

## DENTAL PIECES OF *MAMMUTHUS MERIDIONALIS* (NESTI, 1825) HOUSED IN THE COLLECTION OF THE ARGEȘ COUNTY MUSEUM

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**ABSTRACT.** The aim of the current study is to describe the dental remains of the mammoths housed in the vertebrate collection of the Department of Natural Sciences of Argeș County Museum and comes as an addition to the previous studies. The abundance of the dentognathic fragments discovered during the years in Argeș County contributes to a better understanding of the taxonomy and distribution of the Elephantidae during the Neogene - Quaternary period in the previously mentioned area.

**Keywords:** palaeontology, fossils, Elephantidae, Neogene, Quaternary.

**REZUMAT.** Piese dentare de *Mammuthus meridionalis* (Nesti, 1825) aflate în colecția Muzeului Județean Argeș. Prezentul studiu are ca obiectiv analiza resturilor fosile de elefantide aflate în colecția de vertebrate a secției de Științele Naturii din cadrul Muzeului Județean Argeș și vine ca o completare a cercetărilor anterioare. Piese analizate au fost încadrate din punct de vedere taxonomic pe baza observațiilor morfologice și a măsurărilor de ordin morfometric. Numărul mare de fragmente dentognatice descoperite de-a lungul timpului în arealul județului Argeș contribuie la o mai bună înțelegere taxonomică și distribuțională a elefantidelor din perioada Neogen - Cuaternar.

**Cuvinte cheie:** paleontologie, fosile, elefantide, Neogen, Cuaternar.

### INTRODUCTION

The fossil remains discovered during the years on the territory of Argeș County have revealed the presence of proboscideans in this area during the Neogen - Pleistocene period.

The Argeș County Museum Collection houses over 40 dental pieces belonging to specimens of the Elephantidae family, being discovered over the years in 10 fossiliferous sites (Fig. 1).

The discoveries of dental pieces occurred in most cases by accident (e.g. as a result of landslides) and less frequently during systematic excavations. Therefore, the stratigraphic position and sometimes their origin are not known precisely. However, the dental pieces in the Argeș County Museum collection are a source

which represents an important contribution which enriches the taxonomic data of the *Mammuthus* genus in Romania.

A few dental pieces present in the collection of Argeş County Museum were studied by I. Băcanu (Băcanu, 1956), L. Apostol and R. Stancu (Apostol & Stancu, 1968), R. Stancu, R. Gava and I. Băcanu (Stancu et al., 1969) and R. M. Ilie (Ilie, 2016).

