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Bats hibernating in the natural caves in the Polish part of the Sudetes

Nietoperze zimujące w naturalnych jaskiniach polskiej części Sudetów

Abstract

In three winter seasons (1999/2000, 2000/2001, 2001/2002) 26 caves in the Polish part of the Sudetes were investigated and 13 bat species were found: *Myotis myotis, M. bechsteinii, M. nattereri, M. emarginatus, M. mystacinus, M. brandtii, M. dasycneme, M. daubentonii, Eptesicus nilssonii, E. serotinus, Plecotus auritus, Barbastella barbastellus* and *Rhinolophus hipposideros*. *M. myotis* and *M. mystacinus/brandtii* were the dominant species (27.3% and 24.4% of all identified bats, respectively). *M. daubentonii* (18.9%) and *M. nattereri* (10.7%) were relatively abundant. *B. barbastellus* and *P. auritus* represented 8.3% and 8.6% of all bats.

The largest hibernacula were Niedźwiedzia Cave near Kletno (with max. 251 individuals in 2002) and Szczelina Wojcieszowska Cave in Połom near Wojcieszów (max. 194 ind. in 2001). They seem to be the most important winter localities in the Polish part of the Sudetes for *M. mystacinus/brandtii* (max. 132 ind.), *M. myotis* (102 individuals), *M. daubentonii* (max. 59 ind.), *P. auritus* (max. 33 ind.) and *M. emarginatus* (max. 7 ind.). Single individuals of *M. dasycneme* were found in caves in Połom. In Na Ścianie and Nad Lądkiem caves *Rh. hipposideros* were recorded for the first time in the winter of 2002. The caves are very important hibernating places for bats, but more winter localities in the Sudetes are located in old mines. The number of bats hibernating in the Polish part of the mountains is lower than in hibernacula in the Czech part, where there are several localities with nearly 300-1300 individuals and a greater number of rare species.

Key words: *Chiroptera*, hibernation, caves, Sudetes

1. Introduction

The caves in the Sudetes have been researched from the beginning of twentieth century. The first systematic bat surveys of underground shelters on Silesian side of Sudetes were made in 1926 by SEIDEL (1927), who checked among other places, two caves: the Złota Sztolnia near Zieleniec (Goldener Stollen, Rainerz) and Solna Jama by Gniewoszów. He listed *Myotis mystacinus, M. nattereri, M. bechsteinii, M. daubentonii, M. myotis, Plecotus auritus, Barbastella barbastellus* and *Rhinolophus hipposideros*. DITTRICH (1938) described single records of bats, also. In 1928, 1929 and 1942 M. SCHLOTT published papers devoted to bats of Lower and Upper Silesia, in which he showed mainly underground sites described by SEIDEL (1927). He also recorded *Eptesicus nilssonii* and *Myotis emarginatus* in Silesian part of Sudetes.

The first observations post Second World War of bats in natural caves in the Polish side of Sudetes were conducted by

K. KOWALSKI (1953) between 1947 and 1953. He listed 5 species of bats: *M. myotis, M. daubentonii, M. mystacinus, P. auritus, B. barbastellus*. Between 1964 and 1966 B. W. WOŁOSZYN (1968, 1971) carried out systematic observations. He investigated 11 shelters in Lower Silesia, including 3 caves by Lwówek Śląski, 3 caves in Połom mount by Wojcieszów, Radochowska Cave, Niedźwiedzia Cave and Solna Jama Cave (WOŁOSZYN 1968, WOŁOSZYN 1971). In addition to the species observed earlier, he recorded *Myotis dasycneme*. Between 1971 and 1974 surveys of 37 winter shelters in Lower Silesia were carried out by R. HAITLINGER (1976). He checked all caves, surveyed during previous studies. He found *Eptesicus serotinus* and *Plecotus austriacus* for the first time in this region.

Between 1985 and 1995 winter shelters in the Sudetes and Sudetic Foreland, including several caves, were investigated by different researchers (KOKUREWICZ 1987, 1990, 1991, 1992, POSTAWA et al. 1994, JARNO et al. 1995, BUŘIČ et al. 2001a, 2001b, KLIŚ et al. 2001, FURMANKIEWICZ et al. 2001). *Pipistrellus pipistrellus/pygmaeus* were noted for the first time in this area (BUŘIČ et al. 2001a). The winter records of several rare species were described by SZKUDLAREK and PASZKIEWICZ (1999, 2000) and SZKUDLAREK et al. (2001). This work summarizes the present data of the bats of natural caves of this area.

2. Material and methods

2.1. Study area

During the study 26 natural caves in the Polish part of Sudetes were investigated. Most are situated in two Sudetic carst areas: Kaczawskie Mountains and Śnieżnik Massif. The remaining caves are located near Lwówek Śląski (3 caves), in Złote Mountains (2 caves), in Orlickie Mountains (2 caves) and in Bystrzyckie Mountains (1 cave). Hibernacula with more than 10 bats (Tab. 1) have been described below. Detailed description of all caves can be found in the study edited by PULINA (1996) and in ROGALA et al. (1998). The air temperature in caves was measured electronically by thermometer (± 0.1°C) or taken from literature (KLIŚ et al. 2001). The automatically collected data from the middle part of Niedźwiedzia Cave was made available by the Department of Meteorology and Climatology, Institute of Geography, University of Wrocław.

Niedźwiedzia Cave (near Kletno)

The Niedźwiedzia Caves is located near Kletno in Śnieżnik Massif. It was discovered during marble quarrying in 1966 and was probably inaccessible from the late Pleistocene (WISZNIOWSKA 1989). The two entrances of the cave are located 790 m a.s.l. They are artificial and closed by doors. In the frame of the entrance door small holes for bats were made.

The total length of tunnels exceeds 2700 m and change in elevation is 70 m. This is the biggest cave in Polish part of the Sudetes. It has three main levels, connected by carst chimney and cracks – upper, middle (with length about 500) and the longest lower part. Only the middle part is accessible and has been adapted for tourists with an electrically lit route. The cave has very rich rock pendants, which make it difficult to count hidden bats. It has a stable microclimate (middle part +6.3 °C and almost 100% of humidity).

Kontaktowa Cave (near Stara Morawa)

The cave is located in old quarry, probably from XVIII-XIX century, near Nowa Morawa in Śnieżnik Massif, 764 m a.s.l. The cave has two entrances: the main one (2.8 m of width, 0.6 m of height), and

