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Takhi's (*Equus przewalskii* Polj., 1883) home range and water point use

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Award

I presented my master thesis to the Scientific Conference of Master Students at the National University of Mongolia and got the second price of the Conference in November 2002.

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INTRODUCTION

The history of evolution of horse has lasted over fifty million years but domestication of this animal took only 8-10 thousand years. Takhi or Przewalskii horses (*Equus przewalskii* Polj.,1883) who are the ancestors of today's Mongolian domestic horses, lived in the Piedmont Gobi of Altai and Zuungaryn Gobi up to recent years, as noted by Mongolian and foreign researchers (Danzan,1993). During about 100 years of sending takhi from Mongolia to Zoos in foreign countries (Europe), takhi have been bred in 107 zoos of 23 countries in mild weather conditions and have become exhibit animals. Today about 2000 takhi are held in captivity all over the world.

Taking into consideration the fact that takhi were separated from their wild day to day live, returning takhi to the wild nature is the best way to preserve this genetic unique species. Therefore activities of reintroducing takhi have been organized in Mongolia by the Government of Mongolia jointly with the Christian Oswald Foundation (Germany) and the International Takhi Group (1999.05.03.) for the last 10 years.

The first matters to be solved, in connection with the reintroduction of takhi, were the matters of water and pasture land for takhi. With this in mind and with an aim to earn a master's degree, I have done this academic research on the topics of water and pasture land use for takhi and all other hoofed animals of the Gobi B Strictly Protected Area.

BACKGROUND OF RESEARCH

The takhi herd of the Takhi Research and Adaptation Center along Bijiin Gol (Bij River basin) have been under constant supervision of researchers i.e. in a semi-wild condition during the years of 1992-1997. That was a period of time to pay attention to acclimatization of the takhi which were just brought from zoos to Mongolia. During this period especially veterinary services, protection from death causes and animal husbandry matters were of main concern. The first herd was released to the wild from the adaptation enclosure in 1997. Though the matters on biology and ecology of takhi have been touched since that time, matters on water and pasture land had not been the focus of attention due to the fact that there has been just a small number of takhis feeding along Bijiin Gol since 1999.

I have chosen to focus on the importance and significance of research on water and pasture for reintroduction of takhi, and on research comparing takhi demands with that of khulan (*Equus hemionus*, Asian wild ass) and black-tailed gazelles (*Procapra subguturosa*) in the zone "B" of the Great National Park of Gobi. This is of special importance since the takhi population is constantly growing since 1999 and because of the possibility to release takhi into other parts of the park (Takhi Us, Baitag, Yolhony Gobi) – for this future perspective we need to know more about the use of water sources by takhi and have to study the dependence of other hoofed animal on this limited resource.

RESEARCH FOR THIS MASTER THESIS

In my research I have tried to show how the takhi, which have lost their wild status, are choosing and using water sources and pasture lands after release from the adaptation enclosures. The research describes herd dynamics and the capability of takhis to acclimatization to a free-ranging live over the years. The novelty of this research are the studies on feeding behavior and the use of water source and pasture land by takhi, khulan, black-tailed gazelles and domestic stock.

STUDY AREA

1.1 The Great Gobi National Park (GGNP)

The research has been done on the territories of Bij bag of Bugat soum and Altan Soyombo bag of Tonkhil soum of the Gobi-Altai aimak. Some research work was also carried out on the territories of Barlag bag of Altai soum of the Khovd aimak.

The Great Gobi National Park has been declared by Decree # 283 of the Presidium People's Great Khural in 1975 and it demanded certain measures to preserve and protect the native features, animal and plant life as well as create the frame to re-introduce and acclimate extinct species.

The GGNP is divided into two main parts indicated as "A" and "B". The part "A" consists of 4.419 million ha. and the part "B" consists of 881 thousand ha. and the total territory covers 5,3 million ha. land. The GGNP is the third biggest national park of the world national parks by its size of territory. By administration the part "A" of GGNP belongs mostly to the territories of Tsogt and Erdene soums of the Gobi-Altai aimak, the southern territories of Bayan-Undur and Shinejinst soums of the Bayankhongor aimak, whereas the part "B" of the GGNP belongs to territories of Bugat and Tonkhil soums of the Gobi-Altai aimak, the southern territories of Altai and Uench soums of the Khovd aimak.

