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**Особливості біології, живлення та будови нір сліпака звичайного (*Spalax microphthalmus*) на території регіонального ландшафтного парку «Великобурлуцький степ»****Н.В.Токарська**

Представлені нові дані про біологію сліпака звичайного на території регіонального ландшафтного парку «Великобурлуцький степ» (Харківська область, Україна), що стосуються харчування, структури нір, соціальних зв'язків. Протягом року у сліпака звичайного буває тільки один виводок, що складається з 1–3 дитинчат. Всупереч загальній думці про те, що сліпаки ведуть одиночний спосіб життя, нами встановлено спільне проживання самки, самця і цьоголіток на трьох з семи нами досліджених ділянках. Молоді сліпаки розселюються в кінці червня – початку липня. Їх досить часто можна зустріти в цей час на поверхні. У популяції звичайного сліпака з регіонального ландшафтного парку «Великобурлуцький степ» самці характеризуються довжиною тіла 220–260 мм, довжиною задньої ступні 27–30 мм, масою тіла 219–520 гр. Для дорослих самок характерна середня довжина тіла 200–250 мм, довжина задньої ступні 26–30 мм, маса тіла коливається від 284 до 409,6 гр. У багатьох екземплярів сліпака на лобі або потилиці є специфічна світла пляма (жовтувато-біла) або біла поздовжня смуга, за якою ми можемо ідентифікувати особин при повторному відлові. Харчуючись підземними частинами рослин, сліпак проробляє дуже довгі ходи, риючи їх горизонтально і близько від поверхні і викидаючи уздовж них великі купи землі (до 0,5 м в діаметрі). Земляні викиди, які відзначають кормові ходи, мають діаметр в основі до 50–60 см. У гніздовій частині нори число житлових камер і камер для запасів досягає 10, розміщуючись на глибині до 3,5 м. Риюча активність сліпаків підвищується в кінці березня – початку квітня і восени в кінці вересня – початку жовтня. Ми неодноразово відзначали появу викидів в зимовий період під час відлиг. Сліпак шкодить землеробству своєю риючою діяльністю (псує оброблені ділянки, підриває рослини та ін.); крім того, місцями сліпаки безпосередньо поїдають бульби картоплі, цибулю та коренеплоди інших рослин. Загальна вага їх запасів може сягати 16 кг. В одній з нір, розкопаних нами біля городів місцевих жителів с. Нестерівка Великобурлуцького району Харківської обл., було виявлено 8 кг картоплі, 4 кг моркви, 3 кг коренів лопуха справжнього, 0,6 кг коріння пирію повзучого.

**Ключові слова:** сліпак звичайний, популяція, просторова структура, чисельність, будова нори, живлення.

**Biological characteristics, feeding and structure of tunnels of the greater mole-rat (*Spalax microphthalmus*) in the area of the regional landscape park «Velikoburlutskiy Steppe»****N.V.Tokarskaya**

New data on the greater mole-rat's biology in the territory of the Regional landscape park «Velikoburlutskiy steppe» (Kharkiv region, Ukraine) concerning nutrition, burrow structure and social structure are presented. The greater mole-rat has only one litter consisting of 1–3 pups during the year. Contrary to the prevailing general opinion that mole-rats lead solitary way of life we have found cohabitation of a female, a male and their young of the current year at three of the seven areas of our study. Young mole-rats settle in a new place at the end of June – early July. They can be found above ground often at this time. In the greater mole-rat population from the Regional Park «Velikoburlutskiy steppe» males are characterized by the body length of 220–260 mm, by hind foot length of 27–30 mm, by the body weight of 219–520 g. For adult females the average body length is 200–250 mm, the hind foot length is about 26–30 mm, the body weight ranges from 284 to 409.6 g. Many greater mole-rat specimens on the forehead or occiput have an individual light spot (yellowish-white) or a white longitudinal strip by which we can identify individuals at repeated catching. Eating the underground parts of plants, the mole-rat makes very long tunnels conducting by them horizontally and closely to the surface and throwing along them the large piles of soil (up to 0.5 m in diameter). Soil emissions marking feeding tunnels had a base diameter of up to 50–60 cm. In the nest part of the hole the number of habitable chambers and chambers for stocks can be up to 10, and they are located at the depth of 3.5 m. Digging activity of the mole-rat grows in late March – early April and in the autumn at the end of September – early October. We have repeatedly noted the appearance of emissions in the winter during the thaw. Mole-rats harm the agriculture with their digging activity (damage cultivated areas, digging under the plants and so on); in addition, mole-rats sometimes directly eat potato tubers, onion and other root vegetables. The total weight of one mole-rat stock can reach 16 kg. In one of burrows excavated by us near the vegetable gardens of

locals in Nesterivka village of Velikoburluiskyi district in Kharkiv region we found 8 kg of potatoes, 4 kg of carrots, 3 kg of greater burdock roots, 0.6 kg of couch grass roots.

