International Workshop on the re-introduction of the Przewalski's horse

We were pleased to host the 2nd International Workshop on the re-introduction of the Przewalski's horse from 12-17 June in Takhin Tal, Great Gobi 'B' Mongolia. Thirty-six people from 8 countries attended: Austria, France, Germany, Mongolia, Switzerland, Tanzania, The Netherlands, and USA. We had 22 talks on various aspects of takhi re-introduction and conservation in Mongolia. All talks were of excellent quality and provided interesting and important information and insights for the final discussion round. The workshop was especially fruitful as representatives from the two ongoing re-introduction projects (Hustain Nuruu and Takhin Tal) and a third projected re-introduction project (Khomin Tal), were present. Abstracts as well as the most recent biannual report on the research and conservation activities in Takhin Tal, Great Gobi B Strictly Protected Area can be downloaded from www.takhi.org and www.wildvet.at

Workshop abstracts

Historical information of wild horses (takhi)

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The presence of wild horses in Mongolia was already noted in the books and writings of the 10th-11th centuries. During the 17th–19th centuries, the Mongolian kings gave wild horses to foreign visitors as gifts. In 1637, King of Manchuria sent his people to Mongolia to catch the wild horses. According to these sources Takhi have occurred in Mongolia since ancient times. Later, in 1878, the Russian tourist and investigator, Przewalskii, found some takhi remains from the Mongolian Gobi. He sent these remains to the Russian scientist Polyakov who named the species as *Equus przewalskii Poljakov, 1881.* At about this time, western countries started to develop an interest in the wild horses for exhibition in zoos. Even though this had a negative impact on takhi in the wild, nobody knew at the time, that the captive horses would eventually provide breeding stock for a reintroduction program. Mongolian takhi occurred in a relatively small area and in low numbers. They had already suffered from human impacts (poaching, reduction of their breeding and grazing area) and natural disasters (such as droughts and hard winters) and became endangered during the 1970's. However, international conservation organizations and professionals decided to reintroduce them back to Mongolia. The idea of reintroducing takhis eventually obtained support from the Mongolian Government. From 1992, takhis started to be transferred into Mongolia. Some of these horses were reintroduced in the area of Takhi Shar Range, Khonin Us Gobi, Bij River, and Takhiin Tal, where the last wild horses occurred. Special attention and care were needed because the takhis were no longer used to the harsh climate of the Mongolian Gobi desert. This became most obvious during the reintroduction process. The Mongolian government established a "Research and Experiment Center of Wild Horse Reintroduction". Since 1992 more than 70 individual takhis have been transported from foreign zoos to Mongolia. Although half of them were lost, 60 females have given birth and were able to cover the losses. At the moment, about 60 individuals in 5 herds are grazing in the wild. In addition, one breeding group was established and is grazing in a fenced area and under human control. Meanwhile we know that wild horses are able to adapt to the harsh conditions of the Mongolian Gobi Desert and today individuals of several generations already inhabit the Gobi. This indicates that takhis can be successfully reintroduced to their native land.

Reproduction status of takhi being reintroduced in Hustai National Park

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In Hustain Nuruu National Park, the reproductive rate of adult mares over the last ten years was 60.4%, with 56.4% of their foals surviving. Mortality of young foals can be attributed to the following categories: 51.95 % due to wolf attacks, 18.9 % due to weakness after birth or miscarriage, 8.8 % due to injuries, 5 % due to mothers, which did not want to let their foal suckle and 12.6 % due to unknown reasons. Young mares dispersed from their natal harem when they reached 2-4 years of age and became sexually mature at age 3-4. 10.3 % of mares born in Hustai Nuruu started foaling at an age of 3 years, 71.4 % at an age of 4 years and 8 % at an age of e"5 years.

Mortality of takhis and its causes

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During the period 1992-2000, the Dutch Foundation Reserves for the Przewalski Horse (FRPH) brought 24 stallions and 60 mares, in total 84 takhi, to Hustain Nuruu. Within 12 years, from 1992 until the end of 2003,

46 of the transported takhi and 8 takhis born in Hustai Nuruu (age > 2 years) died. The analysis of the cause of death revealed that most mortality could be attributed to the following categories: injuries, blood parasites, dzud and wrong position of the foetus. 58.6% of all mortalities occurred within the first year after the transportation of the animals to Mongolia. This shows the difficulties the animals have to cope with their first cold winter with deep snow. 31.2% of all takhi stallions brought to Hustai at age 2-5 years (n=16) and 31.2% of all mares in the same age category died. However, mortality for older takhis was even higher and 62.5% of all stallions over age >6 years and 66.6% of all mares in the same age category died in the first year after arrival to Mongolia. These results show that older individuals are less able to adapt to the harsh conditions of their native land than younger ones. In addition, mortality of Takhi born in Hustain Nuruu is much lower than for those originating from Holland.

