

***Pipistrellus kuhlii*, a bat species breeding and hibernating in the Czech Republic**

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Abstract. On 2 December 2010, an adult female Kuhl's pipistrelle (*Pipistrellus kuhlii*) was caught in the village of Dobšice, a southeastern suburb of the Znojmo town. The finding supports the hypothesis of the species' hibernation in the urban area. On 18 May 2012, another adult female was mist-netted above a small pond surrounded by reeds and shrubs in an abandoned quarry located at the northeastern edge of the Brno city. On 5 June 2012, the female gave birth to male twins after three weeks in captivity. This is the third record of *P. kuhlii* in the Czech Republic but the first one indicating reproduction of this species in the country.

***Pipistrellus kuhlii*, distribution, reproduction, postnatal development, Central Europe**

Introduction

Pipistrellus kuhlii is one of the most common and abundant bat species in the Mediterranean zone of the Palaearctic region, occupying mainly lowlands, areas along sea coast, river valleys, but also urban areas such as cities or their suburbs. The first record of *Pipistrellus kuhlii* from the Czech Republic comes from 25 August 2007, when one individual was caught in Znojmo, southern Moravia (Reiter et al. 2007). This record supports evidence of occurrence of this species in close proximity to human shelters. Almost all previous records from the marginal parts of its range show that *Pipistrellus kuhlii* is highly attached to urban habitats, as it exhibits one of the highest degrees of synanthropy among bat species in Europe (Bogdanowicz 2004). Due to several observations made in neighbouring countries, presence and reproduction of the species in the Czech Republic has been considered very likely. The northern edge of the western part of its range passes through southern Germany, large parts of Austria and Hungary where reproduction has been documented recently (Bauer 1996, Fiedler et al. 1999, Estók 2006). The eastern part of the range and recently expanding population was found in the Dnester basin in Ukraine (Sachanowicz et al. 2006). Danko (2007) found reproducing population in southeastern Slovakia. Findings between the western and eastern parts of the range are connected to occurrence in Pannonia, filling out the lowland areas inside the Carpathian Arc. Ceľuch & Ševčík (2006) netted only one adult male in a park in the town of Nitra, but reproduction of the species was not confirmed. Another record comes from the Bratislava city (see the map by Hanák et al. 2010). The finding made in Poland is probably related to a passively transported individual or a vagrant (Sachanowicz et al. 2006, Popczyk et al. 2008).

Results

Our first record of *P. kuhlii* was made at Dobšice near Znojmo (48° 51' N, 16° 05' E, 230 m a. s. l.), only 1.7 km from the record published by Reiter et al. (2007). The bat was captured

Table 1. Weight (W) and forearm length (LAt) of juveniles at particular weeks of age before weaning. The pups were not marked, therefore mean values for the two individuals are given.

age	W [g]	LAt [mm]
new born	1.0	11.7
1st week	1.0	15.6
2nd week	1.5	20.3
3rd week	2.0	28.8
4th week	3.2	32.2
5th week	4.3	32.8

in a prefab house on the edge of a small housing estate. The wider area of the finding place is a typical peripheral part of the town (garages, family houses) and industrial areas of the south are connected to gardens and fields. Location of the record is 900 m from the Dyje river. A female was found in bad condition, dehydrated, and died after several days in captivity. External measurements of the bat were as follows: weight 6.1 g, head and body length 48 mm, tail length 40 mm, forearm length 34.5 mm, ear length 12.3 mm, tragus length 6.0 mm. The white fringe on the plagiopatagium and uropatagium reached only 0.5 mm in width. The dead bat was deposited in the zoological collection of the South Moravian Museum in Znojmo, under the number 6997 (alcohol preparation, skull extracted). On the skull we found an old healed injury on the nose and a healed upper canine.

Another record was made during a mist netting session on 18 May 2012. Two nets, 12 and 10 m long, were installed near the water body in the former Růžena quarry (registered as a *Significant Landscape Element*), a part of the Hády quarry complex (49° 13' N, 16° 40' E, 310 m a. s. l.). The locality is situated on the eastern edge of the Brno city; the large quarry on the southern slope of the Hády hill is located close to the borders of the Moravian Karst Protected Landscape Area. Of all Bohemian and Moravian quarries, Hády has a unique location on the southern slope in the middle of rich forest-steppe vegetation. The quarry has not been fully mined out. That is why there is, instead of a deep hole, a hillside furrowed with opened terraces, which offer much more room for subsequent reclamation. Several water bodies were made there and immediately inhabited by many animal and plant species associated with aquatic habitats. In the past years successful reclamation minimized the environmental effects of mining.

Nets were installed at the place where there is a gap in reeds and shrubs surrounding all ponds in the area. The closest buildings are situated around 550 m from the mist-netting place. One *Pipistrellus kuhlii* – a pregnant female was netted on that night at around 10 p.m. together with a *Myotis myotis* female. The female of *P. kuhlii* showed typical characteristics of the species: light reddish-brown fur and brown colored naked parts of the body. On plagio- and uropatagium there was a clear white fringe, reaching 1.5 mm in width.

