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The common hamster (*Cricetus cricetus*) in Ukraine: evidence for population decline

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Abstract. The common hamster (*Cricetus cricetus* L.) is supposed to be an abundant species in Eastern Europe including Ukraine. However, the current data on hamster's occurrence in Ukraine from 1990 till nowadays show that the species became rare. The common hamster can be found in the West, North-East Ukraine and the Crimean peninsula. The species have declined in the forest-steppe zone and became extinct in most part of the steppe zone. Its actual distribution range has thus been strongly reduced. One of the possible causes of this decline is the habitat loss due to changes in agricultural management.

Key words: endangered species, Eastern Europe, density, distribution range

Introduction

The Cricetinae hamsters are rodent species of the Palearctic steppe and forest-steppe zone (Wilson & Reeder 2005). One of the Cricetinae species, *Cricetus cricetus*, extended its range far to the west, being the only hamster present in Central and Western Europe (Niethammer 1982). The common hamster is a semi-fossorial species living mainly solitarily in extensive underground burrows. Hamsters collect there large amounts of food, mostly grain, for a long period of hibernation, which may last from August/September till March/April (Franceschini-Zink & Millesi 2008). During the active season the females may raise two or even three litters of 2 up to 14 offspring (Nechay 2000). In good conditions, the local populations proliferate very quickly. The species was never very abundant in natural steppe localities, and its geographic spread into Central and Western Europe was apparently connected with agriculture. The cereal fields were suitable habitats for hamsters with large amounts of food and agricultural management beneficial for the species. Most of traditional agricultural management was performed during the hibernation period of the hamsters thus not disturbing the animals greatly. As a result, the hamsters became very abundant in man-made fields and in some countries they were considered serious pests, especially in the years of mass outbreaks. In the extensive range of the species, from Central Siberia to Western Europe (Niethammer 1982), the mass appearances were reported from Germany, Hungary, former Czechoslovakia, Ukraine and Russia (Nechay et al. 1977). The densities during peak years were so high that the species was subject to commercial harvest and trade of furs. For example in Ukraine about two millions hamsters were trapped during 1934-1939 (Gershenson 1945), 1.8 millions more were trapped during 1947-1970 (Samosh 1972), but the highest density was observed at 1928 when 3.3 millions of hamsters were captured (Vilniy 1928). During the 70s of the 20th century the decline of the hamster populations was noticed in Western Europe. The isolated populations in France, Belgium and the Netherlands became critically endangered at the beginning of 1990s (Weinhold 2008). The assumed causes were multiple and probably acting in synergy: urbanization of formerly agricultural areas, intensification of agricultural management, growing use of pesticides and climate change with less and less suitable conditions for winter hibernation (Nechay 2000). At first, it was thought that the problem concerns solely Western Europe, however, the reports about population declines from Central Europe started to appear. The species lost most of its former distribution area in Germany (Weinhold 2008), Poland (Ziomek & Banaszek 2007) and the Czech Republic (Tkadlec et al. 2012) and the remaining range became severely

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fragmented. However, according to the IUCN the species status is "Least Concern", as its range extends far into Siberia, and there is a widespread belief that in Eastern Europe and Siberia, the species is still abundant and without negative changes in numbers and range (Kryštufek et al. 2008).

Ukraine is among the countries were the common hamster is supposed to be numerous and a widespread species. In the past, till the 1970s, this was true. The species range covered most of the country, excluding only the Carpathian and Crimean mountains and densely forested regions in Northern Ukraine (Fig. 1). The common hamster was especially abundant in the forest-steppe zone, where its densities were about 5-10 burrows per ha (Samosh 1972). The hamsters were less frequent in the steppe zone and this area in Ukraine provided less than 15 % of hamsters fur trade bag (Gershenson 1945). At 1930s the species was reported for 529 localities, which covered most parts of the country (Gershenson 1945). All these data prove that in the past *C. cricetus* was widely distributed and numerous in the whole of Ukraine. However, at the end of the 20th century, first information about the common hamsters' decline in Ukraine appeared (Gorban et al. 1998). The noticeable drop in numbers and distribution led the Ukrainian nature protection authorities to include the species to the Red Book of Ukraine (Mezhzherin 2009). But the lack of information on the current situation of the species did not allow to give it any other protection status than "Data Deficient". This deficiency in knowledge encouraged us to collect all the information on the common hamster occurrence in Ukraine since 1990 and compile a new distribution map.