Wild Bactrian Camel Conservation

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The wild Bactrian camel (*Camelus bactrianus ferus*) is critically endangered throughout its range in China and Mongolia. Yet, wild camels remain poorly understood, with knowledge derived primarily from a few short studies and anecdotal information. We initiated a wild camel conservation project to determine the reasons for camel decline and to develop a program to address those problems. We are employing satellite telemetry to gather data on wild camel movement patterns, home ranges, habitat use, and sources of mortality. We are also collecting faeces from camels and wolves to determine important foraging plants and to begin to assess predation levels, respectively. In addition, steroid faecal analysis may help us evaluate wild camel reproductive physiology. Finally, we are directly observing wild camels to study their behaviour. Thus far, we successfully collared 2 wild camels (1 M, 1 F). We received 1 year's data on the cow before her Doppler satellite collar failed and are receiving only sporadic data from the GPS satellite collar on the bull. Over one year, the cow covered a minimum distance of 4,527.34 km and her 100% minimum convex polygon (MCP) home range was 17,232 km^2. Her kernel home range sizes covered 8,696 km^2 for 95%, 4,031 km^2 for 75%, 2,284 km^2 for 55%, and 612 km^2 for 25% kernels. We received only 17 GPS locations on our bull from October 10, 2003 – February 1, 2004. During that time, he traveled a minimum of 463 km and his 100% MCP home range extended over 6,923 km^2. His kernel home ranges covered 6,298 km^2 for the 95%, 2,162 km^2 for the 75%, 682 km^2 for the 50%, and 464 km^2 for the 25% kernel. Over the past few autumns, mean group size was 10.07 ±1.82 wild camels/group. We are currently analyzing the behavioural data and plan to evaluate the faecal samples once we have sufficient samples. We hope to use the knowledge gleaned from our work to develop a proactive conservation program working in close cooperation with the Mongolian government and other scientists and conservationists.

Parasitologic examinations in reintroduced Przewalski horses as compared to domestic horses and Dschiggetais in the Dzungarian Gobi, Mongolia

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In order to evaluate the health status of re-introduced Przewalski horses (*Equus ferus przewalskii*) in southwest Mongolia, parasite load and status was examined. In various equids, individual parasite loads and the average rates of parasite infections were assessed and compared in pooled faecal samples over a period of one year. Altogether 1497 faecal samples were examined, of which 1365 were derived from Przewalski horses (226 pooled samples; 1139 individual samples), 80 from domestic horses (*Equus caballus*; 27 pooled samples; 53 individual samples) and 52 from Dschiggetais (*Equus hemionus*; 19 pooled samples; 33 individual samples). In addition, 37 larval cultures were examined, of which 29 derived from Przewalski horses, 6 from domestic horses and 2 from Dschiggetais.

In all groups, the infection with strongyles predominated and demonstrated a marked seasonal variation. In the free-living group of Przewalski horses, Dschiggetais and in domestic horses, parasite infection rates increased comparatively early in the year and showed higher parasite loads than in the de-wormed

Przewalski horses inside the enclosures. However, in autumn and winter parasite loads were again similar. The free-living equids were generally infected with a greater diversity of parasite species, corresponding to those of the domesticated horses in Takhin Tal. The observations of the present study suggest that parasitic infections in wild-living equids do not create any health problems as long as no further immuno-suppressive factors occur.

Takhi condition scoring in Hustai National Park

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The body condition an animal needs for living and reproduction is an adaptation to its environment. Thus condition scoring provided a valuable tool to assess an animal's adaptation. The body condition of free-ranging, unfed takhis undergoes monthly and seasonal changes and depends on weather, productivity of the vegetation (pasture quality). During the first year after arrival, takhis loose weight, especially takhi stallions. Generally, female takhi loose 20-25% and male takhi loose 25-35% of their body mass in the first year. After this first adaptation year, body condition becomes more stable, obviously a consequence of the adaptation of the takhis to the new environmental conditions. In Hustain Nuruu systematic, year-round condition scoring was introduced 2 years ago and shows the following pattern: from October till the end of January body condition of takhi is stable, from the middle of February to the last 10 days of May (90-100 days) body condition is slowly decreasing, and from June until October body condition is increasing. However, weather additionally influences the body condition and may cause changes by month and season.

