook; breakfast and dinner were provided at base and a lunch pack was supplied for each day spent in the field.

Figure 1.4a. Base camp with kitchen and mess tunnel tents (left), dome tents for participants and shower and toilet tents (foreground). There is also an expedition lorry for transporting base cam and the expedition 4x4 vehicles.

Weather

The local climate is temperate continental with short, hot summers (during which the expedition took place) and prolonged, cold winters. Winter temperatures range from -9°C to -45°C, summer temperatures from +11°C to +35°C during the day. Base camp was in the mountains at varying altitudes and as such the weather was very variable and in extreme cases turned from hot sunshine to a snow shower at temperatures below zero at any time, even in high summer (see Figure 1.4b).

Figure 1.4b. Snow shower at base camp on 15 August 2014.

Field communications

There was an unreliable Inmarsat BGAN satellite phone, which failed during the expedition and was replaced. There were also hand-held radios for groups working close together. There was generally no mobile phone network. The expedition leader posted a diary with multimedia content on Wordpress and excerpts of this were mirrored on Biosphere Expeditions' social media sites such as Facebook and Google+.

Transport & vehicles

Team members made their own way to Bratislava or Kraľovany. From there onwards and back to Bratislava all transport was provided for the expedition team. A variety of 4x4 vehicles were rented from Almaz Alzhambaev of www.carforrent.kg. Local partner NABU also provided a 4x4 vehicle and a lorry (see Figure 1.4a). Horses were rented from local people as necessary.

Medical support and incidences

The expedition leader was a trained first aider and the expedition carried a comprehensive medical kit. Further medical support was provided by the Public Foundation "Rescue in the mountains of Kyrgyzstan", a small district hospital in the town of Suusamyr (about 40 km from camp) and large hospitals in Kara-Balta and Bishkek (about 140 km and 200 km from camp respectively). Safety and emergency procedures were in place, but did not have to be invoked, as there were no medical or other emergency incidences during the expedition.

All team members were required to carry adequate travel insurance covering emergency medical evacuation and repatriation.

1.5. Expedition scientist

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

1.6. Expedition leaders

The expedition was led by Ronald Seipold and Paul O'Dowd. Ronald Seipold graduated from the University of Berlin with a Masters Degree in Business Administration and then spent several years working in different branches of industries leading organisational and IT related projects. He then decided to go for a total change of career & lifestyle and focus on his passion for travelling, wildlife and the outdoors. After a 100 day intensive training course with COLT (Canadian Outdoor Leader Training) he qualified as an outdoor leader, radio operator, sea kayak and canoeing guide, backcountry first-aider, etc.. Ronald then began leading and instructing groups in the outdoors primarily in Scandinavia and Canada as well as working for outdoor camps and lodges. Ronald joined Biosphere Expeditions in 2007. His favourite activities are mountaineering, canoeing and climbing.

Paul O'Dowd was born in Melbourne, Australia. From the beginning, his primary interests have been natural history and adventure. As a teenager he learned to dive and at 19 years old left Victoria to move to Cairns to work on the Great Barrier Reef in the dive industry. Shortly thereafter he was offered a job managing a dive facility in Papua New Guinea. In PNG Paul became involved in expeditionary and documentary film work. Paul has worked for the BBC's Natural History Unit and various other companies on documentary projects as well as with assorted tourism-based expeditions to places such as the Sepik Basin and the Kokoda Track. Paul also delivers a lecture programme in rainforest ecology, conservation and sustainability for a study abroad programme for American university students. A broad base of scientific literacy and a genuine interest in communication has led to a career in introducing diverse audiences to the natural world. Diving, rock climbing and just about anything that provides a good opportunity to get into nature and help others to do the same is Paul's idea of time well spent.

1.7. Expedition team

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

9 – 21 June 2014

Aizada Baiysh (placement, Kyrgyzstan), Sylvia Caravotas (South Africa), Sabine Corzelius (Germany), Marion Goedhart (Australia), Piero Gossi (Australia), Dieter Graf von Helmstatt (Germany), John Haddon (UK), Sharon Heywood (Russia), Monique Mannaert (Germany), Astrid Mariaschk (Germany), Melissa Shepstone (USA), Steven Shepstone (USA), Martin Ziebell (Germany). Also for part of the slot: Matthias Hammer (Executive Director, Biosphere Expeditions).

23 June – 5 July 2014

Jeannine Finzel (Germany), Julija Grinberga (Latvia), Anders Krüger (Sweden), Simone Lechner (Italy), Gabriele Methou (Germany), Aude Neuville (Belgium), John Oliver (UK), Roger Schauls (Luxembourg), Nancy Tran (USA), Jens Warstat (Germany), Natalie West (UK), Matt Wright (UK).

14 – 26 July 2014

Günter Elsner (Germany), Pei Hao Goh (Singapore), Martin Haslam (UK), Agnes Mitschke (Austria), Liss Myrås (Sweden), Thomas Rainer (Austria), Ulan Rakhmatov (placement, Kyrgyzstan), Martin Scholz (Germany), Ilka Schweda (Germany), Ulf Schweda (Germany), James Smith (UK), Marlies Sperandio (Austria), Gordon Thomson (UK).

28 July – 9 August 2014

Aliaskar Adylov (placement, Kyrgyzstan), Rhys Everitt (UK), Dennis Loh Ing Han (Singapore), Ali Meade (New Zealand), Kelvin Meade (New Zealand), Peter Pilbeam (UK), Meinhard Platzer (Austria), Xiao Ye Tan (Singapore), Si Ning Yeo (Singapore), Wen Zhong (Singapore).

11 – 29 August 2014

Robert Brozovic (Germany), Katie Bunting (UK), Susanna Eggimann (Switzerland), Thomas Gerber (Germany), Michael Gröschl (Switzerland), Nadezhda Maltseva (Russia), Gaby Meier (Switzerland), Ulan Rakhmatov (placement, Kyrgyzstan), Gary Schiavi (USA), Franziska Schumann (Germany), Norbert Stein (Switzerland), Natalia Valkovskaya (Russia).

Also our expedition cook throughout the expedition, Emma Alimbekova, and, on a rotational basis, members of NABU's anti-poaching patrol 'Grupa Bars' (Zholdosch Akunov, Kurmanbek Duischeev, Schailoo Tesektschiev, Aman Talgartbek Uulu), all from Kyrgyzstan.

1.8. Expedition budget

Each team member paid towards expedition costs a contribution of £1,780 per person per seven-day slot. The contribution covered accommodation and meals, supervision and induction, special research equipment and all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses such as telephone bills, souvenirs etc., or visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how this contribution was spent are given below.

Income	£
Expedition contributions	106,110
Expenditure	
Expedition base includes all food & services	9,443
Transport includes hire cars, fuel, taxis in Kyrgyzstan	19,420
Equipment and hardware includes research materials & gear etc. purchased internationally & locally	13,088
Staff includes local and Biosphere Expeditions staff salaries and travel expenses	18,426
Administration includes miscellaneous fees & sundries	3,770
Team recruitment Tien Shan as estimated % of annual PR costs for Biosphere Expeditions	6,525
Income – Expenditure	**35,438**
Total percentage spent directly on project	**67%**

1.9. Acknowledgements

We are grateful to the volunteers, who not only dedicated their spare time to helping but also, through their expedition contributions, funded the research. Thank you also to our partner organisation, the Naturschutzbund (NABU = nature protection alliance), in particular the Grupa Bars (see section 1.7. for their names), as well as Tolkunbek Asykulov, Boris Tichomirow and Britta Hennig. A big thank you also to Almaz Alzhambaev of www.carforrent.kg, who has helped us very much over and above the call of duty. Emma Alimbekova, was an amazing cook and the heart and soul of the expedition. Biosphere Expeditions would also like to thank members of the Friends of Biosphere Expeditions and donors for their support.

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 on the website.

2. Monitoring snow leopards and other species on the south side of the Kyrgyz Ala-Too mountain range in the Tien Shan mountains of Kygryzstan

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

2.1. Introduction

2.1.1. Background on the snow leopard

The snow leopard (*Uncia uncia*) is a member of the *Felidae* subfamily *Pantherinae* and on the basis of morphology and behaviour, it is placed alone in a separate genus. Snow leopards are found in twelve countries across Central Asia (China, Bhutan, Nepal, India, Pakistan, Afghanistan, Tajikistan, Uzbekistan, Kyrgyzstan, Kazakhstan, Russia and Mongolia). China contains as much as 60% of the snow leopard's potential habitat.

Figure 2.1.1a. Part of the snow leopard's range (brown) and range countries. Expedition study site in black ellipse.

Inaccessible and difficult terrain, along with the secretive nature of this rare cat helps account for the fact that large parts of its range have yet to be surveyed. Between 4,500 and 7,350 snow leopards are thought to occur within a total potential habitat area of 1,835,000 km^2. Snow leopards are generally solitary and mating usually occurs between late January and mid–March, and one to five cubs are born after a gestation period of 93 to 110 days, generally in June or July. Snow leopards are closely associated with the alpine and subalpine ecological zones, preferring broken, rocky terrain with vegetation that is dominated by shrubs or grasses.

The home range of five snow leopards in prime habitat in Nepal ranged from 12 to 39 km^2, with substantial overlap between individuals and sexes. In Mongolia, where food resources may be scarcer, home ranges of both males and females exceeded 400 km^2. Snow leopards are opportunistic predators capable of killing prey up to three times their own weight. They will also take small prey such as marmot or chukar partridge. In general, their most commonly taken prey consists of wild sheep and goats (including blue sheep, Asian ibex, markhor and argali). Adult snow leopards kill a large prey animal every 10-15 days, and remained on the kill for an average of three to days, and sometimes up to a week. Predation on livestock can be significant, which often results in retribution killing by herders.

Snow leopards are listed as Endangered on the IUCN Red List. Currently the species does not meet the standards of Critically Endangered, but populations projected to decline by 50% or more over the next three generations due to potential levels of exploitation (trade in pelts/bones and conflict with livestock), and due to declining suitable habitat, extent of occurrence, and finally quality of habitat (prey depletion). They appear in Appendix I of both CITES and the Convention on Conservation of Migratory Species of Wild Animals (CMS). Snow leopards are protected nationally over most of their range. However, in some countries the relevant legislation may not always be very effective.

2.1.2. The snow leopard in Kyrgyzstan

Kyrgyzstan was once home to the species' second largest population in the world. In the 1970s and 1980s, the trapping and export of wild animals was officially organised by the Soviet national zoo authority. Kyrgyzstan supplied approximately 40 snow leopards annually, which the central office in Moscow sold to zoos worldwide for USD 50 per animal. With the end of the Soviet Union, many official wildlife trappers were put out of work. Today, because of the high prices snow leopard parts earn on the black market, snow leopards have been poached heavily since Kyrgyzstan gained independence from the Soviet Union in 1991.

In Kyrgyzstan (representing around 4% of the snow leopard home range, Table 2.1.2a), numbers declined from an estimated 600–700 individuals in the late 1980s (Koshkarev 1989) to 150–200 individuals by 2000 (Koshkarev & Viripaev 2000), putting the species at high risk of extinction in the country.

Table 2.1.2a. Potential Habitat Area (in square kilometers) for snow leopard across its range in Central Asia (after Hunter & Jackson 1997).

Country	Total potential habitat (estimated occupied habitat)	Good	Fair	Percent protected
All Countries	3,024,728	549,706	2,475,022	6.0
Kyrgyzstan	126,162 (105,000)	32,783	93,379	1.1

Across the snow leopard’s range, gaining a more accurate picture snow leopard distribution and identifying ‘hotspots’ is a critical conservation need. Over most of the range, it is uncertain about where the species occurs. This emphasises the need for snow leopard surveys and distribution mapping, the results of which will help identify areas for conservation.

Secondly, there is a need for a better understanding of prey species distributions and populations. As with snow leopards themselves, the distribution and abundance of the cat's prey is poorly documented over much of the range. Baseline population estimates should be gained for this purpose. This will allow long-term trend monitoring to begin.

Thirdly, an important issue is the evaluation of the attitudes and lifestyles of local communities who share the snow leopard's habitat.

Recently these needs have been incorporated into a new international effort to save the snow leopard and conserve high-mountain ecosystems (the Global Snow Leopard & Ecosystem Protection Program, GSLEP, www.globalsnowleopard.org/documents-grid/), which corresponds to the commitments of the Bishkek Declaration adopted by twelve snow leopard home range countries at the Global Snow Leopard Forum in 2013. Under GSLEP, portfolios of national activities have been designed and are expected to be implemented with the support from international and national partners.