Material and Methods

We obtained information about *C. cricetus* distribution from four sources:

1. The largest zoological museums in Ukraine were checked for recent hamster specimens: Zoological Museum of Taras Schevchenko National University of Kiev, National Museum of Nature History (NMNH), Zoological Museum of Ivan Franko National University of Lvov (ZMUL).

2. We performed a survey of zoological literature for the information on the occurrence of hamsters. Most of the records came from the studies of the diet composition of birds of prey and research on mammal fauna in specially protected areas. The following literature was used for mapping: Gorban et al. 1998, Shevchenko 2000, Storozhuk 2002, Zorya 2005, Evstafiev 2006, Bashta & Potish 2007, Buchko &

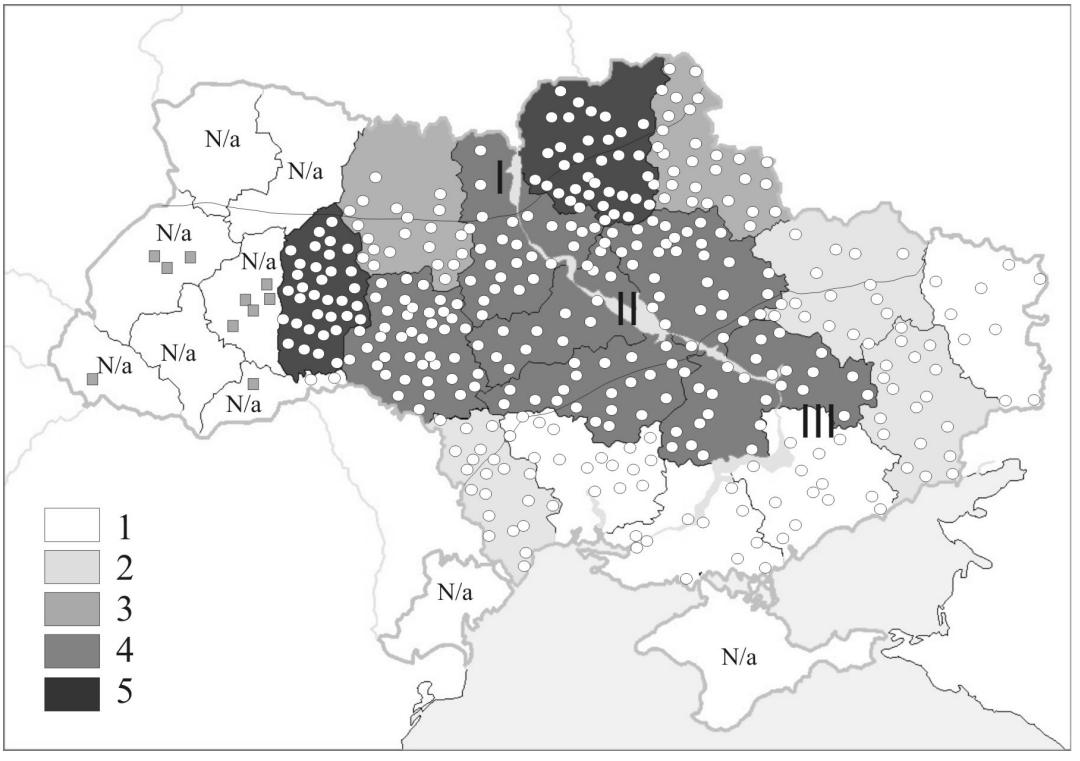


Fig. 1. The range of the common hamster in Ukraine in the middle of the 20th century. Open circles represent localities of Gershenson (1945), grey squares represent localities of Tatarinov (1956). The number of hamsters trapped during five years (1934-1939) is showed by shading (based on Gershenson 1945): 1 – < 20000, 2 – 20000-50000, 3 – 50000-100000, 4 – 100000-250000, 5 – > 250000 individuals, N/a – no data available for that part of the country. Natural zones: I – forest (Polesie), II – forest-steppe, III – steppe.