**Key words:** *greater mole-rat, population, spatial structure, number, burrow structure, feeding.*

## **Особенности биологии, питания и строения нор обыкновенного слепыша (*Spalax microphthalmus*) на территории регионального ландшафтного парка «Великобурлукская степь»** Н.В.Токарская

Представлены новые данные о биологии обыкновенного слепыша на территории регионального ландшафтного парка «Великобурлукская степь» (Харьковская область, Украина), касающиеся питания, структуры нор, социальных связей. У обыкновенного слепыша в течение года бывает только один выводок, состоящий из одного-трех детенышей. Вопреки принятому общему мнению о том, что слепыши ведут одиночный образ жизни, нами установлено совместное проживание самки, самца и сеголеток на трех из семи нами исследованных участках. Молодые слепыши расселяются в конце июня – начале июля. Их довольно часто можно встретить в это время на поверхности. В популяции обыкновенного слепыша из регионального ландшафтного парка «Великобурлукская степь» самцы характеризуются длиной тела 220–260 мм, длиной задней ноги 27–30 мм, массой тела 219–520 гр. Для взрослых самок характерна средняя длина тела 200–250 мм, длина задней ноги 26–30 мм, масса тела колеблется от 284 до 409,6 гр. У многих экземпляров слепыша на лбу или затылке есть специфическое светлое пятно (желтовато-белое) или белая продольная полоса, по которой мы можем идентифицировать особей при повторном отлове. Питаясь подземными частями растений, слепыш проделывает очень длинные ходы, ведя их горизонтально и близко от поверхности и выбрасывая вдоль них большие кучи земли (до 0,5 м в диаметре). Земляные выбросы, отмечающие кормовые ходы, имеют диаметр основания до 50–60 см. В гнездовой части норы число жилых камер и камер для запасов может достигать 10, размещаясь на глубине до 3,5 м. Роющая активность слепышей повышается в конце марта – начале апреля и осенью в конце сентября – начале октября. Мы неоднократно отмечали появление выбросов в зимний период во время оттепелей. Слепыши вредят земледелию своей роющей деятельностью (порча возделанных участков, подрывание растений и пр.); кроме того, местами слепыши непосредственно поедают клубни картофеля, лук и корнеплоды других растений. Общий вес их запасов может достигать 16 кг. В одной из нор, раскопанной нами возле огородов местных жителей с. Нестеривка Великобурлукского р-на Харьковской обл., было обнаружено 8 кг картофеля, 4 кг моркови, 3 кг корней лопуха большого, 0,6 кг корней пырея ползучего.

**Ключевые слова:** *обыкновенный слепыш, популяция, пространственная структура, численность, строение норы, питание.*

### **Introduction**

Types of mammals that form the basis of the steppe faunal complex are a very vulnerable part of the modern biodiversity of the steppes of eastern Ukraine. To them it is possible to attribute fully mole-rat (*Spalax microphthalmus*). This grounded the aim of our study: to study feeding habits of the greater mole-rat both in the virgin steppe areas and agricultural fields in the territory of Kharkiv region. In the past the greater mole-rat skins appeared in small amounts in the fur manufacturing (Vinogradov, Gromov, 1952), but now due to the labor-intensive inputs this species is not used for fur. In historical times in some parts of the range it became rare or even extinct, but elsewhere extended its occurrence. In the northern part of the range and in the Volga Region it occurs in small isolated populations and is considered rare. These populations are threatened by habitat loss (ploughing of major habitats). In the southern part of the range (Stavropol Region) in the 1950s, population and range declines occurred because of ploughing. Population density differs significantly in different parts of the range. Maximum densities are found in Central Black Earth Region (Russia) adjacent to Ukrainian territories. Population density there is on the average 3–10 individuals per hectare, however, locally it could reach up to 20. In the southern part of the range the density may be lower, as the arid climate of the steppes is less favorable. Populations are stable and do not undergo periodical fluctuations (Tsytulina, 2008).

Mole-rats harm the agriculture with their digging activity (damage the cultivated areas, digging under the plants and so on); in addition mole-rats sometimes directly eat potato tubers, onions and other root vegetables. We present new data on the species biology in the territory of the Regional landscape park «Velikoburluiskyi steppe» concerning feeding, burrow structure and morphometric characteristics.

