

## THE DISTRIBUTION OF THE COMMON HAMSTER (*CRICETUS CRICETUS*) IN WESTERN UKRAINE

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**Abstract.** The aim of this study was to determine the current range of the common hamster (*Cricetus cricetus*) in western Ukraine by checking the points of occurrence known from literature, personal reports and museum collections. According to RUSIN *et al.* (2013) the common hamster was reported from 23 localities grouped in 12 areas in 7 oblasts of Western Ukraine. In total, we confirmed eight areas of hamster occurrence from RUSIN *et al.* (2013) and found one new locality. The highest densities of the common hamster occurred around Hrymailiv, Ternopol oblast and Halych, Ivano-Frankovsk oblast. The areas located in the vicinity of Lutsk in Volyn oblast, Chernovtsy and between Sambir and Old Sambir in Lvov oblast represent medium density populations. Low and very low densities were found in areas close to Lvov and Kamieniec Podolski, and Khmel'nitskiy oblast. In general, it can be stated that the Volyn Upland and Podolia are still inhabited by the common hamster. Moreover, habitat conditions that support the existence of the common hamster and possibilities of contact with hamster populations from neighboring countries are also discussed in this paper.

**Key words:** endangered species, distribution range, contact zone, phylogeographic lineages

### INTRODUCTION

The common hamster (*Cricetus cricetus*) is a rodent species characterized by a large Eurasian range extending from the river Yenisei in Russia, to Central and Western Europe where it forms isolated populations in Belgium, the Neth-

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erlands and France. The European northern boundary of this species is spread between 45° and 55° N, however, in Russia its range reaches further north up to 59° N (WILSON and REEDER 2005). The natural habitat for common hamsters is steppe and forest-steppe zones, although in Central and Western Europe, hamsters are associated almost exclusively with agricultural habitats (NECHAY 2000). Despite the extensive range and high population densities of this species up to the 1970s, the decline of some Western European hamster populations was noticed (NECHAY 2000). Over the last forty years, the range of the common hamster has contracted significantly not only in the west but in all European parts of its range (WEINHOLD 2008). In Belgium and France, the hamster is threatened with extinction, while in the Netherlands it is already extinct (NECHAY 2000). Currently, hamster populations in the Netherlands are the result of reintroductions. In Germany, where agriculture suffered from mass outbreaks of the hamsters in the second half of the 20<sup>th</sup> century, the species range shrank significantly and became fragmented (WEIDLING and STUBBE 1988). Also in Poland, hamsters, which were formerly highly abundant, nowadays have lost most of their range (ZIOMEK and BANASZEK 2007). The same trend was described from the Czech Republic where hamsters retreated to the best habitats in the river valleys (TKADLEC *et al.* 2012). The causes of the progressive disappearance of the common hamster are not fully understood.

However, the common belief was that the species was not globally endangered as it was supposed to be quite abundant in the Eastern European and Asiatic part of its range (IUCN 2012). The decline in the inhabited area and numbers were presumably the problem of Western and Central European populations. However, recent studies on occurrence of the common hamster in Ukraine showed results similar to the rest of Europe. The species was rare in the western and northern part of the country or even extirpated in Eastern and Southern Ukraine (RUSIN *et al.* 2013). According to RUSIN *et al.* (2013), there are currently only three main geographic areas occupied by the common hamster: North-Eastern Ukraine (Kiev, Chernigov, and Sumy oblasts), Western Ukraine (Ivano-Frankovsk, Lvov, and Chernovtsy oblasts) and Crimea. To define the current state of the common hamster population in Ukraine, the authors used data from: zoological museums, available literature, personal reports of field zoologists and their own research carried out from 2004 to 2012 in 620 localities mainly in South-Eastern and North-Eastern Ukraine. When it comes to Western Ukraine, there was only one locality in Ivano-Frankovsk oblast which was confirmed by the authors. The other locations reported by RUSIN *et al.* (2013) were obtained from the outer sources mentioned above. In effect, the current state of hamster populations in Western Ukraine is still poorly recognized.