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Table 1. The years and seasons in which the field survey for the presence of the common hamster was carried out in particular regions of Ukraine.

Region	Year	Season	Number of localities checked	Number of occupied localities found
Kherson	2004-2005	May-October	44	0
	2008-2009	April, August	10	0
Lugansk	2005-2011	March-November	287	0
Crimea	2007-2008, 2012	August	5	4
Zaporozhe	2009-2010	March-April	39	0
Donetsk	2010-2011	April-July	102	0
Dnepropetrovsk	2009	May	5	0
	2012	August	7	0
Nikolayev	2012	August	10	0
Odessa	2012	August	16	0
Poltava	2009	October	4	0
Sumy	2009	October	8	1
	2012	August	4	1
Chernigov	2009	October	30	1
	2012	August	11	4
Kiev	2009	August, October	22	4
	2012	June, August, September	12	1
Ivano-Frankovsk	2009	August	4	2

Cheremnykh 2008, Gorban et al. 2008, Kravchenko 2008, Ponomarenko 2008, Redinov 2009, Volutsa & Volutsa 2010, Drebet & Chervonyi 2010.

3. Personal reports of field zoologists, who work at the universities, nature parks, nature reserves and sanitary epidemiological stations (A.-T. Bashta, T. Buteiko, S. Domashevskiy, M. Drebet, Y. Geryak, V. Reminniy, I. Kotzerzhynska, Y. Kuzmenko, T. Kuzmenko, O. Nekrasova, E. Nesher, A. Pirkal, K. Redinov, I. Skilskiy, N. Tovpinets, H. Trikoz). The collaborators provided photos of the common hamster sites, burrows and sometimes individuals or at least they could describe and identify the common hamster precisely.

4. Own research. From 2004 to 2012 we carried out a survey including 620 localities in different parts of the country (Table 1). In the description of the common hamster distribution we follow the administrative division of Ukraine, which is divided into 25 first-level units (24 regions [oblast] and the Autonomous Republic of the Crimea) and 490 second-level units (districts [raion]). We examined habitats such as: natural pastures and steppes, fields of alfalfa, winter cereals, maize, sunflowers, soya, rapes and vegetable gardens. During our survey we searched for hamster burrows and in some cases used live box-traps and hair traps (Reiners et al. 2011). Traps were usually exposed in one locality for one-two days and checked two-three times a day. All the captured animals were released to their burrows. In each locality we checked at least 20 hectares. If no hamster burrows were found in such an area we evaluated the locality as abandoned by the hamsters. Most of the survey was done during faunistic research of the Eastern part of the steppe zone of Ukraine, thus it is the best studied region. In 2009 and 2012 we collected hamsters for phylogeographic analyses. For our survey in Northern and Western Ukraine and western part of the steppe zone we chose localities where the hamster presence was reported in literature. We were able to check personally only 12 regions and the Autonomous Republic of the Crimea. To compile a map of hamster distribution we used only positive information from outer sources (first three groups) and both positive and negative ones from our own research. For example, in many zoological publications the common hamster is not included in the list of mammals present in the area, however, it is not explicitly stated, that the authors searched for the presence of the common hamster and failed to find active burrows. In such case we cannot mark a locality as abandoned, as the common hamster presence could be overlooked during, for example, simple trapping for small rodents and insectivores. We applied the same reasoning to information received from zoologists, who claimed that the common hamster is absent in some regions. Finding the hamsters burrows in vast areas of agricultural fields is quite difficult, especially in low density populations, and it is not a task to be performed during any other specialized research.

Results

We describe current distribution of the common hamster in Ukraine (Fig. 2) according to landscape zones.