### Material and methods

For each habitat type, the records were conducted 3–15 times in trial areas of 1 hectare. At the same time all the emissions generated till the time of registration during a given year were taken into the account. Holes excavations were carried out in the territory in May–June 2001–2017. While carrying out excavations we took into the account the number of emissions per the hole, we also determined the depth of the tunnel passage, the diameter and the total length of the hole. Before the registration all the inhabitants of the holes were caught out. During the period of investigations 7 holes were excavated entirely (about 1.5 km in length totally).

For the entire period, 13 individuals were extracted, 8 of them were females, 4 males, 1 – unknown. In addition, measurements of 2 samples were taken, which are stored in the Museum of Natural History of V.N.Karazin Kharkiv National University. Because of a small sample of mined animals, we did not do statistical analysis.

The species composition of plants used by the mole rat as a food was also determined.

### Results and discussion

The common fur color tone of a greater mole-rat is buff grayish-brown; it is highly variable between individuals and also depends on the degree of fur shabbiness. The head is relatively lighter than other body parts, gray shades dominate on the belly, and sometimes there are 1–2 white spots of irregular shape (partial albinism). From the nose through the sides of the head there are brushes of not long wiry whiskers, covered by yellowish-white or whitish hairs. Hairs sit compactly on the clearly expressed ridge. The hairs around the mouth are noticeably lighter than ones on the cheeks. The length of hairs on the back is about 10–14 mm. In young individuals' coloration the gray tones dominate. The other mole-rats species may differ in coloration from described for the greater mole-rat either by predominance of dark brown tones, or by the lighter gray or silver shades (Ovchinnikova, 1971).

Many specimens on the forehead or occiput have an individual light spot (yellowish-white) or a white longitudinal strip by which we can identify individuals at repeated catching (Fig. 1).



**Fig. 1. Many greater mole-rat specimens have an individual light spot (yellowish-white) or a white longitudinal strip on the forehead or occiput**

The greater mole-rat belongs to massive (big) species of the family, yielding in this respect, to the giant mole-rat (*Spalax giganteus*), to the Ural mole-rat (*Spalax uralensis*), and possibly sandy mole-rat (*Spalax arenarius*). According to Ognev (1947), male body length is 203–267 mm, female body length is 197–227 mm and the hind foot length is 23.8–30 mm and 24.1–27.3 mm in males and females respectively. According to Topachevsky (1969) the mole-rat body length reaches 290 mm (232 mm on average), the hind foot length is up to 30 mm (26.3 mm on average). For the mole-rats from Voronezh

region (Russian Federation) there are some other data: the adult body length is 260–315 mm (287 mm on average), the hind foot length is 26–33 mm (29.4 mm on average) (Ovchinnikova, 1971).

The average weight of the animals is 537 g (406–818 g). A female is usually 30–40 % smaller than a male. According to Puzachenko observations (Kursk region, Russian Federation) the average body length for females of 3 years old and older is about 214.4 mm (190–247 mm), the hind foot length is about 27.1 mm (21.5–30.2 mm), the body weight ranges from 120 g to 500 g (359 g on average). In males, the body length is 234 mm on average (200–280 mm), the hind foot length is about 28.6 mm (26.4–30.8 mm), the average body weight is 488.6 g (243–780 g). So, the overall size of the species individuals may vary considerably from place to place. In addition, it has been shown (at the example of one population) that there is a stable polymorphism in body weight and size among males that is less manifested in females (Puzachenko, 2001).

In the greater mole-rat population from the Regional landscape park «Velikoburlutskiyi steppe» males are characterized by the body length of 220–260 mm, by hind foot length of 27–30 mm, by the body weight of 219–520 g. For adult females the average body length is 200–250 mm, the hind foot length is about 26–30 mm, the body weight ranges from 284 to 409.6 g (Table 1).

