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Vertebrates from the Early Miocene lignite deposits of the opencast mine Oberdorf (Western Styrian Basin, Austria)

3. Reptilia 2: Serpentes

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(With 4 text-figures)

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Summary

The ophidian fauna from the lower Miocene (MN 4) of Oberdorf (Austria) consists of 6 or 7 taxa: cf. *Bavarioboa* sp. (family Boidae s.l.); *Coluber* cf. *C. caspioides*, *Palaeonatrix* sp., cf. "*Neonatrix*" sp., perhaps an unidentified non-natricine colubrid (Colubridae s.l.); a natricine or elapid (Colubridae or Elapidae); *Vipera* sp. (Viperidae). The snakes belong to both extinct and extant genera. The assemblage closely resembles those from other coeval localities of Central Europe. Most (perhaps all) taxa represent waves of invaders that settled Europe during the lower Miocene.

Key words: Lower Miocene, Austria, Reptilia, Serpentes, vertebrae.

Zusammenfassung

Die Schlangenfauna aus dem Unter-Miozän (MN4) von Oberdorf (Österreich) besteht aus 6 oder 7 Taxa: cf. *Bavarioboa* sp. (Familie Boidae s.l.); *Coluber* cf. *C. caspioides*, *Palaeonatrix* sp., cf. "*Neonatrix*" sp., möglicherweise eine nicht näher bestimmbare nicht-natricine Natter (Colubridae s.l.); eine natricine Natter oder Giftnatter (Colubridae oder Elapidae); *Vipera* sp. (Viperidae). Die Schlangen gehören sowohl zu ausgestorbenen als auch zu rezenten Gattungen. Sie zeigen enge Beziehungen zu Schlangen aus zeitgleichen Lokalitäten in Europa. Viele (vielleicht alle Taxa) sind Einwanderer, die in Wellen während des Unter-Miozäns Europa besiedelten.

Schlüsselwörter: Unter-Miozän; Steiermark, Österreich; Schlangen, Wirbel.

Introduction

The ophidian material from the lower Miocene locality of Oberdorf consists of 121 vertebrae or vertebral fragments. These remains are referred to 6 or 7 different forms belonging to 3 or 4 families. Most taxa are referable to the generic level. They represent several ophidian taxa previously reported from a few coeval (MN 4) localities of Czechia and southern Germany (RAGE & RŮŽEK 1983; SZYNDLAR 1987; SZYNDLAR & SCHLEICH 1993; IVANOV 1996, 1997).

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Systematic paleontology

Family Boidae (s.l.)

cf. *Bavarioboa* sp.

(Text-fig. 1)

M a t e r i a l: 3 trunk vertebrae from Oberdorf O4 (Inv. Nr. NHMW 1997z0180/0002).

The three vertebrae, compared here with the extinct genus *Bavarioboa*, are fairly well preserved and they display clearly several features characteristic for the family Boidae, among others relatively very short centra and reduced prezygapophyseal processes.

In the end of the lower Miocene, Europe was inhabited by several boids belonging to the subfamilies Boinae, Pythoninae, and Erycinae; of them, the extinct boine *Bavarioboa hermi* from Petersbuch 2 (SZYNDLAR & SCHLEICH 1993) most resembles the snake from Oberdorf. Close similarities are visible in the stout morphology of the entire vertebrae, their relatively large absolute size, weakly marked indentation between pre- and postzygapophyses, vaulted neural arch, and especially strongly built haemal keel. These conditions cannot be observed in some other constrictors known from the area of Central Europe, in particular "*Bransateryx*" *septentrionalis* (actually a non-erycine boid) from Dolnice and Petersbuch 2 (SZYNDLAR 1987; SZYNDLAR & SCHLEICH 1993). Precise taxonomic allocation of the vertebrae from Oberdorf is however not fully possible because of the lack or damage of some important diagnostic structures (neural spine, paradiapophyses); on account of that the generic name is preceded by the particle "cf."

