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Vegetation in the vicinity of Takhin Tal area

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Preface

One of the protected areas that rank at top level in their territorial sizes and conservation significance at nationwide and worldwide is Great Gobi Strictly Protected Area (SPA).

Mongolia is the developing (industrializing) country that is divided into greatly differentiated natural zones and covers relatively vast territories and has well preserved its natural conditions in comparison with other countries in the world. Great Gobi SPA lies in the southwest of the country and is included into the gobi desert region and consists of "A" and "B" zones.

According to research sources the vast area of the country was widely inhabited by Takhi (or Przewalski's wild horse) in the beginning of the XXI century, however, the number of the species had drastically decreased since 1940 furthermore the species had rarely been seen since the end of 1950. By the end of 1970 the species had totally disappeared from its habitats.

Takhi that became extinct in the wilderness was seen only in the zoo in fewer numbers those were brought from Mongolia several years ago. In order to save the species from its extinction the reintroduction and conservation of the species in its wilderness has become one of vital issues raised at the international level. The project site for reintroduction of the species is the territory of Bugat soum of Gobi-Altai aimag where herds of Takhi were abundantly found, however they are not seen nowadays. There are some areas named after Takhi such as Takhi Tal / Takhi Steppe, Takhi Shar Nuruu / Takhi Yellow Mountain range, Takhi Us / Takhi Water, and Takhi Ulaan Khad / Takhi Red Rock in the soum territory. The areas are now distributed by hundreds of herds of Khulan and therefore the areas are regarded as one of the original habitats for wild horse.

Great Gobi SPA, called Zuun Garun Gobi, is totally 881 thousand ha area and 1500 km far away and to the west of Ulaanbaatar, capital city of Mongolia. Takhi has been reintroduced in the zone "B" under assistance by German, Austria and Swaziland.

Justification

Prior to reintroduction of any species, preliminary studies on the ecosystem should be conducted and direct / indirect and positive / negative ecological impacts on the species have to be properly identified.

Over past years, untouched vast areas in the gobi region have been used for grazing of domestic livestock as a result the unique ecosystem has been deteriorated, moreover some plant and animal species are likely to be decreased even some of them have been threatened with extinction.

Therefore, the conservation of rare species and reintroduction of endangered species in Altai Ovor and Zuun Garun gobi region are inevitably necessary.

Relating to this, comprehensive studies on vegetation covers and pastureland in the region should be carried out.

Takhi Tal / Takhi Steppe according to the vegetation-geographical classification, lies in the Zuun Garun gobi desert circuit.

The proper use of pastureland and in particular reintroduction of rare species require more detailed geo-botanical map of the vegetation covers of the target areas. Currently there is only a vegetation map of Mongolia with a scale of 1:1500000 available. This map has a scale of 150 km per one centimeter. Nevertheless, the proposed area to study is 43:45 that is impossible to read from the vegetation map of 1:1500000 scale. Therefore, we are proposing to make / produce a vegetation map of 1:100000 scale.

Study Purpose:

To produce / make the vegetation map of Takhi Tal /Takhi Steppe is a main task of our study work. Within the framework of this work the following objectives are to be achieved:

1. Determine and classify plant species composition in the area
2. Conduct comprehensive studies on vegetation and its cover and produce a geo-botanical map.

Natural features of the study area

Geographical location:

According to the vegetation – geographical region classification Takhi Tal / Takhi Steppe lies in the Zuun Garun circuit, that is the “B” zone of the SPA. The area lies in the vast valley that is surrounded by continued mountain ranges of Mongol Altai, Khuld and Alag Khairkhan (3739 m) to the north and by the Takhi Shar Nuruu/ Takhi Yellow Mountain range to the south. The steppe is located between 092°30' and 093°50' E and 45°10' and 45°50' N (Map 1).

The study area belongs to the western dry sub-region of Altai Ovor Govi region of the Central Asian Great region according to the geo-morphological region classification. Topography and natural features of this region is generally similar to that of Altai Ovor govi, however the region is characterized by its abundance of continued mountain ranges those are affiliated to Tyani-Shani mountain system and rolling hills with gobi features. The area is dominated by plains with relic low mountains, rolling hills, and tussocks. Under the desert natural processes of fading the mountain tops became pointed, mountain slopes became steep, and fundamental rocks became conspicuous as well as cliffs and straight rocks were formed. Mountain slopes were deteriorated by flooding water as a result numbers of ditches / ravines were created. Mountains are at the elevation of 1500-2500 m a.s.l. For instance, Ilmen and Serven Mountains are at 2049 m, Sheree Khairkhan at 2086 m, Duut Uul 2468 m, Khondlon Uul at 1978 m, and Tangadun Khar at 1884 m etc. The elevation rates for tussocks are from the lowest 20-30 to the highest 100 m a.s.l. The area, where malleable / light stone,, rocks are found, is dominated by mountains with smooth / shiny tops and sloping (slanting) slopes, whereas the area where hard stones , rocks are found is dominated by rocky mountains with moderately pointed tops and moderately steep slopes (Tsegmid 1969).

Climate and Hydrology (meteorological data 1994-2001)

According to the climatic classification the area lies in the zone of dry, cool summers and medium severe winters. The mean temperature in January is –

16° C the coldest temperature is about – 40° C. The mean temperature in July is + 17° C and the hottest temperature is up to +40° C. The annual mean precipitation amount is 41.5 mm.

Mean air temperature and precipitation (1994-2001)

Table 1.

| Years | Mean air temperature C° | | Precipitation (mm) |
|-------|-------------------------|------------------|--------------------|
| | Summer (July) | Winter (January) | |
| 1994 | 15.4 | -14.4 | 32.4 |
| 1995 | 16.1 | -16.6 | 76.8 |
| 1996 | 18.3 | -18.2 | 45.6 |
| 1997 | 16 | -14.8 | 91.2 |
| 1998 | 16 | -17.8 | 69.6 |
| 1999 | 18.6 | -14.1 | 74.4 |
| 2000 | 18.5 | -18.2 | 58.8 |
| 2001 | 17.4 | -16.2 | 49.2 |

Indicators of air temperature and humidity (2001)

Graph 1.

One of the specific climatic conditions is higher wind velocity especially in springs, summers and autumns depending on marked differences in diurnal temperatures: the warmest temperature during day time and the coldest temperatures at night time. The number of days with wind velocity above 15 m/sec is 15-20 days per annum.

Because of dry climate, low rainfall and higher evaporation the area lacks in surface water resources. There are few springs such as Khonin Us, Shiiriin Us, Gun Tamgiin Bulag, Khaikhan Bulag, Toodgiin Us, and Bijiin Gol those are mostly used by humans and livestock for their drinking water. In the proximity of these springs there are some dry and swampy salt marshes and they are mostly fed up by snow and rainwater.

Soil

Soil-geographical classification the Zuun Garun govi lies in the desert zone with desert brown gray and desert steppe brown types of soil as well as a type of soil with salt marsh. This zone lies in the western part of Altain Ovor Govi or the Baruun Khuurain depressed area that is located between continued mountain ranges of Mongol Altai and a group of Baitag Mountain ranges.

To the south of the zone and along the state border there are some mountain ranges such as Baitag Bogd, Baga Havtag, Ikh Havtag, and Takhiin Shar Mountain ranges that are at the elevation of 2100-3100 m a.s.l. The back

slopes of these mountains are distributed by desert steppe brown and light brown types and the mountaintops by brown type of soil as a sign of vertical zone is found. The Baruun Khuurain vast depressed area with plain surface is dominated by desert brown gray type of soil and quite big area in the central part of the depressed area is occupied by salt marshes / solonchok. Additionally, the southern slope and bottom parts of Mongol Altai Mountain range is distributed by desert steppe brown soil in the narrow strip.

Valleys between some rivers such as Bulgan, Uench, and Bodonch mounted from the Mongol Altai Mountain range are occasionally distributed by desert steppe meadow-brown soil (Dorjigotov 1976).

Types of soils found in Takhin Tal are featured by their light sandy, pebbly, marshy, dry conditions and lower levels of nutrients. Additionally, light parts of soils are removed by wind; the outer parts of soils are withered by sun and evenly covered by pebbles turned into black.

Most parts of the study area are distributed by desert gypsum brown gray soil. The dominant type of soil is sandy soil with pebbly covers that is subject to erosions. The valley along Bij river, where Takhi is reintroduced, is distributed by soil with conspicuous salt marshes (in the area of 380-400 m in width). Moreover, the area is distributed by desert steppe light brown soil with pebble and stony/rocky covers (Dariimaa 1999).

Fauna species

The project focal area according to the geographical region of fauna lies in the Western Govi region. There are 204 vertebrate species recorded in the area. There are Takhi, Khulan, black-tailed gazelle and Altai Snowcock listed in the Mongolian Red Book and Black Vulture and Bearded Vulture as well as endangered species such as 45-50 % of about 30 protected animals in the country found in the area.

According to the latest inventory findings obtained by researchers the area included in the Zuun Garun Govi region is distributed by 61 mammals among them two insectivores, four chiroptera, four lagomorpha, 32 rodents, 13 carnivores, two perissodactyla, and four artiodactyla (Monkhtsog 1991).