Current status of takhi research in Takhin Tal, Great Gobi B Strictly Protected Area

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The goal of the establishment of the GGSPA was to protect the unusual ecosystem and the rare animals of the Dzungarian- and the Transaltai Gobi. In 1992 the Takhi Reintroduction Center (TRC) was established as a prerequisite for the re-introduction of Przewalski's horses (*Equus ferus przewalskii*). Today the center is run by the Great Gobi B SPA administration in cooperation with the International Takhi Group (ITG). The center is responsible for protection and monitoring work in Great Gobi B SPA as well as "Khasagt Khairkhan Mountain" SPA, "Alag Khairkhan Mountain" Natural Reserve Area and "Sharga" Natural Reserve Area (saiga protection). The research center has a total staff of 13 employees: 8 employees of the Great Gobi B SPA, 1 takhi ranger, 4 rangers in the other protected areas. The total annual budget provided by MNE is 18.7 million MNT. In 1992 GGSPA was included in the International Biosphere Reserve Network and the re-introduction of takhi to their native habitat was initiated. In 1992 ITG was established to continue and extend this project in accordance with the IUCN re-introduction guidelines and based on sound science. Today, more than 70 takhis in 6 harems inhabit the SPA; grazing between Bij river, Gun Tamgiin valley, Khonin Usni Gobi to Shiiriin Us. There are many rare and very rare animals in Great Gobi B such as takhi, Asiatic wild ass (*Equus hemionus*), black-tailed gazelles (*Gazella subgutturosa*), argali (*Ovis ammon*), ibex (*Capra sibirica*) and snow leopard (*Uncia uncia*). However, with only 5 rangers and 1 driver it is not an easy task to protect wildlife and carry out takhi re-introduction work at the same time. To effectively combat illegal actions such as poaching or the collection of saxaul (*Haloxylon ammodendron*) and other bushy plants for firewood, we lack manpower. To our great relief there are no attempts to mine for gold and other mineral resources that have devastating effects in other protected areas and cause severe land degradation. ITG provided rangers with the necessary equipment, vehicles, motorcycles, horses, binoculars, tents, uniforms and petrol. Thus our rangers, in cooperation with ITG researchers, are able to conduct regular wildlife inventories and intensify controlling and patrolling. An important next step will be the development of a management plan for Great Gobi B based on our experience and research over the past years.

Monitoring of free-ranging Przewlaki's horses with satellite telemetry in Takhin Tal

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The Gobi desert of Mongolia is characterized by its remoteness and harsh climate. Hence large ungulates inhabiting this ecosystem can be expected to cover large ranges in order to meet their dietary and water requirements. Unfortunately, hardly any data is available on spatial organization, movement patterns and habitat use of free-ranging Przewalski's horses (takhi, *Equus ferus przewalskii*) prior to their extinction in the wild. To understand the interaction of released takhi with their environment and other species is of high importance for on-going and future re-introduction projects of Przewalski's horses. Since October 2001 we therefore

monitored takhi group movements with the help of satellite telemetry.

GPS / ARGOS collars (NorthStar® and Telonics®) were programmed to attempt to acquire between 2 and 6 GPS locations every day. These locations were stored on board the collar and were transmitted every third day via ARGOS uplink during a 7-hour transmission period. Between October 2001 and May 2004 we acquired 4705 GPS locations of 9 takhis from 5 different groups. Total area used by all groups was 1352 km² in the NE corner of the Great Gobi B Strictly Protected Area (SPA). Takhi groups seemed very conservative in their range use and only slowly expand their range away from the adaptation enclosure. Group areas were smallest for two groups most recently released (117 – 261 km²) and largest for three established groups (648 – 1526 km²). So far takhi only make use of 5 different water points (Bij river valley, Chonin us, Shirin us, Gun Tamag and Gashurn us). Preliminary analysis of habitat use suggests that takhi select for *Achnaterum spp* and *Stipa glareosa - Anabasis brevifolia* communities, but select against *Haloxylon ammodendron* (Saxaul) communities.

Our experience showed that detailed data on habitat use and small scale movement patterns can only be gained by satellite telemetry. However, for long term monitoring of takhi groups, satellite telemetry is too expensive and ranger monitoring based on "raster maps" is sufficient to describe general movement patterns and spatial requirements. Detailed habitat analysis is scheduled for this summer and will help to identify priority sites for future releases in the Great Gobi B SPA.

Takhis, khulans, wolves and vegetation – an ecosystem approach for takhi conservation

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For a reintroduction to be successful it has to be socially and culturally accepted by the local people, and it is necessary to implement a monitoring program to study the released species interactions with other wildlife and the vegetation. Given the high cultural and symbolic value of the wild horse in Mongolia, the re-introduction of the takhi can also be used as a vehicle to raise awareness for the uniqueness of the Gobi B, thus helping to develop and implement a conservation and management plan for the whole ecosystem.