The genus *Bavarioboa* was widespread in Europe in the lower and middle Miocene; perhaps it appeared already in the late Oligocene (SZYNDLAR & SCHLEICH 1993). "Boidae A" reported by IVANOV (1997) from the lower Miocene (MN 3) of Merkur may have also belonged to this genus.

Family Colubridae (s.l.)

***Coluber* cf. *C. caspioides* SZYNDLAR & SCHLEICH, 1993**

(Text-fig. 2)

M a t e r i a l: 63 trunk vertebrae from Oberdorf O4 (Inv. Nr. NHMW 1997z0181/0002).

The overwhelming majority of the ophidian remains from Oberdorf belong to a large-sized (with the length of vertebral centra up to 6.7 mm) colubrid snake, closely resem-

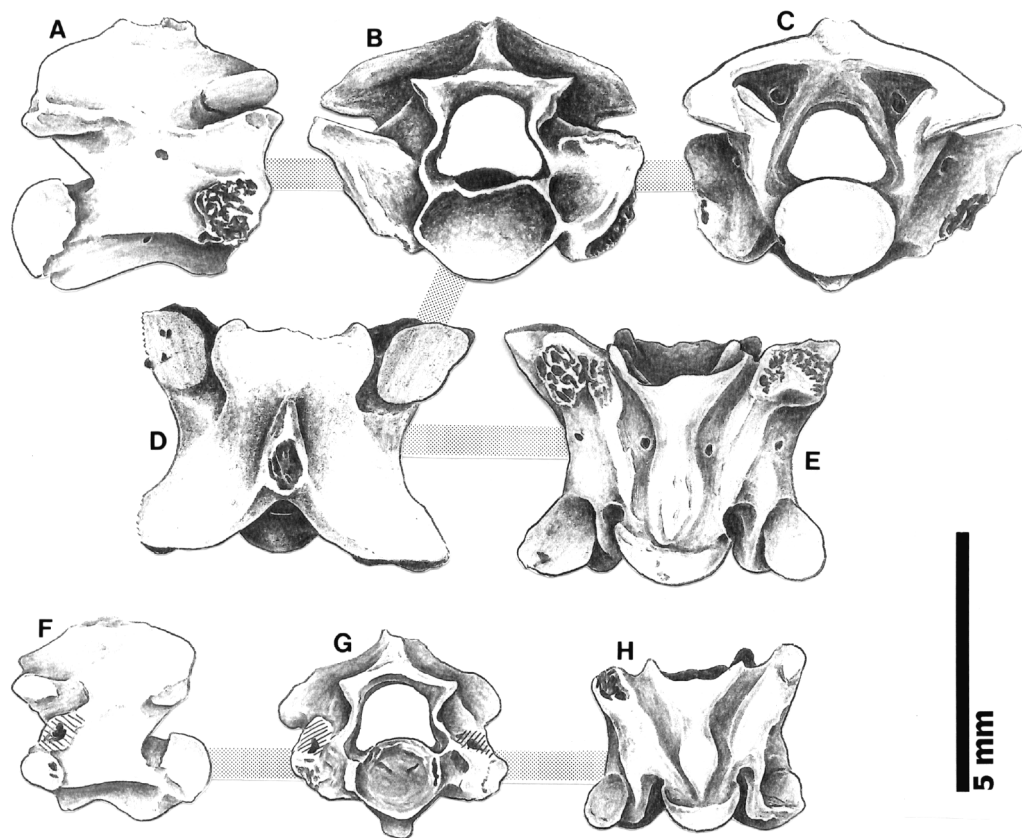


Fig. 1: Two trunk vertebrae of cf. *Bavarioboa* sp. from Oberdorf (Inv. Nr. NHMW 1997z0180/0002). A – right lateral view, F – left lateral view, B, G – anterior views, C – posterior view, D – dorsal view, E, H – ventral views.

bling *Coluber dolnicensis* from Dolnice (SZYNDLAR 1987) and *C. caspioides* from Petersburg 2 (SZYNDLAR & SCHLEICH 1993). These two fossil taxa may actually represent a single species. Both are very similar to *C. (Hierophis) caspius*, inhabiting today southeastern Europe, and may have represented an evolutionary lineage leading to this recent species.