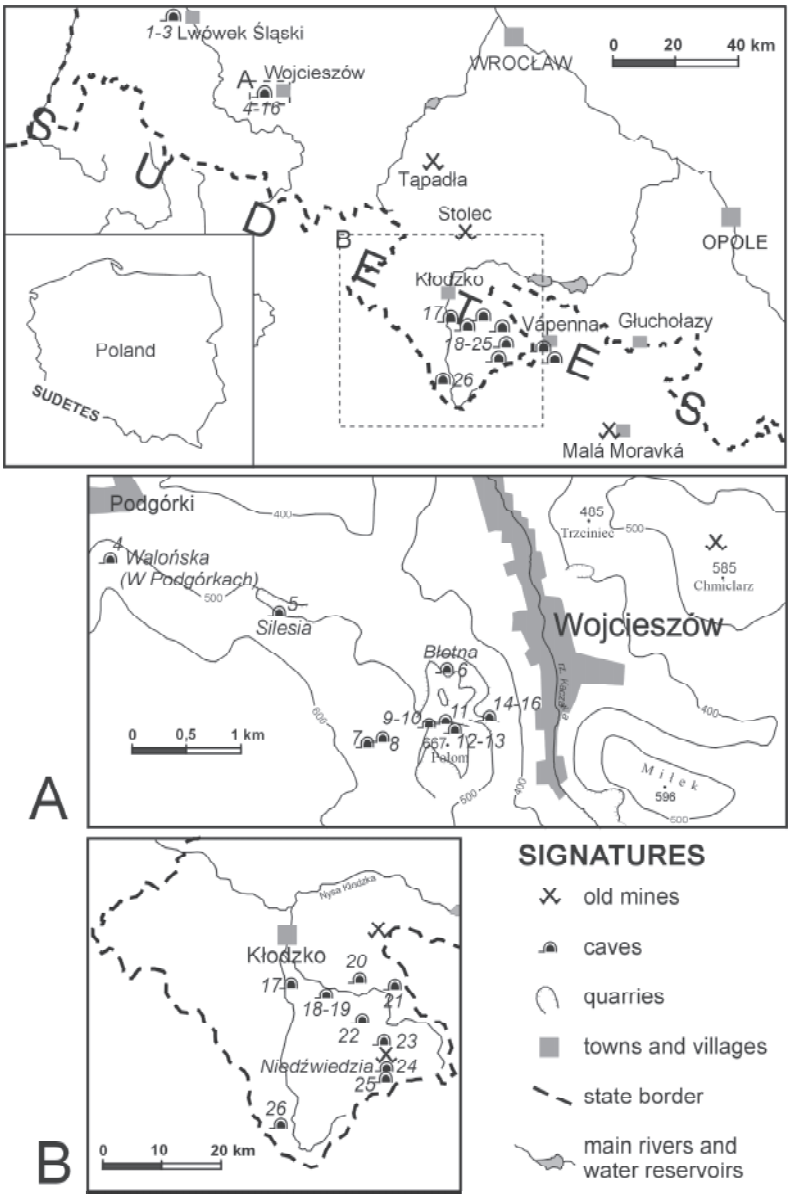

Fig. 1. The location of the investigated caves: 1-Krótka, 2-Czerwona, 3-Lisia, 4-Walońska (W Podgórkach), 5-Silesia, 6-Błotna (Pierwszomajowa), 7-Nad Potokiem, 8-W Leju, 9-Północna Duża, 10-Północna Mała, 11-Szczelina Wojcieszowska, 12-Ostrych Kantów, 13-Aven w Połomie, 14-Komarowa, 15-Nowa, 16-Pajęcza, 17-W Wapniarce, 18-Z Otoczakami, 19-Przy Torach, 20-Radochowska, 21-Nad Lądkiem, 22-Na Ścianie, 23-Kontaktowa, 24-Niedźwiedzia, 25-Miniaturka, 26-Solna Jama.

Ryc. 1. Położenie badanych jaskiń.

a second smaller one, through which it is difficult for people to enter. The length of cave corridors is about 119 m. Its main part consists of two small halls, with ceiling of slate and floor of marble. Two marble corridors branch off from these halls. Inside the cave there is a high humidity (nearly 90-100%) and in winter the temperature changes from about +4°C at the entrance part (which are subject to outside condition) to nearly +6°C at the end part of the cave.

Na Ścianie Cave (near Rogóżka)

The cave is located in Krowiarki range (north part of Śnieżnik Massif), at nearly 670 m a.s.l. The entrance is 41 m above the floor of the inoperative marble quarry and is closed by two small doors. The bats fly in through another small entrance which is inaccessible to people. The cave system is horizontal and 250 m long. The main part of cave consists of two big halls with rubble on the floor crossed by labyrinths. It had rich rock pendants, now destroyed. The microclimate is stable. The temperature changes from nearly +7°C in Sala Złomisk (Rubble Hall) to +9°C at the end of Korytarz Nadziei (Corridor of Hope).

Radochowska Cave (near Radochów)

The cave is located in Złote Mountains at about 460 m a.s.l. It has three entrances, one natural and two that were dug at the beginning of twentieth century. They are 10 m above valley bottom on the forest edge. The caves are formed from marble and have horizontal character exceeding 500 m in length. Between the entrances there are corridors and halls, and a small lake in the biggest hall. The microclimate is dynamic with a flow of air between entrances. The temperature (measured on 1.02.2002) changed from nearly +5.7°C in north entrance to +7.6°C in main hall. The cave was well known from the early eighteenth century and is often visited by tourists.

Solna Jama (near Gniewoszów)

The cave is situated close to Gniewoszów in Bystrzyckie Mountains. Its entrance is located 600 m a.s.l. in old eighteenth-century quarry. The cave developed in marble. It has one wide corridor with small lake at the end. In the ceiling there are several carst chimneys. The microclimate in the entrance is changeable. During frosts the temperature increases from the beginning to the end of the cave to nearly +7°C. The cave is easily accessible to tourists, but in winter is seldom visited, because of the long distance from the nearest village.

Szczelina Wojcieszowska (near Wojcieszów)

This cave was discovered in the 1950s, but the main parts were discovered between 1984 and 1987. The entrance is in marble quarry, 560 m a.s.l. The corridors are 440 m long and change in elevation is 112.6 m (Pulina 1996). The microclimate condition inside the cave is stable. The average temperature is +5 to +6°C and humidity 90-95% (Kliś et al. 2001).

Nowa Cave (near Wojcieszów)

This cave was discovered in a quarry in 1947, but the entrance was probably opened some years before. The total length is 232 m, and change in elevation is 49 m. It has two entrances: one 443 m a.s.l. and another 24 m above this. This causes a dynamic microclimate and a flow of air from the lower to the upper entrance. In winter the lower entrance corridor can freeze during frosts for a dozen and so meters. In main hall the temperature reaches max +6°C 1.5 m above the ground (Kliś et al. 2001).

Północna Duża Cave (near Wojcieszów)

The cave was discovered in 1924 during works in the quarry. Traces of human

residence were found inside from the Palaeolithic. The entrance is located 587 m a.s.l. The length of cave is nearly 113 m and change in elevation is 39 m (PULINA 1996). The main part of cave forms a big sloping hall 45 m long, 20-25 m wide and 4-5 m high. The microclimate is dynamic and cold air stagnation is observed. The temperature decreases from the entrance to the end of the cave. The lowest temperatures (average +3°C) are noted in January. Warm air stagnates only in the end part and in the part called "Sala Dziada". All the year the humidity is high (86–98%) (KLIŚ et al. 2001).

Nad Potokiem Cave (near Wojcieszów)

This cave is very short (29 m long) and was discovered in 1970s. A stream flows into the cave and ends in the sinkhole at the end of lowest corridor. In winter the low temperature (+1 to +4 °C) in the entrance to the cave depends on the outside air temperature.

2.2. Data collection

The observation was conducted in January and February in the years 2000-2002. Only two surveys were made in March. To check seasonal change in number of hibernating bats in Kleśnica river valley (Kletno), three winter counts were conducted in November 2000 and February and March 2001 (Tab. 8).

All bat species were determined without awaking them, on the basis of the external characteristic features. The very similar species *M. mystacinus* and *M. brandtii* were distinguished only during several controls without taking them into hand, by external features described by GÖRNER and HACKETHAL (1987) and SCHOBER and GRIMMBERGER (1998). If this was not possible, both species were classified together as *M. mystacinus/brandii*. Non-identified species from the genus *Myotis* were classified as *Myotis sp.*, and remaining not recognized as *Indeterminata*.

2.3. Data analysis

The following ecological indices were used to describe the species composition of bats hibernating in the Sudetic caves:

– proportion of bat species (%), as number of all records of *i* species (N_i), divided by number of total records of individuals of all identified species (N):

$$P=(N_i/N) \cdot 100\%$$

– frequency (F %)

$$F = (I_i / L) \cdot 100\%$$

where:

I_i – number of controls with *i* species

L – number of all controls (controls without bats were counted)

Individuals not classified to species (*Indeterminata* and *Myotis sp.*) were not taken into calculation. *M. mystacinus* and *M. brandtii* were taken into account as *M. mystacinus/brandtii*. Some winter shelters were surveyed several times in the winter season. In this case data from the main winter survey (January-February) were taken into consideration.

3. RESULTS

3.1. Species composition and number of bats hibernating in the caves

Characteristics of the four biggest caves are given below. Proportions of different bat species are shown in Tab. 1. Change in the number of bats in Niedźwiedzia Cave during the winter season 2001/02 (3 controls) is shown in Fig. 2.

