

Observations of the serotine bat *Eptesicus serotinus* (Schreber, 1774) in underground hibernacula of Slovenia

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Abstract. *Eptesicus serotinus* is rarely found hibernating in Slovenia. This article summarises data on all 18 recorded published and new field observations. Individual bats were found in the entrance parts of 11 caves, one in a cliff overhang, and one in a cellar. Bats were mostly resting in small crevices and less frequently hanging freely from ceiling or walls. In one case, *E. serotinus* was also found 40 cm deep in stone gravel. Temperatures near bats ranged from just below zero to approximately +5.5°C.

Key words: *Eptesicus serotinus*, underground roosts, hibernation, Slovenia

Izvleček. Opazovanja poznih netopirjev *Eptesicus serotinus* (Schreber, 1774) v podzemnih prezimovališčih Slovenije – Pozni netopir (*Eptesicus serotinus*) je v Sloveniji med prezimovanjem redko opažen. Prispevek povzema vseh 18 literaturnih navedb in novih najdb. Posamezni pozni netopirji so bili najdeni v vhodnih delih 11 jam, v enem spodmolu in v eni kleti. Netopirji so se večinoma skrivali v majhnih razpokah, manj pogosto pa so viseli prosto na stropu ali stenah. Enkrat je bil pozni netopir najden tudi 40 cm globoko v grušču. Temperature ob netopirjih so bile od malo pod lediščem do +5,5 °C.

Ključne besede: *Eptesicus serotinus*, podzemna zatočišča, prezimovanje, Slovenija

Introduction

The serotine bat *Eptesicus serotinus* Schreber, 1774 is a common bat species in Slovenia, particularly in the lowlands (Koselj 2009). In Slovenia and Europe, numerous summer maternity colonies have been recorded in buildings, whereas winter records are scarce (Baagøe 2001, Dietz et al. 2009, Koselj 2009). The aim of this paper is therefore to sum all available records of the hibernating *E. serotinus* in Slovenia.

Material and methods

All literature data given by Presetnik et al. (2009) as well as later sources (altogether over 500 sources) and primary data (over 14,500 data (CKFF 2013)) on bats in Slovenia and extracted records for hibernating *Eptesicus serotinus* were reviewed. During field surveys, the positions of *E. serotinus* were marked on maps of the caves or building and temperatures measured as close as possible to the animals with digital thermometer. In some cases, sex and age of the bats were also determined.

Results and discussion

Only 18 sightings of hibernating *E. serotinus* have been recorded in Slovenia since 1959, all of which come from 13 underground shelters (Tab. 1). During our 771 winter surveys (from 15th October to 15th March in each winter from 2003/04 to 2012/13) in the last 10 years, for example, we have found *E. serotinus* in underground hibernacula only 10 times (2.2% of all surveys) at 7 different locations (1.3% of all locations; CKFF 2013). On each occasion, we found only one animal per cave. In the list of internationally important underground sites for bats in Europe (Mitchell-Jones 2012), there is a slightly higher percentage of underground shelters with *E. serotinus* – 6.5% (98 out of 1,487 underground shelters). Also at those sites, the species was always recorded in low numbers, the highest being 31 individuals found in Osowiec Fortress in Poland. The rarity of *E. serotinus* in underground hibernacula was also noted by Haensel (1989), who found that in vicinity of Berlin (Germany) less than 0.2% of all bats hibernating in underground were *E. serotinus*. In our research, *E. serotinus* was even more rarely observed - altogether 10 observations of *E. serotinus* or 0.01% out of a total of 123,859 hibernating bats have been made during the last ten years (CKFF 2013).

In Slovenia, *E. serotinus* was found hibernating at altitudes between sea level and approximately 850 m a.s.l. and in all regions of the country (Tab. 1), which corresponds well with its summer distribution (Koselj 2009). In the context of species distribution in Europe, such elevations are expected as hibernating *E. serotinus* were found up to 1,200 m a.s.l. (Boschamer & Bekker 2006) and even up to 1,440 m a.s.l. (Spitzenberger & Bauer 2001) in the neighbouring Austria.

