

## Distribution of the European Ground Squirrel (*Spermophilus citellus*) in the Czech Republic in 2002–2008

Rozšíření sysla obecného (*Spermophilus citellus*) v České republice v letech 2002 až 2008

Jan MATĚJŮ<sup>1,2</sup>, Petra NOVÁ<sup>1</sup>, Jitka UHLÍKOVÁ<sup>3</sup>, Štěpánka HULOVÁ<sup>4</sup> & Eva CEPÁKOVÁ<sup>3</sup>

<sup>1</sup> Department of Zoology, Faculty of Science, Charles University, Viničná 7, CZ–128 44 Praha, Czech Republic; nova-petra@centrum.cz

<sup>2</sup> Agency for Nature Conservation and Landscape Protection of the CR, Bezručova 8, CZ–360 00 Karlovy Vary, Czech Republic; honzamateju@seznam.cz (correspondence address)

<sup>3</sup> Agency for Nature Conservation and Landscape Protection of the CR, Nuselská 34, CZ–140 00 Prague, Czech Republic; jitka.uhlikova@nature.cz, cepakova@seznam.cz

<sup>4</sup> Department of Zoology, Faculty of Biological Science, University of South Bohemia, Branišovská 31, CZ–370 05 České Budějovice, Czech Republic; spenky@seznam.cz

received on 20 November 2008

**Abstract.** In 2002–2008, occurrence of the European ground squirrel was recorded at or reported from 45 sites in the Czech Republic. However, only 35 sites were verified to host ground squirrel colonies in 2008. Most of the colonies (91%) were found in some kind of artificial habitat with high anthropogenic influence. Only (9%) of the European ground squirrel colonies occurred in natural steppe habitats. Although three sites (9%) were recorded at altitudes above 550 m, majority of the sites (60%) were situated below 300 m a. s. l. In most (54%) of the colonies, the estimated abundance was 50 individuals or less. Only one third of the colonies hosted 100 individuals or more. Considering the fact that 7 sites were abandoned in the period 2002–2008, it can be concluded that the decline of the European ground squirrel in the Czech Republic continues.

**Key words.** European ground squirrel, *Spermophilus citellus*, distribution, habitat.

### INTRODUCTION

The European ground squirrel, *Spermophilus citellus* (Linnaeus, 1766), currently ranks among the most threatened mammal species of the Czech fauna. Listed as a critically endangered species, it is protected by the Act no. 114/1992 Coll. on Nature Conservation and Landscape Protection. An action plan aimed at long-term preservation of the European ground squirrel as a wild living species in the Czech Republic was adopted by the Ministry of Environment in 2008 (MATĚJŮ et al. 2007).

Historical data on *S. citellus* distribution in the area of the present Czech Republic are very scarce. Apparently, their number and quality has gradually increased with population decline of the species. Only fragmentary notes of regional character were available till the half of the 20th century, e.g. KAFKA (1892), WEISBAUER (1894), PRAŽÁK (1896), JACOBI (1902) and ZÁLESKÝ (1924). Distribution range of the *S. citellus* in Czechoslovakia was described first in the early

1950s, when the species probably reached its peak numbers in the country and became an important pest (GRULICH 1960). Due to the changes in agricultural practices causing destruction of small landscape patches, the *S. citellus* has declined since the 1960s (ANDĚRA & ČERVENÝ 2004). In the Czech Republic, this trend was recorded by two questionnaire surveys: one organised by the Department of Zoology, Faculty of Science, Charles University in Prague in 1972 and another one managed by the Department of Zoology, National Museum in 1991. Using this data, occurrence of the *S. citellus* was mapped in the mid 1990s by ANDĚRA & HANZAL (1995). A complete overview of the *S. citellus* distribution in the Czech Republic in 2000 and 2001, with respect to the forthcoming selection of Natura 2000 sites, was published by ČEPÁKOVÁ & HULOVÁ (2002). All available records of *S. citellus* occurrence (including historical data) in the Czech Republic were listed by ANDĚRA & ČERVENÝ (2004).

The aim of this study, carried out in 2002–2008 as a part of preparation and implementation of the *S. citellus* action plan, is to present new data on the species' distribution in the country and to compare them with previous knowledge.

## MATERIAL AND METHODS

The study is based mainly on data collected by the authors during mapping of *S. citellus* occurrence and regular monitoring of their abundance in the period 2002–2008. Moreover, data collected by regional offices of the Agency for Nature Conservation and Landscape Protection of the Czech Republic (ANCLP CR) and data from other regional contributors are included. A database of records including vector GIS maps of the sites is deposited at the ANCLP CR, Prague.

Order of the sites in the list below follows the numeral code of 11.2×12 km squares of the Central-European KFME mapping grid (EHRENDORFER & HAMANN 1965, SLAVÍK 1971). The following data are given for each site: 1 – municipality name (in bold), 2 – district name (in brackets), 3 – more detailed description of the site, 4 – altitude and 5 – WGS coordinates of the site. In each site, a list of records of the species in particular years is given, including negative records (neg.). The records include: 6 – date of observation, 7 – observation details (where available, the number of individuals observed or burrow entrances found is mentioned, and/or an estimate of the total abundance is given – see below; neg. = negative record, i. e. neither individuals nor burrow entrances recorded), 8 – name of observer(s), 9 – reference (where appropriate). Note: All available data were used in the list below, despite the fact that inconsistent information on the status of the colony in the given year can be found in some sites.

Municipality names follow PRUNER & MÍKA (1996). Altitude values were obtained as an intersection of a centroid of the polygon defining the area of an *S. citellus* colony with a vector surface contour map using the ArcMap™ 9.2 software (ESRI Inc.).

In the sites visited by the authors of this paper, abundance of local *S. citellus* colonies (populations) was estimated. Regarding the lack of a standard method for estimating *S. citellus* abundance (GRULICH 1960, ČEPÁKOVÁ & HULOVÁ 2002, MATĚJŮ et al. 2007), the estimation was based on personal experience of the authors and the following data: (a) number of individuals observed during all visits in the particular year; (b) area of the colony (i.e. total size of the area where burrow entrances were found). In the field, borders of each colony were marked in an air photo with 0.2 m resolution and after digitalisation of the data, colony area was calculated using the ArcMap software. In vineyards, orchards and gardens, not allowing an easy survey, only a rough identification of the borders of the *S. citellus* colonies was made; (c) comparison of the estimated abundance of the particular colony with the results obtained during visits of other sites in the same year; (d) comparison of the estimated abundance of the particular colony with relevant observations from previous years (if available). Considering consistence of the team of observers, possible subjective errors should be minimized, allowing comparison of the obtained data.

Population density values (number of individuals per hectare) were calculated using the estimated abundance of the colony and its area. For the analysis of “land cover” types, the sites were classified using the

following categories: a) airfield or airport, b) campsite or sport area, c) meadow or pasture, d) vineyard, orchard or garden and e) “natural” habitat – steppe.

## RESULTS – LIST OF SITES

**5356: 1. Hodkovice nad Mohelkou** (Liberec dist.), airfield, 445 m a. s. l.; N 50° 39' 11.5" E 15° 04' 35.4". 2 May 2003: estimated abundance max. 10 inds., E. CEPÁKOVÁ; September 2004: neg., M. ANDĚRA (ad verb.); 11 October 2004: neg., E. CEPÁKOVÁ; 20 September 2005: 2 inds. observed, estimated abundance 10 inds., J. ŠAŠEK (ad verb.); 2. October 2005: 1 ind. observed, estimated abundance 10 inds. E. CEPÁKOVÁ; 10 April 2006: neg. (animals probably hibernating), J. ČEJKA & J. MATĚJŮ; 10 July 2006: 3 inds. observed (observation of 6 inds. reported by airfield staff), estimated abundance 10 inds., T. ADAMOVÁ, P. JEDELSKÝ, J. MATĚJŮ & P. NOVÁ; 27 March 2007: 1 ind. observed; 29 March 2007: several burrow entrances, J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 14 July 2007: several burrow entrances, estimated abundance 10 inds., J. MATĚJŮ, P. NOVÁ & V. VOHRALÍK; 3 April 2008: neg. (animals probably hibernating), J. MATĚJŮ, T. MINÁRIKOVÁ & J. UHLÍKOVÁ; 13 April 2008: emergence of *S. citellus* from hibernation reported by airfield staff; 9 July 2008: 4 inds. observed (observation of 8–10 inds. reported by airfield staff), 18 burrow entrances, estimated abundance 10 ind., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK.

**5548: 2. Raná, Hrádek** (Louny dist.), airfield, 255 m a. s. l.; N 50° 24' 18.5" E 13° 44' 57.8". 29 April 2003: 2 inds. observed, estimated abundance 50 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 15 August 2004: tens of burrow entrances, estimated abundance 15 inds., J. MATĚJŮ; 7 July 2005: 12 inds. observed, estimated abundance 40 inds., J. MATĚJŮ, P. MORAVEC, P. NOVÁ & J. ŠAŠEK; 11 April 2006: 15 inds. observed, T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 11 July 2006: 10 inds. observed, estimated abundance 35 inds., T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 30 March 2007: 23 inds. observed, J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 13 July 2007: 7 inds. observed; estimated abundance 50 inds., B. FRANĚK, D. KRÁL, J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK; 4 April 2008: 7 inds. observed, J. MATĚJŮ & J. UHLÍKOVÁ; 19 July 2008: 78 inds. observed, estimated abundance 130 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK.

**5548: 3. Raná** (Louny dist.), E, S and W slopes of the Raná hill, i.e. Raná National Nature Reserve and neighbouring areas, 355 m a. s. l.; N 50° 24' 16.6" E 13° 46' 10.9". 29 April 2003: estimated abundance 15 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 15 August 2004: E slope 2 inds. observed, W slope 15 burrow entrances, total estimated abundance 20 inds., J. MATĚJŮ; 7 July 2005: E slope 16 inds. observed, E, S and W slopes tens of burrows, total estimated abundance 100 inds., J. MATĚJŮ, P. MORAVEC, P. NOVÁ & J. ŠAŠEK; 11 April 2006: E slope 7 inds. observed, W slope 15 inds. observed, T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 11 July 2006: 32 inds. observed, estimated abundance 200 inds., T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 30 March 2007: 46 inds. observed, J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 7 May 2007: tens of inds. observed, J. MATĚJŮ; 13 July 2007: 39 inds. observed, estimated abundance 300 inds., B. FRANĚK, D. KRÁL, J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK; 4 April 2008: E slope 2 inds. observed, J. MATĚJŮ & J. UHLÍKOVÁ; 19 July 2008: 14 inds. observed, J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK; 5 October 2008: E slope 1 ind. observed, estimated abundance 250 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK.