The area where we conducted our surveys is distributed by Khulan (*Equus hemionus*), black-tailed gazelle (*Gezella subgutturosa*) and Takhi (*Equus przewalskii*) from Ungulates and Grey Wolf (*Canis lupus*), Red Fox (*Vulpus vulpes*) and Manul (*Felis manul*) from carnivores and all types of domestic livestock.

Economic activities

Takhiin tal and Big bags of Bugat soum have over 150 households. Over 60 or 40 % of the households engage in animal husbandry and the remaining households engage in crop cultivation in the valley of Bij River. The project focal area covers some water points such as Gun tamga, Toodog, Gashuun bulag, Khonin Us, Shiiriin Us and Bij rivers important for seasonal movements of wildlife and domestic livestock in the area (Map 20). Over 40 households from 60 herder households and 60% of the total livestock reside along the water points above in springs and autumns and spend winter in Takhiin shar Mountain ranges.

According to informal information by herders the area is grazed by 18206 heads of livestock including 876 horses, 347 camels, 187 cattle, 6732 goats and 10064 sheep as stated at the end of 2001.

Enclosed grazing areas for Takhi

There are five enclosed grazing areas covering 189.9 ha area for Takhi. The enclosed area #1, covering 23.5 ha area, was built in 1994, the enclosed area #2, covering 109.2 ha area, built in 1992, the enclosed area #3, 20.6 ha area, in 1996 and the enclosed area #5 5.90 ha area in 1996.

Associate Dr. Monibazar (1996) studied and determined vegetation types in enclosed areas for Takhi. The enclosed areas include river valleys, and riverbanks that are dominated by Nanophyton erinaceum, Achnatherum splendens communities. Additionally the researcher identified numbers of communities found in the areas.

Vegetation types in the enclosed areas are specifically formed depending on specific conditions of topography, humidity, and impacts of humans and livestock in the areas. For instance,

1. Saline and clayish types of soil are distributed by forb-sedge communities, among them *Potentilla anserina*, *Leymus chinensis* etc are dominated. 70 % of the ground surface is distributed by the species and mean height of growth of species is 13 cm.
2. Areas outside from the riverbanks are distributed by heavy clayish desert gobi brown gray soil that is distributed by *Achnatherum splendens* – *Atraphaxis pungens* community. The communities are found in enclosed areas # 1,2 and 3. 20-40 % of the ground surface is distributed by the communities that include *Nanophyton erinaceum*, *Ajania fruticulosa* those are found widely and in numbers in the areas close to riverbanks.
3. Some parts of the enclosed areas #3, 4 and 5 are distributed by ... communities. Because of an abandoned crop area in the area the main vegetation types have been replaced by distributions of *Artemisia dracunculus*, *Acroptilon repens*, *Zygophyllum pterocarpum*, and *Medicago falcate*, and the northern part of the area is dominated by *Nanophyton erinaceum*, *Stipa glareosa*, *Anabasis brevifolia* in large numbers that form the next community.
4. Flat plains and riversides are distributed by heavy clayish brown gray soil where .. community is found. Dominant types of vegetation in the area are *Nanophyton erinaceum*, *Stipa glareosa*, *Artemisia terrae-albae*, *Allium mongolicum*, and *Ajania fruticulosa*. 30-40 % of the area is covered by the species (Dariimaa, Otgonsuren 1999).

Study Methodology and findings

Vegetation studies were conducted in June, July and August 1999 and 2001 in water points such as Bij River, Gun Tamgun Us, Toodogiin Us, Khonin Usnii Govi, Shiiriin Us, Yolkhonii Khooloi and Takhi Us and mountainous areas such as Khondlon, Ilmen-Serven, Tangadun Khar, Shiree Khairhan, Tavan Tolgoi, Tovhon Huren, Khaltarun Tolgoi, Taliin Tolgoi, Gashuunii Khar, Huren Del, and Sharun Serven and specifically selected areas such as Takhiin Tal and maintained comprehensive studies on plant species found. Within the studies

500 sheets of records on plant species collection were obtained. The sheets were analyzed and scientific names of species in the collection were determined in the laboratory of Institute of Biology under the Academy of Sciences. In order to determine vegetation covers in Takhiin tal area geo-botanical records were maintained in over 60 plots / points under the Brown –Blank assessment. For maintaining the records one sq. m and 10 sq. m areas were selected and plant composition, abundance, and growth rates/ phases and heights were determined and recorded. The recording was maintained by five-score system. For example,

- Above 75 % or 3/4 of the selected area is covered by the species - 5
- 50-75 % or 1/2-3/4 of the selected area is covered by the species - 4
- 25-50 % or 1/20-1/4 of the selected area is covered by the species - 3
- 5-25 % or 1/20-1/4 of the selected area is covered by the species or individuals in large numbers but covered the area less than 1/20 % - 2
- The species abundant, but covered the area less than 1/20 % - 1
- The species, rare and no covers within the selected area - +
- Species in 1-2 numbers -R

Densities of species within selected areas were estimated by naked eyes. Within maintaining geo-botanical records the following phases of growth in accordance with their morphology:

Growing season

| | |
|-------------------|---|
| Pre-blooming | & |
| Start of blooming | C |
| Blooming | O |
| End of blooming | * |
| Seed development | ^ |
| Fading out | # |

Separated points / boundaries of communities were determined by using GPS and recorded in the map of 1:100000 scale.

Flora species

Flora species in desert zone in Mongolia is greatly distinct from those in cool zones and southern part of Eastern Asian region.

The area for reintroduction of Takhi, Bij river valley of Bugat soum of Govi-Altai aimag lies in the eastern zone/ part of Zuun Garun Govi region of Zuun Gar – Turan desert Khoshun Asian desert region according to vegetation – geographical region classification. The vertical zonation of vegetation types recorded in Baitag Bogd, Ikh Khavtag and Takhiin Shar of Mongol Altai Mountain range in Zuun Garun Govi vicinity is included in the zone of moderately dry (drought) type and lies in the Zuun Gar Northern Tyanishani division. Among steppe vegetation types found in middle parts of the mountains the Kazagstan and western Mongolia steppe plant communities are dominated, whereas among semi-desert vegetation types found in slopes of the mountains the Northern Turan-Zuun Garun communities are dominated (Ecosystem of Mongolia). Vegetation in Zuun Garun Govi region varies because of diversity of its physical features. The Zuun Garun zone. The area / zone is distributed by the species from different parts of areas. The Zuun Garun zone / circuit occupies 1.62 % of the total territory of Mongolia (Ulziikhutag 1989).

Species composition

Numbers of flora species in Zuun Garun Govi zone were differently recorded by researchers / scientists. For instance, Grubov (1982) recorded 438 species of 200 types of 51 families. I.A. Grubanov (1996) recorded 930 species of 279 types of 69 families.

G. Tserenbaljid (1991-1992) recorded 204 species of 135 types of 42 families in Takhiin Tal region and determined economical values of plants such as medicinal, food, anti-sand movement / soil protection, content of chemical substance-ether, technical, livestock fodder, and poisonous values.

There are 113 medicinal plants, 83 bee plants, 16 species with ether substances, 15 food plants, 33 poisonous plants, 2 technical plants, 12 decorative plants, and 7 anti-sand movement and soil protection plants.

According to our studies 184 species of 107 types of 35 families were recorded in the 1700 sq.km area in the proximity of Takhi Tal. The study area occupies 6.7% of the Zuun Garun Govi territory and compositions of total species recorded comprise 38 % of the species recorded by Grubov in this region.

A List of vascular plants recorded in Takhi Tal area

Table 2

| No | Families | Types / genus | Species |
|----|------------------------|---------------|---------|
| 1 | <i>Equisetaceae</i> | 1 | 1 |
| 2 | <i>Ephedraceae</i> | 1 | 3 |
| 3 | <i>Juncaginaceae</i> | 1 | 2 |
| 4 | <i>Graminaceae</i> | 13 | 27 |
| 5 | <i>Cyperaceae</i> | 3 | 5 |
| 6 | <i>Jungaceae</i> | 1 | 1 |
| 7 | <i>Lilaceae</i> | 2 | 3 |
| 8 | <i>Iridaceae</i> | 1 | 1 |
| 9 | <i>Polygonaceae</i> | 4 | 9 |
| 10 | <i>Chenopodiaceae</i> | 15 | 24 |
| 11 | <i>Caryophyllaceae</i> | 1 | 1 |
| 12 | <i>Ranunculaceae</i> | 2 | 3 |
| 13 | <i>Cruciferae</i> | 4 | 6 |
| 14 | <i>Crassulaceae</i> | 1 | 1 |
| 15 | <i>Saxifragaceae</i> | 1 | 1 |
| 16 | <i>Rosaceae</i> | 1 | 3 |
| 17 | <i>Leguminosae</i> | 12 | 16 |
| 18 | <i>Geranieae</i> | 1 | 1 |
| 19 | <i>Zygophyllaceae</i> | 3 | 7 |
| 20 | <i>Tamaricaceae</i> | 2 | 3 |
| 21 | <i>Linaceae</i> | 1 | 1 |
| 22 | <i>Cynomoriaceae</i> | 1 | 1 |

| | | | |
|----|-------------------------|-----|-----|
| 23 | <i>Umbelliferae</i> | 2 | 2 |
| 24 | <i>Primulaceae</i> | 2 | 2 |
| 25 | <i>Gentianaceae</i> | 1 | 2 |
| 26 | <i>Apocynaceae</i> | 1 | 1 |
| 27 | <i>Convolvulaceae</i> | 1 | 2 |
| 28 | <i>Boraginaceae</i> | 2 | 2 |
| 29 | <i>Labiatae</i> | 3 | 3 |
| 30 | <i>Scrophulariaceae</i> | 3 | 4 |
| 31 | <i>Orobanchaceae</i> | 2 | 3 |
| 32 | <i>Plantaginaceae</i> | 1 | 2 |
| 33 | <i>Rubiaceae</i> | 1 | 1 |
| 34 | <i>Plumbaginaceae</i> | 2 | 3 |
| 35 | <i>Compositae</i> | 16 | 37 |
| | <i>Huūm</i> | 107 | 184 |

From the table above dominant families are Compositae, Graminaceae, Chenopodiaceae, and Leguminosae that are 52.3 % of plant types and 56.5 % of the species recorded in the area.