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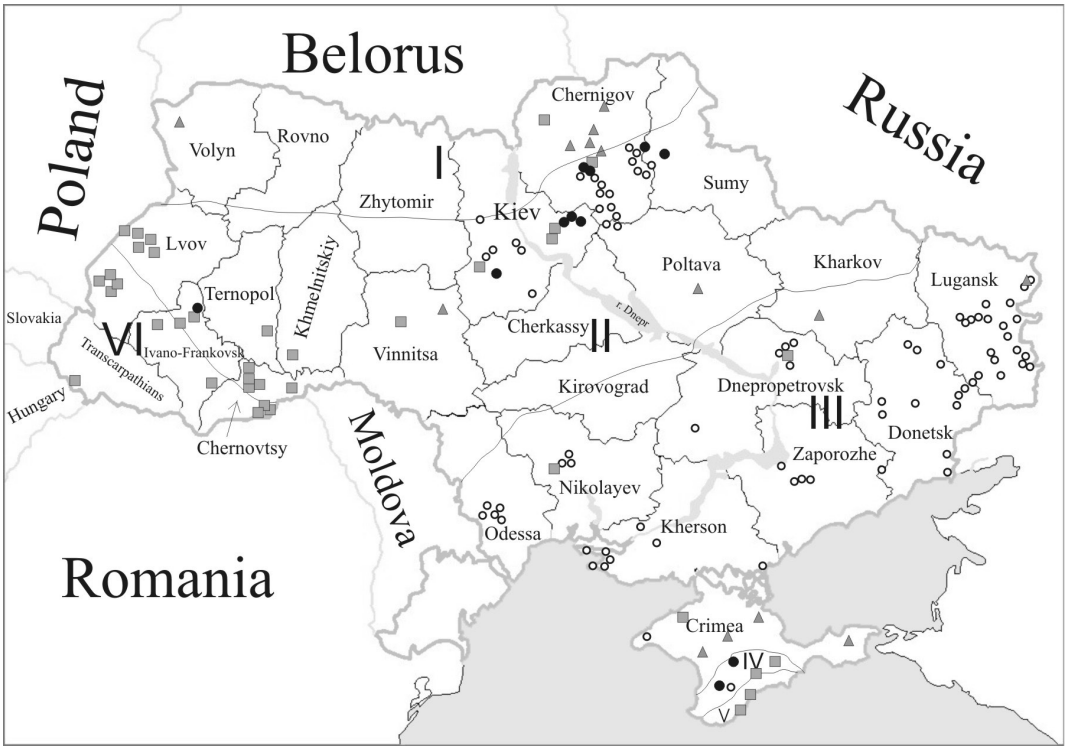


Fig. 2. The map of hamster localities in Ukraine, obtained from our research (filled circles for occupied localities and empty circles for abandoned localities) and from literature data, museum collections information and personal communications (triangles for occupied localities in 1990-2000, squares for occupied localities in 2001-2012). Natural zones: I – forest (Polesie), II – forest-steppe, III – steppe, IV – Crimean foothills (forest-steppe), V – Crimean mountains (forest and mediterranean scrubs), VI – Carpathians and Transcarpathians (forest and meadows).

Steppe zone

The last evidence for the common hamster presence in the steppe part of Ukraine appeared more than two decades ago: Kharkov region in 1991 (Zorya 2005), Lugansk region in 1990 (collection of NMNH), Donetsk region in 1989 (Taranenko et al. 2008). We found no record of the common hamsters from the Kherson, Odessa, Zaporozhe and Kirovograd regions. In the Dnepropetrovsk (Kravchenko 2008, Ponomarenko 2008) and Nikolayev (Redinov 2009) regions the common hamster was reported as a prey of buzzards and goshawks in 2004-2008. Unfortunately, the authors did not provide any photo, skulls or fur to make the identification sure. We checked these localities in 2012 and found no hamster burrows. We cannot be certain that the hamsters are not present there as they could survive in small populations in a very limited area. However, the localities became questionable.

