Bilateral Scientific Collaborative Initiative

Republic of Kazakhstan
Ministry of Agriculture, Committee of Forestry and Hunting
&
Royal Botanic Garden Edinburgh

Report of Botanical Expedition to National Parks of Kazakhstan

Charyn
Kolsai Lakes
Altyn-Emel

19-26 May 2008

Botanical Expedition to National Parks of Kazakhstan

Report designed and produced by
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The expedition was run under the auspices of a Bilateral Scientific Collaborative Initiative between the Republic of Kazakhstan Ministry of Agriculture and Committee of Forestry & Hunting and the International Biodiversity Program of the Royal Botanic Garden, Edinburgh.

It has been arranged jointly by the Remote Sensing Centre - GIS Terra (Kazakhstan) and Cairns-ICL (Scotland, UK).

Fig 1: Volcanic edifices in Altyn-Emel National Park
On the front cover: Kolsai Lakes National Park

CONTENTS

1 INTRODUCTION TO THE EXPEDITION

This expedition report focuses on three distinct National Parks in Kazakhstan, considering each scientifically as areas of significant botanical content and recreationally as National Parks. This two-fold approach was realised through the integration of the expedition notes of Professor N. Ogar (Doctor of Biological Sciences, Chief Scientific Advisor to the Ministry of Agriculture of the Republic of Kazakhstan), Dr D. Rae (Director of Horticulture at the Royal Botanic Garden Edinburgh, RBGE), M. Gardner (Senior Scientist in charge of the International Conifer Conservation Programme), W.J. Cairns (CEO of Cairns Intersphere Consulting Limited) and A. Wilkie (Vice President of Environment at CBCL Limited).

COUNTRY PROFILE

The Republic of Kazakhstan (RoK) is the ninth largest country in the world, coving 2.7 million km^2 in area, extending from the Caspian Sea to the Altay Mountains at the border of China; from the plains of western Siberia to the deserts of central Asia. It is a landlocked country that borders Russia, Uzbekistan, China, Kyrgyzstan and Turkmenistan.

Botanically, the country is very rich due to its diverse topography, climates and broad range of habitats. With the greatest diversity of landscape types among the Central Asian Republics, Kazakhstan can be considered the most important country in Central Asia for biodiversity conservation. The country contains lowland deserts, steppes, mountain forests and meadows. Ecological zones range from semiarid, forested steppes in the northern zones and warm moderate deserts in the south to cold semi-deserts. The eastern and southern parts of Kazakhstan (south-western part of the Altai, the northern Tien-Shan, and the western Tien-Shan) feature several mountain systems, including the Karatau mountains. The Altai is characterized by a typically Siberian flora and fauna, found nowhere else in Central Asia. Generally, the biodiversity of the Kazakhstan mountains increases in richness from the northeast (Altai) to the southwest (West Tien-Shan and Karatau). The Kazakh Steppe is one of the most important habitats and forms part of the largest steppe in the world. This lies at the southern end of the Ural Mountains, the traditional dividing line between Europe and Asia. Much of the Kazakh Steppe is considered to be either semi-desert, desert or grassland. The flora of the RoK contains about 6000 species, 8% of which are endemic.

There are ten National Parks in the RoK, some of which cover vast areas, for example, the Atlyn-Emel National Park, covers 1611km^2. The Botanical Expedition visited three National Parks: Charyn, Kolsai Lakes and Altyn-Emel.

OVERALL AIMS OF THE REPORT

1.To support the sustainable conservation and management of National Parks within Kazakhstan, by facilitating both the preservation of their natural biodiversity and continued use for eco-tourism, both nationally and internationally;

2.To establish a collaborative partnership between the National Parks of Kazakhstan and research organisations within the UK, specifically the Royal Botanic Garden of Edinburgh (RBGE); and

3.To highlight investment opportunities.

SPECIFIC OBJECTIVES

i. To explore ecosystems and plant biodiversity (taxonomy, classification and distribution) within the National Parks and facilitate subsequent dedicated survey and research;

ii. To support the implementation of the Global Strategy for Plant Conservation in Central Asia;

iii. To extend the internationally recognised botanical database held by RBGE for Central Asia, thereby completing the coverage from the western Chinese Border to the Caucasus and the Arabian Peninsula within the provisions of the International Biodiversity Program;

iv. To establish of a working collaborative relationship between Kazakh and Edinburgh based scientists to facilitate ongoing research and exchange initiatives

v. To identify opportunities for eco-tourism development in and adjacent to the national parks visited.

vi. To identify potential impacts of tourism development, and discuss potential mitigation strategies.

vii. To advance of environmental education, including programs focussed on environmental conservation and sustainability, horticulture, and teacher training; and

viii. To support improvement of capacity building for National Parks Scientific staff

STRUCTURE OF REPORT

While the primary objective of this report is to reference the diversity sand richness of the flora and fauna indigenous to Kazakhstan and the importance of its long term conservation and monitoring, the focus of this report lies also in natural resource planning - including the designation and management of nature reserves and sites of special scientific interest (SSSIs) - and the design and facilitation of public access, recreation and interpretation. The report firstly gives the background to an exploratory visit to the three National Parks followed by an introduction to each Park's unique botany and terrain. The expedition notes and findings are referenced to each National Park subsequently drawn together to provide recommendations and conclusions for future actions. The report does not attempt to give a detailed account of the vegetation or development of National Parks in Kazakhstan as a whole, rather it is an account of the findings of the short, but intensive, field trip and the views pertaining to the recreational potential of the Kazakh National Parks visited.

The botanical observations used throughout this report were provided by Dr David Rae of the RBGE. Similarly, the sections pertaining to potential for accessibility and eco-tourism were

Fig 2: Map showing the area of study

Expedition Area

National Park

2 BACKGROUND

By Professor Natalya Ogar, Doctor of Biological Sciences

The UN Convention on Biological Diversity, based on the European Plant Conservation Strategy (2003), includes a Global Strategy for plant life conservation in Central Asia. The major purpose of the Strategy is to prevent the loss of plant species, especially wild plants. European countries, the United Kingdom in particular, have vast experience in this field, which would be useful for Central Asia, and specifically to Kazakhstan.

Kazakhstan is a participant of the UN Convention and entered into a commitment on plant life and fauna conservation by ratifying the Convention in 1994. Much has been done in this field over the intervening years, e.g. the National Strategy and Action Plan were developed for conservation of biodiversity, and funds were raised (GEF, World Bank, WWF and others) to invest in major regional projects such as the "Conservation of West Tian-Shan Biodiversity". The Government gives all-round support to this process by facilitating organisational initiatives and improving environmental legislation, as well as financing target programmes.

Current conservation efforts include:

10 State Wildlife Conservation Reserves;

10 State National Nature Parks;

3 State Natural Reserves;

87 State Wildlife Reserves (Refuges);

5 State Preserved Areas;

26 Natural Monuments; and

5 Botanic Gardens.

International practice suggests that the most effective protection of landscape and biological diversity can be attained through Natural Areas of Preferential Protection (NAPP). An authorized body in Kazakhstan, responsible for

NAPP activity, is the Committee of Forestry and Hunting within the RoK Ministry of Agriculture; this committee carries out serious work on NAPP system development, including upgrading of the quality of research undertaken and enhancement of NAPP's facilities. For example, the National Parks Division is administered by the Ministry of Agriculture of the Republic of Kazakhstan.

In addition to those areas mentioned above, among the NAPPs are zoological, dendrological and local Nature Parks. In 2007 the total

Fig 3: Expedition members in the Toigak Gorge in Altyn-Emel National Park

NAPP area in Kazakhstan amounted to 242,820km^2, 8.9% of the total area of the Republic (2,724,000km^2). Almost all unique landscapes and biologically diverse nature sites are currently protected. Work on opening new NAPPs is ongoing in accordance with the approved NAPP System Development Plan.

State Natural Preserved Areas and National Nature Parks provide the strictest protection and cover 30,375km^2 or 13% of the total NAPP area. The conservation of most of the rare and endemic plant species requires the implementation of special research programs, including the creation of carpological, wet specimens and DNA sample collections, a blood plasma bank, etc.

Such research does not take place in Kazakhstan due to a lack of qualified specialists. Other than a flora inventory, the identification of rare species habitats and their status in accordance with IUCN has not yet been carried out in the National Parks due to their recent establishment. Despite a detailed inventory of species that are valued and should be protected, there is less understanding of the distribution of the in-situ habitats that require protection.

Organisational tasks are being tackled successfully but there are still challenges. Major problems are weak scientific research activity in NAPP and the lack of qualified personnel. To successfully carry out plant conservation work, specialists with a broader understanding of taxonomy, field research methods, ecology and legal parameters associated with conservation are required. International cooperation and exchange programmes and the integration of local and national studies into the global experience are very important.

Taking this context into account, it was decided to begin collaborative work by conducting surveys in the National Parks and preservation areas, aiming on the one hand to help the staff understand the issues related to nature protection and the commercial viability of Parks for future tourists, and on the other hand, to arm scientific staff with modern methods of study and to complete the world botanical database with Kazakh species.