Although there is no complete vertebra of *Coluber* preserved in the Oberdorf material, thanks to the abundance of the remains it is possible to reconstruct entirely the vertebral morphology of this snake. Its vertebrae are relatively elongate, provided with a high neural spine, thin but prominent haemal keel, prezygapophyseal processes almost as long as prezygapophyseal articular facets. The snake from Oberdorf has been compared to *C. caspioides* rather than to *C. dolnicensis*, among others considering its relatively high neural spine. This structure is distinctly lower in *C. dolnicensis*; the latter species however was based on two vertebrae only, therefore the osteological variation of this snake remains unknown.

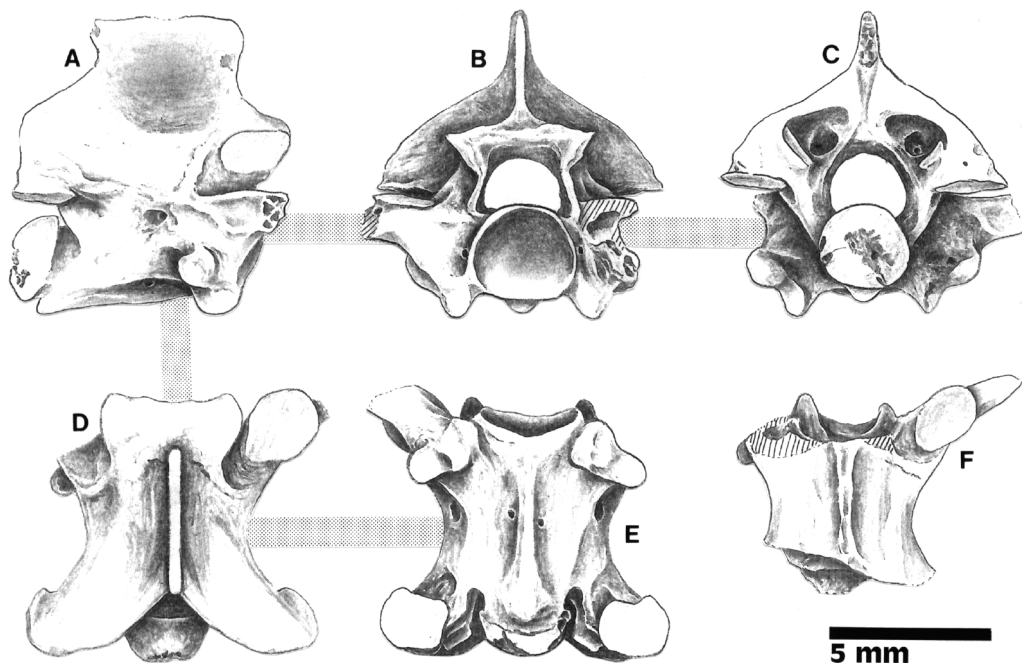


Fig. 2: Two trunk vertebrae of *Coluber* cf. *C. caspioides* (Inv. Nr. NHMW 1997z0181/0002). A – right lateral view, B – anterior view, C – posterior view, D, F – dorsal views, E – ventral view.

***Palaeonatrix* sp.**
(Text-fig. 3 A-E)

M a t e r i a l: One trunk vertebra from Oberdorf O4 (Inv. Nr. NHMW 1997z0182/0002).

This extinct natricine genus is characterized by heavily built (as for natricine standards) vertebrae, provided with strongly built subcentral ridges, prominent epizygapophyseal spines, as well as thick and plate-shaped hypapophysis. These morphological peculiarities are well seen in the single vertebra from Oberdorf. Most likely it belonged to *Palaeonatrix lehmani*, known from Dolnice and Petersbuch 2 (RAGE & RŮŽEK 1983; SZYNDLAR & SCHLEICH 1993), but it cannot be fully demonstrated based on a single and incomplete vertebra.

cf. "*Neonatrix*" sp.
(Text-fig. 3 F-G)

M a t e r i a l: One trunk vertebra from Oberdorf O4 (Inv. Nr. NHMW 1997z0183/0002).

