Small mammal community in the dry valley of Bij-gol, Dzuungarian Gobi, South Western Mongolia

Report 2002-2003

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International Takhi - Group

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Introduction

Mongolian government established protected area network, which is untamed part of Central Asian Desert, extraordinary landscape, and unique living habitat of rare and vulnerable fauna and species in the world. This is the Great Gobi Strictly Protected area and it was established in 1975.

The Great Gobi Park is divided into two parts; A and B. Part A covers 4.419 thousand ha and B covers 881 thousand ha area, and total of 5.3 million ha area encompasses in it. By size, the Great Gobi park getting at 3rd place among the protected areas in the world (Avirmed, 1995).

In the park area, there are many nature conservation activities implementing as preserving

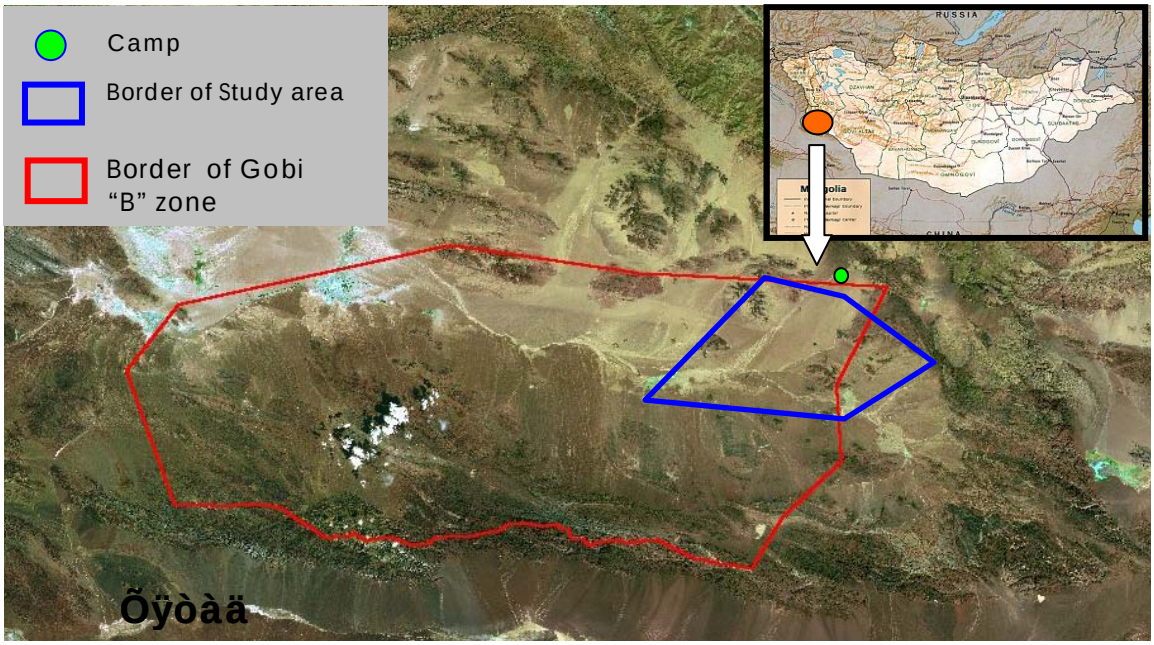

Figure 1. Location of Study area

the biological diversities, protection and re-introduction. One of these activities is the takhi-reintroduction in the part B, its former habitat, in which the species became extinct in the Dzungarian Gobi. Frame of the work, under the initiation and support of the International Takhi Group (ITG), there are many activities have been implementing and therefore, the small mammal study became one part of those activities. Within the frame of the small mammal study, we conducted surveys including two main periods, namely 4th June to 10th July, from 25th August to 1st November 2002, and from 1st July to 1st September 2003.

Background

An existence of every biocenose based on how to complete the long-term existing condition of the biotype in that ecosystem and identification the human, biotic and biotic influences for it.

The study of interaction between habitat and species' existence in the ecosystem, in which the Takhi was reintroduced is interesting and significantly. Particularly, How increases of small herbivorous rodent population affect The takhi grazing area and small rodents relation to the pastureland changes.

The mammal study of this region started earlrer (the end of XIX century). However there have not been many studies to identify the species composition clearly. Because, there was a finding of new species recently in Mongolia. In addition, Sokolov (1918), first time noted the South Gobi Jerboa *Allactaga balicunica* Hsia Wu ping, Fang Xi-yeh, 1964, and Sokolov and Schenbrot (1987) found the Dzungarian Jerboa *Stylodipus sungorus* Sokolov et Schenbrot, 1987. Several rodent distribution area is widening in recent time, therefore, it shows there is still full possibility to find other new species. It shows that that in the future, there detailed study on small mammal should be done.

In the other side, the country of Mongolia is located in the zone junction of Iran, Turan, Tin-Shyan, Kazakhstan-Tajikistan and northeast Central Asian desert. By the zoographical zonation, Dzungarian Gobi is a part of the District of the West Gobi, however, it has not been identified clearly (Shagdarsuren, 1962) by the faunistic composition, rich of Mongolian and Central Asian endemic rare species, which listed not only Mongolian, but also World Red Book, however, the region relatively little studied.

Aim and Objectives

Following objectives were identified to determine small rodent species diversity and their ecosystem significance in the Bij-gol, it's vicinity.

To determine of

- Species composition
- Richness species
- Dominant species in habitat
- Diversity of habitats and distribution characteristics

Review on study

There is not any case study on small rodents in the Bij River, and its surrounding areas. The main surveys are being towered on rare mammals existing in the Dzungarian (West) Gobi (Figure 2), specially, on Takhi, Khulan and Eurasian Beaver in the Bulgan River. According to the surveys, have been observed, caught and collect the some small rodents occur on the way. It could be explained that these surveys were the starting time of the small rodents in this region. In particular, Przewalski's expedition (1870, 1879-1880), Potanin (1876), Pevtsov (1889-1890), Tsevegmid (1947, 1953), Bannikov (1954), Shagdarsuren (1962), Bold (1965), Shagdarsuren, Sosorbaram (1967), Dovchin et all, (1967, 1968), O.Shagdarsuren and N.Munkhbayar (1968), S.Dulamtseren (1969), S.Dulamtseren et all (1969), N.Khotolkhuu et all (1967), V.E.Sokolov and V.N.Orlov (1980), V.E.Sokolov (1981), V.E.Sokolov et al (1981), G.I.Schenbrot (1986), Kh.Sukhbat, B.Munkhtsog (1991), R.Samiya et all (1993) and Ch.Darkhanchimeg (1996) conducted a surveys.