Niedźwiedzia cave

This is the biggest known hibernaculum in the Polish side of Sudetes. 251 bats from 8 species were recorded here (Tab. 1 and 8).

M. mystacinus/brandtii were the dominant bat species (59.2%, N_{max}=132). *M. daubentonii* (12.3%), *P. auritus* (11.4%) and *M. myotis* (9%) were also numerous. *M. nattereri* (4.9%) and two rare species *M. bechsteinii* and *M. emarginatus* were recorded also (Tab. 1 and 8). During all controls (autumn, winter and spring) 73% of all bats hibernated in the lower part of the cave, mostly in Kryształowy Corridor and Diamentowy Corridor. Seasonal changes in the number of hibernating bats were visible only for the most numerous species. The highest numbers of bats were recorded at the beginning of February (Fig. 2). The number of *M. mystacinus/brandtii* increased 3 times from November to February, and then declined slightly to April. A similar change was observed for *M. myotis*. The number of *P. auritus* increased 6 times from November to February and no individuals were observed in April. In April social calls of this species were heard in the forest near cave entrances. The number of *M. nattereri* and *M. daubentonii* hibernating in the cave were highest at the beginning of February and were 1.5–2 times lower during observations in other months (Fig. 2).

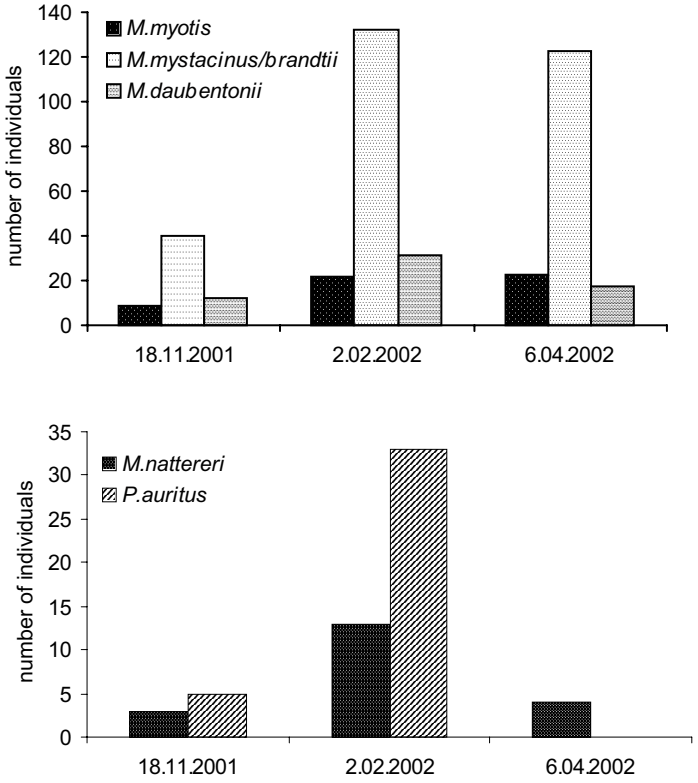

Fig. 2. Changes in the number of the five most numerous bat species hibernating in the Niedźwiedzia Cave during the winter season 2001/02 (see Tab. 8).

Ryc. 2. Zmiany liczebności pięciu najliczniejszych gatunków nietoperzy zimujących w Jaskini Niedźwiedziej w sezonie zimowym 2001/02 (patrz tab. 8).

Szczelina Wojcieszowska

This is the one of the biggest winter localities for bats in the Polish side of the mountains (N_{max}=194). High proportions of *M. myotis* (54.1%) and *M. daubentonii* (31.3%) were characteristic for this cave. Other species were seldom observed (one observation of *M. dasycneme*), or were observed in small numbers (single individuals of *M. bechsteinii*, *P. auritus* and *M. mystacinus/brandtii*) (Tab. 1 and 8).

Północna Duża Cave

In this cave the number of recorded bats was relatively high (N_{max}=75), but in contrast to the two previous caves, *B. barbastellus* and *M. nattereri* dominated (31.4% and 23.2% of all bats, respectively). The other species made up only 0.7 to 9.3% of the total winter community of bats. During our observations *M. dasycneme* was recorded only once (Tab. 1 and 8).

Nowa Cave

A maximum of 75 bats from at least 7 species were recorded in season 2001/02 in this cave. As for Szczelina Wojcieszowska cave, *M. myotis* dominated (37.7%). *M. daubentonii* (22.5%) and *M. nattereri* (21.2%) were co-dominant species. *M. bechsteinii* was observed twice and other species were noted in a small number (Tab. 1 and 8).

In other smaller caves from 1 to 22 hibernating bats from different species were recorded (Tab. 8).

Tab. 1. **The number (N) and proportion (P%) of bat species hibernating in the four biggest caves in the Polish part of the Sudetes (data from the winter seasons 2000-2002 are combined)**.

Tab. 1. Liczebność (N) i proporcja (P%) poszczególnych gatunków nietoperzy zimujących w czterech największych jaskiniach w polskiej części Sudetów (dane z lat 2000-2002).

Caves / Species	Niedźwiedzia		Północna Duża		Szczelina Wojcieszowska		Nowa	
	N	P %	N	P %	N	P %	N	P %
Myotis myotis	39	9.0	15	7.2	197	54.1	57	37.7
Myotis bechsteinii	3	0.7	-	-	2	0.5	1	0.7
Myotis nattereri	21	4.9	48	23.2	26	7.1	32	21.2
Myotis emarginatus	11	2.6	-	-	-	-	-	-
Myotis mystacinus/brandtii	255	59.2	24	11.6	19	5.2	14	9.3
Myotis daubentonii	53	12.3	26	12.6	114	31.3	34	22.5
Myotis dasycneme	-	-	1	0.5	1	0.3	-	-
Plecotus auritus	49	11.4	28	13.5	5	1.4	3	2.0
Barbastella barbastellus	-	-	65	31.4	-	-	10	6.6
Total	**431**	-	**207**	-	**364**	-	**151**	-
indet.	18	-	7	-	6	-	4	-
Total + *indet.*	**449**	-	**214**	-	**370**	-	**155**	

3.3. Number of bat species

13 bat species were observed during three winter seasons (2000-2002). The species are listed below from most to least numerous. The proportion and frequency of occurrence of different species are shown in Tab. 2.

Greater mouse-eared bat *Myotis myotis* (Borkhausen, 1797)

This is the most numerous species (27.3%) and often recorded in surveyed caves (F=44%) (Tab. 2). The highest number of *M. myotis* (N_{max}=102) hibernated in Szczelina Wojcieszowska cave in 2001. More than 20 individuals were observed in Nowa Cave (N_{max}=24) and in Niedźwiedzia Cave (N_{max}=22). In the all caves in the Połom mount a total of 128 *M. myotis* were recorded during one count (2-3.02.2001) (Tab. 8). A contemporary skeleton of *M. myotis* was found in Nad Lądkiem Cave (IV 2002).

Whiskered bat *Myotis mystacinus* (Kuhl, 1817) **and Brandt's bat** *Myotis brandtii* (Eversmann, 1845)

These two species were the second most numerous bat species recorded in the Sudetic caves (24.4%) and noted in one in three localities (F=36%) (Tab. 2). The biggest hibernaculum of these species was Niedźwiedzia Cave (N_{max}=132). Fewer *M. mystacinus/brandtii* hibernated in the Połom mount caves: Szczelina Wojcieszowska (N_{max}=12) and Nowa cave (N_{max}=12). In the remaining caves they were observed at low numbers (Tab. 8). These two species were distinguished by external features only in several surveys in the following caves: Niedźwiedzia in 2001, Szczelina Wojcieszowska, Nowa and Północna Duża in 2002. In most of these places *M. brandtii* was much more numerous than *M. mystacinus* (Tab. 8).