Identification of natricine snakes inhabiting Europe in the end of the lower Miocene is a difficult task because this group was then represented by several different (but often similar morphologically) forms. The only exception displaying a very peculiar morphology in its vertebrae and thus making its identification easy is the extinct genus *Palaeonatrix* (vide supra).

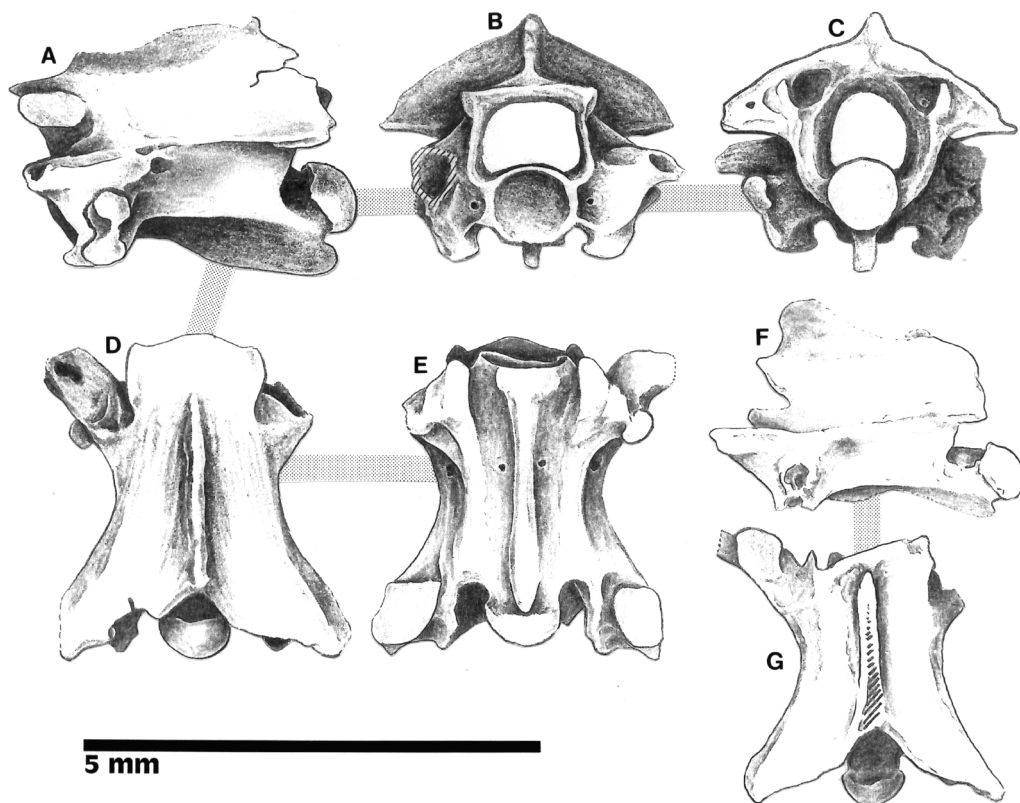


Fig. 3: Trunk vertebrae of two natricine snakes from Oberdorf. A–E: *Palaeonatrix* sp. (A–E) (Inv. Nr. NHMW 1997z0182/0002). F–G: cf. "*Neonatrix*" sp. (Inv. Nr. NHMW 1997z0183/0002). A, F – left lateral views, B – anterior view, C – posterior view, D, G – dorsal views, E – ventral view.