On this expedition our main partner was the German conservation organisation NABU (NABU = Naturschutzbund = nature protection alliance). Founded in 1899, NABU is one of the oldest and largest environment associations in Germany. The association encompasses more than 450,000 members and sponsors, who commit themselves to the conservation of threatened habitats, flora and fauna, to climate protection and energy policy. In Kyrgyzstan, NABU, in cooperation with the Kyrgyz government, is implementing a programme to conserve the snow leopard through a twin approach of research and the prevention of illegal hunting and trade of the endangered species.

2.1.3. Background on Kyrgyzstan

Terrain

The terrain of Kyrgyzstan is dominated by the Tien Shan and Pamir mountain systems, which together occupy about 65% of the country. The Alay range portion of the Tien Shan system dominates the southwestern crescent of the country, and, to the east, the main Tien Shan range runs along the boundary between southern Kyrgyzstan and China before extending farther east into China's Xinjiang Uygur Autonomous Region. Kyrgyzstan's average elevation is 2,750 m, ranging from 7,439 m at Peak Jengish Chokusu to 394 m in the Fergana Valley near Osh. Almost 90% of the country lies more than 1,500 m above sea level.

The mountains of Kyrgyzstan are geologically young, so that the physical terrain is marked by sharply uplifted peaks separated by deep valleys. There is also considerable glaciation. Kyrgyzstan's 6,500 distinct glaciers are estimated to hold about 650 km^3 of water. Because the high peaks function as moisture catchers, Kyrgyzstan is relatively well-watered by the streams that descend from them.

Climate

The country's climate is influenced chiefly by the mountains, Kyrgyzstan's position near the middle of the Eurasian landmass, and the absence of any body of water large enough to influence weather patterns. Those factors create a distinctly continental climate that has significant local variations. Although the mountains tend to collect clouds and block

sunlight (reducing some narrow valleys at certain times of year to no more than three or four hours of sunlight per day), the country is generally sunny, receiving as much as 2,900 hours of sunlight per year in some areas. The same conditions also affect temperatures, which can vary significantly from place to place. In January the warmest average temperature (−4°C) occurs around the southern city of Osh, and around lake Ysyk-Köl. The latter, which has a volume of 1.7 km^3, does not freeze in winter. Indeed, its name means "hot lake" in Kyrgyz. The coldest temperatures are in mountain valleys. There, readings can fall to −30°C or lower; the record is −53.6°C. The average temperature for July similarly varies from 27°C in the Fergana Valley, where the record high is 44°C, to a low of −10°C on the highest mountain peaks. Precipitation varies from 2,000 mm per year in the mountains above the Fergana Valley to less than 100 mm per year on the west bank of lake Ysyk-Köl.

Environmental issues

Kyrgyzstan has been spared many of the enormous environmental problems faced by its Central Asian neighbors, primarily because its designated roles in the Soviet system involved neither heavy industry, nor large-scale cotton production. Also, the economic downturn of the early 1990s reduced some of the more serious effects of industrial and agricultural policy. Nevertheless, Kyrgyzstan has serious environmental problems because of inefficient use and pollution of water resources, land degradation, and improper agricultural practices.

Global climate change, ozone layer depletion, desertification, and biodiversity loss are among global environmental issues presently on the agenda in Kyrgyzstan.

Global Climate Change: Kyrgyzstan acknowledged the problem of global climate change and in 2003 ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change. It is estimated that the energy sector of the country is responsible for emissions of approximately two-thirds of the total carbon dioxide, and in absolute terms this amount is likely to grow, even though there is also an increase in the share of renewable energy such as hydropower. Related to the global climate change in Kyrgyzstan is the problem of deglaciation. The area occupied by glaciers has decreased by 20% lately and there are concerns that glaciers in the country can disappear by 2100.

Biodiversity loss: In terms of biological diversity, Kyrgyzstan holds a prominent place worldwide. It possesses around 1% of all known species, while its area makes up only 0.13% of the world's land mass. According to the national Biodiversity Strategy and Action Plan, the threats to biodiversity are related to anthropogenic activity and include habitat loss and alteration, fragmentation of natural communities due to overuse, over-harvesting, direct mortality, introduction of non-native species, environmental pollution, and climate change.

Degradation of mountain ecosystems: Kyrgyzstan is a mountainous country with 90% of its area located at altitudes above 1,500 m. Large-scale technological pressure on fragile mountain ecosystems by mining and infrastructure projects, and the agricultural sector, served to disturb the natural balance and accelerate a number of natural hazards.

Land management: The most important problems in land use are soil erosion and salinisation in improperly irrigated farmland. An estimated 60% of Kyrgyzstan's land is affected by topsoil loss, and 6% by salinisation, both problems with more serious long-term than short-term effects. In 1994 the size of livestock herds averaged twice the carrying capacity of pasturage land, continuing the serious overgrazing problem and consequent soil erosion that began when the herds were at their peak in the late 1980s. Uncertain land tenure and overall financial insecurity have caused many private farmers to concentrate their capital in the traditional form - livestock - thus subjecting new land to the overgrazing problem.

The Tien Shan mountains

The Tien Shan mountains are the largest mountain range in Asia, in surface area, with a length of 2,800 km and a maximum width of 800 km, and with a total of 40 peaks over 6,000 m. It stretches across several countries and much of the system lies in the territory of Kyrgyzstan. Extending over 2,800 km from the Chatkal range just east of Tashkent to Urumchi, (beyond which it rises again as the Bogdo Ola Range), the Tien Shan mountains are usually described as being divided into northern, western, eastern, central and inner ranges and most of them exhibit typical “alpine” features.

It is the central portion, south-east of lake Ysyk-Köl, which contains the very high mountain peaks such as Khan Tengri and Peak Pobeda, closely grouped together along ridges that stretch east-to-west. The area surrounding the Enilchek glacier has two peaks over 7,000 m (Pobeda and Khan Tengri), 23 higher than 6,000 m including, and 80 more peaks between 5,000 and 6,000 m. The range is made up of sedimentary, metamorphic and igneous rocks.

Kyrgyz Ala-Too

The Kyrgyz Ala-Too (Kyrgyz: Кыргыз Ала-Тоосу, also Kyrgyz Alatau, Kyrgyz Range) is a large range in the north Tien Shan (Figures 2.1.3a and 2.2.2a). It stretches for a total length of 454 km from the west-end of Ikae Ysyk-Köl to the town of Taraz in Kazakhstan. It runs in an east-westerly direction, separating Chuy Valley from Kochkor Valley, Suusamyr Valley and Talas Valley. The Talas Ala-Too Range adjoins the Kyrgyz Ala-Too near the Töö Ashuu Pass. The western part of Kyrgyz Ala-Too serves as a natural border between Kyrgyzstan and Kazakhstan.

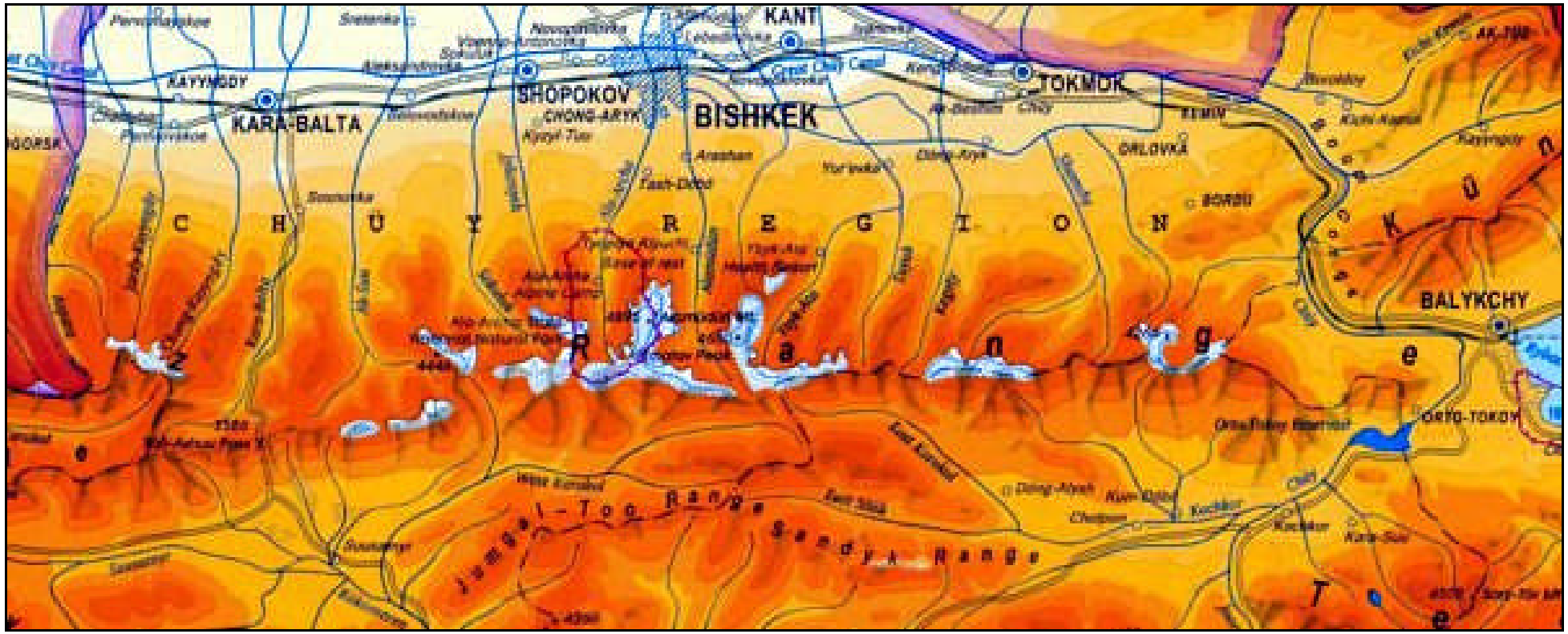

Figure 2.1.3a. The Kyrgyz Ala-Too Range to the south of Bishkek, the capital of Kyrgyzstan. Also see Figure 2.2.2a.

2.2. Materials and methods

2.2.1. Kyryz Ala-Too study site

By a joint decision of NABU and Biosphere Expeditions the Kyrgyz Ala-Too mountain range was chosen for snow leopard inventory and habitat research for several reasons including:

(1) The area in recent times has been poorly surveyed for snow leopard; previous research (Koshkarev 1989, see Table 2.2.1a) of the area has suggested the suitability of the area for sustaining snow leopards, however more evidence is needed before coming to a final conclusion.

Table 2.2.1a. Numbers, density and area occupied by the snow leopard in various parts of the Tien Shan (excerpt from Koshkarev, 1989). Ala-Archa is within the Kyrygz Ala-Too range.

Range, river catchment area	Number of individuals	Average density (per 100 km^2)	Occupied area (in km^2)
Aksu	12-14	2.51	517.5
Sokoluk	6-8	3.25	215.6
Ala-Archa	7-9	2.40	333.5
Issyk-Ata	5-6	3.25	169.0

(2) A map study suggested that the area may be an important corridor for snow leopard dispersal between the Talas Ala-Too Range (western Tien Shan) and ranges located in the Ysyk-Köl basin. According to a draft design of an ecological network for Kyrgyzstan, led by E.M. Shukurov "it supports habitats and migration routes of many wild animals (the snow leopard, black vulture, bearded vulture, hawk-type raptors, lynx, wild boar, Siberian ibex, Himalayan snowcock) as well as juniper and spruce forests that need protection".

(3) The habitat is high in biodiversity, supporting a range of prey species and other carnivores.

(4) The area lacks proper protection and is threatened by a growing economic interest; as quoted in the draft design above "geographically, the zone is located in the Chuisk Oblast, which is the most populous province nationwide (over 1.5 million people). The proximity to the capital city of Bishkek makes the zone more vulnerable, because of heavy recreation pressure from city dwellers visiting the nearest national park, mountaineer camps, *zakaznik* reserves, ski resorts, thermal springs, etc. The anthropogenic impact on natural ecosystems is especially pronounced in summer, as domestic cattle (over 100,000 heads of cattle, over 250,000 of sheep and goats) are put to pasture of the Kyrgyz Ala-Too. The commonest violations of land use are unsystematic cattle grazing, illegal hunting and forest felling". However, there is a potential here for establishing protected areas (several proposals have been made in the quoted draft) that could favour wildlife and benefit local residents.

