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EXAMINATION OF THE SETTLEMENT OF *MYOTIS MYOTIS* IN AN ABANDONED MINE

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Abstract: The paper summarizes results of a study of a *Myotis myotis* roost in a mine where the work was finished 15 years ago. The process of settling lasted several years and started with some vagrant animals that had to become acquainted with the circumstances of the mine. Few years later many bats used the mine as a temporary roost. Finally a huge number used the mine in summer. In future bats will probably also stay there in winter. The investigation shows that the protection of winter roosts is one of the most important tasks of bat conservation.

Key words: Chiroptera, *Myotis myotis*, ecology, roosts, conservation

Introduction

Caves are one of the most important roosts for many bat species. Lack of caves can be a limiting factor for the occurence of these species. In many cases caves can be substituted by mines or cellars. Species like *Miniopterus schreibersi* or *Rhinolophus euryale* use caves and mines as roosts in winter and in summer (**Topál** 1969), whereas other species use them for shorter periods in the year (**Topál** 1956). While several of these underground roosts were used already for thousands of years, others became suitable in the last decades. Even under natural condition caves disappeared and new ones were formed. In the 20th century this process accelerated by human activity. Some of the ancient roosts became unsuitable for bats as a consequence of increasing numbers of visitors and of industrial use. On the other hand lots of caves were excavated by miners and some were opened, or the later unused tunnels to the mines were accessible for bats. The quick changes force bats to move as quick as possible and use the shelters as long as conditions allow it.

To settle in a new roost means a high risk for bats like for any other animal. Bats do not know whether the new roost can ensure for a longer period a safe place and the necessary climatic factors. Two reasons may exist to search for a new roost:

- the number of specimens in a colony reaches an upper limit, either because the shelter does not allow further increase or the accessible food is limited
- the roost is changing (or does no longer exist) or the nearby hunting grounds become worse.

If none of these reasons exist their optimal strategy is to stay at the roost. It may happen that a new-arisen roost has better climatic conditions, or is safer, or is closer to the winter/summer roost; in such a case it can be chosen without the criteria mentioned above.

In this paper I will try to answer the question, how quick a new roost is occupied.

Material and methods

Myotis myotis is one of the most widespread and abundant bats in Hungary (**Topál** 1954). They form nursery colonies with 100-1000 females. These colonies can usually be found in churches and sometimes in mines or caves (**Bihari & Gombkötö** 1993).

Between 1984 and 1996 I studied the settlement of *Myotis myotis* in the mine Bomboly-bánya which is situated in the north-eastern part of Hungary. The mine was used for caolin exploitation until 1978. The entrance opens at 230 m a.s.l. The tunnels are 560 m long, 2-3 m wide and 2 m high. There is only one hall with an area of 150 m^2 and a height of 6 m. Temperature varies between 8 and 12° C during the year.

Between December 2, 1984 and July 30, 1996 every 2 or 4 weeks the mine was controlled. I identified and counted the bats (or estimated the number when the colony had more than 100 specimens). Sometimes it was possible to distinguish *Myotis myotis* and *Myotis blythi*, but *M. blythi* is only few percent of *M. myotis*.

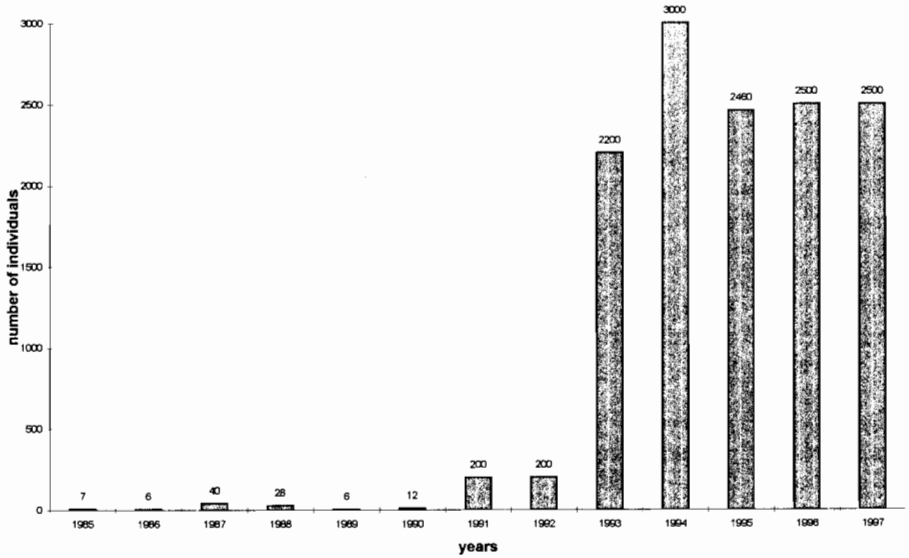

Fig.1: Maximal number of *Myotis myotis* in summer

Results

After mining was finished there was hardly no bat in the mine (fig.1). Their number did not reach 10 until spring 1987, when I found 40 specimens. Between 1987 and 1991 number decreased again but 10-12 bats stayed there for both, winter and summer.

In 1991 there was a significant change: 200 individuals settled in the mine and spent the summer there. In the following year 200 bats appeared again and used the mine in spring and autumn, but not in summer.