Fig 4. Expedition members with the Tien Shan mountain range in the distance

3 EXPEDITION PROGRAM

The seven day Botanical Expedition surveyed three National Parks in Zhetisu—the historic name of the land between Lake Balkash and the mountain ranges of the Tien-Shan- in south east Kazakhstan. The group set off from Almaty on 19 May 2008 and returned to the city on the 25th.

Two to three days were spent in each of three National Parks: Kolsai Lakes (19 & 20 May), Charyn (21 & 22 May) and Altyn-Emel (23-25 May). The expedition concluded with a seminar in Almaty on 26 May 2008. Once in Kazakhstan, the order of the visits to the first and second Parks were switched to make better use of time and the condition of the vegetation (see figure 5). During the expedition staff from the RBGE collected herbarium specimens and live or seed specimens were collected. A species list is located in Appendix I.

The expedition party of eleven included seven scientists, three drivers and one translator.

Joint Scientific Team Leader, Kazakhstan:
Natalya Ogar, RSC-GIS-Terra

Joint Scientific Team Leader, UK:
Dr. David Rae, RBGE

Senior Scientist, (i/c international programme):
Martin Gardner, RBGE

Director of Expedition:
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National Parks Planning Advisor:
Ann Wilkie, CBCL Limited and C-ICL

Joint Expedition Coordinator and Translator:
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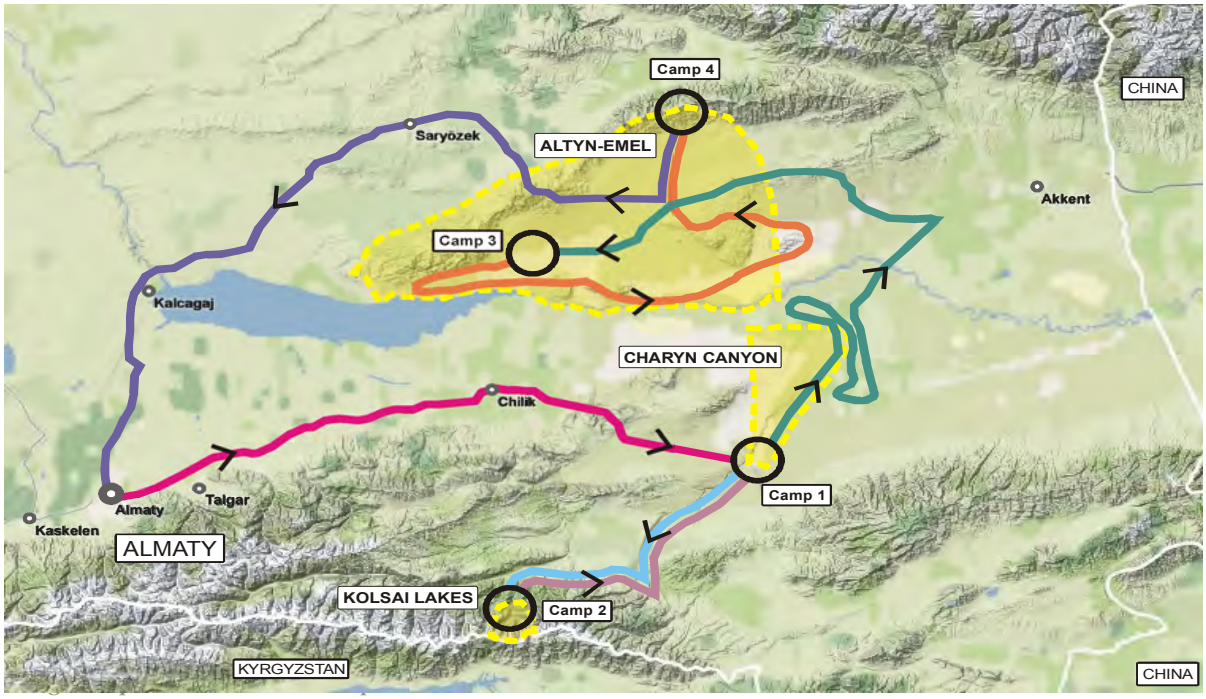

Route Camp National Park

4 STUDY LOCATIONS

Figure 6: Charyn National Park:

This Park was established in 2003. It occupies 932 km^2 as well as a planned enlargement to 1270km^2. The Park is located in the Ili valley basin, 100km from the Chinese border, and acquires its name from the Charyn River. This river rises in the North Tian-Shan Mountains (Kungei Alatau Range) and flows through the eastern area of the National Park in a deep canyon that then enters the Ili River.

Figure 7: Kolsai Lakes National Park:

This Park occupies 1610km^2 and is one of the newer National Parks in the Republic, having been established in February 2007. The Park is located in the Kolsai gorge on the northern macro-slope of Kungei-Alatau, one of the eastern North Tian-Shan ranges. The Park acquires its name from the remarkable three lake system within the gorge.

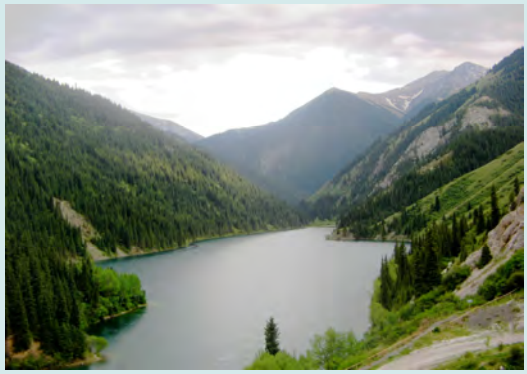

Figure 8: Altyn-Emel National Park:

This Park is one of the largest Parks in the Republic of Kazakhstan. It covers 1611km^2 , and will be extended to 2633km^2 in the near future. The Park was created in 1996 and is located in the centre of the Ili basin, spreading from the southern spurs of the Dzungarian (presently Zhetysu) Alatau mountain range in the north, to the Ili River and Kapshagai water reservoir in the south.

5 CHARYN NATIONAL PARK

Fig 9: The expedition party at Charyn Canyon

The complicated geological and geomorphologic structure of this Park, together with its specific microclimatic conditions, has produced a variety of ecosystems, high endemism of plant life and unique palaeontological findings.

TERRAIN

This National Park offers a unique combination of landscapes including the Charyn canyon, the broad-leaved ash wood, the fan delta of the Charyn River and the rocky deserts with low, bare mountains. The occurrence of thermal and mineral underground water deposits and water outcrops to the surface through tectonic faults is a characteristic of the National Park.

Charyn Canyon, as the main attraction of the Park, is 40-110m deep. The canyon walls reflect rock storeys of different ages and origin: the darker rocks at the bottom are from the Paleozoic basal complex, formed by effusive carbonic rocks and Ordovician granite rocks; they are the oldest in the area. On top, the red

layers are much younger quaternary deposits; these sands and gravels have been deposited slowly over the millennia and worked by wind and the elements into fantastic shapes. Such ragged forms are immensely picturesque and inimitable in beauty, resembling towers or castles. There is evidence of tectonic activity left on flanks in the form of rock bursts, overburden re-casting and upturning of lower strata.

The Charyn river incises deep into the deposits, forming erosion scarps of different levels. The river, as the main water artery of the National Park, rises in the foothills of the Northern Tian-Shan (Kungei-Alatau and Ketmen) at the confluence of the Shet-Merke and Orta-Merke Rivers, forming a large waterfall flowing down into a deep narrow canyon and into the Ili River. The Temirlik River is a tributary of the Charyn River and also flows through a canyon. The powerful Charyn River has

clearly defined spring floods (April-May) and a short summer flood (July). Huge stones block the river channel, creating water

streams, rapids and waterfalls. Considerable climate change has been observed in the upper and lower parts of the Charyn River.

In the lower part of the canyon, the river valley spreads out and transforms into a delta. This area is notable for its broad-leaved forest, formed by Paleogene epiobiotic species-Sogdian or 'lover-of-river' ash tree (*Fraxinus sogdiana*) which has survived due to the favourable microclimate conditions of the canyon. This 5 million year old forest occupies 5km^2 and contains a range of tree and shrub species, the content of which is dependent on the ecological conditions prevailing in this area.

The extensive Dzungarian rocky desert extends through the central area of the Park. It is framed in the north-west by the low mountains (1800m above sea level) of Ulken-Boguta. The mountains are characterised by the development of ancient uplifted peneplain forms and are dissected by various degrees of deep canyons of 500-1000m). The lithology of this solid mass is diverse: including effusives, tuffs, basaltic lava and granites, as well as stone-coal sedimentary rocks (i.e. shale, sandstone, silica and limestone).

