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Early Miocene large land mammals from the Drtija sand pit near Moravče

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During the Burdigalian stage (late Ottnangian) of Miocene, sea-level fall accentuated the beginning of isolation of the Paratethys from the Mediterranean Sea (Harzhauser et al., 2007). Except for the Northern Alpine Foreland Basin and its continuation into the Polish foredeep, no real marine environments are known from the Carpathian–Pannonian–Dinaride domain, and brackish to fresh water sedimentary environments prevailed (Harzhauser et al., 2007). During the Middle to Late Burdigalian (Ottnangian / Karpatian), large deltas were present along the young Alps forming alluvial fan deposits. Formations derived from a fluviodeltaic system of flooding rivers and alluvial fans can be found in several places in Central Slovenia; i.e. Besnica, Tunjiško Hills, and Moravče.

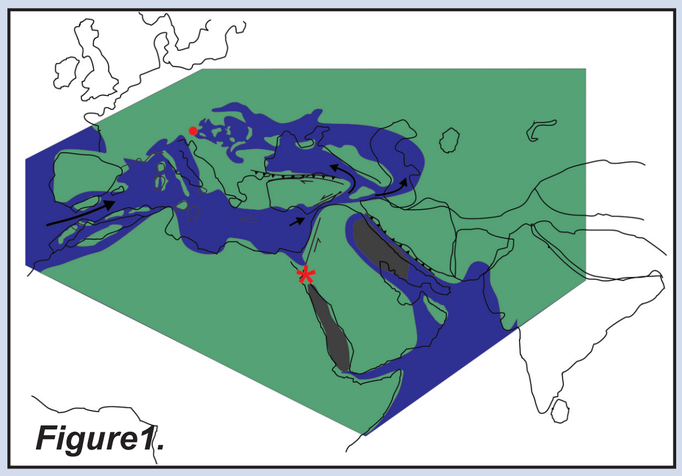
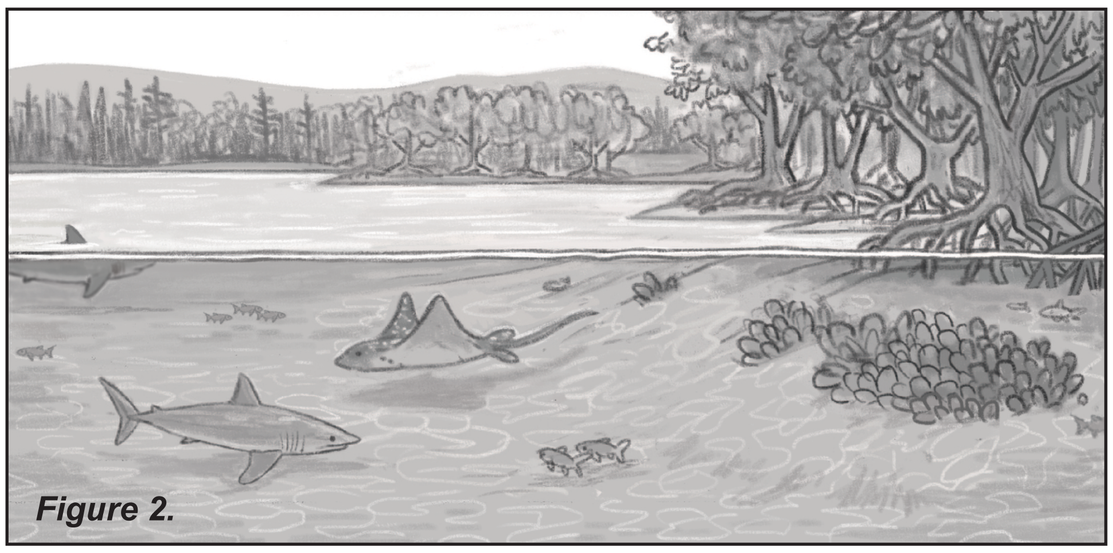


Figure1. *Paleogeographic reconstruction of the Mediterranean and Central Paratethys in the Lower Miocene. Simplified after Rögl, 1999. The location of Drtija is marked with the red dot and "Gomphotherium Landbridge" with asterix.*



A rich assemblage of Early Miocene fossils was collected from an abandoned sand pit Drtija in the vicinity of Moravče, where quartz sandstone, conglomerate or gravel were extracted. Marine and lacustrine fauna is represented by bony fish (*Pagrus cinctus*), sharks (*Cosmopolitodus hastalis* and *Carcharias sp.*), eagle ray teeth (*Aetobatis arcuatus* and *Myliobatis* sp.) and turtles belonging to *Trionyx triunguis*. Frequent finds are oncoids which often formed around a central nucleus, in most cases freshwater gastropods *Brotia* (*Tinnyea*) *eschery*. The remains of nearshore environments are mainly represented by numerous occurrences of thick-shelled oysters *Crassostrea gryphoides* that formed Crassostrea-bioherms. Terrestrial ecosystems are defined by numerous fragments of fossil wood (*Euphorbioxylon*, *Cinnamomoxylon*, *Carapoxylon*, *Myricoxylon*, *Taxodiaceae*? and *Dicotyledoneae*?). The discovered terrestrial paleoflora in Moravče indicates the existence of mangrove habitats along the seashore.

Figure 2. *Paleoenvironmental reconstruction of life in the sea. Drawing by Nika Rupar.*

The most important finds in the Drtija sand pit are the remains of Miocene land mammals. Isolated bone fragments belonging to large mammals, broken and fragmented during the transport and therefore mostly indeterminable, can be found. However, most important finds are teeth, which preserved much better in such high-energy environmets. Almost all teeth have missing roots and the enamel is polished, due the the water transport with the quartz gravel.

