

Fossil snakes from the Late Pleistocene of Tokod (Gerecse Mountains, Hungary)

by

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Abstract — An impressive array of Late Pleistocene Vertebrate fossil bones has been excavated and described from Tokod, Hungary (GASPARIK 1993). Most of the bones of the reptiles are very small, fragmentary skull elements, ribs and vertebrae. So far more than sixty species of vertebrates, among them at least eight genera of reptiles and amphibians have been recognized. Among the reptiles, four genera of snakes have been identified on basis of the morphology of the basiparasphenoid bone or vertebrae. All four of these snake genera: *Coluber*, *Coronella*, *Natrix*, and *Vipera* still occur in Hungary today. Due to the fragmentary nature of the fossil material, positive identification as to the species is not possible at this time and the four snake species are tentatively referred to the modern species found in Hungary: *Coluber caspius*, *Coronella austriaca*, *Natrix natrix*, and *Vipera berus*.

The positive identification of these four snake genera in the Tokod Late Pleistocene fossil assemblage not only expands its faunal list, but because of the specific habitat requirement of these snakes, it provides some palaeoecological information about the environment of the Tokod fossil locality.

Keywords — Late Pleistocene, mosaic vegetation, *Vipera*, *Natrix*, *Coluber*, *Coronella*

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Material

From the record, the following remains of the four snake taxa were identified. In parentheses, the acquisition numbers (Gyn/...) or the inventory numbers (V...) of the specimens are. All specimens are stored in the Department of Geology and Palaeontology of the Hungarian Natural History Museum (HNHM).

Coronella sp.: altogether 63 vertebrae (Gyn/408., Gyn/411., Gyn/417., Gyn/425.) and one basiparasphenoid (V.98.8.; Figure 1).

Coluber sp.: altogether 107 vertebrae (Gyn/486.,

Gyn/413., Gyn/414., Gyn/421., Gyn/424.).

Natrix sp.: altogether 39 vertebrae (Gyn/487., Gyn/412., Gyn/419., Gyn/422.) and one basiparasphenoid (V.98.7.; Figure 3).

Vipera sp.: altogether 302 vertebrae (Gyn/409., Gyn/410., Gyn/420., Gyn/427.) and one basiparasphenoid (V.98.9.; Figure 2).

Table 1 shows the distribution of the specimens in the different layers from the locality.

Description and comparison

The *Coronella* basiparasphenoid (HNHM V.98.8.) measures 7.8 mm and is nearly complete. In comparison to the other two snakes, the ventral surface is quite flat due to a poorly developed basisphenoid crest and associated lateral developments. However, the anterior parasphenoid portion exhibits a relatively deep ventral mid-sagittal depression along its entire length. The well-developed pterygoid crests extend from the center to the lateral margins of the bone. The Vidian canal is relatively long, a character regarded as primitive by UNDERWOOD (1967). The posterior opening of this canal is at some distance from the posterolateral margin of the basisphenoid, while the anterior opening is covered by the pterygoid crest (Figure 1a).

On the dorsal surface the pituitary fossa (i.e. sella turcica) is well-developed and is somewhat heart-shaped. The cultiform process is nearly complete and flanked on both sides by narrow crista trabecularis. The frontal step of the bone is relatively low. The abducens nerve (VI

foramina are widely separated from the constrictio internus dorsalis (cid nerve) foramina (Figure 1b).

The trunk vertebrae assigned to *Coronella* (HNHM Gyn/408., Gyn/411., Gyn/417., Gyn/425.) are of very small size (measuring less than 3.5 mm) and are x-shaped. Their neural arches are dorsoventrally compressed and have a low but relatively long neural spine. The haemal keels are flattened and the prezygapophyseal processes are very short.

The *Vipera* basiparasphenoid (HNHM V.98.9.) measures 5 mm and most of the parasphenoid portion is missing. On its ventral surface it has a well-developed basisphenoid crest which bifurcates anteriorly giving it a Y-shaped configuration (Figure 2a).

