

Population increase of *Rhinolophus hipposideros* in the Šumava Mts. Region, SW Bohemia

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Abstract. The paper summarizes data on the occurrence, distribution and population development of the lesser horseshoe bat in the Šumava Mts. Region in the period 2005–2012. Long-term population trends are analysed using the dataset collected since the 1970s. The population of the lesser horseshoe bat in the Šumava Mts. Region has an isolated character. The core area of the recent distribution is found in the mapping squares nos. 6747, 6846 and 6847, a relatively restricted area in the Šumava foothills and on the border between the geographical units of the Šumava Mts. and the Šumava Piedmont up to the altitude of about 800 m a. s. l. The occurrence is primarily connected with limestone karstic localities. A strong population decline was observed in the past, with the minimum numbers recorded during the late 1980s and early 1990s. A recovery of the population was documented during the second half of the 1990s. Occurrence of the species has been recently documented altogether from 11 mapping squares, indicating a substantial increase of the known area of distribution compared to 6 mapping squares in the previous period 1992–2005. Presence of the species was also confirmed in the southeastern part of the study area (mapping squares 7051, 7152), which means recovery after more than 50 years. A strong population increase during the last 20 years is documented in the long-term monitored hibernacula, nursery colonies as well as temporary shelters. Based on the analysis of monitoring data, population increase of the lesser horseshoe bat in the Šumava Mts. Region is real and corresponds to a similar trend within the whole Czech Republic and Central Europe.

***Rhinolophus hipposideros*, distribution, abundance, population trends**

Introduction

An increase of population numbers of the lesser horseshoe bat in the Šumava region has been documented since the middle of the 1990s. All available data including quantitative parameters and population trends until 2005 were published (Bufka et al. 2009). Moreover, basic faunistic data were summarised in atlases of the Šumava Mts. Region and of the whole Czech Republic (Anděra & Červený 1994, Hanák & Anděra 2005). Nevertheless, since 2005, we have collected numerous new data on the presence, distribution and abundance of the species. The aim of this study is to present a condensed overview of data from the period 2005–2012, the latest findings on the distribution within the study area, as well as the complete knowledge of the recent increase of abundance and long-term population trends. The main questions are: (1) Are there any changes in distribution of the species? (2) Is there a real population increase of the lesser horseshoe bat population in the Šumava Mts. Region?

Study Area and Methods

The study area is situated at the south-western border of the Czech Republic with Germany (Bavaria) and Austria. It covers the Czech side of the Bohemian Forest, and it is represented by the geographical units of the Šumava Mts. and

the Šumava Piedmont (Demek et al. 1987). Data on the occurrence, distribution and changes of population numbers of the lesser horseshoe bat were collected during winter censuses within a long-term monitoring of valuable hibernacula. The whole area is covered by 50 standard mapping squares of the UTM grid system 12×11.1 km (Slavík 1971). The most important sites were checked several times during the winter season to register seasonal dynamics and changes of bat community. Also the smaller roosts were checked to find out about the use by bats especially during late summer and autumn. During the summer season, checks of the known nursery colonies were made as well as netting at the entrances to caves and old mines during the swarming period.

Primarily, the latest data from the period 2005–2012 and also the data from continuous monitoring in the previous period since 1992 were used in the analyses of population changes. In some cases of long-term monitored hibernacula and nursery colonies it was possible to analyse even longer data series collected since the 1970s.

Results

Regional distribution

Occurrence of the lesser horseshoe bat in the Šumava region (Fig. 1) was registered altogether in 11 mapping squares during the last monitoring period 2005–2012. That means a substantial increase of the known area of distribution compared to the previous period 1992–2005, when the occurrence of the species was registered only in 6 mapping squares (Bufka et al. 2009). Moreover, its presence was proved in two mapping squares (6646 and 7152) for the first time. Furthermore, occurrence of the species was confirmed after more than 80 years in the mapping square no. 7051, where only one report on its presence was available from the 1930s (Baťa 1933). If we use a more detailed resolution grid of one-quarter squares, 22 are currently occupied and new occurrence has been recorded in four of them.

The core area of recent distribution is situated in the Šumava foothills and it overlaps to a large degree with the limestone-karstic localities within the study area.

The most frequent occurrence and continuous distribution was recorded in the Sušice-Horažďovice limestone area, with an optimum landscape structure and abundant suitable natural shelters (limestone caves) as well as man-made shelters (old mines, cellars, attics of buildings). In the south, this area continuously reaches the divide of the geographical units of the Šumava Mts. and Šumava Piedmont in surroundings of the small towns of Kašperské Hory and Hartmanice, which is characterised by numerous potential underground shelters in old mines and galleries. The core area covers mostly the mapping squares nos. 6747, 6847 and 6846. The occurrence of the lesser horseshoe bat has been documented there continuously since the beginning of modern bat research in the 1950s. Currently there is the highest number of localities and the most numerous hibernacula and nursery colonies are known in this core area. Distribution of the species extends to the surroundings of the Klatovy town (locality Loreta) in the west and to the vicinity of the Strakonice town (locality Kněží hora) in the east. Another area of less numerous occurrence is situated in the southeastern direction, the Volyně-Čkyně limestone area.

Based on the existing knowledge, the area of occurrence in the southeastern part of the Šumava foothills in surroundings of the Český Krumlov town seems to be separated from the core area of the population (Fig. 1). In this area, occurrence of the lesser horseshoe bat has been documented after more than 50 years. The last previous records (Gaisler & Hanák 1972) come from the year 1958, from the localities Český Krumlov and Černá v Pošumaví (mapping squares 7151 and 7250 respectively). New data are represented by the findings of one individual in the attic of a church in the Brloh village in the summer 2010 (mapping square 7051) and in a mine near the village of Třísov in 2012 (mapping square 7152) – for the list of localities and data see the Appendix.

In total, 162 records of occurrence or positive checks were done at altogether 38 localities during the last period, i. e. 2005–2012. Winter occurrence is represented by altogether 118 records

