

## Observation of a Western Barbastelle *Barbastella barbastellus* (Chiroptera: *Vespertilionidae*) in new ‘crevice’ boxes for bats

Alek Rachwald<sup>1\*</sup> , Iwona Gottfried<sup>2</sup> , Katarzyna Tolkacz<sup>3</sup>

<sup>1</sup>Forest Research Institute, Department of Forest Ecology, Sękocin Stary, ul. Braci Leśnej 3, 05–090 Raszyn, Poland; <sup>2</sup>University of Wrocław, Zakład Ekologii i Behawioralnej, ul. Sienkiewicza 21, 50–335 Wrocław, Poland; <sup>3</sup>University of Warsaw, Faculty of Biology, Institute of Zoology, Department of Parasitology, ul. Miecznikowa 1, 02–096 Warszawa, Poland

\*Tel. +48 22 7150416, fax +48 22 7150507, e-mail: a.rachwald@ibles.waw.pl

**Abstract.** A Western Barbastelle, *Barbastella barbastellus* (Chiroptera: *Vespertilionidae*, Schreber, 1774), was observed to inhabit ‘crevice’ bat boxes very late in the year. In November 2016, in two out of three study areas, a small number of Western Barbastelle specimens, five individuals and one individual respectively, were observed inhabiting bat boxes at night temperatures below zero and with snow cover. The occurrence of this species in summer-type hiding places during winter weather conditions has not been reported previously in Poland.

**Keywords:** bats, Western Barbastelle, *Barbastella*, forest, November

### 1. Introduction

The Western Barbastelle *Barbastella barbastellus* is a forest bat occurring throughout Poland. This species is under strict protection and requires active protection. It is protected under the provisions of several international conventions on nature conservation, including the Berne Convention, the Bonn Convention and the Agreement on the Conservation of Populations of European Bats (EUROBATS). Under the Habitats Directive, the Western Barbastelle is an indicator species for the designation of areas proposed for protection within the Natura 2000 network. It is on Poland’s Red List of animals threatened with extinction and endangered in category DD (data deficient) – with the status of poorly recognised and confirmed threat, but not clearly defined, the European Red List of mammals as a species that may soon become extinct (VU category) and on the IUCN list as near threatened (NT). Records of the Western Barbastelle are not very numerous and uneven (Gottfried et al., 2015). In the summer, it prefers old deciduous tree stands, hiding in the crevices of trunks with a diameter of about 40 cm or more, mainly in oaks, beeches and hornbeams (Rydell, Bogdanowicz 1997, Kowalski et al. 1996, Rachwald, Nowakowski

1994, Spitzenberger 1993). It usually does not use typical tree hollows, but rather the natural fractures of deciduous tree trunks, lobes of the protruding bark of dying trees with a diameter of 20–40 cm, or crevices formed in the fork of trunks (Hermanns et al. 2003; Manias, Ignaczak 2008). Quite often, the Western Barbastelle roosts were located in dead trees that potentially provide more of this type of shelter. For example, in the beech forests of central Italy, 20 out of 33 located roosts of this species were found in dead trees, eight on trees with half of their branches dead, and another five with mostly dead branches (Russo et al., 2004). Similar data from Poland on its summer shelters in forests are extremely scarce. In the summer, the Western Barbastelles are sometimes found behind the exterior wooden cladding of buildings or shutters (Rudolph et al., 2003, Wojtaszyn et al. 2008). They seek shelter in rock crevices during the summer more rarely (Siero 1999). This species overwinters in cool underground cellars, such as in forts, large brick cellars or bunkers, where it is often the dominant species of bat (Fuszara et al. 2003). The first hibernating individuals are observed in November. From the end of January, their numbers in wintering shelters (hibernacula) fall sharply, so that in March, they are almost no longer seen (Fuszara et al. 2003).

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Due to the specific requirements of summer roosts, Western Barbastelles do not inhabit typical nest boxes (imitating hollows) placed in forests for bats and birds. In the entire period encompassing published data from Poland, this bat species was found only once in a bat box (Błachowski 2011). In 2014, as part of a project implemented at the Forest Research Institute and the University of Wrocław, bat boxes were hung for the Western Barbastelle that imitated crevices (Gottfried, Rachwald 2016). In Poland, Western Barbastelle colonisation in this type of artificial roost – the so-called ‘crevice’ box – is a completely new phenomenon and in the testing stage. One of the aims of this project was to determine how long before beginning hibernation do the Western Barbastelles use crevice boxes.

## 2. Methodology

Artificial roosts, in which the Western Barbastelle was confirmed, were placed in tree stands as part of a research project to design and test the crevice boxes designated specifically for this species (Figure 1). Their design was based on a crevice box constructed by F. Greenaway (Greenaway, Hill 2004).

The presence of bats was studied from the beginning of their active season until October 2016 in six areas, where there was a total of 290 boxes of this new type. As of November 2016, inspections were conducted in three sites (two in central Poland: the Chojnowskie Forest and Dąbrowa Naruszewskie Forest and one in the southwestern part of the country, in the Czeszowska Plain), to check 140 boxes (two sites had 50 boxes each, one site had 40). The boxes were arranged in groups of five, with distances of around 200 m between the groups. Each of the five boxes in a group were hung at distances of about 10 meters from each other. In order to determine how long it took until the bats colonised the boxes, inspections were conducted at intervals of about two weeks until the end of December 2016.