1.2. Geographical location and geo-morphology

The study area belongs to part "B" of GGNP and is included in the Zuungar Circle and by its physical characteristics is part of the Front Gobi of Altai of the Great Gobi Region. The Zuungar Circle includes the western part of the Piedmont Gobi of Altai, i.e. territories locating between the branch mountains of the Altai range and Baitag group of mountains. The western side of the region reaches the national border to China and at the eastern side reaches the middle of Aj Bogd mountain range. The landscape is intermountain and surrounded by mountain ranges from north and south. The region is substantially lifted above the general sea level; the highest point is at 3100 meters and the lowest is at 1000 meters. (Tsegmid, 1969).

The climate of the region is characterized by dry and cool summer, cold and windy winters, and the region is considered to have peculiar harsh climatic features. The average annual temperature is 2-4°C, average temperature in January is -16°C with lowest temperatures around -40°C, average temperature in July is +18°C with highest temperatures of up to +40°C. Annual precipitation averages 44.5-100mm of which most falls as rain. The differences in the moisture regime between mountains and valley bottoms are minimal. The relative moisture is 51± 5% in June and 68±3% in January. One of the climatic peculiarities are high wind speeds, specially in spring, summer and

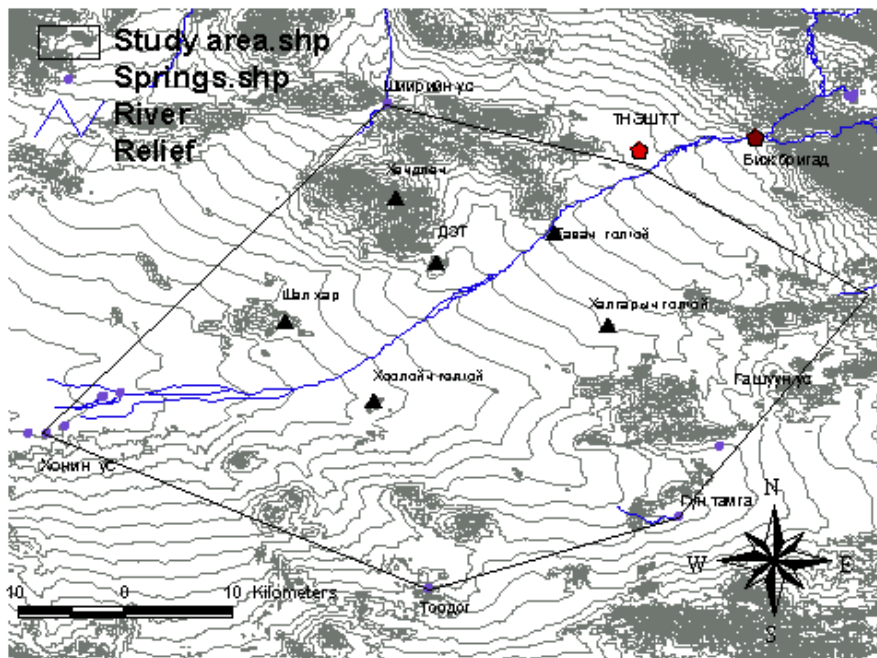
autumn, due to large differences in the day and night temperatures. The annual numbers of days with wind speeds of more than 15 meters per second is 15-20. (According to the meteorological center's information).

The soil of the region, as a result of the harsh climate condition, consists of sandy, gravelly, saline, dry, barren ground with dust flatter because of wind activities. In many places it is flatly covered with black gravel due to intensive sunshine.

1.3. Selection of study area

The borders of the research area had been defined before the research began (Fig.1). It included the takhi reintroducing centers, i.e. territories with total size of 1600 sq.km, including Bijiin Gol, Gashuun Us, Gun Tamga, Khairkhan Bulag, Toodog Us, Khoni Us, Shiiriin Us and the valleys bordering the Bijiin Gol. In some cases the takhi left the pre-defined research area and we had to follow them to get information, leaving the area of the pre-defined study area.