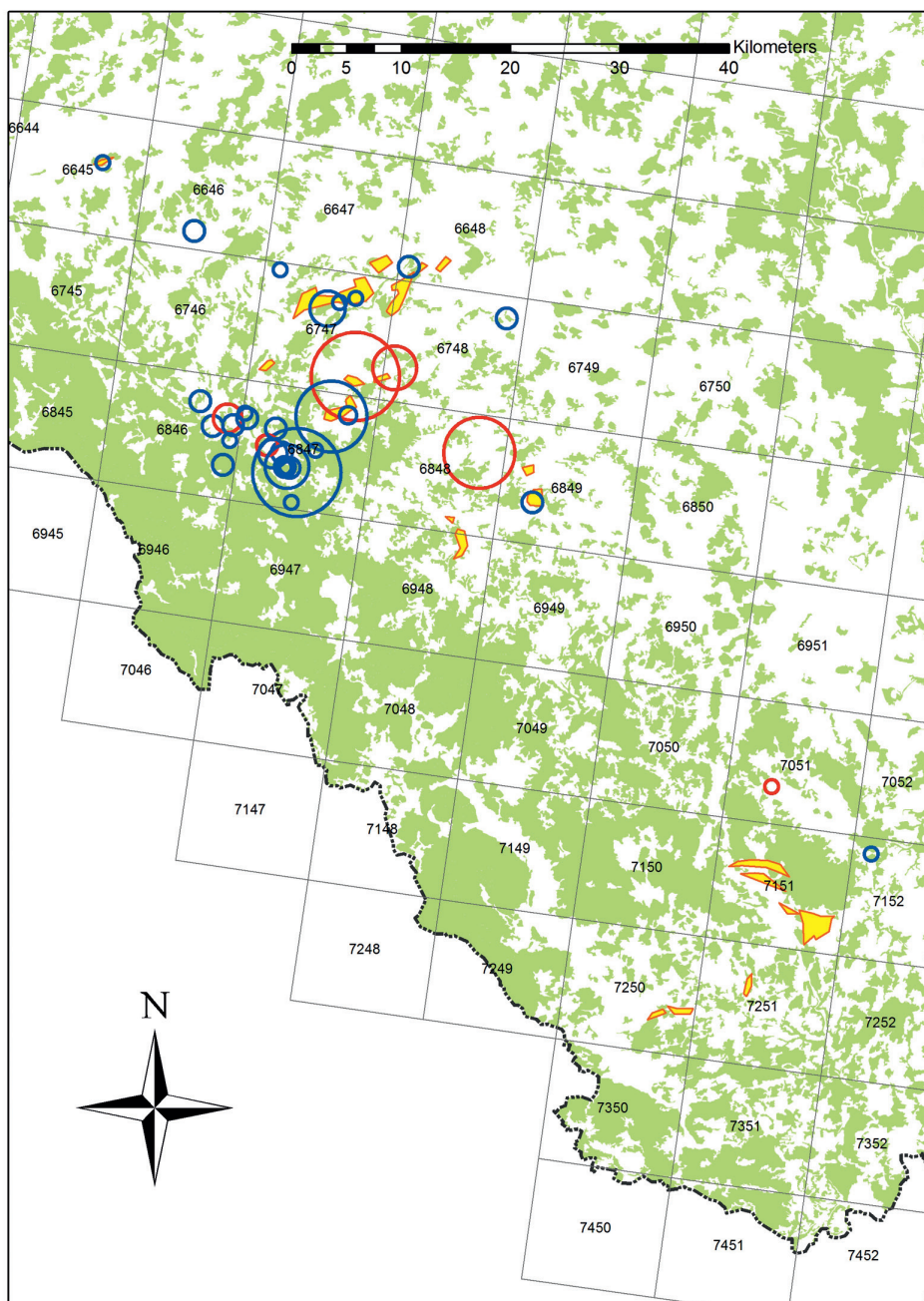


Fig. 1. Distribution of the lesser horseshoe bat in the Šumava Mts. Region in the period 2005–2012. Legend: blue circles – hibernacula, red circles – nursery colonies; circle size represents the maximum bat number per locality (from 1 to more than 50); yellow polygons – limestone areas/karst.

in 30 localities, 28 records are from the summer season. Many winter roosts and small-sized underground roosts are occupied by the bats to various extent also during the autumn migrations and swarming.

Altitudinal distribution

In the study area, the lesser horseshoe bat occurs at the altitudes from 430 m a. s. l. (430 m – Kněží hora) to 750–800 m (localities in the surroundings of Kašperské Hory and Hartmanice). In contrast to winter roosts, the known nursery colonies are situated almost only at lower altitudes, between 450 and 650 m a. s. l. (Fig. 2). The lesser horseshoe bat is documented at higher altitudes only in isolated cases (970 m – Ždánov). The altitude of 800 m is a relatively well-marked upper limit of its occurrence in the study area. Apparently, the differences in landscape and habitat structure play a role apart from the climatic conditions connected with the altitude, because the diverse landscape disappears above 800 m a. s. l. and large and homogeneous coniferous forest represents a predominant habitat at higher elevations. Distribution of the species under study is strongly influenced by distribution and amount of suitable shelters. While suitable places for the existence of nursery colonies, which are represented exclusively by the attics of large buildings, are situated at lower altitudes in the foothills, important winter roosts are found both in the foothills (cellars of buildings, limestone caves) and partly at higher altitudes (namely old gold and quartz mines).

Nursery colonies

Four maternity colonies are known and monitored within the study area. They are the localities Palvínov (mapping square 6846), Žihobce (6747), Mačice (6748), and Čestice (6848). All maternity roosts are situated exclusively in the attics of rather large buildings. The maximum registered numbers of females per roost are 12 (Palvínov, attic of a small castle), 16 (Mačice, attic of a small castle), 49 (Čestice, attic of a castle), 110 (Žihobce, attic of a castle) (Fig. 8).

Winter roosts

The lesser horseshoe bat uses a variety of shelters for hibernating in the area under study, primarily the natural underground spaces in the limestone areas in the Šumava foothills (Fig. 7). Winter occurrence was recorded in all known limestone caves and cavities (Bufka et al. 2009). Recently, presence of the species is known from 5 localities of this type: Loreta – cave and mine (mapping square 6645), Peklo – cave (6846), Nezdice-Fík cave and Strašín cave (6847), Malenice – cave at the Betaň Hill (6849). The numbers of hibernating bats are relatively low, usually only several individuals, the highest abundance is regularly found only in the Nezdice-Fík cave (max. 49 individuals in the autumn 2012). The secondary but very important type of hibernacula is represented by remains of old mines in surroundings of the Kašperské Hory town (mapping square 6847). Occurrence of the species is registered in many mines in the area and the biggest known hibernaculum is the system of the Kristina and Bedřich galleries (details in Bufka et al. 2009). The highest recorded numbers are 69 individuals in the winter season 2011–2012. The cellars of buildings are another roost type, used temporarily by lower numbers of bats for hibernation. Many winter roosts, especially the smaller ones are used as temporary shelters by the bats during the spring and autumn migrations. In these parts of the season, occurrence of the species is registered also at the localities, from which the bats are absent during winter (many small mines, crevices, cellars, small historical military bunkers).

Population dynamics

Considering the existing knowledge, the population of the lesser horseshoe bat in the Šumava Mts. region seems to belong to relict, relatively isolated populations (Bufka et al. 2009). This largely

affects the size of the data sample efficient for a quantitative evaluation of population changes. The total numbers registered within the study area in a particular season reach at most 129 individuals in winter roosts (winter season 2011–2012) and ca. 200 in summer shelters and colonies (year 2012). It is not known what proportion of the population can be detected using our monitoring system. Nevertheless, we believe that we are able to capture the main population changes and trends due to: 1. blanket character of the bat survey and monitoring covering also smaller and temporary shelters, and 2. long-term character of the monitoring with a possibility to compare long-time series of data from certain localities collected since the beginning of the 1970s.

Population changes in winter roosts

Prevailing proportion of the data from the winter season are findings of single individuals or up to 10 bats per hibernaculum. There are only several localities with higher numbers than 10 in the study area. This is a case of the localities Čepice mine (mapping square 6747), the Fik cave in Nezdice (6847) and the system of two interconnected old gold mines of Kristina and Bedřich in the valley of the Zlatý potok brook south of the Kašperské Hory town (6847). The latter locality represents the biggest known hibernaculum in the study area. This locality has been monitored since 1996. A significant increase of the abundance of the lesser horseshoe bat in this locality was stated already in our previous study (Bufka et al. 2009). The development of the population in this hibernaculum during the latest study period till 2012 has confirmed this trend (Fig. 3). The continuous monitoring of all underground spaces enables to record changes in presence and abundance also in smaller hibernacula. Long-term population changes in four important winter roosts