**5551: 4. Roudnice nad Labem** (Litoměřice dist.), airfield, 222 m a. s. l.; N 50° 24' 29.7" E 14° 13' 55.5". 29 April 2003: estimated abundance 25 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 15 August 2004: 36 inds. observed, estimated abundance 80 inds., J. MATĚJŮ; 7 July 2005: approx. 80 inds. observed, estimated abundance 130 inds., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 11 April 2006: approx. 20 inds. observed, T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 11 July 2006: 13 inds. observed, T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 19 July 2006: tens of inds. observed; estimated abundance 130 inds., B. FRANĚK (ad verb.); 29 March 2007: 7 inds. observed, J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 13 July 2007: 18 inds. observed, D. KRÁL, J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK; 14 August 2007: 49 inds. observed, estimated abundance 100 inds., J. UHLÍKOVÁ; 4 April 2008: 55 inds. observed, J. MATĚJŮ & J. UHLÍKOVÁ; 19 July 2008: 50 inds. observed, estimated abundance 100 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK.

**5555: 5. Mladá Boleslav, Debrř** (Mladá Boleslav dist.), steppe areas ca. 200 m E from Radouč National Nature Monument, 240 m a. s. l.; N 50° 25' 59.6" E 14° 54' 11.9". 29 April 2003: 2 inds. observed, estimated abundance 10 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 16 August 2004: 1 ind. observed, approx. 5 burrow entrances, estimated abundance max. 5 inds., J. MATĚJŮ; 8 July 2005: neg., E. CEPÁKOVÁ, J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 14 July 2005: 4 inds. observed, estimated abundance 10 inds., J. MATĚJŮ & P. NOVÁ; 10 April 2006: neg., J. MATĚJŮ; 10 July 2006: 1 ind. observed, 2 burrow entrances, estimated abundance 5 inds., T. ADAMOVÁ, P. JEDELSKÝ, J. MATĚJŮ & P. NOVÁ; 29 March 2007: 1 burrow entrance, J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 14 July 2007: 3 inds. observed, estimated abundance 20 inds., J. MATĚJŮ, P. NOVÁ & V. VOHRALÍK; 3 April 2008: 2 inds. observed, J. MATĚJŮ, T. MINÁRIKOVÁ & J. UHLÍKOVÁ; 9 July 2008: 5 inds. observed, estimated abundance 20 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK.

**5655: 6. Mladá Boleslav, Bezděčín** (Mladá Boleslav dist.), airfield, 232 m a. s. l.; N 50° 23' 52.4" E 14° 53' 45.7". 29 April 2003: estimated abundance 40 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 16 August 2004: 66 inds. observed, estimated abundance 170 inds., J. MATĚJŮ; 8 July 2005: approx. 90 burrow entrances with faeces from juveniles, E. CEPÁKOVÁ, J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 14 July 2005: 92 inds. observed, estimated abundance 240 inds., J. MATĚJŮ & P. NOVÁ; 10 April 2006: 3 inds. observed, hundreds of burrow entrances, J. MATĚJŮ; 10 July 2006: 92 inds. observed; estimated abundance 240 inds., T. ADAMOVÁ, P. JEDELSKÝ, J. MATĚJŮ & P. NOVÁ; 29 March 2007: 29 inds. observed, J. MATĚJŮ, P. NOVÁ & V. VOHRALÍK; 14 July 2007: 50 inds. observed, estimated abundance 200 inds., J. MATĚJŮ, P. NOVÁ & V. VOHRALÍK; 3 April 2008: 22 inds. observed, J. MATĚJŮ, T. MINÁRIKOVÁ & J. UHLÍKOVÁ; 9 July 2008: 97 inds. observed, estimated abundance 250 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK.

**5743: 7. Karlovy Vary, Olšová Vrata** (Karlovy Vary dist.), golf range, 588 m a. s. l.; 50° 12' 47.0" E 12° 55' 42.0". 2002 (the site was visited ca. 35 times during the season): approx. 450 burrow entrances, estimated abundance 200 inds., J. MATĚJŮ; 2003 (ca. 40 visits): approx. 450 burrow entrances, estimated abundance 150 inds., J. MATĚJŮ; 2004 (ca. 20 visits): approx. 300 burrow entrances, estimated abundance 30 inds., J. MATĚJŮ; 4 July 2005: estimated abundance approx. 60 inds., J. MATĚJŮ; 6 April 2006: emergence of *S. citellus* from hibernation reported by golf range manager K. MAŘÍK (ad verb.); 7 April 2006: 5 inds. observed, tens of burrow entrances, J. MATĚJŮ; 19 April 2006: 2 inds. observed (observation of 8 inds. reported by K. MAŘÍK), J. MATĚJŮ; 20 July 2006: 7 juveniles observed, estimated abundance 25 inds., P. JISKRA & J. MATĚJŮ; 13 April 2007: 10 inds. observed, : K. MAŘÍK & J. MATĚJŮ; 9 July 2007: 6 inds. observed, estimated abundance 40 inds. J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 7 March 2008: 1 ind. observed, emergence of *S. citellus* from hibernation, K. MAŘÍK (ad verb.); 25 April 2008: 7 inds. observed, J. MATĚJŮ; June 2008: 32 inds. observed, J. FROUZ (ad verb.); 19 June 2008: 20 inds. observed, estimated abundance 60 inds., J. MATĚJŮ & P. NOVÁ.

**5743: 8. Karlovy Vary, Olšová Vrata** (Karlovy Vary dist.), international airport, 605 m a. s. l.; N 50° 12' 15.9" E 12° 54' 20.8". 2003: 2 inds. observed, estimated abundance 10 inds., K. HADRAVA (ad verb.); 2004: estimated abundance 10 inds., K. HADRAVA (ad verb.); 5 July 2005: several burrow entrances, J. MATĚJŮ & V. MELICHAR; 3 August 2005: 5 inds. observed, estimated abundance 10 inds., K. HADRAVA (ad verb.); 5 April 2006: 2 inds. observed, K. HADRAVA (ad verb.); 7 April 2006: 5 inds. observed, J. MATĚJŮ; 19 April 2006: 1 ind. observed, J. MATĚJŮ & V. MELICHAR; 20 July 2006: 5 inds. observed, estimated abundance 30 inds., P. JISKRA & J. MATĚJŮ; 3 April 2007: 10 ind. observed, P. JISKRA & J. MATĚJŮ; 17 April 2007: 13 inds. observed, V. MELICHAR (ad verb.); 9 July 2007: 4 inds. observed, estimated abundance 50 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 10 April 2008: 13 inds. observed, V. MELICHAR (ad verb.); 13 April 2008: 3 inds. observed, V. MELICHAR (ad verb.); 27 April 2008: 16 inds. observed, V. MELICHAR (ad verb.); 8 July 2008: estimated abundance 40 inds., P. JISKRA & J. MATĚJŮ.

**5743: 9. Karlovy Vary, Vítkův vrch** (Karlovy Vary dist.), campsite, 620 m a. s. l.; N 50° 12' 17.7" E 12° 53' 41.3". 17 July 2002: 2 inds. observed, estimated abundance 5 inds., J. MATĚJŮ; 16 May 2003: 1 ind. observed; estimated abundance 3 inds., J. MATĚJŮ; 9 August 2004: neg., J. MATĚJŮ; 5 July 2005: neg., J. MATĚJŮ & V. MELICHAR; 21 August 2005: neg., J. MATĚJŮ; 7 April 2006: neg., J. MATĚJŮ; 20 July 2006: neg., P. JISKRA & J. MATĚJŮ; 9 July 2007: neg., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**5750 10. Slaný** (Kladno dist.), airfield, 330 m a. s. l.; N 50° 13' 02.9" E 14° 05' 23.8". 29 October 2003: 36 burrow entrances, estimated abundance 15 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 15 August 2004: neg., J. MATĚJŮ; 7 July 2005: neg., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 11 April 2006: neg. (absence of *S. citellus* also reported by airfield staff), T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ.

**5850: 11. Vinařice** (Kladno dist.), Vinařická hora Nature Monument, S slopes of the hill, orchard and steppe, 390 m a. s. l., N 50° 10' 53.5" E 14° 04' 56.8". 29 October 2003: 6 abandoned burrow entrances, E. CEPÁKOVÁ & J. MATĚJŮ; 15 August 2004: neg., J. MATĚJŮ; 7 July 2005: neg., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK.

**5850: 12. Velká Dobrá** (Kladno dist.), airfield, 424 m a. s. l.; N 50° 06' 42.8" E 14° 05' 27.7". 7 August 2007: estimated abundance 5 inds., J. UHLÍKOVÁ; 20 July 2008: 6 inds. observed, estimated abundance 15 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**5853: 13. Praha, Letňany** (Praha-město dist.), airfield, i.e. Letiště Letňany National Nature Monument, 276 m a. s. l.; N 50° 07' 53.2" E 14° 31' 34.8". 2002 (the site was visited ca. 20 times during the season): several tens of inds. observed, estimated abundance 400 inds., J. MATĚJŮ; 2003 (ca. 20 visits): several tens of inds. observed, J. MATĚJŮ; 15 September 2003: 3043 burrow entrances – approx. 1/4 of area, total estimated abundance 400 inds., Š. HULOVÁ & J. MATĚJŮ; April 2004: 136 inds. observed on a half of the area, total estimated abundance 500 inds., J. MATĚJŮ; 9 July 2005: more than 150 inds. observed, J. MATĚJŮ; 6 September 2005: several tens of inds. observed, estimated abundance 600 inds., J. MATĚJŮ & J. ŠAŠEK; 1 April 2006: 49 inds. observed, emergence from hibernation, J. MATĚJŮ; 24 April 2006: several tens of ind. observed, estimated abundance 600 inds., T. ADAMOVÁ, J. MATĚJŮ & I. SCHNEIDEROVÁ; 8 April 2007: several tens of inds. observed, P. BRANDL & J. MATĚJŮ; 10 August 2007: several tens of inds. observed, J. MATĚJŮ & J. UHLÍKOVÁ; 14 August 2007: several tens of inds. observed, estimated abundance 600 inds., J. UHLÍKOVÁ; 4 April 2008: 130 inds. observed, J. MATĚJŮ & J. UHLÍKOVÁ; 21 July 2008: 148 inds. observed on 60% of the area, total estimated abundance 650 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**5957: 14. Kolín** (Kolín dist.), airfield, 270 m a. s. l.; N 50° 00' 15.7" E 15° 10' 30.6".

