

Biological Issues and Distribution of Mongolian Gerbil (*Meriones Unguiculatus*, Milne Edward, 1876) in Mongolia

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Abstract: Grasslands are the dominant landscape in Mongolia, accounting for 70-80 % of the national land area. Spreading of Mongolian gerbil distribution throughout the Mongolia including sandy desert, sandy steppe, steppe and forest steppe, zones of pasture has been shown significantly harmful effects on wildlife habitat. The distribution, morphology characteristic of the rodent Mongolian Gerbil's survey undertaken by researchers Institute of Plant Protection Mongolian in 2012-2013 are described. The expedition trapped a sample of Mongolian gerbils (Scientific name) in different regions, eastern, western and central regions. During the survey expedition collected /261/ Mongolian gerbils during an extended west-central-eastern part of country. Methods applied included distribution, morphologic characteristic, behavioral experiments, and determination of pregnancy comparison. New techniques were introduced to determine life style inside the hole activity of Mongolian gerbils. Most trapped in the steppe were Mongolian gerbils with an estimated density of individuals 200 per km². The need for further complex expeditions through the arid zones of Mongolia are discussed. It is certainly needed to study of the geographical distribution of the species.

Keyword: Mongolian gerbils, rodents, distribution, morphology, behavior

I. Introduction

The increased number of Mongolian gerbil causes harmful effect on pasture and grassland fields. To prevent the harm it is needed to study about the distribution, morphometric characteristics, reproductive system, and population density of this species over the country. For the purpose of the above intention we worked out the following tasks:

- Create a map of the Mongolian gerbil's distribution using GIS.
- To determine the density of the Mongolian gerbil population by using field survey in some provinces of Mongolia;
- To observe average size and number of ovaries, develop experimental method and estimate breeding success based on observation of captured individuals and estimates the average of its reproduction.
- Map colony layout based on observed burrows.

II. Materials And Methods

To produce distribution map of the gerbils, the previous few years' research from the Plant Protection Research Institute scientists were used in the research reports. Also used my own research survey undertaken between the 2012-2013 were used as the data. The study took 19 provinces, including 257 sums prevalence surveys overlap.

Table 1. Number of population

Species Name	Number of male species♂	Number of femal species♀	Number of immature species
<i>Meriones Unguiculatus</i>	100	100	61

To calculate the morphometric average 261 gerbils were captures from Central, East and West areas of Mongolia. To analyze the structure of the hole, we had to dig up 30 hole spread out Central, East and West zones of Mongolia.

- ❖ Breeding surveys took in following provinces: Argalant, Bornuur sums Village Center, Dundgovi, Dornod, Khentii, Arkhangai, Bayankhongor, Uvurhangai, in 2012 and 2013 spring. The survey routes were made up of total of 65 pieces of gerbils.

Traditional methods used in the study environmental science [Shagdarsuren, Avirmed 1972, Kuchyeruk 1982, Sokolov and Orlov 1980] linear transect method in accordance with the methodology and depending on the density of rats on foot; the rat walks 1-2 km walk, 25x25, 50x50, a square of 3 hole's. Counting the frequency of the walk, interviewing local experts and citizens to access information herders, based on previous research studies / exploring ways to detect the general distribution and location maps shall determine. Using GPS to note the survey point and location.

III. Results

Comparative study methodology: Using trapping, cones, and trapping to capture all the gerbils in the hole. Absolute (25x25, 50x50, 100x100, 100x2, R25, R50) of the area will be walked by the chosen gerbils from the hole 3-5 times to determine annual and quarterly methodological density and pre-urban areas. During the study the captured gerbils' morphology measurements in males and females had no considerable difference compared to their body size difference and correlated to study of other analysis in history, these gerbils were smaller than recorded before by other scientists.