CLIMATE

The climate of the Charyn National Park is defined as both desert and 'continental.' Temperatures vary around an average of 5˚C to -6˚C in the coldest month (January) to 27˚C in the hottest month (July). The frost-free season lasts for 180 days and the drought period for 40 days. Shallow snowfall (10-20cm) persists for around 60 days from mid December to mid February; and total annual rainfall is 150mm. A strongly pronounced climatic inversion or 'rock-basin effect' is a distinctive feature of the Park; this refers to

Fig 10: The Charyn River

the process by which air temperature increases towards the centre of the Canyon, while rainfall levels decrease.

FLORA AND FAUNA

Despite the severe desert conditions in the area, the Charyn National Park is notable for its high level of biological diversity. There are 940 species of vascular plants from 426 genera and 90 families registered in the area. This is comparable to the rich plant life found in the mountain regions. This list, however is incomplete due to the lack of exploration in the area.

The rich plant life and high endemity is the result of the presence of differentially aged rock exposures and outcrops, a highly complicated relief morphology and the change of altitudinal belts (500-2000m.a.s.l). Over 65 species of endemic, sub-endemic and rare

plants, representative of 39 genera and 20 families, are registered in the Park. These include epiobiotic species (Ili ferula, Mixelson's marsh-beet and others) and pure local endemics (Nedzvedsky's oxytrope and rock stalwort). There are 21 vascular plant species registered in the Red Book of Kazakhstan. In addition to those listed above, this includes Ilian honeysuckle, ash tree and Charyn astragalus. There are numerous ornamental pulvinate half-shrubs: tragacanth glorybind, dzungarian rockrose and prickly carlina. One plants found to be thriving in this desert location was the rock rose *Helianthemum songaricum* (Fig 12).

The mammalian fauna of the park is represented by 36 species, of which the most common include the fox, corsac (dog fox), tolai hare, wild boar and Siberian mountain goat tau-teke. Persian gazelle, Manul cat and rock marten are rare in the area.

The avifauna of the Park is diverse and includes more than 200 species, among them 111 breeding birds. The avifauna diversity of Charyn National Park is very similar to that found in Altyn-Emel National Park. There are, however some species that are characteristic only of Charyn. For example, the Charyn ash forest contains birds such as the oriole, common nightingale, long-tailed tit and dipper which are not found in Altyn-Emel.

Four species of amphibian inhabit the area, two of which are registered in the Red Book of Kazakhstan, these are; the donatinian true toad and the Siberian wood frog. Eighteen reptile species are found in the Park. This makes up one third of the entire herpetofauna of Kazakhstan. Species such as the agama, Pallas' coluber, mountain racer, snake-arrow, easter boa and 'endangered' lizard-toad, agama are very common in the area. There are ten species of fish in the Charyn River, of which seven are commonly found in mountain-Asian fauna, e.g. Osmans and Tibet brook trout, and one of which is a rare species, the Ilian marinka.

Figure 11: Lush vegetation at the edges of Charyn River

Fig 12: The yellow rock rose Helianthemum songaricum

Fig 13: The yellow rock rose Helianthemum songaricum

PALAEONTOLOGICAL FINDINGS

Neogene sections in Charyn Canyon are inexhaustible sources of information about ancient fauna and flora. The remains of many big and small mammals have been found in various areas of the Park; ancient elephants, rhinos, Stenon horses, antelopes, and ostrich eggshells. Crocodile and tortoise remains have been found in Oligocene deposits. Palaeontologists named this complex as Ilian and confirmed that it corresponds to the Late Pleiocene fauna of Khaprs and Willafrank.

Pollen of boreal angiosperm plants, belonging to the *Betulaceae* and *Juglandaceae* families, as well as broad-leaved species of *Fagaceae, Tilia, Ulmus, Castanea, Zelroua, Myrica, Palirus, Celtis, Gingo* and many other plants have been found in the fossil flora.

HISTORICAL AND ARCHAEOLOGICAL MONUMENTS

The remains of dwelling associated with ancient people who lived in Charyn Canyon have been discovered and date back to the Ascheulean and Mousterian phases, and Bronze and early Iron Ages. As was the case with Altyn-Emel Park, multiple grave-mounds of the Saki period have been found in desert plains of the Charyn Park. It has also been determined that Genghis Khan and his army billeted in the ash forest of the canyon.

SCIENTIFIC RESEARCH

Charyn National Park is a recently designated area, therefore scientific research is in a formative stage. Inventories of the flora, fauna and forest range have only been recently initiated. Sites have been identified for long-term monitoring and phenological observations under the "Nature Records" programme. Herpetological research has already been conducted, resulting in the discovery of a new species, the

Fig 14: Charyn Canyon

Pevtsov' toad.

Due to the uniqueness of the Park's geological structure, a special study has been carried out with the aim of assigning the Park the status of a 'Geo Park.' This is in accordance with guidelines of the First International Conference of UNESCO, relating to the establishment of international Geo Parks all over the world (Peking, 2004), and the draw of such dramatic geological sites of diversity as tourist attractions.

Large-scale mapping of the Park's territory, and the production of a series of subject specific maps (landscape, soil, ecosystems, vegetation, etc.) using modern GIS technologies, is planned over the next few years. Other plans for the Park include extensive studies of plant life (including ecological and biological specific studies of individual plant species), investigations into the dynamics of rare and endemic species populations, and the establishment of a herbarium fund.

SCIENTIFIC OBSERVATIONS

This was a spectacular, rugged and hostile environment. Compared to the Grand Canyon, the scale of Charyn Canyon is much smaller, but it is impressive nonetheless. Wind blown rocks have been carved into a myriad of shapes, and the gradients are treacherous. The canyon itself is scarred by debris and erosion, caused by a lack of footpaths.

In the Charyn Canyon, there was lush vegetation growing within a 250m wide band either side of the river (see figure 15). One of the species that did thrive ion the more arid lands either side of the canyon was the rock rose, *Heliathemum songaricum.* It was amazing to note the precarious nature of this highly contained temperate ash woodland, which favoured the moisture provided by the river, but was surrounded by extremely arid desert conditions. The river community was dominated by *Fraxinus sogdiana*, with associated species including *Populus diversifolia*, *Elaeagnus oxycarpa*, and *Salix angustifolia*. In some of the more mountainous areas of the valley, species such as *Atraphaxis spinosa* (Fig 17) were found growing in rocky outcrops.

As the party left Charyn National Park on 21st May headed for the Kolsai Lakes National Park, the road passed through magnificent 'intermontane desert-steppe plains' habitats. Here, the party encountered the extraordinary rhubarb-*Rheum tataricum* (Fig 20) which had leaves up to 60cm in width. It was abundant in the Siugatin Valley beside the Shunzha to Kokpek road growing in association with *Artemisia semiarida, A. heptopotamica, Peganum harmala, Ferulago tatarica, Lepidium perfoliatum* and *Tulipa* spp.

ECO-TOURISM POTENTIAL

Much needs to be done to make this area safe for the casual visitor who is stopping as part of a tour, for the scientist who knows no better and for those more adventurous individuals who want to hike and explore the area. Paths need to be defined and strategically placed safety barriers erected. There should also to be a strategy put in place for rubbish and other

Fig 15: Temperate ash forest growing close to water but contained within an extremely arid, desert habitat.

Fig 16: The Ash forest (in the Red Book of Kazakhstan)

Fig 17: Rocky outcrops supported a lush vegetation dominated by Atraphaxis spinosa (Polygonaceae)

Fig 18. Martin Gardner collecting Helianthemum songaricum which was seen growing in association with Echinops nanus

wastes, for which regulatory codes of conduct should be posted and enforced. Such management tools would enhance the "visitors'' experience of a wild and wonderful place.

Further infrastructure and accommodation development in the vicinity of an already established cottage area would provide amenities for many visitors without damaging more sensitive sites. Such a development at this sufficiently-sized site could include paths on either side of the river, appropriate signage and recreational facilities. The area could be more intensively developed for recreational purposes and serve as a focus for visitors- i.e. a development node.

Of great importance , visitors must be able to experience the drama of the canyon in safety. Protocols should be established, posted and reinforced with the establishment of dedicated paths, defined viewpoints and the creation of restricted access zones. Furthermore, rescue infrastructure should also be developed including first responders, first aid centres and communication systems. It is recommended that the protocols on safety in other canyon Parks, such as the Grand Canyon, USA, be accessed for reference. Such issues have to be addressed if tourism is going to generate substantive revenues for the Park.

Botanically the River Ili and associated ash forest is of interest, but it may be of greater interest to the scientific community than to the average visitor. There should be a scientific determination of the carrying capacity of this area leading to potential restrictions on access: it should not become a casual picnicking destination.

Fig 19: Signage at the Charyn Canyon

Fig 20: Rheum tataricum growing in the Siugatin Valley

6 KOLSAI LAKES NATIONAL PARK

Fig 21: Martin Gardner collecting a specimen of Picea schrenkiana ssp.tianschanica from which to make herbarium specimens. Sadly, it was too early in the season for ripe seeds.

Kazakhstan is known as a land of steppes and deserts, but the mountains of Altai, Dzungarian Alatau (presently Zhetysu) and North Tian-Shan dominate the south and south-east regions of the country. The environment of these mountains is distinctive and the Kolsai Lakes National Park was created to preserve the unique landscape.

