

## THE PLIOCENE MASTODON *Anancus arvernensis* FROM SCORILA (MEHEDIŢI COUNTY, ROMANIA)

CODREA A. Vlad, DIACONU Florina

**Abstract.** In the Neogene-Quaternary sedimentary Dacian basin, large herbivore fossils are frequent mainly in the southwestern area of the basin, where Pliocene sequences are largely exposed. The Mehedinți County follows this rule, where such finds occurred mainly due to the mining of the Pliocene coal and gravels. A mandible fragment of the Pliocene mastodon *Anancus arvernensis* still bearing the m3 was unearthed in the gravel and sand quarry from Scorila, a small village located nearby the boundary between the Mehedinți and Dolj counties. The rocks from which the mastodon fossil originated belong to the Cândești Formation. Actually, the geological age of this formation is considered Late Pliocene, MN 16a (Late Romanian, Walachian). This find completes the list of localities from which the mastodon species is reported in the Dacian Basin, being a proof of the frequency of this proboscidean in the specified area.

**Keywords:** mastodon, *Anancus*, Pliocene, Oltenia, southwestern Romania.

**Rezumat. Mastodontul *Anancus arvernensis* de la Scorila (Județul Mehedinți, România).** În bazinul sedimentar neogen-cuaternar Dacic, fosilele de erbivore mari sunt frecvente îndeosebi în zona de sud-vest a bazinului, unde secvențele pliocene aflorază în mare măsură. Județul Mehedinți urmează această regulă, unde astfel de descoperiri s-au produs în principal drept consecință a exploatării cărbunilor plioceni și a pietrișurilor. Un fragment de mandibulă a mastodontului pliocen *Anancus arvernensis* care păstrează încă m3 a fost dezgropat în cariera de pietriș și nisip din Scorila, un mic sat situat în proximitatea hotarului dintre județele Mehedinți și Dolj. Rocile din care provine fosila de mastodont revin Formațiunii de Cândești. De fapt, vârsta geologică a acestei formațiuni este considerată pliocen târziu, MN 16a (Romanian Superior, Valahian). Această descoperire completează lista localităților din care este semnalată specia de mastodont în Bazinul Dacic, dovadă a frecvenței acestui proboscidian în zona specificată.

**Cuvinte cheie:** mastodont, *Anancus*, Pliocen, Oltenia, sud-vestul României.

### INTRODUCTION

Pliocene and Quaternary large herbivores (mastodons, mammoths, rhinoceroses etc.) are reported from the Dacian sedimentary basin in several references (e.g., ATHANASIU 1907, 1908; DEMETRESCU 1928; DEMETRESCU & NICOLAESCU-PLOȘOR, 1929; BARBU, 1930; MACAROVICI, 1978; PETRESCU et al., 1987, 1989; RĂDULESCU et al., 2003a, b; ȘTIUCĂ et al., 2004; ANDREESCU et al., 2011, 2013; CODREA & DIACONU, 2003, 2007, 2010, 2011; CODREA & VENCZEL, 2018; CODREA et al., 2018 etc.).

Such vertebrate fossils are valuable markers in establishing the geological age of the Pliocene and Quaternary terrestrial sequences exposed in this basin as long as the dominance of its water-covered areas ended in Romanian (Late Pliocene), when a river network (fluvial plain with numerous channel fills) occurred in the western region of the basin, replacing the Dacian (Early Pliocene) lake, which has narrowed its range, gradually withdrawing to the east side of the basin. In such deposits, the mollusks are of lesser value in establishing the geological ages of the sequences, as long as they are mostly endemic taxa. Contrarily, the vertebrates are extremely useful stratigraphic markers and, therefore, each find is worth being noticed (Fig. 1).



Figure 1. Geographic location of Scorila in Europe (1), Romania (2) and Mehedinți County (3) (orig.).

