Assessing the populations of protected rodents in a natural ecosystem

Cecilia Serban Natural Science Museum Complex Galati, Romania Catalin Razvan Trif[†] Enviro EcoSmart SRL-D Galati, Romania Adrian Ene Enviro EcoSmart SRL-D Galati, Romania

Abstract

The study aims at determining the distribution of protected rodent species of interest to the community, *Spermophilus citellus* (Linnaeus, 1766) (Sciuridae Family) and *Mesocricetus newtoni* (Nehring, 1898) (Cricetidae Family), in the site of community interest ROSCI 0060 The Agighiol Hills, located in southern Romania.

Studied area present the specific ecosystems of steppe and silvosteppe, overlapping over the ecoregion Plateau Dobrogea. The site has an area of 1,433 hectares and average altitudes of 100-150 m.

The observations took place between April and October 2013. The study methods were based on remote sensing and direct observation methods using binoculars, accompanied by catch attempts for individuals reported in low visibility habitats (steppe grasses with high herbs), indirect methods of analysis the different signs of their activity (traces, identification of active and inactive galleries).

Spermatophilus citellus in the site has a favorable conservation status, of the 13 identified populations, 40% have an abundance of 40-15 ind / ha. The study of identification and monitoring for the species Mesocricetus newtoni were not expected, so far no individual of the species has been collected, if their presence was reported by villagers who have adjacent lands in the protected area.

Keywords: natural ecosystem, Spermophilus citellus, Mesocricetus newtoni, population distribution

Introduction

For Romania, *Spermophilus citellus* is considered, according to IUCN criteria, a vulnerable species, European ground squirrel populations being affected by the invasion of grassland by the high herbaceous vegetation, improper for this species, due to the decrease in sheep flock numbers.

The species is protected by the Law 13 of 1993 by which Romania ratified the Berne Convention, the European Directive 92/43 /EEC, Natura 2000, Law 462/2001 on the regime of protected natural areas, conservation of natural habitats, wild flora and fauna.

The European souslik is a burrowing species active during the day when it is looking for food (Murariu, 2010). They are characterized by two pairs of short limbs in order to enter the galleries dug underground. On the inside of their cheeks they have bags

used to carry food back to the lair, where they consume the food immediately, without creating supplies for winter time.

The European souslik is a diurnal species with maximum activity in the early hours of the day. It is a territorial species, the size of the territory being very variable depending on the population density and the trophic supply.

The galleries can be temporary or permanent (winter galleries). Hibernation is mandatory during winter and in hot summers a state of inactivity and metabolic depression called aestivation can also take place (summer sleep). Average prolificity is 4-5 babies, with a single breeding cycle per year. The period of hibernation is from September or mid October to the end of May, mid-April, depending on latitude, altitude, and climate.

Multi-yearly population fluctuations are high, caused by access to reproduction, food, parasites, etc., which can result in the resorption of up to 50% of embryos. The reproduction period begins in the spring, immediately after hibernation, when battles are frequent between males.

The rodent loves warmth and does not tolerate moisture (Pop & Homei, 1973). That's why it's active in the morning after the dew dries.

It's diet is composed of herbs, seeds, roots, bulbs, young stems and leaves, insects, eggs, poultry and even mice (Murariu, 2010). In the spring, it consumes green vegetables and during summer it feeds mainly on grains. (Pop and Home, 1973).

When autumn comes, the rodent prepares for hibernation, gathering numerous nutritional reserves in the form of fat. It makes a bed of dry grass (Pop & Hamei, 1973) in the galleries, and the entrances are filled with vegetation.