Forest-steppe zone

Two geographic groups of the common hamster localities can be differentiated within this zone:

1. Eastern group: the Kiev, Sumy and Chernigov regions. We found hamsters in the Yahotyn, Baryshivka, Bila Tserkva, Nizhyn, Konotop and Bakhmach districts. In the Poltava region hamsters were present in 1990s (Schevchenko 2000), but there is no more new evidence. The population densities vary from less than 1 to around 5-7 burrows per ha. Hamsters occupy wheat and alfalfa fields, sometimes they are reported as pests in the gardens (T. Kuzmenko pers. comm.).

2. Western group: the Ivano-Frankovsk, Lvov and Chernovtsy regions. We found hamsters in the Halych district (Ivano-Frankovsk region) inhabiting wheat and vegetable gardens (preferably in beet) with densities around 1-3 burrows per ha. The hamster is still reported to be quite common in the Lvov (collection of ZMUL, A.-T. Bashta, Y. Geryak pers. comm.), Ivano-Frankovsk (Buchko & Cheremnykh 2008, Gorban et al. 2008, Drebet & Chervonyi 2010, A.-T. Bashta pers. comm.) and Chernovtsy (Volutsa & Volutsa 2010, I. Skilskiy, E. Nesher pers. comm.) regions. No new data are available for the Cherkassy region.

Forest zone

During the last twenty years the common hamster was reported from two regions in this zone: Volyn and Chernigov. In Volyn hamsters became extremely rare during 1990s with only one known locality near

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Schatzk. The density of this population decreased from 12 burrows per 100 ha in 1980s to four burrows per 100 ha in 1990s (Gorban et al. 1998). In the northern part of the Chernigov region only one locality was reported in the vicinity of Chernigov (Y. Kuzmenko pers. comm.). No data are available for the Rovno and Zhytomir regions.

Crimean peninsula

In Crimea the common hamster preferably occurs in the foothills (forest-steppe landscapes), but can be found also in dry steppes of the northern part and was even recorded on the southern coast in Yalta and Alushta towns (Evstafiev 2006, N. Tovpinets pers. comm.). The common hamster colonized urban environment in Crimea and currently occurs in parks, orchards, dooryards and lawns of Simferopol and some other smaller towns (Evstafiev 2006, Surov & Tovpinets 2007). In 2012 we observed hamsters living in the center of Simferopol with 18 burrows per 0.3 ha. In parks of the city hamsters dwell in a very uncommon habitat for the species: in the forest-like part with dense bushes. But the densities there are lower: in the Vorontsov botanical garden we found only seven inhabited hamster burrows at an area less than 8 ha.

Transcarpathians

The common hamster never occurred in the Carpathian Mountains. The current findings from the eastern foothills in the Ivano-Frankovsk and Lvov regions were reported together with other localities from Western Ukraine, located in the forest-steppe zone. In the Transcarpathians the species became very rare (Bashta & Potish 2007). There is only one locality reported from that region: in the valley of the River Tisa near the town Berehove (A.-T. Bashta pers. comm.).

Discussion

The common hamster disappeared from vast parts of the country (Fig. 1). We can state that there are currently only three relatively large geographic areas inhabited by the common hamster: North-Eastern (Kiev, Chernigov, Sumy), Western (Ivano-Frankovsk, Lvov, Chernovtsy) and Crimean (Fig. 2). In general the common hamster tends to occur in forest-steppe habitats, while in the large steppe zone which covers more than 40 % of Ukraine the hamsters became extremely rare or even extinct. Such a pattern of the distribution was also observed in the past: in the forest-steppe *C. cricetus* was the most numerous during the fur-trade period (Gershenson 1945) and it had the highest densities of populations (Samosh 1972), while the steppe part of Ukraine contributed less than 15 % in fur-trade bag and the hamster was never really abundant there (Fig. 1). Thus it is not surprising that currently the species survives in the forest-steppe zone.