2.2.2. Research area & timing of survey

Surveys concentrated on the south side of Kyryz Ala-Too, away from the main cities on the northern slopes. Suusamyr valley was the expedition's main access route into the southern valleys. Suusamyr valley is a high steppe plateau (2,200 m) that although only some 160 km from Bishkek, is also one of the more remote and rarely visited regions of Kyrgyzstan, which was one of the reasons for selecting this option. The valley's population of about 6,000, is mainly Kyrgyz. In Soviet times the valley was one of the major sheep breeding areas in the country. Up to four million sheep a year were driven over the mountain passes in spring to graze on the grasses of the steppe. Today, in the summer, people still live in yurts and graze sheep and horses. The valley's main settlement, the village of Suusamyr, is also the one that gives the valley its name. The village lies at the eastern edge of the plain, about 15 km east of the main Bishkek-Osh road. From here, there is a route following the course of the West Karakol river at the southern foot of the Kyrgyz Ala-Too and up to the Karakol pass (3,452 m) and leading further to Kochkor (Fig. 2.2.2a). The surroundings are practically deserted – there are virtually no settlements in the valley. In summer, people occupy the jailoos (high-mountain pastures) right up to the Karakol pass itself – grazing horses, cattle and sheep.

For reasons of safety, accessibility and convenience, base camps were located close to the Suusamyr-Kochkor road. Base camp was moveable and moved once during the expedition in order to cover the largest area possible (see Table 2.2.2a). From base camp mostly one-day surveys, but also some two-day / one-night surveys were conducted throughout the southern side of Kyrgyz Ala-Too.

Table 2.2.2a. Base camp details for the expedition.

	Dates	Location name	Longtitude	Latitude
Camp 1*	6 June – 5 July	Ala-Archa valley	N 42.348057^{o}	E 74.543530^{o}
Camp 2*	6 July – 23 August	West Karakol river	N 42.3653583^{o}	E 74.8103170^{o}

* see Fig. 2.2.3b for base camp locations on the map.

Snow leopard surveys are best undertaken when weather permits travel within the proposed survey area, when animals are most actively marking and when signs are most long-lived. These conditions rarely coincide, so trade-offs have to be made between logistical factors and biological ones. Logistics and team recruitment factors by and large determined the survey period for this study. On the one hand, summer is a difficult time to find snow leopard signs: marking activity is low, human disturbance is high and livestock grazing can soon obliterate signs. Suitability of tracking substrate is also poor (tracking is much easier in snow). Weather conditions also tend to be unpredictable and contribute to sign erosion and eradication, rain erodes signs very rapidly. On the other hand, recruiting for a summer expedition is much more realistic, logistics are not nearly as prohibitive in winter and, most importantly for this study, human presence can be a valuable source of information, especially in the absence of other baseline data.

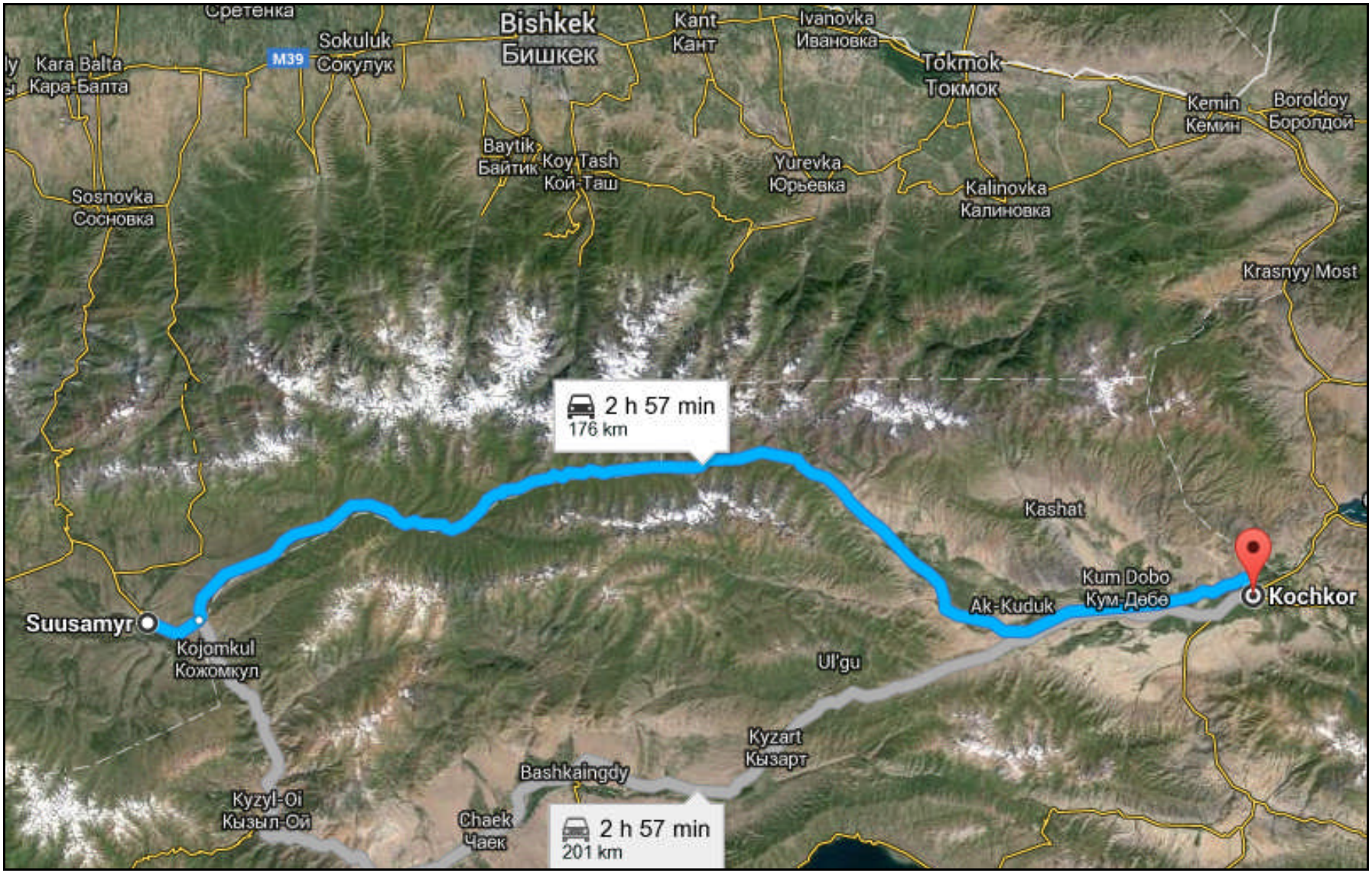

Figure 2.2.2a. Kyrgyz Ala-Too and road from Suusamyr to Kochkor on the range's southern side (from Google Maps).

2.2.3. Methods

Survey routes followed river valleys and landform edges wherever possible. Research focused on areas considered the most important habitat for snow leopard and prey, and with the lowest levels of human disturbance. Distant survey sites were accessed by car. Ground surveys were conducted on foot.

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 (Koshkarev 1984, Mallon 1988, Schaller et al. 1987, Jackson & Ahlborn 1988). These factors are important when deciding where to survey.

Surveying the prey base is another essential component of a snow leopard presence/absence survey. Argali (*Ovis ammon*) and ibex (*Capra sibirica*) are considered the main prey species in the area. Their range closely parallels that of the snow leopard.

Prey species were surveyed by recording signs and by observation. Prey signs included tracks, faeces, hair/wool, and carcasses/bones. Prey species were divided into 'primary' (ibex and argali) and 'secondary' (roe deer (*Capreolus capreolus*), marmot (*Marmota caudata*), pika (*Ochotona* sp.), hare (*Leprus capensis tolai*), wild boar (*Sus scrofa*) and game birds). The same search sites were used for snow leopard and for prey.

The study site encompassed an area of 122 x 38 km within the Kyrgyz Ala-Too Range (see Figs. 2.2.3a and b). The area was divided into 2 x 2 km cells and surveying followed the methodology manual developed for volunteer expeditions by Mazzolli & Hammer (2013).

GIS and mapping

The main reference maps used were Soviet military topographic maps crested between 1950-1980 at a scale of 1:100 000 and 1:200 000. A GIF image of the area was imported and geo-referenced into the GIS freeware program TrackMaker (www.gpstm.com) (Fig. 2.2.3a). A grid of 2 x 2 km cells, of which a fraction was actually surveyed, covering the study area was uploaded into the expedition's GPS units (Garmin etrex 20 and 30) to aid navigation and data collection. Grid data was in Universal Transverse Mercator projection, covering zone 43T and datum WGS 84.

Using GIS freeware programs DIVA-GIS 7.5 (www.diva-gis.org/) and QGIS 2.6.1 (www.qgis.org), grid cells were polygonised, their centroids were found and hexagon buffers were created around them. These shapefiles were then used in the subsequent analysis of collected data.

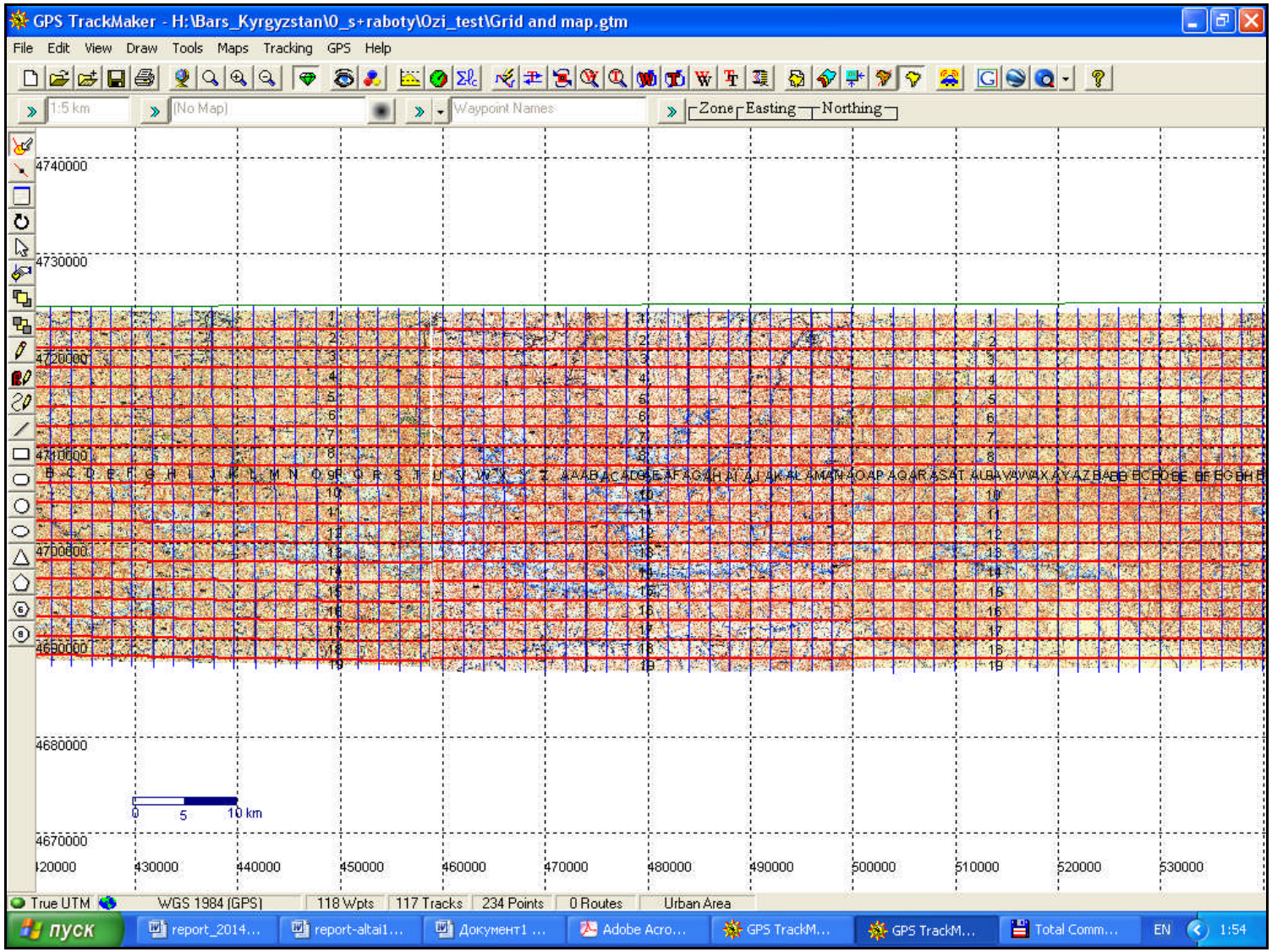

Figure 2.2.3a. Screenshot of the map and grid of 2 x 2 km cells covering the study area (viewed in the GIS freeware program TrackMaker).