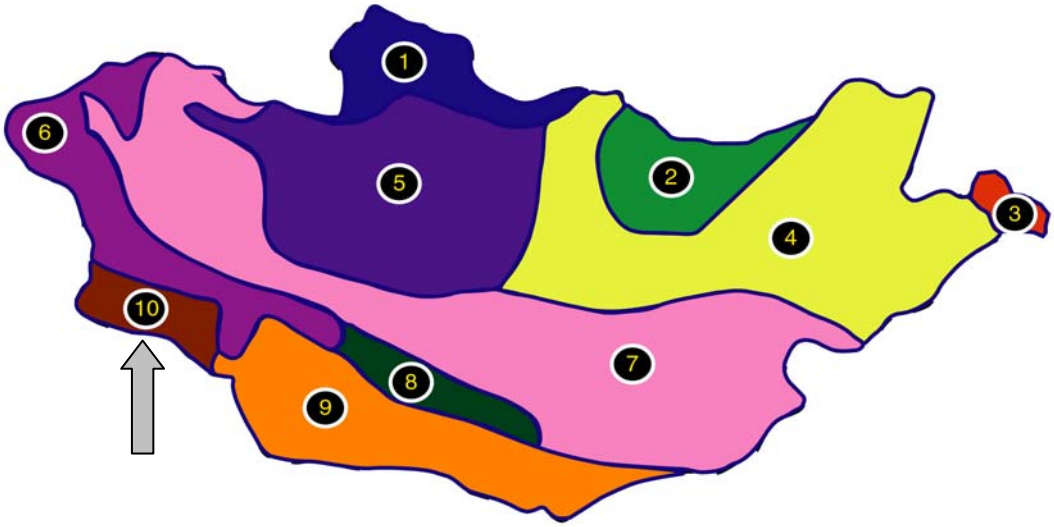

Figure 2. Zoogeographic region of Mongolia (by Bannikov, 1954)

1.Huvsgul region, 2.Khentii region, 3.West Khyangan region, 4.Mongolia-Daurian region, 5.Khangai region, 6.North west Mongolian region, 7.North Gobi region, 8.Gobi-Altai region, 9.Trans-Altai region, 10.Dzuungarian region.

Method and materials

Study area and its selection

The Great Gobi Part "B" has a large area and it is the biggest protected area among the protected areas in Mongolia. Therefore, for the study to entirely cover this region, of course, longer period, more power and expenses are needed. Our study covered 192.0 thousand square ha (Figure 3) located between the Bijgol River, Gashuun Us, Gun Tamga, Toodog Us, Khonin Us and Shiiryn Us oasis. Thus, the study is represented 20 per cent of all part B.

By geomorphology basic features, such as water points, flora and fauna, therefore, the study area, has had the main elements, which could represent for the Dzungarian Gobi District. Eight study points were randomly selected and these points differed distinguish to each by biotype (Table1).

Table 1. Selected habitat and its location to study small mammals

№	Names of habitat	Altitude (m)	Location
1	Nanophyton-feathergrass	1720	$N45.53912^0$ $E93.69568^0$
2	Feathergrass-ephedra-onion	1672	$N45.53515^0$ $E93.58552^0$
3	Caragana-artimiza	1610	$N45.49278^0$ $E93.53561^0$
4	Anabasis- feathergrass	1870	$N45.49080^0$ $E93.43205^0$
5	Halophylus shrubs	1532	$N45.42719^0$ $E93.43205^0$
6	Feathergrass-wormwood	1451	$N45.34655^0$ $E93.33358^0$
7	Achnaterum splendens grassland	1639	$N45.26054^0$ $E93.69379^0$
8	In Fence	1712	$N45.55000^0$ $E93.70000^0$

Materials

We used Sherman© live traps (Figure 3) and pitfall traps for the specimens, which are for biological study, and the positions were taken by the GPS Garmen-12. Cranial and body measurements were taken by the caliper, a ruler in 1 mm, 0.1g scale made in Switzerland and dissecting microscope MBI-1. Data were analyzed by using Word and Excel 2000 program, SPSS, ANOVA: Single factor and GIS programs.

Figure 3. Sherman live traps

Study and analyses have been done at the laboratory of Vertebrates, Department of Zoology, National University of Mongolia.

Method

Field study method

We put the 80 live traps (Figure 4) in every selected eight squares distinguished by biotype along the 400 meters (Figure 5) between 10 meters every live traps. When put two live traps in one

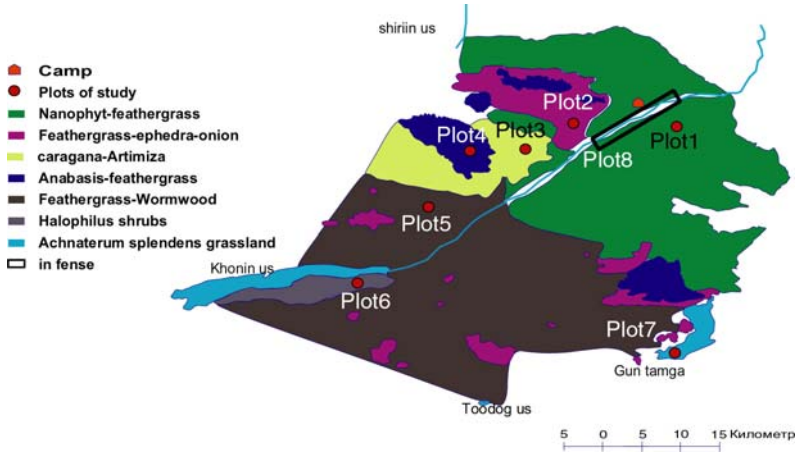

Figure 4. Different vegetation map (Petra, 2002)

place, the live traps putted against each other. We used capture-mark-recapture technique.

Every 3 days, (morning, afternoon and evening) we checked the sampling squares to measure first individual indexes such as age, sex, body weight, body length, tail, hind foot paw and ear, while determining every individuals genital organ changes by its external feature. Every individuals marked by the method of amputation. This method is used to study behavior, movement, habitat ecology and density of population.

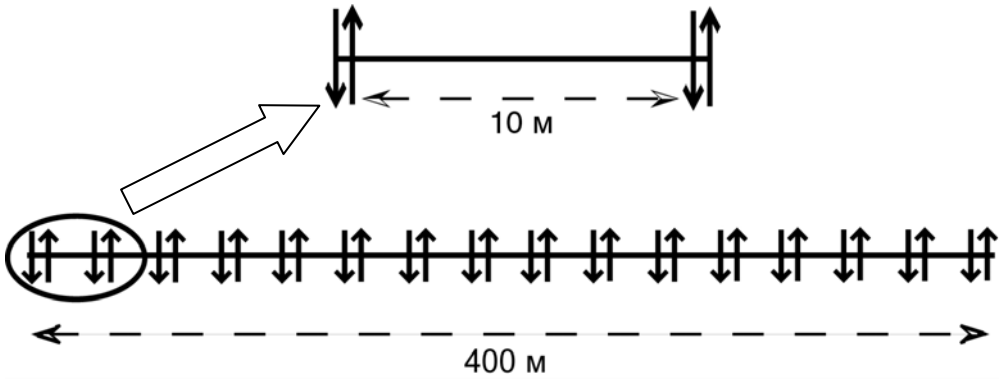

Figure 5. Trappping scheme in the field by Sherman Live Traps

Two systems for numbering toes provide an identification number through amputation of selected digits (toe clipping). A four didgit system developed by French (1964) requires amputation of no more than one toe per limb, is easily read, and will provide up to 899 combinations using four toes on each front foot and five toes on each hind foot. The Second system developed by Baumgartner (1940) gives consecutive numbers up to 158 with only one toe removed per foot.