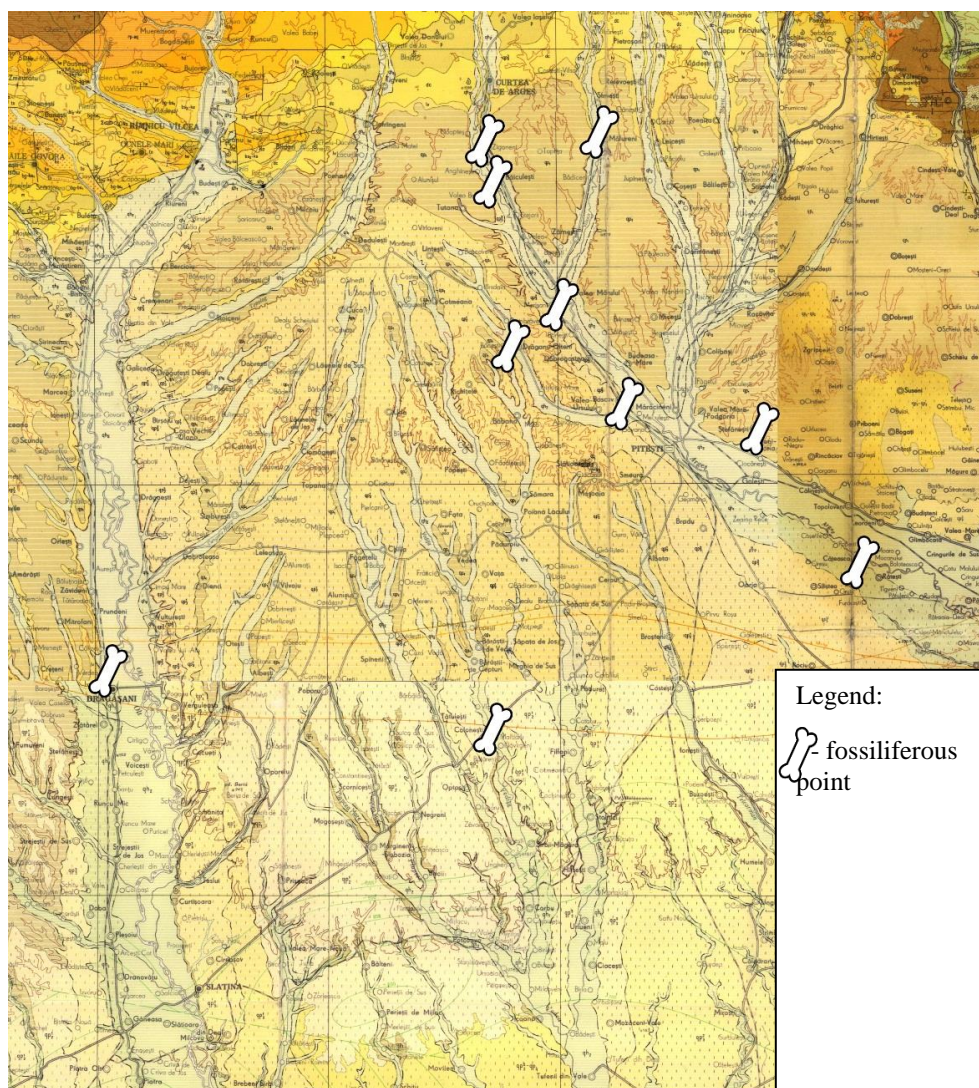


Figure 1 - The localization of the fossilized sites from which the studied pieces from the collections of Argeş County Museum come, on the geological map of the Argeş, Dâmbovița, Olt and Vâlcea counties, according to the Pitești L-35-XXV, Târgoviște L-35-XXVI and Slatina L- XXXI foils of maps. Scale 1: 200000. Institute of Geology and Geophysics, 1967.

## MATERIALS AND METHODS

The taxonomic determination of the dental pieces in this study was done using the most recent methods of measuring of the morpho-dimensional parameters of the molars due to the frequency of their findings (which is favoured by the chemical composition of the teeth which allows a higher degree of preservation unlike the rest of the bones) and the variety of taxonomic features. In order to determine the taxonomic characteristics of the elephantides, parameters such as: the number of plates (dental lamellae), the length, the width and the maximum height of the plate, the lamellar frequency or the thickness of the enamel layer are analysed.

According to the studies performed by Maglio (Maglio, 1973), in the Elephantidae family, the number and frequency of plates, such as the thickness of the enamel and the general morphology of dentition highlighted by the hypsodonty index (represented by the ratio between the height and the maximum width of the molars), show the most relevant taxonomic features that accentuate the evolution of this group. The aforementioned parameters were measured using the measuring tape (for dimensions larger than 15 cm) and the calliper (for sizes less than 15 cm).

Representatives of the Elephantidae Gray, 1821 family has a lophodont dentition, given by the plates (also called lamellae) that form premolars and molars. The plates have a tabular shape and are bonded together with means of a cement layer. These are composed of a layer of enamel surrounding the dentine. The increasing of the degree of wear & tear on the occlusal surfaces is due to the mastication process and leads to the apparition of some forms of erosion. At first punctual forms are observed they merge over time and allow the emergence of continuous antero-posteriorly flattened loops. When the premolars or molars are discovered in a fragmented state (which is quite common), the lack of plates is highlighted by the means of an "X", arranged before or after the number of plates, in order to underline the position of the absent ones. This indicates that the number of plates was higher. The numbering of the plates is done by Arabic digits when starting from the anterior part of the tooth (e.g. P1, P2, etc.) or Roman numerals when the count is done from the back (e.g. PI, PII, etc.). From the morphological point of view, the lower molars are distinguished by the concavity of the occlusal surface and labial edge, while for the upper molars the lingual edge is slightly concave (Maglio, 1973, Lister, 1996). The Elephantides members of the Pliocene - Pleistocene period have a single tooth on the hemimandibula. The advanced wear degree of the first molar leads to the second eruption, which gradually pushes the previous one to the point of complete replacement. The process is repeated until the third molar erupts (Aguirre, 1969).

The terminology and abbreviations used in this study are presented in table 1, and the morphodimensional parameters used for taxonomic determinations of Elephantidae are shown in figure 2.

In order to determine the ages of the individuals, a comparison of the dentition at the morphological level was made with the data presented in the study of Laws (Laws, 1966), which revealed on the basis of wear, the stages of the development of the *Loxodonta africana* Blumenbach, 1797 (African elephant) molars (Fig. 3). In addition to the comparisons with the Laws study, the current paper also uses the corrections presented by Jachmann (Jachmann, 1988) (Fig. 4).

