

# Positive trend in numbers of bats wintering in mass hibernacula in Moravia and Silesia (Czech Republic)

Zvyšování počtu netopýrů zimujících v masových zimovištích  
Moravy a Slezska (Česká republika)



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# INTRODUCTION

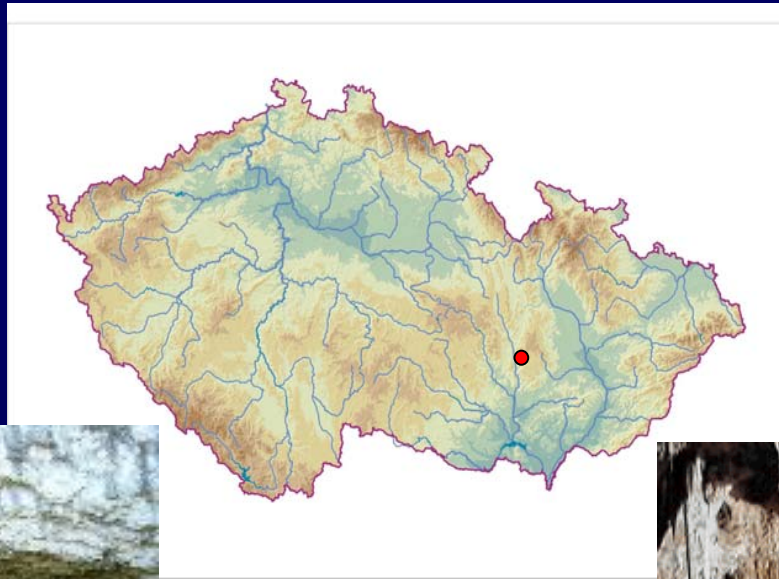
- ❑ Winter checks of bats in extensive underground spaces are an important method of monitoring bat populations. Bats gather in such hibernacula from large area of their summer occurrence.
- ❑ On the territory of the present Czech Republic, winter census of bats started in **1955** but originally it involved only a few sites. Since then, the number of localities was enlarged and winter monitoring of bat numbers has been standardized.

## AIM

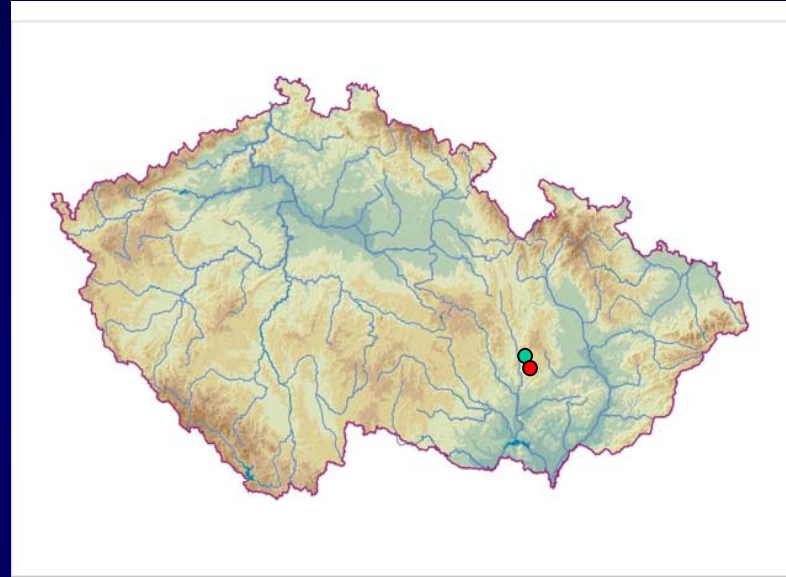
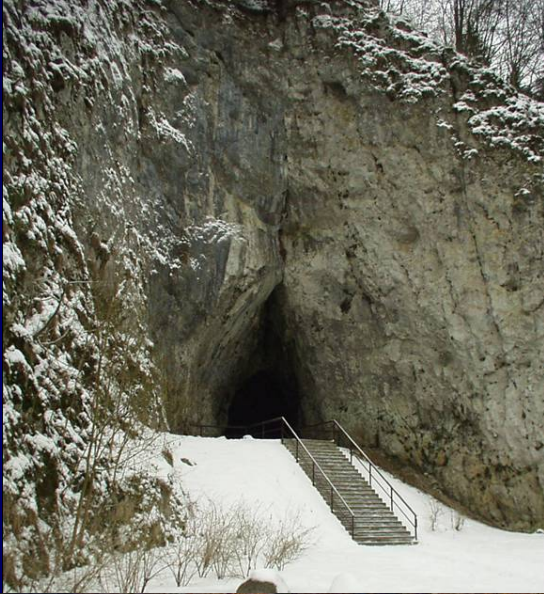
To evaluate the trends in numbers of bats as recorded in six mass hibernacula situated on the territory of Moravia or Silesia, which is the E part of the Czech Republic.