Additional consecutive numbers can be added by clipping more than one toe per foot. In this study, we used the Baumgartner's system (Figure 6).

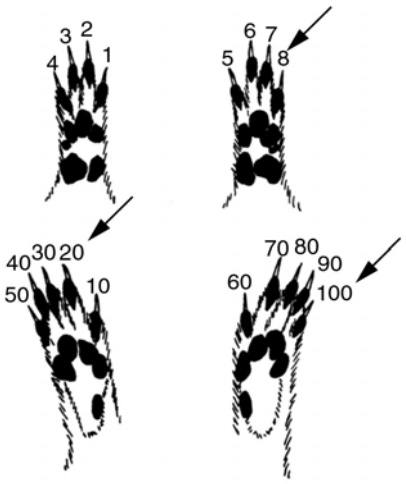

Figure 6. Methods clipping toes. Arrow indicate 128.

The measurements dates shown in the table (see appendix). For the bait, we used rice, oats, mixed oats with peanut and vanilla.

Statistical analysis

For cluster analysis, calculation of difference coefficient of dominant species in the assemblage and richness of mammal species, we used following indexes and coefficients developed and integrated by Krebs (1989) and Balogh (1958).

1.The richness of small mammal and differences of their biotypes identified by Jackknife's assessment

$$\hat{S} = s + \left(\frac{n-1}{n}\right)k$$

$\hat{S}$ = Jackknife estimate of species richness

s=Observed total number of species present in *n* quadrates

n=Total number of quadrates sampled

k=Number of unique species

Based on the species differences, the variance developed by ANOVA: Single factor program and confidence interval is Alpha=0.03 or 3 percent.

This variance can be used to obtain confidence limits for the jackknife estimator as follows;

$$\hat{S} \pm t_{\alpha}\sqrt{\text{var}(\hat{S})}$$

Where

$\hat{S}$ = Jackknife estimator of species richness

t_{α} = Student's *t* value for *n*-1 degrees of freedom for the appropriate value of α

$\text{var}\left(\hat{S}\right)$ = Variance of $\hat{S}$

2. When identify the dominant species in the assemblage, used Baloph's (1958) formula.

It is divided to following, how many percent the dominant species represents among all species composition.

$$D = \frac{n_a}{n} \cdot 100$$

D=Dominant species

n_a= individual number of dominant species

n=total individual number

It is divided to following, how many percent the dominant species represents among all species composition.

Eudominant	10% more
Dominant	5.1%-10 %
Subdominant	2.1%-5.0%
Resident	1.1%-2.0%
Subresident	<1.0%

3. Jaccard's similarity coefficient used for relationship between assemblages.

$$S_j = \frac{a}{a+b+c}$$

S_j=Jaccard similarity coefficient

a=Number of species in sample A and sample B (joint occurrences)

b=Number of species in sample B but not in sample A

c=Number of species in sample A but not sample B

3. We used for single linkage clustering method.

Definitions For single linkage clustering

{ Similarity between a sample and an existing cluster } = { Similarity between the sample and the *nearest* member of that cluster }

{ Similarity between two existing cluster } = { Similarity between the two nearest members of the cluster }

Result

Although, the term small mammal is commonly used in biology, there is no systematical indicator and researchers determine it by themselves. Nevertheless, the body measurement is one of the popular indicator. The small mammal group, we identified the tolai and small-bodied mammals compared with the tolai, as insect eaters, chiropters, lagomorphs and mammals in Order of *Rodent* (Batsiakhan et all., 2004).

Previous researchers (Stubbe et Khotolchuu, 1967; Sokolov and Orlov, 1980; Dulamtseren et al, 1989) and our study show that there have been registered 36 species of small mammals belonging to 26 Genera' in 9 Families of 4 Orders (*Insectivora, Chiroptera, Lagomorpha and Rodentia*) for the study area (Table 2).

Table 2. Species composition of small mammals in the Bij-Gol

№	Names of Small Mammal	Captured method
INSECTIVORA		
1	*Hemiechinus auritus* – Long-Eared Hedgehog	Live traps
2	*Crocidura sauveolens* – Scilly Shrew	Live traps
CHIROPTERA		
3	Myotis mystacinus – Whiskered Bat[5]	
4	*Plecotus austriacus* – Long-Eared Bat[5]	
5	*Pipistrellus savii* – Sav's Pipistrelle[5]	
6	*Eptesicus gobiensis* – Gobi-desert Bat[5]	
LAGOMORPHA		
7	*Ochotona pallasi* – Pallas' Pike[1]	
8	Lepus tolai – Tolai Hare	Observation
RODENTIA		
9	*Spermophilus erythrogenys* –Red-cheeked Souslik	Observation
10	*Phodopus campbelli* *- Dwart Hamster	Live traps
11	*Phodopus roborovskii* – Roborowski's Dwart Hamster	Live traps
12	*Cricetulus migratorius* – Grey Hamster	Live traps
13	*Cricetulus longicaudatus* – Long-tailed Hamster	Live traps
14	*Allocricetulus curtatus* – Mongolian Hamster[2]	
15	*Ellobius talpinus* – Northern mole-vole	Live traps
16	*Alticola strelzovi* – Flatheaded Vole	Live traps
17	*Lagurus Lagurus* – Steppe Lemming[3]	Live traps
18	*Eolagurus luteus* – Yellow Steppe Lemming[4]	Live traps
19	*Eolagurus przewalskii* – Przewalski Lemming	Live traps
20	*Microtus limnophilus* – Meadow Vole	Live traps
21	*Meriones meridianus* – Midday Gerbil	Live traps
22	*Meriones unguiculatus* – Mongolian Gerbil	Live traps
23	*Meriones tamariscinus* – Tamarisk Gerbil	
24	*Rhombomys opimus* – Great Gerbil	Live traps
25	*Apodemus peninsulae* – Korean Field Mouse[2, 6]	
26	*Mus musculus* – House Mouse	Live traps
27	*Alactagulus pygmaeus* – Little Earth Jerboa[2 *]	
28	*Allactaga sibirica* – Siberian Jerboa	Light, Sweet net
29	*Allactaga nataliae* – South Gobi Jerboa[4]	Pitfall traps, Live traps