Economical values of plants recorded in the area

Economical values of 184 species mentioned in the table above are given as follows:

| № | Species | Medicinal | Soil protection | Food | Decorative | Poisonous | Fodder plants | | | | |
|----|-------------------------------|-----------|-----------------|------|------------|-----------|---------------|--------|-------|------|-------|
| | | | | | | | Horse | Cattle | Sheep | Goat | Camel |
| | | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | <i>Equisetaceae</i> | | | | | | | | | | |
| 1 | <i>Equisetum arvense</i> | + | | | | | + | + | | | |
| | <i>Ephedraceae</i> | | | | | | | | | | |
| 2 | <i>Ephedra Przewalskii</i> | + | + | | | + | | | | | + |
| 3 | <i>Ephedra sinica</i> | + | + | | | + | | | + | + | + |
| 4 | <i>Ephedra intermedia</i> | + | + | | | | | | | | |
| | <i>Juncaginaceae</i> | | | | | | | | | | |
| 5 | <i>Triglochin maritimum</i> | + | | | | + | + | + | + | + | + |
| 6 | <i>Triglochin palustre</i> | + | | | | + | | | + | + | |
| | <i>Graminaceae</i> | | | | | | | | | | |
| 7 | <i>Achnatherum splendens</i> | + | | | + | | + | + | + | + | + |
| 8 | <i>Ptilagrostis Pelliotii</i> | | | | | | + | + | + | + | |
| 9 | <i>Stipa glareosa</i> | | + | | | | + | + | + | + | + |
| 10 | <i>Stipa orientalis</i> | | | | | | + | + | + | + | |
| 11 | <i>Stipa sareptana</i> | | | | | | + | + | + | + | + |

| | | | | | | | | | | | |
|----|---------------------------------|---|---|---|---|--|---|---|---|---|---|
| 12 | <i>Stipa gobica</i> | | + | | | | + | + | + | + | + |
| 13 | <i>Alopecurus arundinaceus</i> | | | | | | + | + | + | + | + |
| 14 | <i>Agrostis gigantea</i> | | | | | | + | + | + | + | |
| 15 | <i>Agrostis stolonifera</i> | | | | | | | | | | |
| 16 | <i>Calamagrostis macrolepis</i> | | | | | | | | | | |
| 17 | <i>Calamagrostis macilenta</i> | | | | | | + | | | | |
| 18 | <i>Calamagrostis salina</i> | | | | | | | | | | |
| 19 | <i>Phragmites communis</i> | + | + | | | | + | + | | | + |
| 20 | <i>Aeluropus pungens</i> | | | | | | | | | | |
| 21 | <i>Poa botryoides</i> | + | | | | | + | + | + | + | |
| 22 | <i>Bromus oxyodon</i> | | | | | | | | | | |
| 23 | <i>Agropyron cristatum</i> | + | | | | | + | + | + | + | |
| 24 | <i>Agropyron repens</i> | + | + | | | | | | | | |
| 25 | <i>Agropyron sibiricum</i> | | | | | | + | + | + | + | + |
| 26 | <i>Agropyron geniculatum</i> | | | | | | | | | | |
| 27 | <i>Agropyron Nevskii</i> | | | | | | + | + | + | + | + |
| 28 | <i>Hordeum turkestanicum</i> | | | | | | | | | | |
| 29 | <i>Hordeum brevisubulatum</i> | | | | | | + | + | + | + | |
| 30 | <i>Elymus angustus</i> | | | | | | + | + | + | + | + |
| 31 | <i>Elymus Paboanus</i> | | | | | | | | | | |
| 32 | <i>Elymus ovatus</i> | | | | | | | | | | |
| 33 | <i>Elymus secalinus</i> | | | | | | | | | | |
| | Cyperaceae | | | | | | | | | | |
| 34 | <i>Scirpus Hippolytii</i> | + | | | | | + | + | + | + | + |
| 35 | <i>Blysmus rufus</i> | | | | | | + | + | + | + | |
| 36 | <i>Blysmus sinocompressus</i> | | | | | | + | + | | | |
| 37 | <i>Blysmus eleocharis</i> | | | | | | | | | | |
| 38 | <i>Carex orbicularis</i> | | | | | | | + | + | + | |
| | Juncaceae | | | | | | | | | | |
| 39 | <i>Juncus Gerardii</i> | | | | | | | | + | | |
| | Lilaceae | | | | | | | | | | |
| 40 | <i>Allium mongolicum</i> | + | | + | | | + | + | + | + | + |
| 41 | <i>Allium polyrrhizum</i> | + | | + | | | + | + | + | + | + |
| 42 | <i>Asparagus gobicus</i> | + | | | | | | | + | + | |
| | Iridaceae | | | | | | | | | | |
| 43 | <i>Iris tenuifolia</i> | + | | | | | + | | + | + | |
| | Polygonaceae | | | | | | | | | | |
| 44 | <i>Rumex aquaticus</i> | | | | | | | | | | |
| 45 | <i>Atraphaxis pungens</i> | | + | | + | | | | | | + |
| 46 | <i>Atraphaxis spinosa</i> | | | | | | | | | | + |
| 47 | <i>Atraphaxis frutescens</i> | | | | | | | | + | + | + |
| 48 | <i>Atraphaxis virgata</i> | | | | | | | | | | + |
| 49 | <i>Calligonum sp</i> | | | | | | | | | | |
| 50 | <i>Polygonum sibiricum</i> | | | | | | | | + | + | + |
| 51 | <i>Polygonum aviculare</i> | + | | | | | + | + | + | + | + |
| 52 | <i>P. polycnemonoides</i> | | | | | | | | | | |
| | Chenopodiaceae | | | | | | | | | | |
| 53 | <i>Chenopodium glaucum</i> | | | | | | + | | + | | + |
| 54 | <i>Chenopodium aristatum</i> | + | | | | | | | | | |
| 55 | <i>Chenopodium vulvaria</i> | | | | | | + | | | | |
| 56 | <i>Eurotia ceratoides</i> | | | | | | + | + | + | + | + |
| 57 | <i>Eurotia Ewersmanniana</i> | | | | | | + | + | + | + | + |
| 58 | <i>Ceratocarpus arenarius</i> | | | | | | + | + | + | + | + |
| 59 | <i>Bassia dasyphylla</i> | | + | | | | | | + | + | + |

| | | | | | | | | | | | |
|-----|------------------------------------|----|----|----|----|----|---|---|---|---|-----|
| 143 | <i>Plantago mongolica</i> | | | | | | | | | | |
| | Rubiaceae | | | | | | | | | | |
| 144 | <i>Galium verum</i> | | | | | | + | + | + | + | + |
| | Plumbaginaceae | | | | | | | | | | |
| 145 | <i>Limonium Gmelonii</i> | + | + | | + | + | | | + | + | + |
| 146 | <i>Limonium suffruticosum</i> | | | | + | | | | | | |
| 147 | <i>Coniolumon spesiosum</i> | + | + | | + | | | | + | + | + |
| | Compositae | | | | | | | | | | |
| 148 | <i>Xanthium strumarium</i> | + | | | | | | | | | |
| 149 | <i>Ajania achilleoides</i> | | | | + | | + | + | + | + | + |
| 150 | <i>Ajania fruticulosa</i> | | | | + | | + | | + | + | + |
| 151 | <i>Kaschgaria Komarovii</i> | | | | | | | | | | + |
| 152 | <i>Artemisia pectinata</i> | + | | | | | + | + | + | + | + |
| 153 | <i>Artemisia pamirica</i> | + | | + | | | | + | + | + | + |
| 154 | <i>Artemisia dracunculus</i> | + | | + | | | + | + | + | + | + |
| 155 | <i>Artemisia santolinifolia</i> | + | | + | | | + | + | + | + | + |
| 156 | <i>Ar. mongolica</i> | | | | | | | | | | |
| 157 | <i>Ar. Caespitosa</i> | | | | | | + | + | + | + | + |
| 158 | <i>Ar. Xanthochroa</i> | + | | + | | | | | | | + |
| 159 | <i>Artemisia terrae –albae</i> | | | | | | + | | + | | + |
| 160 | <i>Artemisia sublessingiana</i> | | | | | | + | | + | | + |
| 161 | <i>Artemisia rutifolia</i> | | | | | + | | | | | |
| 162 | <i>Artemisia macrocephala</i> | + | | + | | | | | + | + | |
| 163 | <i>Ar. Gobica</i> | | | | | | + | | + | + | + |
| 164 | <i>Artemisia obtusiloba</i> | | | | | | | + | + | + | |
| 165 | <i>Artemisia mongolorum</i> | | | | | | | | | | |
| 166 | <i>Echinops humilis</i> | | | | | | | | | | |
| 167 | <i>Saussurea Grubovii</i> | | | | | | | | | | |
| 168 | <i>Saussurea amara</i> | + | | | | | | | | | |
| 169 | <i>Saussurea salsa</i> | | | | | + | | | | | |
| 170 | <i>Saussurea dahurica</i> | | | | | | + | + | + | + | + |
| 171 | <i>Cirsium incana</i> | | | | | | | | | | |
| 172 | <i>Acroptilon australe</i> | | | | | | | | | | |
| 173 | <i>Acroptilon repens</i> | | | | | + | | | | | |
| 174 | <i>Scorzonera pseudodivaticata</i> | + | | + | | | | | + | + | |
| 175 | <i>Scorzonera lkonnikovii</i> | | | | | | | | | | |
| 176 | <i>Scorzonera parviflora</i> | | | | | | | | | | |
| 177 | <i>Sonchus oleraceus</i> | | | | | | | | | | |
| 178 | <i>Lactuca serriola</i> | + | | | | | + | + | + | + | + |
| 179 | <i>Lappula tatarica</i> | + | | | | | | | | | |
| 180 | <i>Chondrilla lejosperma</i> | | | | | | | | | | |
| 181 | <i>Taraxacum leucanthum</i> | + | | + | | | + | + | + | + | |
| 182 | <i>Prenanthes angustifolia</i> | | | | | | | | | | |
| 183 | <i>Youngia stenoma</i> | + | | | | | | | | | |
| 184 | <i>Heteroppapus altaicus</i> | + | | | + | | + | + | + | + | + |
| | <i>Byzō</i> | 66 | 21 | 18 | 15 | 18 | | | | | |
| | | | | | | | | | | | 117 |