A right mandible fragment with the last m3 was found in the village of Scorila, Mehedinți County. Scorila (44° 20' 52.07" N, 23° 05' 07.75" E, elevation 199 m) belongs to the commune of Vlădaia and is located to the SE of the municipality of Drobeta-Turnu Severin, about 48 km away as the crow flies (Fig. 1). The small village is relatively isolated, access being provided by the communal road 94. Geographically, the locality is situated in the south-western area of the Getic Plateau (subdivision: Strehaia Plateau), near the border with the Băileștilor Plain (VELCEA, 1971; POSEA et al., 2005). For various works (construction of roads, houses etc.), sand and gravel were locally mined in a small quarry located on the northeastern side of the locality, near the communal road. From these rocks the mastodon bone fragment was recovered (Fig. 2).

The finder, George Aurel Nisip, donated the fossil to the Museum of the Iron Gates Region in Drobeta-Turnu Severin. The extraction was unprofessional, so that an important portion of the tooth crown was severely damaged. The description of this piece, now hosted in the museum's paleontological collection, is the subject of this paper.



Figure 2. Location of the quarry where the mastodon bone (marked F) originated from (modified from Google Earth Pro, accessed July 5, 2023).

### GEOLOGICAL SETTING AND AGE

Geologically speaking, the area in question belongs to the westernmost region of the Dacian Basin (JIPA & OLARU, 2009), a sedimentary basin located in southern and south-eastern Romania. SCHOVERTH et al. (1963b) mapped the deposits in the Vlădaia - Scorila area as belonging to the Căndești Formation, *more precisely to the so-called 'psamo-psefitic horizon'*, which at that time had a geological age established as '*base of Quaternary, respectively of Villafranchian*' (p. 74), as depicted on the map published by SCHOVERTH et al. (1963a) of what they called '*lower horizon with fine sands and gravels with lens-like accumulations of boulders, exposing a cross-bedded structure*' (SCHOVERTH et al., 1963b, p. 91). For this formation, the above-mentioned authors reported the following fossil mammals: '*Elephas (Archidiskodon) meridionalis* Nesti, *Mastodon (Zygodon) borsoni* Hays, *Mastodon (Anancus) arvernensis* Croizet et Jobert, *Equus* sp., *Cervus* sp., *Rhinoceros* sp.'. At Cernătești, what was at that time specified as *Mammuthus meridionalis* is now reconsidered as *M. rumanus* (RĂDULESCU et al., 2003). Actually, the geological age of the Căndești Formation is late Pliocene (MN 16a, Late Romanian, Walachian; RĂDULESCU et al., 2003; ANDREESCU et al., 2013).

### MATERIAL AND METHODS

The material concerns only a right mandible fragment with a fragmentary crown of m3. At the moment when the fossil was extracted from the rock at Scorila, the tooth crown was complete (Fig. 3a), but subsequent careless handling of the piece damaged this fossil significantly.

The fossil was mechanically cleaned by the matrix rock (conglomerate and coarse quartz sand) and, then, both the bone and the tooth were reinforced by professional glue (Mowilith®) in the Laboratory of Paleotheriology and Quaternary Geology of the Babeș-Bolyai University of Cluj-Napoca.

The nomenclature of the molar cusps follows TASSY (1986, 1997) and the measurements follows GÖHLICH (1998). A professional calliper (precision 0.1 mm) was used for measurements.



**Abbreviations:** **m** - lower molar; **H** - crown height; **W<sub>I, II</sub>** width at the transverse crests I - II; **L** - estimated length of the crown; **MN**, Mammal Neogene Zone; **my**, million years; **pr**, pretrite principal tubercle; **po**, posttrite principal tubercle.

**Institutional abbreviations:** IGRDTS- Iron Gates Region Drobeta-Turnu Severin.

**Systematic paleontology**

Order Proboscidea ILLIGER 1811

Family Gomphotheriidae HAY 1922

*Anancus* AYMARD 1855

*Anancus arvernensis* (CROIZET & JOBERT 1828)

A posterior fragment of the right half-mandible (Figs. 3 a-c) is available for study, on which the m3 with fragmentary crown is preserved (IGRDTS inv. no. 1845).