Therefore, the aim of our study was to determine the current range of the common hamster in Western Ukraine. For this purpose, we tried to verify the potential occurrence of the species in the places compiled by RUSIN *et al.* (2013).

## MATERIAL AND METHODS

Information about possible common hamster sites in Western Ukraine was obtained from a previous study carried out by RUSIN *et al.* (2013). According to this survey, the common hamster was found in 23 localities in Western Ukraine. The localities were grouped in 12 areas in 7 oblasts: Volyn, Lvov, Ternopol, Ivano-Frankovsk, Transcarpathians, Chernovtsy and Khmelnytskiy. The list of sources used by authors to elaborate the common hamster localities in Western Ukraine are given in Table 1, while detailed information is listed in Appendix 1. Only one locality in Halych, Ivano-Frankovsk oblast was confirmed by the authors.

Our research was carried out in late July and early August 2013. During the survey, we checked locations reported by RUSIN *et al.* (2013) in six oblasts: Volyn, Lvov, Ternopol, Ivano-Frankovsk, Khmelnytskiy and Chernovtsy (Fig. 1).



Fig. 1. Map of the common hamster localities in Ukraine obtained from RUSIN *et al.* (2013). Filled circles – occupied localities confirmed by the authors, triangles and squares – occupied localities, known from literature or other sources, in 1990-2000 and 2001-2013 respectively.

Table 1. Localities of common hamster occurrence in Western Ukraine according to RUSIN *et al.* (2013). Details of information sources are given in Appendix 1.

Oblast	Area	Locality	Year of	Information	Presence of
Volyn Lvov	Shatsk	Shatsk	1998	literature	not confirmed
	Zhovkva	Byshkiv	2009	personal reports	not confirmed
	Yavoriv	Krakovetz	2006	museum collection	not checked
	Lvov	Sokolniki	2007	personal reports	confirmed
		Obroshyne	2003	museum collection	confirmed
	Sambir and Old Ralivka		2005	personal reports	confirmed
	Sambir	Chukva	2000-2010	personal reports	confirmed
		Blazhiv	2000-2010	personal reports	confirmed
		Strilkovychy	2000-2010	personal reports	confirmed
	Stryi	Berezhnytsya	2005	museum collection	not confirmed
Ternopol Ivano-Frankovsk	Hrymailiv	Medobory Reserve	2002	literature	confirmed
	Halych	Rozhnyatov	2010	personal reports	not confirmed
		Halychskiy National Park	2008-2009	literature	confirmed
	Kosiv	National Park Gutsulschina	2008	literature	not checked
	Beregove	Beregove	2004	personal reports	not checked
	Chernovtsy	Klyvodyn	2010	personal reports	not checked
		Shypintzi	2010	personal reports	not checked
		Zavoloka	2005	personal reports	confirmed
		Ostrytzya	2009	literature	confirmed
		Hertza	2001, 2009	literature	not checked
Khmelnitskiy		Khryatzka	2007	literature	not checked
		Kulykivka	2009	literature	not checked
	Kamienec	Kamienec Podolski	1999-2000	personal reports	confirmed

In order to verify the presence of hamsters, we searched mostly wheat fields for burrows and we set up hair traps (REINERS *et al.* 2011). Hair traps were usually exposed in one locality for one or two days and checked the next morning. If there were no hamster burrows in the checked locality and surrounding area we identified the location as uninhabited by hamsters. Following RUSIN *et al.* (2013) we checked at least 20 ha before we decided that the locality was abandoned. The areas of checked fields were measured in Google Earth Pro (Sullivan 2009). The density based on the number of active burrows was assessed according to NECHAY (2000): below 0.2 burrow per hectare the density was very low, 0.2-1 low, 2-5 medium, 6-20 high and 21-50 very high.

Maps for the current study were created in QGIS 2.0.1-Dufour using Natural Earth.