From the table above:

1. 66 species of medicinal values or 35.8 % of the total plants recorded in the area
2. 18 food species or 9.7 %
3. 21 specie of soil protection values or 11 %
4. 15 decorative species or 8.1 %

5. 18 poisonous species or 9.7 %
6. 117 fodder species or 63.5 % and there are over 30 nutrient fodder species suitable for wild and domestic livestock fodder such as *Ptilagrostis Pelliotii*, *Stipa gobica*, *Stipa glareosa*, *Phragmites communis*, *Agropyron repens*, *Agropyron cristatum*, *Agropyron geniculatum*, *Elymus Pabianus*, *Elymus angustus*, *Elymus secalinus*, *Achnatherum splendens*, *Scirpus Hippolytii*, *Blysmus sinocompressus*, *Allium polyrrhizum*, *Iris tenuifolia*, *Medicago falcata*, *Melilotus suaveolens*, *Kaschgaria Komarovii*, *Artemisia caespitosa*, *Artemisia Mongolica*, *Artemisia pectinata*, and *Artemisia macrocephala* in the area.

Some endemic and globally endangered species such as *Oxytropis monophylla*, *Zygophyllum neglectum*, *Artemisia gobica*, *Astragalus Sanchirii*, *Ajania achilleoides*, *Artemisia xanthichroa*, *Scirzonera pseudodivariata*, *Scorzonera Ikonnikovii*, and sub/ semi-endemic such as *Ptilagrostis Pelliotii*, *Stipa gobica*, *Allium mongolicum*, *Allium polyrrhizum*, *Artemisia caespitosa*, *Saussurea Grubovii*, *Calamagrostis salina*, *Asparagus gobicus*, *Corispermum mongolicum*, *Kalidium gracile*, *Dontostemon senilis*, *Zygophyllum gobicum*, *Pedicularis altaica*, *Artemisia mongolorum*, and relict species such as *Ephedra Przewalskii*, and *Reaumuria soongorica* have been recorded in the area.

Weed plants such as *Acroptilon repens*, *Lactuca tatarica*, *Cardaria pubescens*, *Lepidium cordatum*, and *Lepidium obtusum* are found along the riverbanks in the enclosed areas for Takhi.

Vegetation

Study status

Vegetation in the Zuun Garun area is specific and it is studied well. The desert zone contains sandy and saline depressions, mountains, sand dunes and stony bare flat KHOTOS.

The Zuun Garun zone / circuit is dominated by BUDARGANT desert vegetation. *Stipa* desert steppe is mostly found in front and bottom sides of Altai Mountains. The area with soil with pebbles is distributed by ... and the area with sandy soils is by ... (Grubov, Yunatov 19952).

The desert zone is dominated by moderately dry shrubs and shrubby types of vegetation, but their vegetation covers are sparse. This zone is widely distributed by *Salsola passerina*, *Reaumuria soongorica*, *Anabasis brevifolia*, and *Nanophyton erinaceum*.

In areas with heavier sands are widely distributed by *Oxytropis aciphylla*, *Convolvulus Gortschakovii*. Valleys between mountains, and flat plains alongside of rolling hills are occupied by desert zone with specific types of stones. The desert zone is distributed by saxual forests with shrubby plants such as *Haloxylon ammodendron*, *Caragana leucophloea*, *Eurotia ceratoides* (Tsogt 1981).

Oasis is found in relatively fewer numbers in Zuun Garun govi, and it ranks in its area per an oasis (247.8 thous ha) after Trans Altai Govi (Chimedregzen 1998). Different types of soils are found in the area because of a variety of soil development phases and water levels in spring water gushing, bottom layer soils

and mineral contents in water in the oasis. For instance, areas of meadow and meadow swampy soils found ranges from 0.1 to 1 ha in relation to nutrients in springs and bottom layer soils. Water levels in these types of soils are found in depth of 70-120 cm, and pulp / mash is widely found in surface layers. Salinization is relatively lower in meadow soils, but some parts of the oasis are widely distributed by saline soils formed by mineral contents in water. According to the vegetation cover and plant families the oasis in Zuun Garun govi lies in the Zuun Garun govi of Zuungar-Turan Khoshuun of Iran-Turan sub-region of Sahar govi desert region. There are 20 families, 31 types / genus, and 35 species recorded in the oasis (Chimedregzen 1998). The saline soil in the Zuun Garun Govi is dominated by *Kalidium gracile* community that is included *Nitraria sibirica*, and *Pheragmites communis* (Hilbig 1995).

According to the vegetation map of Mongolian People's Republic of 1:1500000 scale composed by A. A. Yunatov there were five communities recorded in the vicinity of Bij River (Map 3). For instance,

1. Saxual desert community (*Haloxylon ammodendron*) found in mountainous valleys and ERTNII URSGALUN CUDAG and sloppy areas with sandy brown gray soil
2. TAAR-Mongol grass communities (*Nanophyton erinaceum* – *Stipa glareosa*) in bottom parts of mountains with steppe light clayish brown soil
3. BAGLUUR-MONGOL grass communities (*Anabasis brevifolia*- *Stipa glareosa*) in low and middle alpines
4. ULAAN BUDARGANT desert communities (*Reaumuria soongorica*) in low plain with salty brown gray soil
5. Saxual- moderately saline semi-shrubbery and moderately saline shrubbery desert communities (*Haloxylon ammodendron* – *Reaumuria soongorica*- *Nitraria sphaerocarpa*) in depressed areas with saline brown soil of flooded ...and flooded types

Additionally, Dr, G. Tserenbaljid has classified the following seven types of vegetation in Takhiin Tal area:

1. SHARALJ YETEN community in rocky mountains such as Shiree Khairhan, Ilmen-Serven, Elstei and Tangadiin Khar, at the elevation of 1800 m;
2. BAGLUUR-KHARMAG-ZEERGENET communities in mountain slopes and rolling hills with flat tops
3. TAAR-SHARILJ-*Stipa* communities distributed in flat valleys between mountains with crumbly stony and sandy solid soils
4. BUDARGANA-Saxual, BUDARGANAT, and Saxual-SHAR MODOT communities found in narrow channels and low depressed areas with saline, crumby stony and sandy soils
5. SHARILJ-Kharagana-Takhi grasses communities in mountain slopes and channels with loose sandy soils
6. DERS-KHARMAG-ULAAN BUDARGANAT communities in low depressed areas and the proximity of ponds with saline and clayish soils
7. Sedge-forb communities in areas with meadow soil in vicinity of main springs and saline meadow soils in inter-zones

Moreover, vegetation in enclosed areas for Takhi was studied by Dr. Manibazar (1996) and overviews on the vegetation types were made. The enclosed areas for Takhi contain mainly river valleys and riverbanks and plant communities were recorded. Dominant communities are Nanophyton erinaceum, Achnatherum splendens. Main communities recorded in study areas

In order to determine vegetation types in Bij river valley where Takhi is reintroduced and make contributions in management policy of reintroduction of Takhi in the area we conducted studies on vegetation in the area and recorded coordination of communities recorded using GPS on the map of 1:100000.

We are classifying the following ten communities basing on specific features of topography, directions and soil water supplies:

1. *Stipa orientalis*, and *Anabasis brevifolia* community that is found in Shiree Khaikhan, Ilmen Serven, Tavan Tolgoi, Khondlon Uuls, Shiiriin Serven, Shal Khar, Tovkh Khuren, and Tangadiin Khar mountains. This community is included *Scorzonera pseudodivaricata*, *Orostachys spinosa*, *Echinops himilis*, *Heteropappus altaicus*, and *Dracocephalum integrifolium*.