## RESULTS AND DISCUSSIONS

Class Mammalia Linnaeus, 1758  
 Order Proboscidea Illiger, 1811  
 Family Elephantidae Gray, 1821  
 Subfamily Elephantinae Gray, 1821  
 Genus *Mammuthus* Brookes, 1828

The genus *Mammuthus* is part of the elephant family and includes four species that belong to the same monophyly evolutionary line: *Mammuthus rumanus* (Ștefănescu, 1924), *Mammuthus meridionalis* (Nesti, 1825), *Mammuthus trogontherii* (Pohlig, 1885) and *Mammuthus primigenius* (Blumenbach, 1799).

***Mammuthus meridionalis*** (Nesti, 1825)

*Mammuthus meridionalis* is also known as the southern mammoth and was distributed from the late Pliocene to the end of the early Pleistocene in the Eurasian space. The main features highlighting the species of *Mammuthus meridionalis* of the rest of *Mammuthus* species are: the total number of plates, usually ranging from 12 to 14 in the case of M<sup>3</sup> and between 11 and 14 for M<sub>3</sub>, the lamellar frequency (between 3.5 and 7.7) which is higher than that of *Mammuthus rumanus* ancestral species and the thickness of the enamel layer (between 2 and 4 mm).

Table 1 - Terminology and abbreviations used in the study

| Terminology                  | Abbreviation    |
|------------------------------|-----------------|
| Plates                       | P               |
| Maximum length               | L               |
| Maximum width                | W               |
| Maximum height               | H               |
| Lamellar frequency           | LF              |
| Thickness of enamel layer    | ET              |
| Hypsodonty index             | HI              |
| The second superior premolar | DP <sup>2</sup> |
| The third superior premolar  | DP <sup>3</sup> |
| The fourth superior premolar | DP <sup>4</sup> |
| The first upper molar        | M <sup>1</sup>  |
| The second upper molar       | M <sup>2</sup>  |
| The third higher molar       | M <sup>3</sup>  |
| The second lower premolar    | DP <sub>2</sub> |
| The third lower premolar     | DP <sub>3</sub> |
| The fourth lower premolar    | DP <sub>4</sub> |

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| Terminology                     | Abbreviation   |
|---------------------------------|----------------|
| The first lower molar           | M <sub>1</sub> |
| The second lower molar          | M <sub>2</sub> |
| The third lower molar           | M <sub>3</sub> |
| Dexter                          | Dex            |
| Sinister                        | Sin            |
| Total number of pieces analyzed | N              |
| Arithmetic mean                 | m <sub>a</sub> |
| Millions of years               | Ma             |