Daubenton's bat *Myotis daubentonii* (Kuhl, 1817)

This is the third most abundant species recorded in the caves (18.9%), showing the widest distribution (F=47%) (Tab. 2). Most *M. daubentonii* hibernated in Szczelina Wojcieszowska (N_{max}=59), Niedźwiedzia (N_{max}=31) and Nowa caves (N_{max}=19) (Tab. 8).

Natterer's bat *Myotis nattereri* (Kuhl, 1817)

This species is quite numerous in the caves (10.7% of all bats, F=35%) (Tab. 2). The greatest number of *M. nattereri* was observed in Połom, especially in Północna Duża (N_{max}=24), Nowa (N_{max}=19) and Szczelina Wojcieszowska caves (N_{max}=16) (Tab. 8).

Barbastelle *Barbastella barbastellus* (Schreber, 1774)

This species occurred only in several caves, marked by low temperature in the entrance area during winter. It comprised 8.3% of the total and was found in 20% of the localities (Tab. 2). The highest numbers of *B. barbastellus* was observed in Północna Duża (N_{max}=32) and Radochowska caves (N_{max}=12) (Tab. 8).

Brown long-eared bat *Plecotus auritus* (Linnaeus, 1758)

P. auritus comprised only 8.6 % of all identified bats, but is one of the most frequent species (F=42%) (Tab. 2). It is most numerous in Niedźwiedzia (N_{max}=33) and Północna Duża caves (N_{max}=13) (Tab 8).

Geoffroy's bat *Myotis emarginatus* (Geoffroy, 1806)

This rare species (0.8% of all bats, F=7.3%) was recorded only in the lower part of Niedźwiedzia Cave, max. 6 to 7 individuals in one control (Tab. 2 and 8).

Bechstein's bat *Myotis bechsteinii* (Kuhl, 1818)

Single individuals (0.5%) were observed in several caves: Niedźwiedzia (N_{max}=2), Szczelina Wojcieszowska and Nowa (Tab. 2 and 8).

Pond bat *Myotis dasycneme* (Boie, 1825)

Single bats were recorded only in Północna Duża and Szczelina Wojcieszowska caves (Tab. 8).

Serotine *Eptesicus serotinus* (Schreber, 1774)

Single individuals were recorded only in Radochowska and Nad Lądkiem caves (Tab. 8).

Lesser horseshoe bat *Rhinolophus hipposideros* (Bechstein, 1800)

Single individuals were recorded in 2002 in Nad Lądkiem and Na Ścianie caves (Tab. 8). These were the first observations of this species at these localities.

Northern bat *Eptesicus nilssonii* (Keyserling et Blasius, 1839)

In research period it was observed only in Kontaktowa and Solna Jama caves (Tab. 8).

Discussion

Our research between 2000 and 2002 found 13 bat species hibernating, which were also observed in last 50 years (Kowalski 1953; Wołoszyn 1968, 1971; Haitlinger 1976; Postawa et al. 1994; Buřič et al.

Tab. 2. **Number (N), proportion (P%) and frequency (F%) of bats hibernating in the natural caves in the Polish part of the Sudetes in the years 2000-2002.**

Tab. 2. Liczebność (N), proporcja (P%) i frekwencja (F%) nietoperzy zimujących w naturalnych jaskiniach polskiej części Sudetów w latach 2000-2002.

Species	N	P %	F %
Myotis myotis	363	27.3	44
Myotis mystacinus/brandtii	325	24.4	36
Myotis daubentonii	252	18.9	47
Myotis nattereri	143	10.7	35
Plecotus auritus	114	8.6	42
Barbastella barbastellus	110	8.3	20
Myotis emarginatus	11	0.8	7.3
Myotis bechsteinii	6	0.5	11
Rhinolophus hipposideros	2	0.2	3.6
Myotis dasycneme	2	0.2	3.6
Eptesicus serotinus	2	0.2	3.6
Eptesicus nilsonii	2	0.1	3.6
Total	**1331**	**100**	**-**
Myotis sp.	29	-	-
indet.	9	-	-
Total + *M. sp.* +*indet.*	**1369**	-	-

2001a, 2001b, Kliś et al. 2001). The only species not observed was *P. austriacus*, recorded in winter 1989 in Kontaktowa Cave near Nowa Morawa (Kliś in: Postawa et al. 1994).

Greater mouse-eared bats *M. myotis* and whiskered bat/Brandt's bats *M. mystacinus/brandtii* dominated species composition in the investigated caves. Observations conducted from 1990 show a higher number of Brandt's bats than whiskered bat in controlled caves (see: Buřič et al. 2001b, Kliś et al. 2001, Tab. 8). Similar results was obtained in Szachownica Cave on Wieluńska upland (Kowalski and Lesiński 1991). Dominance of this pair of species resulted from their high number in Niedźwiedzia Cave, which is the second greatest locality of *M. mystacinus/brandtii* in Poland after Czarna Cave in the Tatra Mountains (J. Nowak, pers. comm.). However in the caves of Tatra Mts. *M. mystacinus* dominates (Piksa and Nowak 2000). A great number of *M. mystacinus/brandtii* hibernated in the underground regions of Międzyrzecki Rejon Umocniony, too (Weigle et al. 1999). The most numerous hibernaculum for this pair of species in middle Europe is known from Dobšinská L'adová Cave in Slovakian Paradise (422 ind. in 1999) (Bernadovič 2000). Distinction between this pair of species in Niedźwiedzia Cave was made by external features (Görner and Hackethal 1987, Schober and Grimmberger 1998) without checking the dentition and shape of the penis, what is the most certain way to determine these two species (Hanák 1971). It must be accounted for that the colours of the fur and the interior of the ears vary markedly within *M. brandtii* species. Even after four years, the morphological features of juvenile females do not have the typical fur and ears colour of the adult females and it is possible that it can be mistaken for *M. mystacinus* (Ohlendorf 2001). Therefore the actual number of *M. brandtii* in Niedźwiedzia cave could have been higher. Netting at the cave entrance in spring, when many more Brandt's bats were caught than whiskered bats, confirmed this.

Szczelina Wojcieszowska cave in Połom mount is the greatest winter shelter for *M. myotis* in Polish part of the Sudetes (Kliś et al. 2001). The greater mouse-eared bat is often observed in old mines of West Sudetes (Jarno et al. 1995), in Polish Beskids, on Carpathian Upland (Mleczek et. al 1994), and also in Częstochowska and Krakowska Upland caves (Nowak and Kozakiewicz 2000, Postawa and Zygmunt 2000, Węgiel et al. 2001). Relatively high number of *M. myotis* in the caves of Połom, could be a result of the areas with forests, of the Landscape Nature Parks of the „River Bóbr Valley", „Chełmy", „Rudawy Janowickie", situated in the vicinity of the Połom mount. Such is the feeding habitat of this species (Arlettaz 1993). Moreover, the largest known maternity roost of *M. myotis* in Lower Silesia is in Wleń town, located 18.5 km NW from Połom mount (Furmankiewicz and Zając 1999). At the end of June 2001 there were about 1300 individuals (adults with juveniles) recorded. It is possible, that bats from this colony hibernate in the caves of Połom mount. Additionally the temperature noted in Nowa and Szczelina Wojcieszowska caves (about +6°C) is appropriate for great mouse-eared bat, which prefers high temperatures during hibernation (Harmata, 1973; Gaisler 1970, Bogdanowicz 1983, Lesiński 1986). These two caves are difficult to reach, therefore they are less visited by people, resulting in decreased disturbance to bats in winter.

High numbers of *M. daubentonii* hibernated in area of Wojcieszów in Kaczawskie Mountains: in Szczelina Wojcieszowska, and in old Uran Adit located several km away in Chmielarz mount (Kliś et al. 2001). Daubenton's bat

is the most numerous species in many old mines in West Sudetes (Jarno et al. 1995). The prevalence of this species can be connected with the many ponds and rivers located in and around the Jeleniogórska Basin, where the bats can forage before hibernating period.