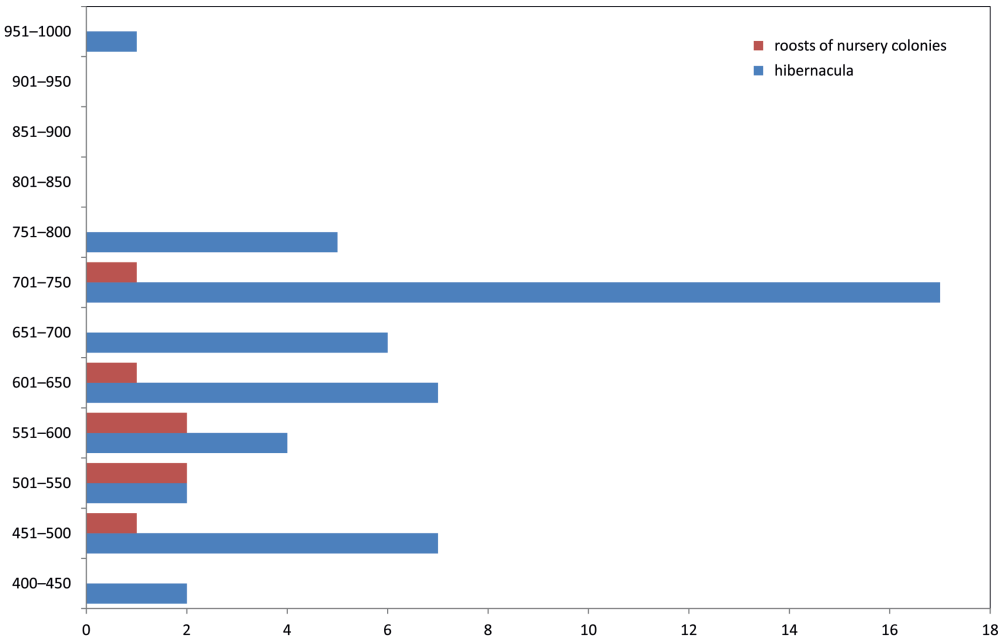


Fig. 2. Altitudinal distribution of the known localities with presence of the lesser horseshoe bat; x-axis: number of localities, y-axis: altitude (m a. s. l.).

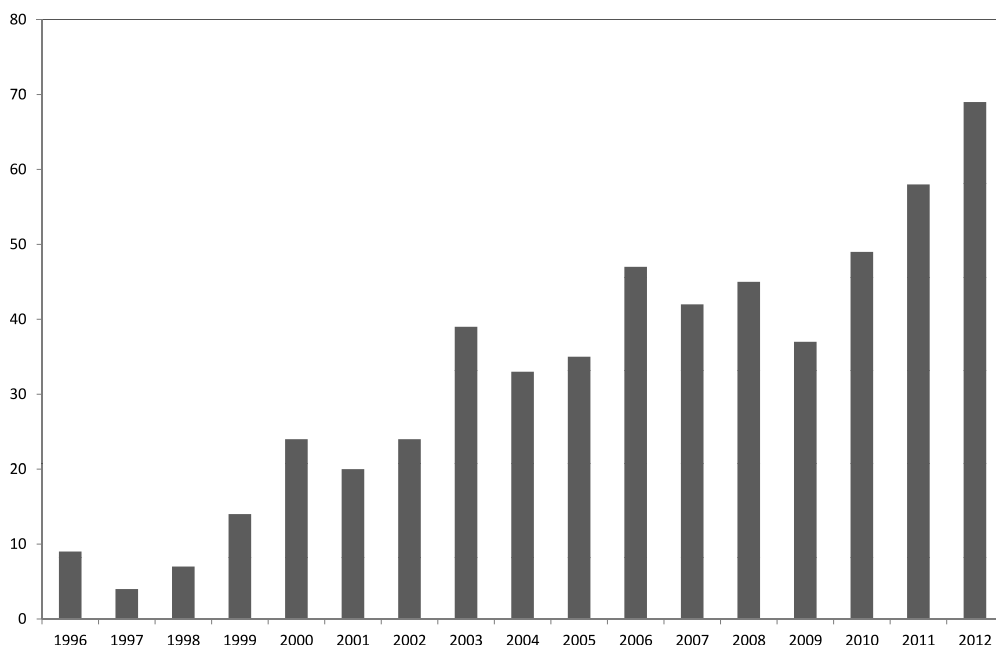


Fig. 3. Long-term changes in abundance of the lesser horseshoe bat in the Kristina-Bedřich hibernaculum.

are expressed as a mean maximum abundance per hibernaculum during the individual decades from 1970 to 2012. Apart from the above mentioned three hibernacula (Kristina-Bedřich, Čepice, Nezdice), the locality Amálino údolí valley is also included. It is represented by a complex of 21 regularly checked underground spaces – mines, some of them are used as small winter shelters. There is the longest series of representative data available from this locality. A dramatic decline and subsequent recovery during the last 22 years is well visible on the basis of these data. A continuous increase of abundance is documented also at the locality Čepice. The most significant population increase is apparent at the localities Kristina-Bedřich and Nezdice during the last 20 and 10 years, respectively. However, older data for comparison are not available from these localities. The hibernaculum in the galleries of Kristina and Bedřich was discovered for the bat research in 1996 and the Fík cave at the locality Nezdice has been monitored since 2002. In summary, we can state that the increase in numbers has been documented in all long-term monitored hibernacula since the middle of the 1990s. This trend is apparent in the biggest as well as in the “average” hibernacula (Fig. 4).

Population changes in nursery colonies

For the analysis of long-term trends, data series since 1970 are available for three maternity colonies (Čestice, Mačice, Palvínov) and since the 1980s for the locality Žihobce (Figs. 5, 6). A decline of the population was documented at the end of the 1980s and beginning of the 1990s. The absolute minimum was registered in the summer seasons of 1992 and 1993, when the checks were negative at the localities Mačice, Čestice, Žihobce and only one individual was found at the locality Palvínov. Recovery of nursery colonies is apparent since the middle of the 1990s.

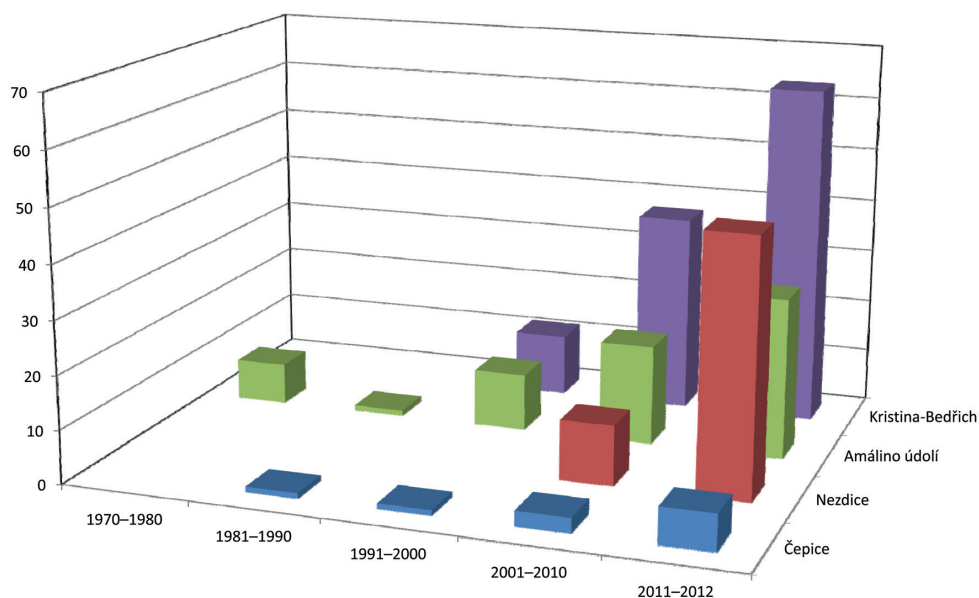


Fig. 4. Population trends in four long-term studied winter roosts of the lesser horseshoe bat in the Šumava Mts.
x-axis: years, y-axis: mean maximum abundance, z-axis: names of localities/winter roosts.