Figure 3. *Anancus arvernensis*, Scorila: a - right m3 unprepared, crown view; b - m3, actual crown view; c - labial view.

The molar's roots are dark grey in colour and well mineralized. This aspect is visible mainly on the lingual side. In occlusal view (Fig. 3b), the crown is broken on an oblique line starting anteriorly from the lingual side of the third *po*, ending at the boundary between the fourth and fifth *pr*. Consequently, only the first two *po* remain accessible for a current direct study and, out of the tubercles of the opposite row, only the first two *pr* are preserved in their entirety, the following ones being split in different degrees. Even severely damaged, the preserved portions of the crown illustrate the anacoid pattern, with forward advancement of the main tubercles of the posttrite row relative to the pretrite one. Following this configuration, the transverse crests are practically divided into two portions, as semi-lophids.

Fortunately, a photo is available (Fig. 3a) showing the molar at the moment of its extraction from the quarry rocks, unprepared. The photo is useful to reconstruct the morphology of the entire crown, but also to determine, even approximately, certain dimensions of the tooth, such as its length. From the photograph it is evident that the tooth was hexa-lophodont and the talonid was in the form of a distal dilatation. The molar was elongated and narrow, with a tendency to recurve anteriorly in a labial direction. Consequently, the labial side (Fig. 3b) was slightly concave and the opposite lingual side, convex. All main tubercles were worn, indicative for an adult, rather old mastodon. Most of the central conulids and mesoconulids were fused with the primary tubercles on both rows. Traces of a discontinuous cingulum can be observed as an extension of that at the base of the first *pr*. In the remaining preserved *pr*, the bases of the crowns have wrinkled enamel, which could prove the existence of a vestigial discontinuous cingulum. On the lingual side a cingulum was present at the bases of the last three *po*, as an extension of the posterior cingulum. The cement is completely missing in the transverse valleys or in any other portion of the crown, but this could be consequence of the pre-depositional transport of the bone by the water streams. Enamel thickness is considerable, ranging from 3-7 mm, depending on the tubercle on which this value was measured.

Measurements (mm; \*estimated, based on the photo captured after extraction, in quarry):

L\* - >212.0; W<sub>I</sub> - 73.6; W<sub>II</sub> - >79.0; H - >41.0

### COMPARISONS AND DISCUSSIONS

The fragment of the right mandible preserving the last molar exposes advanced mineralization. Being found isolated, with no other skeletal elements in the vicinity, it can be assumed that it was transported by water prior to burial into sediment. The matrix rock is represented by whitish quartz sand mixed with coarse gravel clasts, to which medium-coarse quartz gravel of metamorphic origin is added, probably originating from the Southern Carpathians.

Comparisons are difficult to be done as long as there is so little metric and morphological data available. The nearest locality that provided an exceptionally rich sample of *Anancus arvernensis* cranial bones and teeth is Dorkovo in Bulgaria (MN 14, Bulgaria; THOMAS et al., 1986; METZ-MULLER, 2000), but the geological age of Dorkovo is older compared with Scorila. In Dorkovo, the exceptionally rich taphocoenosis document an older population of this mastodon species, while in Scorila we deal with a geological late specimen, among the youngest ones reported from Romania, as far as in the Early Pleistocene Tetoiu Formation (Argedavian; RADULESCU & SAMSON, 1990) following the Căndești Formation (ANDREESCU et al., 2011; 2013) mastodons are no longer found, being replaced by *Mammuthus meridionalis*. Moreover, even in the coeval formations of the Tetoiu Formation in other areas of the Dacian Basin, i.e., Coconi Beds and Frătești mastodons are missing, being probably already extinct in this region (RĂDULESCU & SAMSON, 2001; RĂDULESCU et al., 1998, 2003a, b; ANDREESCU et al., 2011, 2013).