TERRAIN

The Kolsai Lakes National Park is an alpine retreat with snow clad peaks, fir forests, meadows and mountain pastures on the Zaili Alatau ridge of the Tien Shan, occurring at 1800–3280m.a.s.l. The southern edge of the Park aligns with the state frontier between Kazakhstan and Kyrgyzstan. The eastern and western boundaries lay over range watersheds, while the southern edge lies just beyond the Shilek river valley and separates the Kungei Alatau and Ili Alatau ranges. The immediate focus of the park is the three mountain lakes: the first at 1,815m.a.s.l., the second at 2,252m.a.s.l. and the third at 2,680m.a.s.l, but it is also the location of the second largest land-based glacier in the world. Indeed, the highest peaks are covered with permanent snow and glaciers.

The basins of the lakes form a chain (cascade) along the vertical extent of the slope, ranging over 800m of altitude. Kolsai River flows through all three lakes and then into the Shilek River. The water ranges from pearl-blue to dark turquoise and deep blue, even appearing pink or violet at sunset. The water is pure, and transparent to 5-8m. At the peak of summer the water temperature does not exceed 15˚C and the upper lake never reaches more than 6-7˚C.

The upper lake, the smallest of the three, is situated at the head of the Kolsai River and has a

maximum depth of 23.5m. The lake is 580m in length and 190m wide with a surface area of 180km^2. The lake is characterized by rocks and scree debris, interlaced with alpine meadows.

The middle lake, sometimes called 'Mynzholke', is situated 5km further up the gorge. It has an irregular oval shape, it is 1150m long, 290-800m wide (343km^2 surface area) and up to 57m deep. The slopes above the lake are surrounded by rocks of dramatic beauty, covered by Tian-Shan fir trees. The south lakeshore is flat with meadow-swamp vegetation.

The lower lake, stretching 1520m along the gorge is 220m metres wide, has a surface area of 337km^2 and a maximum depth of 36m. Slopes around the lake are steep and covered by Tian-Shan fir trees and scree. In some places there are glades and shrubby ledge rocks.Further up the mountain (6km along the path) is the Sary-Bulak pass (3278m), which opens out to a magnificent panorama of the largest lake in the Tian-Shan mountains – blue Issyk-Kul, situated in neighbouring Kyrgyzstan.

CLIMATE

The climate in the Park is 'mountain continental'. The average annual precipitation is 600-800mm, with the highest rainfall in April and May. In the upland area (above 2500m) rains are rare and usually turn into snow, which can fall throughout the year. This snow cover can remain for 15-200 days, and can reach 0.5-0.7m in depth. The average temperature of the upland area during the coldest month (January) is -9.7˚C and of the hottest month (July) is 10.6˚C. The temperature in the daytime can sometimes reach 30˚C.

Fig 22: Tian-Shan Fir (*Picea schrenkiana* spp. *tianschanica*)

FLORA & FAUNA

The following altitudinal belts have been defined in the area; each has a distinctive vegetation structure and combination of flora and fauna species:

Nival and subnival belts (over 3200m above sea level). Permanent snow and glaciers prevail in this area, interlaced with moraines and rockslides inhabited by rare cryophyte cushion plant formations (*Sibbaldia, Tulacospermum*). Wildlife in the area is quite poor, with only Siberian mountain goats and, in some places, snow leopards. Avifauna is represented by the Alpine chough and snow-white pigeon.

Alpine belt (2800-3200m). A feature of this belt is the interchange between various landscapes: low-grass cryophyte meadows and steppes, alongside moss and sedge moors which are interlaced with rockfalls and rocks. Edelweiss, Alpine aster and gentian, regarded as symbols of uplands, grow in sorrow conditions of this belt. In addition to the animal species found in the Nival belt, there are stone marten, common weasel, least weasel and various bird species.

Subalpine belt (2400-2800m). This belt differs from the others by its high floristic diversity. Vegetation cover includes midgrass cryophyte meadows, steppes and shrubbery comprising mainly trailing juniper. Park fir woods with juniper in the lower layer and diversified herb are associated with the northern slopes. Along with the species found at higher altitudinal belts, gray marmots, red pikes and white toothed shrews inhabit the area.

Meadow-shrub-conifer belt (1600-2800m). The conifer forests of Tian-Shan firs and small-leaved birch and aspen woods prevail in the valleys and gorges of these distinctive northern slopes. Mountain steppes and shrubberies e.g spiraea, briar, cotoneaster, juniper and barberry, are found on the southern slopes. The forests create a suitable habitat for many animal species including Siberian stags, Tian-Shan brown bears, Turkestan lynxes, squirrels, marmots and stone marten. The local aviafauna is rich and diverse and includes three-toed woodpeckers, auldets and blackbirds.

Fig 23: A Kolsai River

As the Park is a recent creation, a full inventory of flora and fauna has not yet been undertaken. According to preliminary data, the Park flora totals about 1000 species of vascular plants, as well as multiple mosses, ferns and other lower plants. There are many rare and endemic plants in the Park, including the Shrenk fir, Falkoner liverleaf, orange wormseed, Semenov puss moth and many other. These species together with other Tian-Shan native plants beautify and colour the local landscapes from spring until late autumn.

Fig 24: Middle Kolsai Lake showing the extraordinary blue colouration. This lake was created following an earthquake that caused a rock fall which blocked the valley causing it to flood. Trunks of dead Picea schrenkiana ssp. tianschanica can still be seen in the lake surrounded by steep slopes of healthy living trees.

SCIENTIFIC RESEARCH

Kolsai Lakes National Park was only created in 2007, therefore research activity is in a formative stage. Inventories of flora and fauna, studies of the space usage, the biodiversity of the ecosystems, research on rare species and extensive work on collections are planned. Limnologic and hydrobiologic studies should be carried out to understand the dynamics and nature of the hydrobiological regime and to ensure that the National Park is maintained and preserved in a stable condition. The first forestry expedition into the Kolsai Lakes area was in 1929. The denuded mountains seen en route to the Kolsai Lakes National Park certainly bare witness to intensive harvesting. It is estimated that there has been a 60% loss of trees since commercial logging began in the late 1940s. Within the Park there has been some commercial planting of *Pinus sylvestris* and *Larix* spp.

SCIENTIFIC OBSERVATIONS

The park is an excellent alpine location with beautiful lakes dominated by the magnificent columnar trees of the Tian Shan Fir, *Picea schrenkiana* spp. *tianschanica* (Fig 21). The typical species occurs in mountains north of the Naryn River in Russia and in the Chinese ranges of the Tian Shan. However, *Picea schrenkiana* spp. *tianschanica* is geographically separated from the typical species by high mountains and dry arid treeless valleys. Morphologically it differs from the latter by having shorter and thicker needles. Obviously the recent creation of the Kolsai Lakes National Park is very important for the conservation of the *Picea* and all its associated species. This species is extremely rare in cultivation in Britain and Ireland, even though it would be perfectly hardy. Arrangements are now being made to introduce well-documented seed collections into Britain and Ireland from the forests close to Almaty.

While casual observation could easily detect the rich diversity of these alpine meadows, the lateness of the visit meant that little was in flower. However, the *Umbelliferae* were well represented and the following species were collected: *Aulocospermum tianchanicum, Carum caucasicum, Ferula* spp., *Semenovia transilensis* and *Seseli* spp. Other herbaceous plants collected included *Phlomis oreophila* and the highly ornamental *Phlomoides speciosa* (Fig 28). Other noteworthy plants seen were *Clematis alpina* ssp. *sibirica* (Fig 26) and *Primula nivalis* (Fig 25) which grew on steep, wet, shaded banks. A few specemins were seen of the threatened *Betula jarmolenkoana* growing on the banks of a small river which drains from the Kolsai Lakes (Fig 29).

Despite it being late in the season it was clearly possible to see the rich plant diversity of this attractive protected area and it would have been fascinating to climb higher later in the season, to see and record the true high alpine flora.

Fig 25: Primula nivalis. Approx 25cm

Fig 26: Clematis alpina ssp. sibirica

Fig 27: Iris tenuifolia.

Fig 28: Phlomoides speciosa, a true high alpine with woolly-encased flowers growing in scree at 1,933m in Kolsai Lakes National Park

Fig 29: The attractive bark of Betula jarmolenkoana

ECO-TOURISM POTENTIAL

Importantly, Kolsai Lakes Park has the potential to be a site not only of ecological and geomorphologic research, but a destination for tourism and recreation. The area would appear to have the capacity for fairly high visitor numbers if extra capacity is built into the infrastructure in terms of water supply, sanitation, accommodation, waste disposal and related services. A severe limitation to development at the present time is the state of the road approaches to the area. There needs to be immediate and substantial investment to upgrade the road, but such investment could bring much benefit to the local community and business, as well as visitors. Furthermore, enhancement of the design detail of supporting infrastructure is essential, and includes that of paths, steps, signage, benches, fences.