M. nattereri was often observed in Połom caves. In February 2001 a total of 59 individuals were recorded in the three biggest caves: Północna Duża, Nowa and Szczelina Wojcieszowska. This is slightly fewer than were recorded in the biggest hibernaculum of Natterer's bat in Stolec mine (the Sudetic Foreland) – max 81 ind. in March 2002. The Połom caves are one of the most important hibernacula for *M. nattereri* in the Polish side of Sudetes.

B. barbastellus occurred only in several caves. It was observed hibernating in Północna Duża Cave in Połom as early as in the 1960s and 1970s. In Radochowska Cave the highest number of *B. barbastellus* was recorded in 1991 (53 individuals) (Buřič et al. 2001a). The biggest winter localities of this species in Polish part of the Sudetes are known from the mine in Stolec and in Młoty, where above 100 individuals were observed, but the most numerous hibernaculum of barbastelle was described in Zálužná mine in the Czech part of Sudetes (maximum 1167 individuals) (Wagner 2001).

The maximum record of *P. auritus* from Niedźwiedzia cave (N_{max}=33 ind.) is the highest known in the Polish side of Sudetes. This species occurred often in Sudetes.

The remaining bat species did not exceed 1% of the total composition. There are rare and common species, but all are seldom recorded in caves, for instance *E. serotinus*. This species hibernates mostly singly in deep crevices in different shelters. It is often observed in the buildings, which house nursery colony, or behind paintings in churches (Schober and Grimmberger 1998). Horáček (1971) mentioned a serotine in adit rubble.

Most of the cave-dwelling bat species are rare and were entered into the Polish Red Book of Animals (Głowaciński 2001). *Rh. hipposideros*, *M. emarginatus* and *M. dasycneme* are classified to category EN (endangered) and *E. nilssonii* and *M. bechsteinii* to category NT (species of lower risk, but near threatened).

The most rare species during winter seasons in our study was *E. nilssonii*. It was recorded in autumn in Kontaktowa Cave and 01.03.2001 in entrance part of Solna Jama cave, where it had also been observed previously (Wołoszyn 1968, 1971, Buřič et al. 2001a). The northern bat was observed only once in Niedźwiedzia Cave in 1996 (Oostween 1996). These rare records are interesting, because it is noted more often in other underground sites (e. g. old adits) (Wołoszyn 1968, 1971, Haitlinger 1976, Szkudlarek and Paszkiewicz 1999, Buřič et al. 2001a, 2001b) and in summer localities in the Sudetes. In Stołowe Mountains National Park (middle Sudetes) it is one of the most frequently observed species in summer (Szkudlarek and Paszkiewicz in: Mikusek and Pikulska 1999). Foraging *E. nilssonii* were often observed in Śnieżnik Massif in June and July. This species is considered to be a boreal-mountain species (Schober and Grimmberger 1998). This is one of the most frequent species in Tatras but it hibernates in the entrance part of caves (Piksa and Nowak 2000). It is possible, that the northern bat avoids the interior part of caves due to its low thermal preference. We observed several individuals buried in rubble inside the adits or in leaves in entrance in places of cold air flow. This may explain low records in winter seasons.

The small number of *M. emarginatus* and *Rh. hipposideros* may be because they are at the northern border of their distribution in northern part of the Sudetes

(Pucek and Raczyński 1983). The latter dominates together with *M. myotis* in caves of south Poland: in Polish Beskids, Carpathian Upland and Krakowska Upland (Mleczek et al. 1994, Nowak and Kozakiewicz 2000, Węgiel et al. 2001). Lesser horshoe bat was recorded in Kontaktowa Cave in 1995 and in Złota Sztolnia (Gold Adit) in 1998 (Szkudlarek et al. 2001). Information given by P. Potok about observation of *Rh. hipposideros* in Niedźwiedzia Cave in December 1999 (P. Potok in: Furmankiewicz et al. 2001) is questionable (Buřič et al. 2001b, Szkudlarek et al. 2001). *Rh. hipposideros* was observed in our study at two new localities: Nad Lądkiem Cave and Na Ścianie Cave in 2002. This species was regularly observed in the 1980s in winter shelters in Opawskie Mountains (East Sudetes), in the 1990s in Złoty Stok neighbourhood and in Śnieżnik Massif (Kokurewicz 1987, 1992, Węgiel et al. 1995, Buřič et al. 2001b, Szkudlarek et al. 2001). The only known nursery colonies of this species in the Polish side of Sudetes were recorded in Jarnołtówek in the Opawskie Mts. (Węgiel et al. 1995, Szkudlarek et al. 2001). More frequent records of *Rh. hipposideros* may be connected with its increase in hibernacula in the Czech part of Sudetes (Buřič and Šefrova 2001, Řehák and Gaisler 1999, 2001).

M. emarginatus was observed only in Niedźwiedzia Cave (maximum 7 individuals). To date mainly single individuals of these species have been recorded (maximum 4 ind.) in some other hibernacula (old mines) in Głuchołazy, Uniemyśl, Stolec and Złoty Stok (Kokurewicz 1990, Jarno et al. 1995, Szkudlarek and Paszkiewicz 1999, 2000, Furmankiewicz and Telatyński 2000). It was also rarely recorded in caves of other regions of south Poland (Krakowska and Częstochowska Upland, Carpathian Mts.) (Piksa 2000, Nowak and Kozakiewicz 2000, Postawa and Zygmunt 2000, Nowak 2001). There are big hibernacula of Geoffroy's bat in south, Czech part of Sudetes: in Dobrošov Fortress (N_{max}=70 ind.) and in old mine Franz-Franz in Hrubý Jeseník (N_{max}=128 ind.). The number increase of this species was observed over a minimum of 10 years (Buřič and Šefrova 2001, Flousek 2001).

Apart from the authors' observation Bechstein's bat *Myotis bechsteinii* was recorded in Na Ścianie Cave and in Kontaktowa Cave (Buřič et al. 2001a, Górniak and Furmankiewicz 2001). Single individuals were recorded in many winter shelters in the Polish part of Sudetes (Szkudlarek and Paszkiewicz 1999, Górniak and Furmankiewicz 2001). Similarly a small number of this species was observed in the Czech part of the mountains (e.g. Buřič and Šefrova 2001, Flousek 2001, Wagner 2001).

M. dasycneme was recorded only in two caves in Połom mount (Kliś et al. 2001). It was previously observed here in the 1960s and 1970s (Wołoszyn 1968, 1972, Haitlinger 1976). In the Polish side this species was already recorded in winter locality only in the old mine in Kowary (Szkudlarek and Paszkiewicz 1999). It is also rarely recorded in the Czech part of Sudetes (Flousek 1984).

More than 50 bats were recorded in only 5 caves: in Niedźwiedzia, Szczelina Wojcieszowska, Nowa, Północna Duża and in Radochowska. Most of the known caves are small and with low number of hibernating bats (Tab. 3). *P. auritus* often hibernates in small caves. Similarly Nowak and Kozakiewicz (2000) and Węgiel et al. (2001) noted, that *P. auritus* and *B. barbastellus* are found relatively frequently in small caves. Small undergrounds shelters possibly provide low temperatures, appropriate for species preferring such temperature conditions during winter (Gaisler 1970, Bogdanowicz 1983, Lesiński 1986, Urbańczyk 1991).

Tab. 3. **The natural caves in the Polish part of the Sudetes with maximum bat records in last 15 years (published data and own observations).**

Tab. 3. Maksymalne liczebności nietoperzy odnotowane w ciągu ostatnich 15 lat w naturalnych jaskiniach polskiej części Sudetów (dane własne i publikowane).

