

## The Frequency of Winter Sleep Interruptions in Two Species of Bats Hibernating in Limestone Tunnels

CZĘSTOŚĆ PRZERYWANIA SNU ZIMOWEGO DWOCH GATUNKÓW NIETOPERZY  
ZIMUJĄCYCH W WAPIENNYCH SZTOLNIACH

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In several small limestone tunnels near Cracow (50°02'N, 19°52'E) it was found that on average *Rhinolophus hipposideros* awaken every 17.8 days, and *Myotis myotis* 41.2 days.

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It is widely accepted that hibernation in bats of the temperate zone is normally interrupted from time to time for reasons yet unknown. The aim of this report is to determine frequency of such interruptions in two bat species: *Rhinolophus hipposideros* (Bechstein, 1806) and *Myotis myotis* (Borkhausen, 1797) wintering in man-made limestone tunnels.

During 1956—1983 period the frequency of awakening was observed in bats hibernating in several small limestone tunnels made during the First World War period near Cracow (50°22'N, 19°52'E). The largest of ten tunnels has a length of 70 m, the smallest — 15 m. The height of underground passages ranged from 3 to 5 m, the width — 2 to 10 m. In the parts of tunnels close to their entrances, the temperature in winter months ranged from -4° to 0°C while in their deepest parts it reached 10°C with humidity of 80—90%. Daylight penetrated only the parts closest to the entrances. The tunnels were visited in 3 to 5-day intervals. The exact position of each bat was registered without disturbing the animal. The duration of uninterrupted stay at particular position and intervals at which the animal shifted to other places were noted.

The average length of uninterrupted winter sleep in *R. hipposideros* was 17.8 days, SD=5.2, SE=0.98 (the number of individuals observed  $n=141$ ). The longest period without awakening was 86 days, the shortest — 2 days. In *M. myotis* the average length of uninterrupted sleep was 41.2 days, SD=5.92, SE=0.54 ( $n=55$ ). The longest uninterrupted sleep lasted for 98 days, the shortest — 5 days. The longest spells of uninterrupted sleep occurred in both species in the middle of winter *i.e.* between December and February. The bats inhabited tunnels from the beginning of October till the end of April. *R. hipposideros* were hibernating within temperature range from 2 to 10°C while *M. myotis* — from -4° to 10°C.

Hooper & Hooper (1956) found that *R. hipposideros* in England awake at average 7 to 14-days intervals which partially agrees with the above

results. In some Dutch localities however, *M. myotis* awakened more frequently than *R. hipposideros* (Dean & Wichers, 1968). Also there, *Myotis daubentoni* (Kuhl, 1819) is reported to awake more frequently than *R. hipposideros* and *M. myotis* (Dean, 1960). Yet another data provided from Slovakian caves (Rybar, 1975) indicate that *M. myotis* there awaken, on average, every 45 days. This figure agrees well with my observations. The above authors report that *R. hipposideros* and *Myotis emerginatus* awaken infrequently.

It was shown that *R. hipposideros* awakened more frequently and assume active behaviour faster than *M. myotis* (Harmata, 1985). The thermal preferendum for *R. hipposideros* in natural and laboratory conditions fell over higher temperatures than that in *M. myotis* (Harmata, 1969; 1973). In contrast to *M. myotis*, *R. hipposideros* avoid cooler places for hibernation (Ancieux, 1948); this may facilitate more frequent awakening. All the above information points at linkage between the frequency of awakening and thermal preferendum.

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