## RESULTS AND DISCUSSION

In total, we confirmed eight areas of hamster occurrence from RUSIN *et al.* (2013) located in Volyn, Lvov, Ternopol, Ivano-Frankovsk, Chernovtsy and Khmelnytskyi oblasts (Table 1 and 2, Fig. 2). Furthermore, we found one new locality located in Volyn oblast in Kopachivka near Lutsk (Fig. 2). The newly discovered locality turned out to be quite abundant in hamsters. The density amounted to 1.8 burrows/ha which represents medium density (Table 2). We were able to collect 6 hair samples from 21 traps set for one night. The quite high numbers of hamsters in this area are most probably associated with the traditional agriculture management and the presence of the gardens around each village. Such gardens are small fields of 0.5 – 2ha with a variety of crops: wheat, alfalfa, potatoes, beets and other vegetables which form suitable habitat for hamsters. We failed to confirm the presence of the common hamster in another locality in Volyn oblast reported by GORBAN *et al.* (1998), in the region of Shatsk. This area is located in the Shatsky National Natural Park, created in order to protect the rare natural complexes in the region of Shatsk Lakes. The largest part of the Park is covered by Shatsk lake group, marshes and coniferous forests which are not normally inhabited by hamsters. It is definitely not a typical agricultural region and there are practically no cultivated fields, except some gardens in the villages which are situated on very sandy soils. Referring to GORBAN *et al.* (1998), the common hamster still occurred in the Shatsk area in 1997. We consider this population to be extinct now because the presence of hamsters in such habitats could only result from dispersal of individuals from areas of high population density, most probably during mass outbreaks. Unfortunately, such conditions do not occur nowadays. To sum up, in the Volyn oblast, hamsters are still present in the Volyn Upland, whereas northern and central parts of that oblast, called Polesia, are most probably abandoned.

According to RUSIN *et al.* (2013) research, there were five areas inhabited by hamsters in Lvov oblast. The first one, situated in Byshkiv in Zhovkivskyi district, was still inhabited by the species in 2009. During this study we failed

to find any burrows in that area. The locality is situated in the West Bug Valley which is, in general, an area with high ground water level and intensively meliorated. During our research, the soils were very wet and even rainwater accumulated on the surface. We suppose that hamsters could not survive in such conditions. However, as the area is located in the middle of the Polish-Ukrainian range of the species (ZIOMEK and BANASZEK 2007, RUSIN *et al.* 2013), it is possible that migrating animals could establish transient populations during drier years. We did not try to verify the presence of hamsters in the second point in Lvov oblast located near the Polish border in Krakovetz, Yavorivskyi district because there are data supporting multiple occurrences of the hamsters in that region on the Polish side, around the Torki village near Medyka (ZIOMEK and BANASZEK 2007) or Radymno near Jarosław (BANASZEK and ZIOMEK 2011). In the next two points reported by RUSIN *et al.* (2013) in the south of Lvov (in Pustomyty district), located in the agglomeration of Lvov, we found no cultivated fields to check due to the high degree of urbanization of the area. Therefore, we could not confirm the locations so close to Lvov, but moving more to the southwest we found a population in the vicinity of Horodok (about 33 km southwest of Lvov). The entire area located near Horodok was not abundant in hamsters and was characterized by low density (Table 2). Six hair samples were collected during one night from 25 hair traps that were set up in that site. We also confirmed the presence of hamsters in several localities given by RUSIN *et al.* (2013) situated between Sambir and Old Sambir. That region proved to be fairly abundant in hamsters. Density amounted in this case to 2.07 burrows/ha (medium density) and we collected 8 hair samples from 23 hair traps from two nights of trapping. The hamster localities occur in the valley of the river Dniester which provides convenient conditions for agriculture development. Important is the fact that besides the presence of the multi-acre fields, there is also traditional farming in that region. We did not confirm the presence of hamsters in the last point from the Lvov oblast, Berezhnysya, located southeast of Stryi because of the lack of suitable habitats in that area. Due to the close proximity of Stryi city, the surrounding areas were either built up or were fallow land. However, similar to the points close to Lvov city, we cannot exclude the presence of hamsters in this area.

We were able to confirm the presence of hamsters in Ternopol oblast near Hrymailiv and Vikno. The density here reached 8.83 burrows/ha which is the highest density recorded during this study (Table 2). There were no large industrial fields present, only small 0.5 – 1 ha ones, often in the vicinity of the home vegetable gardens which provide adequate habitat for hamsters. From the described area, 5 samples were collected from 31 hair traps during one night and an additional 2 were obtained from museum specimens from the Medobory Reserve collection.