Whereas in the past the key focus has been on the well-being of the re-introduced takhi (veterinary- and ethological research, monitoring) in the north-eastern corner of the park, nowadays efforts are spread over the whole park and include other mammals, the vegetation and the local population. Often interactions at the first glimpse seem rather straightforward: people like takhis, khulan (*Equus hemionus*) are pasture competitors for takhis and wolves (*Canis lupus*) eat takhis. However, who gave much thought to takhis as pasture competitors for livestock? Or the fact that poaching of khulan would result in dead takhis because some people do not know the difference? Or that hunting of wolves facilitates poaching? Many things to consider and many more interactions than initially anticipated – thus it was time to switch from a species to an ecosystem approach, including the local people, other wildlife and the vegetation.

Some of the activities initiated over the past 3 years were:

-monthly wildlife transects to determine the distribution and movement patterns of wild and domestic ungulates

-monitoring not only of takhi, but also of wild ass, and wolves with satellite telemetry to gain insight into spatial requirements and habitat use

-vegetation mapping and the analysis of the feeding habits of ungulates and wolves

-livestock inventories and mapping of herder camps and migration routes

-workshops aimed at integrating takhi re-introduction and park management with sustainable local livelihoods in Great Gobi B to identify key conservation issues

Plant utilization of reintroduced Przewalski's horse

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The reintroduction site belongs to the arid Dzungarian-Gobi landscape ecosystem. Here the takhis compete with other wildlife (e.g. *Equus hemionus* and *Gazella subgutturosa,* but also rodents) and domestic livestock (sheep, goat, cattle, horse, and camel) for limited pasture resources. In September 2003 we started a project that focuses on the plant utilisation of the reintroduced Przewalski´s horses. For food plant identification we use the n-alkane method. This analysis technique uses gas chromatography and is based on the fact that the cuticular wax of different plant species contains varying amounts and proportions of predominantly odd chain length n-alkanes. The alkane pattern within species has been shown to be sufficiently consistent over time to enable individual pasture species

to be identified. These differences can be used to determine botanical composition of an animal's diet. By measuring n-alkane proportions of feed and faeces it is possible to make a least-square estimation of the diet composition. The indigestible internal marker C_{31} can be used for calculating digestibility according to the equation: Digestibility = 1- marker concentration in herbage / marker concentration in faeces.

Mongolian desert ungulates: is there any future?

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Wild ungulates that have largely disappeared from the rest of Asia still remain in the Mongolian deserts: Mongolian saiga (*Saiga tatarica*), wild sheep (*Ovis ammon*), ibex (*Capra sibirica*), khulan (*Equus hemionus*), goitered gazelle (*Gazella subgutturosa*) and Mongolian gazelle (*Procapra gutturosa*). Argali are the world's largest mountain sheep, and the Mongolian population is estimated to be around 13,000 animals. The species is declining and it is listed as threatened in Mongolia and internationally. Estimates of the ibex population suggest about 80,000 animals in Mongolia. Mongolian gazelle once inhabited the entire steppe- and semi desert region of Mongolia and adjacent areas of Russia and China. But now the species is largely restricted to the eastern steppes and southern semi deserts. In the latter areas also the goitered gazelle can be found. The goitered gazelle is listed as near-threatened by the World Conservation Union (WCU). Mongolia represents one of the last strongholds for khulan, which is listed as globally threatened. Population assessments in September 2003 showed that 19,000-20,000 animals inhabit the Mongolian deserts. Mongolian saiga is classified as endangered in the Red Book by the IUCN. Saiga populations have greatly declined due to illegal hunting, competition with domestic livestock for pastures and water resources, and high mortality rate during harsh winters. Unfavourable and extreme weather conditions such as long lasting summer droughts, severe winters, in combination with food shortage, illegal hunting, competition with livestock, chasing and disturbance, and natural predators are the main threats to desert ungulates. In this paper we propose recommendations for future conservation of desert ungulates in Mongolia.

Conservation issues for wild zebras, asses, and horses in Africa and Asia

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The family Equidae is composed of zebras, asses, and horses. During the Pleistocene they were the most abundant medium-sized grazing animals of the grasslands and steppes of Africa, Asia, and the Americas. Today there remains only seven species. In Africa, the African wild ass (*Equus africanus*) is critically endangered, the Grevy's zebra (*Equus grevyi*) and the Mountain zebra (*Equus zebra*) are endangered, and the Plains zebra (*Equus burchelli*) is dependent on conservation support. In Asia, the Asian wild ass (*Equus hemionus*) is vulnerable with some subspecies in an endangered state. The Kiang (*Equus kiang*) is considered 'Least Concern', but data is inadequate for the assessment of the status of two of the subspecies. The Przewalski's (*Equus ferus przewalskii*) horse exists in captivity, but is extinct in the wild. Re-introduction projects for the Przewalski's horse are occurring in China and Mongolia. The majority of species in this small family are endangered or vulnerable. Equids are significant for conservation both for their unique genetic heritage and their role as flagship species for the conservation of biodiversity in desert and grassland ecosystems in Africa and Asia. At present better information is needed on:

- national and local population status and trends
- genetic definition of sub-species
- genetic viability of isolated and re-introduced populations
- behavioural ecology, resource requirements, disease epidemiology and demography
- risk assessment of geographically distinct populations
- socio-economics and viability of alternative conservation/utilization strategies

National capability needs to be supported by a training and communication network. In addition, the involvement of local communities in the conservation of their natural resources is fundamental to the future of these species. Conservation of wildlife and natural resources often results in economic and cultural deprivation for local resource users. It is important to develop economic and political mechanisms that allow local people to benefit from the conservation of wildlife.

"BIJ CRAFT-Enterprises" Felt training in Takhin Tal, Gobi B

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For the families who live near the Takhin Tal Research Center, economic opportunities remain very limited, especially in the settlement of Bij. Thus, the International Takhi Group (ITG) initiated some training for home-based

hand-crafted products in order to: Provide supplementary income for locals; Strengthen local support for conservation of the Great Gobi B ecosystem.

The population of Takhin Tal and the surrounding areas numbers ~800 people, representing ~120 families. The main livelihood of about 60 of these families is from livestock herding. Most of the remaining families live in the bag center Bij. Economic opportunities in this settlement are very limited and most families are very poor. There are few, if any, ways for people to earn money and most families just own a few livestock for their personal needs. In Bij, 3 women teach at the local school and 3 women work at the local hospital. Only these 6 women receive wages from the government. In order to improve the socio-economic prospects in the area ITG started to support a local wood carver of Bij in 2002. We suggested another initiative, which could involve several women in Bij. Women with training and a guarantee of sales of their products could significantly improve individual and family lifestyles. The felt craft industry we are proposing is based on materials that are readily available to these women and felt making is based on traditional skills. ITG provided a first round of training courses in 2003 to adapt inherent felt making skills to the creation of souvenirs. Possible markets are visitors of the Great Gobi B research center and the shops of European Zoos connected with the Takhin Tal Przewalski's horse (*Equus przewalskii*) re-introduction project. If the felt craft initiative could be further developed it will strengthen the ties of local people with the activities and goals for wildlife conservation by the Great Gobi B Strictly Protected Area and ITG.

For the near future our main goals are: To teach high standard wool felting techniques to local women; To introduce and develop distinct products typical for the Great Gobi B region and suitable for an international market; To develop financing schemes for the necessary production tools; To guarantee sales of products which meet pre-defined quality standards and purchase of the products on a bi-annual basis; To link such a program with wildlife conservation and protected area management; In summer of 2003 the project coordinator, Ruth Baumgartner of ITG, came to Takhin Tal and helped initiate the pilot phase of the felt craft project. The initial activities were restricted to the Takhi Research Center and involved only a small number of women. However, we already produced some felt souvenirs that were sold to tourists visiting the research camp. This year we plan to broaden the initiative and include more local households.

Biology and Epidemiology of Equine Piroplasmoses in Takhin Tal

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Equine piroplasmoses, caused by *Babesia caballi* and *Theileria equi* (formerly *Babesia equi*), have been identified as an important mortality factor during the reintroduction of Przewalski's horses (*Equus ferus przewalskii*) to Takhin Tal. The two intra-erythrocytic protozoa are both exclusively transmitted by ticks and cause primarily haemolytic anaemia and associated lesions in their equine host. Young horses without humoral defence can be infected up to a certain age without clinically apparent disease. In older horses, acquired immunity protects against clinical disease, but does not prevent re-infection. In enzootic areas, constant super infections induce stable immunity. Older horses without humoral protection are more seriously affected and may die. The tick vectors become infected with piroplasms during their blood meal on an infected host. The parasites are transmitted when the next stage feeds on a susceptible host. Six hard tick species have been described in the Gobi habitat. From these species, *D. nuttalli* and *D. daghestanicus* were reported to transmit *B. caballi* and the latter to be a vector for *T. equi*. During our preliminary study in Takhin Tal in 2001 we could only confirm the presence of *D. nuttalli*. Hence, the transmitting tick species of *T. equi* is not clearly identified for this region.