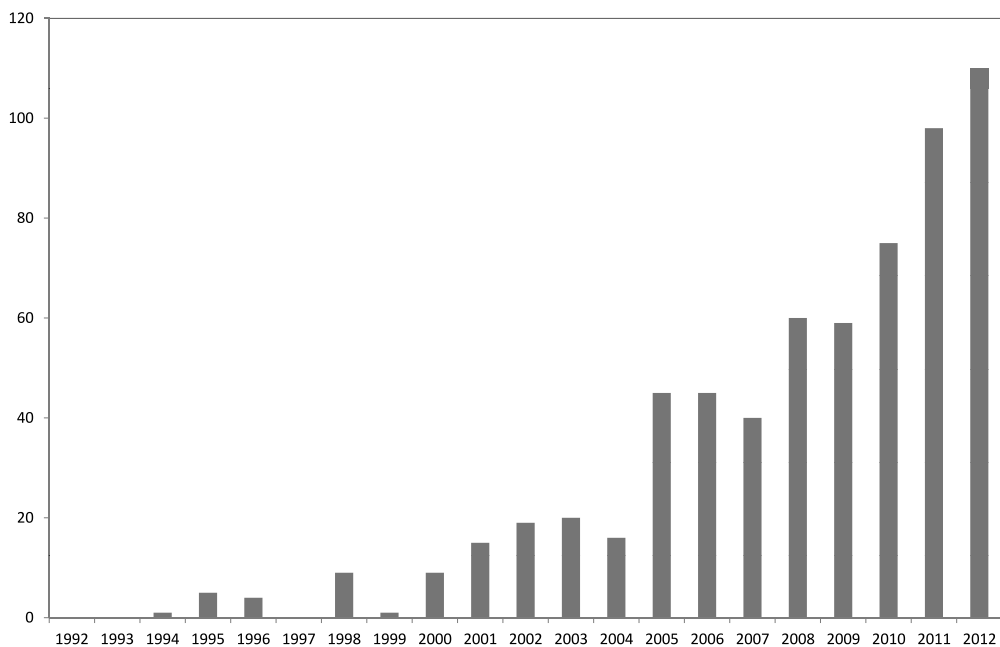


Fig. 5. Long-term changes in abundance of the nursery colony of the lesser horseshoe bat at the locality Žihobce.

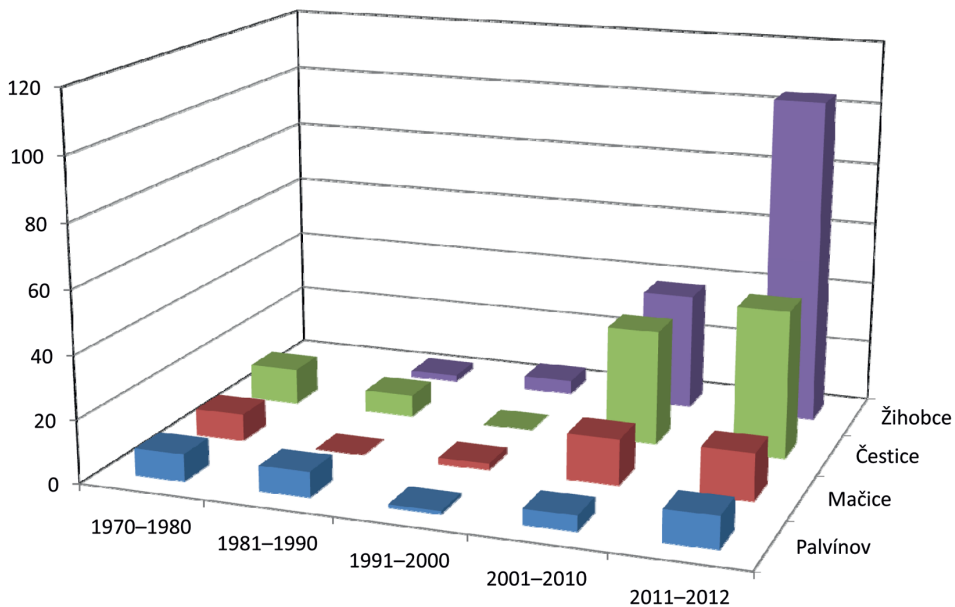


Fig. 6. Long-term population trends of four nursery colonies of the lesser horseshoe bat in the Šumava Mts. x-axis: time periods, y-axis: mean maximum abundance, z-axis: names of localities/nursery colonies.

Then, a significant increase in numbers was observed (e.g. locality Čestice), which reached even exponential character at some sites (locality Žihobce – Fig. 5).

Discussion

The core area of the population of the lesser horseshoe bat in the Šumava Mts. Region is situated in the limestone area in the foothills of the mountain range. New data collected during the study period 2005–2012 confirm the core area of the population to be limited to a relatively narrow belt along the mountain ridge and on the border between the mountains (geographical unit of Šumava Mts.) and the foothills (geographical unit of Šumava Piedmont). The occurrence is evidently connected with the presence of natural underground spaces (limestone and limestone-karstic areas). This pattern is in accordance with the knowledge of the distribution of the lesser horseshoe bat in other areas of the Czech Republic (e.g. Horáček et al. 2005). The other recent nearest populations are found in central Bohemia (Bohemian Karst and Sedlčany areas), 100 and 80 km from the study area, respectively (Nová et al. 2001). Other populations exist in Bavaria (Zahn & Weiner 2004), the nearest one in the vicinity of Straubing and Regensburg (ca. 100 km). Populations in the Alpine region as well as those in Austria are more distant (Spitzenberger 2001). The population in the Šumava Mts. is isolated and has a relict character.

Compared to the previous study (Bufka et al. 2009), recovery of the presence in the southeastern part of the study area – the vicinity of Český Krumlov has been recently confirmed. So, the previous isolated finding of one hibernating individual in southern Bohemia during the winter 2005–2006 (Lučan 2006) could be connected with the occurrence in the Český Krumlov area.



Fig. 7. Karstic underground spaces are primary winter and temporary roosts of the lesser horseshoe bat in the Šumava foothills – Nezdice, the Fik cave, 27 October 2012 (photo by L. Bufka).

There is still one finding of one hibernating bat from the Bavarian side of the mountains near the town of Zwiesel from the winter 2008–2009 (Morgenroth in Bufka et al. 2009). Despite repeated checks of the historical localities in neighbouring areas in the north (Nepomuk, Žinkovy – map-



Fig. 8. Females with juveniles becoming successively independent – a part of the nursery colony, Žihobce, attic of the castle, 27 July 2009 (photo by J. Červený).

ping square 6546 – Bufka et al. 2001) during the seasons 2011–2012, occurrence of the species was not confirmed there.

The extent of altitudinal distribution corresponds to previous results (Bufka et al. 2009), and it is comparable with the other populations in the Czech Republic (e.g. Hanák & Anděra 2005), with a certain shift to higher elevations in comparison to some areas (e.g. Řehák 2006). In Bavaria, the findings are mainly from 400 to 600 m a. s. l., at most 930 m a. s. l. in summer (Holzhaider 1998), and 1252 m a. s. l. in winter. Data from relatively high elevations (max. 1450 m a. s. l.) are available from the Austrian and Swiss Alps (Spitzenberger 2001, Stutz 1989). Nursery colonies restricted exclusively to buildings are typical for the whole Central European part of the distribution range, and the monitored colony in the loft of a castle in Žihobce numbering over 100 females is one of the bigger known within Central Europe, where the colonies mostly consist of 15–30 individuals (rarely 100 or more – Roer & Schober 2001). The individual findings made during spring, summer and mainly in the period of autumn migrations from small shelters, frequently of artificial or technical character (mines, cellars, bunkers), is a typical phenomenon for the species in the region and is known from older data and for other areas (Hůrka 1973, Zahn & Weiner 2004). The biggest winter roosts are found mainly in secondary underground spaces (mines) in the Šumava Mts. and their foothills, although the natural limestone caves are probably the primary roosts.

