

# Aktualne trendy zmian liczebności nietoperzy zimujących w Jaskini Szachownica

## Current trends of bat numbers wintering in Szachownica Cave

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### Abstract

Szachownica Cave located in the Wieluń Upland, in the north Jura is one of the five largest bat wintering sites in Poland. It is protected by the reserve conservation and it is included in the Natura 2000. It is an object where bats are monitored continuously for 37 years - twice in each winter season: at the end of January and at the early March. The highest number of winter bat colony in the Szachowica Cave was recorded in March 2009, when 2902 bats, representing 11 species were recorded. Every year, there are recorded quite large variations in the size of the whole group as well, as in the individual species. For most of the most over-wintering taxa in the course of many years of research, there is an upward trend in numbers. The least common species found in the cave are Serotine bat *Eptesicus serotinus*, Noctule *Nyctalus noctula* and Pond bat *Myotis dasycneme*. In the years 2015 and 2016, there were conducted extensive mining works to secure the ceiling and walls of some of the halls of the Cave, that were the cause of the infarction (as part of the Life + project, carried out by RDOŚ in Katowice). The next few years of monitoring of species abundance and species diversity in bats wintering in Szachownica Cave will help answer the question of whether and to what extent the work will affect bats life.

### Introduction

Monitoring of the number of wintering bat groups in the Szachownica Cave in the Wielun Upland (Silesian Voivodeship) was initiated in March 1981. Since then, regularly every year at the end of January and early March in the wintertime bats are counted using the same methodology. Parts of the cave Szachownica I and Szachownica II cut with the quarry are treated as one. Also numbers of the two very difficult to identify hibernation species are counted together: Wiskered bat *Myotis mystacinus* and Brandt's bat *Myotis brandtii*. Monitoring of the number of wintering bats in the Szachownica cave was summarized several times (Kowalski and Lesiński, 1991; Kowalski and Lesiński, 1994; Kowalski et al., 2002 and Ignaczak et al., 2004). The results of thirty years of research are summarized in Lesiński and others (2011). The cave has about 1000 meters of corridors, with a large part of the natural emptiness being transformed by the activity of the quarry. As a result of these

changes and the activity of weathering the cave, the cave was in danger of collapsing.

The project "Carrying out the necessary conservation work on the territory of Szachownica Cave designated within Natura 2000 / Wykonanie zabiegów ochrony przyrody na terenie Specjalnego Obszaru Ochrony Siedlisk Natura 2000 Szachownica" LIFE12 NAT/PL/000012, co-financed by the European Union under the Life + and the National Fund for Environmental Protection and Water Management in the two summer seasons (2015 and 2016), mining works inside the facility were carried out, consisting in the physical protection of the ceiling of Szachownica Cave from uncontrolled collapse.

The results of many years of research indicate significant changes in the structure of wintering bat groups and their directivity in relation to the majority of species.

### Objective of the study

The paper aims to summarize 37 years of study of changes in winter abundance of bats in Szachownica Cave, and to present and attempt to evaluate the results of the last two seasons, made during and immediately after the roof collapse in the Life + project.

### Results

There were 11 species of bats in Szachownica Cave (Tab. 1). In case of small species of mouse-eared bat, so far it has not been confirmed unequivocally possibility of occurrence of the recently distinguished Alcatheo whiskered bat *Myotis alcathoe*. In contrast, there was demonstrated wintering of both morphologically similar mouse-eared bats: Brandt's bat and Whiskered bat, where there is the highest number of Brandt's bats.

The cave in January and March is dominated by both Natterer's bat *Myotis nattereri*, and Greater mouse-eared bat *Myotis myotis*,

**Tab. 1.** Species composition and dominance (%) of hibernating bats in Szachownica Cave in the past 10 years

Species	January (17697)	March (18764)
Greater mouse-eared bat <i>Myotis myotis</i>	23,79	25,86
Bechstein's bat <i>M. bechsteinii</i>	0,64	1,16
Natterer's bat <i>M. nattereri</i>	35,54	44,65
Brandt's bat <i>M. brandtii</i> / Whiskered bat <i>M. mystacinus</i>	3,55	3,65
Pond bat <i>M. dasycneme</i>	0,11	0,09
Daubenton's bat <i>M. daubentonii</i>	2,04	3,24
Serotine <i>Eptesicus serotinus</i>	0,005	0
Noctule <i>Nyctalus noctula</i>	0,025	0,03
Brown long-eared bat <i>Plecotus auritus</i>	10,11	7,08
Barbastelle <i>Barbastella barbastellus</i>	24,19	14,24

*Barbastella barbastellus* and Brown long-eared bat *Plecotus auritus*. In the "heat-loving" species (Natterer's bat and Greater mouse-eared bat), the higher percentage of the grouping was recorded in March, while in cold-loving species (Barbastelle and Brown long-eared bat) in January (Table 1). Other species are less numerous. Noteworthy is the very close dominance of Lesser mouse-eared bat (Whiskered bat and Brandt's bat) for both dates of registration (Table 1). The highest numbers of bats of particular species are presented in Table 2. The number of Bechstein's bat *Myotis bechsteinii* counts Szachownica Cave as the largest wintering area of this species in Poland (Ignaczak et al., 2011).