Fig.1: Study area (DTD - Dood Tsagaan Ders, DET - Dood Elsen Tolgoi).



The research region is located in the east part of the national park and this part gives wide possibility of getting valuable information on wild animals who's population is high in this part thanks to the absence of herdsmen. But during spring and autumn seasons herdsmen use the park and move to the water sources located in the study area. There are 8 springs and water sources on the research regions, which are very important for the animal life of the Gobi, especially the hoofed animals inhabiting the eastern part of the national park. These water sources are located comparatively close to each other, which creates suitable condition for feeding of wild animals. Most of the springs have constant water supply, but freeze in winter.

1.4. Flora

The features of vegetation of Zuungar district are widely reflected in "Synopsis on flora of the MPR" by Grubov (1955). After having searched the flora and vegetation of Zuungaryn gobi in 1980, E.A.Volkova and E.P.Rochkovskaya created a large scale vegetation map of the region. Takhiin Gol region where the research has been carried out is enrolled in Zuungariin circle and has 233 species of plants belonging to 135 genus and 42 families. 23.6 % (56 species) of these plants belong to the order of monocotylodons and 75.4 % (175 species) belongs to dicotylodons. From 1999-2001 A.Oyunbolor made research on the territories near Takhiin Tal and registered 184 plant species of 107 genus and 35 families. Dominant families were *Gramineae*, *Compositae*, *Leguminosae* and *Chenopodiaceae*. There are also 12 endemic species, 15 sub-endemic species and 27 species of native and semi-native vegetation in the territories near Takhiin Tal (Tserenbaljid, 1993).

Most of the land (70%) is covered with *Nanophyton erinaceum* - *Stipa glareosa* which are the dominating desert plants and *Haloxylon ammodendron-Reaumuria soongorica* which are the dominating vegetation of the genuine desert. The collected vegetation can be divided into 66 species medicinal herbs (35.8% of total vegetation), 18 species food herbs (9.7%), 21 species of soil protecting vegetation (11%), 15 species of decorative plants (8.1%), 18 species of poisoned plants (9.7%), and 117 species of fodder vegetation (63.5%). Among our collection the species *Hordeum turkestanicum* was newly registered in the Zuungryn Circle and the species *Aeluropus pungens* documented for the first time in Mongolia (Oyunbolor, 2002).

1.5 Fauna

The research region belongs to West Gobi Circle by its zoological geographical regionalization. 204 species of vertebrates have been registered in this region: 1 amphibian, 6 reptiles, 156 birds and 44 mammals (Sukhbat & Munkhtsog, 1991).

45-50% of the more than 30 protected animals listed in the red book of Mongolia, such as takhi, khulan, black-tailed gazelle, argali sheep (*Ovis ammon*), ibex (*Capra sibirica*), snow leopard (*Uncia uncia*) and the extremely rare birds like Altai snow cock (*Tetraogallus altai*) and bearded vulture (*Gypaetus barbatus*) live in the Gobi B National Park (Shiirevdamba, 1997).

1.5.1 Takhi (*Equus przewalskii* Polj.,1883)

It is considered that the takhi research basis have been laid by the end of the 19th century. Since the end of 1970s expeditions headed by N.M. Przewalskii, G. Potanin, M. Pevtsov, brothers Grumm-Grjimailo, P. Kozlov and M. Klements collected information about takhi's location, characters, color and bodies measurements from local peoples. In addition, they collected skins, skulls and bones of takhi from local hunters of the Zuungaryn Gobi.

By this time the Zuungaryn Gobi was the only place where the wild horse had survived. These very rear wild horses, inhabiting only a small piece of land, caught the interest of the Europeans. They began to catch takhi and transport them from their native land to breeding facilities in zoos. Since that time, detailed research on captive takhi have been carried out in Europe and America.

The Benerchikes searched and discovered the difference in the number of chromosomes between *Equus przewalskii* and domestic horse. The chromosomes of takhi are $2n=66$,

whereas for the domestic horse they are $2n=64$. Despite these chromosomal differences, *Equus przewalskii* and domestic horse can interbreed and produce fertile offspring (Boyd. L and Houpt. A, 1994).