Records on SAIRIIN *Stipa*-BAGLUURT community

Table 4

| № | Зүйлийн нэр | Бичиглэлийн дугаар | | | | | | | |
|----|------------------------------------|--------------------|----|-----|----|-----|----|-----|-----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | <i>Stipa glareosa</i> | II | II | III | II | III | I | III | III |
| 2 | <i>Anabasis brevifolia</i> | I | I | II | I | I | II | II | II |
| 3 | <i>Ptilagrostis Pelliotii</i> | | I | I | | + | I | I | |
| 4 | <i>Dontostemon senilis</i> | + | + | R | | + | + | R | |
| 5 | <i>Ephedra sinica</i> | | | R | R | R | | R | |
| 6 | <i>Scorzonera pseudodivaricata</i> | | R | | | R | | + | |
| 7 | <i>Orostachys spinosa</i> | | R | | | | R | R | |
| 8 | <i>Allium polyrrhizum</i> | | R | | | | + | | |
| 9 | <i>Echinopsis humilis</i> | | R | R | | | | | |
| 10 | <i>Coniolumon spesiosum</i> | | | R | | | | R | |
| 11 | <i>Atraphaxis pungens</i> | | | | + | | | | |
| 12 | <i>Atraphaxis frutescens</i> | | | | + | | | | |
| 13 | <i>Scorzonera Ikonnikovii</i> | | | | | | | + | |
| 14 | <i>Artemisia sublessingiana</i> | R | | | | | | | |
| 15 | <i>Ephedra intermedia</i> | | R | | | | | | |
| 16 | <i>Zygophyllum neglectum</i> | | R | | | | | | |
| 17 | <i>Poa botryoides</i> | | | R | | | | | |
| 18 | <i>Astragalus Sanchirii</i> | | | R | | | | | |
| 19 | <i>Blysmus eleocharis</i> | | | R | | | | | |
| 20 | <i>Anabasis eriopoda</i> | | | R | | | | | |
| 21 | <i>Galium verum</i> | | | R | | | | | |
| 22 | <i>Zygophyllum Rosovii</i> | R | | | | | | | |

| | | | | | | | | | |
|----|------------------------------------|---|--|---|---|---|---|---|---|
| 23 | <i>Caragana leucophloea</i> | | | R | | | | | |
| 24 | <i>Eurotia ceratoides</i> | | | | R | | | | |
| 25 | <i>Arnebia desumbens</i> | R | | | | | | | |
| 26 | <i>Schizonepeta annua</i> | R | | | | | | | |
| 27 | <i>Lapulla semiglabra</i> | | | | | R | | | |
| 28 | <i>Linaria hepatica</i> | | | | | R | | | |
| 29 | <i>Artemisia macrocephala</i> | | | | | | R | | |
| 30 | <i>Stipa orientalis</i> | | | | | | | R | |
| 31 | <i>Dracocephalum integrifolium</i> | | | | | | | R | |
| 32 | <i>Vicia costata</i> | | | | | | | R | |
| 33 | <i>Ajania fruticulosa</i> | | | | | | | | R |
| 34 | <i>Eurotia Ewersmanniana</i> | | | | | | | | R |
| 35 | <i>Zygophyllum gobicum</i> | | | | | | | | R |

2. *Caragana leucophloea*, *Eurotia Ewersmanniana*, and *Atraphaxis pungens* community with bigger and higher shrubs and *Stipa glareosa*, *Ajania fruticulosa*, and *Kochia prostrata* from grass communities that are found in Mountain slopes, ditches of rolling hills and ravines.

Records on Kharagana-TESEGT communities

Table 5

| № | Зүйлийн нэр | Бичиглэлийн дугаар | | | | | |
|----|----------------------------------|--------------------|----|----|----|----|----|
| | | 9 | 10 | 11 | 12 | 13 | 14 |
| 1 | <i>Caragana leucophloea</i> | II | I | I | II | I | II |
| 2 | <i>Eurotia Ewersmanniana</i> | I | | + | I | + | I |
| 3 | <i>Ajania fruticulosa</i> | I | | R | + | + | + |
| 4 | <i>Allium mongolicum</i> | + | + | | + | + | + |
| 5 | <i>Convolvulus Gortschakovii</i> | | | R | R | R | R |
| 6 | <i>Bassia dasyphylla</i> | + | R | | R | | |
| 7 | <i>Koshia prostrata</i> | I | R | | | R | |
| 8 | <i>Sympegma Regelii</i> | I | | | | | + |
| 9 | <i>Ephedra Przewalskii</i> | | | | + | | R |
| 10 | <i>Atraphaxis spinosa</i> | | + | | | | R |
| 11 | <i>Ar. Caespitosa</i> | + | | | | | |
| 12 | <i>Eurotia ceratoides</i> | | + | | | | |
| 13 | <i>Reaumuria soongorica</i> | | | + | | | |
| 14 | <i>Salsola Paulsenii</i> | | | | R | R | |
| 15 | <i>Artemisia obtusiloba</i> | R | | | | R | |
| 16 | <i>Artemisia macrocephala</i> | | | | | R | |
| 17 | <i>Zygophyllum Rozovii</i> | | | | | R | |
| 18 | <i>Zygophyllum neglectum</i> | | R | | | | |
| 19 | <i>Ajania achilleoides</i> | | R | | | | |
| 20 | <i>Chenopodium glaucum</i> | | | | | R | |
| 21 | <i>Nanophyton erinaceum</i> | | | R | | | |
| 22 | <i>Kaschgaria Komarovii</i> | | | R | | | |

| | | | | | | | | | |
|----|------------------------------|--|---|--|--|--|--|--|--|
| 28 | <i>Heteroppapus altaicus</i> | | R | | | | | | |
|----|------------------------------|--|---|--|--|--|--|--|--|

4. *Haloxylon ammodendron*+*Reaumuria soongorica*+*Salsola arbuscula* community that is found in low depressed areas and channels with saline, crumby stony and sandy soils

Records on Saxual-ULAAN BUDARGANAT community

Table 7

| № | Зүйлийн нэр | Бичиглэлийн дугаар | | | | | |
|----|---------------------------------|--------------------|-----|----|-----|-----|----|
| | | 24 | 25 | 26 | 27 | 28 | 29 |
| 1 | <i>Haloxylon ammodendron</i> | IV | III | V | III | III | II |
| 2 | <i>Reaumuria soongorica</i> | II | II | + | II | II | I |
| 3 | <i>Salsola arbuscula</i> | III | + | R | + | I | + |
| 4 | <i>Ephedra Przewalskii</i> | + | + | + | I | + | + |
| 5 | <i>Eurotia Ewersmanniana</i> | | I | + | | + | |
| 6 | <i>Stipa glareosa</i> | | I | R | | | |
| 7 | <i>Anabasis eriopoda</i> | | + | | | | |
| 8 | <i>Allium mongolicum</i> | | | R | | R | R |
| 10 | <i>Oxytropis aciphylla</i> | + | | | | | |
| 11 | <i>Caragana leucophloea</i> | | R | | | R | |
| 12 | <i>Zygophyllum kaschgaricum</i> | | | | R | | |
| 13 | <i>Artemisia terrae –albae</i> | | R | | | | |

5. *Artemisia xanthochroa*+*Oxytropis aciphylla*+*Caragana leucophloea* community that is found in mountainous slopes and channels with loose sandy soils. This community contains *Agropyron cristatum*, *Iris tenuifolia*, *Corispermum mongolicum* etc.

Records on SHARILJ-ORTUUZAT community

Table 8

| № | Зүйлийн нэр | Бичиглэлийн дугаар | | | | | |
|----|--------------------------------|--------------------|-----|----|-----|----|----|
| | | 30 | 31 | 32 | 33 | 34 | 35 |
| 1 | <i>Artemisia xanthochroa</i> | III | III | | III | II | + |
| 2 | <i>Ar. Caespitosa</i> | II | + | I | II | R | + |
| 3 | <i>Artemisia terrae –albae</i> | | I | I | | | I |
| 4 | <i>Stipa sareptana</i> | | + | | R | | |
| 5 | <i>Caragana leucophloea</i> | I | + | R | R | + | R |
| 6 | <i>Ephedra Przewalskii</i> | + | R | + | + | + | R |
| 7 | <i>Ajania fruticulosa</i> | | R | | | | R |
| 8 | <i>Panzeria lanata</i> | | R | R | R | | |
| 9 | <i>Allium mongolicum</i> | + | + | II | + | R | R |
| 10 | <i>Stipa glareosa</i> | + | | IV | I | | II |
| 11 | <i>Oxytropis aciphylla</i> | I | + | I | | + | R |

| | | | | | | | |
|----|----------------------------------|---|---|---|---|-----|---|
| 12 | <i>Corispermum mongolicum</i> | + | R | + | R | + | |
| 13 | <i>Iris tenuifolia</i> | + | + | + | | | |
| 14 | <i>Elymus angustus</i> | | | | + | III | |
| 15 | <i>Agropyron cristatum</i> | | | | + | R | |
| 16 | <i>Salsola Paulsenii</i> | | R | R | R | | |
| 17 | <i>Bassia dasyphylla</i> | | | R | | R | R |
| 18 | <i>Convolvulus Gortschakovii</i> | | R | R | | | |
| 19 | <i>Atraphaxis spinosa</i> | | + | | | | |
| 20 | <i>Heteropappus altaicus</i> | | | | R | R | |
| 21 | <i>Eurotia Ewersmanniana</i> | | | R | | | R |
| 22 | <i>Convolvulus Ammanii</i> | | | | R | R | |
| 23 | <i>Linaria pedicellata</i> | | | | | R | |
| 24 | <i>Achnatherum splendens</i> | | | | R | | |
| 25 | <i>Goniolimon speciosum</i> | | | R | | | |
| 26 | <i>Atraphaxis pungens</i> | | | | | | R |

6. *Kalidium foliatum*+*Kalidum gracile*+*Suaeda heterophylla* community that is found in low depressed area and the vicinity of ponds with saline and clayish soils.