Given the terrain, there are many opportunities for ecological tourism including riding, climbing, trekking and bird watching. Plus, given the location of the villages on approach to the Park, some of the more intensive recreational activities could be located outside of the Park, thereby bringing benefit to the local people and protecting the Park from overuse.

Fig 30: Pony Trekking in the Kolsai Lakes– a potential ecotourism activity

SCIENTIFIC OBSERVATIONS

On the excursion day (23rd May) to the massive semi-desert areas of the Altyn-Emel National Park itself, the weather was exceptionally wet and overcast, meaning the full impact of the desert was lost. Nevertheless, a major highlight of the day was observing and climbing the impressive, moving sand dunes (Fig 34).

The flora in the National Park is very rich, and includes the *Cynomorium songaricum* (Fig 41) widely used in traditional medicine. Collections were made from *Ferula karleni, Helitropium brachycarpus, Dendrostelleria arenaria* and *Calligonum caput-medusae*. Seed was collected from the many spikes of *Eremurus anisopterus* (Fig 39). .It was again interesting to note the highly contained ash forests growing on the margins of the major rivers, surrounded by extremely arid desert conditions. In the morning of 25th May, a small group woke early to explore a small canyon- of the Toigak Gorge (Fig 38) . The experience was memorable due to the clarity and freshness of the early morning air, the interesting vegetation and abundant birdlife. The rocky slopes were covered by the imposing leaves of *Crambe kotschyana* which grew in association with *Salix* spp. and *Celtis caucasica*. The stems of which had grown to 60cm and the leaves to 45-60cm across. Other plants of note here were *Scaligeria setacea, Ephedra equisetina* (Fig 40), *Schrenkia involucrata*, *Euphorbia songorica* and *Allium caeruleum*.

Fig 39: Eremurus anisopterus which has white flowers in early Spring

Fig 40: Ephedra equisetina

Fig 41: A parasitic plant Cynomorium songaricum widely used in traditional medicine

ECO-TOURISM POTENTIAL

There are many sensitive sites in the Altyn-Emel National Park that should be protected from general access, but the scale of the Park is so great that significant numbers of visitors could be accommodated. It is suggested that an international architectural competition for a visitor centre should be considered because the diversity of the area warrants that level of expertise and publicity. There are several examples of great visitor centres in Europe, North and South America from which to gain inspiration

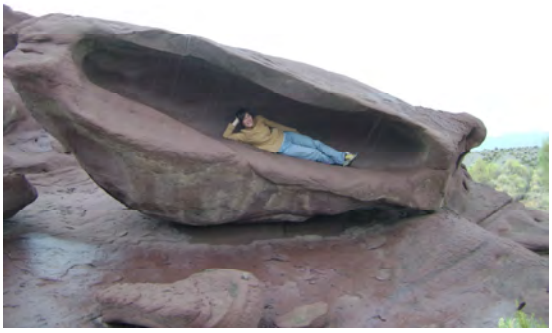

Fig 42: Volcanic edifices in Altyn-Emel

Fig 43: A decorative yurt

Fig 44: The expedition party having lunch

Fig 45: Four of the expedition members sitting outside a 'yurt'

7 ALTYN-EMEL NATIONAL PARK

Fig 31: Stone columns at Besshatyr Barrows made more imposing due to the vastness of the open land- and skyscape

This Park contains a combination of landscapes from plains to mountains, from extreme arid deserts to alpine meadows and wetlands, and from sand massifs to near-spring oases. Of the three Parks visited, this is certainly one of the most internationally significant: ecologically, botanically, geologically and culturally.

TERRAIN

The arid mountains of Sholak, Degeres and Matai frame the northern edge of the Park, with heights varying from 1600 to 2880m.a.s.l. In the north east of the Park are the higher mountains of Altyn-Emel (2928m) and Koyandytau (3459m), with the Konyrolen depression adjacent. In the south a lower relief prevails, broken up with the Ulken, Kshi-Kalkanay and Katatau hills (800–1630m) and the paleogene cretaceous Aktau upland.

The southern area of the Park includes a vast plain with depressions, dissected by numerous dry stream beds. There are many oases of hardy-shrub species surrounding the springs and thermal water seepages in the central section of the Park. This area is named Mynbulak or the “Thousand Springs”.

Among the unique natural sites within the Park is the “Singing Barchan” located between the Small and Big Kalkana Volcanic Mountains. It is ranked as a ‘natural monument’. The presence of this 150m high sand dune in the middle of rocky steppe is strange and is said to have formed from grains of sand being blown from the floodplains of the Ili River and accumulating between the mountains. Sounds are emitted during dry weather, often described as organ music, or the rumble of a jet plane. It is no wonder that the sands are the origin of many legends and superstitions associated with fantastic dragons and spirits of the desert. Some of these stories are apparently referenced by Marco Polo in his diary notes. Despite the instability of the sand and strong winds, the Barchan has not moved across the plain: it has remained in the same place for several thousands of years.

Fig 32, Fig 33 (right):Two of the many sides to the Altyn-Emel National Park., Above, and right

Another unique phenomenon of the Park is the Aktau mountains, a remarkable relief of white hills surrounded by arid black rock deserts. There are several extinct volcanoes in the Park, including the Katutau and Kalkany mountains, with the most notable volcanic edifices (solidified lava) existing in the Katutau mountains. The west section of the Katatau mountains are of cretaceous origins metamorphosed into chalk sands, red sands and claret red rocky soils.

The rivers of Taigak, Kyzylauyz, Sholakzhide and Taldysai, and numerous streams flow along the picturesque ravines, enter the plains and filter out into underground runoff. The foothill plains are therefore arid. The largest river in Kazakhstan, the Ili River, forms the southern boundary of the Park, flowing in the lowest central section of the Ili depression. Here it enters the Kapshagai reservoir, forming vast areas of wetlands. The reservoir is approximately110km long from east to west and has a volume of over 2700km^2. More than 50km of the northern shore is within the boundaries of the Park.

Fig 34: 'Singing Barchan' in Altyn-Emel National Park

CLIMATE

The climate of the Park can be described as "extreme continental", with very hot summers and very cold, dry winters. Annual precipitation does not exceed 300-330mm, with the maximum rainfall occurring in April and May. The average air temperature is 4-5˚C. In January, the coldest month, the average temperature is -8.6˚C, but can reach -29˚C. The average temperature in the hottest month, July, is 26˚C, with a maximum temperature of 45˚C. Winters have low snowfall, and snow is very rare in the plains. The presence of the northern mountain barrier protects the Park from the cold winds from the steppe, and the Ili River and Kapshagai Reservoir control dusty storms from the desert.

FLORA & FAUNA

The combination of varied relief forms and altitude determines the uniqueness of the local climate and, accordingly, the wide diversity of plants and animals. Desert (in the plains) and steppe (in the mountains) vegetation types prevail within the Park. Coniferous (spruce) forests, shrub vegetation (*Spiraea*, pea shrub, *Cotoneaster*, juniper, *Ephedra*) and mountain meadows cover the mountain slopes. The flora of the Park is estimated at about 1500 species, however this has not yet been fully investigated. At present, there are 830 confirmed species, which includes 380 genera and 84 families.

The Park contains 29 rare and endemic plant species registered in the Red Book of Kazakhstan. The Park blossoms continuously from early spring until late autumn. From primroses, poppies and rosaries in spring to multicoloured astragaluses, umbellate species and sages in summer and to mountain ash and hawthorn tree bright fruit in autumn. The vegetation around the banks of the river and reservoir remain a magnificent green for the whole summer, forming a stark contrast to the deserts.

The fauna of the Park is also rich. Invertebrates are represented by a variety of arachnids and insects (including venomous spiders). According to a preliminary study, insect diversity contains over 5000 species, 25 of which are registered in the Red Book of Kazakhstan. Vertebrate animals are represented by 393 species. In the rivers there are 26 species of fish, 15 of which have been moved from other reservoirs (including sazan, catfish and zherekh). Among the 25 reptile species habitant in the Park, are poisonous snakes such as the copperhead snake, arrow-snake and Orsini's viper.

Over 260 bird species have been identified in the Park, including 174 breeding birds: half of the total avifauna of Kazakhstan. Among the 18 rare species of local birds registered in the Red Book, are the European white pelican, black stork and eagle owl. Predatory birds found in the Park include the steppe eagle, golden eagle and bearded vulture.

There are 78 mammal species found in the Park, including the rare Prezewalski's horse, skewbald putorak, Turkestan lynx, Siberian brown bear and snow leopard, and 7 of these species are registered in the Red Book of Kazakhstan. Measures taken in the past to safeguard endangered animals have already produced significant results. In the 1970s,

27 Turkmen dziggetais were moved to the Park

Fig 34: *Extremely rare Prezewalski's horses, a symbol of Central Asia on the plains of Altyn-Emel*

from the island of Barsa-Kelmes in the Aral Sea; in 2007 the population stood at about 2000. Another species now thriving in the Park is the Jarans antelope, with more than 6000 individuals present in 2007. The Siberian argali population has reached 48, and the Siberian ibex (Tau-teke) over 1500.