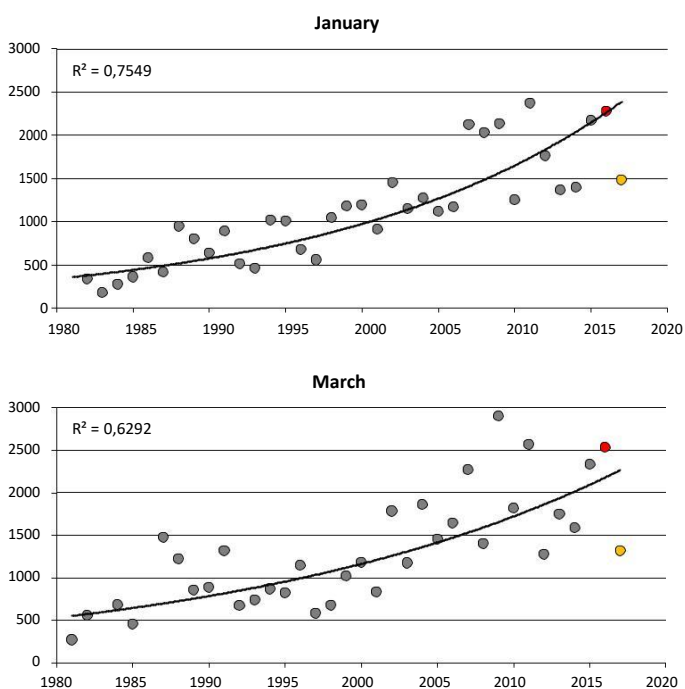
Over 37 years of monitoring studies in Szachownica Cave, there were significant variations in the total number of wintering bats between successive seasons. However, in both cases is seen a significant (statistically significant) upward trend (January and March) (Figure 1).

This rule covers also the results of the registrations during last two seasons. The size of the entire grouping in 2016, both during the January and March counts, was one of the highest recorded so far (marked in red on Fig.1).

**Tab. 2.** Maximum number of individual species of bats found in Szachownica Cave

Species	Date	Number of bats
Greater mouse-eared bat <i>Myotis myotis</i>	05.03.2016	846
Bechstein's bat <i>M. bechsteinii</i>	05.03.2011	50
Natterer's bat <i>M. nattereri</i>	05.03.2011	1457
Brandt's bat <i>M. brandtii</i> / Whiskered bat <i>M. mystacinus</i>	07.03.2015	108
Pond bat <i>M. dasycneme</i>	06.03.2005	8
Daubenton's bat <i>M. daubentonii</i>	07.03.1987	212
Serotine <i>Eptesicus serotinus</i>	01.02.2014	1
Noctule <i>Nyctalus noctula</i>	27.01.2008	2
Brown long-eared bat <i>Plecotus auritus</i>	01.03.2009	376
Barbastelle <i>Barbastella barbastellus</i>	27.01.2008	922
All species	01.03.2009	2902

With quite low results in 2017 (orange color). These studied seasons are related to wintering during the Life + project and subsequent to it.



**Fig. 1.** Trends in the number of wintering bats in Szachownica Cave during the survey in late January and early March. The 2016 data point is red and 2017 is orange (during and after the Life + project). R2 - correlation coefficient