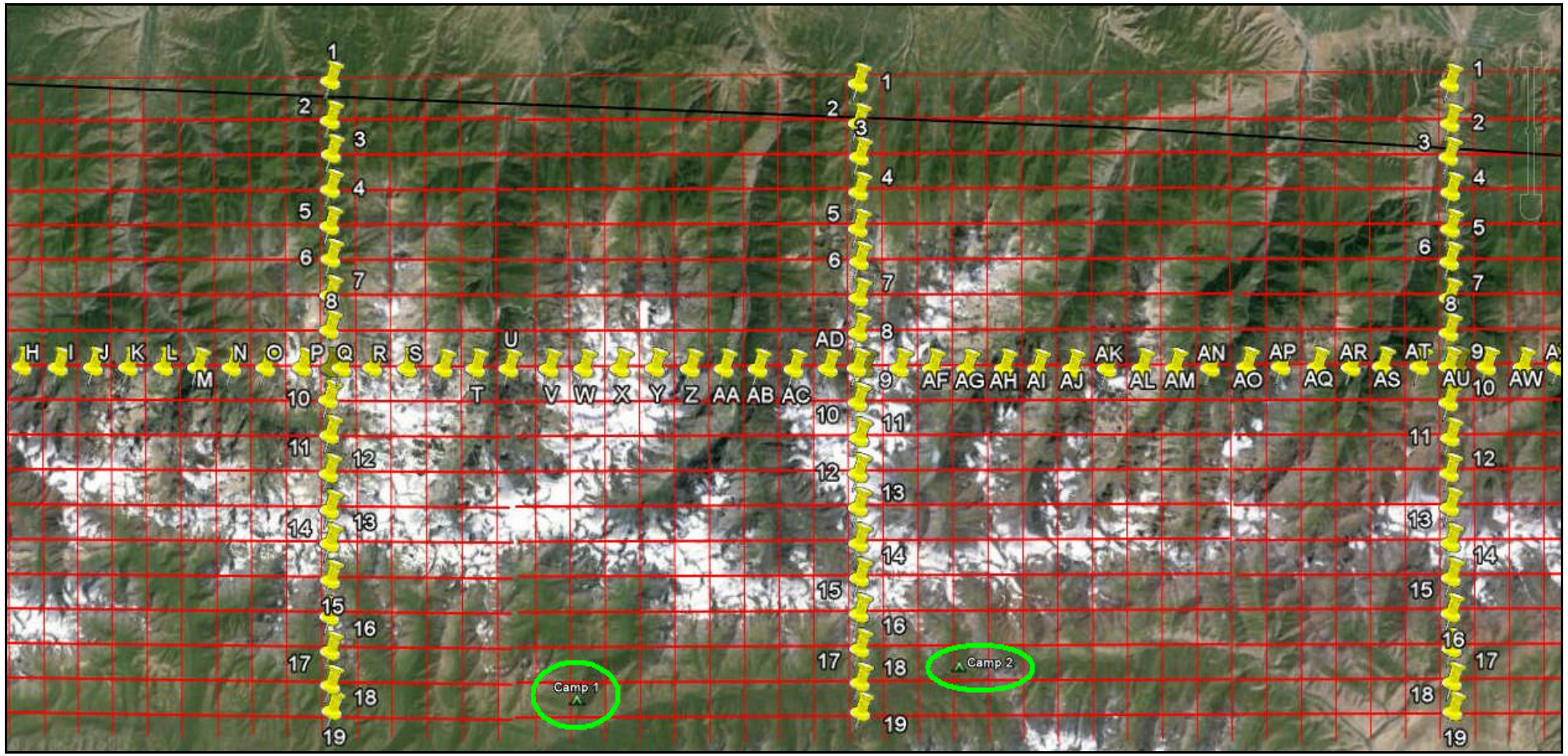

Figure 2.2.3b. Fragment of the map and grid of 2 x 2 km cells (depicted in Figure 2.2.3b above), shown as a Google Earth file (*.kml). Grid lines (tracks) – red, waypoints – yellow pins, base camps – green.

2.2.4. Training of expedition participants

In this study, data collection was performed by volunteers with no previous knowledge of wildlife research and conservation, except those given during the initial stages of a short-duration expedition. Training included an introduction to snow leopard conservation issues, the role of NABU and Biosphere Expeditions in the snow leopard survey and the methods of recording presence of species using GPS and datasheets. For these purposes various handouts were produced, including an 18 page illustrated Expedition Field Guide (Fig. 2.2.4a).

Before participants were split into small groups to perform their various research tasks, an introductory survey on the first day was performed as part of the training process. During this survey, tracks and scats of known species were shown.

To reduce identification errors, participants were instructed to bring scats to base camp whenever they were unable to identify the species. They were also briefed on how to take photos of tracks for identification later at base. The large surveying team recruited by Biosphere Expeditions helped to cover a substantial geographical area in a short time, meaning that chances of finding snow leopard and other wildlife sign were maximised by having many people fully engaged in looking for vestiges.

2.2.5. Sampling

Seventy-seven cells 2 x 2 km in size over a 14 x 60 km area located in the southern Kyrgyz Ala-Too Range (Fig. 2.2.5a) were surveyed for snow leopard and sympatric medium and large-sized mammals and game birds during a 10-week period in June-August 2015. Some cells were resampled a number of times. Individual survey teams ranged from four to eight volunteers. Following the presence/absence method of occupancy (MacKenzie et al. 2002) and the field manual developed by Mazzolli & Hammer (2013), the presence of prey species and large carnivores was recorded using the general location given by a cell code. Once a species or its signs were found in a given cell, it was scored as containing the species.

This methodology was chosen because there is a need to cover large areas so that the survey can better represent the snow leopard and potential prey populations. Furthermore, MacKenzie & Royle (2005) recommend that rare species should be surveyed in more locations less intensively than few locations intensively. For this reason, teams usually covered two or more 2 x 2 km cells during their daily surveys.

Nineteen digital Bushnell camera traps were set throughout the study area. The cameras were installed in areas which the field team perceived as good spots to produce photos of snow leopard and its prey.

Other species, particularly birds, were recorded whenever possible.

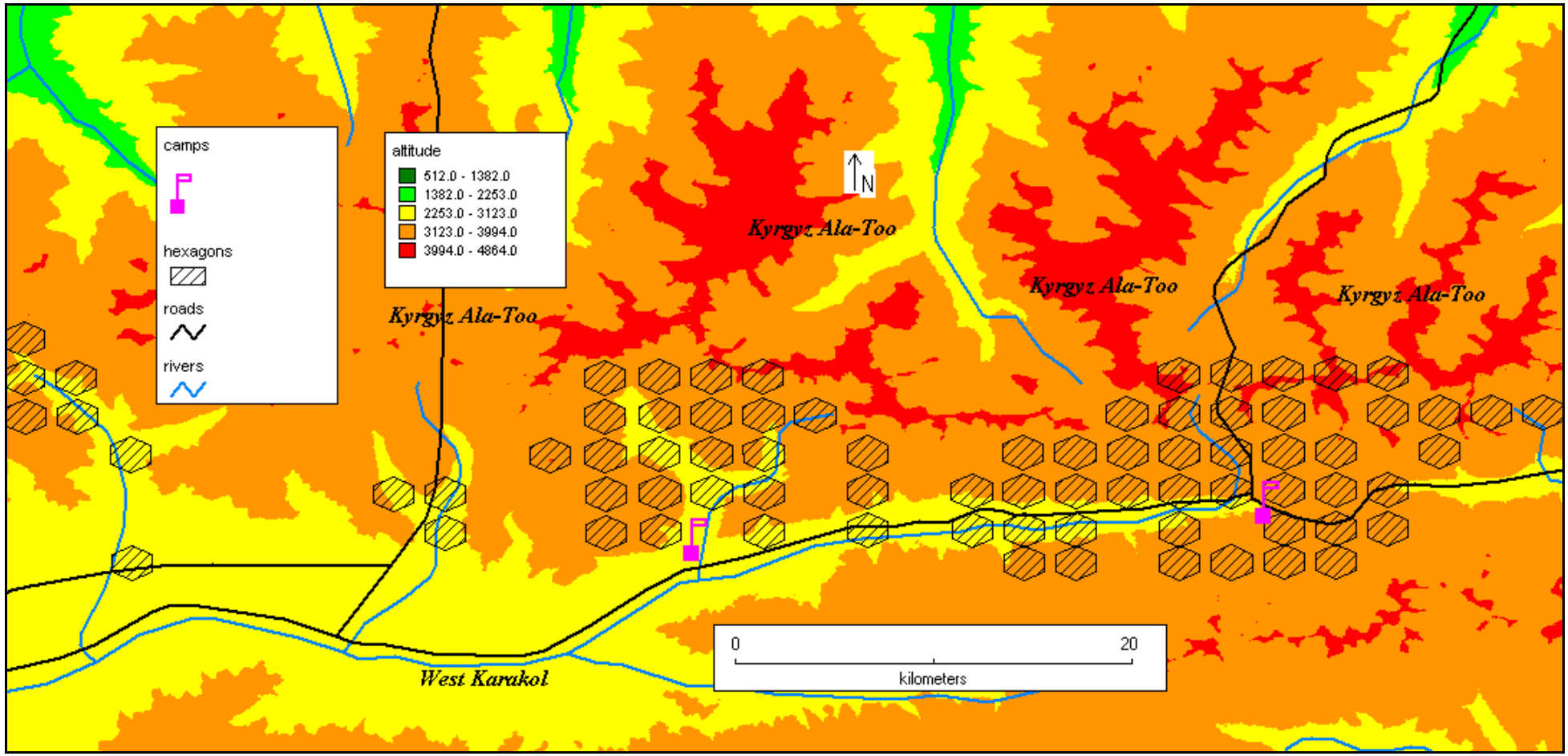

Figure 2.2.5a. 2 x 2 km cells sampled during the expedition.

Note that for computer processing convenience in GIS the 'square' cells are represented by hexagons, which share the same centroids as the square cells. This also applies to all further representations showing hexagons.

2.2.6. Outreach activities

Involvement of the local communities through interviews and talks was an important part of the expedition. Time was spent with local people in their villages, settlements and surrounding areas, in order to gather local knowledge about the area and record snow leopard sightings, to investigate the level of human/wildlife conflict and to learn about local attitudes to wildlife and natural resources. Participants helped by assisting with recording data gathered during interviews.

2.2.7. Petroglyphs - rock art

A large number of petroglyphs (pictures drawn or etched onto stones) were found in the field. These petroglyphs left on rocks can provide evidence of the way of life and the environment of times gone by when there was no system of writing. Kyrgyzstan boasts a very large number of petroglyphs and recent mapping of sites showed that petroglyphs are found all over the country. However it may be that some of the locations found during the expedition were previously unknown.

2.3. Results

2.3.1. Snow leopard presence/absence survey

Over a 10 week period from June to August 2014 snow leopard presence/absence surveys were carried out in 77 2 x 2 km cells (Fig. 2.2.5a). The search effort took from 5 to 10 hours per cell. Elevations ranged from 1,998 m to 3,396 m. The dominant landscape surveyed in the areas consisted of narrow valleys and broken terrain. Other landforms included grass plateaus, ridges, rock falls, moraines and glacial lake areas.

Snow leopard signs searched for during this study included: pugmarks (tracks), scrapes, faeces (scat), urination, rock scent spray and direct observation, as well as oral statements of snow leopard presence made by local people.

Tracks (pugmarks)

These are more easily found in sandy rather than gravelly places, but sandy or muddy areas were only present at lower elevations, away from preferred snow leopard terrain. Most of the area surveyed was unsuitable for tracking (scree, boulders, vegetation, etc), so any conclusions are fairly dubious. Snow patches left over from the winter and fresh snow cover were specifically examined for pugmark sign.

No distinct tracks (pugmarks) that could belong to the snow leopard were found.

Scrapes

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

No scrapes of possible snow leopard origin were encountered.

Faeces

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

No sign of faeces was recorded.

Urination

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

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

Scent spray

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

No scent-spray was found during the survey.

Local records from interviews

There were up to five indications (Fig.9) of snow leopard presence originating from statements received by locals during the interviews. These were not always clear and could refer to records that occurred between three to five years ago.

Only two records were from the originally planned research area (cell V14 encompassing the upper reaches of the Bash-Ala-Archa and repeatedly visited by the team) and cell AM14 (upper reaches of a valley eastwards next to the valley of Dunguruma). In both cases interviewees claimed to have seen the snow leopard. In the second location the interview claimed to have seen a snow leopard “eating a sheep”.

One record refers to the other (northern) side of the Kyrgyz Ala-Too Range – Aksai (cell V9), were the snow leopard was alleged to have been seen.

Other records involved attacks on domestic horses left unattended on high-mountain pastures (both not exactly in the originally planned research area – mountains on the other side of the West Karakol river, but not ignored). One (in cell AA19) had taken place some time ago (the interviewed herder affirms the horse was killed), whereas in cell AF20 the incidence occurred during the expedition, when a foal was alleged to have been attacked and mutilated, but not killed, by a snow leopard. Four camera traps set near the attack location for 17 nights yielded no results, though did record presence of ibex.