To investigate the epidemiological status of the two protozoa, we conducted a preliminary serological survey in the domestic horse population (N=142) in direct proximity to the reintroduction site in Takhin Tal in 2001. We found high seroprevalences, which indicated an endemic stability of *B. caballi* and *T. equi* in the domestic horse population. Maternal antibodies for both piroplasms were found in all of 16 foals, but only one seroconverted during its first summer. In yearlings (N=16) the seroprevalence rose from 20% to 100% at the end of the investigation period, indicating that most domestic horses become infected in their second tick season. To assess the infection pressure, we developed a crude mathematical model and estimated the inoculation rate. This rate is a function of many variables including the degree of infestation with vectors, size of vector population, activity level and biting activity of vectors, prevalence of disease in vectors, ratio of successful infections per bite etc.

It is now clear, that Przewalski's horses are exposed to equine piroplasms at the reintroduction site. Due to their age at arrival in Takhin Tal, they are at high risk to develop clinical disease or even die. Hence, preventive measures are necessary. In order to determine these measures we will elucidate the epidemiology of the two protozoa by determining their prevalence in the domestic horse population throughout the whole strictly protected area and characterise them by molecular means (PCR). We will identify the tick fauna

infesting horses and incriminate the vector species. From these data we will assess the infection pressure in time and space, considering the tick biology and the transhumance of the herders and their horses. Finally we will develop a mathematical model describing the transmission patterns and hence evaluate the risk for Przewalski's horses to become infected with piroplasms.

Behavioural features of bachelor groups in Hustain Nuruu

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A Bachelor group consist of old stallions that have lost the leadership of a harem group and of young stallions, which were expelled, from their natal harem group. A bachelor group does not have an own home range, but rather grazes everywhere. In addition the composition of the group is quite variable as it often divides into subgroups that join up again. Especially young bachelors, who have been expelled often, separate from the group. However, the members of the bachelor group know each other well and have a good relationship with each other. Within the bachelor group they playfully learn fighting behaviour, which prepares them for a future role as a harem stallion. Thus the behaviour of a bachelor group is quite different than that of a harem group. Once the members are fully-grown and sufficiently experienced they leave the bachelor group and form their own harem. This presentation describes: Home range size and the use of different vegetation communities by the bachelor group; Composition and dynamics of the bachelor group; Behaviour features of bachelors; Relationship between bachelors; Interactions of bachelors with harem groups; Interactions of bachelors with livestock and other wildlife.

Behavioural observations of a newly released takhi group in Takhin Tal, Great Gobi B Strictly Protected Area

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The takhi (*Equus ferus przewalskii*) has only survived due to captive breeding and the re-introduction of a naïve species back to its original habitat represents a great challenge. One of the problems is that very little knowledge is available on the species behaviour prior to extinction in the wild. Thus the aims of this research were to document the time budget and activity pattern of a newly released Takhi group from 13 May until 2 September 2003. Behaviour was sampled via scan sampling every 10 min and the distance recorded between the individual of the group every 15 min. Systematic sampling was restricted to the daytime hours from 08: 00 to 21: 00. Body condition of each horse was recorded every other week. The takhi group spends 46% of the observation time grazing and 36% resting, which is similar to the values described for feral horses and takhis in captivity and semi-reserves. Grazing followed a distinct diurnal pattern, with main grazing bouts in the early morning and late afternoon, when the ambient temperature was relatively cool. Resting was highest at midday that is during the hottest hours of the day, a pattern previously described for feral horses and takhis alike. Released takhi did not attempt to return to the acclimatization enclosure, nor did they lose body weight. On the contrary, all horses actually improved in body condition. The results of my study show that this newly released takhi group obviously had little problems to adapt to the wild.

Integrating Takhi Re-Introduction and Park Management with sustainable local livelihoods

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IPECON (Initiative for People Centered Conservation), the international program of NZNI (New Zealand Nature Institute), focuses on sustainable protected area management, - on parks and people. NZNI team members have been instrumental in projects in Mongolia on protected area and buffer zone management, poverty alleviation and combating desertification.

In 2003, NZNI was contracted by ITG (International Takhi Group) to undertake two missions in Takhiin Tal to evaluate problems of resource degradation, opportunities of local livelihood improvement, the impact of the takhi reintroduction project on local communities and their perception of the project. Moreover, the missions served to initiate community organization for self-help to improve livelihoods through sustainable resource use and to initiate stakeholder cooperation in the framework of the project. The findings are the basis for a project proposal on "Integrating Takhi re-introduction and park management with sustainable local livelihoods in Great Gobi B".

Participatory Rural Appraisal and Participatory Planning with community groups and other stakeholders addressed issues of poaching of wildlife, use of saxaul

and juniper for firewood, status of Bij Dam and options for water management and use rights, problems of isolation from marketing opportunities, lack of cash income, lack of information, lack of understanding of PA laws and of the functioning of the market economy. Outcomes of the NZNI mission include the formation of a Bij Dam User Committee and several community organisations and self-help groups and the establishment of an Information and Resource Centre in Bij bag school. These initiatives have laid a foundation for local communities and stakeholders to address livelihood and conservation issues in a collaborative manner and in improved cooperation with ITG and the Takhi re-introduction project.