In Ivano-Frankovsk oblast, the common hamster was reported from the Halychskyi National Park and this locality was confirmed by RUSIN *et al.* (2013). We also confirmed the presence of hamsters in two localities in this area:

Kinashiv near Halych and Nyzhnia Lypytsia near Rohatyn. The density in that region was maintained at a high level of 5.39 burrows/ha, however hamster hairs were present in 3 out of 16 hair traps only. It should be mentioned that the surrounding fields were mostly burned which may have contributed to lower activity of common hamsters. Another locality in Ivano-Frankovsk oblast was Rozhnyativ area, where the presence of hamsters was reported in 2010. However, we did not find any burrows in Dolyna and Rozhnyativ area. It is possible that the density of populations there is extremely low and we simply did not succeed in finding burrows in large monoculture fields that were present in that area. The region of Kosiv (the area of National Park Gutsulschina) has not been checked because the presence of hamsters is very doubtful there as the putative locality is situated in the mountains.

There is only one locality, given by RUSIN *et al.* (2013), of common hamster occurrence in Khmelnytskyi oblast around Kamienec Podolski, as the species is reported from the Podilski Tovtry National Park. Our studies showed very low density in this area (Table 2). There was only 1 hair sample obtained from 12 hair traps set up in that region which is not surprising considering the fact that most of the local fields are multi-acre, industrial ones covered mainly with sunflowers, corn and sometimes wheat. According to RUSIN *et al.* (2013) the increase of area used for sunflower and corn may be one of the main causes for the decline of common hamster populations in Ukraine, as this type of crop forms unsuitable habitats due to lack of long-term food and shelter for rodents and higher use of pesticides during cultivation.

In Chernovtsy oblast, RUSIN *et al.* (2013) pointed out seven localities of the common hamster based on literature data and personal reports. During our research, we found large numbers of common hamster burrows in the Ostrytsya area. Taking into account the surface of checked fields, obtained density was medium. The agriculture in this area was again traditional with small fields and various crops. Points located south of Chernovtsy, close to the Romanian border were not checked in this study, however, considering the density of hamsters in the Ostrytsya area, similar agriculture system and lack of clear barriers for dispersal, the whole area around Chernovtsy may be considered inhabited by hamsters.

Regarding the Transcarpathian oblast, there is one locality given by RUSIN *et al.* (2013) based on a personal report. This locality needs to be checked in the future as we were not able to travel there during this expedition. However, the Beregove site is situated in the Transcarpathian Lowland, which is a part of the Great Hungarian Plain where, at least in Slovakian part, hamsters are abundant (NECHAY 2000, BANASZEK, unpubl. data).

In conclusion, the common hamster in the western part of Ukraine occurs in the Volyn Upland and Podolia. High or medium densities of hamsters were found in Ternopol, Ivano-Frankovsk, Chernovtsy, Volyn oblasts and Sambir and Old Sambir in Lvov oblasts (Table 2). Low and very low densities were reported in some parts of Lvov oblast (Horodok) and in Khmelnytskyi oblast. The exist-



ence of hamsters in Western Ukraine is supported by traditional agriculture management and, above all, the presence of small, private gardens which form ideal habitat conditions for this rodent. In the areas where traditional agriculture has been replaced by large-scale fields, the densities of hamsters are low, as mentioned above, or we were not able to confirm the presence of hamsters as in case of Dolyna and Rozhnyativ. Another threat for hamster populations is urbanization and the increase in area of fallow land. However, the presence of hamsters cannot be ruled out in urbanized areas of Lvov or Stryi as the hamster populations are repeatedly reported from the cities (SUROV and TOVPINETZ 2007, FRANCESCHINI-ZINK and MILLESI 2008, BANASZEK and ZIOMEK 2010).