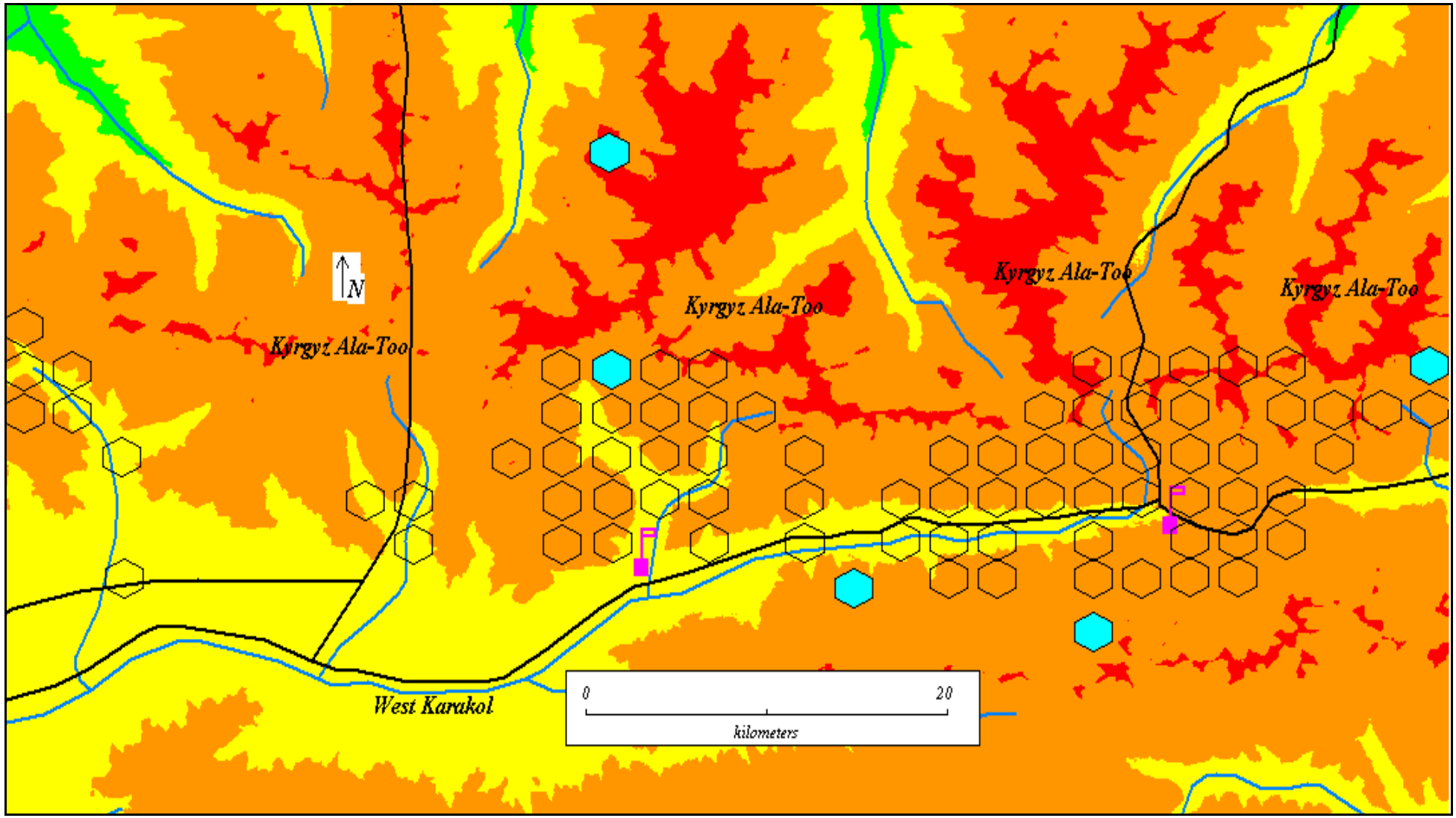

Figure 2.3.1a. Map showing the distribution of snow leopard (recording methods: interviews).

2.3.2. Threats to snow leopard presence

In the course of the presence/absence survey, an account was taken of human-induced factors considered to threaten snow leopard presence in the area. Grazing activities turn out to be the most common and are widespread. In the early season most of the grazing is confined to foothills and mouths of valleys facing the West Karakol. However, later on in the summer (with the depletion of the grass stands), herds move up the valleys and reach altitudes where they become a disturbing factor to snow leopards and/or they prey.

In general, the grazing pressure in the area has considerably reduced from the communist era. Many areas suitable for grazing have been abandoned by herders as they are no longer subsidised by the government. Today these areas are considered to be 'empty', but judging by the abundance of ruderal weeds, much of the ecosystem in the area is still far from full recovery.

Occasional horse droppings and car tracks found at higher altitudes indicate sporadic human presence over most of the area. Other signs of human presence and disturbance included bullet cases, hides, campfires and various items of rubbish left behind by visitors.

2.3.3. Prey base survey

Signs of prey species during presence/absence surveys were found to be fairly abundant and widespread in a variety of terrains for some species (Fig. 2.3.3a). Most signs were of Siberian ibex (50%). Argali (9%) is quite rare in the study area and was seen only on two occasions, one of them in cell Q17 (direct observation) and one in cell U16 (camera trapping). Second in the number of sign are marmots (28%), followed by the snow cock (13%).

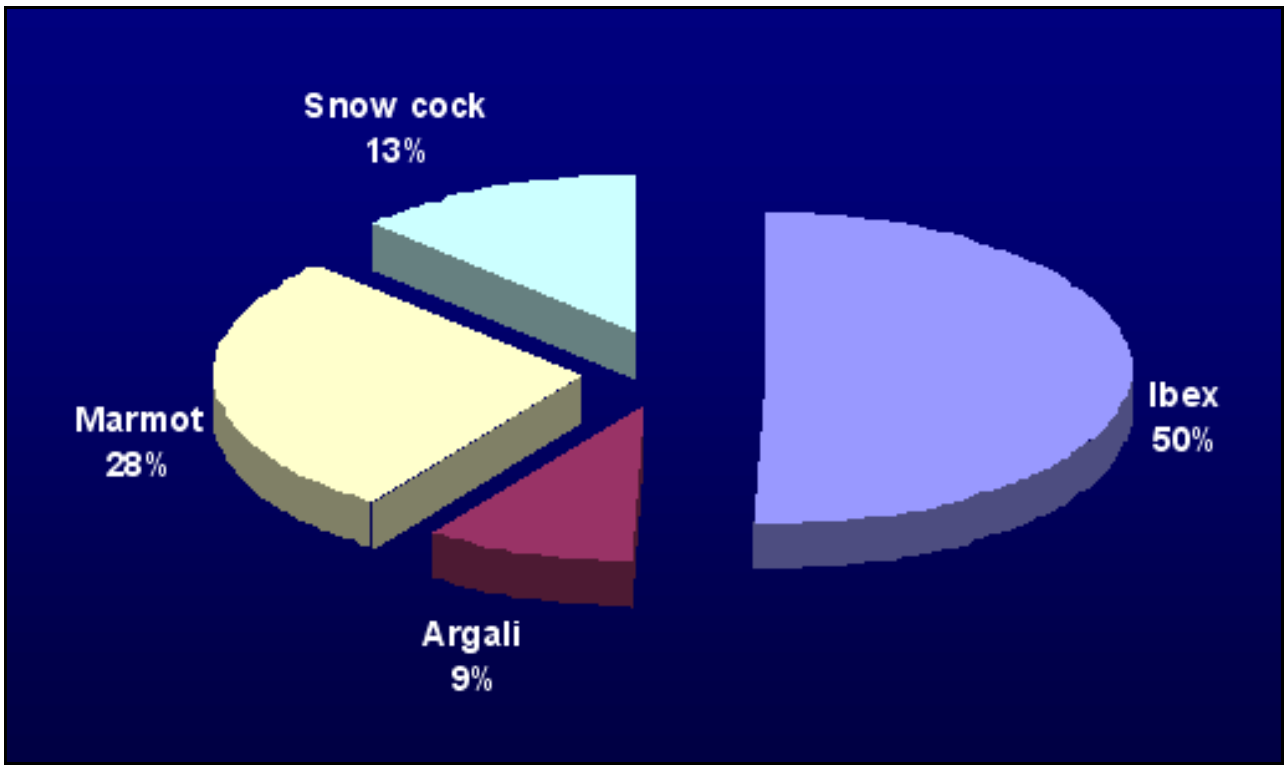

Figure 2.3.3a. Signs of prey species found in the presence/absence surveys (in %) during the expedition.

The maps below display the cells in which species with substantial quantitative information were found.

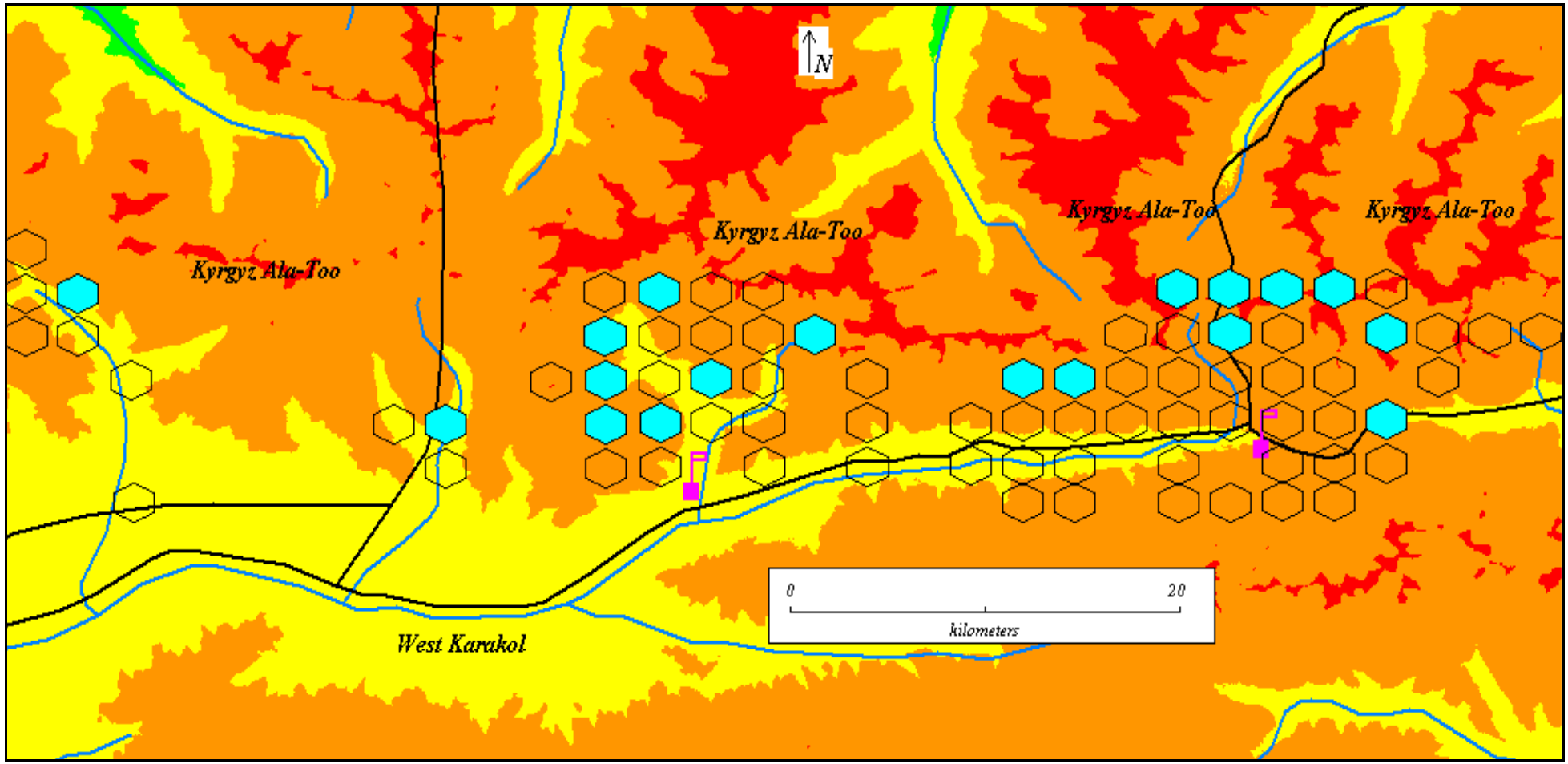

Figure 2.2.3b. Map showing the distribution of ibex (recording methods: direct observation, n=39 and camera traps, n=17).