# STUDY SITES

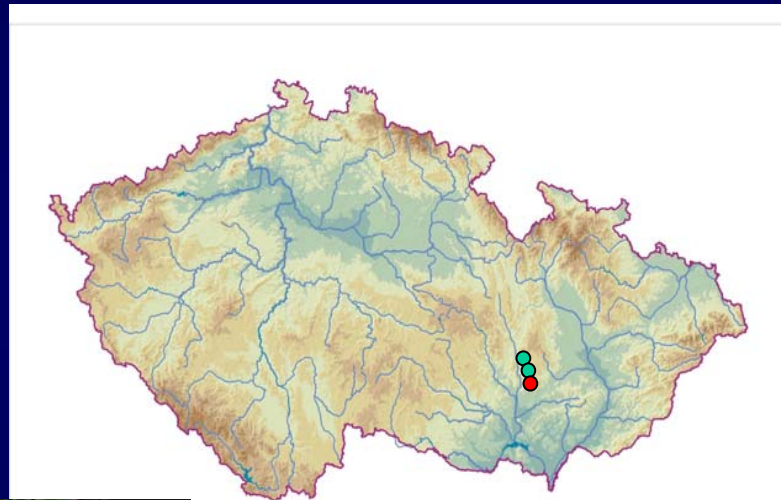
1. Sloupsko-šošůvské caves, SŠC (49° 25' N, 16° 45' E)
  - a natural limestone cave system in the N part of the Moravian Karst (MK, C Moravia). A complicated set of corridors and domes in two storeys connected by deep chasms. **Total length ca 7 km, six entrances at the elevation of 460 – 472 m.**



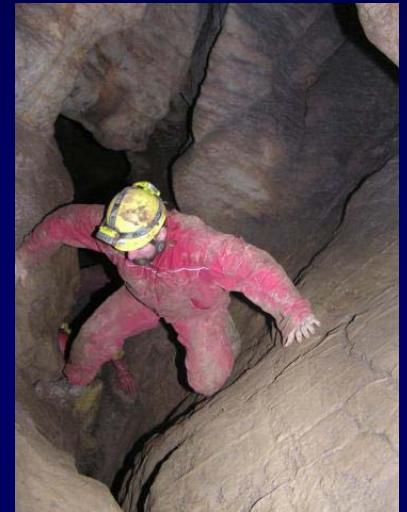
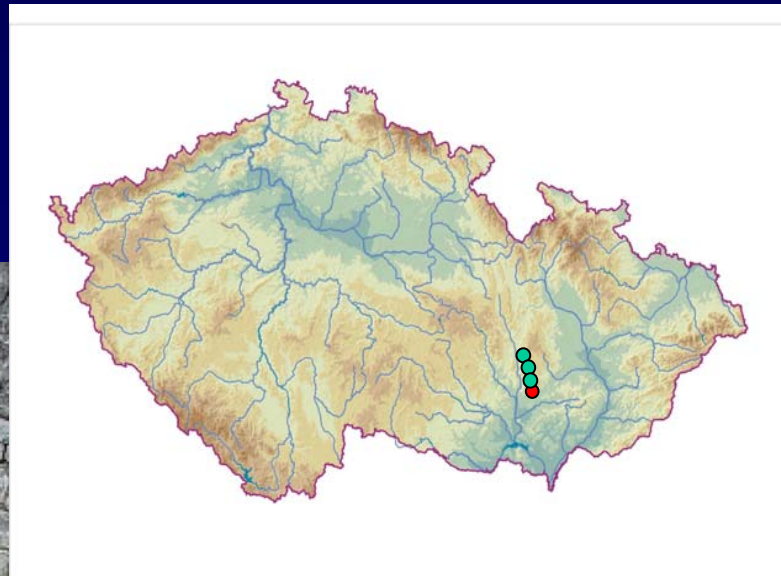
2. Kateřinská cave, KC ( $49^{\circ} 21' N$ ,  $16^{\circ} 48' E$ ) – a natural limestone cave in the N part of MK with **one entrance at the elevation of 345 m.** Total length of corridors and three large domes **ca 500 m.**



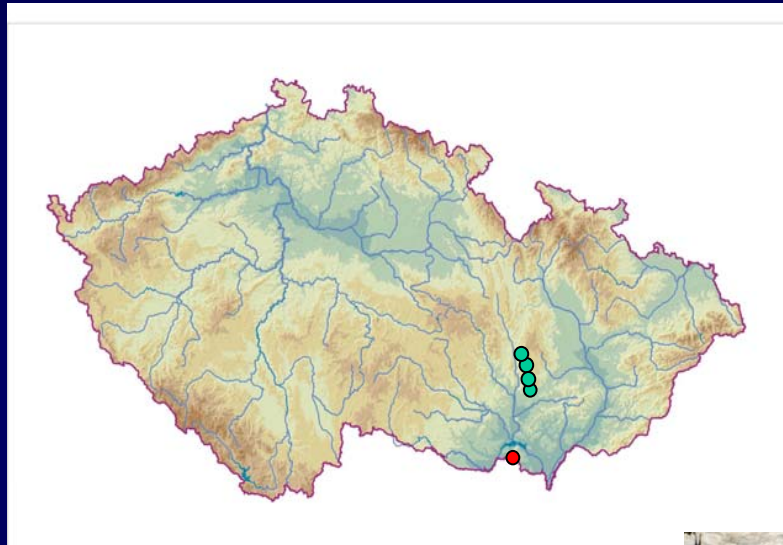
3. **Býčí skála cave, BSC** (49° 18' N, 16° 42' E) – a natural cave in the part of MK with **three entrances**, a large man-made, a large natural (**elevation 302.5 m**) and a small natural upper window. Total length of the whole system **ca 13 km** but bats have been checked in its small part only, the Old Býčí skála incl. Brunina cave.