PALAEONTOLOGICAL FINDINGS

Unique palaeontological findings have been discovered in the Aktau mountains, formed by Cenozoic deposits. These include 56 species of Miocene flora, such as the pine tree, pistachio and hackberry and fossilised remains of 25-30million year old animals, including crocodiles, giant rhinoceroses and turtles.

HISTORICAL AND ARCHAEOLOGICAL MONUMENTS

Archaeological and palaeontological research is ongoing in the Park. Distinctive historical monuments have been found. In the centre of the Park is the well-known Besshatyr Barrows and necropolis tomb of East Scythians and Tigrakhauda Sakis, who lived on the territory in VII-IV centuries BC. The first Kazakh historic-ethnographic visitor centre is planned here.

In the Kaskyrsai canyon is the Ungirtas cave or "Shelter", a unique natural creation. It is approximately 2.5m high, 10m long and 5m wide. Palaeontologists believe a small tribe of people may have lived there during the Stone Age, and shepherds are known to have taken shelter within the cave, often with their flocks of up to 500 sheep.

Petroglyphs (rock engravings) are found all over the National Park, with a high incidence in the Karakespe (~200) and Taigak mountains (~300). Rock paintings from the Bronze Age depict hunting, fighting warriors, wild animals, pets, rituals and deities with "sun faces". One of the earliest paintings is found on the Terekate rocks, and it is believed to show wild goats and arkhars, which are still present in the Park, along with marals and saiga, which are no longer found in the area.

Fig 35: A dry desert

Fig 36: The Katutau Mountains

Fig 37 The Ungirtas Cave

Fig 38 The Togiak Gorge in the early morning sunshine

8 FALCONRY IN KAZAKHSTAN

By Ann Wilkie, CBCL Limited

One of the unquestionable highlights of the expedition was our visit on leaving Almaty to the falconry in Nura. Falconry is a living partnership between a man and a bird, and it is an activity that has a limited, but dedicated following throughout much of Europe and North America. The art is to cast the bird from your wrist into the sky from where it spies its prey, soars to a pitch and swoops down at speeds up to 120 mph, killing its prey with its talons. It is certainly one of the oldest sports in the world, believed to have originated in China over 4000 years ago. What distinguishes falconry in Kazakhstan is the use of the powerful golden eagle to down prey on the open steppe. It is a unique feature of the Kazak life, and the skills and secrets involved are imparted from father to son down dynasties. The *berkutchi,* i.e., the falconer who hunts with the golden eagle, is a respected person and a qualified connoisseur of the natural and hunting qualities of the species. This, together with life long training, is important, because the fruitful collaboration and friendship that develops between the bird and the man can last for thirty years.

At Nura a renowned *Berkutchi* and his family have built a small museum where they display photographs of Kazak hunting traditions and examples of the associated handicrafts connected to the activity including the tough leather gloves, the leather hoods used to cover the eagles eyes to keep them calm and the wrist supports needed to carry a bird weighing up to five kilograms on the arm while in the saddle for long periods of time. Beyond the museum the birds: proud and aloof. Watching them on their perches denied both the immediacy of their power which is apparent on film and the evidence of the years of training with man, horse and dog that is necessary to attain the level of competency essential to a successful hunt. This nucleus of artifacts, expertise and eagles at Nura is special. Those involved need support to maintain and better display the treasures that exist, to develop their facilities to accommodate more visitors and to demonstrate their skills through appropriate seasonal events to what is a select international market. It is not ecotourism; it is more important: it is a poignant display of the cultural essence of the Kazak steppe and an essential link to each of the parks visited.

Figure 46: A Falcon at Nura

Figure 47: the Berkutchi and his family show enormous hospitality

9 RECOMMENDATIONS FOR IMPROVING PUBLIC ACCESSIBILITY OF NATIONAL PARKS

The following section aims to discern how best to improve the accessibility of RoK National parks to both national and international visitors. Improving access is vital for purposes of research, environmental education, and also to encourage tourism, which could provide vital income to both local communities and nature conservation initiatives.

The expedition revealed that tourism and recreation infrastructure within the park is as yet, very limited. With increasing recognition of Kazakhstan as a destination for eco-tourism, and ever increasing visitor numbers to national Parks, it will be necessary to improve the current infrastructure to best avoid negative environmental impacts as a result of the increased traffic, both vehicular and pedestrian. It is important that infrastructural improvements should be both visually un-imposing—so as to retain the 'ruggedness' of the land, and also be sustainably produced and durable—a necessary requirement in such harsh environments.

The investigations discovered that in many cases, the National Parks had limited protocols in place pertaining to access routes and safety regulations. Park regulations are important to maintain visitor safety. Furthermore, demarcated access routes serve to prevent destruction of natural habitats, or rare plant species.

Nature conservation and public access rights, in the often rugged, mountainous terrain of Scotland may provide some guidelines by which the Kazakhstan National Parks authority can begin to improve public accessibility. The following presents some examples from Scottish Natural Heritage (SNH) Countryside Access Guidelines, in the development of countryside access structures.

The SNH guidelines recognise that the development of countryside access structures is an ongoing process which must meet the evolving needs of all sections of society. The guide further wishes to promote free access to all, and where possible to encourage the use of the least restrictive option, whilst also allowing for sustainable management of country-side access.

Communication and Signage

The guidelines recommend the provision of clear information to all users in the following manner:

- Identify the place and indicate whether it is accessible to everyone by using the appropriate international symbol of access;
- Identify the location of main activity areas, reserved parking spaces for disabled persons, accessible entrances, washrooms, telephones, etc.;
- Provide trail routing information such as: type of trail, distance, degree of difficulty, special features, procedural information, location of rest areas; and
- Indicate hazards.

Signage (fig 48,49,50) must accurately describe facilities to help individuals decide whether to participate in an experience based upon: sign information, unique capabilities, and personal preferences. It is important to use accessibility symbols in a sensitive manner.

Figure 48: Signage to indicate a hazard

Figure 49: Signs to identify locations

Figure 50: Signage for area mapping

Steps

Steps (fig 51) or switchbacks should be used on steep slopes to ensure the safety of trail users and to prevent soil erosion. Steps are best suited for short steep climbs while switchbacks are preferable for longer slopes.

On trails meant for general use, the detailing of steps for the protection and comfort of people with diverse abilities is important. For example, handrails should be provided, preferably on both sides of the steps.

Bridges, Docks and Boardwalks

On wilderness hiking trails the simplest forms of bridging should be used. In many situations two logs, side-by side, will be adequate. Less conventional types of bridging can be used on wilderness trails for crossing gorges, ravines etc. These also have value in that they provide additional trail interest. More substantial forms of bridging are required for trails that will be used by a broader cross-section of the public or by wheeled vehicles..

Fords and stepping stone crossings can be used to facilitate the crossing of streams and rivers, but there should be careful investigation to determine whether they will be useable throughout the entire trail season.

For boardwalks it should be noted that the appearance of plank decking on stringers is more precise than that of the decking on sills. However, the casual look of the second may be sometimes preferable; it is also less expensive because there is less sawing and nailing involved. In areas of shifting sand, flexible plank decking can be used to help control erosion.

Where trails cross wetland areas, adequate drainage must be provided. In addition the trail must be able to withstand fluctuations in water level. The surface should either be built above maximum water level or constructed to withstand flood conditions, i.e. surfacing that will not wash away easily, or wooden stringers that are securely anchored. The trail surface should be high enough to avoid submersion during high rainfall periods.

Figure 51: example of steps within UK National Parks

Figure 52: Two examples of bridges from Scottish Na-

Fig. 53 Bridge over waterfall

Barriers, Edging, Fences and Gates

Barriers can be used to protect trail users from dangerous situations (cliff edges, rapids, etc.) and to protect sensitive areas. Barriers may also be required to prevent motor vehicles from using trails. Removable bollards can be used to block access to cars and trucks on bicycle trails. When access is required by service vehicles, the bollards can be unlocked and removed.

A simple design of timber edging re-uses old telegraph poles to define the limit of permitted vehicle access. This type of barrier design is often useful as an edging to informal rural car parks, acting more as a limitation on vehicle access than as a barrier.

Post and rail fencing is more versatile and flexible than post and wire fencing in that it can more readily accommodate changes in direction and slope. It is also visually attractive and robust and can often be easily and cheaply repaired. It is therefore especially suitable for use on countryside recreation sites and alongside footpaths.

Lockable gates should be included on trails used by service vehicles. The gates can be unlocked when general use of the trail is intended and locked during off hours. For reasons of safety, one-way opening gates should be used adjacent to roads, where they should open away from the road. A horse stile should be installed where there is a proven and demonstrable need to deter access by motorcyclists along a path used by horse-riders.