As regards the contact between populations living in the territory of Western Ukraine and populations from neighboring countries, there is still contact with populations inhabiting the areas near the Polish border. Populations inhabiting the areas of Lvov oblast, located west of Sambir may remain connected with populations situated south of Przemyśl in Poland (Hermanowice and Nehrybka), as was suggested earlier by ZIOMEK and BANASZEK (2007). Such contact is also possible between populations inhabiting the aforementioned Krakovetz and populations living in the area of Jarosław, Radymno and Torki in Poland. Given the occurrence in Volyn oblast, it is highly probable that populations inhabiting the area around Lutsk may be connected to populations from the Lublin Upland (Hrubieszów) in Poland. The possibilities of gene flow between the aforementioned populations will be confirmed through the genetic analyses of microsatellite markers. However, it is already clear that conservation of the species should be taken across the border with an agreement between Poland and Ukraine. Furthermore, the potential populations inhabiting Transcarpathian Lowland may be in contact with populations from Hungary, Slovakia and Romania, hence future studies are needed to confirm this.

The possibilities of gene flow between populations in Western Ukraine and South-Eastern Poland are additionally complicated by the presence of two phylogeographic lineages, Pannonia and E1 in Southeastern Poland (BANASZEK *et al.* 2010). The Pannonia lineage in Poland inhabits the southern part of Małopolska Upland, Kraków-Częstochowska Upland, Upper Silesia and Sandomierz Basin. Whereas the E1 lineage comprises populations living in the Lublin Upland, Roztocze and the northern part of the Małopolska Upland (BANASZEK *et al.* 2010). The area that provides a barrier between two lineages was found to be in the Małopolska Upland (BANASZEK *et al.* 2012). According to BANASZEK *et al.* (2012), the habitat quality in the barrier area is too low for the survival of hamsters. The area is located in a region with a high percentage of woodland and composed of sandy soils that prevent the construction of stable, deep burrows which are needed by hamsters to survive the winter. Another area of probable contact between phylogeographic was formed in the past by the Solska Forest. The Solska Forest separates E1 populations inhabiting the Lublin Upland with Roztocze and Pannonia populations from the San River Valley (BANASZEK and ZIOMEK 2012). As it was discussed above, the populations from the Volyn



Upland, Lutsk area may have contact with populations of E1 lineage while populations from the Lvov oblast remain connected with Pannonia populations in Poland (Fig. 2).

Unfortunately, there is only one source of information about the distribution of phylogeographic lineages in Western Ukraine. The common hamsters belonging to the E1 lineage occur in the area of Halych (BANASZEK *et al.* 2011) (Fig. 2). In such a case, it is very probable that in Ternopol, Ivano-Frankovsk, Chernovtsy and Khmelnytskyi oblasts the E1 lineage would be present. Putative