The European ground squirrel has a very specific habitat, namely the steppe, with low and very low grassy vegetation (pastures and well-drained soil), where it makes its galleries. For galleries they look for slopes, huts, dikes, quiet slopes. They live in dry land with small grass, often grazed. They tend to avoid the forest and even highweed places (Pop and Home, 1973). Its habitat requirements are quite limited. It prefers secondary steppes, such as those in the region of Moldova, but also artificial habitats such as pastures or sports fields, well drained soils, exposed to the sun, where it can easily arrange its galleries (Kryštufek 1999, Spitzenberger 2002). Rarely, it can be found in vine plantations (Spitzenberger 2002), avoiding any other type of crops. In the ground, it builds simple galleries for temporary shelter or galleries with a more complicated structure with side chambers for more permanent situations. The exit corridor has a oblique orientation.

It was also observed in cultivated lands especially with perennial plants (to prevent the risk of galleries being destroyed). In Romania it is spread from the sea level to about 450 m altitude, but in Bulgaria it goes up to 2500 m.

Spermatophilus citellus is the westernmost species of all thirteen Spermophillus species that are present in the palearctic region, being endemic for Central and South-Eastern Europe. The area of the species is disjoint, the two parts being separated by the Carpathian Mountains and the Danube River at the Cazane. The Northwest sub-basin includes SW Germany, NW Austria, the Czech Republic, Slovakia, SE Poland, Hungary, Northern Serbia and the Western Plain of Romania. The south-eastern sub-basin includes the SV Ukraine, the Republic of Moldova, eastern and southeastern Romania, Bulgaria, Macedonia, Greece and mainland Turkey.

In Romania also, the distribution of the species is disjunctive. The area of extra-Carpathian spreading includes Moldova (almost only in the area between Prut and Siret), Muntenia, Oltenia (all the Danube meadow, from Turnu Severin to Galati) and Dobrogea. Another area of distribution is in Crişana and Banat (between Halmeu to the north and Foeni to the south). With the exception of Dobrogea, where it also ascends to the Măcin Mountains, in all the other provinces it only occupies the plain and the hill area.

A feature of the species is the existence of isolated populations of high genetic and taxonomic value both at the edge of the area and between the two sub-areas. Recent research has demonstrated the genetic diversity of these isolated populations and, consequently, their scientific value. In Romania there are such populations in Câmpenești and Țaga (Cluj County), Lunca Buzăului (Istrița Hill, between 400 and 600 m altitude) and in several localities on the right side of Siret.

The population density in western Romania is estimated at 5-6 individuals/ha and in the extra-Carpathian area at 13-17 ind./ha. Old data estimates the total population of the species in Romania at about 90 million individuals at an average density of 15 individuals/ha. However, up to 100-150 galleries per hectare can be counted in Dobrogea mountain and hill area (eg. Limanu, Valul Traian, Enisala Fortress, Gura Dobrogei, Macin, etc.). Recent data estimates the number of individuals to being approximately 15,000 (Murariu, 2010).

Mesocricetus newtoni is a species protected by Law 13 of 1993 by which Romania ratified the Berne Convention, GEO 57/2007, it is included in the Red Book of Vertebrates in Romania and the IUCN World List with status "almost threatened".

The species is threatened by the expansion of intensive agriculture in Dobrogea and the destruction of natural habitats.

The species is endemic within a very restricted area, in Dobrogea and NE of Bulgaria; The spread may be broader, but there is no data to support this theory. The data on the spread in Dobrogea shows that the species was reported in all the reliefs here: Măcinului Mts., Danube Delta, Babadag Forest, Danube Alluvial Plain, Valu lui Traian - Medgidia - Cernavodă viticol, Dobrogea Meridional Plateau, Hagieni Forest (Murariu, 2010).

The Dobrogean hamster is a crepuscular and nocturnal species, having a more intense activity in the early hours of the evening and in the morning before the sun rises. It lives both on the hills and in the middle of the plain, usually in subdued lands where they dig their galleries to a depth of 0.6-0.8 m (rarely 1.5 m), with usually two exits.

It is estimated that the population of this species is about 2000 individuals.

Material and Methods

Observations regarding the distribution of protected rodent species of community interest *Spermophilus citellus* and *Mesocricetus newtoni* were carried out between April and October 2013, on the site of community importance Agighiol Deal.