The takhi is a keen-eared and very careful, very ferocious animal. It looks like a horse by external appearance, but is a little bit smaller and podgy. The body length is 220-280 cm, the head is big, the forehead is wide, it also has a wide chest, a short and fleshy neck, narrow legs, short and hard hair, and a tail length of 38-60 cm. (92-111 cm up to end of tail hair). The ears are shorter than khulan's (14-17 cm) and the mane is differed from domestic horse – it is strait without forelock. The weight of the takhi is up to 300 kg. The general body color is light bay and the lower part of body is smooth white. The chest has dark stripes, the mane and tail are black or dark brown, and the lower parts of the legs have dark stripes. In addition, a dark or dark brown stripe (Eal stripe) is visible along the back from mane to tail. The end of nose is white or whitish.

The Asian wild horses were distributed on the territories of Eastern Kazakhstan and on the wide pasture land located along territories of China and Mongolia in the 18th century. The takhi, defined by N.M. Przewalskii at the end of the 19th century, was only found in the Zuungaryn Gobi. The northern border of the former takhi distribution range was Urumch Gol, Piedmont Gobi of Mongol Altai (N 46), the eastern border was Aj Bogd mountain (E95), the southern border was the north site of Tian-Shian mountain (N44), the western border reached Manas Gol (E86). By the 1840s the takhi areal had been reduced by half. By the 1930s and 1940s the wild horse were only left on the territories bordering the southwestern steppe of the Mongol Altai range, the eastern branches of the Khuvch range, the southern mountains from Baitag Bogd to the Takhiin Shar Nuruu range. One or several *Equus przewalskii* separated from their herds were seen by research expeditions and local people only in the Zuungaryn Gobi in the years from 1950-1960. The last takhi (stallion) was seen at water source of Guntamag Us in 1969.

MATERIAL AND METHOD

2.1. Aim and Purpose of the Research

The purpose of this research was to study and discover matters connected with the choice of pastures during feeding, the use of water sources, pasture and water source site fidelity and other related matters.

1. Identification of the role of water sources in the pasture land utilization by the takhi herd released into the wild from the Takhi Reintroducing Center at Bijjin Gol:
 - ◆ Identification of constantly used water sources and water points by each herd
 - ◆ Identification of preferred pastures and home ranges
 - ◆ Mapping of water points and locations of water sources
 - ◆ Timing and frequency of drinking by takhis in respect to climate, season and other reasons
 - ◆ Pasture utilization by herds of takhi, sizes and borders of pastures, changes and movements

2. Possibilities of expanding the present borders of takhi pastures based on water availability for the reintroducing of takhi:
 - ◆ Acclimatization of takhi to new land (depending on location of water source, human and their livestock, pasture condition and the presence of other wild animals)
 - ◆ Identification of factors associated with choosing water source and pasture (Honi Us, Takhi Us, water sources of Yolhkhon Gobi). Changes of behavior and structure of herd.

3. Influence of khulan, black tail gazelle, and domestic herds which are using the same water sources and pastures as takhi - define the relationship between the animals:
 - ◆ Changes in the numbers of khulan and black-tailed gazelle depending on water availability and pasture quality
 - ◆ Study of movements, utilization of pasture and feeding of khulan, which is similar to takhi by its ecological niche and may be competitor
 - ◆ Features of water source utilization by domestic animals
 - ◆ Possible competition over water sources and pasture land between takhi, khulan, black tail gazelle and domestic animals

2.2. Methods of the Research

The research has been conducted using the following simple scientific methods; however, in a few circumstances more complicated techniques were applied:

1. Traditional methods such as **observing and writing down the observations** were used for the most of research on herds of wild animals (takhi, khulan, black-tailed gazelle).
2. The study of foot prints on the dirt were used for defining the time and frequency of drinking by takhi herds. In order to establish the frequency and timing, old print were erased. In order to distinguish between takhi foot prints and khulan foot prints, we learnt takhi prints left near the takhi adaptation enclosures.
3. In order to define influence of khulan, black-tailed gazelle and domestic animals on the pasture used by takhi we counted all other hoofed animals using binoculars or by transect methods.
4. With the aim to use biological and ecological knowledge of local people about khulan and black-tailed gazelle, we have carried out a questionnaire study among the local herdsman.
5. We also documented the utilization of water sources and pastures by domestic animals as well as the time and frequency of confrontations between domestic and wild animals.