30	*Allactaga bullata* – Gobi Gerboa[3]	Pitfall traps, Live traps
31	*Allactaga elater* – Little Gerboa[1]	
32	*Dipus sagitta* – Hairy-footed Jerboa	Light, Sweet net
33	*Salpingotus kozlovi* – Kozlov's Pygmy Jerboa	Light, Sweet net, Live traps
34	*Salpingotus crassicauda* – Thick tailed Pygmy Jerboa	Light, Sweet net, Live traps
35	*Cardiocranius paradoxus* – Satunin's Jerboa	Light, Sweet net
36	*Stylodipus songorus* – Zuungarian Jerboa*	Light, Sweet net, Live traps

[1] A.Bavaasan and J.Tamir /1993/

[2] N.Hotolhuu et all /1971/

[3] Ch.Darkhanchimeg /1996/

[4] N.Batsaikhan /1993/

[5] N.Davaadorj /2000/

[6] S.Dulamtseren /1989/

Zoo geographically, the study area encompasses Dzungarian Gobi District. If compare this district to small mammal assemblage of the study area's assemblage of the small mammal, we registered 90 per cent or 36 species small mammals (Figure 7).

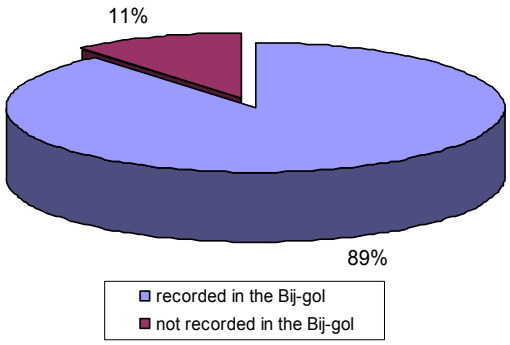

Figure 7. Small mammals in the Dzuungarian Gobi

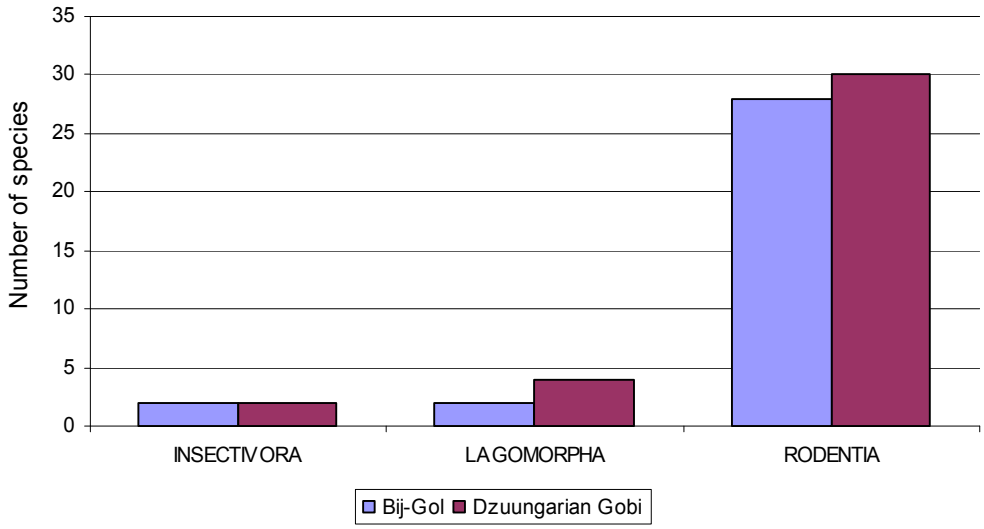

Figure 8. Compared orders of Small Mammals in the Bij gol to the Dzungarian Gobi

Recognize if those registered species by Order type, species composition is relatively different from each other and most of them belong to the Order of Rodents. Particularly, in the study area registered that the Mongolian gerbil, Great gerbil, dwarf hamster and Korean field

mouse, which are the commonly occurring species in the Forest steppe zone, Mongolia (Figure 8). Thus, it shows that these species have had wide choices on forage and living habitat. In addition, there are some indicator species for the Jungarian Gobi District. For example, the Tamarisk gerbil occurs in the foot of terraces, depression with hillocks, small hills with the tamarisk bushes, in Jungarian Gobi, and is the species included in the Mongolian Red Book.

On the other hand, the Bijgol River and its surrounding are have many biotypes, which could be representative of the biotypes of the Mongolian Gobi and Jungarian Gobi. Therefore, it given the basic possibility to live there various species. Particularly, there are main biotypes of the Jungarian Gobi, as the Khonin Us, Shiiryn Us and Gun Tamga Oasis', soft muddy ground steppe with *Haloxylon ammodendron, Salsola* sp, hillocky steppe with *Stipa, Allium*, small rocky soiled terrain with *Haloxylon ammodendron*, muddy soiled river valley with *Caragana* and *Aremesia* an along the Bij River. Therefore, there are 10 species (83.3 per cent) of mammals recorded at the study area from the Family of *Dipodidae*, which is the family commonly distributed in the Mongolian Gobi (Figure 9).

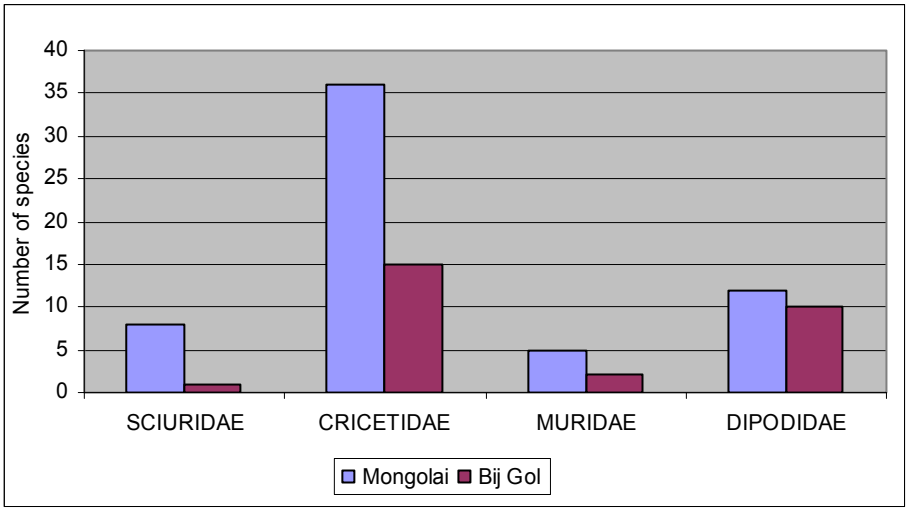

Figure 9. Compared families of order for Rodentia

Related to the life rhythm, sufficient food source, and habitat ecology, the small mammal existing in the Gobi desert or near the Bij-gol River, 88 per cent (29 species) of them are nocturnal, nocturnal and diurnal animals. These species have relatively different ability on how they endure harsh natural condition and cold winter period. Particularly, among the species, 61 per cent (22 species) overcome the unsuitable condition in the hibernation. In this type of animals included insectivores, chiropters, jerboas and hamsters. Among the hibernating animals, 91 per cent (20 species) of they are nocturnal, but the species not hibernating have many superiorities compared to the nocturnal species, such as preparing and keeping food for winter in their burrow and living by family type for passing the natural difficulties (Figure 10, see appendix). For example, the Great gerbil and Mongolian pica prepare a large size of food in their burrows for winter.