Table 2. Average morphology measures

Species Name	N	Weight	Body Length	Tail Length	Paw Length	Ear Length
<i>Meriones Unguiculatus</i>						
Male	100	44.3±1.02	10.7±0.34	7.95±0.25	2.77±0.03	1.12±0.02
Female	100	43.4±0.9	10.7±0.29	8.1±0.23	2.74±0.04	1.12±0.03
Immature	61	30.8±0.64	9.1±0.07	5.94±0.12	2.2±0.04	1.12±0.02
Total	261	40.6±0.85	10.1±0.23	7.77±0.2	2.57±0.03	1.13±0.02

Table 3. Eastern region

Species Name	N	Weight	Body Length	Tail Length	Paw Length	Ear Length
<i>Meriones unguiculatus</i> - The Average in the Eastern Region						
♂ Male	50	51.49±1.25	10.49±1.25	10.15±0.17	2.68±0.02	0.76±0.01
♀ Female	38	46.62±1.36	9.68±0.11	10.18±0.10	2.64±0.02	0.74±0.01
Immature	12	29.6±0.87	8.8±0.05	5.90±0.12	2.0±0.06	1.10±0.02
Total	109	42.57±1.16	9.65±0.47	8.74±0.13	2.44±0.03	0.86±0.01

In the eastern region, the body weight of the male species was an average of 10 grams more than the female individuals. There were no other clear differences.

Table 4. Central region

Species Name	N	Weight	Body Length	Tail Length	Paw Length	Ear Length
<i>Meriones unguiculatus</i> - The Average in the Central Region						
♂ Male	100	60.72±2.71	10.72±2.71	10.3±0.20	2.92±0.03	0.83±0.03
♀ Female	100	49.64±2.53	10.52±0.17	10.2±0.14	2.90±0.07	0.88±0.01
Immature	18	30.6±0.65	9.5±0.02	6.20±0.29	2.1±0.09	1.0±0.02
Total	218	46.9±1.96	10.2±0.96	8.9±0.21	2.64±0.06	0.91±0.02

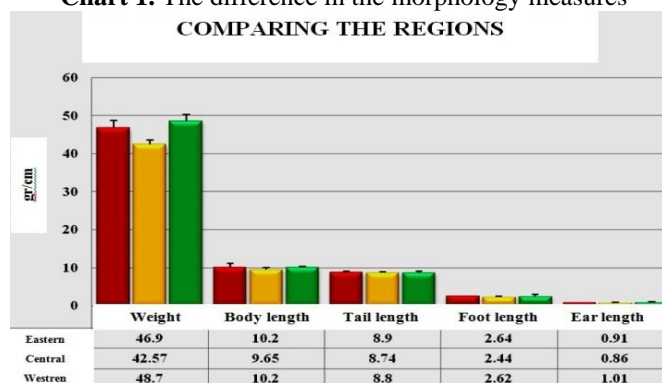
In the central region, the average body weight of the male species was 9g more from the female species, and the body length was 8mm longer.

Table 5. Western region

Species Name	N	Weight	Body length	Tail Length	Paw Length	Ear Length
<i>Meriones unguiculatus</i> - The Average in the Western Region						
♂ Male	47	57.9±1.98	10.8±0.16	10.0±0.24	2.93±0.02	0.96±0.1
♀ Female	17	57.7±2.4	10.6±0.2	10.3±0.56	2.85±0.9	1.12±0.02
Immature	10	30.6±0.57	9.4±0.07	6.2±0.12	2.1±0.09	0.97±0.1
Total	74	48.7±1.65	10.2±0.14	8.8±0.30	2.62±0.33	1.01±0.07

As you can see from the chart, the female species in the Western region had 3mm longer tail and 3mm longer ears. There are no clearly distinguishable difference in the feet, body length and height.

**Chart 1. The difference in the morphology measures
COMPARING THE REGIONS**



Mongolian gerbils' physical body appearances had no distinguishable differences.