**Table 1.**

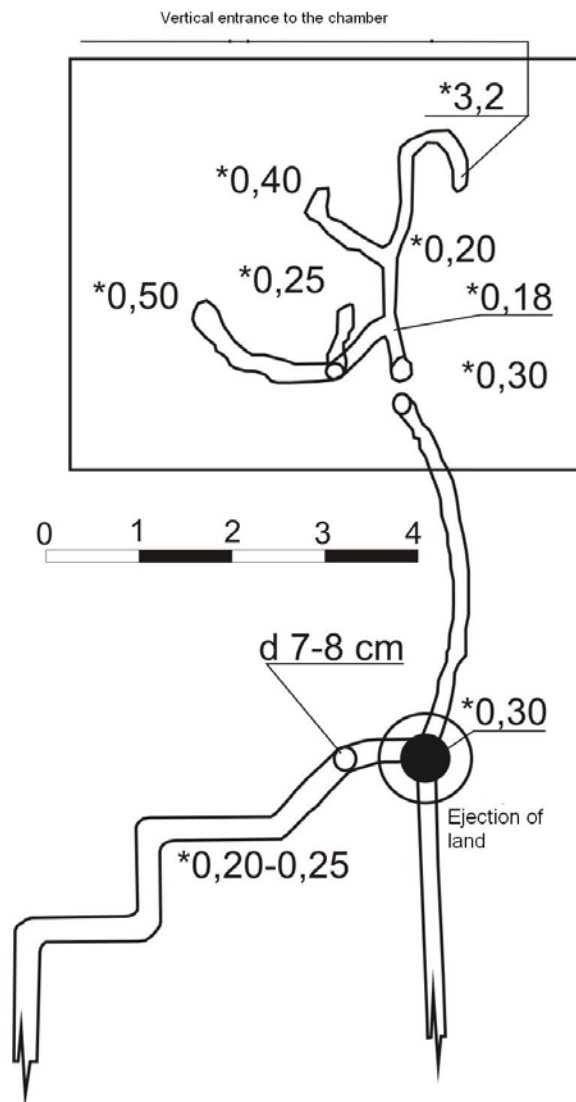
**Morphometric parameters of mole rats**

№	Name	Sex	Date of sample	Place	Weight (g)	Lt (cm)	Pl (cm)
1	4	f	04.04.2017	v. Serednii Burluk	409.6	25	2.9
2	11	f	09.04.2017	v. Serednii Burluk	420.5	26	3.0
3	12	f	24.05.2017	v. Serednii Burluk	403.0	27	2.9
4	1	f	04.05.2017	v. Serednii Burluk	284	22	2.8
5	3	f	04.04.2017	v. Serednii Burluk	370	23.5	2.7
6	5	f	-	v. Serednii Burluk	348	20	3
7	6	f	-	v. Nesterivka	370	21	2.6
8	8	f	04.04.2017	v. Nesterivka	335.6	26	3
9	2	m	04.04.2017	v. Serednii Burluk	219	22	2.8
10	7	m	16.06.2009	v. Vvedenki	235	25	3
11	9	m	07.07.2015	v. Nesterivka	520	26	3
12	10	m	16.06.2013	v. Nesterivka	355	25	2.8
13	0	-	12.07.1956	v. Lyptsi	350	22	2.7
14	45 (2596)	m	15.04.1950	Dubovskiy district, Rostovska oblast		24	2.6
15	40 (2600)	m	21.06.1937	Donetska oblast		26	2.9

There are contradictory data about the social structure of mole-rat populations in the literature (Ovchinnikova, 1971a; Topachevsky, 1969). Most authors agree that all adults live separately in independent burrow systems. The research results allowed concluding that social organization of the greater mole-rat is more complex than it was previously thought. The basis of this species population is the family groups of one, or rarely two females and one male. Within the group individuals burrow systems are either joined or in immediate proximity to each other. The individual male lot is usually larger than the female one (excluding feeding tunnels dug by youngsters). The described structure is stable in time and space and breaks up only with the death of one of the partners, or its displacement from the family group area. Some animals (about the half of males) live alone and, that is important, virtually excluded from reproduction (Puzachenko, Vlasov, 1993; Dukelskaya, 1932). The greater mole-rat, like other species of the family, exhibits strong aggression toward relatives. If one of adult opponents does not have the possibility to retreat, then the scuffle is almost always accompanied by death. During the scuffle they usually bite each other's nose, rostrum or ears. Young animals are also exposed to the aggression of adults. At that, young mole-rats start to let out the squeak, which is not used by adults under no circumstances, leading to the halt aggression.

During the year there is only one litter consisting of 1–3 pups. Contrary to the prevailing general opinion that mole-rats lead solitary way of life we have found cohabitation of a female, a male and their young of the current year at three of the seven areas of our study. Young mole-rats settle in a new place at the end of June – early July. They often can be found above ground at this time.

While eating the underground parts of plants the mole-rat makes very long tunnels, sometimes in several tiers. Forage tunnels are placed horizontally and closely to the surface. In this case mole-rats eject large hills (up to 0.5 m in diameter) of soil onto the surface of the earth. These molehills form chains, sometimes reaching 170 meters in length, along the tunnels. The total length of the surface tunnels (with branches) of one mole-rat can reach 300 meters. The nesting site of the hole has a depth of 3.5 m; at this part of barrow, except the nest itself, there are larders for winter stocks storage, and several galleries, connecting different parts of the hole. The scheme of larders localization is in Fig. 2.