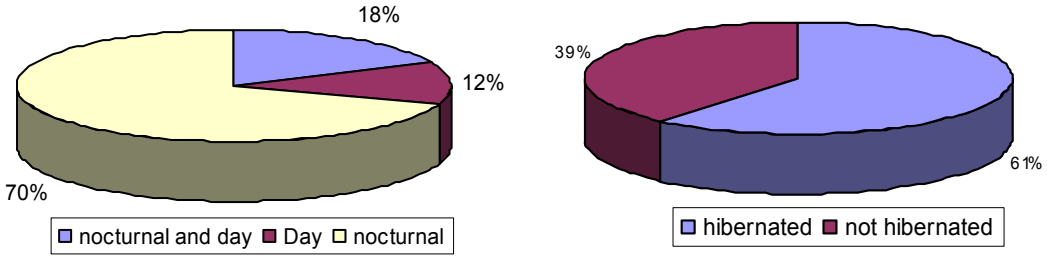

Figure 10. life style of small mammals

By the classification of the food type, 63 per cent (23 species) are omnivores, 14 per cent (5 species) herbavores, 17 per cent (6 species) insectivores and 6 per cent (2 species) granivores (Figure 11, see appendix).

A omnivores and plant eaters are represent more percentage among the animals, because they adapted to Central Asian arid zone and had more ability to select and eat common food than other species. These include, dwarf hamster, long-tailed hamster, midday gerbil and hairy-footed jerboas.

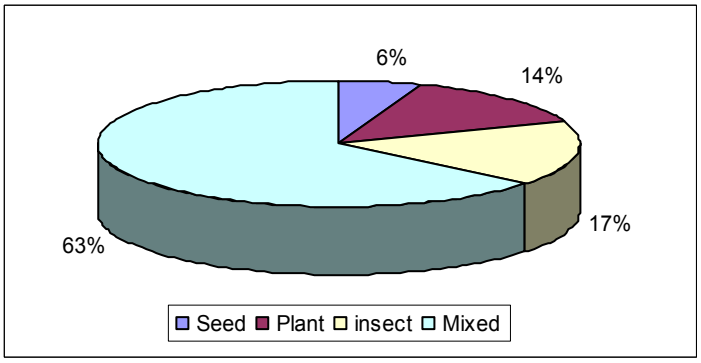

Figure 11. Food type of Small Mammals

Species Richness

We conducted the study at the same time and by method for every selected area that differ from each other.

Species richness is that the total number of species existing in given assemblage. There are several methods to identify the species richness. In this study, we used the jacknife's method, which is the commonly used method recently.

$$\hat{S} = s + \left(\frac{n-1}{n}\right) \bullet k = 19 + \left(\frac{7}{8}\right) \bullet 10 = 27.8$$

We calculated variance of richness by ANOVA; Single factor program var($\hat{S}$)=2.4

For this sample, for 95% confidence $t_{\alpha} = 2.26$, and confidence interval would be approximately;

$$27.8 \pm (2.26)\sqrt{2.4} = 27.8 \pm 3.4$$

24.4min=27.8=max31.9

Previously, we mentioned that species richness was 27.8 or proximately 28 species registered at the sampling area. Based on this quantity, We calculated the possible maximum and minimum interval as 32 and 24, by the 95 confidence of interval. This calculation was based on quantities from the places, we selected and it was estimated before we actually compiled the species list. On the other words, the result developed at two different time and the method. When we determined species composition, we include concrete recorded species based on our two years dates and previous researchers materials. If looks at the time, all species noted in the published materials, since started of the mammal study in the middle of XIX century until today for Dzungarian Gobi. Nevertheless, last calculated species richness based on caught species number and density in the selected places during the last two years.

Dominant species in the assemblage

Our selected study area has unique nature systems and weather conditions. The previous researchers materials show that at the small mammal assemblage level, most commonly distributed and dominated species was the Yellow steppe lemming (Batsaikhan, 1996).

According to the study of 2002-2003, an assemblage and individual number of small mammals decreased. However, the dominant species were relatively different, when used Balogh's (1958) method, dividing the total number species in assemblage to total individual number (Table 3). Particularly, differences of the dominant species in each year, is related to the biology and other habitat impacts of the given species.

Table 3. Comparison of Dominant species

	subdominant	**dominant**	**Subdominant**
2002	*Meriones meridianus*	*Allactaga sibirica*	*Stylodipus songorus*
		Meriones unguiculatus	
		Rhombomys opimus	
		Phodopus roborovskii	
2003	*Phodopus roborovskii*	*Meriones meridianus*	*Cricetulus migratorius*
		Salpingotus crassicauda	*Salpingotus kozlovi*
		Phodopus sungorus	*Cardiocranius paradoxus*
		Allactaga sibirica	

Even though, the dominant species were different in each year, but the species number was same. In addition, in 2002, the species number was at minimum level in the study area. But in 2003, the trend line was higher (Figure 12).