29 October 2003: estimated abundance 50 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 16 August 2004: 20 inds. observed, estimated abundance 60 inds., J. MATĚJŮ; 11 July 2005: estimated abundance 35 inds., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 12 April 2006: 19 inds. observed, J. MATĚJŮ & P. NOVÁ; 10 July 2006: 24 inds. observed, estimated abundance 40 inds., T. ADAMOVÁ, P. JEDELSKÝ, J. MATĚJŮ & P. NOVÁ; 26 March 2007: 10 inds. observed, J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 19 July 2007: 25 inds. observed, estimated abundance 40 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 31 March 2008: 12 inds. observed, Š. HULOVÁ, J. MATĚJŮ & J. UHLÍKOVÁ; 21 July 2008: 26 inds. observed, estimated abundance 50 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**6051: 15. Loděnice** (Beroun dist.), meadows at N slope of the hill Špičatý vrch, ca. 1 km S from the village, 340 m a. s. l.; N 49° 59' 06.6" E 14° 09' 49.9". 1 May 2003: estimated abundance 30 inds., J. MATĚJŮ; 10 June 2003: 20 burrow entrances on a half of the area, estimated abundance 30 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 19 August 2004: 8 inds. observed, estimated abundance 50 inds., J. MATĚJŮ; 7 July 2005: 12 inds. observed, estimated abundance 40 inds., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 12 April 2006: 10 burrow entrances, J. MATĚJŮ & P. NOVÁ; 11 July 2006: 13 inds. observed, estimated abundance 35 inds., T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 28 March 2007: 9 inds. observed, J. MATĚJŮ & T. MINÁRIKOVÁ; 15 July 2007: 20 inds. observed, estimated abundance 50 inds., J. MATĚJŮ & P. NOVÁ; 3 April 2008: 6 inds. observed, J. MATĚJŮ, T. MINÁRIKOVÁ & J. UHLÍKOVÁ; 20 July 2008: 18 inds. observed, J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; August and September 2008: 40 inds. captured and marked, estimated abundance 50 inds., P. NOVÁ.

**6351: 16. Dubovice, Chramosty** (Příbram dist.), pastures ca. 500 m N from the village, 392 m a. s. l.; N 49° 40' 11.6" E 14° 19' 23.2". 10 June 2003: 13 burrow entrances, estimated abundance 6 inds. (only a part of the site visited), E. CEPÁKOVÁ & J. MATĚJŮ; 19 August 2004: estimated abundance 25 inds., J. MATĚJŮ; 13 July 2005: old burrow entrances, neg., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 5 May 2006: neg., P.

NOVÁ; 12 July 2006: 1 ind. observed, 3 burrow entrances, estimated abundance max. 10 inds., T. ADAMO-VÁ, J. MATĚJŮ & P. NOVÁ; 2 April 2007: 1 burrow entrance, P. NOVÁ; 15 July 2007: 1 ind. observed, estimated abundance max. 10 inds., J. MATĚJŮ & P. NOVÁ; 2 April 2008: 4 burrow entrances, J. MATĚJŮ & J. UHLÍKOVÁ; 20 July 2008: 1 ind. observed, J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 6 August 2008: 1 ind. observed; estimated abundance 5 inds., P. NOVÁ.

**6351: 17. Dubovice, Líchovy** (Příbram dist.), lawns round the hotel Mana, ca. 1 km W of Líchovy, 350 m a. s. l.; N 49° 40' 42.0" E 14° 17' 48.1". 10 June 2003: 18 burrow entrances, estimated abundance 7 inds., presence of 13 inds. reported by hotel staff, E. CEPÁKOVÁ & J. MATĚJŮ; 19 August 2004: estimated abundance 25 inds., J. MATĚJŮ; 13 July 2005: 5 inds. observed, estimated abundance 10 inds., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 5 May 2006: 4 inds. observed, several burrow entrances, P. NOVÁ; 12 July 2006: 1 ind. observed, 10 burrow entrances, estimated abundance 10 inds., T. ADAMO-VÁ, J. MATĚJŮ & P. NOVÁ; 2 April 2007: 1 ind. observed, 4 burrow entrances, P. NOVÁ; 15 July 2007: neg., estimated abundance max. 5 inds., J. MATĚJŮ & P. NOVÁ; 2 April 2008: neg., J. MATĚJŮ & J. UHLÍKOVÁ; 20 July 2008: neg., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**6451: 18. Milešov** (Příbram dist.), Trhovky, Bor & Loužek campsites, 360 m a. s. l.; N 49° 35' 06.9" E 14° 10' 39.0". July 2002: several tens of *S. citellus* killed by torrential rain and hailstorm, V. HAVELÍK (HAVELÍK 2002); 19 August 2004: 2 inds. observed, estimated abundance 15 inds. (Trhovky only), J. MATĚJŮ; 13 July 2005: observation of 4 inds. reported by campsite staff, estimated abundance 10 inds. (Trhovky only), J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; August 2005: estimated abundance 25 inds. (Trhovky and Bor), Š. HULOVÁ; 12 July 2006: neg., campsite staff reported that the last 2 inds. were killed by cat (Trhovky only), T. ADAMO-VÁ, J. MATĚJŮ & P. NOVÁ; 15 July 2007: 12 inds. observed (Trhovky and Bor), J. MATĚJŮ & P. NOVÁ; 14 August 2007: 14 inds. observed, estimated abundance 30 inds. (Loužek), total estimated abundance 55 inds., J. UHLÍKOVÁ; 2 April 2008: 10, 8 and 4 inds. observed at Loužek, Bor and Trhovky, respectively, J. MATĚJŮ & J. UHLÍKOVÁ; 10 July 2008: 28 inds. observed (Loužek only), J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK; 20 July 2008: 9 inds. observed at Bor, neg. at Trhovky, total estimated abundance 60 inds., J. MATĚJŮ, P. NOVÁ, & J. UHLÍKOVÁ.

**6565: 19. Bořitov** (Blansko dist.), airfield, 360 m a. s. l.; N 49° 26' 08.7" E 16° 35' 38.0". 16 April 2003: 12 inds. observed, 162 burrow entrances, estimated abundance 40 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 16 August 2004: 20 inds. observed, estimated abundance 60 inds., J. MATĚJŮ; 11 July 2005: approx. 55 inds. observed, estimated abundance 100 inds., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 13 April 2006: 17 inds. observed, T. ADAMO-VÁ, J. MATĚJŮ & P. NOVÁ; 12 July 2006: 85 inds. observed, estimated abundance 140 inds., T. ADAMO-VÁ, J. MATĚJŮ & P. NOVÁ; 26 March 2007: 38 inds. observed, J. MATĚJŮ, P. NOVÁ & J. ŠAFÁŘ; 16 July 2007: 99 inds. observed, estimated abundance 170 inds., J. MATĚJŮ, P. NOVÁ, J. ŠAFÁŘ & J. UHLÍKOVÁ; 31 March 2008: 52 inds. observed, Š. HULOVÁ, J. MATĚJŮ, J. ŠAFÁŘ & J. UHLÍKOVÁ; 15 July 2008: 76 inds. observed, estimated abundance 200 inds., J. MATĚJŮ, P. NOVÁ, J. ŠAFÁŘ & J. UHLÍKOVÁ.

**6568: 20. Prostějov** (Prostějov dist.), public and military airfield, 210 m a. s. l.; 49° 27' 00.2" E 17° 07' 48.2". 16 April 2003: 3 inds. observed, approx. 50 burrow entrances, estimated abundance max. 15 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 16 August 2004: neg., absence of *S. citellus* also reported by airfield staff, J. MATĚJŮ; 11 July 2005: neg., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 2007: occurrence reported by airfield staff (ad verb.); 15 July 2008: neg., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**6749: 21. Strakonice** (Strakonice dist.), airfield, 420 m a. s. l.; N 49° 15' 15.4" E 13° 53' 32.1". 19 August 2004: 6 ind. observed, estimated abundance 30 inds., J. MATĚJŮ; 13 July 2005: 6 inds. observed, estimated abundance 35 inds., J. MATĚJŮ, P. NOVÁ, J. PYKAL & J. ŠAŠEK; 14 July 2006: 6 inds. observed, estimated abundance max. 35 inds., J. MATĚJŮ & P. NOVÁ; 28 March 2007: 2 inds. observed, J. MATĚJŮ, T. MINÁRIKOVÁ & J. PYKAL; 16 July 2007: 27 inds. observed, estimated abundance 60 inds., J. MATĚJŮ & P. NOVÁ; 2 April 2008: 8 inds. observed, J. MATĚJŮ, J. UHLÍKOVÁ & Z. VENKRBICOVÁ; 10 July 2008: 44 inds. observed, estimated abundance 75 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK.