It will be important to link emerging community organizations in Great Gobi B to other local communities and facilitate experience sharing among COs and local government in NZNI project regions where local models for sustainable resource use and livelihoods are being developed and local community organizations are recognized as natural resource management institutions with rights and responsibilities over local resources and where collaborative management and joint protection of protected lands and resources are being tested.

Selection criteria for re-introducing Przewalski's horses to the wild

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"Re-introductions should not be carried out as a means of disposing of surplus stock" (IUCN Guidelines for Re-introductions). Since re-introduction projects started in the beginning of the 1990s, zoos which bred Przewalski's horses (*Equus ferus przewalskii*) wanted to get involved. A re-introduction of captive bred animals into the wild always was and still is one of the ambitious goals of modern zoos because a successful re-introduction is the key argument to justify captive breeding programs. Adaptation to the wild is a stressful time for a captive born Przewalski's horse and only the strongest will pass this bottleneck on the way back to nature. Each individual horse needs to be carefully selected according to a predefined qualification list (genetic make up, health check, etc.). After the transfer, all of them need our full support and knowledge to help them survive the initial difficulties. This includes the careful composition of family groups with the greatest possible genetic variability and the right choice of the release site, to guarantee a high survival rate in order to achieve a self-sustaining population as soon as possible.

From species to ecosystem conservation – 10 years takhi reintroduction in Takhin Tal

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A private fund and the Mongolian Society for the Conservation of rare animals of the Ministry of Environment initiated the Takhin Tal Project with the support of various international sponsors. In 1992 the first group of captive born takhis were airlifted to the Takhin Tal site at the edge of the 9000 km^2 Greater-Gobi-B Strictly Protected Area (SPA) and International Biosphere Reserve. To date a total of 73 horses have been transported. In 1997 the first harem group was released into the wild from the adaptation enclosures and in 1999 the first foals were successfully raised in the wild. At present 74 takhis live at the Takhin Tal site with 50 horses belonging to 4 harems and 1-bachelor group ranging freely in the Gobi-B SPA. The Gobi-B is a cultural landscape and management aims to conserve it as a biosphere reserve in the sense of the IUCN. The vision is the integral protection of the Gobi habitat and the life style of the semi-nomadic herders. Establishing a permanent field station at the edge of the national park with the necessary infrastructure (solar power, laboratory, office, vehicles and petrol) and communication abilities (satellite based email and phone) has proven crucial to the development of the project. Initiating training possibilities for young Mongolian biologists and creating employment has resulted in well-trained and motivated local staff and essential project advocates. Starting out initially as a single-species reintroduction project, the magnitude of the activities has greatly expanded in recent years. Seen from a species perspective, research projects dealing with the Mongolian wild ass (*E. h. hemionus*), grey wolf (*Canis lupus*) and various rodent species have been implemented. Whereas the initial reintroduction efforts were by and large driven by veterinarians and biologists the disciplinary scope has also been significantly broadened with botanists and remote sensing experts involved with habitat mapping and assessment, community development experts establishing a socio-economic framework for future project development. Away from the field an important prerequisite for project advancement has proven to be the lobbying activities both in Ulaanbaatar and to the international community. Lobbying activities not only enhance information flow and political understanding for the project but also create collaborative opportunities and necessary alliances. Comprehensive interdisciplinary monitoring and research are the foundation for management decisions at the present but training and empowerment of local scientists and residents will constitute the future of this program.

Mortality of takhis in Takhin Tal

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Little information exists on causes of mortality prior to the implementation of a disease-monitoring program in 1998. Since 1999 all dead horses recovered (n = 28) have been examined and samples collected and submitted for further investigation. Equine piroplasmosis, a tick transmitted disease caused by *Babesia caballi* or *Theileria equi*, is endemic in Takhin Tal and was identified as the cause of death of four stallions and one stillborn foal. In December 2000, wolf predation was implicated in the loss of several Przewalski's horses. However, thorough clinical, pathological and bacteriological investigations performed on dead and surviving horses of this group revealed lesions compatible with strangles. The extreme Mongolian winter of 2000-2001 is thought to have most probably weakened the horses, making them more susceptible to opportunistic infection and subsequent wolf predation. Other occasional causes of death since 1999 were trauma, exhaustion, wasting, urolithiasis, pneumonia, abortion and stillbirth. The pathologic examination of the Przewalski's horses did not result in a definitive diagnosis in each case. Several disease factors were found to be important in the initial phase of the reintroduction, which could potentially jeopardize the establishment of a self-sustaining population.

