The Current Status of *Citellus fulvus* Licht. in the Southern Regions of Uzbekistan today's status (using the example of Guzar district)

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Abstract. The rodent fauna of southern Uzbekistan, particularly the species *Citellus fulvus* (yellow miter), displays significant adaptations to the agrocenoses and diverse biotopes of the region. This study, conducted from 2022 to 2023 in the Guzar district of the Kashkadarya region, aimed to investigate the population density, ecological characteristics, and geographical distribution of *Citellus fulvus*. Various methods were employed, including route tracking, morphometric measurements, and observations of colony distribution. Our findings revealed a notable reduction in natural habitats, resulting in a shift of *Citellus fulvus* colonies toward agrocenoses and semi-urban areas. Colony structures were observed to vary based on geographical features, with a maximum distance of 200-300 meters between colonies in some cases. Morphological characteristics of individuals, such as fur color and body size, also showed seasonal and age-related changes. The study highlights the need for further investigation into the species' adaptation mechanisms, especially considering the increasing anthropogenic pressures and habitat loss in the region. These findings provide valuable insights into the population dynamics and ecological stability of *Citellus fulvus*, with implications for regional biodiversity conservation and pest management strategies.

1 Introduction

The natural climatic conditions of the southern regions of Uzbekistan are considered favorable for the distribution of rodent species. Consequently, the distribution and population of rodent representatives vary across different landscapes, manifesting in diverse patterns. The rodent fauna of the southern regions of Uzbekistan is characterized by its unique features. As a result of biotic and anthropogenic factors affecting representatives of this group, a gradual change in their natural habitats and a closer proximity of the population to agrocenoses are being observed. Studying the process of intensification of this situation, revealing its causes, and assessing the changes in the ecological stability of species have both theoretical and practical significance. The yellow miter (*Citellus fulvus*

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Licht.) of the genus Spermophilopsis of the family Sciuridae of the genus Rodentia. It is a cosmopolitan species distributed in the southern regions of Uzbekistan. The degree of occurrence of *Citellus fulvus* colonies in the Guzar district of the Kashkadarya region, their distribution area, and signs of adaptation to the fauna of this region, as well as their ecology, have been studied. In the Kasan and Mubarek districts of the Kashkadarya region, an expedition led by I.Y. Polyakova was organized, during which research was conducted on rodent's characteristic of the area. In 1936, B.S. Vinogradov discovered a fine-fingered bicuspid in the sands of the northwestern part of the Sundukli region, near the Khojadavlat station, and in 1958, R.N. Meklenburtsev discovered a fine-fingered bicuspid in the sands of the south and west of the Mubarek district [1]. During the expedition of D.N. Kashkarov to the Jizzakh district in 1921-1922, he collected enough information about the species composition of rodents, their biology, and their harmful properties [3]. As a result of the development of deserts and their transformation into valleys, yellow squirrels practically leave these lands, their number sharply decreases, and features emerge that distinguish them from other squirrels, such as the absence of colonial nesting. However, our observations have shown that yellow squirrels are found in remote villages and around agrocenoses, and even in district centers and cities. In the Kashkadarya region, nest colonies are also found on vacant lands between agrocenoses, in cemeteries, and on similar hills where human activity is partially restricted. These circumstances can be explained by their extreme adaptability and a drastic reduction in natural habitats, as well as a shortage of suitable nesting sites.

2 Materials and methods

The study was conducted from 2022 to 2023 in various biotopes located in the Guzar district of the Kashkadarya region. The calculations were performed using the formula proposed by N.G. Chelinsev [4].

$$D = \frac{n}{2} * LW \tag{1}$$

Where D is the density; n is the number of species encountered; L is the length of the route. W is the width of the route or the distance from the axis of the route to the boundary of the track where the calculation was performed. The results of the counting were extrapolated to a measured area of 10 hectares. A shagomer and a 5-meter roulette wheel were used to determine the route length and the distance between the nests in the colonies. Based on the characteristics of the site where the calculations were conducted, routes were determined to be 1-2 km long and 50-100 meters wide. These zoological studies were conducted in natural zones with a high probability of occurrence in settlements, agrocenoses, and colonies of Citellus fulvus in the region, and materials were collected using wood and iron traps and chemical preparations in the field. To study the territorial distribution of species and the current state of their habitats, observations were conducted at times of the year when rodents are most active. Using the method of S.S. Schwartz, morphometric indicators of rodents were measured by body mass (M) before dissection, length measurements were taken, and work was carried out to determine the species of animals.