Records on BADARGANAT community

Table 9

| № | Зүйлийн нэр | Бичиглэлийн дугаар | | | | | |
|----|--------------------------------|--------------------|----|----|----|-----|-----|
| | | 36 | 37 | 38 | 39 | 40 | 41 |
| 1 | <i>Kalidium foliatum</i> | II | I | II | II | II | III |
| 2 | <i>K. gracile</i> | I | + | I | I | | |
| 3 | <i>Reaumuria soongorica</i> | + | | + | + | III | I |
| 4 | <i>Suaeda heterophylla</i> | + | + | | | R | |
| 5 | <i>Nitraria sibirica</i> | R | | + | | R | + |
| 6 | <i>Suaeda corniculata</i> | | | | + | | |
| 7 | <i>Polygonum sibiricum</i> | R | | R | | | |
| 8 | <i>Anabasis aphulla</i> | R | | | | | |
| 9 | <i>Lepidium amplexicaule</i> | | | | | + | |
| 10 | <i>Cynocorium songaricum</i> | | | | | | R |
| 11 | <i>Lepidium obtusum</i> | | | | | | R |
| 12 | <i>Atraphaxis pungens</i> | | | | | | R |
| 13 | <i>Glycyrrhiza uralensis</i> | | | | | | + |
| 14 | <i>Salsola arbuscula</i> | | | | | | + |
| 15 | <i>Limonium suffruticosum</i> | | | | | | R |
| 16 | <i>Sphaerophysa salsula</i> | | | | | | R |
| 17 | <i>Astragalus lasiopetalus</i> | | | | | | R |
| 18 | <i>Artemisia mongolorum</i> | | | | | | R |
| 19 | <i>Aeluropus pungens</i> | | | | | | + |
| 20 | <i>Acroptilon australe</i> | | | | | | R |
| 21 | <i>Limonium Gmelenii</i> | | | R | | | |

| | | | | | | | | | | | | | | |
|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | <i>songaricum</i> | | | | | | | | | | | | | |
|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|

8. *Halerpestes salsuginosa*+*Glaux maritima* community that is found in meadows with inter-zone saline soils. The community contains *Triglochin palustris*, *Triglochin martimum*, and *Pamassia palustris* etc.

Records on Forb-Grass community

Table 11.

| № | Зүйлийн нэр | Бичиглэлийн дугаар | | | | |
|----|--------------------------------|--------------------|----|-----|-----|----|
| | | 55 | 56 | 57 | 58 | 59 |
| 1 | <i>Halerpestes salsuginosa</i> | II | I | III | III | |
| 2 | <i>Glaux maritima</i> | | II | II | II | |
| 3 | <i>Juncus Gerardii</i> | | + | I | I | |
| 4 | <i>Halerpestes sarmentosa</i> | | | | | II |
| 5 | <i>Triglochin maritimum</i> | | + | I | I | |
| 6 | <i>Carex orbicularis</i> | | | I | + | |
| 7 | <i>Blysmus rufus</i> | | + | I | | |
| 8 | <i>Blysmus sinocompressus</i> | | | | | I |
| 9 | <i>Hordeum brevisubulatum</i> | I | | | | |
| 10 | <i>Polygonum aviculare</i> | R | | | | + |
| 11 | <i>Silene repens</i> | + | | | | + |
| 12 | <i>Alopecurus arundinaceus</i> | R | | | | + |
| 13 | <i>Garum carvi</i> | R | | | | + |
| 15 | <i>Potentilla dealbata</i> | | | + | | |
| 16 | <i>Taraxacum leucanthum</i> | | | + | | + |
| 17 | <i>Scirpus Hippolytii</i> | | | | + | |
| 18 | <i>Parnassia palustris</i> | | | + | | |
| 19 | <i>Plantago major</i> | + | | | | |
| 20 | <i>Geranium collinum</i> | R | | R | | |
| 21 | <i>Bromus oxyodon</i> | + | | | | |
| 22 | <i>Potentilla anserina</i> | + | | | | |
| 23 | <i>G. desumbens</i> | | | R | | |
| 24 | <i>Primula longiscapa</i> | | | R | | |
| 25 | <i>Astragalus sulcatus</i> | R | | | | |
| 26 | <i>A. tibetanus</i> | R | | | | |
| 27 | <i>Peucedanum falcaria</i> | | | R | | |
| 28 | <i>Gentiana leucomelaena</i> | | | R | | |
| 29 | <i>Prenanthes angustifolia</i> | | | R | | |
| 30 | <i>Triglochin palustre</i> | | | | R | |
| 31 | <i>Chondrilla lejosperma</i> | | | | R | |
| 32 | <i>Pedicularis altaica</i> | | | R | | |
| 33 | <i>Galium sp</i> | R | | | | |
| 34 | <i>Equisetum arvense</i> | | | | | R |
| 35 | <i>Clematis tangutica</i> | | | | | R |
| 36 | <i>Rumex aquaticus</i> | | | | | R |

| | | | | | | |
|----|-----------------------------|---|--|---|--|---|
| 37 | <i>P. polycnemonoides</i> | | | | | R |
| 38 | <i>Cirsium incana</i> | | | | | R |
| 39 | <i>Sonchus oleraceus</i> | | | | | R |
| 40 | <i>Odontites serotina</i> | R | | | | |
| 41 | <i>Oxytropis Gorbunovii</i> | | | R | | |

9. Except the communities above, *Phragmites communis* grove / patch in the vicinity of mouth of rivers and springs such as Shiiriin Us, Toodgiin Us, Khonin Us.

Records on EGEL NISHINGET community

Table 12.

| № | Зүйлийн нэр | Бичиглэлийн дугаар | |
|---|----------------------------|--------------------|----|
| | | 60 | 61 |
| 1 | <i>Phragmites communis</i> | V | V |
| 2 | <i>Glaux maritima</i> | r | |

10. KHONHOT Caragana-BOR SAZAGT (*Halimodendron halodendron*-*Kashgaria Komarovii*) community, GURAVDAGCHIIN river floodplain forest relic plant species, found in areas with ancient tracks of Khonin Us riverbeds and water catchment area.

Records on *Halimodendron halodendron*-*Kashgaria Komarovii* community

Table 13

| № | Зүйлийн нэр | Бичиглэлийн дугаар | |
|----|----------------------------------|--------------------|----|
| | | | |
| 8 | <i>Halimodendron halodendron</i> | III | II |
| 9 | <i>Kaschgaria komarovii</i> | I | + |
| 10 | <i>Saussurea grubovii</i> | R | |
| 11 | <i>Tamarix ramosissima</i> | R | |
| 12 | <i>Reaumuria soongorica</i> | R | |
| 13 | <i>Phragmites communis</i> | | R |
| 14 | <i>Elymus pabaonus</i> | | R |