**6765: 22. Brno, Medlánky** (Brno-město dist.), airfield, 260 m a. s. l.; N 49° 14' 11.8" E 16° 33' 22.2". 17 April 2003: approx. 65 burrow entrances, estimated abundance 15 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 17 August 2004: 8 inds. observed, estimated abundance 30 inds., J. MATĚJŮ; 11 July 2005: 10 inds. observed, estimated abundance 35 inds., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 13 April 2006: 21 inds. observed, T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 13 July 2006: 17 inds. observed, estimated abundance 40 inds., J. MATĚJŮ & P. NOVÁ; 26 March 2007: tens of burrow entrances, J. MATĚJŮ, P. NOVÁ & R. ZAJÍČEK; 16 July 2007: 71 inds. observed, estimated abundance 120 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & R. ZAJÍČEK; 31 March 2008: 15 inds. observed, Š. HULOVÁ, J. MATĚJŮ & J. UHLÍKOVÁ; 16 July 2008: 73 inds. observed, estimated abundance 120 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**6765: 23. Rozdrojovice** (Brno-venkov dist.), lawns round the hotel Atlantis, 280 m a. s. l.; N 49° 14' 52.0" E 16° 31' 01.2". 17 August 2004: 3 inds. observed, approx. 100 burrow entrances, estimated abundance 20 inds., J. MATĚJŮ; 11 July 2005: 30 inds. observed, estimated abundance 40 inds., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 13 April 2006: 4 inds. observed, T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 13 July 2006: 59 inds. observed, estimated abundance 75 inds., J. MATĚJŮ & P. NOVÁ; 26 March 2007: tens of burrow entrances, J. MATĚJŮ, P. NOVÁ & R. ZAJÍČEK; 16 July 2007: 11 inds. observed, estimated abundance 30 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & R. ZAJÍČEK; 31 March 2008: 4 inds. observed, Š. HULOVÁ, J. MATĚJŮ & J. UHLÍKOVÁ; 15 July 2008: neg., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**6768: 24. Vyškov** (Vyškov dist.), airfield, 275 m a. s. l.; N 49° 17' 59.2" E 17° 01' 27.7". 16 April 2003: tens of ind. observed, estimated abundance 300 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 17 August 2004: approx. 120 inds. observed, estimated abundance min. 400 inds., J. MATĚJŮ; 11 July 2005: approx. 200 inds. observed, estimated abundance 500 inds., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 13 April 2006: approx. 160 inds. observed, T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 12 July 2006: 185 inds. observed, estimated abundance 600 inds., T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 26 March 2007: 108 inds. observed, J. MATĚJŮ, P. NOVÁ & J. ŠAFÁŘ; 16 July 2007: 174 inds. observed, estimated abundance 600 inds., J. MATĚJŮ, P. NOVÁ, J. ŠAFÁŘ & J. UHLÍKOVÁ; 31 March 2008: 103 inds. observed, Š. HULOVÁ, J. MATĚJŮ, J. ŠAFÁŘ & J. UHLÍKOVÁ; 15 July 2008: 210 inds. observed; estimated abundance 650 inds., J. MATĚJŮ, P. NOVÁ, J. ŠAFÁŘ & J. UHLÍKOVÁ.

**6856: 25. Člunek, Lomy** (Jindřichův Hradec dist.), lawns and meadows at military shooting range, 606 m a. s. l.; N 49° 06' 38.6" E 15° 09' 57.0". 23 November 2003: estimated abundance 30 inds., E. CEPÁKOVÁ; 18 August 2004: 1 ind. observed, estimated abundance 25 inds., J. MATĚJŮ; 13 July 2005: 9 inds. observed, estimated abundance 25 inds., J. MATĚJŮ, P. NOVÁ, J. PYKAL & J. ŠAŠEK; 14 July 2006: 2 inds. observed, estimated abundance 5 inds., J. MATĚJŮ & P. NOVÁ; 28 March 2007: one occupied burrow, J. MATĚJŮ, T. MINÁRIKOVÁ & J. PYKAL; 19 July 2007: 3 inds. observed, estimated abundance 5 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & Z. VENKRBČOVÁ; 2 April 2008: one occupied burrow, J. MATĚJŮ, J. UHLÍKOVÁ & Z. VENKRBČOVÁ; 1 July 2008: 4 inds. observed; estimated abundance 8 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & V. VOHRALÍK.

**6863: 26. Mohelno** (Třebíč dist.), meadows between the village and the Mohelenská hadcová step National Nature Reserve, 364 m a. s. l.; N 49° 06' 35.7" E 16° 10' 55.9". 18 August 2004: approx. 20 burrow entrances, estimated abundance 10 inds., J. MATĚJŮ; 12 July 2005: 27 inds. observed, estimated abundance 50 inds., V. BERAN, R. FORMÁNEK, J. MATĚJŮ, P. NOVÁ, J. ŠAŠEK & R. ZAJÍČEK; 14 April 2006: tens of burrow entrances, T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 25 April 2006: 22 inds. observed, V. BERAN (ad verb.); 13 July 2006: 4 inds. observed, J. MATĚJŮ & P. NOVÁ; 21 July 2006: approx. 25 inds. observed, V. BERAN (ad verb.); 10 August 2006: 5 inds. observed, estimated abundance 50 inds., P. MARHOUL, J. MATĚJŮ, O. RŮŽIČKOVÁ & V. VOHRALÍK; 27 March 2007: 2 inds. observed, J. MATĚJŮ, T. MINÁRIKOVÁ & P. NOVÁ; 18 July 2007: 29 inds. observed, estimated abundance 60 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 1 April 2008: 4 inds. observed, Š. HULOVÁ, J. MATĚJŮ & J. UHLÍKOVÁ; 17 July 2008: 36 inds. observed, estimated abundance 70 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**6865: 27. Černovice** (Brno-město dist.), military airfield, 240 m a. s. l.; N 49° 10' 46.8" E 16° 39' 43.2". 16 April 2003: 4 inds. observed, estimated abundance 15 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 17 August 2004:

neg., J. MATĚJŮ; 11 July 2005: neg., J. MATĚJŮ, P. NOVÁ & J. ŠAŠEK; 13 April 2006: neg., T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ.

**6866: 28. Újezd u Brna** (Brno-venkov dist.), gardens, vineyards and fields on the NE border of the village, 211 m a. s. l.; N 49° 06' 35.0" E 16° 45' 47.0". 18 August 2005: 2 inds. observed; estimated abundance 5 inds., E. CEPÁKOVÁ, J. MATĚJŮ & P. NOVÁ; 13 July 2006: 1 ind. observed, estimated abundance 10 inds., J. MATĚJŮ & P. NOVÁ; 16 July 2007: 1 ind. observed, estimated abundance 10 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 29 June 2008: central part of the site – neg., but colony considered as existing, estimated abundance 10 inds., J. MATĚJŮ.

NOTE. Due to high heterogeneity of habitats at this site not providing an easy survey, estimates of *S. citellus* abundance are uncertain.

**6956: 29. Nová Bystřice, Albeř** (Jindřichův Hradec dist.), campsite, 646 m a. s. l.; N 49° 01' 34.9" E 15° 08' 54.1". 2003: estimated abundance 30 ind. reported by campsite staff (ad verb.); 18 August 2004: 2 inds. observed, estimated abundance 40 inds., J. MATĚJŮ; 13 July 2005: 6 inds. observed, estimated abundance 20 inds., J. MATĚJŮ, P. NOVÁ, J. PYKAL & J. ŠAŠEK; 14 July 2006: 13 inds. observed, estimated abundance 35 inds., J. MATĚJŮ & P. NOVÁ; 28 March 2007: 3 burrow entrances and footprints in snow, J. MATĚJŮ, T. MINÁRIKOVÁ & J. PYKAL; 19 July 2007: 18 inds. observed, estimated abundance 40 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & Z. VENKRBČOVÁ; 2 April 2008: 40 burrow entrances, J. MATĚJŮ, J. UHLÍKOVÁ & Z. VENKRBČOVÁ; 30 June 2008: approx. 25 inds. observed, estimated abundance 40 inds., J. MATĚJŮ.

**6963: 30. Ivančice, Hrubšice** (Brno-venkov dist.), the Nad řekami Nature Reserve, 242 m a. s. l.; N 49° 05' 37.6" E 16° 17' 36.2". 17 April 2003: neg., E. CEPÁKOVÁ & J. MATĚJŮ; 18 August 2004: neg., J. MATĚJŮ; 12 July 2005: neg., R. FORMÁNEK, J. MATĚJŮ, P. NOVÁ, J. ŠAŠEK & R. ZAJÍČEK; 18 August 2005: two occupied burrows, estimated abundance 5 inds., E. CEPÁKOVÁ, J. MATĚJŮ & P. NOVÁ; 14 April 2006: neg., T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 14 July 2006: neg., J. MATĚJŮ & P. NOVÁ; 10 August 2006: neg., J. MATĚJŮ, P. MARHOUL, O. RŮŽIČKOVÁ & V. VOHRALÍK; 27 March 2007: 3 occupied burrows, J. MATĚJŮ, T. MINÁRIKOVÁ & P. NOVÁ; 18 July 2007: 2 inds. observed, estimated abundance 10 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 1 April 2008: 3 inds. observed, Š. HULOVÁ, J. MATĚJŮ & J. UHLÍKOVÁ; 18 July 2008: 13 inds. observed, estimated abundance 20 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**6963: 31. Ivančice, Biskoupky** (Brno-venkov dist.), meadows in the valley of Jihlava river ca. 600 m SE from the village, 240 m a. s. l.; N 49° 05' 39.3" E 16° 17' 15.0". 12 July 2005: 22 inds. observed, estimated abundance 50 inds., R. FORMÁNEK, J. MATĚJŮ, P. NOVÁ, J. ŠAŠEK & R. ZAJÍČEK; 14 April 2006: 4 inds. observed, tens of burrows, T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 14 July 2006: 34 inds. observed, estimated abundance 70 inds., J. MATĚJŮ & P. NOVÁ; 27 March 2007: 16 inds. observed, J. MATĚJŮ, T. MINÁRIKOVÁ & P. NOVÁ; 18 July 2007: 38 inds. observed, estimated abundance 90 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 1 April 2008: 41 inds. observed, Š. HULOVÁ, J. MATĚJŮ & J. UHLÍKOVÁ; 18 July 2008: 56 inds. observed, estimated abundance 110 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**6963: 32. Jamolice** (Brno-venkov dist.), meadow (former airfield), ca. 1 km N from the village, 375 m a. s. l.; N 49° 04' 57.3" E 16° 15' 07.3". 17 April 2003: estimated abundance 20 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 18 August 2004: 8 inds. observed, estimated abundance 35 inds., J. MATĚJŮ; 12 July 2005: 15 inds. observed, estimated abundance 40 inds., V. BERAN, R. FORMÁNEK, J. MATĚJŮ, P. NOVÁ, J. ŠAŠEK & R. ZAJÍČEK; 13 April 2006: tens of burrow entrances, T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 13 July 2006: 15 inds. observed, J. MATĚJŮ & P. NOVÁ; 10 August 2006: 5 inds. observed, estimated abundance 40 inds., P. MARHOUL, J. MATĚJŮ, O. RŮŽIČKOVÁ & V. VOHRALÍK; 27 March 2007: 1 ind. observed, J. MATĚJŮ, T. MINÁRIKOVÁ & P. NOVÁ; 18 July 2007: 31 inds. observed, estimated abundance 60 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 1 April 2008: 18 inds. observed, Š. HULOVÁ, J. MATĚJŮ & J. UHLÍKOVÁ; 17 June 2008: 30 inds. observed, D. KRÁL & J. UHLÍKOVÁ; 18 July 2008: 60 inds. observed, estimated abundance 100 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**6964: 33. Ivančice** (Brno-venkov dist.), meadows around water station on the SE periphery of the town, 212 m a. s. l.; N 49° 05' 36.5" E 16° 22' 38.5". 18 July 2007: 2 inds. observed, estimated abundance