The bats were found hanging individually, near the entrance of a cave or cellar, where the influence of the outside cold could still be observed, as temperatures measured near each bat (usually less than 2 cm from the bat), ranged from just below zero to approximately +5.5°C (Tab. 1). *E. serotinus* were often (6 out of 11 occasions where the exact hanging locations are known) hiding in small, less than a centimetre wide crevices, or less frequently (3 out of 11 occasions) hanging freely on a wall or from the ceiling. Interestingly, in the cave Erjavčeva jama, one male was found 40 cm deep in the ground, in loose gravel (diameter of gravel stones ranging approximately from 2 to 10 cm). An individual animal may use the same hibernation place in different winters, as was the case of an adult female (which was identified by specific wing scars) that hibernated in the same crevice in the cave Huda luknja in 2012 and 2013.

Table 1. Recorded observations of serotine bats *Eptesicus serotinus* in underground hibernacula in Slovenia
(» / « – unknown, M – male, F – female, u – unknown sex, ad – adult, juv – juvenile, T – temperature near the animal).
Tabela 1. Opažanja poznih netopirjev *Eptesicus serotinus* v podzemnih prezimovališčih v Sloveniji
(» / « – neznano, M – samec, F – samica, u – spol neznan, ad – odrasla žival, juv – mladič, T – temperatura pri živali).

Location [cave cadastre number] (altitude a. s. l.; geographical latitude/longitude) / Najdišče [številka jame katastra jam] (nadmorska višina; geografska širina / dolžina)	Date / Datum	Type of hanging location (distance from entrance) / Tip visišča (oddaljenost od vhoda)	Sex / Spol	T [°C]	Source / Vir
Cave, Kevderca na Lubniku [3] (810 m; 46.1654/14.2676)	15.10.1959	/	u	/	Kiauta 1960
Cave, Fantovska luknja 2 [3967] (550 m; 46.2038/15.3097)	15.1.1979	/	M	/	Kryštufek 1984
Cliff overhang at confluence of the stream Poganja (Argila) and the river, Dragonja (20 m; 45.4433/13.6813)	30.1.1984	/ (<10 m)	F	/	Kryštufek 1984
Cave, Srednja jama nad izvirom Šice [6326] (190 m; 45.8086/14.9673)	3.2.1994	/ (30 m)	u	/	Hudoklin 1994
Cave system, Predjamski sistem [734] (530 m; 45.8159/14.1312)	21.3.1999	/	u	/	Presetnik et al. 2009
Cave, Planinska jama [748] (520 m; 45.8202/14.2504)	23.1.1999	/	u	/	Presetnik et al. 2009
	14.1.2001	/	u	/	Presetnik et al. 2009
Cellars of the castle, Grad na Goričkem (330 m; 46.8006/16.1010)	6.2.2000	wall (10 m)	u	/	Presetnik 2004
	22.1.2011	wall corner (10 m)	u	/	
Cave, Erjavčeva jama [466] (660 m; 46.3836/14.7273)	2.2.2006	40 cm deep in ground gravel (50 m)	ad M	+0.9	
Cave, Betalov spodmol [473] (540 m; 45.7925/14.1923)	29.12.2006	ceiling (20 m)	ad M	/	
Cave, Križna jama [65] (640 m; 45.7455/14.4720)	6.1.2009	crevice (140 m)	u	+4.0	
	3.1.2013	crevice (190 m)	u	+5.5	
Cave, Matjaževe kamre [672] (540 m; 46.0028/14.1505)	28.1.2009	crevice (5 m)	u	+4.5	
Cave, Turjeva jama [821] (250 m; 46.2438/13.5092)	10.2.2009	wall (40 m)	juv F	/	
Cave, Huda luknja pri Gornjem Doliču [413] (540 m; 46.4148/15.1791)	12.2.2009	crevice (30 m)	ad parous F	+3.0	
	5.2.2012	crevice (70 m)	ad parous F	-0.2	
	9.2.2013	crevice (70 m)	ad parous F	+3.3	

The preference of *E. serotinus* for hibernating in small crevices, and difficulty with recording them in such places, might explain the rarity of recorded sightings of this species in underground locations. Additionally, its indicated tolerance to low temperatures supports the prediction that it hibernates in non-cave roosts, such as various crevices of cliffs and buildings, as reported by Baagøe (2001) and Dietz et al. (2009).

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