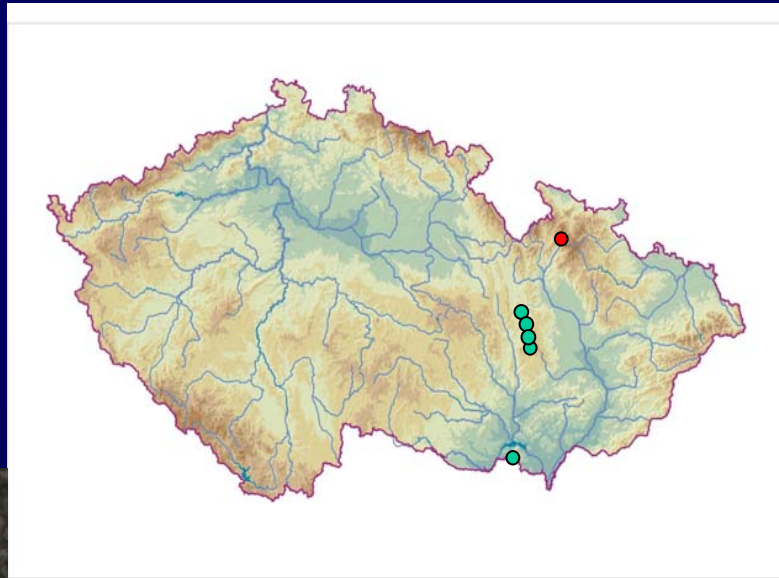
4. Caves of the Říčka valley, CŘV (49° 15' N, 16° 45' E) – four natural caves, viz, Ochozská., Netopýrka, Malčina and Pekárna, in the S part of MK. Their entrances are situated at the bottom of a valley. Total length of **Ochozská cave > 1 km**, of each of the remaining caves 100 m.



5. Cave of Na Turoidu, CT (48° 48' N, 16° 38' E) – a natural limestone cave in S Moravia at the border with Austria. A complicated system of corridors and storeys with only small domes, **elevation 250-295 m**. Total length of accessible spaces **ca 1100 m**.



**6. Mines near Malá Morávka, MMM** (50° 03' N, 17° 18' E) – two abandoned iron ore mines in the Jeseníky Mts., N Moravia. Complicated systems of galleries and spacious halls in several storeys connected by vertical shafts at the elevation of **900 m**. Total length of „standard“ spaces checked regularly since 1970/71 ca. 600 m, of „new“ spaces discovered in 1993 and checked since 1994 over 500 m.