The structure of Mongolian gerbils

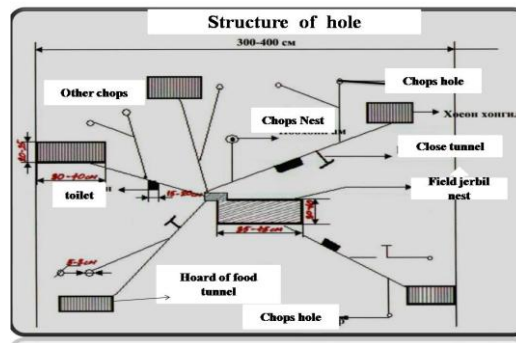
In dogged holes the gerbils create many paths forks and tunnels to allow stabilize humidity and heat. Also their feces, hoards of food, rodent's nest becomes fertilizer for the soil. Mongolian gerbils' hole's external and internal structure, hole form the rim of a large number of external parts at once. They leave small spaces between the entrance of each hole and put on loose soil. Hole is classified simple and well organized. Hole is determined to be the most convenient place for rodents. Mongolian gerbils' very organized old hole seems to have a big opening. Hole is suit favorable for unfavorable weather conditions in addition to overcome temporary shelter to protect themselves, and other animals. Research done in any region had the similar organized structure of Hole. The species created a large number of pores on the surface, mounted beneath the soil, so the gerbils can live in separate groups of their own. They created tunnels underground to create nest, hoard food tunnel, topped tunnel, toilet. Eastern and central regions the rim of the pit, rodents nest, reserved food storage, the number of toilet quantity were about equal but different from the western region. Gerbil's hole in the western region of branching and rodent's nest, feed storage and toilet with a relatively small and less in quantity. But it was documented the stored food in the western region was more than in the eastern and central regions.

Table 6. Mongolian gerbils' hole's research results

Region	Number of open holes	Rodents nest	Food Storage	Restroom	Topped tunnel	Stored food supplies/kg/
East	4-25	1-2	3-6	1-4	2-6	5.2
Central	5-28	1-2	3-7	1-5	2-7	5.8
West	3-16	1-2	4-7	1-3	2-4	7.9

According to the researcher D. Avirmed's /1985/ experiment results, the internal structure of hole consists of separate parts, bedding and hoard food, hole for excrete, feed storage and usually locates 8-122 cm underground and has 2-3 floors inside. According to the study the internal organization of nearly one year hole does not have many tunnels and floors, and it locates 20-60 cm underground. Such holes have 1-2 hoard of food, 0-1 bedding, hole for excrete and the soil that covers the entrance of the hole is 10-26.1 cm thick.

Scheme.1. Structure of rodent's hole.



Drugs studied individuals embryos

Chart 2. Comparison of the gerbil's individuals embryos/right/

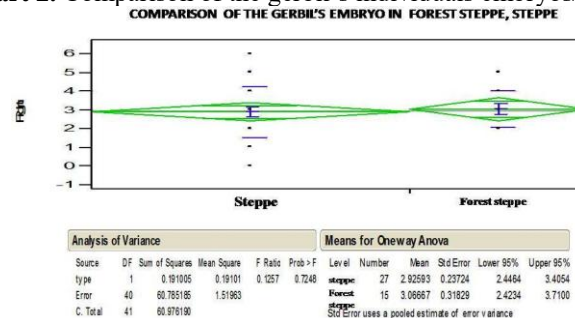
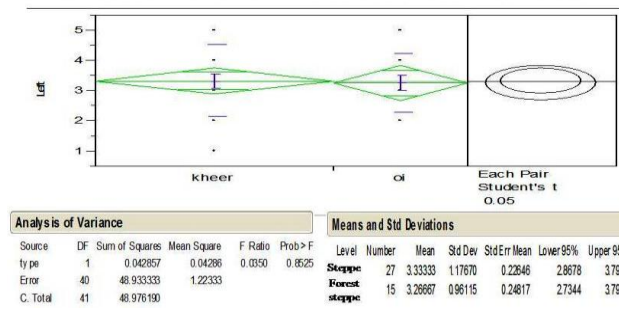


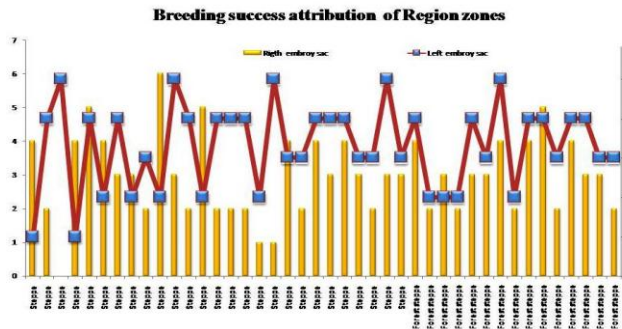
Chart 3. Comparison of the gerbil's individuals embryos /left/ **COMPARISON OF THE GERBIL'S EMBRYO IN FOREST STEPPE, STEPPE**



The 42 female gerbils caught in 2012 represents there is no difference between the forest steppe and steppe gerbils is shown in the above graph.