In order to carry out our observations we chose a mountain peak or the highest point of the landscape so that the wild animal herd couldn't notice the observers. In our research we used cars, motorcycles, horses, bicycles and if necessary also hiked a long distance to observe the objects. For most observations we used a "Swarowskii" type telescopes. All observation was made during a certain time of the day for a certain herd and noted down in the results.

2.3. Duration of the Research

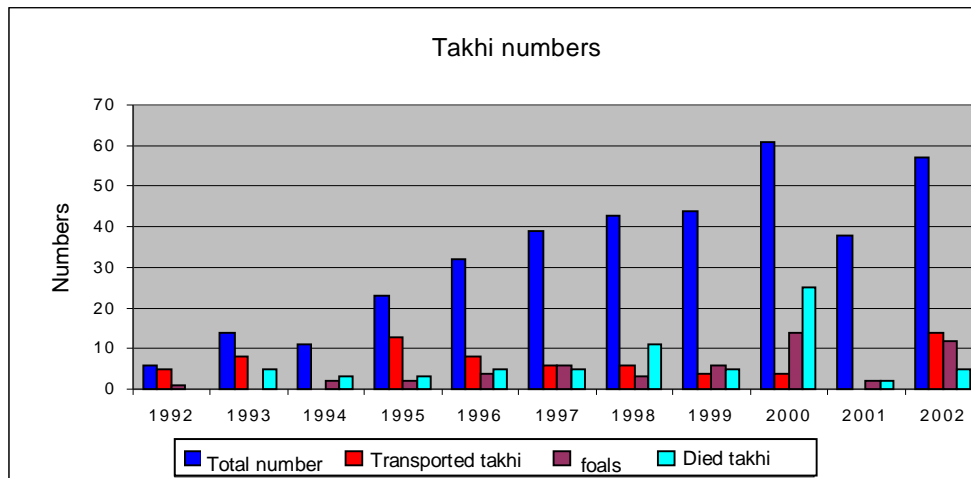
The research was conducted in the years 1999-2002 and the time period was broken down in 2 stages and for the 4 seasons of the years.

RESULTS

3.1. Number of takhis and takhi herd composition

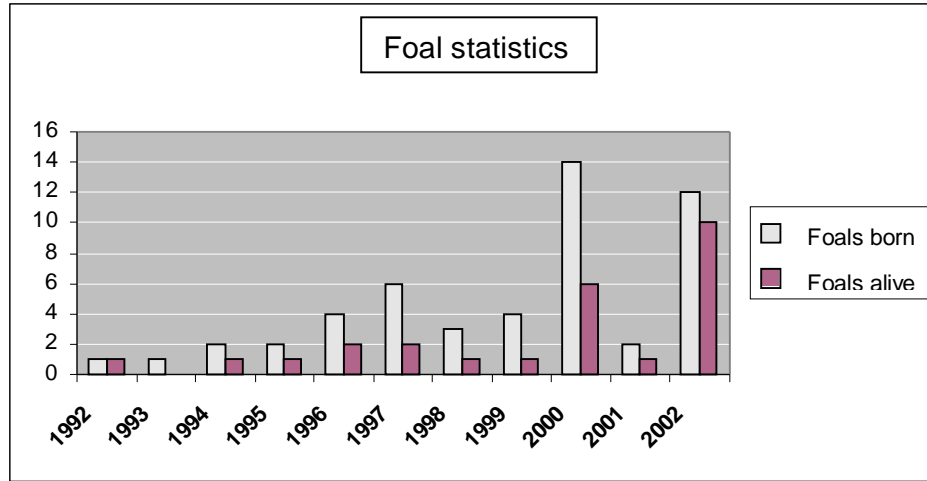
The work on re-introducing Mongolian takhi to their native land was initiated by Mr. Christian Oswald, citizen of Germany, and adaptation enclosures and food storage facilities were built in 1991. On 6 June 1992 the first 5 takhi (2 stallions and 3 mares) arrived in Takhin Tal, Mongolia. On 22 September of that same year a mare named "Bij" gave birth of a female foal who was names "Ugan" - symbolizing the first reintroduced foal born on Mongolian soil. Ten years have passed since that time and the takhi have already acclimatized and many more foals have been born. During the passed years, with the exception of 1994 and 2001, more takhi were flown in from zoos and national parks of different European countries once a year in early summer.