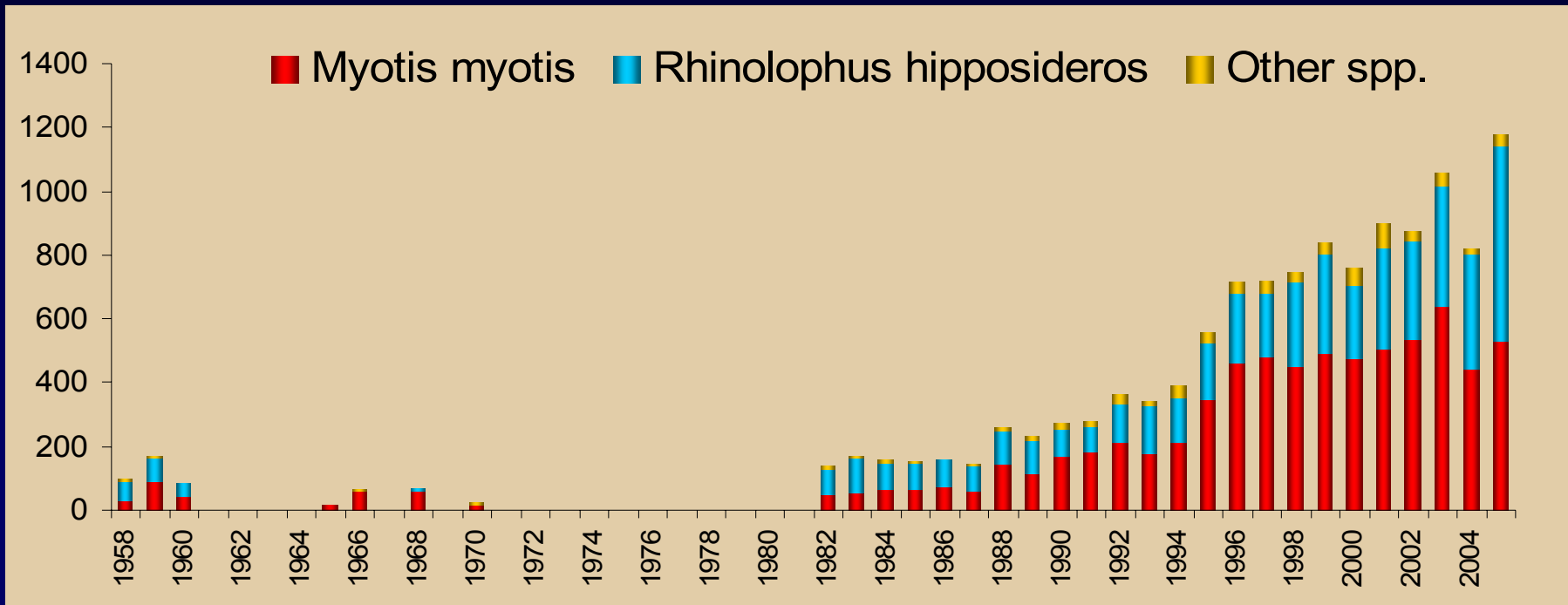
# METHODS

- Each of the hibernacula was visited once per winter, usually in January or February.
- Up to 1980, the census was coupled with marking and recapturing, since 1981 the bats were censused visually without marking
- Both published and unpublished data have been used.
- Published data sources:
  - SŠC** - Zupal et al. (2001, 2003),
  - KC** - Řehák et al. (1994), Zupal et al. (2001),
  - BSC** - Zima (2001),
  - CŘV** - Gaisler & Řehák (2001),
  - CT** - Chytil & Gaisler (2001), Gaisler & Chytil (2002),
  - MMM** - Gaisler et al. (1993), Řehák & Gaisler (1999, 2001)..
- Unpublished data sources, mainly after 2000, were assumed from field protocols of the authors and their co-workers (Zupal, Kovařík, Chytil, Bartonička).
- The changes in numbers of bats were assessed using **linear regression analysis**.

# MATERIAL

Species / Localities	SŠC	KC	BSC	CŘV	CT	MMM
Rhinolophus hipposideros	+	+	+	+	+	+
R. ferrumequinum	0	0	+	0	0	0
Myotis mystacinus	+	+	+	+	+	+
M. brandtii	+	+	+	+	+	+
M. emarginatus	+	+	+	+	+	+
M.nattereri	+	+	+	+	+	+
M. bechsteinii	0	+	+	+	0	+
M. myotis	+	+	+	+	+	+
M. blythii	+	+	0	+	+	0
M. daubentonii	+	+	+	+	+	+
M. dasycneme	+	+	+	0	0	+
Pipistrellus pipistrellus s.l.	0	+	0	0	0	0
Eptesicus nilssonii	0	0	0	0	0	+
E. serotinus	+	0	+	+	0	+
Barbastella barbastellus	+	+	+	+	0	+
Plecotus auritus	+	+	+	+	+	+
P. austriacus	+	+	+	+	+	+
No. of species	13	14	14	13	10	14

## Sloupsko-šošůvské caves, SŠC (1958-2005)

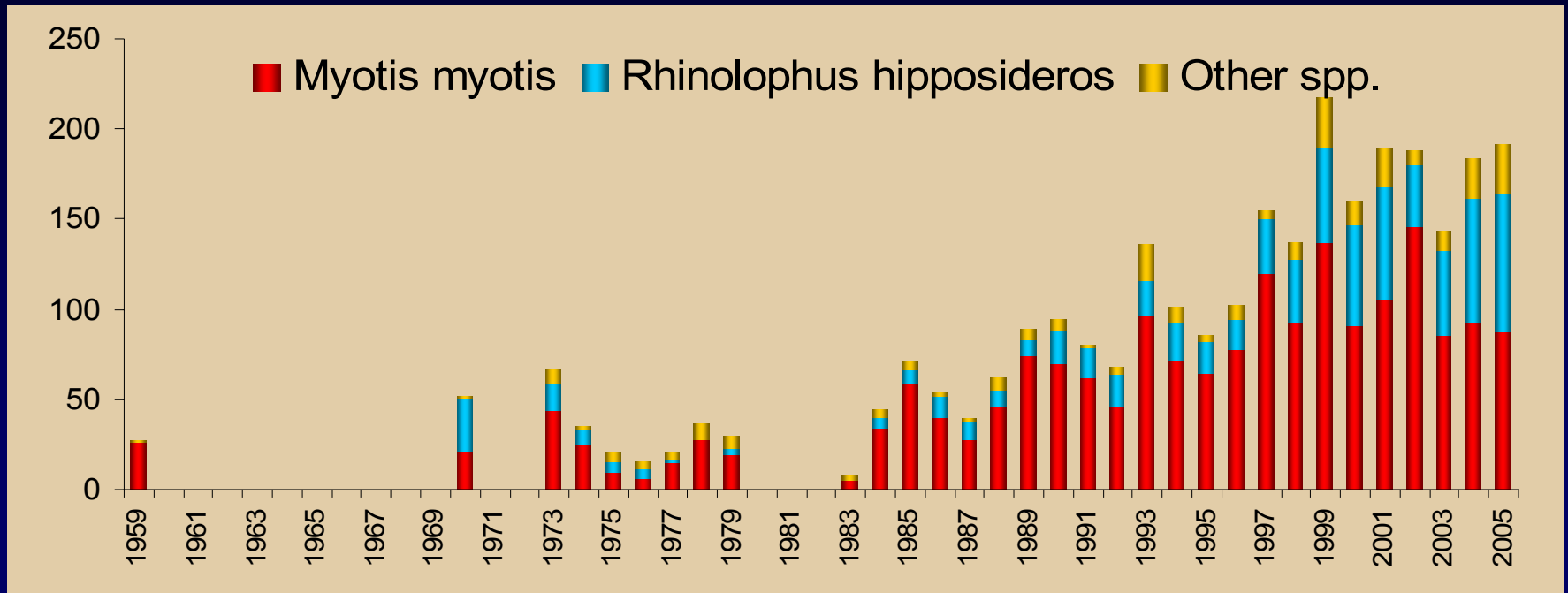


Two species are dominant in the SŠC, viz,  
*M. myotis* (57.0 %) and *R. hipposideros* (38.1 %).