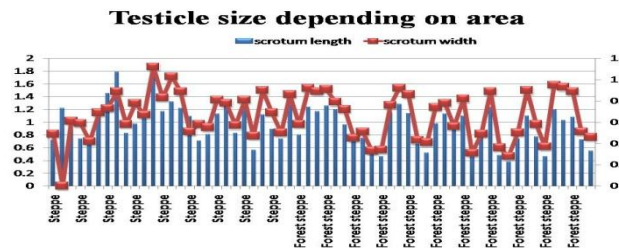
Comparisons of number of ovaries by the forest steppe, steppe zones

Chart 4. Comparison of individuals embryo by the region



Looking at the graph above, Mongolian gerbils' gestation are more numerous than the number of forest-steppe grassland region. The forest steppe zone to the west and east had more gerbils than a free field. Blue curve shows the left of the number of species in the west, while the red color represents the east. The total marked 61 of gestations, 18 had black spots.

Chart 5. Testicle size depending on area



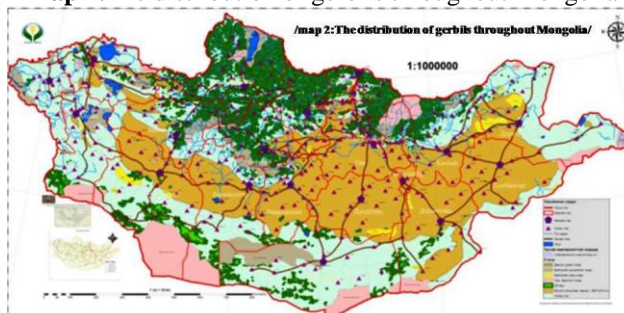
In 2012, 61 gerbils were measured. Looking at the curve the testicle of the gerbils in steppe are is bigger than the ones in forest steppe.

Table 7. Mongolian gerbils' hole's research results

Specification	Male Length	Female (right)	Female (left)
Mean	0.963666667	2.976190476	2.60952381
Standard Error	0.040515022	0.188175713	0.168645954
Standard Deviation	0.313828014	1.219518002	1.092950699
Sample Variance	0.098488023	1.487224158	1.194541231
Minimum	0.38	0	1
Maximum	1.79	6	5
Sum	57.82	125	139
Count	60	42	42
Confidence Level(95.0%)	0.081070372	0.380028558	0.34058741

Looking at the table, the average testicular measure is 0.96mm. The average testicle length of Western gerbils' is 2.9mm, which is on average 0.3mm longer than the eastern gerbils. For the female gerbils the standard error for the measurement was 1.6-1.8, which is close to the male difference of 0.3 proves that there are no distinguishable difference between the two kinds of gerbils.

Map 1.The distribution of gerbils throughout Mongolia



As a result of our experiment, It is estimated Mongolian gerbils' distributed throughout 70 million hectares. Mongolian gerbil is heavily distributed through steppe and forest steppe areas.

IV. Conclusion

1. The gerbils' spread throughout Mongolia had no significant difference in their morphology measures. And between the males and females, there weren't significant physical dimensions difference. But it all seems to be smaller than the previous measures scientists' had recorded.
2. To examine the reproductive system of these species compared reproductive organs of male and female gerbils based on their living conditions of steppe and forest steppe. As a result the steppe gerbils had bigger reproductive organs than forest steppe. However, those who live in forest steppe carried 1-2 bribery more than the other gerbils live in different environment. Looking here for forage quality, resources may be causing the number of bribery and reproductive organ sizes to be different depending on the environment. It is also been studied the size of male reproductive system does not affect the ability to inseminate.

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