

# Mating of *Myotis capaccinii* (Bonaparte, 1827) and other interesting autumn bat observations in the cave Rivčja jama (central Slovenia)

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**Abstract.** Rivčja jama in central Slovenia is a well researched bat summer roost; however, the autumn composition of its bat fauna is still poorly known. Therefore, we conducted mistnetting in front of the cave on 28. 9. 2011. We caught five bat species; most interesting among them were long-fingered bat (*Myotis capaccinii*) and lesser mouse-eared bat (*M. oxygnathus*), both otherwise rarely recorded in central and eastern Slovenia. Mistnets captures, together with visual observation, also confirmed mating of *M. capaccinii* in the cave.

Key words: Rivčja jama, cave, bats, mating, *Myotis capaccinii*, *Myotis oxygnathus*, Slovenia

**Izvleček.** Parjenje dolgonogih netopirjev *Myotis capaccinii* (Bonaparte, 1827) in druge zanimive jesenske najdbe netopirjev v Rivčji jami (osrednja Slovenija) – Rivčja jama je dobro raziskano poletno zatočišče netopirjev, medtem ko je jesenska sestava netopirske favne manj poznana. Zato smo 28. 9. 2011 pred vhom jame opravili mreženje. Ujeli smo 5 vrst netopirjev, od katerih sta bili najbolj zanimivi v osrednji in vzhodni Sloveniji sicer redko zabeleženi vrsti: dolgonogi netopir (*Myotis capaccinii*) in ostrouhi netopir (*M. oxygnathus*). Glede na vmrežene dolgonoge netopirje in opazovanje v jami sklepamo, da je jama tudi parišče te vrste.

Ključne besede: Rivčja jama, netopirji, parjenje, *Myotis capaccinii*, *Myotis oxygnathus*, Slovenija

## Introduction

Rivčja jama (cave cadastre number 110) is a cave, situated approximately 20 m from the left bank of the Krka River, near Male Rebrce between Ivančna Gorica and Žužemberk in central Slovenia (lat. 46° 07' E, long. 14° 53' N; 220 m a.s.l.). The cave entrance is approximately 10 m wide and 6 m high. First part of the cave is around 30 m long horizontal hall, with a rise at the innermost part of the cave. Observations of bats from Rivčja jama are mostly known from summer, when approximately 500 female greater mouse-eared bats (*Myotis myotis*) form a nursery colony in the cave (Zagmajster 2009a). Individuals of greater horseshoe bat (*Rhinolophus ferrumequinum*), lesser horseshoe bat (*R. hipposideros*),

Schreibers' bat (*Miniopterus schreibersii*) and (in summer 2011) a few individuals of long-fingered bats (*Myotis capaccinii*) were recorded in the cave (Presetnik et al. 2009, 2011, Hudoklin & Presetnik 2012). At the end of summer and in autumn bats may congregate in large numbers in front of the caves during the nights and bat species that swarm at cave do not necessarily roost in it or visit it in other parts of the year (Dietz et al. 2009). As very few data are known for the autumn period (Presetnik et al. 2009), we wished to gain some insights in bat species composition during the swarming period.

## Material and methods

On 28. 9. 2011, we conducted day survey in Rivčja jama and evening mistnetting in front of its entrance. Two mistnets (6 m and 5 m long and approximately 3 m high) were placed at the cave entrance, but they did not reach the ceiling. Mistnets were erected 30 minutes before the sunset (sunset: 17:48 CET DST) and pulled down at 00:50, when bat activity (monitored with Pettersson D200 heterodyne ultrasound detector Pettersson Elektronik AB) abated for at least 30 minutes. Mistnets were regularly checked, species of the caught bats determined using Dietz & von Helversen identification key (2004), sexed, and age category and reproductive status estimated according to Anthony (1990) and Haarsma (2008). We measured the body mass using 60 g Pesola spring scale with 0.5 g precision and forearm length using calliper. Bats were released as quickly as possible, a few meters away from the cave.

## Results and discussion

We caught nine bats of five different species (Tab. 1). This, however, was just a small proportion of flying bats according to bat detector observations. We assume that Rivčja jama is a swarming place; for absolute confirmation, additional research is necessary.