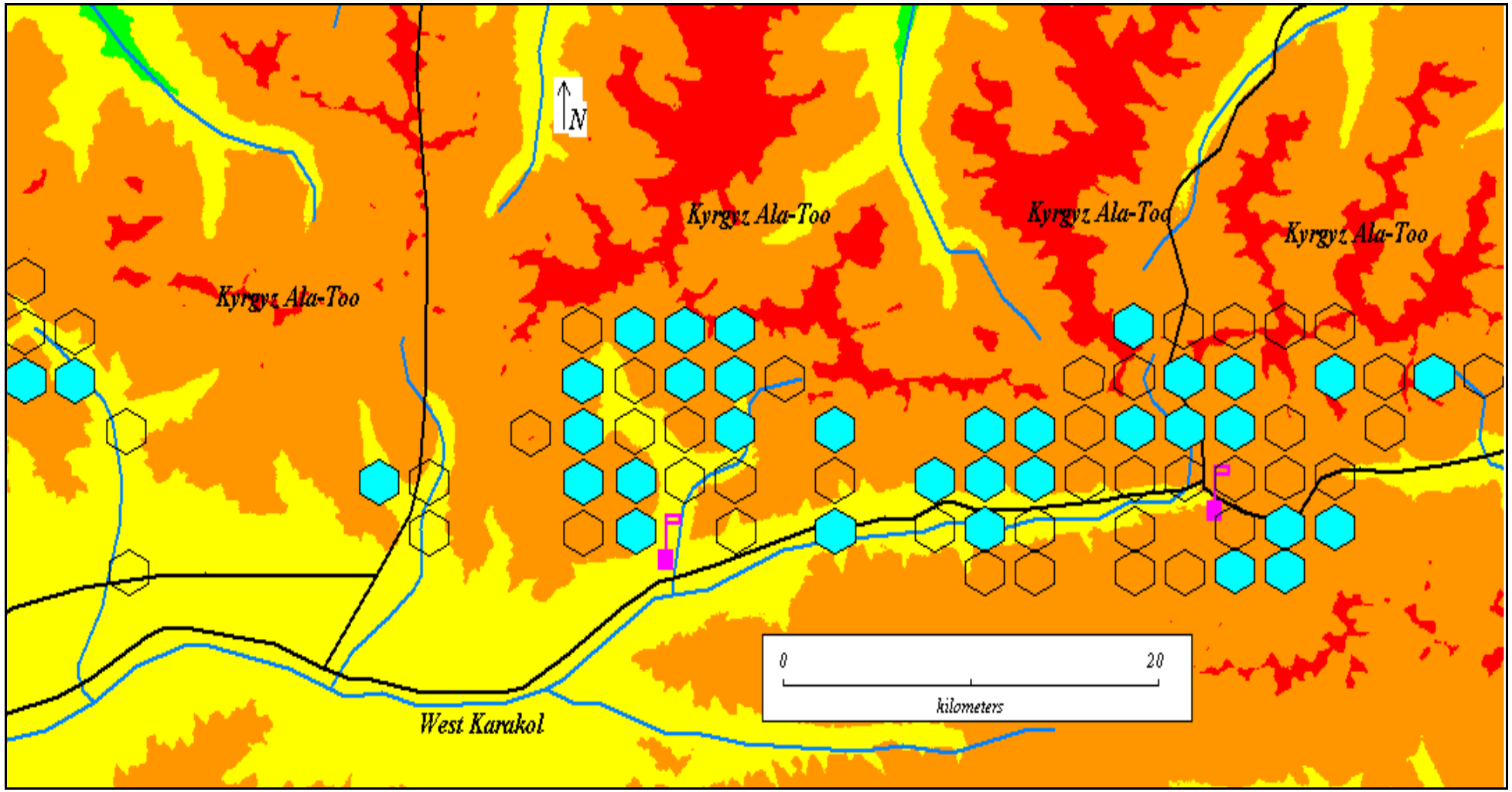

Figure 2.2.3c. Map showing the distribution of ibex (recording methods: track, scat and other, n=65).

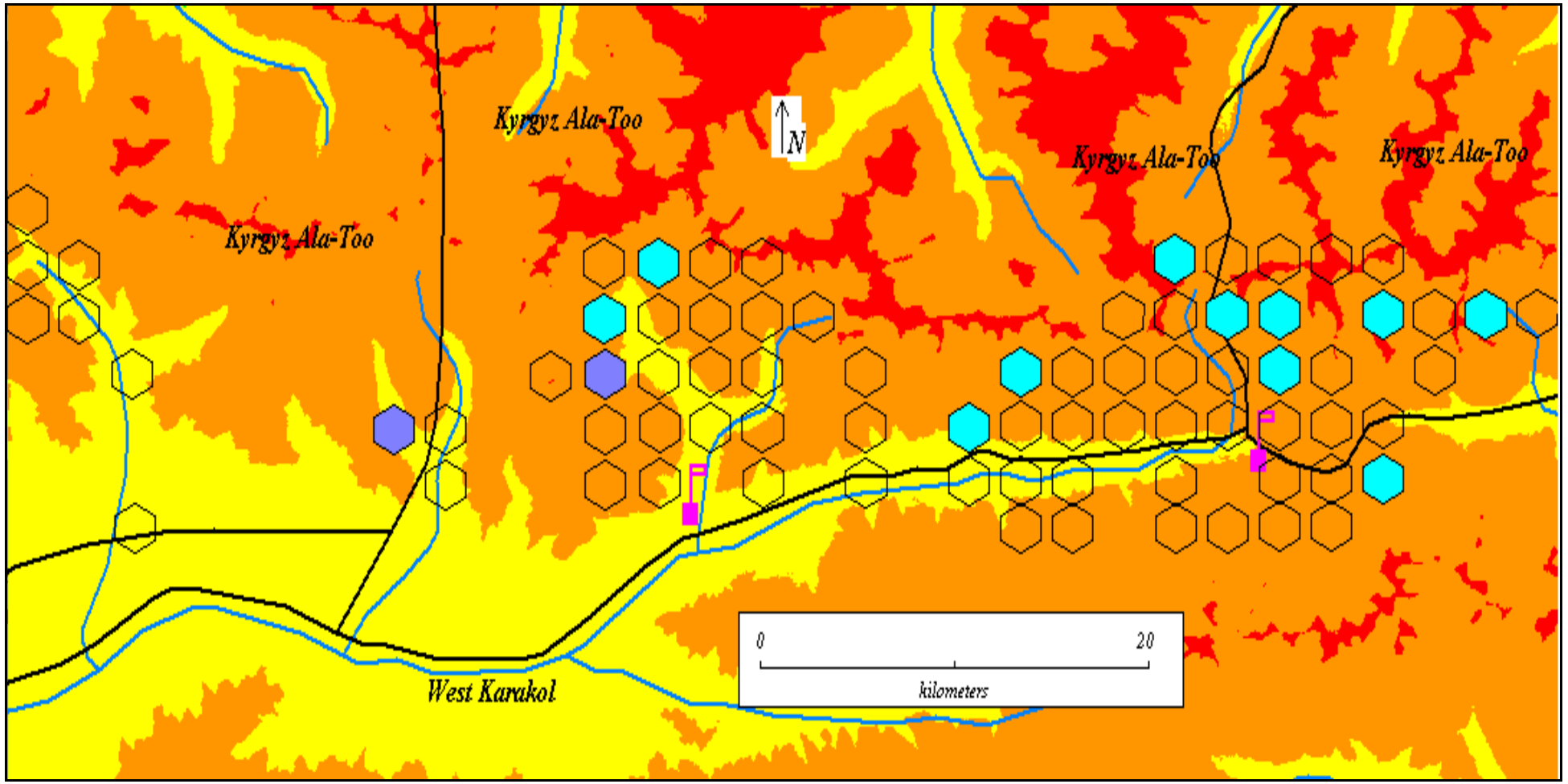

Figure 2.2.3d. Map showing the distribution of argali (recording methods: direct observation, n=1, and camera traps, n=2, purple filling; track, scat and other, n=19, blue filling).

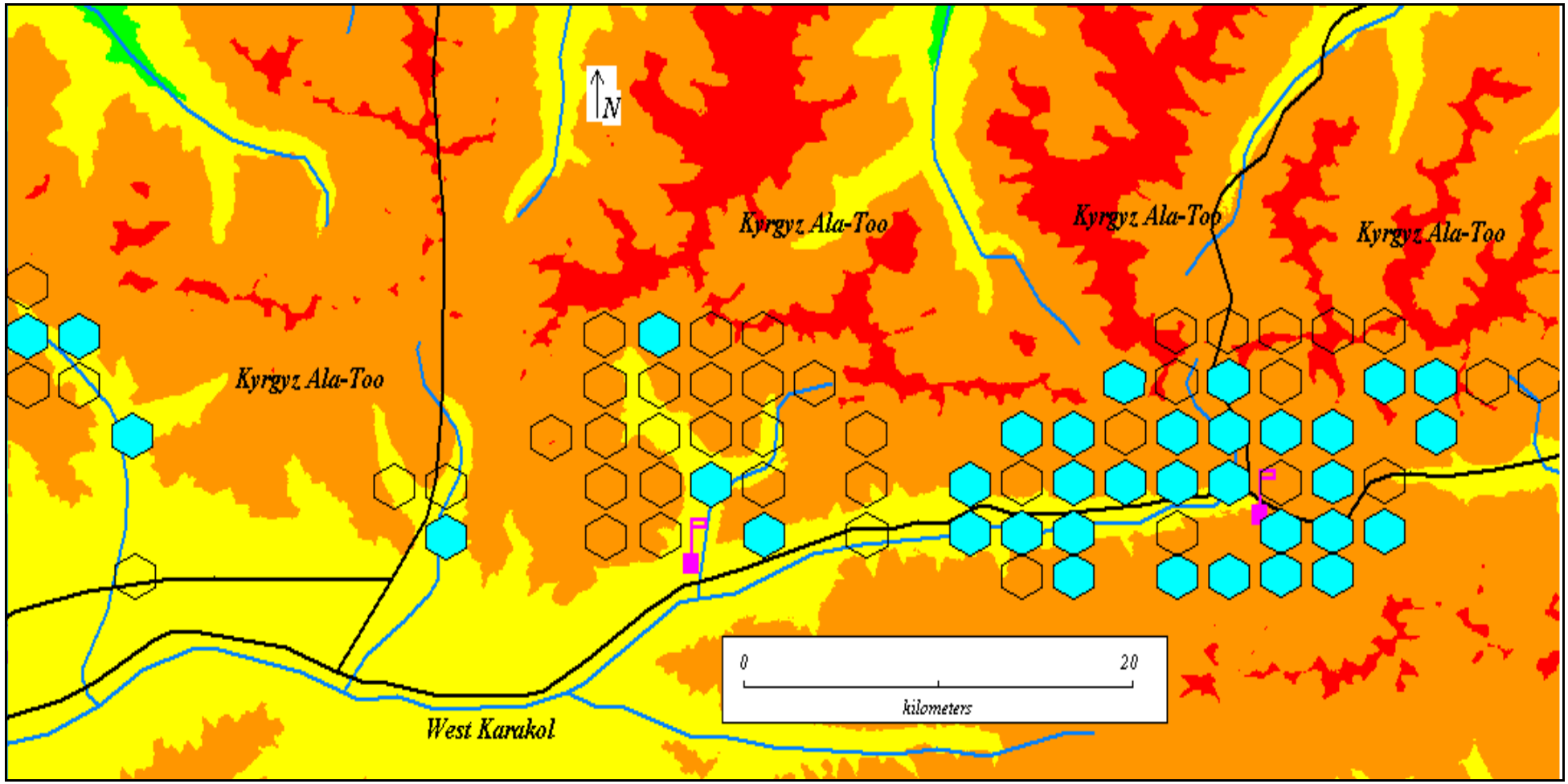

Figure 2.2.3e. Map showing the distribution of marmot (recording methods: all, n=66).