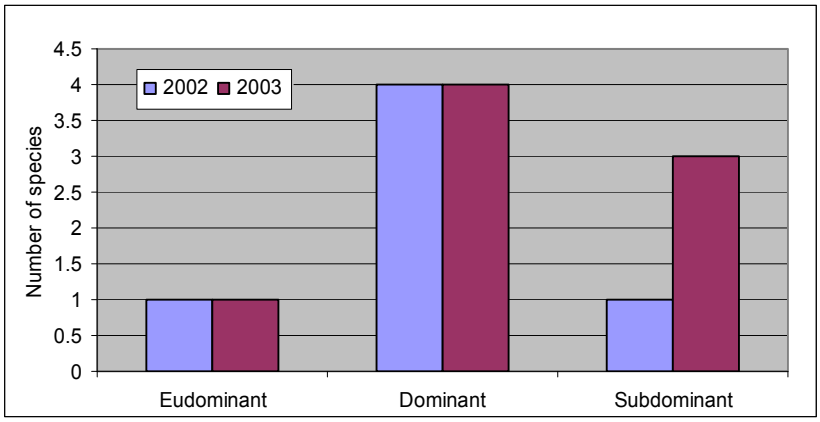

Figure 12. Compared of Dominant species

Even, the species composition is rich, the population number in each year was relatively different, because it is probably related to the weather conditions and other biological impacts. Study materials in 1991, 1992 and 1993 (Danzan et all., 1991; Darkhanchimeg, 1996) show that the Midday gerbil number increased in 1992-1993 and the density was 19-20 individuals per ha, but in July and August 1993, the Yellow steppe lemming density was higher and Midday gerbil only existed near the takhi fence in assemblage type (Batsaikhan, 1996). In April and May 1994, the Yellow steppe lemming density was 16-120/1ha, but in April and May 1995, an individual number in ha was sharply decreased (Darkhanchimeg, 1996). Ganbaatar and Enkhsakhan informed (personal communication) that the Yellow steppe lemming and the Midday gerbil density was high in August and September 1999. According to the study in 2002, the small mammals density inside the fenced area, is the field for hay hervets by the local people (N45.91.667, E094.16.667) was 0.16 live trap/per day (Scilly shrew, House mice, Dwarf hamster, Midday gerbil and Mongolian gerbil). In the place named Dood Elsen Tolgoi (N45.82.130, E094.89.268) with *Caragana* and *Artemisia* biotype, was 0.005 live trap/per day (Roborowsky's dwarf hamster, Midday gerbil) and in the west Bijgol bank with *Nanophyton-Stipa* and covered by gravel was 0.025 live trap/per day (Midday gerbil). It shows that the population number of the Yellow steppe lemming and the Midday gerbil was minimum density in 2002.

Above-mentioned facts show that the Yellow steppe lemming population increased and deceased in every 3-4 years frequently.

Our study result shows that in the Djungarian Gobi, density of the Mongolian pica and the Flat headed vole (plant eaters) was less than seedeaters.

12000 years ago, the time of middle and the end of the Holocene, the plant-eating mammals, such as pica and vole population density was more than seed-eating mammals, as Yellow steppe lemming and Jerboas (Knyazev et al, 1986; Knyazev & Savinetski, 1987).

According to this study, they explored that the small mammal population structure changed after transition between periods wet and dry in the Mongolian South desert zone. At, that time, (300-200 years ago) when the dry season appeared, the yield of the green plant decreased, and the seed and insect eaters increased in species number the Gobi Desert and they were the dominants. Herewith clear example about the Yellow steppe lemming, which is the species common distributed in the Gobi Desert zone. In the Trans-Altai Gobi, the Yellow steppe lemming distributed in mosaic, but in small density. In the Jungarian Gobi, they exibit in high population dynamic amplitude, however they show the key species feature (Batsaikhan, 1993; Darkhanchimeg, 1996 and Lhagvasuren & Samiya, 2004).

Nevertheless, all species of the *Dipodidae* or Jerboas, their food selectivity is broad to include plant, seeds, fruits, root and new green parts (Schenbrot, 1986), thus, the population number changes are not too sharp and their hind foot paw structure directly related to the ground-covering stone for a given place (Vinogradov, 1937; Fokin, 1978).

Feature of the habitat ecology

The habitat ecology and distribution of the small mammals in the Bij River of Dzungarian Gobi, relatively different. The species composition and percent of density was relatively different for selected areas that differ from each other. We have calculated the differences between the various habitats by its species composition and expressed their interaction (Table 4).

Table 4. Similarity coefficient between the communities of small mammals of various habitats

	plot1	**plot2**	**Plot3**	**plot4**	**plot5**	**plot6**	**plot7**	**plot8**
Plot1	1							
Plot2	0.58333	1						
Plot3	0.56250	0.60000	1					
Plot4	0.50000	0.50000	0.58333	1				
Plot5	0.56250	0.50000	0.57143	0.50000	1			
Plot6	0.50000	0.66667	0.60000	0.62500	0.60000	1		
Plot7	0.50000	0.50000	0.50000	0.57143	0.62500	0.50000	1	
Plot8	0.53571	0.54545	0.63636	0.59091	0.53846	0.60000	0.52381	1

We also described the relationship between variety of habitats by cluster method using the coefficient of differences (Figure 13).

Above facts show that the highest relationship was 0.66 (Plot 2 and 6) and but the smallest was 0.50 (Plot 1 and 7) or most biotypes are highly related to each other, with less differences among them. It means the selected areas in Bij-River, and its surrounding areas were different from each other by the flora, soil structure and geological structure. However, the small mammal species composition was almost the same. The every small mammal species has their own ecological niche, and distribution.

Although, the species number was almost the same in the selected areas, but occurrence of the species was variable. Therefore, every species occurring in various biotypes shows that the place has unique species composition.

The soil cover, its mechanic structure, and size of the stones significantly influenced the small mammals distribution in the Gobi. Particularly, animals of the *Diodide,* their moving apparatus are unique, substrate ecology of the habitat (Rogovin, 1986).

The species composition and density were different for various habitats. Particularly, according to the study 2002-2003, only one habitat living species were 10 and it represents 50 percent of all animals caught. During these periods, species quantity and density were at minimum level, because of harsh weather condition, hard winter or "zud" and drought of the summer. The last year, August 2003, the small mammal populations started to increase.

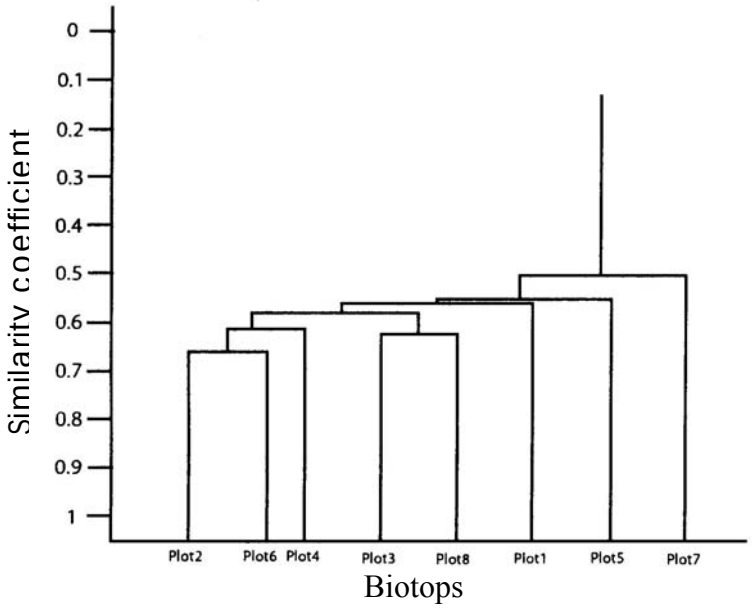

Figure 13. A dendrogram constructed using similarity data between various habitats

If recognize an every biotypes by the species richness, the plot number 8 has 10 species , which is fencing square along the Bijgol River for harvesting in Autumn, (Figure 14).

