



# A Mass Wintering of the Common Noctule *Nyctalus noctula* (Schreber, 1774) (Chiroptera: Vespertilionidae) in a Town of South-eastern Poland

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**Abstract:** Sites of mass wintering of the common noctule *Nyctalus noctula* were found in a small town (Nowy Sącz – ca. 83 thousand inhabitants) in south-eastern Poland. Bats hibernated in attics of five-storey buildings in a housing estate. In total, 905 individuals were found in attics surveyed on 20 November 2014 and 230 individuals in two nearby attics surveyed on 10 February 2015. Much more bats of this species, probably several thousands, hibernated in the whole housing estate, which counted 65 similar buildings. During the reproduction period, common noctules occupied attics less frequently (up to 48 individuals in one building).

**Key words:** bats, hibernation, winter roosts, urban habitat, climate change, Central Europe

## Introduction

The common noctule *Nyctalus noctula* (Schreber, 1774) (Vespertilionidae) is amongst the bat species with the longest seasonal migrations at distances as far as 1,600 km (HUTTERER et al. 2005). Particularly, long passages have been noted in the eastern part of the continent, which is characterised by longer and relatively cooler winters (STRELKOV 1969). Several decades ago, this bat species was considered in Poland a regularly migrating species, which was especially true for populations living in the eastern part of the country (KRZANOWSKI 1956, KOWALSKI & RUPRECHT 1984). According to STRELKOV (1969), the species selects areas of mean air temperature in January above  $-3^{\circ}\text{C}$  for its wintering grounds. Large winter roosts have been known in Germany (GEBHARD & BOGDANOWICZ 2004), where over 10,000 of hibernating common noctules have been found in some places (HAARJE 1994).

In recent years, the number of winter records of the common noctule has markedly increased in Poland (ŁUPICKI et al. 2007). Wintering of this species was noted in the central and eastern parts of the country (LESIŃSKI et al. 2001, LESIŃSKI 2006, RUCZYŃSKI & RUCZYŃSKA 2006, LESIŃSKI & JANUS 2019). Increasing colonisation of urban areas and markedly enhanced sedentariness of this species was described for some places in Central Europe (KAŃUCH & CEEUCH 2000, PROKOPH & ZAHN 2000, BIHARI 2004, CEEUCH et al. 2006). Having this in mind, one may expect to find a greater number of winter roosts of the common noctule in Poland.

## Materials and Methods

Studies were carried out in Nowy Sącz, a town in south-eastern Poland (83,000 inhabitants), in two residential buildings built of concrete slabs (Fig. 1). The five-storey buildings have been insulated with

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Styrofoam. Between the highest floors and the flat roofs of the buildings, there are low attics (with maximum height of 80 cm). Their floor has been insulated with mineral wool.

Nowy Sącz is situated in the flat bottom of the Sądecka Valley between the Dunajec River and its tributary the Kamienica Nawojowska River at an elevation from 272 to 475 m a.s.l. (Majdan Hill). The town is located at the foothill of mountain ridges: Beskid Sądecki to the south, Beskid Wyspowy to the west, Beskid Niski to the east and Pogórze Rożnowskie to the north. At a short distance from the town, there the Rożnowskie Lake is situated. The surface area of the town is 58 km<sup>2</sup> and the geographic coordinates of the housing estate are 49°37'30" N, 20°41'44" E.

A detailed survey of the buildings was made on 23 April, 20 July and 20 November 2014. All walls were observed with particular attention paid to cracks and openings in the walls (especially those with visible smudges of dirt and fat left by rubbing animals), air holes and surroundings of window sills, gutters and drainpipes. Much attention was paid to the edges of metal sheets on roofs (frequent places of hiding). Marks of the presence of bats (faeces) were searched for near the buildings. Attics were also surveyed.

Evening counting of bats flying out of attics was done on 17 September 2014. Observation of bats leaving their daily shelter started two hours before dusk. Every flying individual was recorded and the time of start and end of bats' flying out of the attic was noted. Bats were identified considering their size and silhouette. Additional monitoring was performed with ultrasonic detector LunaBat DFD-1 operating in the system of frequency division. Sounds were recorded with digital sound recorder Samson Zoom H1.

Detailed survey of whole attics was made in only two buildings (further referred to as Building 1 and Building 2). In other two buildings, parts of attics were surveyed on 10 February 2015. In many other buildings, studies were not possible due to

unavailability of attics, which entrances were bricked up.