Who is the boss? – Endocrinologic evaluation of re-introduced takhis in Takhin Tal – Implications and consequences

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Throughout a year faecal samples from four Przewalski's harem stallions and eight bachelor stallions were collected. Faecal extracts were analysed for immunoreactive androgen and oestrogen metabolites. Harem stallions secreted significantly higher levels of estrogens, testosterone and epiandrosterone than bachelor stallions did. For estrogens and epiandrosterone a seasonal pattern with higher levels in spring and summer when compared to autumn and winter was determined. The monitoring of faecal steroid hormone levels in Przewalski stallions is possible using estrogens, 17â-OH-Androstane and 17-oxo-Androstane assays. Using faecal samples instead of plasma the hormonal status of free-ranging Przewalski stallions can be evaluated in a non-invasive way. The results pertaining to the seasonality of hormone levels and the various faecal hormone levels in bachelor and harem stallions confirm previous findings of plasma testosterone and oestrogen levels in domestic and feral horses.

In addition to their effects on sexual differentiation and reproduction, sex hormones influence the immune system. Numerous epidemiological and clinical studies have noted differences in the incidence and severity of parasitic diseases between males and females. Sexually mature male vertebrates are often more susceptible to infection and carry higher parasite burdens.

According to literature, there is overwhelming evidence that sex-associated hormones modulate immune responses and consequently directly influence the outcome of parasitic infection. Males generally exhibit lower immune responses than female conspecifics. Specifically, humoral immune responses (i.e. antibody production by B-cells) are typically elevated in females as compared to males. Cell-mediated immune responses, in particular helper T-cells, also differ between males and females, with females exhibiting higher responses (i.e. interleukin production) than males.

In contrast to data that favour the immuno-suppressive effects of androgens, some studies argue that sexual differences in home range, rather than body size, are the more proximate mechanism of sex-biased parasitism. Mammals that traverse a greater area are exposed to a greater number of parasites, because they interact with more parasite habitat and with more individuals carrying infectious parasites. Because S*trongyles spp.* infect multiple host species, in the case of our study Przewalski horses, Dschiggetais and domestic horses, inter-specific interactions among hosts potentially play an important role in parasite transmission dynamics. In a study in 11 sympatric African bovids, individual parasite richness increased among hosts occupying habitats with higher numbers

of bovid species.

Data were collected from February until November in 2000. Some horses in the study year were treated with anthelmintic drugs and thus for data analysis results from these horses were excluded for 2 months after treatment. During the study year, two harem groups and a group of six bachelor stallions were released from adaptation enclosures in May, June, and July, respectively. Another harem group was kept within an adaptation enclosure throughout the year. Yet a further group (the Pas-group) was free-roaming and ranged throughout the reintroduction site for already 3 years. Small and large strongyles were quantitatively analysed according to the McMaster technique and egg counts per gram faeces were determined. Faecal extracts were analysed for immunoreactive androgen and oestrogen metabolites. Assays included 17-oxo-androstane (trivial name: epiandrosterone) and total estrogens.

The aims of this study were to analyse 1) whether endoparasite counts in Przewalski horses were correlated to faecal steroid hormone levels. We further analysed to what extent Strongyles 2) differ seasonally throughout the year, 3) differ between stallions and mares, 4) between harem stallions and bachelor stallions, 5) between pregnant and non-pregnant mares, and 6) whether parasite levels in group samples collected from the free-ranging group differed from the newly released groups.

Hormone levels and parasite counts varied significantly throughout the year. Maximum levels of parasites in both sexes were observed during May, June, July, August, September and October. Maximum hormone levels were observed between March and July, shortly before and during the breeding and birthing season. In general, the hypothesis of male biased parasitism was not confirmed, as parasite counts did not differ significantly between stallions and mares, and because the differences in parasite counts between bachelor and harem stallions were inconclusive. Bachelor stallions had lower steroid hormone levels throughout the year, and parasite counts in this group were significantly lower in July and August, compared to the harem stallions. However parasite counts between the two groups did not differ during September, October and November.

The most obvious and significant result was the difference in parasite counts between the Pas-group (that was already free-ranging for 3 years) and the groups that were released during the study year. Mean parasite counts per gram faeces during the May to September period were 1400 – 2200 in the Pas group and 750 – 1100 in the samples from the other groups. Our results thus indicate that rather than sex-biased parasitism, inter-specific interactions among hosts (Przewalski horses, Dschiggetais and domestic horses) are more important in parasite transmission dynamics. Differences in home ranges between the Przewalski horses that were released from adaptations enclosures and the free-ranging equid species, are a possible explanation for our findings, as was reported for African bovid species. Thus additional studies are required to determine to what extent habitat overlap is contributing to parasite infections in re-introduced Przewalski horses in Mongolia.