**Table 1.** Mistnetted bats at Rivčja jama on 28. 9. 2011.

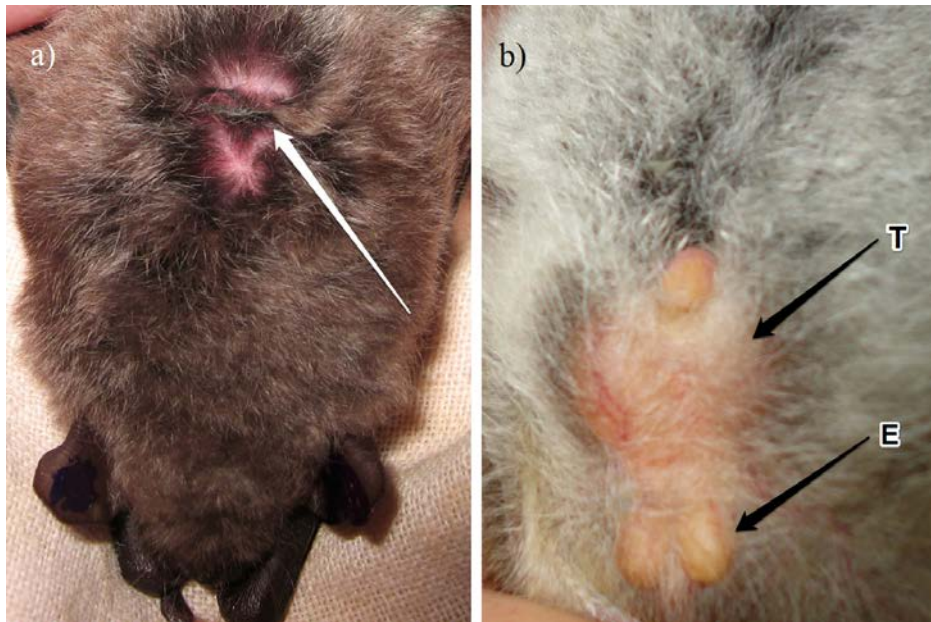
(side of the net: in / out – bats was flying from / into the cave, sex: F – female, M – male; sexual characteristics: E (epididymes): 0 / + / ++ / +++ – empty / little filling / round and almost filled / very rounded and filled, T (testes): 0 / + / ++ / +++ – not swollen / slightly / intermedate / very swollen, age: AD – adult, SUBAD – sub adult, AB – forearm length, m – body mass)

**Tabela 1.** Netopirji, ujeti v mreže pred Rivčjo jamo dne 28.9.2011.

(stran mreže: in – netopirji so leteli iz jame, out – netopirji so leteli v jamo; spol: F – samica, M – samec; spolne značilnosti: E (obmodki): 0 / + / ++ / +++ – prazni / malo polni / okrogli in skoraj polni / zelo okrogli in polni, T (testisi): 0 / + / ++ / +++ neodebeljeni / rahlo / srednje / močno odebeljeni; starost: AD – odrasel, SUBAD – spolno nezrel; AB – dolžina podlahti, m – masa telesa)

Time of capture / Ura ujetja	Air temperature / Temp. / zrak [°C]	Side of net / Stran mreže	Species / Vrsta	Sexual characteristics /			AB [mm]	m [g]
				Sex / Spol	Spolne značilnosti	Age / Starost		
19:11	16.8	In	<i>Myotis capaccinii</i>	F	parous	AD	41.0	9.0
19:20	16.2	In	<i>Myotis capaccinii</i>	F	parous	AD	40.8	8.5
19:26	15.9	In	<i>Myotis capaccinii</i>	F	parous	AD	40.6	9.0
19:26	15.9	In	<i>Myotis capaccinii</i>	M	E: +++ T: ++(+)	AD	39.0	8.5
21:18	14.0	In	<i>Barbastella barbastellus</i>	M	E: ++ T: +	AD	40.0	8.5
21:38	13.6	In	<i>Myotis capaccinii</i>	M	E: +++ T: +++	AD	42.3	8.5
21:38	13.6	Out	<i>Rhinolophus hipposideros</i>	F	nullipara	AD	40.2	8.5
22:22	13.0	Out	<i>Myotis daubentonii</i>	M	T: tiny, dark	SUBAD	37.4	8.5
22:51	12.7	Out	<i>Myotis oxygnathus</i>	M	E: +	AD	58.1	26.0