On the dorsal surface, the well-developed pituitary fossa has an ovaloid configuration. The cultiform process is not preserved, but a small portion of the crista trabecularis on the left-hand side of the bone suggests that this process is better developed in *Vipera* than in *Coronella* (Figure 2b).

The centra of the trunk vertebrae assigned to *Vipera* (HNHM Gyn/409., Gyn/410., Gyn/420., Gyn/427.) are long and with depressed neural arches bearing a distinctly low and long neural spine. The hypapophyses are shorter than the centra and is hooked postero-ventrally. All of the vertebral characters listed are consistent with those of the "berus group" of the genus *Vipera* (SZYNDLAR 1984).

The basiparasphenoid of *Natrix* (HNHM V.98.7.) is small and incomplete, measuring 3.5 mm. On its ventral surface the basisphenoid crest is broad and short in comparison with *Coronella* and *Vipera*. The pterygoid crests are well developed and directed posteroventrally and terminate in the pterygoid processes (Figure 3a). The Vidian canal is extremely short and its anterior opening is not accompanied by the "cid" nerve foramen. The latter character is regarded as a "modern" pattern for the species group (SZYNDLAR 1991b). On the dorsal surface the pituitary fossa is short and broad and has a somewhat squarish appearance. The parasphenoid portion is not preserved (Figure 3b).

The vertebrae assigned to *Coluber* (HNHM Gyn/406., Gyn/414., Gyn/421., Gyn/424.) resemble closely that of *Coluber caspius*, described and figured by SZYNDLAR (1991a) from Yarbesh, Bulgaria. In lateral view the neural arch of the trunk vertebrae is vaulted and provided with a high and long neural spine, slightly overhanging anteriorly and posteriorly. The dorsal margin of the neural spine is not keeled. The parapophysis is slightly longer than the

diapophysis. In ventral view the haemal keel is prominent with a thin ventral margin. In dorsal view the zygosphenes is concave or slightly crenate; the prezygapophyseal processes are long about the same length as the prezygapophysis and distally pointed. In 12 measured vertebrae the centrum length ranged between 5.51–7.75 mm. The centrum length/centrum width ratio was 1.18–1.36 (mean = 1.27).

The three basiparasphenoid from Tokod have been compared with recent species housed at the Herpetology Department of Harvard Museum of Comparative Zoology and at the Hungarian Natural History Museum and the Tarii Crișurilor Museum in Oradea, Romania. There is good agreement in general morphology between the Tokod fossils and the basiparasphenoids of recent genera of *Coronella*, *Vipera*, *Natrix* and *Coluber*. However it must be emphasized that the Tokod material is too limited and fragmentary to allow for definitive specific assignment.

Table 1 — Numbers of vertebrae of the four snake taxa from the different layers of Tokod II locality.

layers:	1-2	3	4	5
<i>Coronella</i> sp.	15	8	12	28
<i>Coluber</i> sp.	20	31	45	11
<i>Natrix</i> sp.	2	2	20	15
<i>Vipera</i> sp.	90	75	95	42