Community site ROSCI 0060 Agighiol Hills is located in the steppe bioregion, overlapping over the ecoregion Plateau Dobrogea. The site with an area of 1.433 ha (according to the GIS measurements on the polygonal limit) is found all over the territory of Tulcea County. There are three types of habitats (40C0 * - Ponto-Sarmatian deciduous heaths; 62C0 * - Ponto-Sarmatic Steps; 91AA - Ponto-Sarmatic forestry with fluffy oak forest) characteristic of steppe bioregulation, two of which are priority (40C0 * And 62C0 *). The mosaic of habitats is in a favorable conservation status, there being a very valuable scientific and landscape alternation between rock habitats, steppe meadows, silvicultural and forest habitats. (Doniță et al., 2005).

For the elaboration of the present study, remote sensing and direct observation methods were applied with the aid of binoculars and capture attempts for individuals signaled in low visibility habitats (steppe grass with high herbs), indirect methods of analysis of different signs of their activity (traces, identification of active and inactive galleries). Direct observation was done by camouflage in the territory so that the animals would not be disturbed at all by the presence of observers.



Figure 1. Map distribution of Spermatophilus citellus in different zones in the Agighiol Hills area (green point – active gallery, grey point – inactive gallery, orange stain – distribution area)

In the perimeter of the natural protected area of community interest ROSCI 0060 -The Agighiol Hills (Figure 1) have been researched in terms of localization of the two target species, the following zones: the eastern slope of the Pietros Hill, the steppe meadows of the Izlazul Mare (4) and Agighiol Forest area (7), the eastern slopes of Causa Mare (10) and Causa Mica (9), the western slope of Platon's Hill (11), Pietris Hill (Caraconstantin) (5,6), west side of Pietros Hill (8), the northern slopes of the Stanca Mare Hill (3), Uzum Bair Hill (1), and Tauşan's Movila (2).

The direct species monitoring crossings were chosen to cover the whole area of the community interest ROSCI 0060 being located mainly in the favorable habitats for the development of the two target species: agricultural land and steppe meadows.

The work choice areas were based on site maps for each location. The sampling sites were selected to be representative of the target species and the territory under consideration. For the data collection, observation sheets were used for each location and each landing respectively, recording the presence of animals in the monitored area, information on the territories used, and information on existing habitats.

Another method used to identify micro-mammalian species of priority interest for Agighiol Hills is that of the field survey that was used in interviews with locals, providing information about the species *Mesocricetus newtoni* as present in the area investigated.

For mapping the spatial distribution of individuals belonging to *Spermophilus citellus*, we made field visits and noted the geographic coordinates corresponding to the position of their active ditches, both inside and outside the protected area, to assess the need for a possible extension of protected areas. Based on the data collected during the displacements, a map of the distribution of the active dowries in the area concerned and the number of individuals present in the area was made.

Results

For the species Spermophilus citellus - the methods of direct observation in the transects revealed vast areas of relatively large numbers, up to 30-40 individuals per hectare, especially in the steppe grasslands of Agighiol Forest, the western slopes of Pietris Hill and Hill Tausan. In the other areas, individuals of the species were identified but their presence was reported in a smaller number.

Species Spermophilus citellus was present especially in low-vegetation grasslands, the number of active galleries decreasing directly proportional to the height of the grassy layer. Usually the vegetation around the gallery did not exceed the height of the animal.

Probably this habitat selection is based on the daily activity of the animal that, in order to avoid terrestrial and aerial predators, requires open spaces with good visibility.

We also found a preference for areas with a rich diversity of grasses and an interesting neutrality to the amount of biomass available around the main gallery. The density of the *Spermophilus citellus* population varies widely over a short period of time (Hoffmann et al., 2003), so longer-term studies are needed to evaluate populations. Currently, there are no uniform methods for estimating the density of *Spermophilus citellus* in the monitoring studies of this species (Cepakova & Hulová 2002, Katona et al., 2002).