30 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 1 April 2008: 1 ind. observed, Š. HULOVÁ, J. MATĚJŮ & J. UHLÍKOVÁ; 17 July 2008: 7 inds. observed, estimated abundance 25 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**6965: 34. Hrušovany u Brna** (Brno-venkov dist.), gardens, vineyards and fields on the SW border of the village, 194 m a. s. l.; N 49° 01' 49.7" E 16° 35' 06.2". 16 June 2008: 3 inds. observed, D. KRÁL & J. UHLÍKOVÁ; 16 July 2008: 17 inds. observed, estimated abundance 100 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

NOTE. Due to high heterogeneity of habitats at this site not providing an easy survey, estimates of *S. citellus* abundance are uncertain.

**7063: 35. Miroslav** (Znojmo dist.), airfield, 234 m a. s. l.; N 48° 55' 56.1" E 16° 17' 55.8". 16 June 2008: 1 ind. observed, D. KRÁL & J. UHLÍKOVÁ; 16 July 2008: 3 inds. observed, estimated abundance 10 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**7066: 36. Velké Pavlovice** (Břeclav dist.), gardens, vineyards and fields round the village, 206 m a. s. l.; N 48° 54' 39.0" E 16° 48' 15.0". 18 August 2005: 1 ind. observed, estimated abundance 20 inds., E. CEPÁKOVÁ, J. MATĚJŮ & P. NOVÁ; 9 August 2006: several burrow entrances, estimated abundance 20 inds., P. MARHOUL, J. MATĚJŮ, O. RŮŽIČKOVÁ & V. VOHRALÍK; 17 July 2007: 3 inds. observed, estimated abundance 40 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 16 June 2008: 3 inds. observed, estimated abundance 40 inds., D. KRÁL & J. UHLÍKOVÁ.

NOTE. Due to high heterogeneity of habitats at this site not providing an easy survey, estimates of *S. citellus* abundance are uncertain.

**7067: 37. Čejč** (Hodonín dist.), gardens, vineyards and fields ca. 1.2 km N from the village, 254 m a. s. l.; N 48° 57' 30.1" E 16° 57' 57.7". 9 August 2006: several burrow entrances, occurrence reported by local people, estimated abundance 10 inds., P. MARHOUL, J. MATĚJŮ, O. RŮŽIČKOVÁ & V. VOHRALÍK; 17 July 2007: 2 inds. observed, estimated abundance 20 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 16 June 2008: 1 ind. observed, estimated abundance 20 inds., D. KRÁL & J. UHLÍKOVÁ.

NOTE. Due to high heterogeneity of habitats at this site not providing an easy survey, estimates of *S. citellus* abundance are uncertain.

**7068: 38. Kyjov, Milotice** (Hodonín dist.), airfield, 202 m a. s. l.; N 49° 58' 48.8" E 17° 07' 29.5". 17 April 2003: 42 inds. observed, approx. 265 burrow entrances on a half of the site, estimated abundance 120 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 17 August 2004: 25 inds. observed, estimated abundance 200 inds., J. MATĚJŮ; 12 July 2005: 130 inds. observed, estimated abundance 300 inds., R. FORMÁNEK, J. MATĚJŮ, P. NOVÁ, J. ŠAŠEK & R. ZAJÍČEK; 14 April 2006: 2 inds. observed, tens of burrow entrances, T. ADAMOVÁ, J. MATĚJŮ & P. NOVÁ; 13 July 2006: 53 inds. observed, estimated abundance 240 inds., J. MATĚJŮ & P. NOVÁ; 27 March 2007: 23 inds. observed, J. MATĚJŮ, T. MINÁRIKOVÁ & P. NOVÁ; 17 July 2007: 95 inds. observed, estimated abundance 250 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & R. ZAJÍČEK; 1 April 2008: 85 inds. observed, Š. HULOVÁ, J. MATĚJŮ & J. UHLÍKOVÁ; 16 July 2008: 141 inds. observed, estimated abundance 250 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**7068: 39. Svatobořice-Mistřín** (Hodonín dist.), gardens, vineyards and fields ca. 1 km W from the village, 211 m a. s. l.; N 48° 58' 58.4" E 17° 04' 12.0". 9 August 2006: 2 inds. observed, approx. 20 burrow entrances, estimated abundance 15 ind., P. MARHOUL, J. MATĚJŮ, O. RŮŽIČKOVÁ & V. VOHRALÍK; 17 July 2007: 1 ind. observed, estimated abundance 15 inds., J. MATĚJŮ, P. NOVÁ, J. UHLÍKOVÁ & R. ZAJÍČEK; 2008: site not visited, colony considered as existing, estimated abundance 15 inds.

NOTE. Due to high heterogeneity of habitats at this site not providing an easy survey, estimates of *S. citellus* abundance are uncertain.

**7167: 40. Břeclav, Ladná** (Břeclav dist.), airfield, 155 m a. s. l.; N 48° 47' 24.2" E 16° 53' 15.4". 17 April 2003: estimated abundance 7 inds., E. CEPÁKOVÁ & J. MATĚJŮ; 17 August 2004: 2 inds. observed, estimated abundance 5 inds., J. MATĚJŮ; 12 July 2005: 3 inds. observed, estimated abundance 5 inds., R. FORMÁNEK, J. MATĚJŮ, P. NOVÁ, J. ŠAŠEK & R. ZAJÍČEK; 14 April 2006: 3 occupied burrows, T. ADAMOVÁ, J. MATĚJŮ &

P. NOVÁ; 13 July 2006: 5 inds. observed, estimated abundance 10 inds., J. MATĚJŮ & P. NOVÁ; 27 March 2007: 1 ind. observed, J. MATĚJŮ, T. MINÁRIKOVÁ & P. NOVÁ; 17 July 2007: 6 inds. observed, estimated abundance 25 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 1 April 2008: 5 inds. observed, Š. HULOVÁ, J. MATĚJŮ & J. UHLÍKOVÁ; 16 July 2008: 19 inds. observed, estimated abundance 35 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

**7263: 41. Jaroslavice** (Znojmo dist.), peach tree orchard and verges of a field path along the Czech Republic – Austria national border, ca. 2 km SW from the village, 230 m a. s. l.; N 44° 44' 31.5" E 16° 12' 26.1" 18 July 2007: 1 ind. observed, estimated abundance 10 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ; 17 July 2008: 1 ind. observed, estimated abundance 10 inds., J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

NOTE. Due to high heterogeneity of habitats at this site not providing an easy survey, estimates of *S. citellus* abundance are uncertain.

**7263: 42. Křídlovky** (Znojmo dist.), garden and orchard, 195 m a.s. l.; N 48° 47' 09.2" E 16° 14' 30.2". 17 July 2008: occupied burrows, occurrence of 1 ind. reported by local people (photo and video records), J. MATĚJŮ, P. NOVÁ & J. UHLÍKOVÁ.

NOTE. Only a single individual was recorded, a more detailed survey was not performed and thus the size of the colony (if any) is not known.

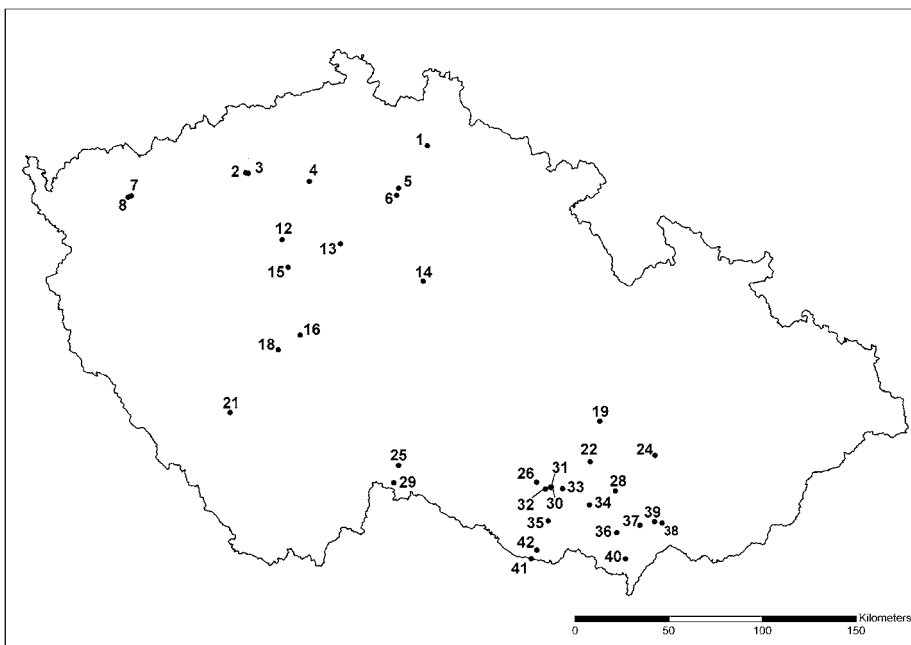


Fig. 1. Distribution of *S. citellus* colonies verified in 2008 (numbers correspond with site numbers given in the text).