External measurements of the specimen were as follows: weight 8.2 g, head and body length 50.8 mm, tail length 34.5 mm, forearm length 34.9 mm, ear length 11.2 mm, tragus length 5.4 mm, 3rd finger 58.2 mm, 5th finger 42.5 mm. Coloration as well as external measurements are in accordance with description of the species and characteristics given in identification guides (e.g. Schober & Grimberger 1998, Dietz et al. 2007).

The female was measured, fed and given water to drink. The female showed signs of exhaustion therefore we kept it in captivity for ca three weeks. During this time we recognized that

female was pregnant and on 5 June it gave birth to male twins (Fig. 2). The female nursed the pups perfectly despite some stress from captivity. Both young bats were regularly weighed and measured (Table 1), the female received vitamin mixture in water and food ad libitum. The pups ate some mealworms for the first time at the age of five weeks. After one more month the young were released at the netting place, while the female was deposited in the zoological collection of the Department of Botany and Zoology of the Masaryk University, Brno, under the number 124 (alcoholic specimen).

Discussion

Both our records of the Kuhl's pipistrelle in the Czech Republic prove that the species has been spreading within Europe. At the end of the millennium it was observed to spread northwards to most of Europe, especially in the Iberian Peninsula, northeastern part of France, Italy, southeastern Austria, Switzerland and Hungary. Spitzenberger & Bauer (2001) found a stable reproducing population of *Pipistrellus kuhlii* in Vienna, which is the closest site to the first Kuhl's pipistrelle record in the Czech Republic (Reiter et al. 2007), and to our winter finding as well. The record made in Brno is located about 61 km northeast of Znojmo. At present, Brno and its environs seems to be the northernmost point of the species' regular occurrence and reproduction.

The female from Brno was caught quite soon after dusk, when foraging bats usually seek water source (Barti 2010). This may mean that there might be a maternity roost in the close proximity. The study conducted by Barak & Yom-Tov (1991) in Israel showed that lactating females from the maternity roost fly directly to an already known foraging site and use regular flight paths.



Fig. 1. Female of *Pipistrellus kuhlii* with three-week-old offspring.

This bat species occurs mostly in the neighborhood of human shelters and was found to use roosts in man-made structures despite the availability of natural shelters (Abdulaziz 2008). This way of choosing places can be very beneficial. A study focused on big brown bats (*Eptesicus fuscus*) showed comparison of two populations, one roosting in a natural and one in artificial (man-made) shelter (Lausen et al. 2006). Thermoregulation played a crucial role there. During pregnancy females from man-made structures used much less torpor than those in the natural habitat. Such differences can help bats using buildings to give more active days for fetal development which is connected with the fact that they give birth much earlier than the bats which use natural sites (crevices in rocks, hollow trees). All this helps bats to save energy and focus on giving birth and feeding juveniles. Microclimate is one of the most important roost characteristic, therefore females as well as juveniles can have benefits of associating with higher temperature in buildings. Higher temperature determines life style and behavior of *Pipistrellus kuhlii*, can save energy, reduce predator risk, give birth faster and increase juvenile development (Neuweiler 2000). All these aspects can play an important role, particularly in the occurrence in the marginal region of the range, in colder areas of the temperate zone (Burnett & Kunz 1982, Kunz & Fenton 2003).

Moreover, we observed very rapid development and growth of the young in captivity, documenting an ability to succeed in the temperate zone. Parental care and raising of the juveniles is performed by females during lactation, which takes usually 3–4 weeks. In our case, the young were raised in captivity and the mother had a less varied diet but the food was given much more often than it is possible in natural conditions. During the first week we observed rapid growth of the juveniles: a 30% increase of body mass and 48% in forearm length, which is less when compared to juveniles raised in natural conditions – 40 and 57% of increase (Abdulaziz 2008). The juveniles were able to fly and take solid food independently at five weeks, when they reached 72% of the female weight (similarly as in *Pipistrellus pipistrellus*, e.g. Kelly et al. 2008).

Within one kilometer from the netting place, there are two large blocks of flats, which in the past provided roosts to at least seven nursery colonies of *Nyctalus noctula*, *Pipistrellus pipistrellus* and *Eptesicus serotinus*. The species *Pipistrellus pipistrellus* and *Nyctalus noctula* are known to use prefab houses widely in recent years (Cef'uch et al. 2006), and in particular, they lose these roost possibilities due to the rapid process of reconstructions and insulation of the houses. There are many such roosts in Brno. During 2012, when systematic monitoring was conducted, at least 20 shelters of *Pipistrellus pipistrellus* were found (own unpublished data). The findings by Danko (2007) documented nursery colonies of *Hypsugo savii* and *Pipistrellus kuhlii* from the same types of prefab houses in eastern Slovakia. We suppose that the netted female found a refuge in a similar environment and perhaps shared a common roost with females of *Pipistrellus pipistrellus*. Sharing of one roost by different species is well known from *Pipistrellus nathusii*, *P. pipistrellus* and *P. pygmaeus* (Flaquer et al. 2005).

Little information is available on hibernation in the Kuhl's pipistrelle; however it could hibernates in prefab houses such as *Pipistrellus pipistrellus*. Possible hibernation in an urban area is supported by the finding from Dobšice in 2010. Nevertheless, it is unlikely that the female flew over a long distance from its previous roost. It is therefore highly likely that the bat hibernated somewhere in the buildings at Dobšice or Znojmo.

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