The abundance of *Spermophilus citellus* species in the Agighiol Hills area was done by direct counting of animals and active galleries over a 1ha area. We identify for S. citellus 4 population categories with respect to the density of individuals in the

investigated areas: A: 40-15 ind / ha; B: 14-2 ind / ha; C: & It; 2 ind / ha; D: insignificant (only passing by / inactive galleries)

Taking into account the ecological requirements of this species, the surface of ROSC10060 Hills of Agighiol and the distribution of characteristic habitats, we appreciate that the populations of *Spermatophilus citellus* in the site have a favorable conservation status, of the 13 identified populations, 40% have an abundance of 40-15 ind / ha (table 1).

The species is not under significant influence from the point of view of pressures and threats. Its long-term survival is assured.

The results of the identification and monitoring study for the species Mesocricetus newtoni were not expected, so far no individual of the species has been collected even though their presence has been reported by the villagers who have adjacent lands in the protected area. Therefore, it is necessary to further investigate the ROSCI 0060 site both by placing traps in the habitats of this species, but also by collecting the regurgitated material of the raptors, this method being able to provide a more accurate picture of the structure of the micromycetic populations and implicitly of Mesocricetus newtoni.

Investigated areas in ROSCI 0060	Spermophilus citellus populations			
	Α	В	С	D
Uzum Hill	-	-	+	+
Movila Hill	+			
Stânca Mare Hill			+	
Izlazul Mare		+		
Pietriș Hill (West slope)	+			
Pietriș Hill (East slope)		+	+	
Agighiol Forest	+			
Pietros Hill (East slope)	+			
Căușa Mică Hill		+		
Căușa Mare Hill			+	
Platon's Hill	+			

Table 1 - The abundance of Spermophilus citellus in the Agighiol Hills area.

Discussion

In general, the mammalian species that are part of the fauna of the studied area are specific for steppe and silvostepa ecosystems. From a qualitative and quantitative point of view, mammalian species characteristic of the steppe habitat predominate. The studied area has a very high ecological value because here are protected and strictly protected species. For most mammalian species there is a certain way of organizing the population, related to the use of the territory where they form their lair and procure their food. Within individual crops, individuals of a species occupy a particular sector, where the animal has its nest and where it carries out its daily activity.

Thus, the European ground squirrel lives alone in the galleries, but in the neighborhood with other individuals. It can be found on sands, roadside, edge of protection curtains and in perennial herbaceous crops. Under the conditions of the studied area the grouping of the galleries was visible for the individuals who occupied the edges of the exploitation roads or the grounded land.

References

- Cepáková E. & Hulová Š. (2002) Current distribution of the European souslik (Spermophilus citellus) in the Czech Republic. Lynx, n. s., 33: pp.89–103.
- Doniță, N., Popescu, A., Paucă-Comănescu, Mihaela, Mihăilescu, Simona, Biriş, I.A. (2005) Habitatele din Romania. Editura Tehnică Silvică, București, 496 pp.
- Hoffmann I., Millesi E., Piet a K. & Ditt ami J., 2003: Anthropogenic effects on the population ecology of European ground squirrels (Spermophilus citellus) at the periphery of their geographic range. Mammal. Biol., 68: 205–213.
- Katona K., Vaczi O. & Altb acke r V., 2002: Topographic distribution and daily activity of the European ground squirrel population in Bugacpuszta, Hungary. Acta Theriol., 47: pp.45–54.
- Krystufek, B. & S. Petkovski, (1999) Mammals of Macedonia. In: The Atlas of European Mammals. Academic Press, London, San Diego, 484 pp.
- Murariu, D., Chisamera, G., Petrescu, A., Atanasova, I., Rajkov, Y. (2010) Terrestrial vertebrates of Dobrogea Romania and Bulgaria. Travaux du Museum National d'Histoire naturelle "Grigore Antipa", 53: pp. 357-375.
- Pop I., Homei V. (1973) Mamifere din România. Volumul II. Editura Științifică București, pp. 99-101.