A dramatic decline of the lesser horseshoe bat populations since the 1950s and 1960s has been described from many areas of Europe, especially from the western and northern, partly central part of its distribution (e.g. Stebbings 1988, Ohlendorf 1997, Schofield 1999, Roer & Schober 2001). A similar situation was described for the Czech Republic. A strong decline of the population in the Šumava Mts. Region was documented during the 1970s and 1980s (Červený & Hanák 1977, Anděra & Červený 1994).

The beginning of the population increase has been registered since the second half of the 1990s, more pronounced in the eastern part of the Czech Republic (Moravia and Silesia – e.g. Gaisler 1997, Hanák & Anděra 2005, Horáček et al. 2005, Horáček 2010). Therefore, the process described in the Šumava Region corresponds to that pattern. The recent population increase documented in the nursery colony and winter roosts in the Šumava Mts. Region, is evidently a part of a general trend in Central Europe (Horáček et al. 2005, Zahn & Weiner 2004, Horáček et al. 2010).

Summary

The population of the lesser horseshoe bat in the Šumava Mts. Region has a relict character. Its occurrence is concentrated in a relatively restricted area in the foothills and is primarily connected with the limestone karstic localities and partly extends to the border between the geographical units of the Šumava Mts. and Šumava Piedmont up to the altitude of about 800 m a. s. l. The core area of recent distribution covers the mapping squares nos. 6747, 6846 and 6847. A strong population decline was observed in the past, the absolute minimum of population numbers was registered during the late 1980s and early 1990s. The species was missing at many localities at that time. The recovery of the population started during the second half of the 1990s. This population increase has become more and more pronounced in the course of time and manifests itself by a certain expansion of the area of distribution. The occurrence is recently documented altogether in 11 mapping squares. Presence of the species was also confirmed in the southeastern part of the study area (mapping squares 7051, 7152), which means a recovery after more than 50 years. In the core area, a strong population increase has been documented in the long-term monitored hibernacula, nursery colonies as well as temporary roosts. Based on the analysis of monitoring data, the population increase is real and corresponds with the general trend of population increase within the whole Czech Republic and Central Europe.

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Appendix

The list of data is structured as follows: mapping square, locality, type of locality, all primary data (date, number of individuals, f – female, m – male), reference in case of published data.

Mapping square 6645-2

Loreta, mine. *Published data:* 8 August 1972, net. 2 ♂♂, 9 August 1972, net. 2 inds., 29 September 1972, net. 1 sad ♀, 16 November 1972, 1 ♂, 9 December 1972, 2 ♂♂, 1 ♀, 29 December 1972, 2 inds., 13 January 1973, 1 ind., 15 February 1973, 2 ♂♂, 24 March 1973, 1 ind., 14 April 1973, 1 ind., 10 August 1973, net. 1 ♂, 23 August 1973, 1 ind., 20 February 1974, 1 ind., 9 May 1974, net. 2 ♂♂, 9 May 1974, 1 dead ind., 2 September 1974, net., 1 sad ♀, 6 August 1977, net., 1 ♂, 4 October 1980, net., 1 sad ♀, 31 December 1980, 1 ind., 6 December 1981, 1 ind., 31 December 1981, 1 ind., 24 January 1982, 1 ind., 22 January 1983, 1 ind., 19 August 1990, net., 1 ♂ (Červený & Hanák 1977, Červený 1982, Anděra & Červený 1994), 18 August 1996, net. 2 ♂♂, 19 August 1996, net., 1 ♂ (Bufka et al. 1999, Dvořák et al. 2001c, Hanák & Anděra 2005, Bufka et al. 2009). *Original data:* 29 March 2011, 1 ind.

Mapping square 6645-3

Klenová, cellar of the new castle. *Published data:* 8 August 1972, 1 ind. (Červený & Hanák 1977, Anděra & Červený 1994, Hanák & Anděra 2005, Bufka et al. 2009).

Mapping square 6646-3

Mlázovy, cellar of the small castle. *Original data:* 20 October 2012, 2 inds.

Mapping square 6647-3

Nalžovské Hory, attic of the castle. *Published data:* 6 July 1971, colony 5 inds. (Krátka & Krátký 1973, Anděra & Červený 1994, Hanák & Anděra 2005).

Mapping square 6648-3

Prácheň, mine. *Published data:* 27 November 1996, 1 ind., 10 January 1997, 1 ind., 21 March 1997, 1 ind., 8 August 1997, net. 1 ♂, 1 ♀, (Dvořák et al. 2001c, Hanák & Anděra 2005, Bufka et al. 2009). *Original data:* 25 October 2005, 1 ind.

Mapping square 6746-1

Velhartice, attic of the church. *Published data:* 19 September 1970, 1 ind. (Krátka & Krátký 1973, Červený & Hanák 1977, Anděra & Červený 1994, Hanák & Anděra 2005, Bufka et al. 2009).

Velhartice, attic of the castle. *Published data:* 12 August 1972, 1 ind. (Krátka & Krátký 1973, Červený & Hanák 1977, Anděra & Červený 1994, Hanák & Anděra 2005, Bufka et al. 2009).

Velhartice, mine. *Published data:* 5 November 1977, 1 ind. (Červený & Hanák 1977, Anděra & Červený 1994, Hanák & Anděra 2005, Bufka et al. 2009).

Horní Staňkov, attic of the castle. *Published data:* 30 April 1972, colony 3 inds., 10 August 1973 colony 5 inds., 2 juv. (Červený & Hanák 1977, Anděra & Červený 1994, Hanák & Anděra 2005, Bufka et al. 2009).

Kojšice, attic of the castle. *Published data:* 30 April 1972, colony 6 inds., 13 July 1972, colony 36 inds. including juv., 25 July 1973, colony 29 inds., 8 juv., 26 April 1974, colony 25 inds., 5 juv., 10 July 1976, colony 13 inds., 3 juv., 11 June 1978, colony 6 inds., 30 June 1979, colony 10 inds., 14 July 1979, colony 8 inds., 2 June 1986, colony 6 inds., 2 juv. (Krátka & Krátký 1973, Červený & Hanák 1977, Anděra & Červený 1994, Hanák & Anděra 2005, Bufka et al. 2009).

Vošovy, attic of the castle. *Published data:* 10 July 1976, 1 ind., 14 June 1980, 1 ind., 27 June 1980, 2 inds., 12 July 1980, 1 ind., 28 June 1981, 1 ind., 19 June 1982, 1 ind., 30 June 1985, 1 ind., 3 June 1995, 1 ind. (Anděra & Červený 1994, Dvořák et al. 2001c, Hanák & Anděra 2005, Bufka et al. 2009).

Mapping square 6747-1

Čejkovy, cellar of an old family house. *Original data:* 11 October 2011, 3 inds., 8 November 2011, 1 ind., 20 October 2012, 1 ind.

Dobříš, crevices in the rocks. *Published data:* 5 December 1981, 5 inds. (Anděra & Červený 1994, Hanák & Anděra 2005, Bufka et al. 2009).

Mapping square 6747-2

Rabí, cellars of the castle ruins. *Published data:* 5 June 1956, 1 ind., 24 January 1963, 2 ♂♂, 26 November 1968, 2 ♀♀ (Gaisler & Hanák 1972, Hůrka 1973, Hanák & Anděra 2005, Bufka et al. 2009). *Original data:* 1 December 2005, 1 ind., 31 January 2012, 1 ind.