Their numbers increased since 1982 and this trend has been highly significant (*M. myotis*,  $r = 0.95$ ,  $p < 0.001$ , *R. hipposideros*  $r = 0.87$ ,  $p < 0.001$ ).

## Kateřinská cave, KC (1959-2005)

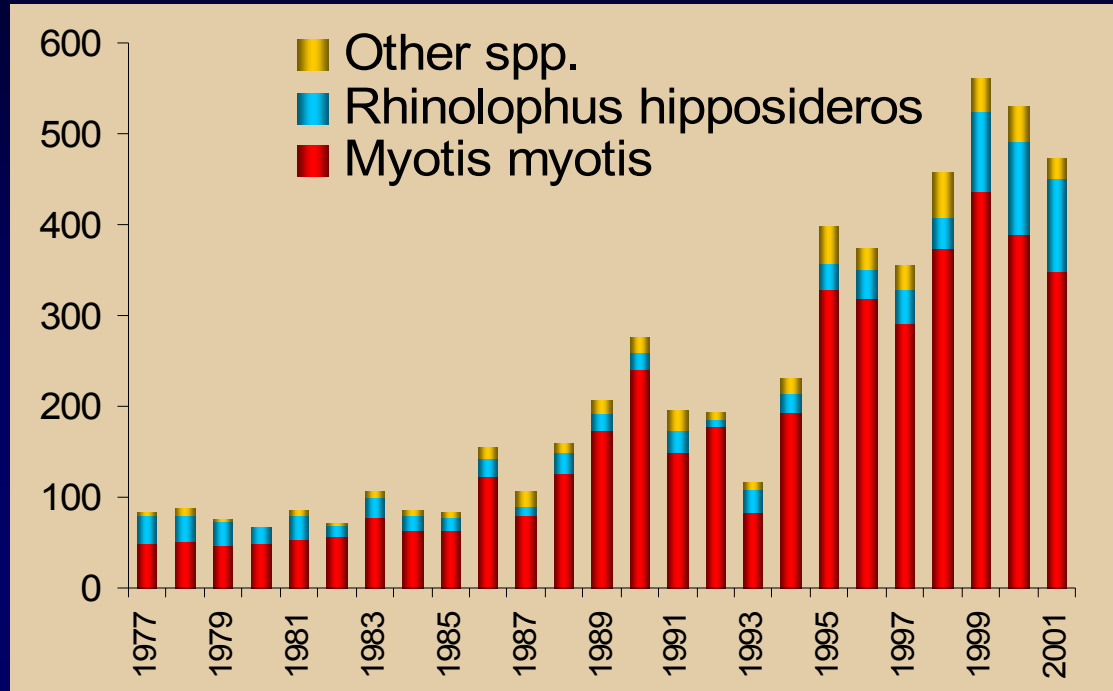


Similar results were obtained in the **KC** where *M. myotis* prevailed (**66.4 %**) while *R. hipposideros* was the second most common species (**24.5 %**).



Since 1983, the increase in their numbers was highly significant (*M. myotis*,  $r = 0.79$ ,  $p < 0.001$ , *R. hipposideros*,  $r = 0.90$ ,  $p < 0.001$ ).

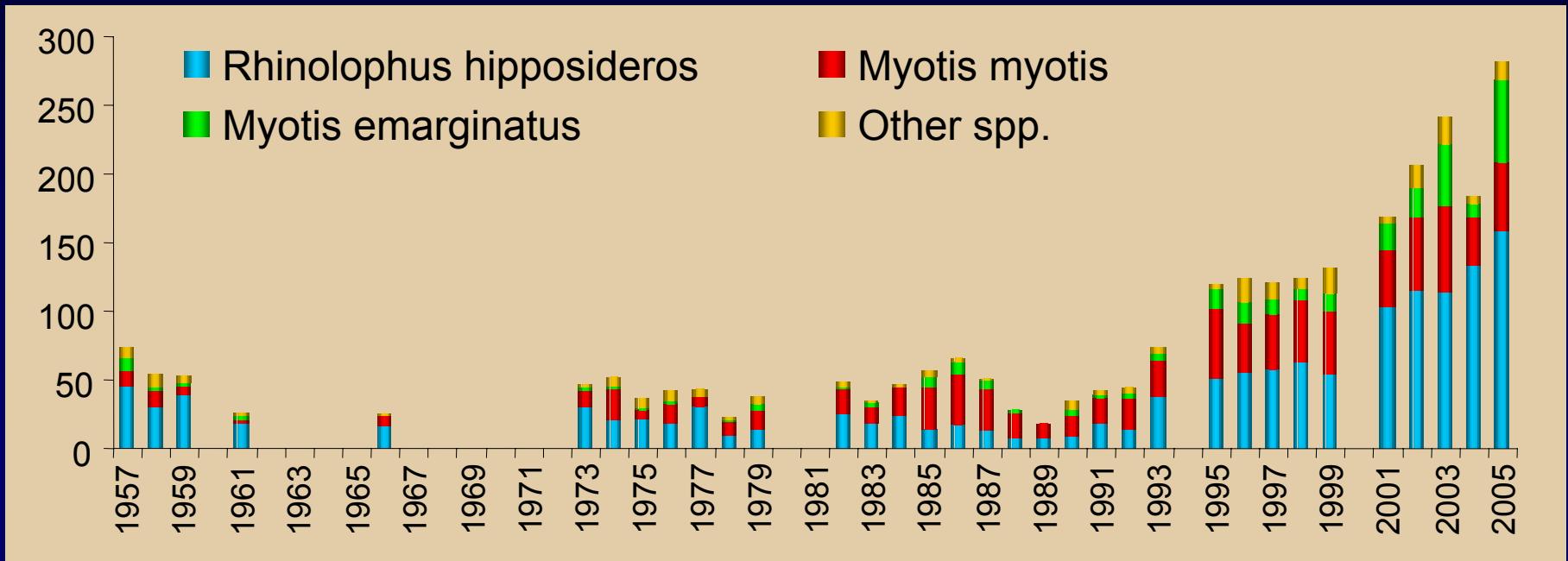
## Býčí skála cave, BSC (1977-2001)