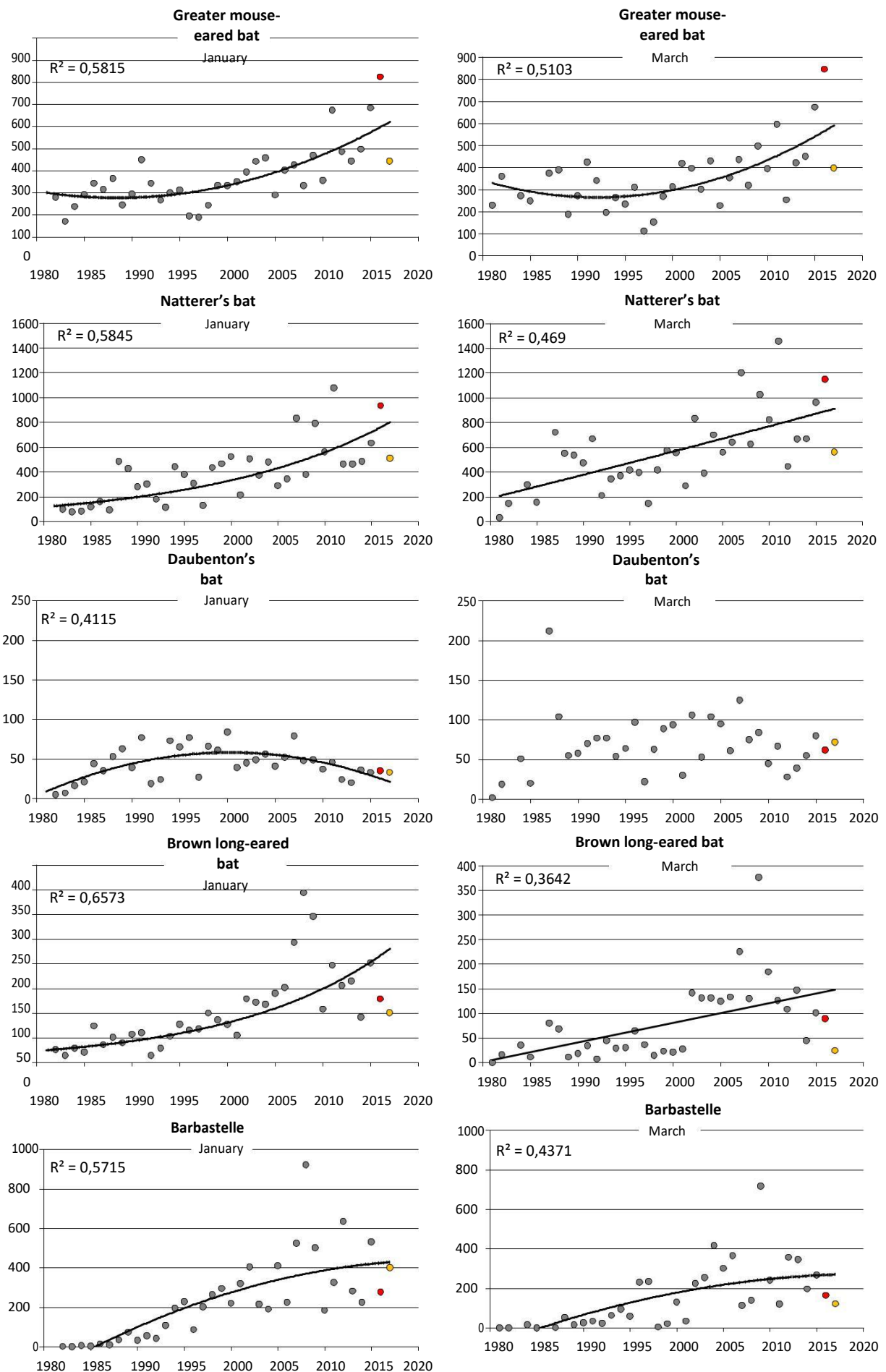
For the species frequently wintering in the cave, the trends of change tend to increase (Figure 2). The only species with a decrease in abundance is Daubenton's bat *Myotis daubentonii*. The lines of long-term trends in the number of hibernating individuals for low temperature wintering species (Brown long-eared bat and Barbastelle) have been stabilizing in recent years (Figure 2). On the other hand, the maximum numbers of Greater mouse-eared bat (for January and March counts) was not reported until recent years (Figure 2).

## Summary and Conclusions

The overall number of wintering bats in Szachownica Cave is growing, as it is shown by the average trend of long-term changes. This applies to both monitoring counters, conducted each year at the end of January and early March. Growth trends also apply to most wintering species in the cave. Only Daubenton's bat after the stabilization of the population in the years 1990-2010 has recorded a decline in recent years. The decline in the number of individuals of this species is evident during the January counts. Recent population stabilization can be observed in two wintering species in the cooler parts of the facility. They are Brown long-eared bat and Barbastelle. Those two taxa are the most sedentary of the species recorded in the Cave.

The numbers of bats recorded in the last two years (the winter season between the Life + project periods and the first one after their completion) are part of the overall upward trend in wintering in cave. Also, for individual species, the results of the last two years do not differ from the long-term trends, while in the 2016 season there were high numbers, while in 2017 they are low. In both cases it concerns both January and March counts. Large fluctuations in the results of seasons between individual wintering seasons are characteristic for this facility. The reason for such variation can be the dynamic nature of wintering, where, depending on the momentary, several days (before each counting) of the average temperature, a large proportion of bats are hiding deep into the slits or winter in visible, parts under ceiling. A large part of Szachownica Cave is thermally very dependent on external conditions. Species wintering in such places (Brown long-eared bat and Barbastelle) often leave Szachownica Cave in the warm early March (e.g. as it was in 2017).

The next years of research in Szachownica Cave will contribute to the full assessment of the impact of collapse protection measures (Life + project) on the number of wintering bats. They will also confirm the good condition of the population of these animals in central Poland.



**Fig. 2.** Trends in the number of wintering bats in Szachownica Cave during the survey in late January and early March. The 2016 data point is red and 2017 is orange (during and after the Life + project). R2 - correlation coefficient