Čepice, mine. *Published data:* 22 November 1981, 1 ind. (Anděra & Červený 1994), 27 November 1996, 1 ind., 28 December 1996, 1 ind., 10 January 1997, 1 ind., 21 March 1997, 1 ind., 21 November 1997, 1 ind., 28 December 1997, 1 ind., 29 January 1998, 1 ind., 10 February 1998, 1 ind., 24 March 1998, 1 ind., 24 May 1998, 1 ind., 26 October 2000, 1 ind., 2 November 2001, 1 ind., 5 December 2001, 1 ind., 18 January 2002, 1 ind., 17 February 2002, 2 inds., 16 October 2002, 1 ind., 7 November 2002, 2 inds., 30 October 2003, 4 inds., 17 March 2004, 1 ind., 21 October 2004, 2 inds. (Bufka et al. 2009). *Original data:* 25 October 2005, 1 ind., 1 December 2005, 1 ind., 5 January 2006, 2 inds., 10 March 2006, 2 inds., 14 November 2006, 4 inds., 12 January 2007, 1 ind., 11 December 2007, 3 inds., 17 January 2008, 3 inds., 27 March 2008, 2 inds., 20 January 2009, 3 inds., 2 January 2010, 5 inds., 5 February 2010, 5 inds., 10 August 2010, 5 inds., 21 August 2010, net. 2 ♂♂, 3 ♀♀, 23 January 2011, 8 inds., 8 March 2011, 4 inds., 2 November 2011, 12 inds., 31 January 2012,

3 inds., 26 March 2012, 9 inds., 7 October 2012, 8 inds., 19 October 2012, 8 inds., 20 October 2012, 3 inds., 21 October 2012, 11 inds., 27 October 2012, 5 inds.

Chanovec, mine. *Original data:* 25 October 2005, 1 ind.

Mapping square 6747-4

Žihobce, attic of the castle. *Published data:* 23 June 1983, 1 ind., 1 August 1986, colony 3 inds. (Anděra & Červený 1994), 14 July 1994, 1 ind., 18 July 1995, colony 5 inds., 1 juv., 11 July 1996, colony 4 inds., 1 juv., 26 June 1998, colony 9 inds., 21 June 1999, 1 ind., 20 June 2000, colony 9 inds. (Dvořák et al. 2001c), 26 June 2002, colony 19 inds., 28 June 2003, colony 20 inds., 9 June 2004, colony 16 inds., 16 June 2005, colony 45 inds., 15 June 2006, colony 45 inds., 21 June 2007, colony 40 inds., 20 June 2008, colony 60 inds. (Bufka et al. 2009). *Original data:* 12 June 2009, colony 39 ♀♀, 27 July 2009, colony 85 ♀♀ and juv., 22 June 2010, colony 60 ♀♀, 21 July 2010, colony 75 ♀♀ and 55 juv., 22 June 2011, colony 98 ♀♀, 11 August 2011, colony 98 inds., 29 June 2012, colony 110 ♀♀, 12 July 2012, 110 ♀♀ with juv., 24 July 2012, 110 ♀♀ with juv.

Mapping square 6748-2

Kněží hora, mine. *Published data:* 17 November 1975, 17 inds., (Červený & Hanák 1977, Anděra & Červený 1994), 10 January 2002, 1 ind., 15 November 2002, 1 ind. (Bufka et al. 2009). *Original data:* 5 October 2009, 3 inds.

Mapping square 6748-3

Mačice, attic of the castle. *Published data:* 20 July 1971, colony 10 inds., 26 April 1974, colony 7 inds. (Červený & Hanák 1977, Anděra & Červený 1994). *Original data:* 5 August 2009, colony 8 ♀♀ with 5 juv, 2 July 2010, colony 7 ♀♀ with 7 juv., 13 June 2011, colony 16 ♀♀, 2 August 2012, colony 14 ♀♀ with 14 juv.

Mapping square 6748-4

Radkov, ruins of an old furnace. *Original data:* 6 November 2005, 1 ind.

U kapličky, mine. *Original data:* 9 December 2000, 2 inds., 4 November 2012, 1 ind.

Mapping square 6846-2

Dobrá Voda, family house. *Original data:* 4 October 2005, 1 ind.

Palvínov, attic of the building. *Published data:* 17 June 1970, colony 5 inds., 6 July 1970, colony 12 inds., 29 June 1972, colony 13 inds., 3 juv., 23 June 1974, colony 7 inds., 2 juv., 2 July 1978, colony 5 inds., 19 July 1985, colony 8 inds., 2 August 1986, colony 8 inds., 2 juv., 5 July 1992, 1 ind., 30 June 1998, 1 ind., 19 July 2001, 1 ind. (Krátka & Krátký 1973, Červený & Hanák 1977, Anděra & Červený 1994, Dvořák et al. 2001b, Hanák & Anděra 2005, Bufka et al. 2009). *Original data:* 19 July 2008, 2 inds., 8 August 2009, 12 inds., 8 July 2010, 12 inds., 27 June 2011, 10 inds., 1 July 2012, 1 ind.

Palvínov, cellar of the small castle. *Original data:* 9 January 2006, 1 ind.

Kundratice, attic of the castle. *Published data:* 13 August 1971, colony 15 inds., 26 June 1974, colony 12 inds., 2 juv., 8 July 1978, colony 4 inds., 19 July 1985, colony 8 inds., 2 juv., 2 August 1986, 2 inds. (Krátka & Krátký 1973, Červený & Hanák 1977, Anděra & Červený 1994, Dvořák et al. 2001b, Hanák & Anděra 2005, Bufka et al. 2009).

Kundratice, cellar at the castle. *Published data:* 10 December 1998, 1 ind., 26 December 1998, 3 inds. (Dvořák & al. 2001b, Hanák & Anděra 2005, Bufka et al. 2009). *Original data:* 21 September 2012, 1 ind.

Hartmanice, cellar of the school building. *Published data:* 18 October 1974, 1 sad ♂ (Červený & Hanák 1977, Hanák & Anděra 2005, Bufka et al. 2009).

Peklo, cave. *Published data:* (Červený & Hanák 1977, Anděra & Červený 1994), 19 October 1974, 2 inds., 12 November 1974, 2 inds., 15 March 1995, 1 ind., 24 March 1995, 1 ind., 21 October 1998, 1 ind., 13 January 2000, 1 ind., 10 January 2002, 1 ind., 15 November 2002, 2 inds. (Bufka et al. 2009). *Original data:* 15 November 2012, 2 inds.

Vatětice, remains of an old cellar. *Original data:* 15 November 2009, 2 inds., 15 October 2011, 2 inds., 21 September 2012, 1 ind., 23 September 2012, 2 inds., 10 October 2012, 1 ind., 20 October 2012, 5 inds., 27 October 2012, 4 inds.

Mapping square 6847-1

Grosswiesel, historical military bunker. *Published data:* 13 October 1999, 1 ind. (Dvořák et al. 2001c, Hanák & Anděra 2005, Bufka et al. 2009).

Tuškov, historical military bunker. *Published data:* 20 September 2001, 1 ind. (Bufka et al. 2009).

Annín, mines. *Original data:* 5 November 2005, 4 inds., 18 November 2005, 7 inds., 14 January 2007, 1 ind.

Rajsko, mine. *Original data:* 14 April 2010, 1 ind.

Mapping square 6847-2

Ždánov, mine. *Published data:* 26 December 2000, 1 ind. (Dvořák et al. 2001c, Hanák & Anděra 2005, Bufka et al. 2009). *Original data:* 7 November 2012, 1 ind.

Strašín, attic of the church. *Published data:* 5 September 1970, 2 inds., 3 June 1971, colony 15 inds., 25 July 1973, colony 10 inds., 19 June 1974, colony 10 inds., 19 July 1985, colony 4 inds. (Krátka & Krátký, 1973, Červený & Hanák 1977, Bufka et al. 2009).