The bats were observed using non-invasive methods. Their presence was confirmed without disturbing them by shining a strong stream of light from a flashlight directed

from below (this was possible due to the open construction of this model of box). Bats were identified on the basis of external morphological features. Binoculars were used for the identification. This identification method was fully effective due to the Barbastelle’s characteristic appearance and lack of similar species in the Polish fauna. The non-invasive observation methods used – with binoculars – made it impossible to determine their age and sex.

The minimum and maximum temperature during individual inspections per day was taken from the website of the meteorological station closest to the study area where the Barbastelles were recorded (<http://www.weatheronline.pl>).

## 3. Results

In the course of the research, it was confirmed that the Western Barbastelle readily inhabits this new type of artificial roost and is the dominant species in them (Gottfried, Rachwald 2016). During the autumn inspections (migration period and the end of migration) conducted in 2016, individuals of this species were regularly observed in the crevice boxes. In November 2016, the presence of Western Barbastelles was also confirmed at the sites of the Chojnowskie Forest and Dąbrowa Naruszewskie Forest. In the Czeszów Plain, individuals of this species were recorded until October. The latest confirmed sighting of a Western Barbastelle took place in the second half of November 2016. Five individuals were observed in the boxes in Dąbrowa Naruszewskie Forest and one in the Chojnowskie Forest. The minimum temperature during the day at that time was 0 °C, while the maximum temperature was +1 °C. In the discussed period (starting from November 4), the air temperature at night had been dropping below zero. At both sites, snow lay on the ground after the precipitation of November 9, 2016 (Fig. 1). In southwestern Poland, the latest observations of bats occur during the second half of November. Two *Pipistrellus* sp. (species not identified) were found in a crevice box on a day when the minimum daily temperature was -4 °C and the

**Table 1.** Observations of Western Barbastelle and bats of other species in boxes in three research areas in November-December 2016

Study area	1 <sup>st</sup> half of November	2 <sup>nd</sup> half of November	1 <sup>st</sup> half of December	2 <sup>nd</sup> half of December
Dąbrowy Naruszewskie	15 Bbar	5 Bbar	0	0
Lasy Chojnowskie	2 Bbar 1 Paur	1 Bbar	0	0
Równina Czeszowska	1 Pispp 1 Nnoc	2 Pispp	0	0

Explanations: Pispp – *Pipistrelle* sp. / *Pipistrellus*, Nnoc – Greater Noctule / *Nyctalus noctula*, Paur – Brown Long-Eared Bat / *Plecotus auritus*, Bbar – Western Barbastelle / *Barbastella barbastellus*



**Figure 1.** Snow-covered ‘crevice’ box in November 2016, when specimen of Western Barbastelle was found there (photo A. Rachwald, 2016)

maximum was +4 °C; however, no Barbastelles were found at that time. Inspections conducted in December did not find the presence of bats in boxes at any of the sites (Table 1).

#### 4. Discussion

So far, such a prolonged occurrence of Western Barbastelles in roosts used during the breeding season has not been observed. This is probably due to the lack of proper research, and in particular, to the fact that this bat occupies hard-to-reach roosts – crevices (Hermanns et al. 2003, Hillen et al. 2011). Therefore, complete data are lacking on its distribution, as well as knowledge about the many facts relating to the biology of this species. The maximum information about the occurrence of bats in forests comes from the study of species that inhabit typical bat boxes, as well as nest boxes designed for birds (Kasprzyk, Tomaszewski 2008, Lesiński 2009). Only the use of the crevice boxes designed specifically for the Western Barbastelles allowed us to obtain direct data by observing and counting bats in their summer roosts (Greenaway, Hill 2004).

In August and September in the Northern Hemisphere, one can observe the bats that winter in underground roosts (including the Western Barbastelle) congregating in the vicinity of larger wintering sites, where ‘swarming’ takes place, that is, the concentration of bats combined with foraging and mating behaviours (Gottfried 2009, Parsons et al 2003, Schunger et al. 2004). Bats in Poland were occasionally observed in nest boxes during warm autumn days until the middle of November; however, the Western Barbastelles (Lesiński, Blicharski 2002, Lesiński 2009) were not recorded among them. The Western Barbastelles probably begin to leave the forests they inhabited over the summer at the end of August or beginning of September, when young bats are fully able to fly. Colonies of this species finally disperse in September–October (Sachanowicz, Ciechanowski 2005), but the concentration of individuals in the vicinity of the underground roosts is already observed at the turn of August and September (Gottfried 2009). A very late record of these bats in summer roosts located directly at the site of summer breeding colonies (Gottfried, Rachwald 2016) is an interesting contribution to the knowledge about the seasonal activity of this species. It would be important to determine the features of the bats occupying the boxes in November: whether they were immature individuals or fully mature and sexually active. It is also possible that there is an undiscovered wintering roost close to the site of this observation. The ways and time of bats’ use of summer roosts requires further research, which may contribute to a better understanding of the behaviour of this species, which will help in the development of effective protection measures.

#### Conflict of interest

The authors declare that there are no potential conflicts of interest.

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## Authors' contributions

A.R. – concept, field work, writing, literature review, corrections; I.G. – concept, field work, writing, literature review; K.T. – field work, writing, literature review.