Figure 54: Boardwalk built above the maximum

Figure 55: Example of a two-way opening gate

Figure 56: cross-drainage channel to prevent erosion

Rest Areas and Benches

Provision of rest areas with benches on trails extends their use to people with lower levels of endurance and strength (fig 57). Rest areas should be provided at points providing shade, if possible. The frequency of the need for rest areas will depend on the difficulty of the trail.

Access to waste management facilities

Provision of adequate waste management facilities is necessary to prevent littering. Waste options should include:

- Litter receptacles placed at all points of visitor concentrations (e.g. picnic areas);
- Waste collection routines (e.g. daily);
- Foresight in design of litter bins to prevent wildlife intrusion;
- Adequate restroom facilities, sustainable, composting toilets would be ideal;
- Regulations and fines to prevent fly tipping;
- Training and signboards to enforce litter prevention;

Construction and maintenance of public accessibility infrastructure

Construction of National Park infrastructure should aim to ensure social, economic and environmental sustainability. In adherence to this, local community participation in construction and maintenance will be key.

- Workshops in each national park village to construct timber benches fencing, bridges, boardwalks, signboards
- Raw materials locally sourced
- Standardised design guidelines and design detailing and style of each product to be constructed.
- Robust designs to ensure longevity and low maintenance.

Conclusion

From international experience within national parks, particularly those in the USA, Canada and the UK, where conservation of the quality of the natural landscape is a primary consideration, it follows that all man-made structures need to be designed and sited to harmonise with the natural landscape. Specific attention is given to the design of all artefacts and structures including fencing, benches, signboards and bridges.

Fig 57: wooden picnic bench in forested area

Fig 58: Limited signage as it currently stands in Charyn National Park

10 SEMINAR: 26TH MAY 2008, ALMATY

The main seminar event discussed plans and ideas for possible future collaboration, and was attended by the following;

Director Aralbaev Kuldarbekovich—head of laboratory of plant intro Sitpaeva Gulnara Tokbergenova
Professor Rachkovskaya Ekaterina Ivanova—Botanical geography
Ivashenko Galina Andreevna—Botanist
Professor Natalya Ogar, Director, RSC-GIS Terra
Dr Boris Geldyyev, Managing Director, RSC-GIS Terra
Kairat Ustemirov
Natalia Skvirskaya
Dr David Rae, Director of Horticulture, RBGE
Martin Gardner, Senior Scientist, International Programme, RBGE
William J Cairns, FLI FRSA MCP(MIT) DLD MHort DHE, Chairman & CEO C-ICL
Ann G Wilkie, Vice President, Planning and Environment, CBCL Limited and C-ICL
Marianne Docherty, Ecologist, C-ICL
Natalia Zakharova, Translator, C-ICL
Dr Gulmira Khobdabergenova, Director, Kazakhstan ERM

The Seminar was chaired by WJ Cairns, Director of the Expedition who first of all expressed the enormous debt of gratitude to Dr Ogar and Dr Geldyyev and their team at RSC GIS Terra for their most generous hospitality and efficiency throughout the period of the Expedition and for introducing the British delegation to the some of the most outstanding landscapes and areas of great botanical diversity of Kazakhstan. He also acknowledged the considerable skill and safety provided by the drivers of the three vehicles (names please), the quality of the cooking provided at each of the Camps and the hospitality and kindness extended to us by the National Park Directors and their staff.

Following this, a number of presentations were made on the work of Royal Botanic Garden Edinburgh (RBGE), the work of GIS-Terra and various botanical projects. Following a period of discussion, all were agreed on the desirability of future collaboration and partnership projects but a period of reflection was thought necessary before the submission of specific proposals. It was noted that the only barriers to possible collaborative projects were: the language, the distance between collaborating bodies, and the necessity to raise funds for specific projects, particularly those relating to tourist development.

The expedition and concluding seminar enabled dialogue to commence between scientists of Kazakhstan and the UK. The seminar conveyed the importance of a commitment to:

- Establishing a joint biodiversity/botanical/ research program between the Republic of Kazakhstan (RoK) and the UK and seek admission of the RoK into the international botanical research program embraced by the RBGE;
- Addressing the potential for setting up a scientific exchange program for scientists and students as an integral part of the protocol;
- Exploring areas of sponsorship potential and making these bodies aware of this Kazakh-UK initiative;
- The Almaty Botanic Garden has major potential for regeneration. However, current design and related health and safety issues need to be addressed; and
- The proposed new National Botanic Garden in Astana as a joint design exercise between RBGE and the National Parks Service requires a feasibility study to explore the options that may be adopted.

Fig 59: The Botanic Garden in Almaty, with much potential for regeneration

11 OVERALL CONCLUSIONS

Over the course of the Botanic Expedition 2008, discussions focused around the value and role of Kazakhstan National Parks. It was noted that the relative attributes and appeal of each National Park studied vary, and their role in any system of National Parks across the country of Kazakhstan would accordingly vary. Therefore, in the definition of strategies for further investment, it is important that the role of each Park and its anticipated function in the broader national context is taken into account. This includes a determination of what interests and groups are likely to visit the Park, from where and to what end. These are key questions, and the answers will influence the nature of development projects and investment priorities made.

The primary objectives for the National Parks were defined to be:

- Sustainable conservation (proactive protection of the special attributes - ecological, geological and cultural - of each of these locations);
- To establish links with education (Scholars and the general public);
- To attract and accommodate visitors (scientific and tourist);
- To realise local economic objectives; and
- To develop scientific research (across a range of disciplines such as botany, geology, archaeology, hydrology and hydrogeology).

These objectives guided the expedition members in their observations and recommendations for the future development of tourism, biodiversity and conservation in the National Parks of Kazakhstan. The administration is challenged both to protect these very special places and to provide, at the same time, opportunities for increased public awareness and the creation of sources of revenue.

Scientifically, it was emphasised that conservation was of a high importance as there are many important endemic species native to these National Parks. It is important to note is that these species' only chance of survival is through natural preservation in National Parks or ex situ preservation (in which the RBGE could play an important role). Additionally, for future assessments of the National Parks, in-depth and high resolution mapping is important, coupled with a complete inventory and database of flora and fauna.

Key recreational issues that were drawn out within the expedition and seminar were the issues of management, safety and the value of ecotourism within the Parks. Infrastructure developments are seen to be invaluable to the National Parks if they are to be effectively developed, but the recommendation of 'designing in accordance with nature' was agreed upon.

Fig 60: Most of The Expedition Party at Altyn-Emel

12 CONCLUSIONS FROM THE CONTRIBUTORS

From Professor Natalya Ogar

The results of the reconnaissance surveys of this Botanic Expedition form the basis of further continuing collaboration between scientists in Kazakhstan and in the United Kingdom, including joint work as part of the International Biological Diversity Programme.

From William Cairns

We are greatly indebted to both the Ministry of Agriculture, Committee of Forestry and Hunting, GIS-Terra and the RBGE for their commitment and participation in the bilateral scientific programme. Cairns-ICL have been engaged in Kazakhstan since 1995 and it became clear that very considerable underlying scientific work had been in progress for many years but had been disrupted by the events surrounding the collapse of the former Soviet Union and the founding of the Republic of Kazakhstan. With the passage of time following a transition period, it is now quite obvious for all to see that the Republic is rising to the challenge of conserving its most scientifically important areas for posterity. It was therefore a privilege for Cairns-ICL to arrange this collaborative scientific programme. The visit was a real eye opener and will leave compelling memories for us all. It became abundantly clear as our travels progressed that we were unveiling a natural heritage of immense international significance that was truly unknown to the rest of the world and that the potential for the Republic to offer eco-tourism on a scale similar to that of Yellowstone, Yosemite and the Grand Canyon of the United States was beyond question. As a group we have been visiting areas which are unquestionably of World Heritage standing. The designations of the ten State National Parks of Kazakhstan are of comparatively recent origin commensurate with the Republic's independence. We are to compliment our fellow scientists, park administrators and the government of Kazakhstan for the remarkable progress over the last period for their achievements made thus far. We are fully aware of the challenges that are faced in securing the necessary finance to ensure that the conservation of nature and landscapes is not compromised by misdirected visitor pressure or poorly designed facilities. There is an opportunity in the Republic to ensure that the pristine quality of nature is

fully reflected by a corresponding response by the Park's design team to ensure the provision of pristine landscape, engineering and architectural quality throughout every aspect of facility development in the National Parks.

Fig 61: Mr. W.J. Cairns with the Falconry Berkutci & his family and Natalya Ogar

From the David Rae and Martin Gardener

Despite the brevity of the visit and the vastness of the country, this visit was enormously beneficial as it gave us an opportunity to both get a feel of the vegetation and landscape of Kazakhstan and to start to get to know some of our hosts.

RBGE would not wish to impose themselves on any aspect of any work in Kazakhstan and most fervently desire to work, therefore, in partnership with institutes or individuals in Kazakhstan. For the RGBE, possible areas of future collaboration fall within the following categories:

- General training and development in connections with existing or planned botanic gardens in Kazakhstan
- Important Plant Area (IPA) and/or IUCN threat designation training
- Joint fieldwork
- Park development
- Conservation biology protocols

In conclusion, we at the RBGE very much look forward to welcoming a delegation from Kazakhstan to Scotland at a future date.