The plot (8), which fenced and made by the human, impossible to enter for livestock inside and often irrigated, has more species richness, because, of the more suitable conditions and possibility for the species, when faced the nature hard condition. On the other hand, the yield of

grasses inside the fence high, and there is less possibility for the small mammals to be taken by the raptors and carnivores.

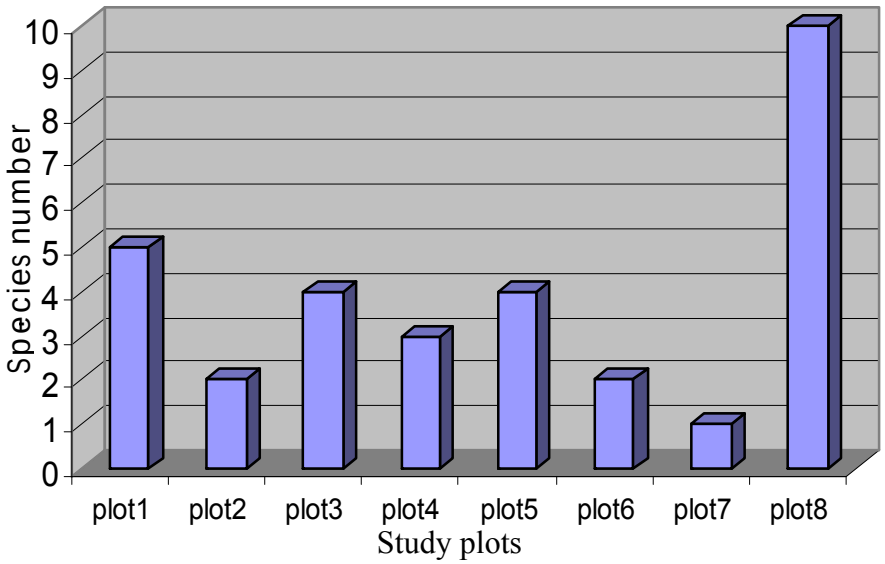

Figure 14. Species richness of different habitats

Therefore, when population number is sharply decreasing by the natural impacts such as hard natural conditions, and increase of raptors, very few individuals in most suitable habitat, are left who has more ability to survive. These individuals increase again, when suitable condition comes back. On the other hand, it can be said that the small mammal population dynamic is related to the given species biological circle.

Discussion

The Great Gobi is the globally-recognized area, which is untamed nature. The richness of the small mammal of this area is high.

According to the our study, we registered 36 species belonging to 4 Order, however, there are few species whose systematic status was not decided, such as South Gobi Jerboa *Allactaga nataliae* and Zungarian Jerboa *Stylodipus songorus*.

Previous researcher's study shows that until 1980, Gobi jerboa *Allactaga bullata*, Little jerboa *Allactaga elater* and Siberian jerboa *Allactaga sibirica* have been recorded in Mongolia (Dulamsteren, 1970; Sokolov & Orlov, 1980). Nevertheless, recently, based on morphology and skull features of the Gobi jerboa *A.bullata*, there are two separate species; Gobi jerboa and South Gobi jerboa (Sokolov, 1981; Sokolov et al, 1981) and South Gobi jerboa distributed from Ajbogd Mountain to east Alashan Gobi until Borzon Gobi. The Gobi jerboa commonly occur in the entire Mongolian Gobi Desert zone.

Recent researcher's study shows that there South Gobi jerboa (Batsaikhan, 1993) and Gobi jerboa (Darkhanchimeg, 1996) were recorded in Bij River and surroundings therefore it is possible that these two species occur.

Sokolov and Schenbrot (1987) related to the color, teeth, and genital organs of two species *Stylodipus telum* and *Stylodipus andrewsi*, which been recorded in Mongolia before and they add another new species *Stylodipus songorus* in the fauna of Mongolia. However, the source of recent study (Reading et al, 1994; Tinin et al, 2002) deny the species *Stylodipus telum* and changed it into the species *Stylodipus songorus.*

Our study area is geographically located in the Dzungarian or West Dry Depression District. There are few species, that can represent this district feature, such as the Tamarisk gerbil. During our study, this species was not recorded. However, the researcher's materials show that the species occurs by a few numbers in east part of the Ajbogd Mountain and valleys and depressions with the tamarisk and saxaul bushes in the Dzungarian Gobi (Dulamtseren, 1989). We conclude that the Tamarisk gerbil can survive in our study area.

The population density of the Yellow steppe lemming was higher near the Bijgol River, but it was different in each year, probably because of the given habitat features and other impacts.

Accord to the previous study, the Yellow steppe lemming population increased in July and August 1993, but also in 1994. However, in 1995, the population number decreased because of the drought. From 1999, the number started to increase, after hard winter and drought 2000, and their population number sharply decreased within its distribution in 2002. It shows that the circle of the Yellow steppe lemming population fluctuated in every 3-4 years, related to weather condition.

Conclusion

We presented following conclusions from this study.

- Various biotypes near the Bij River were the main cause of the diverse species composition.
- The differences of the dominant species proportion in the assemblage were related to certain species cycle and other biological impacts.
- The dominant species in the ecosystem of Bij River is the Yellow steppe lemming. The population number of the species increased by 3-4 years frequencies.
- The average species richness at the selected areas different from each other is 27.8 (24.4 min and 31.9 max)
- Of captured animals from the eight selected biotypes, 50 percent were stenotype animal or arounds only living in one habitat.
- The individuals which have more survival ability could choose the most suitable habitat for them and survive the most dry and not suitable periods.
- The species of the Family *Dipodidae* they overcome the harsh natural condition in the hibernating condition.

Published work based on the present study

Batsaikhan N., **Lkhagvasuren D**., and Samiya R., 2004

Small Mammals of Great Gobi Strictly Protected Area. // Proceeding of Great Gobi Project. (in press)

Lkhagvasuren D., and Samiya R., 2004

Species diversity and habitat selection of Small Mammals in Bij-Gol.//Outstanding research works of master course students of National University of Mongolia. (in press)

Lkhagvasuren D., and Samiya R., 2004

Ecological Study of Small Mammals in the vicinity of Bij-gol.// Report. GGSPA 'B' region. UB. 21 p. (in Mongolian)

Reference

Avirmed A., 1995

Natural Conditions and Bioloical resources in Great Gobi National Park.UB. p 4-6. (in Mongolian)

Avirmed D., 1975

New distribution recorded of Mandarin Vole (*Microtus mandarinus*), Northern Mole-vole (*Ellobius talpinus*).// Proceedings of the Instituite of Biology, Mongolian Academy of Sciences. № 10. UB. p.47-49.(in Mongolian)

Bannikov A.G., 1954

The mammals of Mongolian People's Republic. Academy of Science of the U.S.S.R., Moscow, Russa. 669pp. (in Russian).