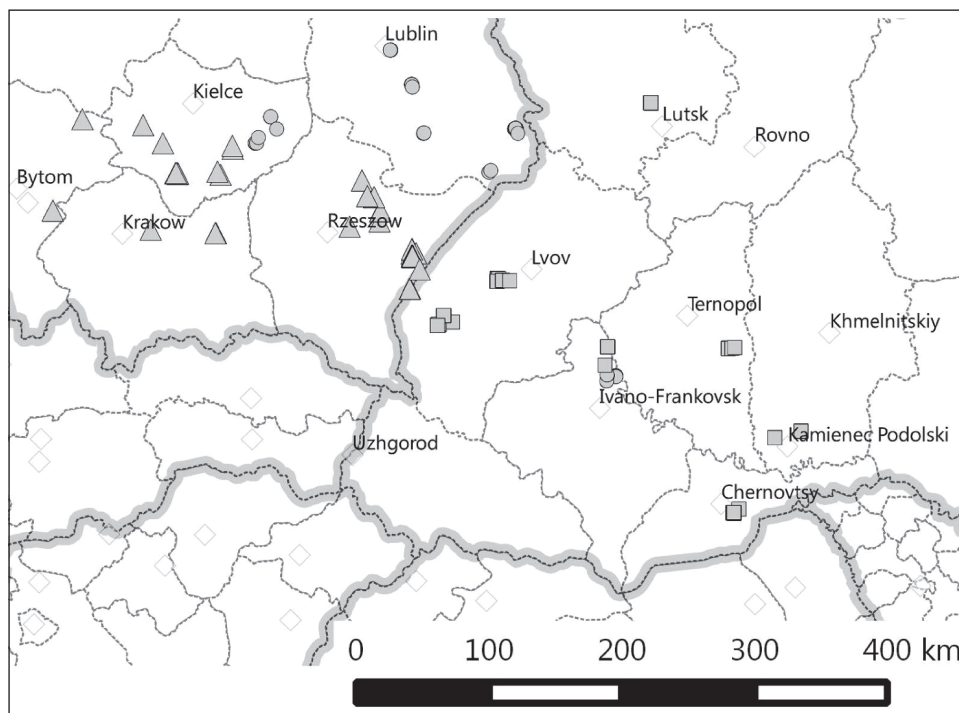


Fig. 2. The sampling localities of the common hamster (*Cricetus cricetus*) in south-eastern Poland (BANASZEK *et al.* 2010, BANASZEK and ZIOMEK 2011) and Western Ukraine. Triangles – the Pannonia lineage, circles – the E1 lineage, squares – unknown lineage.

location of the contact area of E1 and Pannonia lineage would extend somewhere along the border between Lvov and Ternopol and then Ivano-Frankovsk oblasts. However, we are not able to indicate now any geographical barrier which could separate the lineages. To verify the distribution of the phylogeographic groups and areas of contact we will perform mitochondrial DNA analysis from hair samples collected during the field work.

Table 2. The results of the field survey of the common hamster localities in western Ukraine with the population densities and number of collected samples.

Oblast	Area	Locality	Density (burrows/ hectar)	Category of density
Volyn	Lutsk	Kopachivka	1.81	medium
Lvov	Lvov	Horodok	0.31	low
	Sambir and Old Sambir	Sambir and Old Sambir	2.07	medium
Ternopol	Hrymailiv	Medobory Reserve	8.83	high
Ivano-Frankovsk	Halych	Kinashiv	5.39	high
	Rohatyn	Nyzhnia Lyptysia		
Chernovtsy	Chernovtsy	Ostrytsya	2.48	medium
Khmelnitskiy	Kamienec Podolski	Shatava	0.07	very low

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#### WYSTĘPOWANIE CHOMIKA EUROPEJSKIEGO (*CRICETUS CRICETUS*) W ZACHODNIEJ UKRAINIE.

#### STRESZCZENIE

Celem niniejszych badań było określenie aktualnego rozmieszczenia populacji chomika europejskiego (*Cricetus cricetus*) na terenie zachodniej Ukrainy. W tym celu sprawdzono obszary dotychczas uważane za zamieszkane przez chomika, znane z dostępnej literatury, indywidualnych obserwacji i informacji pochodzących ze zbiorów muzealnych. Zgodnie z badaniami opublikowanymi przez RUSIN i in. (2013), chomik Europejski występuje w 23 lokalizacjach zgrupowanych w 12 głównych obszarach położonych łącznie na terenie 7 obwodów zachodniej Ukrainy. Podczas tegorocznych badań potwierdzono obecność chomika europejskiego na terenie 8 z 12 obszarów opisanych przez RUSIN i in. (2013) oraz znaleziono jedną nową

lokalizację występowania tego gatunku. Największe zagęszczenie populacji chomika odnotowano w okolicy miejscowości Grzymałów, obwód Tarnopolski oraz miejscowości Halicz, obwód Ivano-Frankowski. Obszar zlokalizowany w sąsiedztwie Łucka w obwodzie Wołyńskim, Czerniowiec w obwodzie Czerniowieckim i pomiędzy Sambirem a Starym Sambirem w obwodzie Lwowskim charakteryzuje średnie zagęszczenie populacji chomika europejskiego. Niski i bardzo niski stopień zagęszczenia stwierdzono w populacjach zamieszkujących teren w okolicach Lwowa i Kamieńca Podolskiego położonego w obwodzie Chmielnickim. Dodatkowo w przedłożonej pracy omówione zostały warunki siedliskowe preferowane przez badany gatunek oraz możliwości kontaktu populacji zamieszkujących tereny przygraniczne z populacjami chomika europejskiego z sąsiednich krajów.