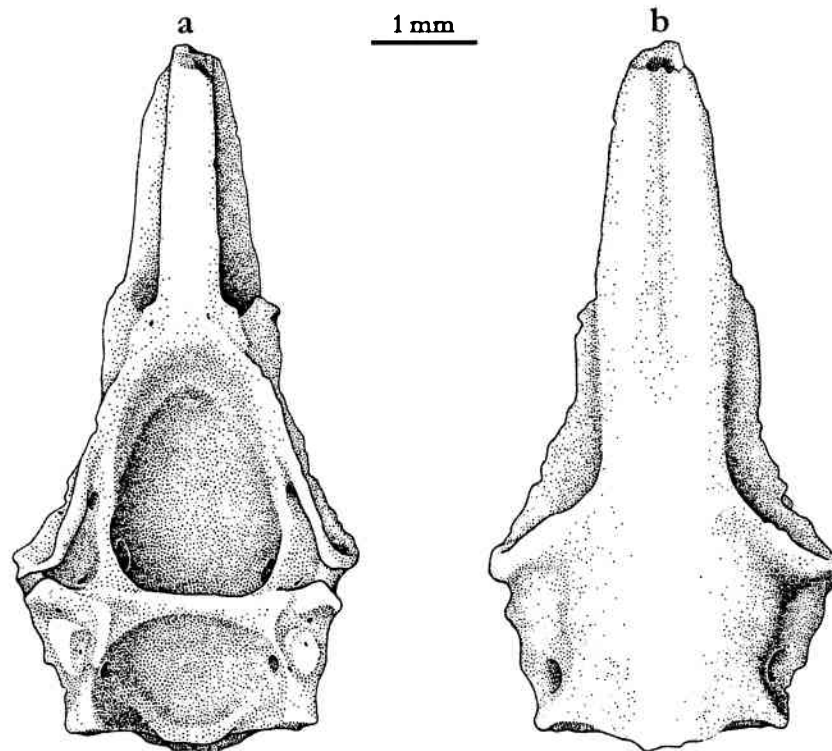


Figure 1 — *Coronella* sp. (HNHM V.98.8.) basiparasphenoid from the layer 4 of Tokod II locality. — a = ventral view; b = dorsal view.

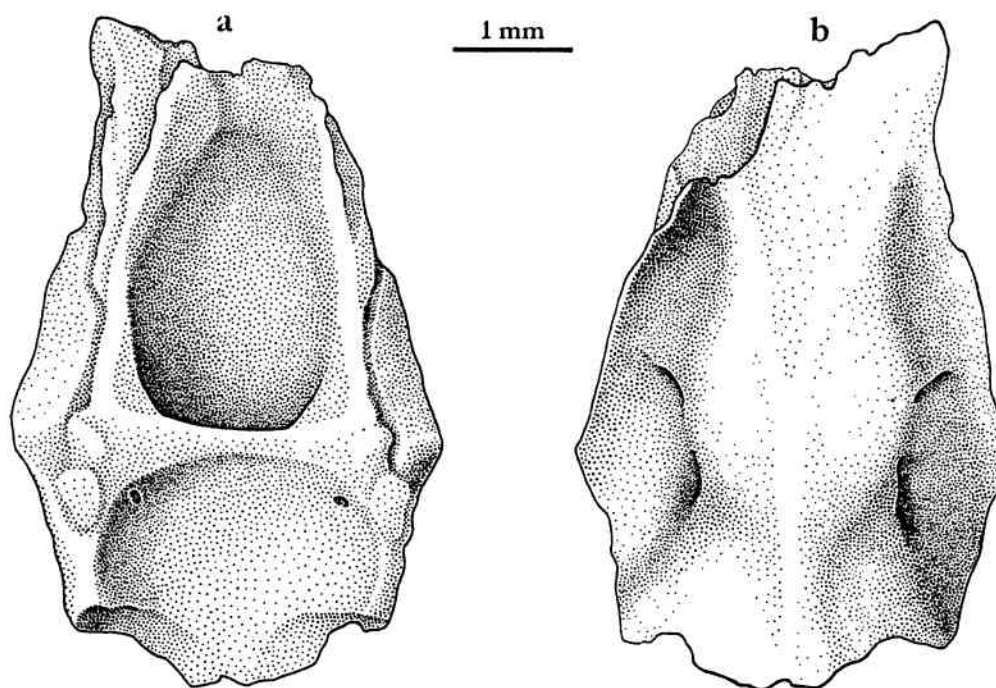


Figure 2 — *Vipera* sp. (HNHM V.98.9.) basiparasphenoid from the layer 4 of Tokod II locality. — a = ventral view; b = dorsal view.