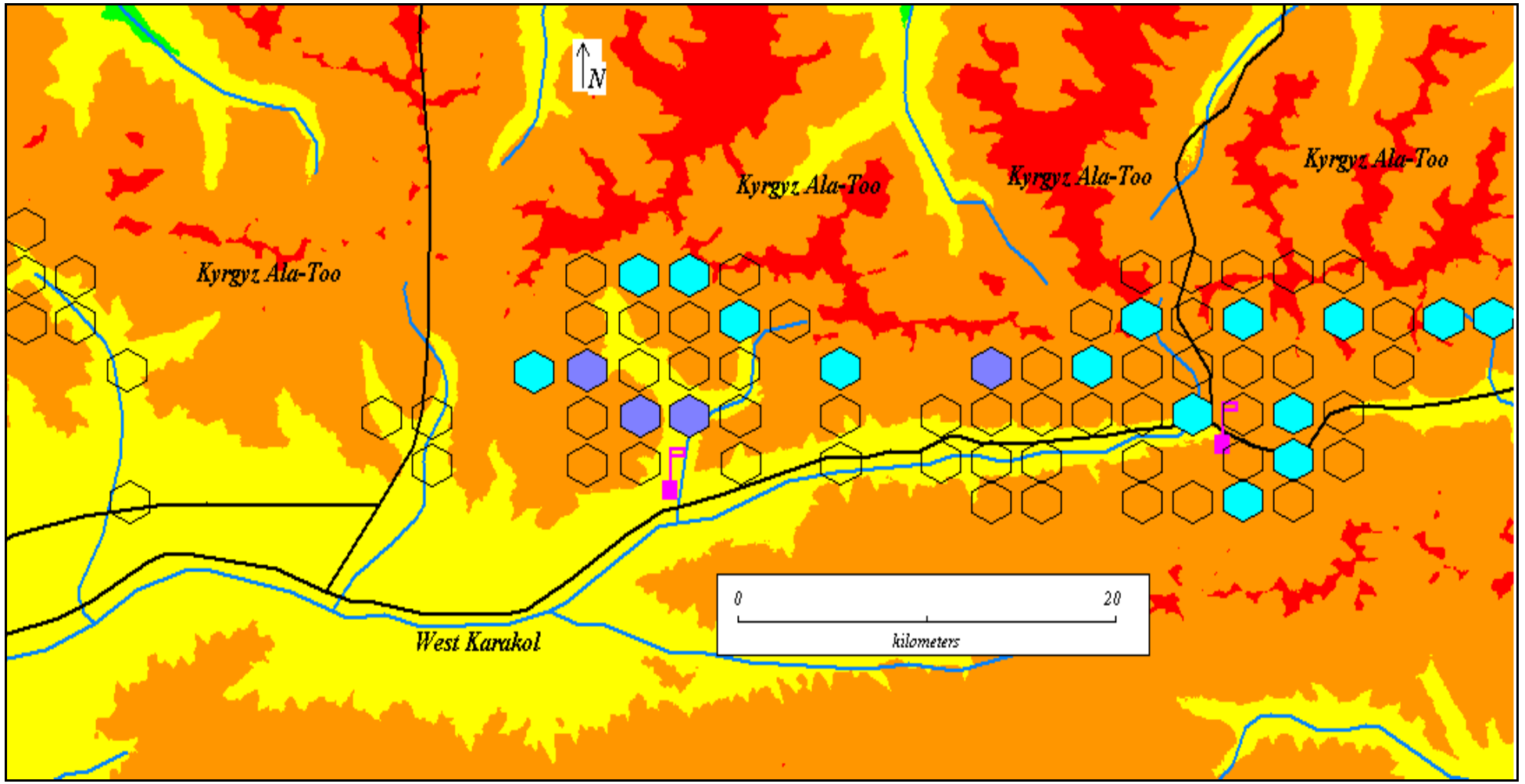

Figure 2.2.3f. Map showing the distribution of the snow cock (recording methods: direct observation, n=9, and camera traps, n=5, purple filling; scat and other, n=17, blue filling; in two of the cells where the snow cock was recorded by sight and camera trapping (U16, V17), scat and other sign of the game bird were found as well).

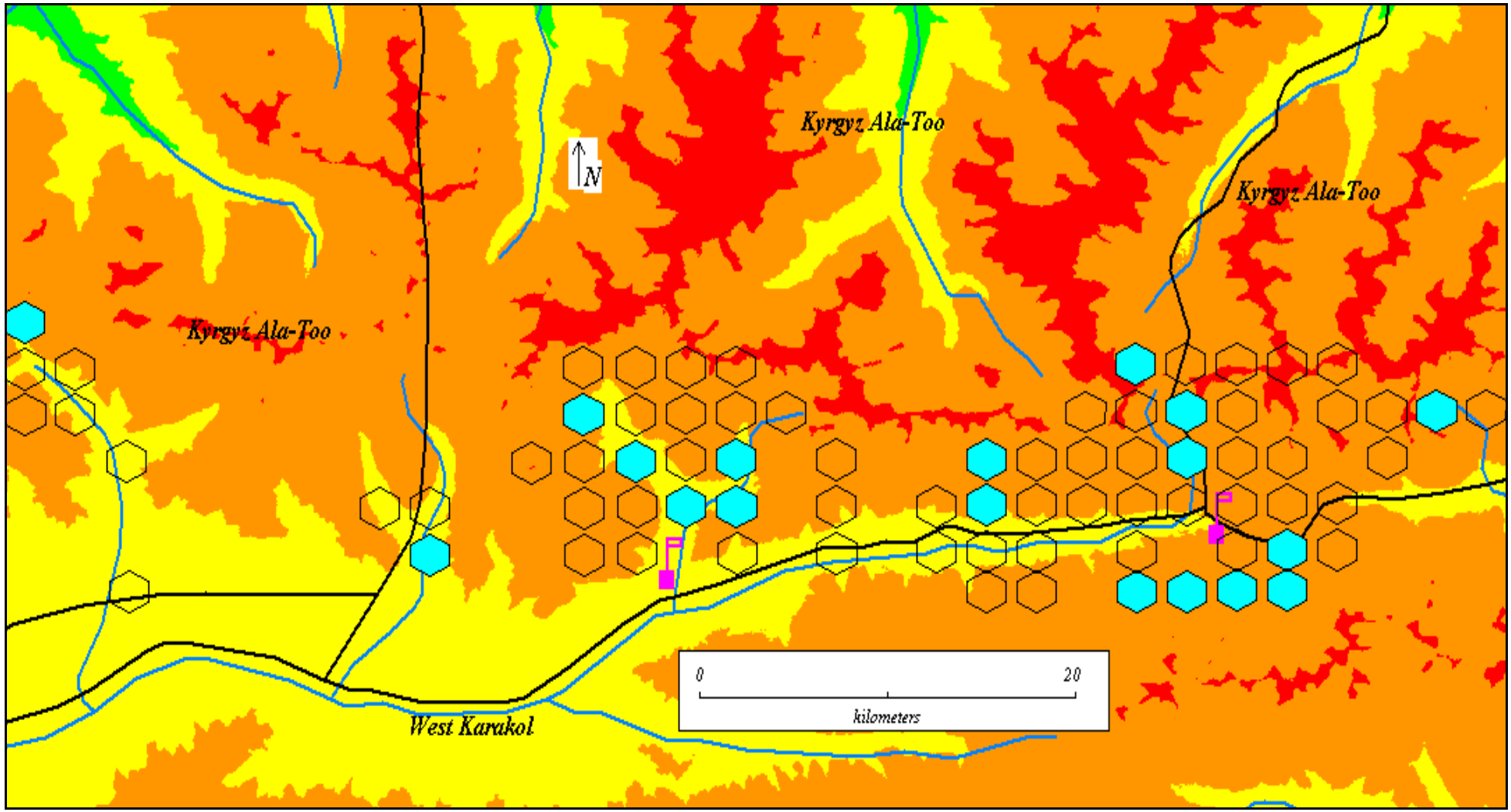

Figure 2.2.3g. Map showing the distribution of wolf (*Canis lupus*) (recording methods: all, n=23, including two sightings in AF14 and AI19).

2.3.4. Additional surveys

Evidence of other carnivores sharing snow leopard habitat was also recorded. These included the wolf (*Canis lupus*) and the red fox (*Vulpes vulpes*). Wolf signs were found in a variety of places ranging from lowlands to mountain passes (Fig. 2.2.3g). Wolf is the major predator currently preying on domestic livestock in the area. Eradication measures for the wolf also pose a potential hazard for the snow leopard. Besides this, there is a high potential for conflicts between these two predators (Kubanychbek et al. (2014).

Capturing images of the target species, camera-trap studies, commonly record numerous additional species, although much of this extraneous data has been historically marginalised and rarely published. It may, however, provide important information about the biodiversity in the region, differences between areas, efficacy of protected areas, and documentation of species thought to be locally extinct (McCarthy et al. 2010). In our case this particularly concerns argali, which before the expedition was not to be present in the study area (as evidenced from talks of the NABU Grupa Bars with suspected poachers), but photographed by the expedition.

Figure 2.3.4a. Argali camera-trapped during the expedition.

Birds are convenient indicators of biodiversity, at least at larger scales, and as monitors of environmental change (Furness & Greenwood 1993). One reason is that birds have long been popular with naturalists, amateur and professional, and consequently their taxonomy and distributions are better known than any other comparable group of animals. However, only a few keen birdwatchers were part of the team. Nevertheless, the joint efforts of the teams came up with a list of 56 bird species (Appendix I).

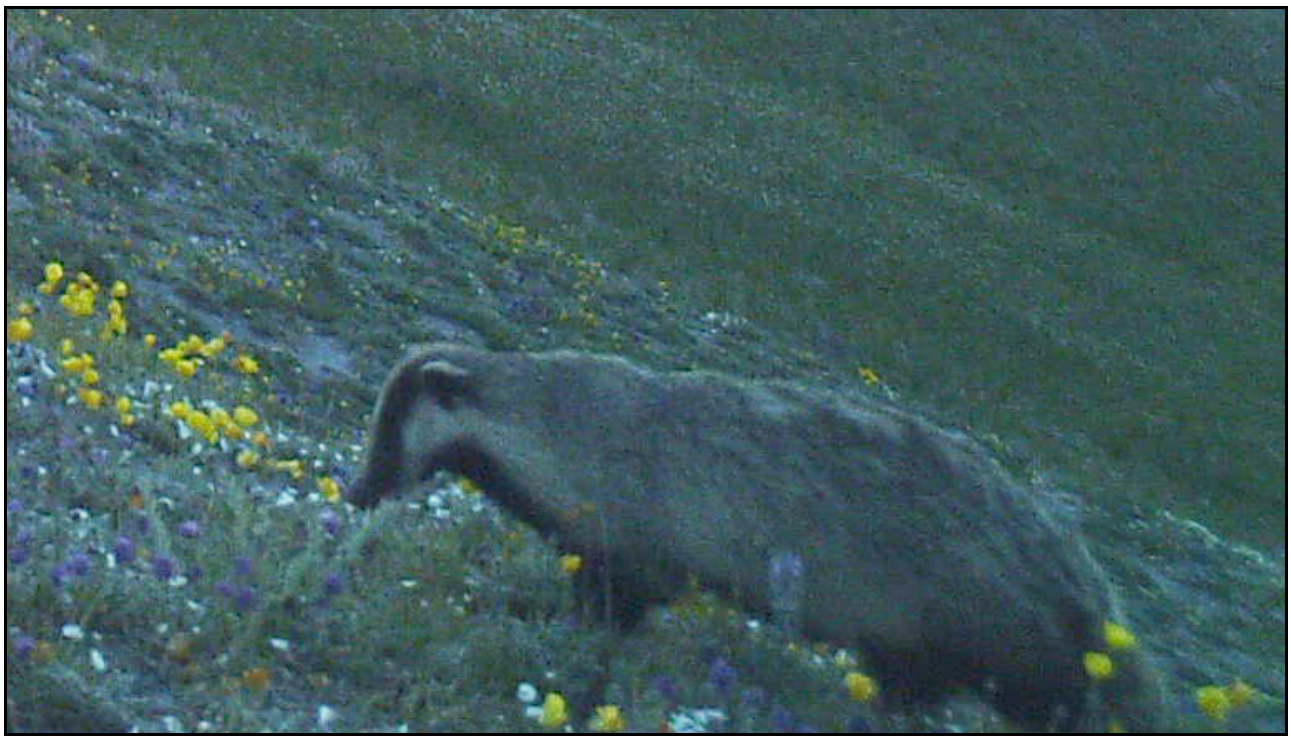

Figure 2.3.4b. Badger camera-trapped during the expedition.