The most numerous mistnetted bats were the long-fingered bats, with four out of five caught early in the night on the inner side of the nets. Therefore we assume that they were using the cave as a day roost, which is also consistent with our day time observation, when between 14 and 20 bats of a smaller species of the genus *Myotis*, which were assumed to be long-fingered bats, were observed. Two of them were hanging solitarily, while others rested in small groups of 2-3 animals on the ceiling at the end of the cave. At 19:26, a male and a female were caught simultaneously, flying out of the cave (Tab. 1) after a short period of chasing each other at the cave entrance, as observed by ultrasound detector. Wet tuft of fur on the back of the female and very swollen testes and fully filled epididymes of the male indicated that a mating couple had most likely been caught (Fig. 1a, b). Especially wet fur on the female back side (Fig. 1a) is indicative of recent mating, given that during actual mating male bat embraces the female with forearms (ventral dorsal position) and in many species firmly bites into her neck-fur (Dietz et al. 2009). Additional confirmation of mating was the result of cave inspection during the mistnetting. At least 10 long-fingered bats were hanging in a loose group approximately 20 cm apart from each other in the central part of cave ceiling at approximately 22:20 and 22:50. Among them there were at least two presumably mating couples – one bat covering the other with its wings. Mistnetting observations as well as observations from the cave confirm that long-fingered bats use Rivčja jama as mating site. Our and other recent findings (Presetnik et al. 2011, Hudoklin & Presetnik 2012) in respect of this species in Rivčja jama are the first indications that long-fingered bat could have their permanent population also in the Krka River area in the central part of Slovenia. This gives a new perspective of the long-fingered bats' distribution, since all other new records have been restricted mainly to the SW part of the country (Jazbec 2009, Presetnik et al. 2011), with only one record of a single individual in the Krka River valley approximately two decades ago (Hudoklin 1999). The possible permanent population is therefore important information for the species' conservation. More research, however, is needed to fully understand its distribution in this area.



**Figure 1.** a) Wet tuft of fur on *M. capaccinii* female's back indicating recent mating, b) very swollen testes (T) and fully filled rounded epididymes (E) of male caught simultaneously at Rivčja jama on 28.9. 2011 (photo: Simon Zidar).

**Slika 1.** a) Moker šop dlake na hrbtu, ki nakazuje da se je samica dolgonogega netopirja (*M. capaccinii*) pred kratkim parila in b) močno odebeljeni testisi (T) in zelo polni okrogli obmodki (E) samca, ki je bil ujet hkrati s samico pred Rivčjo jamo dne 28.9.2011 (foto: Simon Zidar).

Second interesting finding was the discovery of lesser mouse-eared bats (*M. oxygnathus*), which is the second observation of this species in SE Slovenia; it is the first after more than 30 years (Đulič 1979 in Presetnik et al. 2009) and approximately 30 km E of the eastern most published newer record of this species in the southern part of Slovenia (Zagmajster 2009b). The caught male had 9 horizontal creases on the left ear and 8 on the right ear, which initially indicated a greater mouse-eared bat, until noted that it was without the characteristic black spot on the tip of the tragi. The length of its upper tooth row was 8.6 mm, which firmly determined it as lesser mouse-eared bat. Nursery colonies of the greater mouse-eared bat are often mixed with other bat species in large clusters (Dietz et al. 2009). In Slovenia, at least two such cases are known, where individuals of lesser mouse-eared bats are mixed in groups with greater mouse-eared bats and other species in caves (Zagmajster 2009a, b). Our finding of the specimen of lesser mouse-eared bat at Rivčja jama opens a question, whether the species is also present in nursery colony with greater mouse-eared bats during the summer.

Other caught bats, i.e. lesser horseshoe bat, barbastelle bat (*Barbastella barbastellus*) and Daubenton's bat (*M. daubentonii*), are commonly found in the vicinity of Rivčja jama (Presetnik et al. 2009). Nevertheless, the last two are new species for Rivčja jama, in which 8 bat species have now been confirmed.

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