Fig. 2: Takhi numbers in Takhin Tal, Gobi B.



The above graphic shows the growth and the re-introduced takhi population. The highest number of takhi was reached with 61 heads in 2000. However, due to the hard winter 2000/1 and wolf predation we lost up to 40% of the takhis during this winter. The remaining 60% have become the selected herd with an ability of surviving hard winter conditions and the attacks of predators. Since 1992 the takhi population has constantly increased thanks to the continuing takhi transports from abroad.

Fig. 3: Reproduction and foal mortality.



The above graphic shows the number and survival of foals born in Takhiin Tal. Over the last 10 years 54 foals were born, but only 24 (42%) survived, which was not such a good result. Among the foals born in Mongolia, stallions "Tuulai" and "Mundel" have become harem stallions and are in charge of their own herds. Of the mares that have born foals, "Uugan" gave birth 5 times, "Toodog" 3 times, "Tsagaadai" 3 times, "Khongoroo" 2 times, and "Misheel" 1 time.

Recently there are 57 takhi living in the Takhi Tal, among which 36 takhi in 4 herds are free-ranging. One herd consisting of 8 takhi is permanently kept as a breeding group in the enclosures. In 2002 14 new takhi (one of them died) have been transported from Europe. They will be kept separate in a stallion and mare group until the end of the year.

3.2. Water supply for takhi

Takhi drink from the river and other water sources during all seasons of the year, except in winter time. Sometimes they drink stagnant water of melted snow (e.g. Pas group in April 2000). During the period when water is available in the form of snow and ice, herds use the most distant pastures from any water source.

During the warm seasons Bijjin Gol river supplies the fenced takhis with water. However, during July and August of 2000, 2001, 2002 the dams water reserves were fully dried up. During these periods takhis were watered with water transported to the adaptation enclosures. The wild herds had to move to the water sources of Shiiriin Us, Gun Tamga, Gashuun Us. They sometimes even used water ahead of Bijjin Gol river, passing by Bij village, to reach the water of Gunangiin Gol. At this river many herdsmen spend the dry season.

Takhi are drinking daily in spring and autumn and are drinking every other day during summer, when the vegetation is still green and rich in water content. However, the newly released herds Uyench and Shonkhor used to drink 2-3 times a day when it was very hot – a sign that they were not yet well adapted to live in the desert. Compared with khulan and black-tailed gazelle, takhi use a water source very conservative – that is they do not easily switch between different water sources: drinking frequency, presence

in the same place and movements to another place are much depend on season, weather changes and pasture conditions.

3.2.1. The Water sources used by wild takhi

Every takhi herd has a different drinking frequency and drinks from different water sources. All takhi herds drink water of Bijiiin Gol river during spring and autumn. In the summer time Pas group used water of Gun Tamga, whereas Mundel group used water of Shiir Us and Tuulai group and Bachelor group drank water from Bijiiin Gol. During some winters the herds fed near Choni Us in the Gobi, but it is not clear if they drank water from the springs at this place, or merely ate snow.

3.3. Utilization of Pasture

During my research the takhi herds used a variety of different pastures. However, as compared with khulan and black-tailed gazelle, takhi have a weak ability to feed far from the water sources and hence are somewhat more restricted to move in accordance with the vegetation conditions – they rather tend to feed on the pastures they already know.