Strašín, cave. *Published data:* 16 February 1973, 2 inds., 14 December 1975, 1 ind., 10 April 1977, 2 inds., 6 August 1978, net. 5 ♂♂, 5 ♀♀, 26 August 1978, net., 2 ♂♂, 1 ♀, 18 September 1978, net., 1 ♂, 7 September 1979, net., 1 ♀, 30 August 1980, net., 1 ♂, 1 ♀, 10 November 1981, 2 inds., 8 February 1986, 1 ind., 26 February 1989, 2 inds., 28 December 1990, 2 inds., 1 February 1992, 1 ind., 15 February 1992, 1 ind., 19 July 1993, net., 1 ♂, 1 ♀, 8 August 1993, 1 ind. by detector, 25 July 1994, 2 inds., 19 August 1994, net. 2 inds., 26 August 1994, net. 1 ♂, 22 October 1994, 2 inds., 31 December 1994, 2 inds., 15 March 1995, 1 ind., 27 September 1995, 2 inds., 14 March 1996, 1 ind., 23 August 1996, net., 1 ♂, 2 ♀♀, 4 November 1996, 1 ind., 27 August 1997, net. 1 ♂, 27 December 1997, 2 inds., 15 December 2003, 1 ind. (Hůrka 1973, Červený & Hanák 1997, Anděra & Červený 1994, Dvořák et al. 2001c, Bufka et al. 2009). *Original data:* 3 December 2008, 1 ind., 29 January 2010, 1 ind., 7 January 2011, 1 ind.

Strašín, attic of buildings. *Published data:* 25 July 1992, 2 inds. (Bufka et al. 2009).

Nezdice, Fík cave. *Published data:* 3 February 2002, 1 ind., 12 November 2002, 12 inds., 22 November 2002, 8 inds., 25 March 2003, 1 ind., 28 November 2003, 22 inds., 3 January 2004, 13 inds., 26 February 2004, 13 inds., 28 November 2004, 21 inds., 4 January 2005, 6 inds. (Bufka et al. 2009). *Original data:* 12 October 2005, 14 inds., 3 March 2006, 2 inds., 11 December 2006, 6 inds. And remains of 3 dead inds., 11 January 2008, 1 ind., 3 December 2008, 2 inds., 29 January 2010, 1 ind., 7 January 2011, 5 inds., 11 August 2011, 4 inds., 1 November 2011, 46 inds., 2 August 2012, 2 inds., 27 September 2012, 31 inds., 11 October 2012, 38 inds., 27 October 2012, 49 inds.

Mapping square 6847-3

Amálino Údolí valley, old mines. *Published data:* 4 galleries, 11 June 1955, 5 inds., 18 March 1956, 5 inds., 25 March 1958, 10 inds., 30 March 1958, 23 inds., 13 April 1958, 2 inds., 21 November 1959, 2 inds., 11 February 1960, 3 inds., 24 January 1963, 11 inds.; **mine I**, 28 January 1962, 4 ♂♂, 3 ♀♀, 24 January 1963, 8 ♂♂, 2 ♀♀, 15 March 1964, 1 ♀, 1 December 1965, 1 ♂; **mine II**, 1 December 1965, 1 ♂, 1 ♀, 21 March 1967, 1 ♂, 25 March 1970, 1 ♂, 28 March 1970, 1 dead ♂, 15 October 1998, 2 inds., 1 October 1999, 1 ind., 6 October 2001, 1 ind., 11 February 2002, 2 inds., 7 March 2003, 1; **mine V**, 2 April 1969, 2 ♂♂, 10 November 1970, 1 ♂, 23 February 1971, 2 ♂♂; **mine Myší díra**, 25 March 1970, 1 ♀, 1 ♂, 28 March 1970, 1 ♀, 1 ♂, 29 December 1970, 2 inds., 10 January 1987, 1 ind., 17 January 1988, 1 ind., 10 November 1989, 1 ind., 5 March 1993, 1 ind., 3 August 1993, net. 1 ♂, 22 February 1995, 2 inds., 11 March 1995, 3 inds., 16 March 1995, 3 inds., 22 September 1995, 2 inds., 5 November 1995, 1 ind., 22 December 1995, 1 ind., 28 December 1995, 1 ind., 26 March 1996, 1 ind., 18 December 1996, 1 ind., 20 November 1996, 1 ind., 18 April 1997, 2 inds., 29 October 1997, 2 inds., 27 November 1997, 1 ind., 25 January 1998, 1 ind., 17 November 1998, 1 ind., 17 December 1998, 1 ind., 23 January 1999, 1 ind., 7 February 1999, 1 ind., 16 September 1999, 1 ind., 15 October 1999, 1 ind., 15 November 1999, 2 inds., 14 December 1999, 1 ind., 27 October 2000, 2 inds., 22 December 2000, 2 inds., 3 January 2001, 2 inds., 19 January 2001, 1 ind., 16 February 2001, 1 ind., 16 March 2001, 3 inds., 6 October 2001, 1 ind., 9 November 2001, 1 ind., 11 January 2002, 2 inds., 11 February 2002, 2 inds., 13 March 2002, 2 inds., 6 November 2002, 5, 7 March 2003, 1 ind., 31 October 2003, 2 inds., 22 December 2003, 2 inds., 27 February 2004, 2 inds., 12 January 2005, 2 inds., 23 February 2005, 2 inds.; **mine Veřejné Záchodky**, 25 March 1970, 1 ♂, 28 March 1970, 1 ♂, 29 December 1970, 1 ind., 24 February 1971, 2 ♂♂, 23 November 1995, 1 ind., 10 May 1996, 1 ind., 17 May 1996, 1 ind., 23 May 1996, 1 ind., 20 November 1996, 1 ind., 18 April 1997, 2 inds., 13 September 1997, 1 ind., 26 September 1997, 1 ind., 25 May 1998, 1 ind., 16 September 1998, 1 ind., 15 October 1998, 1 ind., 27 October 2000, 1 ind., 6 October 2001, 1 ind., 9 November 2001, 1 ind., 13 March 2002, 1 ind., 31 October 2003, 3 inds.; **mine VIII**, 13 January 1971, 1m, 1f, 29 November 1971, 1 ♂; **mine A**, 23 May 1996, 1 ind., 20 November 1996, 1 ind., 29 October 1997, 1 ind., 15 October 1998, 1 ind., 16 September 1999, 2 inds., 15 October 1999, 1 ind., 15 September 2000, 1 ind., 27 October 2000, 2 inds., 6 October 2001, 1 ind., 9 November 2001, 3 inds., 30 August 2002, 3 inds., 31 October 2003, 3 inds.; **mine Barbasteli**, 20 November 1996, 1 ind., 18 December 1996, 1 ind., 17 December 1998, 1 ind., 17 November 1999, 2 inds., 19 February 2002, 1 ind.; **mine Barbasteli II**, 22 February 1995, 1 ind., 20 November 1996, 1 ind., 17 November 1998, 2 inds., 17 November 1999, 1 ind., 23 November 2000, 1 ind.; **mine Bedřich**, 20 November 1996, 8 inds., 18 December 1996, 7 inds., 23 January 1997, 3 inds., 2 April 1997, 2 inds., 17 April 1997, 1 ind., 26 September 1997, 3 inds., 19 December 1997, 3 inds., 29 January 1998, 3 inds., 16 February 1998, 2 inds., 25 March 1998, 3 inds., 25 May 1998, 1 ind., 16 September 1998, 4 inds., 19 November 1998, 3 inds., 23 December 1998, 2 inds., 1 December 1999, 9 inds., 22 December 1999, 9 inds., 14 January 2000, 8 inds., 23 November 2000, 20 inds., 21 December 2000, 20 inds., 15 February 2001, 15 inds., 16 March 2001, 13 inds., 26 April 2001, 3 inds., 3 October 2001, 6 inds., 9 November 2001, 21 inds., 6 December 2001, 20 inds., 4 January 2002, 18 inds., 28 February 2002, 10 inds., 6 November 2002, 14 inds., 22 November 2002, 19 inds., 18 February 2003, 11 inds., 25 March 2003, 11 inds., 31 October 2003, 27 inds., 28 November 2003, 31 inds., 23 December 2003, 22 inds., 19 February 2004, 13 inds., 13 January 2005, 20 inds., 25 February 2005, 21 inds., 13 January 2006, 24 inds., 2 March 2006, 18 inds., 16 January 2007, 16 inds., 24 March 2007, 10 inds., 22 January 2008, 14 inds.; **mine Kristina**, 20 November 1996, 1 ind., 23 January 1997, 1 ind., 27 February 1997, 1 ind., 23 April 1997, 1 ind., 19 December 1997, 1 ind., 29 January 1998, 2 inds., 18 February 1998, 3 inds., 25 March 1998, 4 inds., 19 November 1998, 2 inds., 23 December 1998, 3 inds., 21 January 1999, 4 inds., 26 February 1999, 2 inds., 1 December 1999, 3 inds., 29 December 1999, 5 inds., 31 January 2000, 6 inds., 21 December 2000, 4 inds., 18 January 2001, 4 inds., 15 February 2001, 5 inds., 15 March 2001, 5 inds., 4 January 2002, 6 inds., 28 February 2002, 8 inds., 22 November 2002, 6 inds., 18 February 2003,