Distributions of vascular plants in Takhi tal area

Table 14

| Овог № № | Төрөл № | Зүйл № | Зүйлийн нэр | Уул | Уулын бэл | Тэгш хөндий | Нарийн хоолой | Хотос тойром | Нуга | Сул элс |
|-------------|------------|-----------|---------------------------------|-----|-----------|----------------|------------------|-----------------|------|---------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1 | | | Equisetaceae | | | | | | | |
| | 1 | 1 | <i>Equisetum arvense</i> | | | | | | + | |
| 2 | | | Ephedraceae | | | | | | | |
| | 2 | 2 | <i>Ephedra Przewalskii</i> | | + | + | + | | | + |
| | | 3 | <i>Ephedra sinica</i> | + | | | | | + | |
| | | 4 | <i>Ephedra intermedia</i> | + | | | | | | |
| 3 | | | Juncaginaceae | | | | | | | |
| | 3 | 5 | <i>Triglochin maritimum</i> | | | | | | + | |
| | | 6 | <i>Triglochin palustre</i> | | | | | | + | |
| 4 | | | Graminaceae | | | | | | | |
| | 4 | 7 | <i>Achnatherum splendens</i> | | | + | | + | | |
| | 5 | 8 | <i>Ptilagrostis Pelliotii</i> | + | | | | | | |
| | 6 | 9 | <i>Stipa glareosa</i> | + | + | + | + | + | | |
| | | 10 | <i>Stipa orientalis</i> | + | | | | | | |
| | | 11 | <i>Stipa sareptana</i> | | | | | | | + |
| | | 12 | <i>Stipa gobica</i> | + | | | | | | |
| | 7 | 13 | <i>Alopecurus arundinaceus</i> | | | | | | + | |
| | 8 | 14 | <i>Agrostis gigantea</i> | | | | | + | | |
| | | 15 | <i>Agrostis stolonifera</i> | | | | | + | | |
| | 9 | 16 | <i>Calamagrostis macrolepis</i> | | | | | + | | |
| | | 17 | <i>Calamagrostis macilenta</i> | | | | | + | | |
| | | 18 | <i>Calamagrostis salina</i> | | | | | + | | |
| | 10 | 19 | <i>Phragmites communis</i> | | | | | + | | |
| | 11 | 20 | <i>Aeluropus pungens</i> | | | | | + | | |
| | 12 | 21 | <i>Poa botryoides</i> | + | | | | | | |
| | 13 | 22 | <i>Bromus oxyodon</i> | | | | | | + | |
| | 14 | 23 | <i>Agropyron cristatum</i> | | | | | | | + |
| | | 24 | <i>Agropyron repens</i> | | | | | + | | |
| | | 25 | <i>Agropyron sibiricum</i> | | | | | + | | |
| | | 26 | <i>Agropyron geniculatum</i> | | | | | + | | |
| | | 27 | <i>Agropyron Nevskii</i> | | | | | + | | |
| | 15 | 28 | <i>Hordeum turkestanicum</i> | | | | | + | | |
| | | 29 | <i>Hordeum brevisubulatum</i> | | | | | | + | |
| | 16 | 30 | <i>Elymus angustus</i> | | | | | + | | + |
| | | 31 | <i>Elymus Paboanus</i> | | | | | + | | |
| | | 32 | <i>Elymus ovatus</i> | | | | | + | | |
| | | 33 | <i>Elymus secalinus</i> | | | | | + | | |

| | | | | | | | | | | |
|-----------|----|----|-------------------------------|---|---|---|---|---|---|---|
| 5 | | | Cyperaceae | | | | | | | |
| | 17 | 34 | <i>Scirpus Hippolytii</i> | | | | | | | + |
| | 18 | 35 | <i>Blysmus rufus</i> | | | | | | | + |
| | | 36 | <i>Blysmus sinocompressus</i> | | | | | | | + |
| | | 37 | <i>Blysmus eleocharis</i> | + | | | | | | |
| | 19 | 38 | <i>Carex orbicularis</i> | | | | | | | + |
| 6 | | | Juncaceae | | | | | | | |
| | 20 | 39 | <i>Juncus Gerardii</i> | | | | | | | + |
| 7 | | | Lilaceae | | | | | | | |
| | 21 | 40 | <i>Allium mongolicum</i> | | + | + | + | | | + |
| | | 41 | <i>Allium polyrrhizum</i> | + | | | | | | |
| | 22 | 42 | <i>Asparagus gobicus</i> | | | | | | + | |
| 8 | | | Iridaceae | | | | | | | |
| | 23 | 43 | <i>Iris tenuifolia</i> | | + | | | | | + |
| 9 | | | Polygonaceae | | | | | | | |
| | 24 | 44 | <i>Rumex aquaticus</i> | | | | | | | + |
| | 25 | 45 | <i>Atraphaxis pungens</i> | + | + | + | | | + | + |
| | | 46 | <i>Atraphaxis spinosa</i> | | + | | | | + | |
| | | 47 | <i>Atraphaxis frutescens</i> | + | + | | | | + | |
| | | 48 | <i>Atraphaxis virgata</i> | | + | | | | | |
| | 26 | 49 | <i>Calligonum sp</i> | | | | | | + | |
| | 27 | 50 | <i>Polygonum sibiricum</i> | | | | | | + | |
| | | 51 | <i>Polygonum aviculare</i> | | | | | | | + |
| | | 52 | <i>P. polycnemoides</i> | | | | | | | + |
| 10 | | | Chenopodiaceae | | | | | | | |
| | 28 | 53 | <i>Chenopodium glaucum</i> | | | + | | | + | |
| | | 54 | <i>Chenopodium aristatum</i> | | | + | | | | |
| | | 55 | <i>Chenopodium vulvaria</i> | | | | | | + | |
| | 29 | 56 | <i>Eurotia ceratoides</i> | + | + | + | + | | | |
| | | 57 | <i>Eurotia Ewersmanniana</i> | | + | + | + | | + | |
| | 30 | 58 | <i>Ceratocarpus arenarius</i> | | | | | | + | + |
| | 31 | 59 | <i>Bassia dasyphylla</i> | | + | + | | | + | |
| | 32 | 60 | <i>Kochia prostrata</i> | | + | | | | | |
| | 33 | 61 | <i>Corispermum mongolicum</i> | | | | | | | + |
| | 34 | 62 | <i>K. gracile</i> | | | | | | + | |
| | | 63 | <i>Kalidium foliatum</i> | | | | | | + | |
| | 35 | 64 | <i>Suaeda acuminata</i> | | | | | | + | |
| | | 65 | <i>Suaeda heterophylla</i> | | | | | | + | |
| | | 66 | <i>Suaeda corniculata</i> | | | | | | + | |
| | 36 | 67 | <i>Salsola arbuscula</i> | | | | | + | | |
| | | 68 | <i>Salsola Paulsenii</i> | | + | | | | + | |
| | 37 | 69 | <i>Anabasis eriopoda</i> | + | + | + | + | | | |
| | | 70 | <i>Anabasis brevifolia</i> | + | + | + | + | | | |
| | | 71 | <i>Anabasis aphylla</i> | | | + | | | + | |
| | 38 | 72 | <i>Haloxylon ammodendron</i> | | | | | | + | |

| | | | | | | | | | | |
|-----------|----|-----|----------------------------------|---|---|---|---|---|---|---|
| | 39 | 73 | <i>Nanophyton erinaceum</i> | | + | + | | | | |
| | 40 | 74 | <i>Halogeton glomeratus</i> | | | | | + | | |
| | 41 | 75 | <i>Micropeplis arachnoidea</i> | | + | | | + | | |
| | 42 | 76 | <i>Sympegma Regelii</i> | | + | | | + | | |
| 11 | | | Caryophyllaceae | | | | | | | |
| | 43 | 77 | <i>Silene repens</i> | | | | | | + | |
| 12 | | | Ranunculaceae | | | | | | | |
| | 44 | 78 | <i>Clematis tangutica</i> | | | | | | + | |
| | 45 | 79 | <i>Halerpestes salsuginosa</i> | | | | | | + | |
| | | 80 | <i>Halerpestes sarmentosa</i> | | | | | | + | |
| 13 | | | Cruciferae | | | | | | | |
| | 46 | 81 | <i>Lepidium obtusum</i> | | | | + | | | |
| | | 82 | <i>Lepidium amplexicaule</i> | | | | + | | | |
| | | 83 | <i>Lepidium latifolium</i> | | | | + | | | |
| | 47 | 84 | <i>Cardaria pubescens</i> | | | | + | | | |
| | 48 | 85 | <i>Dontostemon senilis</i> | + | | | | | | |
| | 49 | 86 | <i>Erysimum cheiranthoides</i> | | | | + | | | |
| 14 | | | Crassulaceae | | | | | | | |
| | 50 | 87 | <i>Orostachys spinosa</i> | + | | | | | | |
| 15 | | | Saxifragaceae | | | | | | | |
| | 51 | 88 | <i>Parnassia palustris</i> | | | | | | + | |
| 16 | | | Rosaceae | | | | | | | |
| | 52 | 89 | <i>Potentilla anserina</i> | | | | | | + | |
| | | 90 | <i>Potentilla bifurca</i> | | | | | + | + | |
| | | 91 | <i>Potentilla dealbata</i> | | | | | | | |
| 17 | | | Leguminosae | | | | | | + | |
| | 53 | 92 | <i>Thermopsis mongolica</i> | | | | | + | | |
| | 54 | 93 | <i>Medicago sp</i> | | | | | + | | |
| | 55 | 94 | <i>Melilotus suaveolens</i> | | | | | + | | |
| | 56 | 95 | <i>Sphaerophysa salsula</i> | | | | | + | | |
| | 57 | 96 | <i>Halimodendron halodendron</i> | | | | | + | | |
| | 58 | 97 | <i>Caragana leucophloea</i> | | + | + | | | | + |
| | 59 | 98 | <i>Astragalus lasiopetalus</i> | | | | | + | | |
| | | 99 | <i>Astragalus Sanchirii</i> | + | | | | | | |
| | | 100 | <i>Astragalus sulcatus</i> | | | | | | + | |
| | | 101 | <i>A. tibetanus</i> | | | | | | + | |
| | 60 | 102 | <i>Oxytropis aciphylla</i> | | | | + | | | + |
| | | 103 | <i>Oxytropis Gorbunovii</i> | | | | | | + | |
| | | 104 | <i>Oxytropis monophylla</i> | | | | | + | | |
| | | 105 | <i>Oxytropis puberulus</i> | | | | | + | | |
| | 61 | 106 | <i>Glycyrrhiza uralensis</i> | | | | | + | | |
| | 62 | 107 | <i>Vicia costata</i> | + | | | | | | |
| 18 | | | Geraniaceae | | | | | | | |
| | 63 | 108 | <i>Geranium collinum</i> | | | | | | + | |

