

kus és fácies viszonyok) ma nem aktívak, kivéve a 9. lelőhely, ahol a bejáratí aknán keresztül törmelék ma is hullik a zombolyszintre.

A zomboly tágabb környékén levő barlangok, mint a Kőháti-barlang, vagy a Nagy-Tölgyes-oromi-víznyelő a Kis-kőháti-zombolyhoz hasonló elagott, erősen feltöltődött és pusztuló állapotban van. Nagyon valószínű, hogy e barlangok a pleisztocén folyamán egy vízrendszerhez tartoztak, s ma már erősen átalakult (feltöltődött) roncsbarlangok, amelyek között nem valószínű járható összeköttetés.

A Kis-kőháti-zomboly nagytömegő kitöltésének fiatal kora azért jelentős, mert az a Bükk tetején nyílik, s ha a fokozatosan leszálló karsztvízszinthez igazodó barlangképződési modellt elfogadjuk, úgy e zombolynak a legidősebbek közé kellene tartozni. Ennek ellentmond a közölt adatokon kívül az, hogy hasonló magasságban igen változatos korú barlangkitöltéseket ismerünk, így a Tarkői-kőfülkében középső-pleisztocént, a Peskő-barlangban felső-pleisztocént, a Petényi-barlangban pedig holocént. A Bükk számos barlangjában is találunk ellentmondó adatokat erre az egyszerű modellre. Ezért a Kis-kőháti-zomboly kitöltésének kronológiai adatai arra figyelmeztetnek, hogy a maitól lényegesen eltérő, bonyolultabb fejlődéssel kell számolni a Bükk mai formájának kialakulásakor, mint azt az eddigi elképzelések tették.

VERTEBRATE FAUNA OF THE KIS-KŐHÁT POTHOLE

(Abstract)

The pothole of Kis-Kőhát opens 920 m above sea level on the highland of the Bükk mountains in North Hungary. The pothole, first opened in 1929, is a shaft system of more than one levels. The entrance shaft is 35 m deep leading to a larger part (so called Giant hall). Then a 50 m deep vertical pipe goes till the end of the cave at the depth of 110 m. 9 localities of vertebrate fauna have been uncovered so far in the pothole of Kis-Kőhát (fig. 1). The present summary was preceded by several shorter reports. The most significant of them were the one examining the *Rhinolophus hipposideros* population of the 3rd locality and the one giving the definition of the holocene biostratotype of the 4th locality (Kőhát Phase). The examinations yielded palaeoclimatical data about the caves as well as about the open air areas, which data have already been partially published. The article contains the description of remains found on different sites, while now I sum up the circumstances of uncovering, the chronological place and the palaeoclimatical, faunistic and geomorphological results.

1st locality: J. Dancza collected big mammal fauna from the Riss-Würm interglacial from undefinable site in 1936. It was published by Dénes Jánossy, who had found the material in the Natural Science Museum. 2nd locality: the material was found in depth of 110 m, in the deepest part of the cave, in rubble. It is younger than Riss-Würm. 3rd locality: it was uncovered on the bern of the pipe leading upwards from the Giant Hall, from under dripstone layer. The fauna, containing 483 *Rhinolophus hipposideros* individuals, has been published in details. It is dated from the Körös Phase (Atlantic) of the Holocene.

4th locality: The rubble falling in the entrance shaft of the pothole of Kis-Kőhát formed a cone. The surface of the cone does not broaden in the Giant Hall since no further rubble arrives there. The finds are from the surface of the rubble cone found in 1971–72. The complex of the snail and bone finds tell about the accumulation circumstances. The material falling into the shaft contains, beside the big mammals, the remains of frogs and snails living in the soil and in the forest floor. The small animal fauna of the surroundings can be found in the cast of the owl living in the entrance shaft. The bats got into the sediment through the death of the animals spending the winter there. The fauna of the 4th locality represents a set of transitional phase in the development of the Hungarian vertebrate fauna, first identified this time. Thus in 1974 I set up the "Transitional Phase" between the Bükk and the Alföld Phases in manuscript. Later I reexamined the holocene vertebrate biostratigraphy and gave a general definition of the faunal phases that, neglecting the climatic factors and the concrete species setting, concentrates on the development of the fauna. This new definition appeared in 1976 under the name "Kőhát Phase" described as follows: "Kőhát Phase (nom. n.) — Biostratotype: Pothole of Kis-Kőhát 4th locality. — The lower limit of this new phase can be set with the final fade-out of Pleistocene species or with their retrocession to considerably limited 'relic' areas. The phase can be characterised by species of contemporary fauna showing however a divergence from the following phase." (Ann. Hist.-Nat. Mus. Nat. Hung. 68, 1976, p. 22.).