## Results

Counting bats flying out of attics of two buildings just before hibernation (on 17 September 2014) revealed the presence of 546 individuals of the common noctule (Table 1). No other bat species were recorded. The flight of common noctules took place early before dusk (Fig. 1). The time of flying out of the attic of the Building 1 was determined for 252 individuals. The first individual flew out 50 minutes before sunset and the last one 10 minutes before sunset. The greatest intensity of flying was noted from 47 to 32 minutes before sunset (Fig. 2).

In total, 905 wintering individuals of the common noctule were recorded during the survey of attics on 20 November 2014. Bats stayed on the walls of attics and on mineral wool lining the floor (Fig. 3). Those on walls formed groups of up to 30 individuals (Fig. 4). Moreover, surveys made on 10 February 2015 in two other buildings revealed the presence of about 230 hibernating individuals. Roosts in attics were also inhabited by common noctules during the reproduction period. Their number was, however, notably lower. In a single building no more than 50 individuals were present (Table 1).

## Discussion

Having in mind that detailed studies covered only two buildings out of 65 similar buildings in this housing estate in Nowy Sącz, one may expect that several times more bats than actually observed are wintering there. During observations in September, bats flying out of attics were noted not only from the two analysed buildings but also from several others in the neighbourhood. If other buildings were occupied by similar number of bats, then their total number in the housing estate might be estimated at several thousand. Wintering of this species in similar buildings has also been noted in the town of

**Table 1.** Numbers of individuals of the common noctule during four surveys of buildings.

Building	23 June 2014*	20 July 2014*	17 September 2014**	20 November 2014*
1	37	35	277	580
2	42	48	269	325
Total	79	83	546	905

\* surveys of attics

\*\* counting bats flying out of buildings



**Fig. 1.** Building with the common noctule flying out of the attic. Arrows indicate some outlets from the attic.

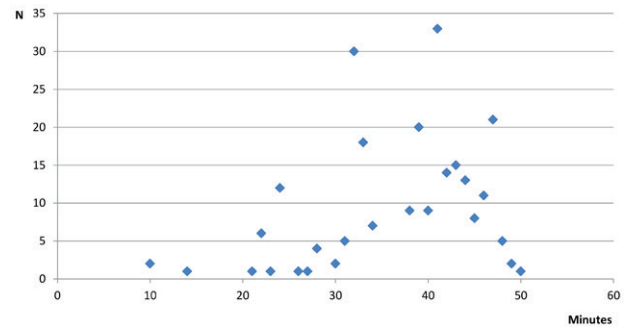


**Fig. 3.** Individuals of the common noctule hibernating on mineral wool in building's attic.



**Fig. 4.** A cluster of the common noctule hibernating in an attic.

Prešov (Slovakia), situated 80 km south of Nowy Sącz (KAŃUCH & CEEUCH 2000). So far, the nearest finding of wintering common noctules recorded was in Krynica (about 30 km south-east of Nowy Sącz), where one individual survived winter 2005/2006 in the attic of an Orthodox church (ŁUPICKI et al. 2007). One may not exclude the possibility of other



**Fig. 2.** The number of common noctules flying out of attic in relation to the time (in minutes) before sunset (N=252).

winter roosts of the common noctule in buildings in the regions of southern Poland and north-eastern Slovakia.

Since the number of bats occupying buildings in Nowy Sącz during reproduction is much lower than those wintering there, one might expect that most wintering bats fly in from other areas. There are no data on the distances of their flights. An indication of how long such flights might be an example of a common noctule ringed in a winter roost in Slovakia and found next summer in the Białowieża Forest, north-eastern Poland (KAŃUCH et al. 2004). It is thus possible that buildings in Nowy Sącz serve as a winter roost for bats inhabiting regions several hundred kilometers away. These might be the areas of eastern Poland but also in the Baltic republics and Belarus.

The described case of mass wintering of common noctules is certainly not exceptional and further studies should allow for finding other large winter roosts of *N. noctula* in Poland. Such findings may be expected also in cooler regions of the country, especially if global climate change will proceed. The indicated by STRELKOV (1969) threshold mean temperature in January ( $-3^{\circ}\text{C}$ ) that enables wintering of the common noctule has been recently confirmed in central and partly in eastern regions of Poland (WÓJCIK & MIĘTUS 2014). Recently common noctules successfully hibernated even in poorly isolated place (balcony) in Warsaw, central Poland (LESIŃSKI & JANUS 2019).

The increasing number of winter roosts of the common noctule found in Central Europe confirms the deeper penetration of its populations into towns in search for shelters in buildings. With increasing trend of global climate change, these bats could show enhanced sedentariness and likely hibernate in areas, from where they flew for wintering over 1000 km away several decades ago (HUTTERER et al. 2005).

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