Cave	Locality	Length of cave [m]	Max number of bats	Year	Source
Niedźwiedzia	Kletno	~ 2700	**251**	2002	Tab. 8
Szczelina Wojcieszowska	Wojcieszów	440	**194**	2001	Kliś et al. 2001
Nowa	Wojcieszów	232	**75**	2001	Kliś et al. 2001
Północna Duża	Wojcieszów	113	**75**	2002	Tab. 8
Radochowska	Radochów	502	**65**	1991	Buřič et al. 2001a
Na Ścianie	Rogóżka	205	**24**	1991	Buřič et al. 2001a
Kontaktowa	Nowa Morawa	119	**11**	2002	Tab. 8
Solna Jama	Gniewoszów	40	**11**	1991	Buřič et al. 2001a
Nad Potokiem	Wojcieszów	30	**10**	2002	Tab. 8
Błotna (Pierwszomajowa)	Połom	140	**9**	2002	Tab. 8
Miniaturka	Kletno	20	**7**	2002	Tab. 8
W Podgórkach (Walońska)	Podgórki	17	**4**	2002	Tab. 8
Nad Lądkiem	Lądek Zdrój	near 30	**3**	2002	Tab. 8
Złota Sztolnia	Zieleniec	120	**2**	1998	Buřič et al. 2001a
Czerwona	Lwówek Śląski	65	**2**	1988	Postawa et al. 1994
Lisia	Lwówek Śląski	63	**2**	1988	Postawa et al. 1994
Pajęcza	Wojcieszów	62	**2**	2001	Kliś et al. 2001
Aven w Połomie	Wojcieszów	102	**1**	2000	Kliś et al. 2001
Ostrych Kantów	Wojcieszów	15	**1**	2002	Tab. 8
W Wapniarce	Żelazno	15	**1**	2002	Tab. 8
Schronisko Krótkie	Lwówek Śląski	11	**1**	2000	Tab. 8
Przy Torach	Ołdrzychowice	3.5	**1**	1995	Rogala et al. 1998

The number of bats hibernating in natural caves in the Polish part of Sudetes is relatively high, but most winter shelters are in old mines. Several of them are shown in Tab. 4. The greatest in number of bats and most valuable is Niedźwiedzia Cave, old mines in Stolec and Szczelina Wojcieszowska cave. The maximum records of several species in the Polish side of Sudetes were noted in these three undergrounds (for *M. myotis, M. daubentonii, M. nattereri, M. emarginatus, M. mystacinus/brandtii, P. auritus and B. barbastellus*) (Tab. 5).

Tab. 4. **The biggest hibernacula (above 100 bats) in the Polish part of Sudetes. The caves are marked with bold type**.

Tab. 4. Największe zimowiska (powyżej 100 nietoperzy) w polskiej części Sudetów. Jaskinie zaznaczono pogrubioną czcionką.

Name of locality	Type of locality	Max. number of bats	Year of observation	References or authors
Niedźwiedzia Cave	**cave**	**251**	**2002**	**Tab. 8**
Mine in Stolec	mine	242	1999	PTPP "pro Natura" in: Wołoszyn 2002
Szczelina Wojcieszowska	**cave**	**194**	**2001**	**Kliś et al. 2001**
Mine in Tąpadła	mine	145	1999	PTPP "pro Natura" in: Wołoszyn 2002
Adit in Młoty	mine	141	2002	PTPP "pro Natura" in: Wołoszyn 2002
Mine in Podlesie	mine	132	2001	PTPP "pro Natura" in: Wołoszyn 2002
Complex Włodarz	mine	120	2002	PTPP "pro Natura" in: Wołoszyn 2002
Adit in Gontowa, Sokolec	mine	118	2000	PTPP "pro Natura" in: Wołoszyn 2002
Mine in Wojcieszów Dolny	mine	101	2002	PTPP "pro Natura" in: Wołoszyn 2002

Tab. 5. **The greatest records of different bat species in underground shelters in the Polish part of the Sudetes (from literature and own researches). The caves are marked with bold type.**

Tab. 5. Największe liczebności poszczególnych gatunków nietoperzy w zimowiskach polskiej części Sudetów (dane z literatury i własne). Jaskinie zaznaczono pogrubioną czcionką.

Species	N_{max}	Year	Winter shelter	Source or authors
Myotis mystacinus / brandtii	132	2002	**Niedźwiedzia Cave**	Tab. 8
Myotis myotis	102	2001	**Szczelina Wojcieszowska**	Kliś et al. 2001
Myotis nattereri	81	2002	Mine in Stolec	J. i M. Furmankiewicz, M.Biegański, M.Wiklik
Myotis daubentonii	59	2002	**Szczelina Wojcieszowska**	Tab. 8
Myotis emarginatus	7	2002	**Niedźwiedzia Cave**	Tab. 8
Myotis dasycneme	4	1998	Mine in Kowary Górne	Szkudlarek and Paszkiewicz 1999
Plecotus auritus	33	2002	**Niedźwiedzia Cave**	Tab. 8
Plecotus austriacus	12	2002	Kamieniec Ząbkowicki castle	Wrocław Chiropterological Group, unpublished
Eptesicus nilssonii	7 7	2001 1993	Mine in Sokolec[1] Mine near Miłków[2]	[1] Górniak and Furmankiewicz 2001 [2] Szkudlarek and Paszkiewicz 1999
Eptesicus serotinus	2	2002	Kłodzko Main Fortress	Wrocław Chiropterological Group, unpublished
Pipistrellus pipistrellus /pygmaeus	3	1995	Kłodzko Main Fortress	Buřič et al. 2001a
Rhinolophus hipposideros	24	1992	Mine in Głuchołazy (near Domek Myśliwski)	Szkudlarek et al. 2001
Barbastella barbastellus	169	1999	Mine in Stolec	PTPP "pro Natura" in: Górniak 2000

The number of bats hibernating in winter shelters in the Polish side of the mountains (mainly northern) is lower then in the Czech part (Tab. 6).

The largest hibernacula with nearly 600 to 1300 bats are located mainly in the southern part of East Sudetes: Hrubý Jeseník (Šimon and Juda and Franz Franz mines), in and around Níský Jeseník (Černý důl, Zálužná I mines and buildings in Šternberk) and in Zábřežská upland (Javořícka cave) (Tab. 6).

Tab. 6. **The biggest hibernacula (above 200 bats) in the whole Sudetes and nearest areas.**
Tab. 6. Największe zimowiska (powyżej 200 nietoperzy) w Sudetach i na terenach przyległych.

Name of locality	Type of locality	Max. number of bats	Year of observation	References or authors
Buildings in Šternberk	buildings	1327	2000	Rumler 2001
Zálužná mine	mine	1302	2001	Wagner 2001
Pod Jelení cestou (Šimon and Juda) (Malá Moravká)	mine	1170	2001	Řehák and Gaisler 2001
Franz Franz (Malá Moravká)	mine	968	2001	Buřič and Šefrova 2001
Javoříčské caves	cave	822	2000	Koudelka and Reiter 2001
Černý důl	mine	667 (441)	1984 (1999)	Wagner 2001
Na Pomezí (Dolní Lipová)	cave	459	1997	Šafář and Rumler 2001
Roušarova (Vápenná)	cave	358	2000	Buřič and Šefrova 2001
Rasovna (Lipová Lázně)	cave	344	2001	Buřič and Šefrova 2001
Niedźwiedzia Cave (Kletno)	cave	251	2002	Tab. 8
Mine in Stolec	mine	242	1999	PTPP "pro Natura" in: Wołoszyn 2002
Szczelina Wojcieszowska (Wojcieszów)	cave	194	2001	Kliś et al. 2001

The issue of bat protection in caves

Sudetic caves deserve for special protection for hibernating bats, and for other natural values (e.g. other fauna species and rich rock pendants). Initially in Sudetes caves protection was not connected with bats (Pulina 1975, Węgiel and Węgiel 1998).

The best-protected cave is Niedźwiedzia Cave. The deepest part is not open to visitors. Most of the bats (73% in all bats in 2001-2002) hibernate in this part. The middle region is open to groups of tourists and has electrical light switched on during visits. Tourist route is open 5 days per week, from February to November. This can negatively affect hibernating bats (in February and March), however the numbers of people is limited. Oostveen (1996) showed that in the open part of the cave, the number of bats did not decrease much between February and April (from max. 59 bats at end of February to 55 ind. in April). However, it could be that bats from other parts of the cave, moving to these regions prior to leaving the winter shelters.