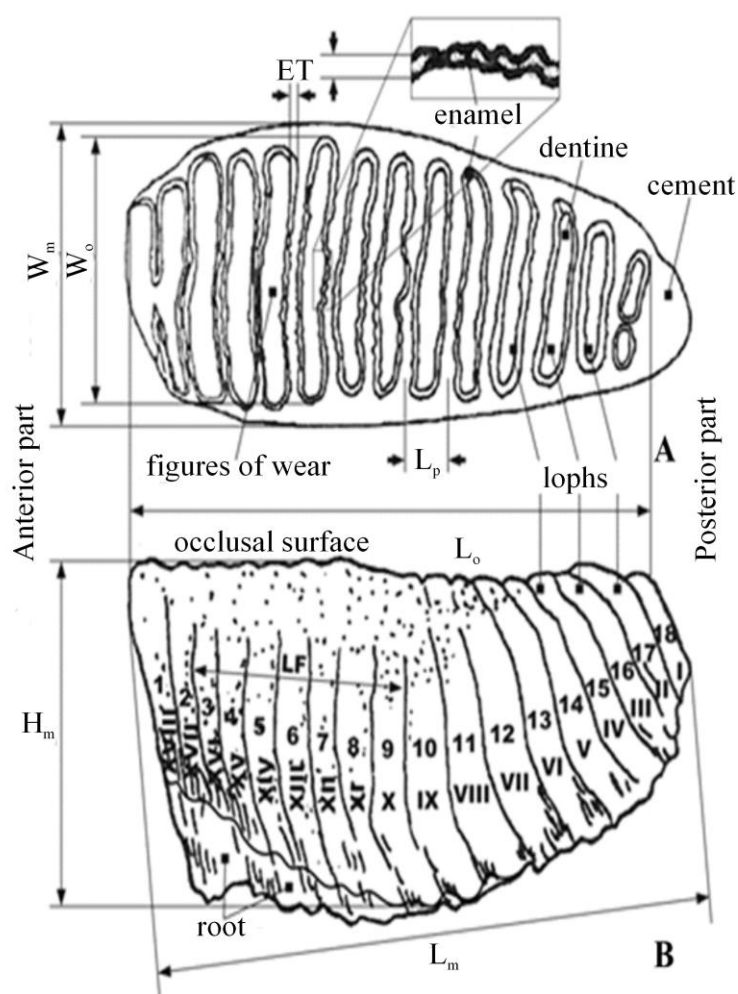


Figure 2 - Morphodimensional parameters measured for taxonomic determination of elephantides; A. occlusal view, B. labial view (after Virág & Gasparik, 2012).



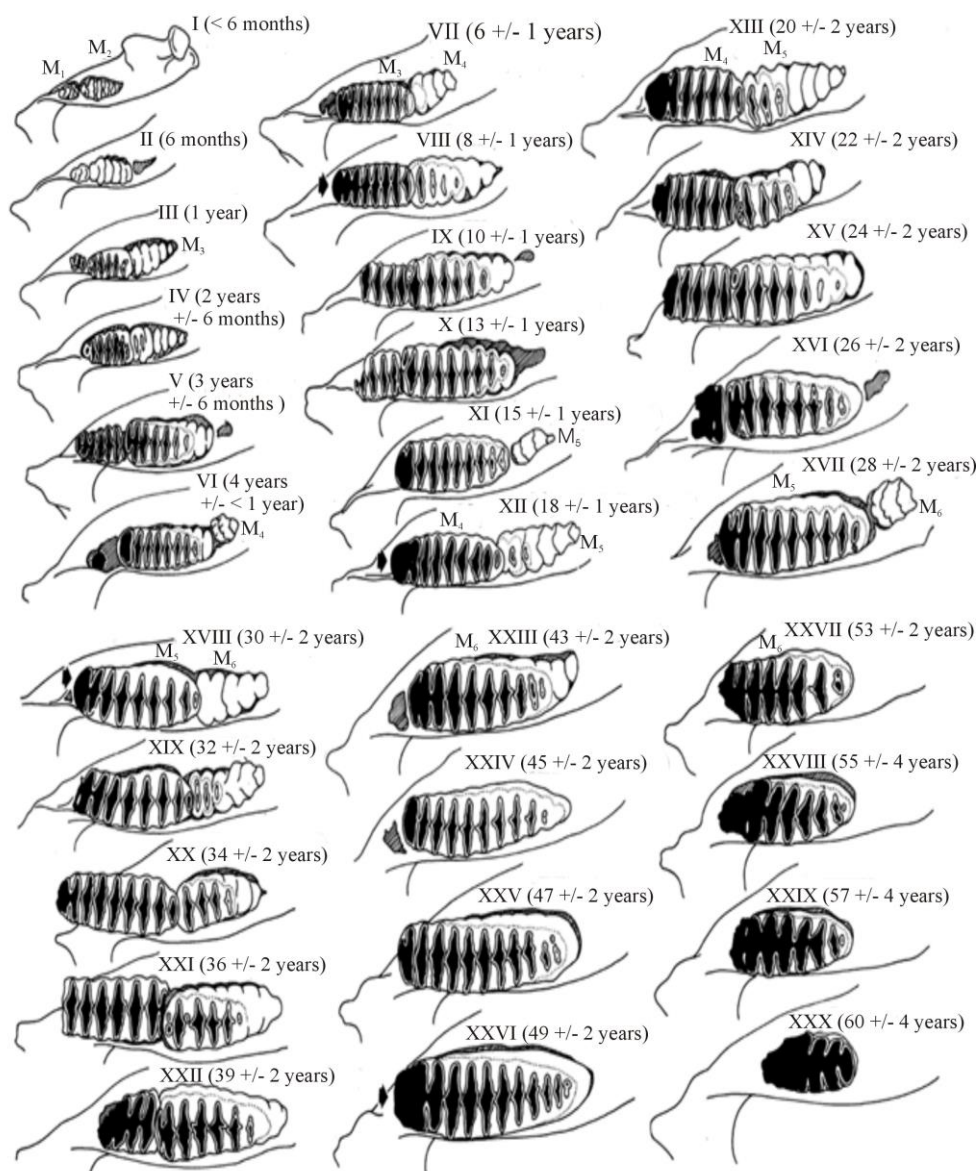


Figure 3 - Wearing stages and age of *Loxodonta africana* (Blumenbach, 1797) molars (after Laws, 1966).