11 inds., 28 November 2003, 8 inds., 23 December 2003, 14 inds., 19 February 2004, 20 inds., 13 January 2005, 15 inds., 25 February 2005, 19 inds., 13 January 2006, 21 inds., 2 March 2006, 29 inds., 16 January 2007, 26 inds., 24 March 2007, 30 inds., 22 January 2008, 30 inds.; **mine Sněmovní**, 15 October 1998, 1 ind., 17 November 1998, 1 ind., 29 September 2001, net, 1 ♂; **mine Štolička**, 15 September 2000, 1 ind.; **Podlesí**, attic of a barn, 21 July 1971, 1 ind.; **Kašperské Hory**, cellar of the house No. 184, 10 November 1995, 1 ind., 25 March 1996, 1 ind., 1 April 1996, 1 ind., 9 April 1996, 1 ind., 21 May 1996, 1 ind., 3 September 1996, 1 ind., 13 September 1996, 1 ind., 27 September 1996, 1 ind., 17 October 1996, 1 ind., 7 November 1996, 1 ind., 11 March 1997, 1 ind., 14 April 1997, 1 ind.; **Kašperské Hory**, cellar of the town hall, 26 November 2002, 2 inds., 2 December 2003, 1 ind., 14 January 2005, 3 inds.; **Kašperské Hory**, attic of the church at a graveyard 6 June 1996, 1 ind.; **Kašperské Hory**, cellar of the house No. 210, 21 October 2003, 1 ind., 23 August 2004, 1 ind.; (Gaisler & Hanák 1972, Krátká & Krátký, 1973, Hanák & Gaisler 1972, Hůrka 1973, Červený & Hanák 1977, Anděra & Červený 1994, Dvořák et al. 2001a, Bufka et al. 2009). *Original data*: **Mine Myší díra**, 2 November 2005, 2 inds., 12 January 2006, 3 inds., 2 March 2006, 2 inds., 4 January 2007, 3 inds., 21 January 2008, 3 inds., 24 January 2009, 1 ind., 7 January 2010, 2 inds., 6 January 2011, 2 inds., 5 November 2011, 5 inds., 4 February 2012, 3 inds., 29 September 2012, 1 ind., 3 October 2012, 1 ind., 12 October 2012, 2 inds.; **Mine Veřejné záchodky**, 2 November 2005, 1 ind., 21 January 2008, 1 ind., 28 September 2010, 1 ind., 6 January 2011, 1 ind., 12 October 2012, 1 ind.; **Mine A**, 6 October 2005, 3 inds., 2 November 2005, 3 inds., 28 September 2010, 5 inds., 6 January 2011, 1 ind., 5 November 2011, 1 ind., 4 February 2012, 2 inds., 29 September 2012, 2 inds., 3 October 2012, 1 ind., 12 October 2012, 37 inds., 3 November 2012, 1 ind.; **mine Bedřich**, 22 January 2009, 5 inds., 7 January 2010, 7 inds., 5 January 2011, 15 inds., 5 November 2011, 23 inds., 3 February 2012, 13 inds., 9 March 2012, 8 inds., 3 October 2012, 24 inds., 10 October 2012, 30 inds., 12 October 2012, 36 inds., 27 October 2012, 52 inds.; **Mine Kristina**, 22 January 2009, 32 inds., 27 February 2009, 37 inds., 7 January 2010, 42 inds., 5 January 2011, 43 inds., 3 February 2012, 56 inds., 9 March 2012, 37 inds., 26 March 2012, 47 inds.; **Mine Sněmovní**, 6 October 2005, 12, 2 November 2005, 10, 3 October 2006, 3 inds., 5 November 2011, 23 inds., 29 September 2012, 21 inds., 3 October 2012, 21 inds., 12 October 2012, 16 inds., 27 October 2012, 11 inds.; **Červená – Na staré hájence**, attic of a small forest challet, 19 August 2009, 1 ind.; **Kašperské Hory**, attic of the church at a graveyard, 13 August 2010, 4 inds., 27 June 2011, 4 inds.; **Kašperské Hory**, cellar of the town hall, 17 January 2006, 2 inds., 14 March 2006, 2 inds., 14 November 2006, 2 inds., 8 January 2008, 3 inds.; **Kašperské Hory**, historical military bunker, 8 November 2007, 6 inds.

Mapping square 6848-2

Čestice, attic of the small castle. *Published data*: 18 June 1974, colony 20 inds., 5 May 1977, 3 inds., 25 June 1986, colony 7 inds. (Červený & Hanák 1977, Krátká & Krátký 1985, Anděra & Červený 1994, Bufka et al. 2009). *Original data*: 3 July 2009, colony 37 ♀♀, 24 June 2010, colony 36 ♀♀, 5 August 2010, colony 45 ♀♀ and juv., 13 June 2011, colony 45 ♀♀, 1 July 2011, colony 45 ♀♀, 22 June 2012, colony 49 ♀♀.

Čestice, cellars in the park. *Original data*: 11 January 2008, 1 ind., 7 January 2011, 1 ind., 5 October 2012, 1 ind.

Mapping square 6849-3

Lčovice, attic of the small castle. *Published data*: 1974, colony 3 inds., 11 June 1975, 1 ind. (Červený & Hanák 1977, Krátká & Krátký 1985, Anděra & Červený 1994, Bufka et al. 2009).

Malenice, Jiříčkova Sluj cave. *Published data*: 31 January 1976, 1 ind., 26 April 1986, net. 1 ♂ (Anděra & Červený 1994, Bufka et al. 2009).

Malenice, cave at the hill Betaň. *Published data*: 6 December 1996, 2 inds., 29 December 2000, 2 inds. (Anděra & Červený 1994, Dvořák et al. 2001c, Hanák & Anděra 2005, Bufka et al. 2009). *Original data*: 7 January 2011, 1 ind.

Mapping square 7051-3

Brloh, attic of the church. *Original data*: 6 July 2010, 2 inds.

Mapping square 7151-4

Český Krumlov, 3 mines. *Published data*: 24 March 1958, 1 ind. (Gaisler & Hanák 1972, Hanák & Gaisler 1972, Anděra & Červený 1994, Bufka et al. 2009).

Mapping square 7152-1

Třisov, mine. *Original data*: 19 September 2012, 1 ind.

Mapping square 7250-2

Černá v Pošumaví, Svatý Josef mine. *Published data*: 24 March 1958, 1 ind. (Gaisler & Hanák 1972, Hanák & Gaisler 1972, Anděra & Červený 1994).