Bat community of the **BSC** is characterized by the high dominance of *M. myotis* (**78.5 %**) the increase in numbers of which has been highly significant ( $r = 0.90$ ,  $p < 0.001$ ).

The second numerous *R. hipposideros* is far less common (**14.3 %**) and the positive trend in its numbers has been less significant ( $r = 0.60$ ,  $p < 0.01$ ).

## Caves of the Říčka valley, CŘV (1957-2005)



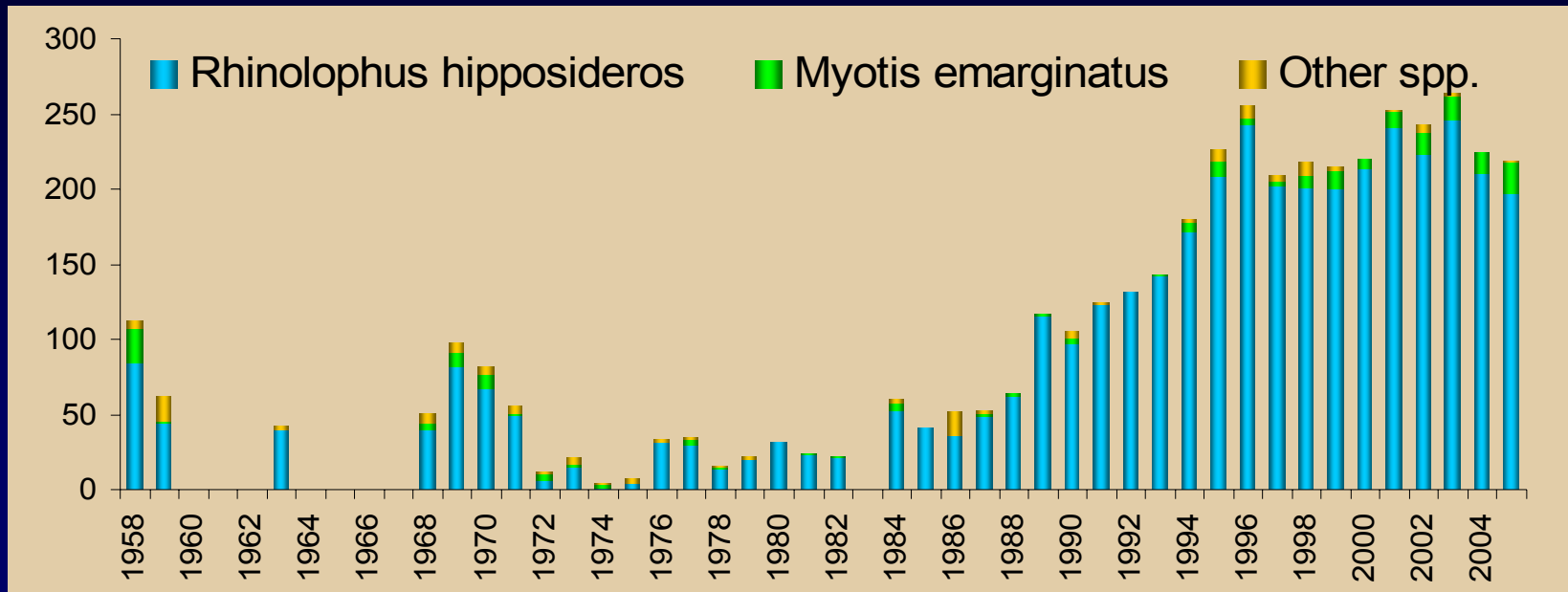
Different situation was found in the CŘV. *R. hipposideros* prevails (50.9 %) while *M. myotis* constitutes only 30.7 %.

Since 1982, both species increased in numbers significantly (*R. hipposiders*,  $r = 0.87$ ,  $p < 0.001$ , *M. myotis*,  $r = 0.75$ ,  $p < 0.001$ ).