**Fig. 2. The scheme of the nesting site of the greater mole-rat hole**

As shown by the results of our research the nest chamber is located at a depth of 100–150 cm, usually 2 turns from the socket, which in turn branch out and lead to the main moves, which are at a depth of 15–20 cm from the surface of the earth. Cameras with stocks are near the nest. Sometimes, the mole rat burrow goes deep down to a depth of 3–3.5 m.

The basis of the mole-rat nutrition are the underground parts of plants (rhizomes, tubers, bulbs), of steppe grasses mainly. In spring, April–May, both youngsters and adults prefer the above-ground organs (leaves and stems). Since mid-summer, the underground parts dominate in the diet. The range of fodder plants includes several tens of species and depends on the frequency of particular species occurrence in phytocoenosis. The basis of the mole-rat nutrition in the Central Black Earth region constitutes the

species from Asteraceae, Umbelliferae and Fabaceae families (Ovchinnikova, 1971a). Locally mole-rats harm the cultivated plants, directly eating potato tubers, onions and other edible roots.

S.L.Ovchinnikova (1969) notes that mole-rats are active all the year round making large larders and placing them in different parts of the hole system, primarily in the area of wintering nests. The weight of stored plants is about 10 kg or more per the individual. Up to 13–14 kg of potatoes and sugar beet can be detected in their larders. In summer the mole-rat eats a lot of food per day, the total eaten mass roughly equals to its own mass (about 0.5 kg).



**Fig. 3. The stock of forage excavated by us from the greater mole-rat hole near the vegetable gardens of locals in Nesterivka village of Velikoburlutskyi district in Kharkiv region**

A.A.Migulin (1938) cites data that in the pantry mall there are only up to 2 kg of different roots. Such as: dandelion, tuberous pea, etc. Our research has shown that the total weight of the stock can be up to 16 kg.

As shown by the results of our research in one camera of one of the holes excavated by us near the vegetable gardens of locals in Nesterivka village of Velikoburluksky district in Kharkiv region it was found 8 kg of potatoes, 4 kg of carrots, 3 kg of burdock roots (*Arctium lappa*), 0.6 kg of couch grass roots (*Elytrigia repens*). As we can see in those cases when the mole-rats settle near the vegetable gardens or directly on them cultivated plants are present in their main diet (Fig. 3).

In Kharkiv region mole-rats are considered to be the pests of agriculture. They spoil mowing grounds and damage the crops of permanent grasses, making impossible their mechanical harvesting. They harm corn crops, as well as onions, potatoes and other root crops. The favorite food of the mole-rat are the underground parts of the dandelion (*Taraxacum sp.*), cow-parsnip (*Heracleum maximum*), wild chicory (*Cichorium intybus*), meadowsweet (*Filipendula ulmaria*), salsify (*Tragopogon sp.*).

It is clear that such stocks are not enough for the mole-rat for whole winter. One can assume that periodically this species falls into hibernation, and eats food resources only when awaking during the winter thaw. We have repeatedly found fresh soil emissions of mole-rat in winter. But this assumption, as well as many other questions of the mole-rat biology, remains open.

### Conclusions

1. The greater mole-rat has only one litter consisting of 1–3 pups during the year. Contrary to the prevailing general opinion that mole-rats lead solitary way of life we have found cohabitation of a female, a male and their young of the current year at three of the seven areas of our study. Young mole-rats settle in a new place at the end of June – early July. They can be found above ground often at this time.

2. In the greater mole-rat population from the Regional Park “Velikoburlujskaya steppe” males are characterized by the body length of 220–260 mm, by hind foot length of 27–30 mm, by the body weight of 219–520 g. For adult females the average body length is 200–250 mm, the hind foot length is 26–30 mm, the body weight ranges from 284 to 409.6 g.

3. Many greater mole-rat specimens on the forehead or occiput have an individual light spot (yellowish-white) or a white longitudinal strip by which we can identify individuals at repeated catching.

4. Sometimes, the mole rat burrow goes deep down to a depth of 3–3.5 m; except the nest itself, here there are larders (up to 10) for winter stocks storage, and several galleries, connecting different parts of the hole.

5. The total weight of one mole-rat stock can reach 16 kg. In one of burrows excavated by us near the vegetable gardens of locals in Nesterivka village of Velikoburlujsky district in Kharkiv region we found 8 kg of potatoes, 4 kg of carrots, 3 kg of greater burdock roots, 0.6 kg of couch grass roots.

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