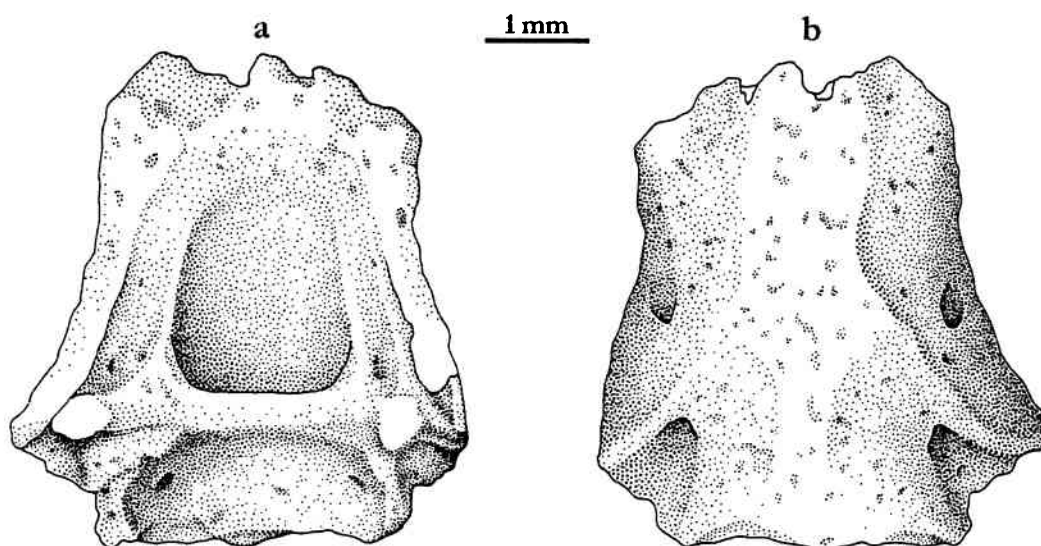


Figure 3 — *Natrix* sp. (HNHM V.98.7.) basiparasphenoid from the layer 4 of Tokod II locality. — a = ventral view; b = dorsal view.

Remarks on the palaeoenvironment

One can separate the layers of the locality into two groups. The upper layers (1–2 and 3) were deposited in the Early Weichselian while the age of the lower layers (4, 5 and 6) is very probably Late Eemian. The remains of the layers show a bit mixed faunal composition. This is the result of two different phenomena. The stratification

of the layers suggest that we have to reckon with some mixing of the deposits (GASPARIK 1993). The other reason is the mosaic palaeoenvironment. We have both floral and faunal evidences that the Carpathian Basin had rather mixed and diverse environments and vegetation during the whole Quaternary. The most part of the micro-

vertebrate remains of the Tokod locality probably came from owl pellets and it is known that the hunting territory of some owl species is very large. Considering these above mentioned facts it is comprehensible that in the record of a same bed we can find remains of species that had rather different habitats. For example, we can find species restricted to forested environments as *Apodemus*,

Glis, *Myodes*, *Sicista* together with species restricted to open areas (grasslands, steppes, semi-deserts) as *Spalax*, *Cricetulus*, *Lagurus* and *Allactaga*. The four described snake taxa suggest also diverse palaeoenvironments. *Natrix* indicates aquatic habitat, *Vipera* (mainly the *Vipera berus*) prefer woodlands while *Coluber* and *Coronella* prefer more opened areas.

Conclusions

Four fossil snakes have been positively identified from the Late Pleistocene deposits of Tokod. The age of the layers in which the snakes were found is Early Weichselian (Würm Glaciation) and Eemian (Riss-Würm Interglacial). The age of the older layers are rather Süttőian than Varbóian as indicated by the presence of large sized shrew *Crocidura cf. leucodon* (MESZOELY & GASPARIK 2002). Both the micromammalian and the gastropod fauna of the lower layers from Tokod appear to indicate a climate milder than that of present day Hungary. The discovery of an agamid lizard among the reptilian fossil remains also supports the

above contention (MESZOELY & GASPARIK 2002).

The fossil snakes described in this paper do not only extend the Tokod Vertebrate faunal list, but they also provide clues to the environment of this locality. The specific habitat preferences of *Coronella*, *Coluber* and *Vipera* include scrubs, parklands and rocky areas, while *Natrix* is closely associated with aquatic habitats. The micromammalian fauna also shows a similar mix of woodland and open land species. The above observations suggest that the landscape of Tokod during the Eemian was essentially open land interspersed with small woodlots.

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