The causes for decline of the common hamster are not clearly understood not only in Ukraine, but in the whole range of the species. One of the main causes could be habitat loss which is caused by the major changes in agricultural management. In search for possible causal relationships between the disappearance of the hamsters in Ukraine and the level of transformation in agriculture we used both official statistics of the Ukrainian Governmental Committee for Statistics (data available online at http://www.ukrstat.gov.ua) and our own observations.

According to these data agricultural management changed fundamentally during the past decades and three factors most likely had the negative impact on hamster populations. The first factor is probably the dramatical decline of alfalfa and other forage crops, from 12 million ha in 1990 to 2.5 million ha in 2011 according to official data. Our observations show that the alfalfa fields are extremely rare in the southern part of Ukraine, and occur mainly in the north. The reason for such a decline of this culture is possibly the decreasing number of cattle, from 25.2 million in 1990 to 4.4 million in 2012 according to official data. The second factor which may strongly influence the abundance of the species is the increase of area used for corn, sunflower, rape and soya cultures. For example, the area used for sunflowers increased from 1.6 million ha in 1990 to 4.7 million ha in 2011 according to official data. Our experience shows that these cultures have a varied distribution: sunflowers form massive monocultural fields in the southern part of the country, covering at least 2/3 of fields in some regions, while corn is mainly cultivated in the northern part. It is important to stress that during agrotechnical management of cultures like corn, sunflower and rape the use of pesticides and herbicides is significantly higher than for winter cereals. Moreover these cultures can provide food for rodents only during spring and early summer, leaving animals with little or no food during the following several months. Thus cultivation of large fields of inappropriate cultures can be a serious threat to survival of the common hamster. The data available for 2011 shows that 8 million ha were used for winter cereals, 0.5 million ha for vegetables (sugar beet, potatoe etc.), 2.5 million ha for forage

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crops, 3.6 million ha for corn, 6.9 million ha for oil-bearing crops. This proves that corn, sunflowers, rapes and soya cultures currently cover at least half of the Ukrainian agricultural landscape.

The third factor with negative impact on habitat conditions is very probably the field burning. While it is prohibited by Ukrainian law, this happens commonly and annually and can cause environmental disasters. Fields are usually burned in August-September after the crop harvesting while pastures and sunflower fields are also burned in March-May. It is worth to notice that March-September is the active season for the common hamster (Franceschini-Zink & Millesi 2008). The impact of these burnings on the biodiversity is not yet fully understood. We found in the Baryshivka district (Kiev region) that burned fields had little or no hamster burrows and the local populations survived only in the areas, where farmers avoided burning of fields.

The Ukrainian populations of *C. cricetus* are supposed to be of high importance as they are connecting Western and Central European populations, which form the western species border, with the wide species range in European Russia, Siberia and Kazakhstan. In Western Ukraine it is still possible that populations in the Yavoriv and Sambir districts of the Lvov region form the link between Ukrainian and Polish populations of the common hamster, what was suggested previously by Ziomek & Banaszek (2007). Moreover the populations from the Transcarpathians can be connected to Hungarian populations. In Eastern Ukraine hamsters from the Sumy region can be connected with Russian populations found in the Bryansk region (Mishta & Sitnikova 2005). However, our data show that within Ukraine the connection between North-Eastern, Western and Crimean hamster populations is weakened or even interrupted. There is evidence that different local populations in Kiev region have a rather high level of genetic differentiation (Banaszek et al. 2011).

As the negative tendencies in the habitat quality continue to affect hamster populations in Ukraine and other neighbouring countries of Eastern Europe, the survival of the species becomes a problem on the whole European scale. Especially the Ukrainian and Russian steppe zone in Europe is considered as a refugial area for the common hamster. For example, the hamsters have been continuously present in the Nikolayev region and the Crimea since the Eemian (Mikulinian) interglacial and most probably served as source populations for expansion (Kowalski 2001). Our research indicates that the populations from the Nikolayev region may be already lost. Summing up, to prevent the species from the extinction further research on the distribution, numbers and genetic diversity is urgently needed, as well as special plans for hamster protection in Eastern Europe.

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