3 Results and Discussion

Our research was conducted in the Guzar district of the Kashkadarya region, which is considered the southern territory of Uzbekistan. The Guzar district is located in the southeastern part of the Kashkadarya region, in the middle reaches of the Kashkadarya River, encompassing the Guzardaryo basin, Guzar foothills, and sloping plains near the mountains. Among the representatives of the rodent fauna in the Guzar district, *Citellus fulvus*, as a dominant species, surpasses the others in terms of its wide range and number of individuals. The geographical location of the territories of the district with the *Citellus fulvus* colony, the influence of the colonies on local agrocenoses, the location, number, slope of the nests in each colony, the structure and size of the nests characteristic of this species were studied (Figure 1). These studies were conducted in Karakamar, Pachkamar, Khumdon, Sangishkon, Tengdosh, Tashguzar, Mashaal, Shurtan, Eshonkuduk, and Sherali regions of the Guzar district. The reproduction of Citellus fulvus differs sharply from each other in terms of geographical location in the Guzar region. According to him, the number of species in near-river, hilly and low hills, irrigated and rain-fed lands is slightly higher than in high hills and rocky lands. In the colony of *Citellus fulvus*, different individuals are distinguished by morphological characteristics (color, size). Depending on the color of the wool, the species exhibited the following differences: males and females with a small volume with a sharp yellow color, with distinctly recognizable black stripes, males and females with a much larger volume with a light-yellow color. These morphological features change depending on the season and age of the species. At the beginning of the year, young individuals have a light-yellow fur color and in the middle of the year, with the beginning of the summer months, their body color begins to turn orange. This trait is characterized by physiological changes in individuals (maturity of young individuals, change in wool color depending on age), adaptation of the species' habitat to climatic conditions (green vegetation around colonial nests is abundant in spring, and in summer, ephemeroid plants around the nests turn yellowish-red after the end of the growing season).

Fig. 1. The yellow wormtail caught in the Guzar district is Citellus fulvus.

The distance between the colonies of *Citellus fulvus* varies depending on the geographical location of the colonies. The distance between colonies, limited by various barriers, cultural and agricultural landscapes, ranges from 60-70 m to 200-300 m. The distance between houses in each colony is different. It has been established that in one colony, 10-15 to 25-30 nests are located, with an interval of 5 to 3 meters (Figure 2). Depending on the degree of occurrence of the species, excavated nests are divided into used and non-used houses. The soil moisture around the nests used indicates that they were recently dug, and the presence of various vegetative and generative organs of local plants

around the houses indicates that the nest is new. Unused houses are surrounded by vegetation, the holes in the nests are covered with spiders, and some nests are used as shelters by local reptiles (turtles, snakes) (Figure 3). The number of individuals in large colonies is 25-30, while in small colonies it is 10-15.

Fig. 2. The nest of Citellus fulvus.

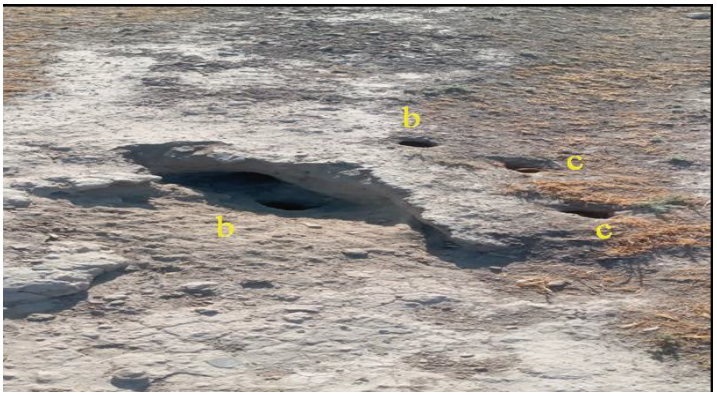

Fig. 3. Utilized (b) and unutilized (c) nests of Citellus fulvus.

The entrance to most of the dug-out nests is oriented east and west, which is a sign that the individuals are accustomed to remotely perceiving and escaping external enemies. The houses were excavated inclined to make it convenient to enter and exit. Additionally, dug nests have steeper entrances. The nests are dug straight 30-60 cm and then the right and left part of the nests are bent to the left, the inlet of the nests is circular in shape, 10-15 cm wide, 12-14 cm long.

Table 1. Number of recovered Citellus fulvus colonies in the Guzar region by region between 2022 and 2023.

No	Returned Colony Area	March		April		May	
		Number of colonies		Number of colonies		Number of colonies	
		2022	2023	2022	2023	2022	2023
1	Karakamar	18	17	20	17	22	20
2	Pachkamar	10	13	13	14	16	14
3	Khumdon	9	8	10	8	10	9
4	Sangishkon	11	14	13	16	13	16
5	Tengdosh	9	8	12	6	6	12
6	Tashguzar	12	14	14	15	14	15
7	Mashaal	14	22	16	22	16	22
8	Sho'rtan	24	19	25	20	25	20
9	Eshonkuduk	25	21	27	21	27	21
10	Sherali	18	16	18	16	18	16
	Total	150	152	168	155	167	165

4 Conclusion

The study of *Citellus fulvus* (yellow miter) in the southern regions of Uzbekistan, particularly in the Guzar district of the Kashkadarya region, has revealed important ecological and behavioral adaptations of this rodent species in response to changing environments. The gradual shift of *Citellus fulvus* colonies from natural habitats to agrocenoses and even semi-urban areas underscores the species' remarkable ability to adapt to anthropogenic pressures and habitat fragmentation. Variations in colony size, nest structures, and inter-colony distances further highlight the impact of geographical and environmental factors on their distribution. Morphological changes, particularly in fur coloration and body size across different seasons, provide insights into the physiological adaptations of this species to fluctuating environmental conditions. The study not only contributes to a deeper understanding of the population dynamics and ecological stability of *Citellus fulvus* but also offers critical information for the development of pest management strategies in agrocenoses. Future research should focus on the long-term impacts of habitat loss and climate change on this species, aiming to ensure the sustainability of both agricultural practices and biodiversity conservation efforts in the region.

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