The other natricine vertebra from Oberdorf, tiny and lightly built, shows a completely different morphological pattern. It is most similar to the vertebrae of *Neonatrix nova*, described from Dolnice (SZYNDLAR 1987), but the fragmentary nature of the remain does not enable precise identification. The extinct genus *Neonatrix* was originally described from the Miocene of North America and then several natricines from the lower and middle Miocene of Europe were identified as belonging to the same genus (RAGE & HOLMAN 1984; SZYNDLAR 1987). The allocation of the European forms in the genus *Neonatrix* is however unconvincing; consequently, SZYNDLAR & SCHLEICH (1993) proposed to restrict this generic name exclusively to the North American forms.

Colubridae indet. "A" (Text-fig. 4 A-B)

M a t e r i a l: 2 trunk vertebra from Oberdorf O4 (Inv. Nr. NHMW 1997z0184/0002).

These badly preserved vertebral fragments belong to the non-natricine Colubridae, i.e. colubrids devoid of hypapophyses in most trunk vertebrae. They are characterized by a

very thin and posteriorly projected haemal keel. These tiny vertebrae may have represented a distinct ophidian taxon, but one cannot exclude that they come from the posterior trunk portion of the vertebral column of *Coluber* cf. *C. caspioides*.

Colubridae indet. "B"

M a t e r i a l: 13 trunk vertebrae from Oberdorf O4 (Inv. Nr. NHMW 1997z0185/0002).

They belong exclusively to the non-natricine Colubridae. Most remains are small hardly identifiable pieces of trunk vertebrae. Most likely a majority belonged to *Coluber* cf. *C. caspioides*, but it cannot be fully demonstrated.

Family Colubridae or Elapidae

Natricinae or Elapidae indet.

(Text-fig. 4 C-D)

M a t e r i a l: 3 trunk vertebrae from Oberdorf O4 (Inv. Nr. NHMW 1997z0186/0002).

These fragmentary vertebrae, belonging to (a) very small snake(s), are characterized by elongate centra and very short hypapophyses. The systematic allocation of these vertebrae is unclear: perhaps they could belong to a natricine Colubridae, different than *Palaeonatrix* or "*Neonatrix*" (vide supra). Their allocation in the family Elapidae is also possible.

Similar small elapids (or presumed elapids) were reported from a number of other lower and middle Miocene localities of Europe (RAGE & HOLMAN 1984; SZYNDLAR & BÖHME 1993; SZYNDLAR & SCHLEICH 1993; IVANOV 1997). Morphologically, these tiny snakes considerably differ from other members of the Elapidae, namely large cobras of the genus *Naja*, widespread in the European Miocene. Unfortunately, drawing credible conclusions about possible relationships of the discussed fossils is still impossible, because the osteology of the presumed living relatives of the small extant elapids remains largely unknown.

Family Viperidae

***Vipera* sp.**

(Text-fig. 4 E-F)

M a t e r i a l: 4 trunk vertebrae from Oberdorf O4 (Inv. Nr. NHMW 1997z0187/0002).

These vertebral fragments, although badly damaged, display well several characteristic features of the complexes '*aspis*' and '*Oriental vipers*' of the living genus *Vipera*: very short centra provided with long and ventrally directed hypapophyses. Considering relatively small absolute dimensions of the vertebrae, they have been classified in the '*aspis*' complex rather than the '*Oriental vipers*'. But by no means they could belong to the '*berus*' complex, characterized by very small size, strongly elongate centra, and short hypapophyses. Members of the '*aspis*' complex of the genus *Vipera* first appeared in Europe in the beginning of the Miocene (SZYNDLAR & BÖHME 1993) and since then until recent they have been widespread in the continent. They were also common in lower Miocene localities of Central Europe, coeval with Oberdorf (SZYNDLAR 1987; SZYNDLAR & SCHLEICH 1993).