Further characteristic species there is *M. emarginatus* (10.6 %) the numbers of which also increased significantly ( $r = 0.69$ ,  $p < 0.001$ ).



## Cave of Na Tuoldu, CT (1958-2005)

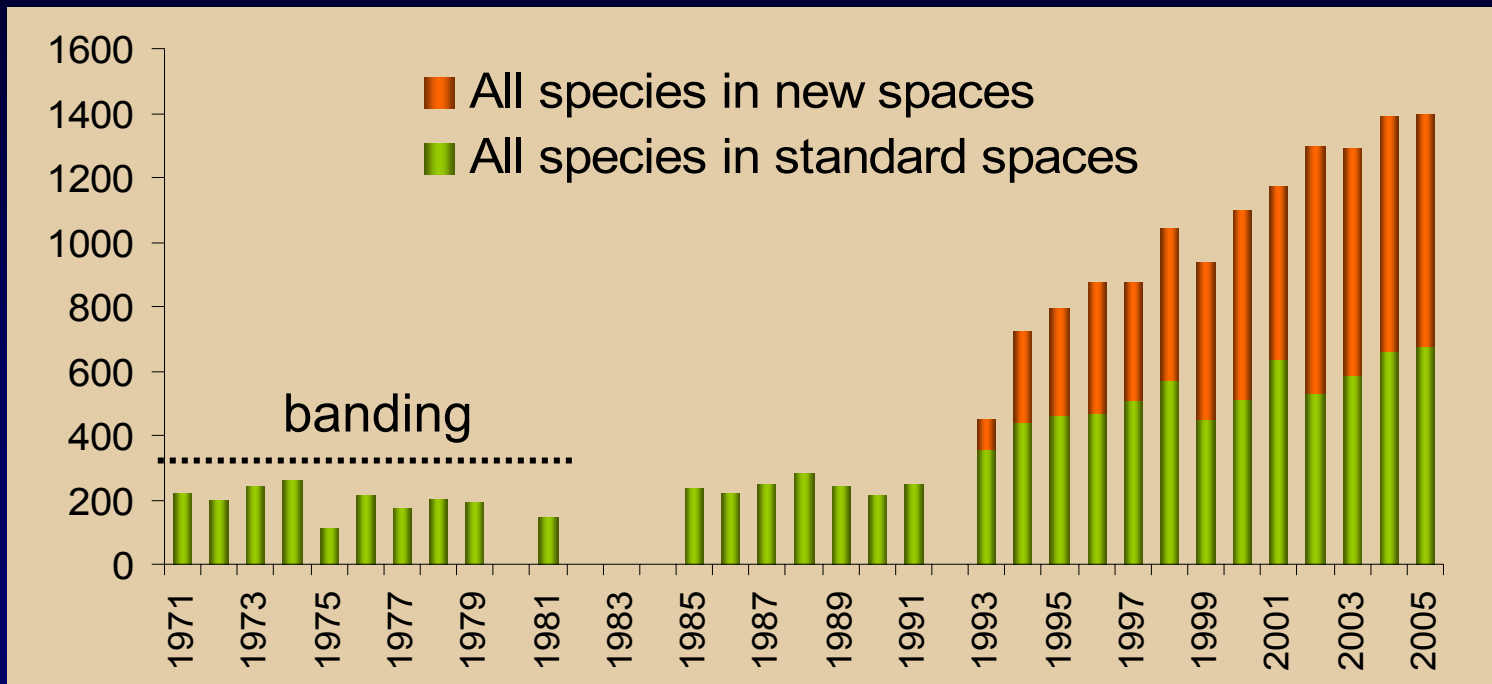


In the **CT**, the only dominant species is ***R. hipposideros*** (92.2 %), remaining nine species are rare (less than 5 % each), ***M. emarginatus*** is most abundant of them.

Considerable decrease in the number of bats in 1969 - 1974 was caused by the destruction of the entrance gate (***R. hipposideros***,  $r = 0.95$ ,  $p < 0.01$ ).

After the cave was closed again in 1975, the number of hibernating bats increased (***R. hipposideros***,  $r = 0.95$ ,  $p < 0.001$ , ***M. emarginatus***,  $r = 0.78$ ,  $p < 0.001$ )

## Mines near Malá Morávka, MMM (1971-2005)



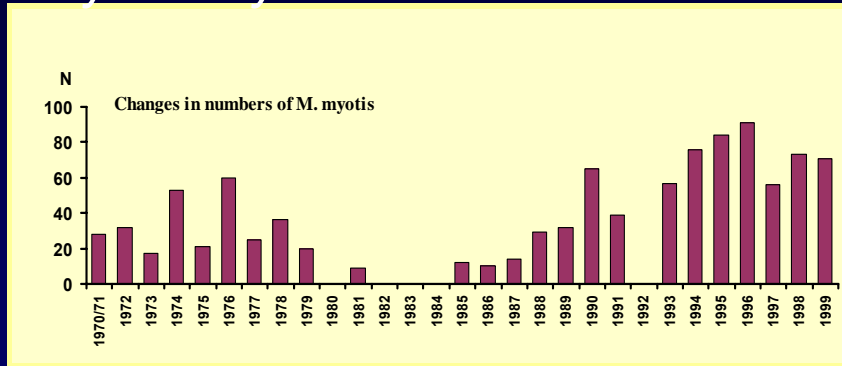
Significant increase in numbers of the whole bat community has been revealed since 1985 in **standard spaces (SS)** ( $r = 0.94$   $p < 0.001$ ) and since 1994 in **new spaces (NS)** ( $r = 0.95$ ,  $p < 0.001$ )