Obr. 1. Přehled kolonií sysla obecného, jejichž existence byla ověřena v roce 2008 (čísla odpovídají číslům lokalit v textu).

Table 1. Classification of the sites based on current status of local *S. citellus* populations (as per 1 September 2008). See the List of sites for site numbers

Tab. 1. Klasifikace lokalit podle současného stavu lokálních populací sýsla obecného (výsledky k 1. září 2008). Čísla lokalit viz List of sites (seznam lokalit)

status / klasifikace	site numbers / čísla lokalit	sites in total / celkem
sites with existing colonies / existující kolonie	1, 2, 3, 4, 5, 6, 7, 8, 12, 13, 14, 15, 16, 18, 19, 21, 22, 24, 25, 26, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42	35
extinct sites / zaniklé kolonie	9, 10, 11, 17, 20, 23, 27	7
sites not visited / neověřené lokality	43, 44, 45	3

#### Sites with reported occurrence (not visited by the authors):

**7066: 43. Hustopeče u Brna** (Brno-venkov dist.), gardens, vineyards and fields, 230 m a. s. l. 19 June 2007: up to 5 inds. observed, occurrence reported for approximately the last 10 years, A. KONEČNÝ (ad verb.).

**7162: 44. Konice** (Znojmo dist.), vineyards at E periphery of the village, 290 m a. s. l. July 2008: 1 ind. observed L. KRATOCHVÍL, occurrence also reported by landowner Mr. JELÍNEK (VALÁŠEK ad verb.).

**7263: 45. Jaroslavice** (Znojmo dist.), slopes of the Kočičí vrch hill, vineyards and meadows, 246 m a. s. l. 17 July 2007: 1 ind. observed P. ČERVENKA (M. ANDĚRA ad verb.)

#### ASSESSMENT OF DISTRIBUTION

In total, occurrence of the *S. citellus* was recorded at or reported from 45 sites (32 squares of the KFME mapping grid) in the Czech Republic in 2002–2008 (Table 1, Fig. 1). Of them, only 35 sites (29 squares) were proved by the authors to host *S. citellus* colonies in 2008 (as per 1 September). *S. citellus* colonies probably vanished from 7 sites (no. 9, 10, 11, 17, 20, 23 and 27) during the period 2002–2008 and the status of 3 sites has remained uncertain. On the other hand, 14 previously unknown sites or non verified sites were visited and confirmed to host *S. citellus* colonies in the study period (new sites no. 12, 17, 31, 33, 34, 35, 36, 37, 41, 42; newly verified no. 8, 23, 27, 28).

The current distribution range of the *S. citellus* in the country includes south-Moravian lowlands (Brno, Znojmo, Břeclav, Hodonín, Vyškov and Blansko districts) with 18 sites, central Bohemia (Praha, Mladá Boleslav, Kladno, Příbram and Beroun dist.) and neighbouring parts of northern Bohemia (Liberec, Litoměřice and Louny dist.) with 12 sites. Only two sites are situated in north-western Bohemia (Karlovy Vary dist.), one in south-western Bohemia (Strakonice dist.) and two in southern Bohemia (Jindřichův Hradec dist.). The fragmentary pattern of the *S. citellus* distribution is highly apparent and the migration of individuals between colonies is perhaps possible only among some south-Moravian sites and two sites in the České středohoří region (nos. 2, 3). In the other cases, migration is probably impossible as distances between the sites usually reach tens of kilometres.

Table 2. Estimated size (number of individuals) of *Spermophilus citellus* colonies proved to exist in 2008

Tab. 2. Odhadovaná velikost (počet jedinců) kolonií sysla obecného, jejichž existence byla potvrzena v roce 2008

site / lokalita			site / lokalita		
no. / č.	name / název	n inds. / počet	no. / č.	name / název	n inds. / počet
13	Letňany	650	8	Karlovy Vary, airport	40
24	Vyškov	650	36	Velké Pavlovice	40
6	Mladá Boleslav, Bezděčín	250	29	Nová Bystřice, Albeř	40
3	Raná	250	40	Břeclav, Ladná	35
38	Kyjov, Milotice	250	33	Ivančice	25
19	Bořitov	200	5	Mladá Boleslav, Debrř	20
2	Raná, Hrádek	130	37	Čejč	20
22	Brno, Medlánky	120	30	Ivančice, Hrubšice	20
31	Ivančice, Biskoupky	110	12	Velká Dobrá	15
34	Hrušovany u Brna	100	39	Svatobořice-Mistřín	15
4	Roudnice nad Labem	100	35	Miroslav	10
32	Jamolice	100	1	Hodkovice nad Mohelkou	10
21	Strakonice	75	41	Jaroslavice	10
26	Mohelno	70	28	Újezd u Brna	10
18	Milešov, Trhovky	60	25	Člunek, Lomy	8
7	Karlovy Vary, golf	60	16	Dublovice, Chramosty	5
15	Loděnice, Špičatý vrch	50	42	Křídlovky	1*
14	Kolín	50		<b>total / úhrnem</b>	<b>3599</b>

\*total size of colony and even its existence are uncertain

More than a half (19, 54.3%) of the *S. citellus* colonies hosted 50 individuals or less (Table 2). Only 12 colonies (34.3%) numbered 100 individuals or more. In the smallest colonies (sites no. 16 and 25), the estimated *S. citellus* abundance was only 5 and 8 individuals, respectively. The presence of a single individual was documented in the extreme case of the site no. 42. In the largest colonies (sites no. 13 and 24), the estimated abundance reached 650 individuals. The total size of the *S. citellus* population in the Czech Republic in 2008 was estimated at approx. 3600 individuals (Table 2).

Mean population density in the colonies, based on the estimated abundance, was 15.1 ind./ha (median 10.9; range 2.1–58.7; n=35). The lowest density (about 2 ind./ha) was recorded at three sites (no. 5, 12 and 34) with different land cover types: natural habitat – steppe, airfield or airport, and vineyard, orchard or garden, respectively. The highest density (58.7 ind./ha) was found at the airfield site no. 19. The second highest density (48.4 ind./ha) was recorded in a campsite area (site no. 29), which is situated at the highest elevation among the currently known Czech localities. Concerning land cover type, the lowest population densities were found in steppe habitats (mean = 6.6 ind./ha, range 2.2–10.1 ind./ha). Very similar values were recorded at airfields or airports (mean = 12.1 ind./ha, range 2.1–58.7 ind./ha), and meadows or pastures (mean = 18.3 ind./ha, range 6.1–35.8 ind./ha). Campsites and sport areas showed the highest *S. citellus* population densities (mean = 27.8 ind./ha, range 13.9–48.4 ind./ha). Concerning vineyards, orchards and gardens, we were unable to identify borders of the colonies precisely, however, it

is not clear whether the *S. citellus* occurrence in this land cover type really has a character of colony settlement, so we did not calculate the densities for this land cover type.

Altitudinal distribution of the species in the Czech Republic is shown in Fig. 2. The mean altitude of sites with *S. citellus* occurrence was 317 m a. s. l. (range 155–648 m a. s. l., median 260 m a. s. l.), with 60% of the sites situated below 300 m a. s. l.

European ground squirrels in the Czech Republic were often found in airfields and airports (see Fig. 3), which host 43% of the known colonies and more than 70% of the total Czech *S. citellus* population (individuals). This “land use/land cover” type also hosts the largest (area of colony) and most numerous *S. citellus* colonies. Concerning the number of *S. citellus* colonies, the second largest number was found in the “vineyard, orchard or garden” type, followed by “meadows or pastures” and “campsites or sport areas” (Fig. 3). The lowest number of *S. citellus* colonies was found in “natural”, steppe habitats (Fig. 3).

## DISCUSSION

In the study period, occurrence of *S. citellus* was recorded at 35 sites in the Czech Republic, i.e. nine more compared to those reported by ČEPÁKOVÁ & HULOVÁ (2002). Four *S. citellus* colonies (no. 9, 10, 11 and 20) of those verified by ČEPÁKOVÁ & HULOVÁ (l. c.) in 2000–2001 became extinct. In addition, disappearance of three other colonies which were either unknown (no. 17), not verified (no. 23) or erroneously considered as extinct (no. 27) in the previous study (ČEPÁ-

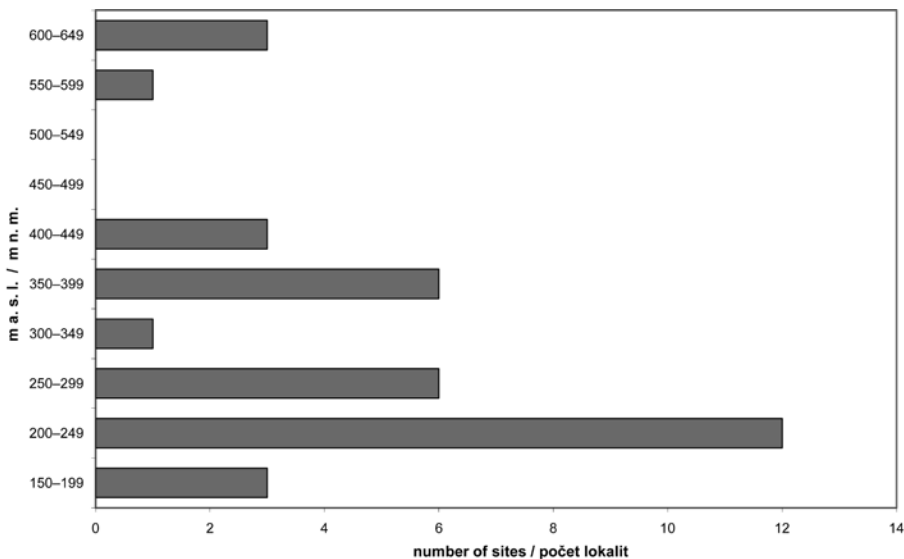


Fig. 2. Altitudinal distribution of the *S. citellus* in the Czech Republic in 2008 (only sites verified as per 1 September 2008 were included, n=35).