Figure 3. Prodinotherium *sp. tooth in situ.*

Figure 4. *Paleoenvironmental reconstruction of life on land. Drawing by Nika Rupar.*

Most of the collected teeth belong to small tragulid ruminants of the genus *Dorcatherium*. Four teeth were discovered; a complete crown of the left lower M2 or M3, two unworn partial tooth crowns with mesial half of the right lower molar, and a distal cusp of the lower right M3.

Two teeth belong to even-toed ungulates of the genus *Hyotherium*; a complete crown of right M1 and a mesial pillar of lower left M3.

Additionally remains of the large mammals were also discovered. Two teeth specimens of rhinocerotid were collected from the sand pit; a polished part of the buccal lamella of the lower premolar/molar, and an almost complete very worn right P4 which we assigned to the genus *Brachypotherium*.

Mikuž and Pohar (2001) described an anterior part of left lower jaw with missing teeth belonging to elephant-like proboscidean of the genus *Prodeinotherium*. Later, a fragment of the lower molar of *Prodeinotherium* and also a completely preserved slightly worn crown of the right upper P3 was found.

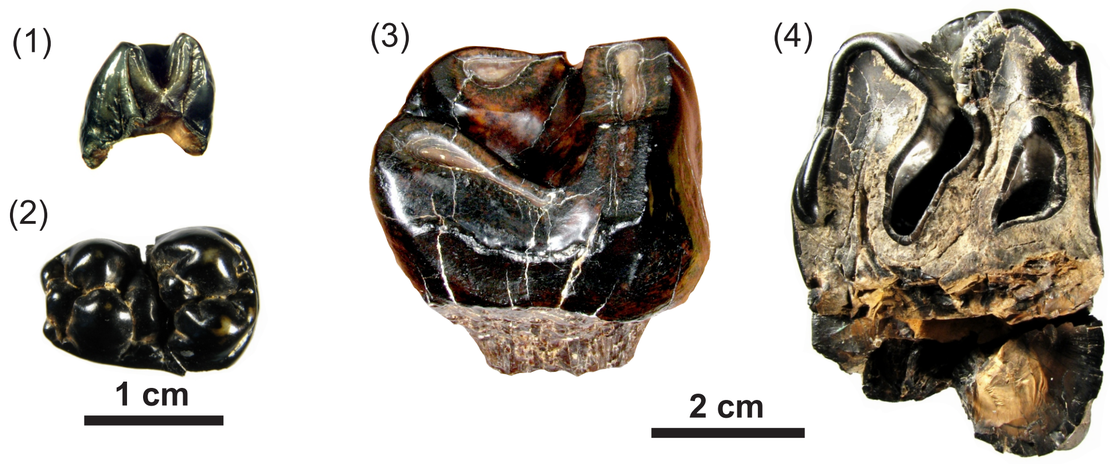


Figure 5. *Teeth belonging to (1)* Dorcatherium *sp.*, *(2)* Hyotherium *sp., (3)* Prodeinotherium *sp. and (4)* Brachypotherium *sp*.

The presence of large mammals is important for estimating the age of these beds. Until the Early Miocene, the open Tethyan Seaway to a large extent hindered land mammal migration between Africa and Eurasia (Harhauser et al., 2007). The collision of the Afro-Arabian plates with Eurasia during the mid-Burdigalian caused the emergence of a terrestrial corridor called the ‘‘Gomphotherium Landbridge’’, which allowed a faunal exchange between Africa and Eurasia (Rögl, 1999). The emergence of a terrestrial corridor and a warmer, less seasonal climate enabled proboscideans from Africa to disperse towards Western Europe in multiple migration events. The first arrivals in Europe were gomphotheres 17.3 Ma before present followed by deinotheres (Prodeinotherium) (Van der Made 1996).
Based on the data above, the beds containing large mammals in Drtija sand pit were deposited in the Middle to Late Burdigalian, which coresponds to the period from Ottnangian to Karpatian in the Central Paratethys. This is also in agreement with the older age determination by Premru (1983), who estimated the Helvetian (=Ottnangian and Karpatian) age of these beds in the Moravče area based on foraminifers and ostracods found in marly beds.

References
- Harzhauser, M., Piller, W.E., 2007. Benchmark data of a changing sea —Palaeogeography, Palaeobiogeography and events in the Central Paratethys during the Miocene. - Palaeogeography, Palaeoclimatology, Palaeoecology 253, 8–31.
- Mikuž V, Pohar V., 2001, Čeljustnica dinoterija (Mammalia, Proboscidea) iz Drtije pri Moravčah = Deinothere jaw (Mammalia, Proboscidea) from Drtija near Moravče (Central
Slovenia). Ljubljana: Slovenska akademija znanosti in umetnosti, Razprave IV. razreda SAZU, 79–101.
- Rögl, F., 1999. Mediterranean and Paratethys. Facts and Hypotheses of an Oligocene to Miocene Paleogeography (Short Overview). Geologica Carpatica 50, 339–349.
- Van der Made, J., Mazo, A.V., 2003. Proboscidean dispersals from Africa towards Western Europe - in: Reumer, J.W.F., De Vos, J. & Mol, D. (eds.) - Advances in Mammoth Research(Proceedings of the Second International Mammoth Conference, Rotterdam, May 16-20 1999) - DEINSEA 9: 437–452.
- Premru, U., 1983. Osnovna geološka karta SFRJ, 1:100000 – Tolmač lista Ljubljana (Basic geological map of Yugoslavia, 1:100000 – Guidebook of sheet Ljubljana). Zvezni geološki zavod, Beograd.

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