The Dorkovo mastodon population demonstrated how important the sampling is in determining the evolutionary grades and trends of a species. For *A. arvernensis* cheek teeth, interpretations based only on isolated fossils were contradicted by what the richness of specimens from Dorkovo is demonstrated, namely that 'the sizes and complexities of the observable molars (...) cover a range of variability of the species *A. arvernensis* from MN 14 to MN 16' (METZ-MULLER, 2000). In Romania there is no comparable site concerning the richness of mastodon fossils.

METZ-MULLER (2000) specifies that in MN 17 the m3 become larger, compared to the ones from the units MN 14-MN 16. An accurate comparison cannot be supported in the case of the Scorila molar due to damage of the crown, but the geological age of the rocks from which it was collected is older than the unit MN 17 (i.e., MN 16a). The above author also observed a gradual increase in hypsodonty from old to recent forms from MN 17. The advanced wear of the cusps of the Scorila specimen as well as the damaged crown makes it impossible to establish the hypsodonty of the teeth.

The m3 from Scorila is longer than the corresponding molars from Chilhac, Viallette, Eastern Schelde Estuary, some specimens from Ferrere - Asti and most of those from Cinaglio d'Asti, falling within the size range of molars from Astignano or Val d'Arno, surpassing most of those from San Paolo-Solbrito. In terms of length, it is comparable to some of the molars reported from places such as Ferrere - Asti, Castelnuovo, Cinaglio d'Asti, Sao Paolo-Solbrito, Montespertoli, Montpellier. It is, however, considerably shorter than most of the molars from Dorkovo, the ones from Montpellier, some of the specimens from Saint-Laurent-des-Arbres, Perpignan, Vacchereccia, Astigiano and especially Marti Italie (data from METZ-MULLER, 2000).

It is obvious that, based on the data concerning the localities where the sampling was considerable, there is a remarkable dimensional variability for this mastodon species. This variability can be related to sex differentiations or individual specificities and, to a lower extent, to evolutionary stages. These aspects remain to be clarified in Romania, where, as we have shown, we do not yet have localities where this species is enough documented on the basis of rich sampling.

## CONCLUSIONS

The western area of the Oltenia region is the richest one in Pliocene mastodon remains in our country. The most frequent finds concern isolated teeth or fragments of cranial bones with associated teeth. The single partial skeleton was found decades ago at Stoina (Gorj County) and it is by far, mostly incomplete (DEMETRESCU, 1928; DEMETRESCU & NICOLAESCU-PLOPȘOR, 1929; CODREA et al., 2021).

The find from Scorila, from the clastic rocks of the Căndești Formation, for instance, simply adds another locality with mastodons on the Mehedinți County map. The damaged condition of the tooth, as well as its isolated occurrence in the Scorila sandstone and conglomerate, prevents us for the time being to draw conclusions regarding the evolutionary trends of the species at the end of the Pliocene. From various Pliocene localities in Romania and abroad, we know that the dental variability of this species was remarkable, both in morphology and size. The geological age of the Scorila deposits is indicative for an evolved representative of the species which lived at the end of the Pliocene.

The mastodon from Scorila brings up issues related to Romanian legislation concerning the protection of such discoveries. It is clear that a stricter legislation, preferably comparable to the one concerning the archaeological sites, would be necessary for the exceptional fossils. The discoverers should simply report the finds to institutions where professional paleontologists are available to carry out extractions from host rocks and subsequently prepare the fossils. This would yield much better-quality fossils with accurate provenances, which would form the basis of studies based on clearer data. This should be an urgent objective for the specialized institutions in our country and for the whole community of the Romanian paleontologists.

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**Codrea A. Vlad**

STAR Institute, Babeș-Bolyai University, RO-400347 Cluj-Napoca, Romania.  
 Department of Natural Sciences, Mureș County Museum, RO-540036 Târgu Mureș, Romania.  
 Department of Natural History, Țării Crișurilor Museum, RO-410087 Oradea, Romania.  
 Speleological Institute "Emil Racoviță", RO-050711 Sector 5, Bucharest, Romania.

**Diaconu Florina**

Iron Gates Region Museum, Drobeta-Turnu Severin, Romania.  
 Corresponding author: florinadiaconu@yahoo.com

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