The most recently free-ranging herds tend to feed near 5-hills at the end of Bijiiin Gol river during most of the year and drink water from Bijiiin Gol and Gun Tamga during summer and autumn seasons. Snow fall normally begins at the end of November, resulting in snow covered pastures. During this time takhi tend to leave the stipa pastures and move to pastures with saxaul bushes and other kinds of grasses growing near Choni Us and Khurgaljin.

The pastures used by takhi herds between 1999-2002 show that herds seem to feed in the same places from year to year, however they do move from pastures with dry grasses to pastures with woody plant in the winter time.

DISCUSSION

We have to pay special attention to the takhi winter pastures – takhi should adapt to the harsh winter conditions as well as khulan and black tail gazelle. Otherwise, the disaster of the winter 2000/1 might happen again. However, it will be difficult to teach the takhi herds to follow the westward migration of khulan and black-tailed gazelles during winter season. Therefore it is important to train and/or release takhi herds to places like Choni us, Takhi Us, Yolkhon. It will be also important to teach them places like Baitag Bogd, Khavtag, Khukh Under etc., where there are very good winter pastures. This is not a work to be done within a short period of time, but it is clear that this must be the goal of the future. In this respect:

Let the takhi herds breed and let there be a lot of them!

CONCLUSION

1. Ten years have passed since the reintroduction of takhi into their native land and takhi have already adapted to the new environment and began to feed in the wild. Free-ranging takhi need daily access to open water in spring, summer and autumn seasons, but are capable of moving between two water sources.
2. The drinking frequency of takhi, longevity of staying in one water source and migration between home ranges depend on the following factors:

- ◆ Season
 - ◆ Weather
 - ◆ Location of human and their livestock
 - ◆ Time since release from the enclosure
 - ◆ Other takhi herd location, time and frequency of drinking
 - ◆ Distance to water source from the herd pasture
 - ◆ Pasture condition near the water source
3. Takhi herds come to drink water during any time of the day, but need to drink every day during spring and autumn. The stallion group normally drinks water at a different time than the other herds. It was noted that the established Pas group and Bachelor group drank water every day or every other day during the summer grass season, while the newly released Shonkhor and Uench groups drank water 2-3 times a day.
 4. Takhi are **social** animals that live in herds and utilize a herd home range. The first own pasture for most takhi is the adaptation enclosure. Takhi herd are feeding in a distance from each other, each group choosing a different **home range**.
 5. The ability of choosing an own home range after release seems to depend on the following factors:
 - ◆ Time since release into the wild
 - ◆ Group composition, namely if the group has a member that had been living in the wild before
 - ◆ Weather condition
 6. The first **choice** of home range by the herd will depend on following:
 - ◆ Location of other herds' home range (dominant herd)
 - ◆ Water source distribution
 - ◆ Human and livestock presence and pasture condition
 - ◆ Behavior of the stallion and the leading mare
 7. Acclimatization of takhi to wild pasture begins with feeding on the banks of river, fields and meadow with grasses dominated by broomgrasses as the pasture in the enclosure is dominated by such grasses. From time to time newly released takhis choose also pastures with feather-grass, saxaul and other bushes. The location and sizes of the herds' home range changes by seasons. During the mating season the border of the territories are guarded with keen care and different herds use different water source. If the same water source is used, it happens during different times of the day.
 8. The takhi harem stallions mark their territories with dung. They constantly drop duns when they meet an other stallion or on the border of their territory.
 9. Khulans and black tail gazelles use water sources constantly during spring and autumn and drink every day or every other day. However, in summer, especially when the pasture is rich in feather-grass and onion type vegetation, black-tailed gazelles almost don't drink water. Both species are migratory and move to the western part of the park in winter time.
 10. The water points such as Bijiin Gol, Honi Us, Toodog, Gun Tamga, Shiiriin Us are considered the most important water sources for wild animals.
 11. Sociological studies have been conducted with 42 herdsman and we gathered information on the number of wild animals, their drinking behavior and pasture use.

12. Taking into consideration the importance of the location of water source on pastures use and acclimatization of takhi to a new environment, we propose to move some of the new takhi herds to Choni Us and suggest further re-introductions towards Yolkhon, Tsonjiin Gobi, Baitag and Khavtag – the latter places are all supported by Takhi us’s water source.

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