Obr. 2. Hypsometrické rozšíření sysla obecného v ČR v roce 2008 (zahrnuti jsou pouze lokality ověřené k 1. září 2008, n=35).

- airfield / letiště
- meadow or pasture / hospodářské louky a pastviny
- steppe habitats / stepní biotopy
- ▣ vineyard, orchard or garden / vinice, sady a zahrady
- campsite or sport area / kempy a sportovní areály

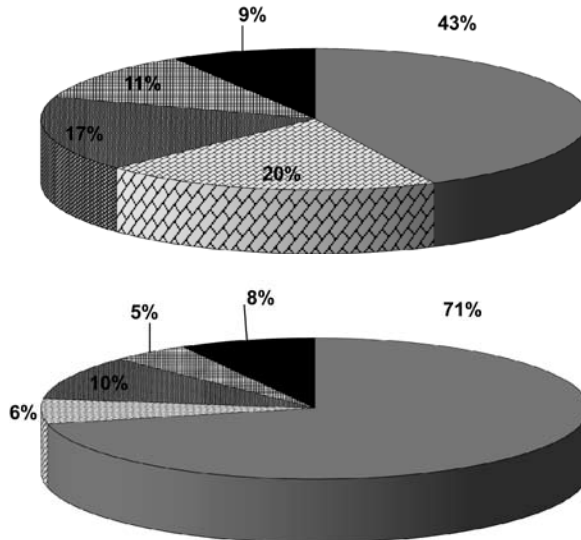


Fig. 3. Top – proportion of *S. citellus* colonies in different land cover types (only sites verified as per 1 September 2008 were included, n=35); below – proportion of numbers of *S. citellus* individuals in different land cover types (n=3599).

Obr. 3. Nahoře – zastoupení lokalit sysla v jednotlivých typech “land-cover” (zahrnutý jsou pouze lokality ověřené k 1. září 2008, n=35); dole – zastoupení počtu jedinců v jednotlivých typech “land-cover” (n=3599).

KOVÁ & HULOVÁ l. c.) was observed during the period 2002–2008. Presence of *S. citellus* was newly discovered or verified at 14 sites; one of the colonies was probably established as a result of the reintroduction action (MATĚJŮ et al. 2007). It should be noticed that the newly recorded sites are not newly established colonies but they have been only recently discovered.

In the Czech Republic, the *S. citellus* reaches the western and northern limits of its distribution range (sites no. 7+8 and 1, respectively, being the extremes) – the situation is the same as described by ČEPÁKOVÁ & HULOVÁ (l. c). This fact somewhat complicates the comparison of *S. citellus* distribution in the country with the rest of the species’ range, since the present situation may be influenced by natural oscillations (ANDĚRA & ČERVENÝ 2004), which are generally most visible on the periphery of the distribution range (LOMOLINO et al. 2005).

The pattern of *S. citellus* distribution in Austria, Slovakia and Hungary is quite similar, however, the sites (colonies) in these countries are more numerous, more populated and also less isolated (AMBROS 2000 and pers. comm.; VACZI ad verb., ENZINGER et al. 2008). The esti-

mated number of *S. citellus* colonies in Hungary is between 200 and 300 (O. VÁČZI ad verb.). About 250 colonies are present in Lower Austria (ENZINGER et al. 2008) and approximately 100 colonies were known in Slovakia in the period 1997–1999 (AMBROS 2000). However, *S. citellus* populations in these countries are also closely related to anthropogenic habitats such as fallow land, vineyards, field margins, golf courses, public baths and industrial sites (ENZINGER et al. 2008). Comparison of our results with the situation in Bulgaria and Romania, where the occurrence of *S. citellus* still has a natural character, is difficult due to limited data available and due to different climatic conditions in these countries.

In comparison with older data (e.g. GRULICH 1960, Fig. 4), it is evident that the current *S. citellus* distribution has a relict character, with only few existing sites as remains of the continuous distribution range in the early 1950s (Fig. 4). The dramatic decline of the species was caused by intensification of agricultural practices in the 1960s, i.e. alteration of meadows and pastures into fields and absence of regular mowing in the remaining grasslands, resulting in habitat loss and fragmentation (ČEPÁKOVÁ & HULOVÁ 2002, ANDĚRA & ČERVENÝ 2004, MATĚJŮ et. al 2007). At present, *S. citellus* colonies are restricted to the grasslands regularly managed by man – air-fields, sport areas, gardens, vineyards and orchards. Preference of these highly anthropogenic habitats suggests high dependence of the *S. citellus* population on human activities.

Population densities of the *S. citellus* (number of individuals per hectare) significantly differ between the sites and show marked interseasonal fluctuations (HOFFMANN et al. 2003, MRLI-

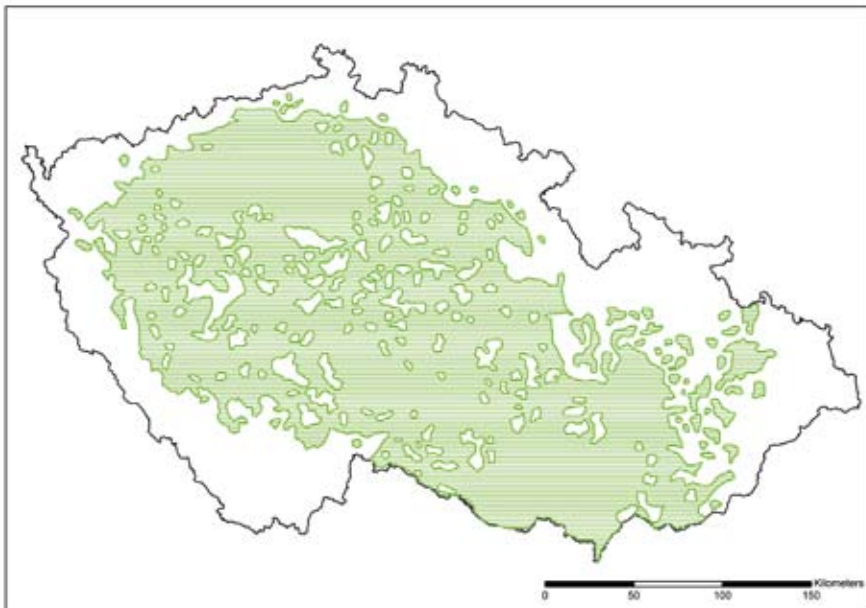


Fig. 4. Distribution of the *S. citellus* in the Czech Republic during the period 1949–1953. Redrawn from GRULICH (1960).

Obr. 4. Rozšíření sýsla obecného na území České republiky v letech 1949 až 1953. Upraveno podle GRULICHA (1960).

KOVÁ 1999, KOSNAR 1979, RUŽIČ 1978). The lowest densities recorded in the Czech Republic are somewhat lower than those usually reported from other parts of the distribution range, e.g. 6.0–15.6 inds./ha, Mimoň, Czech Rep. (MRLÍKOVÁ 1999) and results of this study compared to 4.0–88.0 inds./ha, Neradin, Krušedol, Banatska Palanka, Serbia (ČIROVIC et al. 2008); 18.0–48.0 inds./ha, S Banat, Serbia (RUŽIČ 1978); or 6.3–61.0 inds./ha (only adults), Langenzerdsdorf, Austria (HOFFMANN et al. 2003). This may be a result of the location of Czech populations on the periphery of the species' distribution range – i.e. in the area with less-favourable environmental conditions (LOMOLINO et al. 2005).

SAUER (1976) and TURRINI et al. (2008) report high densities of *Spermophilus beldingi* and *S. citellus* populations occupying highly productive habitats (e.g. alfalfa fields). This suggests that the *S. citellus* density may be related to the productivity of the habitat. Our data could support this hypothesis. In steppe habitats which are usually mowed and pastured only extensively, the availability of fresh food decreases during the season due to accumulation of the dry old grass. On the other hand, in the land cover types where the grass is regularly mowed or pastured (meadows or pastures, airfields or airports, camp sites or sport areas), a sufficient amount of fresh food (i.e. newly grown grass) is ensured throughout the season (BÍBIKOV 1996). Frequent provision of additional food was observed in campsites and sport areas, which may significantly increase the “habitat productivity” and thus enable the *S. citellus* to live in higher densities. Future studies should focus on the comparison of population densities in *S. citellus* colonies occurring in habitats with different primary productivity.

Altitudinal distribution of the current *S. citellus* sites corresponds with the results of ČEPÁKOVÁ & HULOVÁ (l.c.) as well as with the data from Austria, where *S. citellus* colonies were recorded at elevations below 600 m a. s. l. (SPITZENBERGER 2001). Considering the previous studies by GRULICH (1960) and BARTA (1992) who reported frequent occurrence of the *S. citellus* at medium elevations up to 700 and 800 m a. s. l., respectively, survival of the species seems to be better at lower elevations where most of the current colonies were preserved.

The above data indicate two main facts. First, our knowledge of *S. citellus* distribution in the Czech Republic has improved and it is more accurate. Second and more important, it is apparent that the *S. citellus* population in the Czech Republic is highly fragmented and the number of colonies (sites) is still decreasing, as the newly recorded sites are not newly established colonies but they have been only recently discovered. These populations are relicts of the past distribution and are very sensitive to any disturbance. Therefore, we consider adoption of the species action plan as fully justified and hope that this study will contribute to its successful implementation.