Bat community in the **MMM** shows high species diversity. In six out of 14 species recorded in standard spaces, the dominance values exceed 5 %: *B. barbastellus* (53.7 %), *M. myotis* (15.4 %), *E. nilssonii* (9.1 %), *M. mystacinus/brandtii* (8.5 %), *M. daubentonii* (5.8 %) and *P. auritus* (5.0 %). Three species dominate new spaces: *M. myotis* (49.4 %), *R. hipposideros* (35.3 %) and *M. daubentonii* (8.3 %).

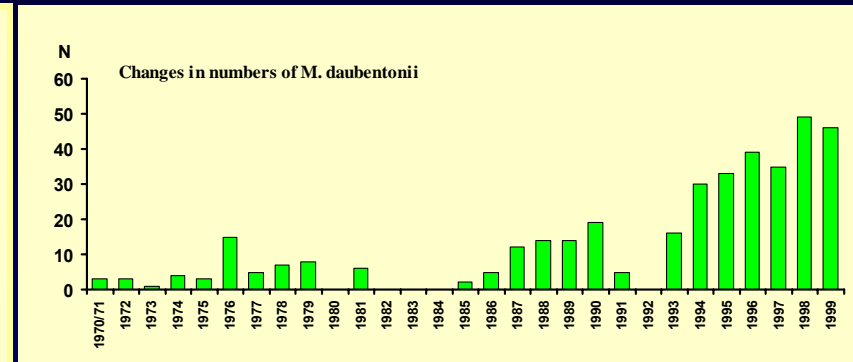


# Mines near Malá Morávka, standard spaces

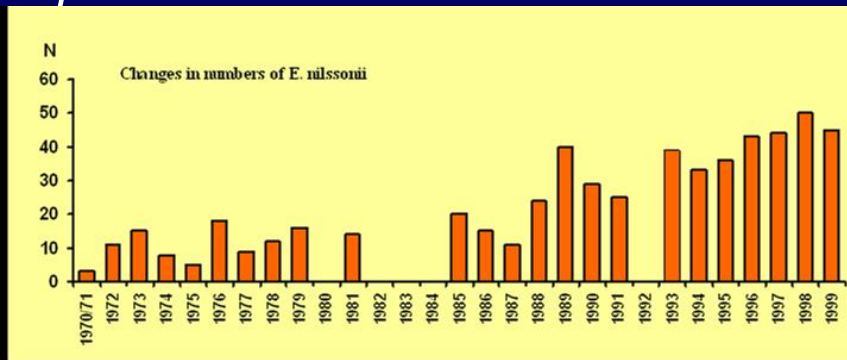
## *Myotis myotis*



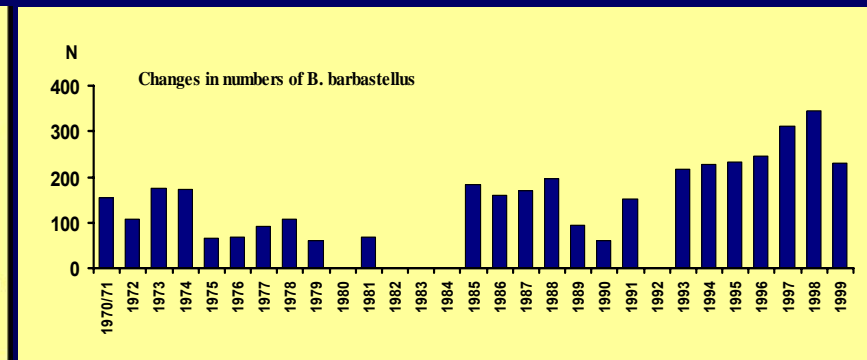
## *M. daubentonii*



## *Eptesicus nilssonii*



## *Barbastella barbastellus*



The population development recorded in 7 species, viz, *M. myotis* (SS:  $r = 0.85$ ,  $p < 0.001$ , NS:  $r = 0.94$ ,  $P < 0.001$ ), *E. nilssonii* (SS:  $r = 0.93$ ,  $p < 0.001$ ), *M. daubentonii* (SS:  $r = 0.79$ ,  $p < 0.001$ ), *B. barbastellus* (SS:  $r = 0.63$ ,  $p < 0.01$ ), *P. auritus* (SS:  $r = 0.79$ ,  $p < 0.001$ ), *M. mystacinus/brandtii* (SS:  $r = 0.77$ ,  $p < 0.001$ ) and *R. hipposideros* (NS:  $r = 0.90$ ,  $p < 0.001$ )

# CONCLUSION

Similarly as in many other C European mass hibernacula, **significant increase in numbers of bats** was recorded during the last decades, after winter marking has been abandoned. In some species, especially *M. myotis* and *R. hipposideros*, data obtained in winter possibly reflect a general positive trend of population development.

## Acknowledgement

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Thank you for your attention

Děkuji za pozornost

Dziękuję za uwagę