| | | | | | | | | | | |
|-----------|----|-----|------------------------------------|---|---|---|---|---|---|---|
| 19 | | | Linaceae | | | | | | | |
| | 64 | 109 | <i>Linum pallescens</i> | | | | | | + | |
| 20 | | | Zygophyllaceae | | | | | | | |
| | 65 | 110 | <i>Peganum harmala</i> | | | + | | | | |
| | 66 | 111 | <i>Zygophyllum kaschgaricum</i> | | | | | + | | |
| | | 112 | <i>Zygophyllum gobicum</i> | | + | + | | | | |
| | | 113 | <i>Zygophyllum Rosovii</i> | + | + | | | | + | |
| | | 114 | <i>Zygophyllum pterocarpum</i> | + | + | | | | + | |
| | | 115 | <i>Zygophyllum neglegtum</i> | + | + | | | | | |
| | 67 | 116 | <i>Nitraria sibirica</i> | | | | | | + | |
| 21 | | | Tamaricaceae | | | | | | | |
| | 68 | 117 | <i>Reaumuria soongorica</i> | | + | + | + | | + | |
| | 69 | 118 | <i>Tamarix arceutoides</i> | | | | | | + | |
| | | 119 | <i>Tamarix ramosissima</i> | | | | | | + | |
| 22 | | | Cynomoriaceae | | | | | | | |
| | 70 | 120 | <i>Cynocorium songaricum</i> | | | | | | + | |
| 23 | | | Umbelliferae | | | | | | | |
| | 71 | 121 | <i>Carum carvi</i> | | | | | | | + |
| | 72 | 122 | <i>Peucedanum falcaria</i> | | | | | | | + |
| 24 | | | Primulaceae | | | | | | | |
| | 73 | 123 | <i>Primula longiscapa</i> | | | | | | | + |
| | 74 | 124 | <i>Glaux maritima</i> | | | | | | | + |
| 25 | | | Gentianaceae | | | | | | | |
| | 75 | 125 | <i>G. decumbens</i> | | | | | | | + |
| | | 126 | <i>Gentiana leucomelaena</i> | | | | | | | + |
| 26 | | | Apocynaceae | | | | | | | |
| | 76 | 127 | <i>Poacynum pictum</i> | | | | | | + | |
| 27 | | | Convolvulaceae | | | | | | | |
| | 77 | 128 | <i>Convolvulus Gortschakovii</i> | | + | + | | | + | |
| | | 129 | <i>Convolvulus Ammanii</i> | | + | + | | | + | + |
| 28 | | | Boraginaceae | | | | | | | |
| | 78 | 130 | <i>Arnebia desumbens</i> | + | | | | | | |
| | 79 | 131 | <i>Lappula semiglabra</i> | + | | | | | + | |
| 29 | | | Labiatae | | | | | | | |
| | 80 | 132 | <i>Dracocephalum integrifolium</i> | + | | | | | | |
| | 81 | 133 | <i>Panzeria lanata</i> | | | | + | | | + |
| | 82 | 134 | <i>Schizonepeta annua</i> | + | | | | | | |
| 30 | | | Scrophulariaceae | | | | | | | |
| | 83 | 135 | <i>Linaria hepatica</i> | + | | | | | | |
| | | 136 | <i>Linaria pedicellata</i> | + | | | | | + | + |
| | 84 | 137 | <i>Odontites serotina</i> | | | | | | | + |
| | 85 | 138 | <i>Pedicularis altaica</i> | | | | | | | + |
| 31 | | | Orobanchaceae | | | | | | | |

| | | | | | | | | | | |
|-----------|-----|-----|------------------------------------|---|---|---|--|---|---|---|
| | 86 | 139 | <i>Orobanche cumana</i> | | | | | + | | |
| | 87 | 140 | <i>Cistanche deserticola</i> | | | | | + | | |
| | | 141 | <i>Orobanche Korshinskyi</i> | | | | | + | | |
| 32 | | | Plantaginaceae | | | | | | | |
| | 88 | 142 | <i>Plantago major</i> | | | | | | + | |
| | | 143 | <i>Plantago mongolica</i> | | | | | | + | |
| 33 | | | Rubiaceae | | | | | | | |
| | 89 | 144 | <i>Galium verum</i> | | | | | | + | |
| 34 | | | Plumbaginaceae | | | | | | | |
| | 90 | 145 | <i>Limonium Gmelenii</i> | | | | | + | | |
| | | 146 | <i>Limonium suffruticosum</i> | | | | | + | | |
| | 91 | 147 | <i>Coniolumon spesiosum</i> | + | | | | | | + |
| 35 | | | Compositae | | | | | | | |
| | 92 | 148 | <i>Xanthium strumarium</i> | | | | | | + | |
| | 93 | 149 | <i>Ajania achilleoides</i> | | | + | | | | |
| | | 150 | <i>Ajania fruticulosa</i> | | + | + | | + | | |
| | 94 | 151 | <i>Kaschgaria Komarovii</i> | | + | + | | + | | |
| | 95 | 152 | <i>Artemisia pectinata</i> | | + | | | + | | |
| | | 153 | <i>Artemisia pamirica</i> | | | | | + | | |
| | | 154 | <i>Artemisia dracunculus</i> | | | | | + | | |
| | | 155 | <i>Artemisia santolinifolia</i> | | | | | + | | |
| | | 156 | <i>Ar. mongolica</i> | | | | | + | | |
| | | 157 | <i>Ar. Caespitosa</i> | | + | | | | | + |
| | | 158 | <i>Ar. Xanthochroa</i> | | | | | | | + |
| | | 159 | <i>Artemisia terrae –albae</i> | | | + | | | | + |
| | | 160 | <i>Artemisia sublessingiana</i> | + | | + | | + | | |
| | | 161 | <i>Artemisia rutifolia</i> | | | | | + | | |
| | | 162 | <i>Artemisia macrocephala</i> | + | | | | | | |
| | | 163 | <i>Ar. Gobica</i> | | | | | + | | |
| | | 164 | <i>Artemisia obtusiloba</i> | | + | | | | | |
| | | 165 | <i>Artemisia mongolorum</i> | | | | | + | | |
| | 96 | 166 | <i>Echinops humilis</i> | + | | | | | | |
| | 97 | 167 | <i>Saussurea Grubovii</i> | | | | | + | | |
| | | 168 | <i>Saussurea amara</i> | | | | | + | | |
| | | 169 | <i>Saussurea salsa</i> | | | | | + | | |
| | | 170 | <i>Saussurea dahurica</i> | | | | | + | | |
| | 98 | 171 | <i>Cirsium incana</i> | | | | | | + | |
| | 99 | 172 | <i>Acroptilon australe</i> | | | | | + | | |
| | | 173 | <i>Acroptilon repens</i> | | | | | + | | |
| | 100 | 174 | <i>Scorzonera pseudodivaricata</i> | + | | | | | | |
| | | 175 | <i>Scorzonera Ikonnikovii</i> | + | | | | | | |
| | | 176 | <i>Scorzonera parviflora</i> | | | | | + | | |
| | 101 | 177 | <i>Sonchus oleraceus</i> | | | | | | + | |
| | 102 | 178 | <i>Lactuca serriola</i> | | | | | + | | |
| | 103 | 179 | <i>Lappula tatarica</i> | | | | | + | | |

| | | | | | | | | | | |
|--|-----|-----|--------------------------------|---|--|--|--|---|---|---|
| | 104 | 180 | <i>Chondrilla lejosperma</i> | | | | | | + | |
| | 105 | 181 | <i>Taraxacum leucanthum</i> | | | | | | + | |
| | 106 | 182 | <i>Prenanthes angustifolia</i> | | | | | | + | |
| | 107 | 183 | <i>Youngia stenoma</i> | | | | | + | | |
| | 108 | 184 | <i>Heteroppapus altaicus</i> | + | | | | + | | + |

Conclusion

1. In the study area 184 vascular plant species of 107 genus and 35 families have been recorded. Dominant families are Gramineae, Compositae, Leguminosae, and Chenopodiaceae.
2. Ten plant communities have been recorded in Takhi Tal area and composed a 1:100000-scale vegetation map. Dominant communities in the area are desert steppe communities such as *Nanophyton erinaceum* – *Stipa glareosa* and *Naloxylon ammodendron*-*Reaumuria soongorica*, of desert communities that cover the most of the area (70%).
3. Regarding economical values of plant species studied there are 66 species of medicinal values or 35.8 %, and 18 food species or 9.7 %, and 21 species of soil protection values or 11 %, and 15 decorative species or 8.1 %, and 18 poisonous species or 9.7 %, and 117 fodder species or 63.5 % of the total plants recorded in the area.
4. According to our study findings *Hordeum turkestanicum* in Zuungarun zone / circuit and *Aeluropus pungens* in Mongolia are newly recorded.
5. Herds of Takhi reintroduced in open areas of Bij river valley are mostly found at the end of Bij river and vicinity of Tavan Tolgoi area with SULI-DERST community and watered in Bij river, and Gun Tamgiin Us and grazed in their valleys with TAAR-SAIR *Stipa* and ZAG-ULAAN BUDARGANAT communities in summers and autumns. Snowing starts at the end of November and the grazing areas are covered by it. Within this period of time herds of species move to mouths of Khurgaljin and Khonin Us rivers with ZAG-ULAAN BUDARGANAT communities for grazing.

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