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**Appendix 1.** Detailed information of sources used by Rusin et al. (2013) to determine the common hamster localities in Western Ukraine.

Oblast	Area	Locality	Year of observation	Detailed information sources
Volyn	Shatsk	Shatsk	1998	Gorban I., Dykyi I., Srebrudolska E. 1998: What has happened with <i>Cricetus cricetus</i> in Ukraine? In: Stubbe M. & Stubbe A. (eds.), Ecology and protection of the Common hamster, Martin-Luther-Universität, Halle/Saale: 87-89.
Lvov	Zhovkva	Byshkiv	2009	A.-T. Bashta (specializes in theriology, Institute of Ecology of the Carpathians, Lvov), personal communication, 1 animal trapped
	Yavoriv	Krakovetz	2006	Zoological Museum of Ivan Franko National University of Lvov, col. Hrechak
	Lvov	Sokolniki	2007	A.-T. Bashta personal communication
	Sambir	Obroshyne	2003	Zoological Museum of Ivan Franko National University of Lvov, col. Kovalyshyn
	and Old	Ralivka	2005	Y. Geryak (comes from Sambir region, specializes in entomology, University of Lvov), personal communication, pest, 20 animals trapped
	Sambir	Chukva	2000-2010	Y. Geryak, personal communication, pest, individuals killed on roads
		Blazhiv	2000-2010	
		Strilkovychy	2000-2010	
Ternopol	Stryi	Berezhnitsya	2005	Zoological Museum of Ivan Franko National University of Lvov, col. Hilezkyi
	Hrymailiv	Medobory	2002	Storozhuk S. 2002: Population density and habitat distribution of mammals in the Medobory natural reserve. Visnuk Lviv. Univ. 30: 141-145 (in Ukrainian with English summary)
		Reserve		
Ivano-Frankovsk	Halych	Rozhnyatov	2010	A.-T. Bashta, personal communication, animal spotted in the field
		Halychskiy National Park	2008-2009	Buchko V.V. and Cheremnykh N.M. 2008: Trophic links of the Eagle Owl ( <i>Bubo bubo</i> (L.)) in Halysky National Natural Park. Materials of III International Scientific Conference "Birds of Prey and Owls of Ukraine", Kryvyi Rih, Ukraine: 39-44 [In Ukrainian].
	Kosiv	National Park Gutsulschina	2008	Gorban I.M., Skilskyi I.B., Meleschuk L.I., Gorban L.I. 2008: Modern status of vertebrate fauna of National Natural Park "Gutsulschyna". Zapovidna sprava v Ukraini, 14 (2): 81-102 [In Ukrainian].
Transcarpathians	Beregove	Beregove	2004	A.-T. Bashta, personal communication, animal spotted in the field
Chernovtsy	Chernovtsy	Klyvodyn	2010	I. Skilskyi (specializes in ornithology, Chernovtsy Municipal Museum), personal communication

Khmelnitskiy	Shypintzi	2010	N. Smirnov (Chernovtsy Municipal Museum), personal communication
	Zavoloka	2005, 2009	I. Skil'skiy, E. Nesher (was a PhD student in the Schmalhausen Institute of Zoology, Kiev), personal communication, one animal trapped
	Ostrytzya	2009	Volutsa A.D. and Volutsa O.D. 2010: Findings of animals from the Red Data Book of Ukraine in Gertsia district (Chernivtsi region). Materials of international conference dedicated to 50th anniversary of publishing of regional report "Animals of the Soviet Bukovina", Chernivtsi, Ukraine: 205-207. [In Ukrainian].
	Khryatzka	2001, 2009	Information from National Park internet site, also by M. Drebet (was a PhD student in Lvov Museum of Natural History), personal communication, in <i>Bubo bubo</i> pellets
	Kulykivka	2007	
	Kamienec	2009	
	Podolski	1999-2000	
	(National Park		
	Podil'ski Tovtry)		