5th locality: The material was found in the dripstone flowdown or in the rubble cemented underneath. It is contemporary to the 4th locality. 6th locality: Behind the entrance of the shaft opening from the Giant Hall between the layers of the dripstone flowdown, the material was found in a rubble of 4–5 cm thickness. It can be dated from the beginning of the Bükk Phase (border of the Atlantic-Subboreal). 7th locality: Bones covered with lime were found in the bottom of the large dripstone cone, in a tetrata basin. Their age is close to that of the 4th and the 8th localities. 8th locality: The material came from a small hole closed between the curtains of dripstone in the wall of the first hole of the pothole. The faunal setting is close to that of the 6th and 4th localities accumulated during the Bükk and the Kőhát Phases. On the bottom of the entrance shaft and in the rubble of the subbreak opening from it bones of big mammals were found, being only some hundred years old.

Faunistic examinations: The faunal development of the pothole of Kis-Kőhát cannot be followed because of the difference in localities. Examining the greater systematic units (fig. 2) it can be pointed out that the localities contain first of all bat fauna, and thus the best results can be gained through their examination. The 3rd figure shows the distribution of the geni of bats of four localities in percentage, according to their chronological places. It is striking that the 3rd locality (Atlantic) contains, beside the dominance of the *Rhinolophus* types, though in low number, the geni of *Myotis*, *Plecotus*, *Barbastella* and *Eptesicus* becoming dominant on younger localities. The change in the distribution of bat species is shown on the 4th figure. It is only the *Rh. hipposideros* that can be found on all of the localities from among the *Rhinolophii*, while the *Rh. ferrumequinum* and the *Rh. euryale* are present only on the 3rd locality. The dominant from the *Myotis* is the *Myotis bechsteini* and the *Myotis blythi oxygnathus* on all the localities. The *M. mystacinus*, the *M. nattereri* and the *M. emarginatus* are always present in small number, while the *M. dasycneme*, the *M. daubentoni* and the *M. myotis* are to be found only sporadically. Tendentional change of quantity in accordance with time sequence can be noticed only in case of *M. bechsteini* (the younger the more) and the *M. blythi oxygnathus* (the most on the 6th locality). The

Eptesicus serotinus gets rarer in the younger phases of the 3rd locality and disappears on the 8th locality, while the *Barbastella* and the *Plecotus*, being originally frequent, are present in larger and larger quantity. The *Rhinolophus ferrumequinum*, the *Rh. euryale*, the *Myotis brandti* and the *M. dasycneme* could be first determined in the Hungarian Holocene fauna in the pothole of Kis-Kőhát.

The faunistic examinations tell that in the high mountains of the Bükk the southern *Rhinolophii* and also the dormouse, the field vole (*Myodes*) and the *Pitymys* appear (3rd locality) beside the cold bearing animals and those of wider adaptational abilities in the warmest phase of the Holocene. The warm loving bat species were forced back in the colder Subboreal-Subatlantic Phase (4th-8th localities). The dominant species from among the small mammals is the *Pitymys-Myodes-Apodemus-Sorex* forest association together with the small mammals of different territories with corresponding averages (e.g. *Cricetus*, *Crocidura*). The development of the above mentioned species setting is going on even in our days.

Palaeoclimatic results: The annual mean degree of the Atlantic Phase, calculated on the basis of the optimal hibernation degree of the *Rhinolophii*, is in 800-900 m height 10-11° C, in 200-300 m height 13-14° C. The mean degree of the surface of the 4th locality in July was 15.4° C as calculated with the help of the vole thermometer.

Geomorphological results: The faunistic examinations help to tell the age of the sediments in the cave. The oldest sediment, the place of which could not be determined, is from the Riss-Würm, while the rubbles and the dripstones are from the younger holocene. These data together with the data from other caves contradict to the simple development model, according to which the caves of the Bükk formed as the karstic water got lower and lower. The pothole of Kis-Kőhát, as the cave opening in the highest in Hungary calls our attention to the fact, that the geomorphological formation of the Bükk mountains was much more complex and different than supposed from the present circumstances.

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