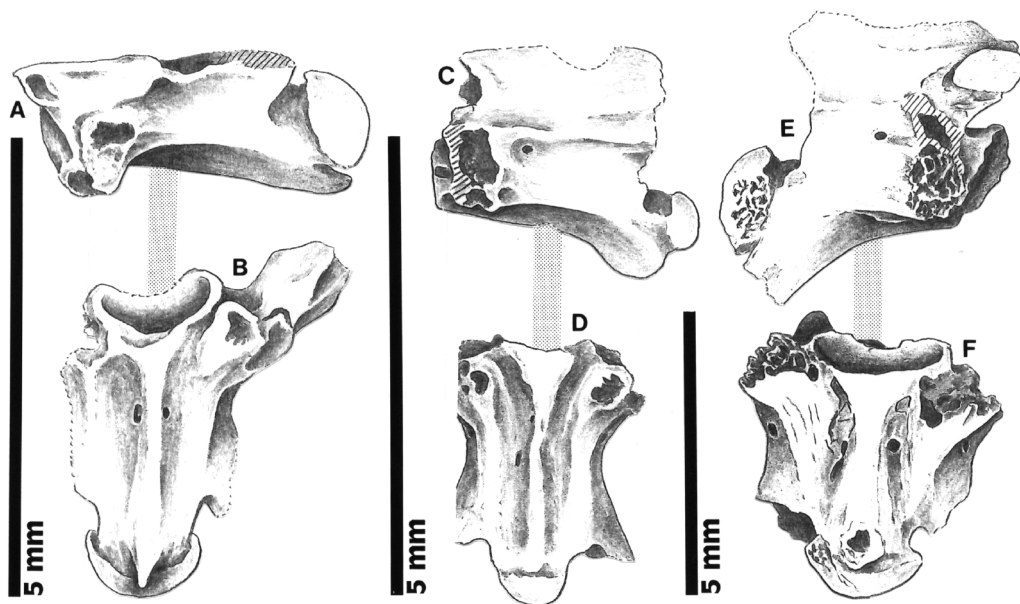


Fig. 4: Fragmentary trunk vertebrae of three snakes from Oberdorf. A–B: Colubridae indet. "A" (Inv. Nr. NHMW 1997z0184/0002). C–D: Natricinae or Elapidae indet. (Inv. Nr. NHMW 1997z0186/0002). E–F: *Vipera* sp. (Inv. Nr. NHMW 1997z0187/0002). A, C –left lateral views, E – right lateral view, B,D,F – ventral views.

Serpentes indet.

M a t e r i a l: 31 caudal vertebrae from Oberdorf O4 (Inv. Nr. NHMW 1997z0188/0002).

The ophidian caudal vertebrae from Oberdorf has not been used for identification purposes. In most snakes, vertebrae coming from the caudal portion of the column display a homogenous morphological pattern and that is why they are much less diagnostic than those coming from the thoracic portion.

Concluding remarks

The ophidian remains from Oberdorf, although not numerous and mostly badly preserved, constitute a surprisingly abundant assemblage. Appearance of such complex fauna is a characteristic event of the end of the lower Miocene (MN 4), when a considerable number of modern taxa invaded Europe (SZYNDLAR & BÖHME 1993; SZYNDLAR & SCHLEICH 1993). As it is well documented by the fossil record coming from several coeval (in particular French and German) localities, in this period distinct radiations of the natricine Colubridae and Elapidae took place in Europe. Additionally, in the end of the lower Miocene, several large-sized snakes belonging to the living genera *Coluber*, *Naja*, and *Vipera* ('Oriental vipers') for the first time appeared in Europe (remains of the two latter taxa are absent in the material from Oberdorf). At the same time, a number of

»archaic« snakes, in particularly members of the Boidae, still existed in Europe. According to recent studies of IVANOV (1997), large members of the genus *Coluber* (extinct species *C. suevicus* and *C. dolnicensis*) appeared even somewhat earlier in Central Europe (Merkur in Czechia, MN 3a).

In conclusion, the ophidian assemblage from Oberdorf consists of taxa characteristic for the lower/middle Miocene transition. The Oberdorf fauna is closely similar to those reported from the nearby localities of Dolnice and Petersbuch 2. No significant differences between ophidian assemblages from Oberdorf 03 and Oberdorf 04 are observable.

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