Fig. 3. The winter colony of greater mouse-eared bats *Myotis myotis* in Szczelina Wojcieszowska cave. Phot. Daniel Horaček.

Ryc. 3. Zimowa kolonia nocka dużego *M. myotis* w Szczelinie Wojcieszowskiej. Fot. Daniel Horaček.

Fig. 4. Brandt's bats *Myotis brandtii* in Nowa Cave. Phot. Miroslav Jóža.

Ryc. 4. Nocki Brandta *M. brandtii* w Jaskini Nowej. Fot. Miroslav Jóža.

The protection of Niedźwiedzia Cave began after its discovery in a quarry. The low number of bats recorded in the first years after the opening of the entrance (Wołoszyn 1968, 1971, Ogorzałek 1989) and palaeontological investigations (Wiszniowska 1989) show that the cave was probably not used as hibernaculum by bats from the upper Palaeogene onwards. Protecting the natural static microclimate necessitated preventing cold or warm airflow using artificial locking entrances (Kwiatkowski and Piasecki 1989). However, these are probably not advantageous for bats, which have only small holes in the doors through which to enter. The higher numbers of bats were observed in the smaller caves with open entrances located near to Kletno in the Czech part of the mountains (Na Pomezí, Roušarova, Rasovna: Tab 4). Niedźwiedzia Cave and its surroundings with other small caves (e.g. Miniaturka,

Dudnisko, Sądejowa Szczelina) are protected by law as natural reserve. The quarries several km from the reserve were closed in the 1990s, because their negative influence on the hydrology in the caves and protected carst area.

The highest people pressure is observed in well-known caves located on tourist routes: Radochowska cave and Krótka, Czerwona and Lisia caves near Lwówek Śląski. Kontaktowa Cave by Kletno and Nad Lądkiem Cave by Lądek Zdrój have a similar situation. This is probably the reason that relatively few bats are observed each year in these shelters (Tab. 3). Especially threatened was Radochowska cave, which had evidence of contemporary use of torches. The closure of the cave and controlled opening for groups with a tourist guide using electrical light will be an improvement for bat protection. But as mentioned above, the risk of disturbance to wintering bats is high and it would be better to close the tourist route in winter.

Relatively few people penetrate caves located in area of Połom mount near Wojcieszów in winter. Alpine techniques are required to access Szczelina Wojcieszowska and Błotna caves and there are difficult carst thresholds at Nowa Cave, too. This naturally limits the number of tourists, especially in winter. The danger for all caves in Połom (nearly 20) is the impossibility of legal protection, because they are mainly on private working limestone quarries. However, in the consequence of private restrictions for people in a working is that the number of visitors to the caves is quite low. Although the caves are beyond the current mine field, the risk of future destruction is real. The caves ought to be protected, especially because they are one of the biggest bat hibernacula in the Polish side of Sudetes (Kliś et al. 2001). There is constant conflict between the interests of the private limestone mining company and the need for protection of the caves. Many newly discovered caves are destroyed before geological, paleontological and zoological surveys despite original carst formations. The areas of Połom mount need special and intensive efforts to secure protection of caves that are not only important bat hibernacula, but also valuable geological monuments. The threat risk of the biggest hibernacula in the Polish part of Sudetes are shown in Tab. 7.

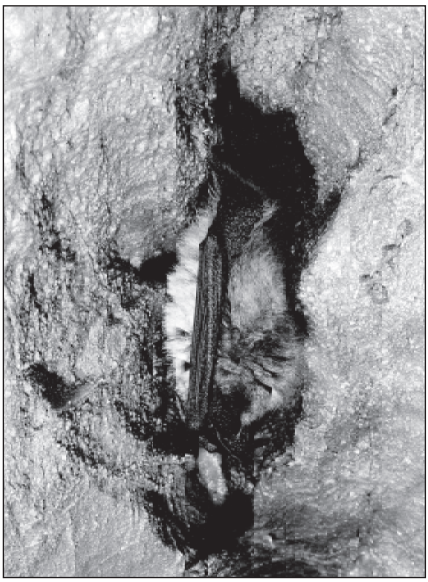

Fig. 5. Geoffroy's bat *Myotis emarginatus* in Niedźwiedzia Cave. Phot. Miroslav Jóža.
Ryc. 5. Nocek orzęsiony *Myotis emarginatus* w Jaskini Niedźwiedziej. Fot. Miroslav Jóža.

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Tab. 7. **Threat risk of the 10 biggest hibernacula in natural caves of the Polish part of Sudetes causing by people pressure.**

Tab. 7. Zagrożenia 10 największych zimowisk nietoperzy w naturalnych jaskiniach polskiej części Sudetów.

Cave	Degree of people pressure	Current protection	Main menace in hibernation period
Niedźwiedzia	practically lack in lower part, limited in middle part	nature reserve, locking cave, number of visitors limited, entrance only with guide on middle part (500 m)	lack in lower part, possibility of bats frightening on tourist route from February to March
Szczelina Wojcieszowska and small not well-known caves in central part of Połom mount	low	no law protection – private area,	in future threat by destruction by quarry
Nowa, Północna Duża and other small, well-known caves in central part of Połom mount	middle	no law protection – private area,	in future threat by destruction by quarry
Radochowska	very high	nature monument (protected by law) but generally open to all visitors	winter tourist movement,
Na Ścianie	low	cave locked by Speleological Club and not visited in winter	practically lack
Kontaktowa	high	cave opened to all visitor without control	snot controlled tourist traffic in winter season
Solna Jama	middle	cave opened to all visitors without control	not controlled tourist traffic in winter season
Nad Potokiem and Błotna (Pierwszomajowa)	low	cave opened to all visitors without control	not controlled tourist traffic in winter season

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Tab. 8a. **Winter records of bats in caves in the Polish side of the Sudetes in the years 2000-2002.**

The following acronyms were used (Wołoszyn 1992): RHH – *Rhinolophus hipposideros*, MYM – *Myotis myotis*, MBE – *M. bechsteinii*, MYN – *M. nattereri*, MEM – *M. emarginatus*, MYS – *M. mystacinus*, MYB – *M. brandtii*, MMB – *M. mystacinus / brandtii*, MDA – *M. daubentonii*, MDS – *M. dasycneme*, MSP – *M. species*, ENI – *Eptesicus nilssonii*, ESE – *E. serotinus*, PAR – *Plecotus auritus*, BAR – *Barbastella barbastellus*, IND – *Chiroptera indeterminata*. No bats were recorded at: Z Otoczakami Cave (Ołdrzychowice Kłodzkie) controls 25.02.2001 and 1.02.2002; Przy Torach C. (Ołdrzychowice Kłodzkie) - 25.02.2001 and 1.02.2002; Północna Mała C. (Wojcieszów) – 5.02.2000, 2.02.2001 and 26.01.2002; Komarowa C. (Wojcieszów) - 8.01.2000 and 3.02.2001; Silesia C. (Wojcieszów) 27.01.2002; W Leju C., (Wojcieszów) 26.01.2002, Lisia C. (Płóczki Dolne) – 1.01.2000.

Tab. 8a. Zimowe stwierdzenia nietoperzy w naturalnych jaskiniach polskiej części Sudetów w latach 2000-2002.