Bavaasan A., and Tamir J., 1991

Study of Fleas of Some Rodents in the Takhiin Tal. // "Proceedings of Takhi Project. UB. p.55-57. (in Molgolian)

Batsaikhan N., 1993

In the issue of Helminthes and Ecology of Some Rodents in the Dzuungarian Gobi. Master's Dissertaition.UB. 41p. (In Mongolian)

Vinogradov B.S., 1937

Jerboa // Mammals. Academy of Science of the U.S.S.R., Moscow, Russa. p196. (in Russian)

Davaadorj N., 1999

Notes of species composition of Small Mammals in Dzuungarian Gobi. // Materials of the Scientofic Conference on the "Takh"-Project, The National Comission on Reintroduction of Takhi-Przewalski Hors –Into Mongolia №4. UB. p.59-73. (in Mongolian)

Darkhanchimeg Ch., 1996

Biology and Ecology of Takhi Reintroduced in Takhiin tal and Influence of Rodents on Takhi. Diploma work.UB. (in Mongolian)

Dulamtseren S., Dovchin N., and Badammagsar Kh., 1969

New distritution recorded Red cheeked Souslik (*Citellus erythrogenus* Brandt) in the Trans Altai. // Proceedings of the Instituite of Biology, Mongolian Academy of Sciences. № 4. UB. p.47-50. (in Mongolian)

Dulamtseren S., 1970

Guide to Mammals of the Mongolia. //Academy of Sciences of Mongolia. UB.241p. (in Mongolian)

Dulamtseren S., Tsendjav D., and Avirmed D., 1989

Fauna of Mongolia. Volume II .Mammal.UB. (in Mongolian)

Jirnov L. V., and Ilienmckii V. O., 1985

The Great Gobi Strictly Protected Area- Refuge of rare animals. Desert of Central Asia. Moscow. 35-40pp. (in Russian)

Knyazev, A.V., Savinetsky A.B., 1987

For the Holocene history of small mammal assemblages in the desert-steppe of Mongolia. // Zool.Dzur. Vol 66, issue 2. 279-285pp. (in Russian)

Knyazev, A.V. 1988

Changes in communities of herbivorous mammals of high mountains during Holocene // Trans Altai Gobi.. p.131-132. (in Russian)

Kojemykin V.V., 1974

About of Biology of Satunin Jerboa (*Cardaocranius paradoxus* satun.) in the Mongolia. // Structure and Dynamic of Steppe and Desert ecosystem of Mongolia. Leningrad. p. 127-131. (in Russian)

Przewalski, N. M. 1946

Mongolia and the country of Tanguts. Moscow. 333p. (in Russian)

Richard P.Reading., Sumiya D., Samiya R., and Batsaikhan N., 1994

Dictionary Of The Vertebrate Species Of Mongolia.UB. 104 pp. (in Mongolian and English)

Rogovin K.A, Kulikov V. F, Surov A. V, and Vasiliev N.Ui, 1986

Small Mammals. Trans Altai Gobi.p.122-131.(in Russian)

Rogovin, K.A., and Surov, A.B., 1987

Organization of desert rodent communities in the Trans-Altai Gobi of Mongolia. Zool. Zhournal. Vol LXVI, issue 4, 567-558 pp. (in Russian)

Samiya R., Davaa N., Stubbe M., Stubbe A et all., 1993

Some rare finded of Mammals in the West Mongolia. //Natural Condition and Biological Resource In the West Mongolia, its region. Hovd. p.104-105. (in Mongolian)

Sokolov V. E., and Orlov V.N., 1980

Guide to Mammals of the Mongolia. Moskov. 350p.(in Rusian)

Sokolov B.E., Rossolimo O.L., Pavlinov I. Yu., Podtyujkin O. I., 1981

A Comparative Characteristics of Two Species of Jerboas From Mongolia– *Allactaga bullata* Allen 1925. A.*nataliae* sokolov, 1981. // Zool.Dzurnal. Volume LX, issue 6. p. 895-906. (in Russian)

Sokolov V.E., 1981

A New Species Of Five-Toed Jerboa – *Allactaga nataliae* Sp.N (Rodentia, Dipodidiae) From Mongolia. // Zool.Dzurnal. Volume LX, Num 5.p.793-795. (in Russian)

Sokolov V.E., and Shenbrot G.E., 1987

A New Species of Thick Tailed Three Toed Jerboa, *Stylodipus sungorus* SP.N (Rodentia, Dipodidiae) From Western Mongolia. // Zool.Zhurnal. Volume LXVI, Num. 4.p.579-587. (in Russian)

Sukhbat Kh., and Munkhtsog B., 1991

The Mammals of Dzuungarian Gobi.//. Materials of Takhi Project. UB. p.13-26. (in Mongolian)

Khotolkhuu N., 1982

A New Species Of Scilly Shrew in the Mongolia. // Proceedings of the Instituite of Biology, Mongolian Academy of Sciences. №17.Ulaanbaatar. (in Mongolian)

Khotolhuu N., Shagdarsuren O., and Dovchin N., 1971

Notes about mammals in the Dzungarian Gobi in Mongilia . // Proceedings of the Instituite of Biology, Mongolian Academy of Sciences, №6. UB. p.59-82. (in Mongolian)

Fokin, I.M., 1978

Locomotion and morphology of locomotory organs of jerboas. Leningrad. 118p. (in Russian)

Shagdarsuren O., 1962

Note about Trans Altai.News Mangolian Academy of Science . №1. UB. p.23-35 (in Mongolian).

Shenbrot G.I., 1986

Food Speciel of Jerboas in desert and same desert of Mongolia. // Natural Condition and Natural resource in the Mongolia. Mockva. p.214-215.(in Russian)

Douglas A.Kelt., James H.Brown., Edward J.Heske and et all., 1996

Community structure of desert small mammals.Comparisons across four continents. // Ecology. Volume 77, №3. (in English)

Krebs J., 1989

Ecological Methodology. (in English)

Mallon D.P. 1985

The Mammals of Mongolian People's Republic. Mammal review 15 (2);71-102. (in English)

Petra Kaczensky., and Chris Walzer., 2002

Przewalski horse, wolves and khulans in Mongolia. // Report. GSPA "Á" . (in English)

Petra Kaczensky., and Chris Walzer., 2003

Przewalski horse, wolves and khulans in Mongolia. Report. GSPA "Á". (in English)

Tinin D.S, Dunnum J.L, Salazer-Bravo J, Batsaikhan N., ScotBurt M., Gardner L., and Yates L., 2002

Contributions to the Mammalogy of Mongolia, with a Checklist of Species for Country.New Mexico. 37 p. (in English)

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