Fig 62: Mike Gardner from the RBGE

Fig 63: Ann Wilkie

From Ann Wilkie

As the months have past and I think back, read more and try to put thoughts on paper to share with friends, family and fellow colleagues, I am increasingly impressed at what Kazakhstan has achieved and at the potential that abides not only in the land, but in the accommodation of the multicultural diversity of the country's peoples.

It was altogether a memorable experience and one that has instigated further reading about a part of the world that had, until I pulled back the curtains on snow capped mountains in Almaty, been unknown to me. Charyn and Kolsai Lakes have much to offer the Kazakhs and their neighbours; Altyn Emel has much to offer the world. I want to return. I would certainly welcome the opportunity to work alongside those who introduced me to their land.

Fig 64: Expedition team at Kolsai Lakes

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Cairns-ICL

Chairman and Chief Executive and Director of the Expedition, William J. Cairns

Director of Environmental Assessment, Ann Wilkie, also representing CBCL Limited, Canada

Joint Coordinator (Kazakhstan) of the Expedition, Natalia Zakharova

Joint Coordinator (Scotland) of the Expedition, Marianne Donoghue

Fig 65: Tian-Shan Fir of Kolsai Lakes National Park; On the back cover: Charyn Canyon of the National Park

14 APPENDIX I

Herbarium Specimens and Living Plants collected on expedition

Coll. No.	Species	Family	Herbarium/ Live	Location
1	Turgenia latifolia (L.) Hoffm.	Umbelliferae	H	East of Alamty (Schelek)
2	Halimodendron halodendron *(Pall.) Voss*	Leguminosae	H	
3	Sophora alopecuroides L.	Leguminosae	H	
4	Nitraria sibirica Pall.	Nitrariaceae	H	
5	Tragopogon salina	Compostiae	H	
6	Ferula dissecta Ledeb.	Umbelliferae	H	
7	Ferula dissecta Ledeb.	Umbelliferae	H	
8	Typha minima Funck	Thyphaceae	H	Charyn Ash Tree Camp
9	Sphaerophysa salsula (Pall.) DC.	Leguminosae	H	
10	Myricaria longifolia Ehrenb.	Tamaricaeae	H	
11	Berberis iliensis Popov.	Berberidaceae	H	
12	Elaeagnus oxycarpa Schltdl.	Elaeagnaceae	H	
13	Fraxinus sogdiana Bunge	Oleaceae	H	
14	Fraxinus sogdiana Bunge	Oleaceae	L	
15	Draba	Cruciferae	H	Charyn National Park
16	Helianthemum songaricum Schrenk.	Cistaceae	H	
17	Scutellaria transiliensis Juz.	Labiatae	H	
18	Schrenkia vaginata (Ledb.) Fisch. & C.A.Mey	Umbelliferae	H	
19	Cynomorium songaricum Rupr.	Cynomoriaceae	H	
19	Populus diversifolia Shrenk.	Salicaceae	H	
20	Populus diversifolia Shrenk.	Salicaceae	H	
21	Echinops nanus Bunge	Compositae	H	
22	Calligonum aphyllum Gürke	Polygonaceae	H	
23	Rheum tataricum L.f.	Polygonaceae	H/L	Siugatin Valley.
24	Tulipa	Iridaceae	L	
25	Ferula tatarica Fisch. & Spreng.	Umbelliferae	H	
26	Lepidium perfoliatum L.	Cruciferae	H	
27	Ferula dissecta Ledeb.	Umbelliferae	H	Eastern Toraigyr Mountain Range
28	Schrenkia involucrata Regel & Schmalh.	Umbelliferae	H	
29	Atraphaxis spinosa L.	Polygonaceae	H	
30	Scorzonera parviflora Jacq.	Compositae	H	
31	Tulipa	Iridaceae	L	
32	Lepidium	Cruciferae	H	
33	Carum caucasicum (M.Bieb.) Boiss.	Umbelliferae	H	Kolsai Lakes National Park.
34	Seseli	Umbelliferae	H	
35	Semenovia transilensis Regel & Herder	Umbelliferae	H	
36	Carum caucasicum (M.Bieb.) Boiss.	Umbelliferae	H	
37	Ferula	Umbelliferae	H	
38	Juniperus pseudosabina Fisch. & C.A.Mey.	Cupressaceae	H	
39	Picea schrenkiana Fisch. & C.A.Mey. ssp. tianshanica (Rupr.) Bykov	Pinaceae	H	
40	Picea schrenkiana Fisch. & C.A.Mey. ssp. tianshanica (Rupr.) Bykov	Pinaceae	H	
41	Iris tenuifolia Pall.	Iridaceae	L	
42	Iris tenuifolia Pall.	Iridaceae	L	
43	Primula nivalis Pall.	Primulaceae	H	
44	Primula nivalis Pall.	Primulaceae	L	
45	Phlomis oreophila Kar. & Kir.	Labiatae	H	
46	Lathyrus gmelinii Fritsch.	Leguminosae	H/L	
47	Aulacospermum tianschanicum (Korov.) Norman	Umbelliferae	H	
48	Aulacospermum tianschanicum (Korov.) Norman	Umbelliferae	H	

49	Picea schrenkiana Fisch. & C.A.Mey. ssp. tianshanica (Rupr.)Bykov	Pinaceae	H	Kolsai Lakes National Park
50	Picea schrenkiana Fisch. & C.A.Mey. ssp. tianshanica (Rupr.) ykov	Pinaceae	H	
51	Iris tenuifolia Pall.	Iridaceae	L	
52	Lonicera	Adoxaceae	H	
53	Lonicera	Adoxaceae	L	
54	Betula jarmolenkoana Goloskokov	Betulaceae	H	
55	Allium	Alliaceae	H	
56	Lathyrus gmelinii Fritsch.	Leguminosae	L	
57	Phlomoides speciosa (Rupr.) Adylov, Kamelin & Makhm.	Labiatae	H	
58	Clematis alpine (L.) Mill. Ssp. sibirica (L.) C.K.Schneid.	Ranunculaceae	H	
59	Phlomoides speciosa (Rupr.) Adylov, Kamelin & Makhm.	Labiatae	L	
60	Phlomis oreophila Kar. & Kir.	Labiatae	L	
61	Angelica	Umbelliferae	H	
62	Seseli	Umbelliferae	L	
63	Seseli	Umbelliferae	L	
64	Seseli	Umbelliferae	L	
65	Tamarix ramosissima Ledeb.	Tamaricaceae	H	Altyn-Emel State National Park
66	Iris spuria L. ssp. sogdiana (Bunge) B.Mathew	Iridaceae	H	
67	Iris spuria L. ssp. sogdiana (Bunge) B.Mathew	Iridaceae	H	
68	Calligonum junceum Litv.	Polygonaceae	H	
69	Corispermum americanum (Nutt.) Nutt. var. americanum	Amaranthaceae	H	
70	Dendrostellera arenaria Pobed	Thymelaeaceae	H	
71	Astragalus brachycarpus Bieb.	Leguminosae	H	
72	Ferula karelini Bunge	Umbelliferae	H	
73	Calligonum caput-medusae Schrenk	Polygonaceae	H	
74	Unknown	Leguminosae	H	
75	Heliotropium arguzioides Kar. & Kir.	Boraginaceae	H	
76	Eremurus anisopterus Regel	Asphodelaceae	H	
77	Eremurus anisopterus Regel	Asphodelaceae	L	
78	Ferula karelini Bunge	Umbelliferae	H	
79	Populus litwinowiana Dode	Salicaceae	H	
80	Rubia	Rubiaceae	H	
81	Crataegus korolkowi Regel ex C.K.Schneid.	Rosaceae	H	
82	Trachomitum lancifolium (Russanov) Pobed.	Apocynaceae	H	
83	Iris pseudacorus L.	Iridaceae	H/L	
84	Iris pseudacorus L.	Iridaceae	L	
85	Crambe kotschyana Boiss.	Cruciferae	H/L	
86	Celtis caucasica Willd.	Cannabaceae	H	
87	Scaligeria setacea (Schrenk) Korovin	Umbelliferae	H	
88	Ephedra equisetina Bunge	Ephedraceae	H	
89	Schrenkia involucrata Regel & Schmalh.	Umbelliferae	H	
90	Euphorbia soongorica Boiss.	Euphorbiaceae	H	
91	Allium caeruleum Pall.	Alliaceae	H/L	
92	Galium	Rubiaceae	H	
93	Scandix stellata Banks & Sol.	Umbelliferae	H	
94	Ferula dissecta Ledeb.	Umbelliferae	H	
95	Crambe kotschyana Boiss.	Cruciferae	H/L	
96	Crambe kotschyana Boiss.	Cruciferae	H/L	
97	Aegopodium podagraria L.	Umbelliferae	H	Almaty
98	Ferula	Umbelliferae	H	

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