Name of cave	UTM	Date	RHH	MYM	MBE	MYN	MEM	MYS	MYB	MMB	MDA	MDS	MSP	ENI	ESE	PAR	BAR	IND	Sum	Source or main authors
Czerwona	WS 35	1.01.2000									**1**								**1**	J.i M. Furmankiewicz
Krótka	WS 35	1.01.2000														**1**			**1**	J.i M. Furmankiewicz
Walońska	WS	3.02.2001																	**0**	J.i M. Furmankiewicz
w Podgórkach	35	27.01.2002				**4**													**4**	J.i M. Furmankiewicz
Błotna	WS 64	5.02.2001																	**0**	Kliś et al. 2001 (entrance parts)
		27.01.2002		**4**		**1**				**2**	**2**								**9**	M.Furmankiewicz (without last well)
Nad Potokiem	WS	2.02.2001									**1**					**3**			**4**	J.i M. Furmankiewicz
	64	26.01.2002				**1**			**3**		**3**					**3**			**10**	M.Jóźa, J.Furmankiewicz, A.Szlachetka
Ostrych Kantów	WS 64	26.01.2002									**1**								**1**	J.Furmankiewicz, M.Jóźa
Aven w Połomie	WS 64	5.02.2000									**1**								**1**	J.Furmankiewicz, R.Klodek

Tab. 8b. **Winter records of bats in natural caves in the Polish side of the Sudetes in years 2000-2002.**

Tab. 8b. Zimowe stwierdzenia nietoperzy w naturalnych jaskiniach polskiej części Sudetów w latach 2000-2002.

Name of cave	UTM	Date	RHH	MYM	MBE	MYN	MEM	MYS	MYB	MMB	MDA	MDS	MSP	ENI	ESE	PAR	BAR	IND	Sum	Source or main authors
Północna Duża	WS 64	15.01.2000		5		9				9	6	1	3			9	32	1	75	J. Furmankiewicz S. Telatyński,
		5.02.2000		2		7				4	7		2			5	18	1	46	J. i M. Furmankiewicz
		2.02.2001		6		24				7	10					6	19		72	J. i M. Furmankiewicz
		26.01.2002		4		15			7	1	10		2			13	14	1	67	M. Jóźa, A.Szlachetka, J. Furmankiewicz,
Szczelina Wojcieszowska	WS 64	2.02.2001		102	1	16				12	55	1	5			2			194	T. Kliś, S. Telatyński, M. Wójcik
		26.01.2002		95	1	10		7			59		1			3			176	D. Horáček, T.Kliś
Nowa	WS	8.01.2000		13	1	3			1		4		1				2		25	J. i M. Furmankiewicz
	64	3.02.2001		20		19				1	11						4		55	J. i M. Furmankiewicz
		27.01.2002		24		10		1	9	2	19		3			3	4		75	D. Horáček, M.Jóźa, T.Kliś
Pajęcza	WS	9.01.2000		1															1	J. i M. Furmankiewicz
	64	3.02.2001									2								2	J. i M. Furmankiewicz
		27.01.2002																	0	D. Horáček. M.Jóźa, T.Kliś
W Wapniarce	XR	25.02.2001																	0	Buřič et al. 2001a
	18	1.02.2002														1			1	M. Furmankiewicz
Radochowska	XR	25.02.2001		6							2				1	3	2		14	Buřič et al. 2001a
	37	1.02.2002		4						1						2	12		19	WroGruC, W. Mysiuk
Nad Lądkiem	XR 37	1.02.2002	1												1	1			3	J. i M. Furmankiewicz, W. Mysiuk, A. Nowakowski

Tab 8c. **Winter records of bats in natural caves in the Polish side of the Sudetes in years 2000-2002.**

Tab. 8c. Zimowe stwierdzenia nietoperzy w naturalnych jaskiniach polskiej części Sudetów w latach 2000-2002.

Name of cave	UTM	Date	RHH	MYM	MBE	MYN	MEM	MYS	MYB	MMB	MDA	MDS	MSP	ENI	ESE	PAR	BAR	IND	Sum	Source or main authors
Na Ścianie	XR 27	12.03.2000		**12**							**2**								**14**	Buřič et al. 2001a
		6.02.2002	**1**	**18**							**2**					**1**			**22**	J.Furmankiewicz, A.Nowakowski
Kontaktowa	XR 36	18.01.2001		**1**		**1**				**2**						**1**	**2**		**7**	Buřič et al. 2001a
		17.11.2001												**1**					**1**	J.Furmankiewicz, R.Klodek, A.Stanuch, S.Telatyński
		3.02.2002		**3**		**2**				**1**						**4**	**1**		**11**	J.Furmankiewicz, K.Gajda
		5.04.2002		**3**		**2**					**1**								**6**	A.Szlachetka, M.Furmankiewicz, A.Nowakowski
Niedźwiedzia	XR 36	19-20.01 2001		**17**	**1**	**8**	**6**	**46**	**77**		**22**					**16**		**5**	**198**	Buřič et al. 2001a, 2001b
		18.11.2001		**9**		**3**	**1**			**40**	**12**					**5**		**3**	**73**	WroGruC, Speleol.Section Stronie Śl., PTOP Salamandra
		2.02.2002		**22**	**2**	**13**	**5**			**132**	**31**		**12**			**33**		**1**	**251**	WroGruC, Speleol.Section Stronie Śl., PTOP Salamandra, CIC Kraków
		6.04.2002		**23**	**1**	**5**	**7**			**123**	**17**							**8**	**184**	WroGruC, Speleol. Section Stronie Śl., Wrocław Univ.
Miniaturka	XR 36	20.01.2001																	**0**	WroGruC
		17.11.2001									**1**								**1**	J.Furmankiewicz
		2.02.2002																	**0**	WroGruC (upper part)
		5.04.2002								**4**			**2**			**1**			**7**	M.Furmankiewicz
Solna Jama	XR 16	1.03.2001		**3**										**1**		**1**			**5**	Buřič et al. 2001a
		4.02.2002		**1**							**1**					**3**			**5**	J. i M. Furmankiewicz, A.Nowakowski

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Nietoperze zimujące w naturalnych jaskiniach polskiej części Sudetów

W trzech sezonach zimowych (1999/2000, 2000/01 i 2001/2002) przeprowadzono zimowe kontrole 26 jaskiń w polskiej części Sudetów. Stwierdzono 13 gatunków nietoperzy: *Myotis myotis, M. bechsteinii, M. nattereri, M. emarginatus, M. mystacinus, M. brandtii, M. dasycneme, M. daubentonii, Eptesicus nilssonii, E. serotinus, Plecotus auritus, Barbastella barbastellus* oraz *Rhinolophus hipposideros.* Dominowały nocki duże *M. myotis* (27,3 % wszystkich oznaczonych nietoperzy) i nocki wąsatki / Brandta *M. mystacinus / brandtii* (24,4 %). Stosunkowo liczne były także nocki rude *M. daubentonii* (18,9 %) i nocki Natterera *M. nattereri* (10,7 %). Mniej liczne były mopki *B. barbastellus* (8,3 %) i gacki brunatne *P. auritus* (8,6 %).

Największym zimowiskiem nietoperzy była Jaskinia Niedźwiedzia koło Kletna (maksymalnie 251 osobników zimą 2002 roku). Jest to zarazem największe w polskiej części Sudetów zimowisko nocka wąsatka / nocka Brandta – 132 osobniki, gacka brunatnego (33 osobniki) i nocka orzęsionego (7 osobników). Drugim co do liczebności zimujących nietoperzy stanowiskiem nietoperzy była Szczelina Wojcieszowska w Połomie koło Wojcieszowa (maks. 194 osobniki zimą 2001 roku). Jaskinia ta jest najważniejszym zimowym stanowiskiem nocka dużego (102 osobniki) i nocka rudego (59 osobników). W jaskiniach Połomu zimowały pojedyncze osobniki nocka łydkowłosego *M. dasycneme*. W jaskiniach Na Ścianie i Nad Lądkiem zimą 2002 roku zaobserwowano po raz pierwszy podkowca małego *Rh. hipposideros*. Naturalne jaskinie Sudetów stanowią ważne miejsca zimowania nietoperzy, ale ustępują one pod względem liczebności zimowiskom w starych sztolniach. Liczebność hibernujących nietoperzy po polskiej (północnej) stronie Sudetów jest mniejsza niż po czeskiej stronie, gdzie na kilku stanowiskach notowano od około 300 do 1300 nietoperzy i większą liczbę rzadkich gatunków.

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