## SOUHRN

Cílem předložené práce je sumarizace poznatků o rozšíření sysla obecného v ČR v letech 2002–2008 a porovnání aktuálního stavu se staršími údaji. Výskyt sysla byl mapován na území celého státu především za pomoci pracovníků AOPK ČR v rámci přípravy a realizace jeho záchranného programu. Na všech lokalitách s výskytem sysla bylo stabilním týmem pozorovatelů opakovaně (obvykle v dubnu a červenci) prováděno vizuální sčítání aktivních jedinců a případně sčítání vchodů do nor. Následně byl pro každou kolonii proveden odhad celkového počtu jedinců. Hranice plochy obývané kolonií byly vyznačeny v leteckých snímcích a digitalizovány v programu ESRI ArcGIS 9.2. Za období 2002 až 2008 se podařilo zjistit výskyt sysla na 45 lokalitách. V roce 2008 byl výskyt sysla potvrzen pouze na 35 z nich, 7 lokalit ve sledovaném období zaniklo a 3 zůstaly neověřeny. Většina současných lokalit (18) se nachází v nížinách jižní Moravy a přilehlých pahorkatinách, významnou oblastí jsou i střední Čechy a přilehlá část severních



Čech, kde bylo zjištěno 12 lokalit. Zbýlých 5 lokalit se nachází v okresech Jindřichův Hradec, Karlovy Vary a Strakonice. Celková početnost sysla v ČR byla v červenci 2008 odhadnuta na 3600 jedinců. Jen třetina (12) všech kolonií však dosahovala početnosti 100 a více jedinců. Naopak na většině lokalit (19) byl počet sýslů menší nebo roven 50. Červencová hustota osídlení v koloniích se pohybovala od 2,1 do 58,7 jedinců/ha (medián 10,9 jedinců/ha). Více než 90% kolonií se nacházelo v biotopech tvořených tzv. kulturními trávníky (polní letiště, vinice a zahrady, louky, sportoviště a rekreační areály), pouze 3 kolonie se vyskytovaly v přirozených stepních biotopech. Průměrná nadmořská výška lokalit byla 317 m (rozpětí 155–648 m n. m., medián 260 m n. m.). Získané informace upřesňují současné znalosti o výskytu sysla obecného na území ČR, avšak upozorňují i na prohlubující se závislost jeho současné existence na činnosti člověka a bohužel i na stále pokračující trend úbytku jeho kolonií. Zdánlivý nárůst počtu kolonií totiž není spojen se vznikem nových, ale pouze s objevením dosud neznámých lokalit.

## ACKNOWLEDGEMENTS

We thank V. VOHRALÍK (Faculty of Science, Charles University, Prague) for his support during the study and useful comments on the paper. We are also indebted to all colleagues, who helped us with the field work and provided us with their data. The study was supported by the Ministry of the Environment of the Czech Republic (grants Nos. VaV/620/1/03 and SP/2d4/61/08).

## REFERENCES

- AMBROS M., 2000: Návrh genofondovej siete lokalit sysla pasienkového (*Spermophilus citellus* L.) na Slovensku [Proposal for a genofund network of the European ground squirrel sites in Slovakia]. Pp.: 99–105. In: URBAN P. (ed.): *Výskum a ochrana cicavcov na Slovensku IV [Mammal Research and Conservation in Slovakia]*. Štátna ochrana prírody SR, Banská Bystrica, 191 pp (in Slovak, with an abstract in English).
- ANDĚRA M. & HANZAL V., 1995: Projekt "Sysel". Podúkol A: Mapování výskytu sysla obecného (*Spermophilus citellus*) na území České republiky. Zpráva o řešení I. a II. Etapy, 1994–1995 [Project "European ground squirrel". Task A: Mapping of the occurrence of the European ground squirrel in the Czech Republic]. Unpublished report. AOPK ČR, Praha, 41 pp (in Czech).
- ANDĚRA M. & ČERVENÝ J., 2003: Červený seznam savců České republiky [The Red List of Mammals of the Czech Republic]. *Příroda* [Praha], **22**: 121–129 (in Czech, with summaries in English and German).
- ANDĚRA M. & ČERVENÝ J., 2004: *Atlas rozšíření savců v České republice, předběžná verze IV. Hlodavci (Rodentia) – část 3. Veverkovití (Sciuridae), Bobrovití (Castoridae), nutriovití (Myocastoridae)* [Atlas of the Mammals of the Czech Republic – A Provisional Version. IV. Rodents (Rodentia) – Part 3. Squirrels (Sciuridae), beavers (Castoridae), coypus (Myocastoridae)]. Národní muzeum, Praha, 76 pp (in Czech, with a summary in English).
- BÁRTA Z., 1992: Poslední sýslové obecní, *Spermophilus citellus* L., na Mostecku [Die letzten Ziesel bei Most]. *Sborník Severočeského muzea – Přírodní vědy*, **18**: 151–154 (in Czech, with a summary in German).
- BIBIKOV D. I., 1996. *Die Murmeliere der Welt. Die Neue Brehm-Bücherei. Dritte Edition*. Westarp Wissenschaften, Hohenwarsleben, Germany, 228 pp.
- CEPÁKOVÁ E. & HULOVÁ Š., 2002: Current distribution of the European souslik (*Spermophilus citellus*) in the Czech Republic. *Lynx, n. s.*, **33**: 89–103.
- EHRENDORFER F. & HAMANN U., 1965: Vorschläge zu einer floristischen Kartierung von Mitteleuropa. *Berichte der Deutsche Botanische Gesellschaft*, **78**: 35–50.
- ENZINGER K., HOLZER T. & WALDER C., 2008: Management of ground squirrel habitats in Lower Austria – Origin, options and objectives. P.: 19. In: ANONYMOUS (eds.): *Second European Ground Squirrel Meeting. Book of Abstracts. Sv. Jan pod Skalou, 1.–5. Oct. 2008*. Charles University, Praha, 47 pp.

- GRULICH I., 1960: Sysel obecný *Citellus citellus* L. v ČSSR [European ground squirrel *Citellus citellus* L. in Czechoslovakia]. *Práce Brněnské Zákadny Československé Akademie Věd*, **32**(11): 473–563 (in Czech, with a summary in English).
- HOFFMANN I. E., MILLESI E., HUBER S., EVERTS L. G. & DITTAMI J. P., 2003: Population dynamics of European ground squirrels (*Spermophilus citellus*) in a suburban area. *Journal of Mammalogy*, **84**: 615–626.
- JACOBI A., 1902: Der Ziesel in Deutschland. *Arbeiten aus der Biologischen Abteilung für Land- und Forstwirtschaft am Kaiserlichen Gesundheitsamte*, **2**(4): 506–511.
- KAFKA J., 1892: *Hlodavci země české, žijící i fosilní* [Rodents of Bohemia, living and fossil]. Praha, 94 pp (in Czech).
- KOSNAR J., 1979: *Biologie rozmnožování, populační dynamika a etologie sysla obecného (Citellus citellus)* [Biology of reproduction, population dynamics and ethology of the European ground squirrel]. Unpublished MSc. Thesis. Katedra zoologie, Přírodovědecká fakulta UK, Praha, 154 pp.
- LOMOLINO M. V., BROWN J. H. & RIDDLE B. R., 2005: *Biogeography. Third Edition*. Sinauer Associates, Inc., Sunderland, Mass., 845 pp.
- MATĚJŮ J., HULOVÁ Š., NOVÁ P., CEPÁKOVÁ E., MARHOUL P. & UHLÍKOVÁ J., 2007: *Záchranný program sysla obecného (Spermophilus citellus) v České republice* [Action plan for the European ground squirrel in the Czech Republic]. Unpublished report. AOPK ČR, Praha, 67 pp (in Czech).
- MRĹÍKOVÁ Z., 1999: Etoekologické a sociobiologické vztahy v populaci sysla obecného (*Spermophilus citellus* L.) na lokalitě Mimoň-hřebčín v letech 1996 a 1997 [Etoecological and sociobiological relationship in a population of the European ground squirrel in the site Mimoň-hřebčín in 1996 and 1997]. *Sborník Bezděz*, **8**: 227–241 (in Czech).
- PRAŽÁK J. P., 1896: Beitrag zur Kenntnis der Säugethier-Fauna Böhmens, besonders des nordöstlichen Gebiete des Landes. *Mittheilungen des Naturwissenschaftliche Vereins an der Kaiserlich Königliche Universität in Wien*, **1896**: 55–72.
- PRUNER L. & MÍKA P., 1996: Seznam obcí a jejich částí v České republice s čísly mapových polí pro síťové mapování fauny [List of settlements in the Czech Republic with associated map field codes for faunistic grid mapping system]. *Klapalekiana*, **32** (Suppl.): 1–175 (in Czech, with a summary in English).
- RUŽIČ A., 1978: *Citellus citellus* (Linnaeus, 1766) – Der oder das Europäische Ziesel. Pp.: 123–144. In: NIETHAMMER J. & KRAPP F. (eds.): *Handbuch der Säugetiere Europas. Band 1. Rodentia I (Sciuridae, Castoridae, Gliridae, Muridae)*. Akademische Verlagsgesellschaft, Wiesbaden, 476 pp.
- SAUER W. C., 1976: Control of the Oregon ground squirrel (*Spermophilus beldingi oregonus*). Pp.: 99–109. In: ANONYMOUS (ed.): *Proceedings of the 7th Vertebrate Pest Conference*. University of Nebraska, Lincoln.
- SLAVÍK B., 1971: Metodika síťového mapování ve vztahu k připravovanému fyto geografickému atlasu ČSR [Methodik der Netzkartierung in Bezug auf den eben bearbeiteten phytogeographischen Atlas der Böhmisches sozialistischen Republik]. *Zprávy Československé Botanické Společnosti*, **6**: 55–62 (in Czech, with an abstract in German).
- SPITZENBERGER F., 2001: *Die Säugetierfauna Österreichs*. Bundesministerium für Land- und Fortwirtschaft, Umwelt und Wasserwirtschaft, Graz, 896 pp.
- TURRINI T., BRENNER M., HOFFMANN I. E. & MILLESI E. 2008: Home ranges of European ground squirrels differ according to sex, age and habitat alteration. P.: 23. In: ANONYMOUS (eds.): *Second European Ground Squirrel Meeting. Book of Abstracts. Sv. Jan pod Skalou, 1.–5. Oct. 2008*. Charles University, Praha, 47 pp.
- WEISBAUER J., 1894: Die Verbreitung und Benennung des Ziesels (*Spermophilus citellus* L.) in nord-westlichen Böhmen. *Mittheilungen des Nordböhmisches Excursions Clubs* [Böhmisches Leipa], **17**(3): 240–250.
- ZÁLESKÝ M., 1924: K rozšíření sysla (*Spermophilus citellus*) v Čechách [To the distribution of the European ground squirrel in Bohemia]. *Věda Přírodní*, **5**: 248 (in Czech).