In 1993 again there was an essential change: the size of the summer colony increased tenfold and 2000-3000 specimens stayed there for the next three years (fig.2).

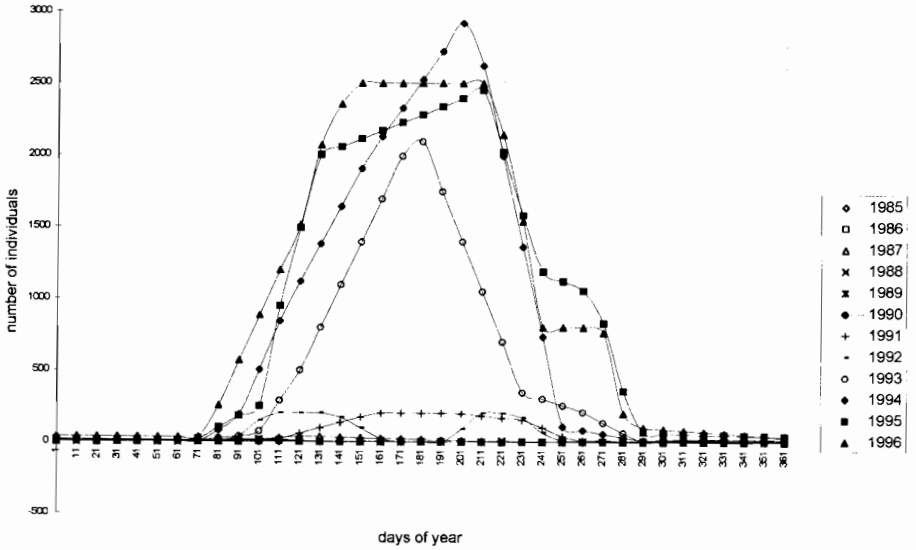

Fig.2: Changes in numbers of *Myotis myotis* between 1985 and 1996

The number of hibernating bats increased, too (fig.3). In the first four years the number varied between 3 and 8. In the next four years the winter colony consisted of 10-14 individuals. In 1992/93 their number nearly doubled. Then, in 1995/96 there was a sudden increase to 53 hibernating bats. Further increase can be expected in the next years and possibly the mine may become an important winter roost.

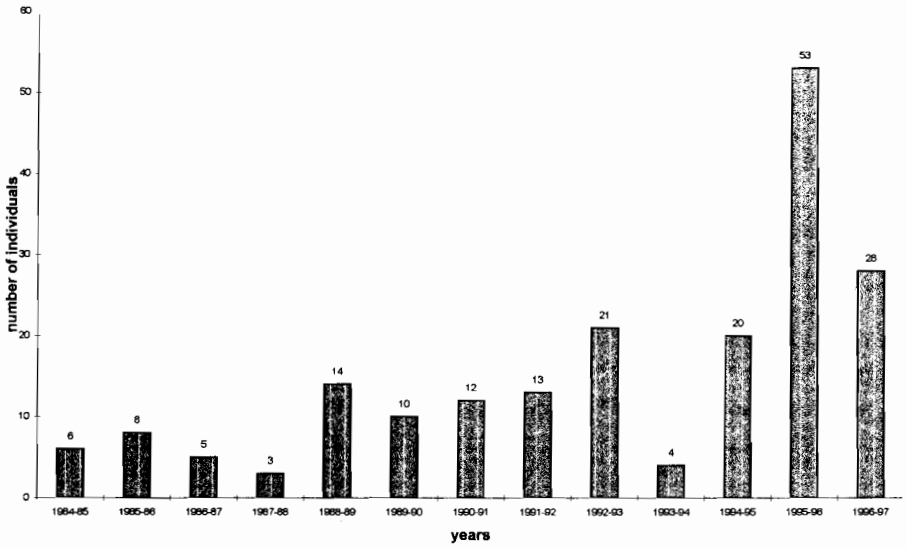

Fig.3: Maximal numbers of *Myotis myotis* in winter

The 18 years of observation since the stop of exploitation can be devided into four periods: between 1978 and 1988 the mine was a day roost, in the period 1989-92 it was a transitory roost, in 1991-96 a nursery roost and since 1995 it functions also as a winter roost.

Discussion

According to my studies it can be stated that the settlement of *Myotis myotis* begins slow and steady in the first years, and later the number shows exponential growth.

We can see a growth of the winter colony, too, but yet it did not reach the extent of the summer colony. The reason for this may be that bats have higher demands towards their winter shelter than to the summer roost. The ambient temperature, humidity and ventilation of the winter roost must be appropriate and the site must be undisturbed. In case that one of these factors worsens and the environment becomes unsuitable during winter, it may be fatal and dangerous for the bats because they have to be economical with their stored energy. It is seriously dangerous to study a new roost in the middle of the winter. Therefore bats strongly cling to their traditional roosts and settle into a new one cautiously.

The risk to choose a new summer roost is less dangerous; therefore they are easier to find and to occupy.

For this reason protection of winter roosts must be an important aim of bat conservation work, since the establishment of a new winter roost is a long process.

The presented data show that the settlement of bats in a new roost is a gradual and long lasting process. In this way they can minimize the risk for the population during the establishing phase at a new und unknown site and hereby maximize their fitness.

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