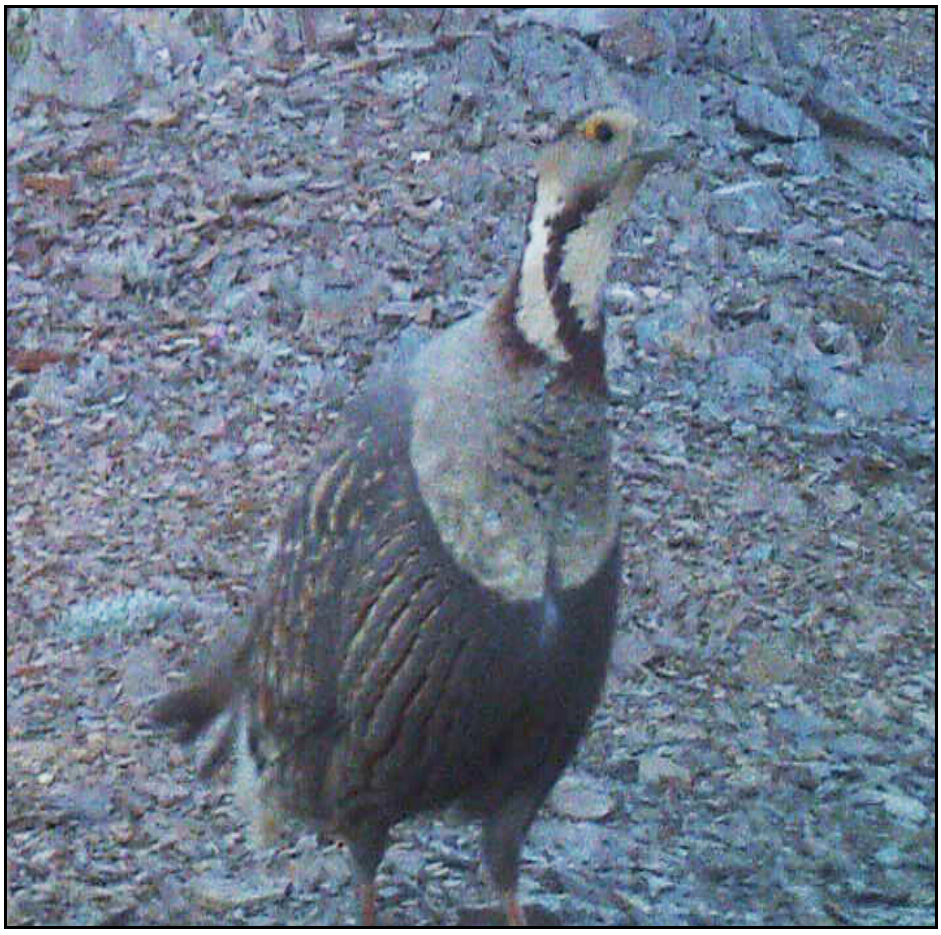

Figure 2.3.4c. Snow cock camera-trapped during the expedition.

Figure 2.3.4d. Red fox camera-trapped during the expedition.

Figure 2.3.4e. Siberian ibex camera-trapped during the expedition.

2.3.5. Petroglyphs - rock art

In addition to the biological surveys, participants compiled an extensive data base, consisting of 148 geo-referenced records of rock art in the study area, grouped into clusters (Fig. 2.3.5a), the largest of which was in the upper reaches of the West Karakol river and its tributaries (Sary-Kol, Iiri-Suu and Takyr-Ter), south of camp 2.

Rock drawings here appear to have been made in two ancient artistic styles. The first technique was silhouette or shadow, typical of many ancient pictures. Blows were made with a metallic or stone instrument to take out the entire surface of the rock nearly 2 mm deep inside the silhouette. Some pictures were beaten by blunt tools, which removed only a thin sunburnt rock layer, and this is typical of later periods. Another technique used tools with sharp edges and frequent blows, producing a deep line engraved in the rock.

The total number of registered rock art sites in Kyrgyzstan is still unclear, as specialists reports show different figures. The State Register of Historical and Cultural Sites of Kyrgyzstan (2002) includes 23 locations that have status of national significance. In addition, some are on the List of Sites of Local Importance.

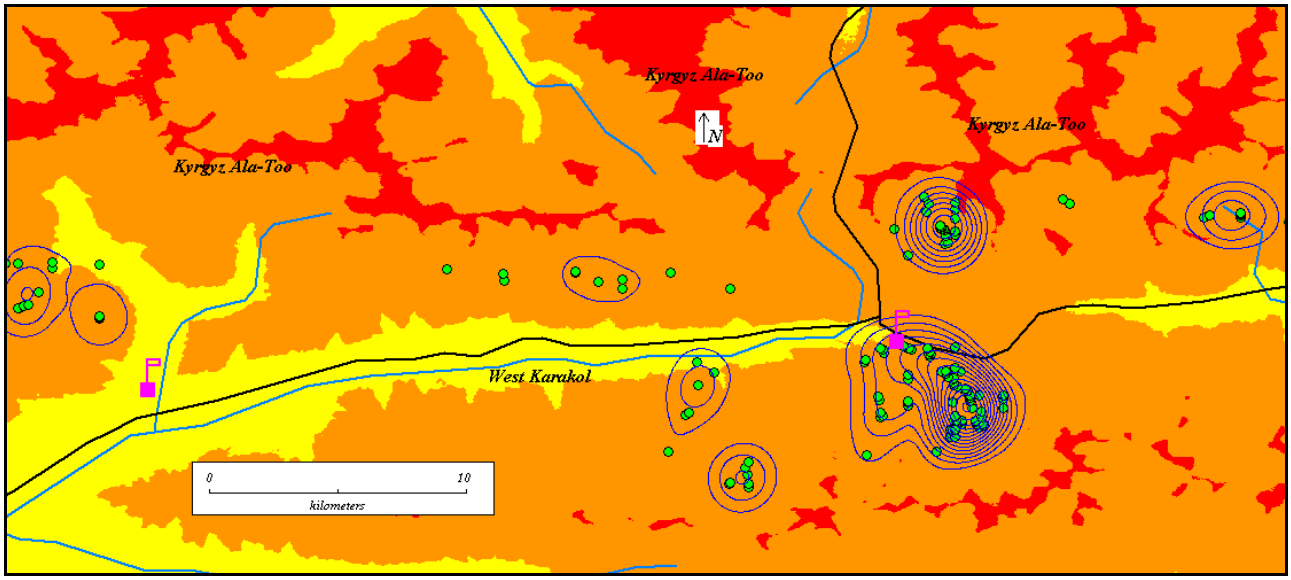

Figure 2.3.5a. Petroglyph sites in the study area: distribution (green dots) and their density (contours derived from a raster heatmap produced in QGIS 2.6.1.

Figure 2.3.5b. Examples of rock art of ibex, the most common theme in the area. Note the different technique.

Figure 2.3.5b. Examples of rock art of red deer. Interestingly, this species is now locally extinct.

Figure 2.3.5c. Examples of rock art of camels in a row. Perhaps from the Silk Road era?

2.3.6. Outreach activities and interviews

Twenty-two interviews were conducted with the local community. These activities reached 27 adult herders (24 men and three women) and two children of school age. Most of the interviewees declared that they liked the snow leopard ("we are proud of this animal") and all answered that they were aware of its protected status, knowing that the species is listed in the Red Data Book of Kyrgyzstan.

Fewer 'dislike' the snow leopard or are 'indifferent', but nevertheless perceive the presence of the animal in their area as 'a good thing'. Moreover, the majority of interviewees found it a 'good thing' if snow leopards attracted more tourists to the region, because this could create more job opportunities. One lady, for instance, said if more tourists would be coming to the area she "would open a shop", others would be glad to sell local products (meat, cheese, kumyz, felt carpets etc.) and/or develop tourist-based businesses.

Regarding snow leopard presence, answers were conflicting on whether the species is declining or increasing. Some blamed hunters for reducing ibex, thus causing the decline of snow leopard numbers ("the snow leopard is leaving the area").

Livestock predation by snow leopards did not seem to be a major issue and snow leopards were mainly perceived as not to impact on game species either. Instead, there were many complaints concerning wolves.

2.4. Discussion and 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 its primary prey species, especially during the absence of prolonged, continuous snow cover. Ungulates and carnivores favour higher ground and are more dispersed during the summer season and snow leopard signs are harder to find.

Evidence from local people, indicated that snow leopard was present in the surveyed area and confirmed the importance of the study area as a habitat for snow leopard. However, no independent confirmation of snow leopard presence was found by the extensive sign surveys or through camera-trapping.

The expedition showed that the habitat in the study area (and beyond) is sufficiently varied and capable of sustaining a healthy prey base for the snow leopard. The developing relationship between the predator and prey species could be very fragile, so any decline (especially this concerns argali) in the prey species may drive the snow leopard out of the area. Indeed, poaching (both in the past and today) and growing disturbance may be the main factors for driving animals out of the area, a notion confirmed by local people during the interviews.

Overgrazing by livestock is a significant problem, particularly at lower altitudes. Higher places are affected too, particularly in the later summer season. As a priority recognised by NABU staff, 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.

Further research is needed to confirm snow leopard presence and monitor snow leopard and prey population trends in the survey area. Presence/absence surveys will need to be repeated in the coming years, using camera traps from the very beginning of the survey. Finding a trail and/or relic scrape(s) is a high priority. If either of these can be found, remote camera-trapping would be enhanced as a survey tool

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

Biosphere Expeditions should continue its presence and annual expeditions in the area. Not finding signs of snow leopards other than anecdotal in the first year is disappointing, but should not deter further expeditions, as results often take years or decades to establish themselves, as evidenced by Biosphere Expeditions' snow leopard expedition to the Altai Mountains from 2003 – 2012 (see expedition reports on www.biosphere-expeditions.org/reports). There it took ten years of expeditions, often not finding snow leopard signs, and working with local people until better protection of the area was achieved and snow leopards had re-established themselves in the area (see media release "Snow leopard presence confirmed in Saylyugem National Park").

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Appendix I: List of bird species recorded during the 2014 expedition.

Latin name	English name	Русское название
Tadorna tadorna	Shelduck	Пеганка
Buteo rufinus	Long-legged buzzard	Курганник
Circus cyaneus	Marsh hawk	Полевой лунь
Aquila chrysaetos	Golden eagle	Беркут
Aq. heliaca	Imperial eagle	Могильник
Milvus migrans	Black kite	Черный коршун
Aegypius monachus	Black vulture	Черный гриф
Gyps himalayensis	Himalayan griffon	Кумай
Gypaetus barbatus	Bearded vulture	Бородач
Falco peregrinus	Peregrine falcon	Сапсан
F. cherrug	Saker falcon	Балобан
F. subbuteo	Hobby	Чеглок
F. columbarius	Merlin	Дербник
F. tinnunculus	Kestrel	Обыкновенная пустельга
Tetraogallus himalayensis	Himalayan snowcock	Гималайский улар
Coturnix coturnix	Quail	Перепел
Tringa ochropus	Green sandpiper	Черныш
Actitis hypoleucos	Common sandpiper	Перевозчик
Streptopelia turtur	Turtle dove	Обыкновенная горлица
Asio flammea	Short-eared owl	Болотная сова
Apus melba	Alpine swift	Белобрюхий стриж
Upupa epops	Hoopoe	Удод
Eremophila alpestris	Horned lark	Рогатый жаворонок
Alauda arvensis	Skylark	Полевой жаворонок
Anthus spinoletta	Water pipit	Горный конек
A. campestris	Tawny pipit	Луговой конек
Lanius phoenicuroides	Turkestan shrike	Туркестанский сорокопут
Pica pica	Magpie	Сорока
Pyrrhocorax pyrrhocorax	Chough	Клушица
Pyr. graculus	Alpine chough	Альпийская галка
Corvus corone	Carrion crow	Черная ворона
C. cornix	Hooded crow	Серая ворона
C. corax	Raven	Ворон
Cinclus cinclus	Dipper	Белобрюхая оляпка
Prunella collaris	Alpine accentor	Альпийская завирушка
Pr. himalayana	Himalayan accentor	Гималайская завирушка
Locustella naevia	Grasshopper warbler	Обыкновенный сверчок
Saxicola torquata	Stonechat	Черноголовый чекан
Oenanthe oenanthe	Wheatear	Каменка обыкновенная
Oen. deserti	Desert wheatear	Пустынная каменка
Oen. isabellina	Isabelline wheatear	Плясунья
Monticola saxatilis	Rock thrush	Пестрый каменный дрозд

Phoenicurus erythrogaster	Guldenstadt's redstart	Краснобрюхая горихвостка
Calliope pectoralis	Himalayan rubythroat	Черногрудая красношейка
Turdus atrogularis	Black-throated thrush	Чернозобый дрозд
T. merula	Blackbird	Черный дрозд
Passer montanus	Tree sparrow	Полевой воробей
Montifringilla nivalis	Snowfinch	Снежный воробей
Acanthis cannabina	Linnet	Коноплянка
Leucosticte brandti	Brandt's rosefinch	Жемчужный вьюрок
L. nemoricola	Plain mountain finch	Гималайский вьюрок
Bucanetes mongolicus	Mongolian finch	Монгольский пустынный снегирь
Carpodacus erythrinus	Common rosefinch	Обыкновенная чечевица
Motacilla citreola	Citrine wagtail	Желтоголовая трясогузка
M. cinerea	Grey wagtail	Горная трясогу́зка
M. flava	Yellow wagtail	Жёлтая трясогу́зка

Appendix II: Expedition diary and reports

A multimedia expedition diary is available on https://biosphereexpeditions.wordpress.com/category/expedition-blogs/tien-shan-2014/

All expedition reports, including this and previous expedition reports, are available on www.biosphere-expeditions.org/reports.