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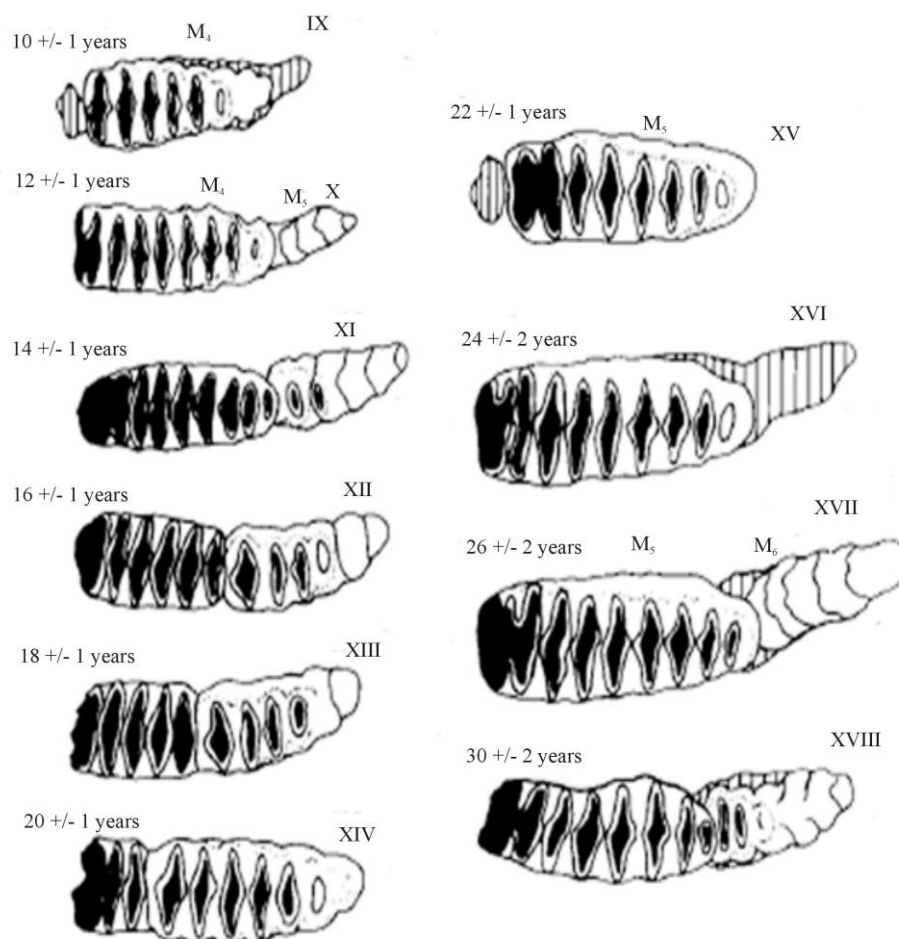


Figure 4 - Corrections applied in stages IX-XVIII for estimated ages for *Loxodonta africana* (Blumenbach, 1797) (after Jachmann, 1988).

All Elephantidae dental pieces studied from the Argeş County Museum Collection were assigned to the species *Mammuthus meridionalis*. The analysed fossil material comes from 10 distinct sites, of which eight fossil points from the current territory of Argeş County and two other sites from Olt and Vâlcea counties (Fig. 1). From each fossiliferous site, only pieces in full conservation status, as well as  $M_3$  and  $M^3$ , were presented.

**a. Bascov, Argeş County:** a mandible with implanted  $M_2$  and  $M_3$  (no. of inventory 177) (Tab. 2).

The mandibula with no. of inventory 177 in the Argeş County Museum collection was discovered after works at the Bascov-Piteşti reservoir dam, at a depth of approximately 13 m, in a sandy lens of a marly-sandy level of early Pleistocene age (Stancu et al., 1969).

The mandible has two molars implanted on each branch and is well preserved (Plate 1). The molar implanted in the anterior part of the left mandibular branch (presented in the present study as 177a) has an anterior talon and has five plates fully in use. The molar implanted in the posterior part is in the process of eruption (177b). It has a slight curvature to the labial edge and has a maximum length of 118.9 mm and a width of 77.37 mm. The average thickness of the enamel layer is 2.64 mm, and the calculated lamellar frequency is 4.21. Molar 177b has 12 exposed plates and an anterior talon. In the case of P1 plate, an average degree of wear was observed, while P2-4 plates exhibited forms of wear of meridionaloid type (— • —) (Baigusheva et al., 2016) at the occlusal surface. The plates P5-7 have forms of island wear. The maximum length of the molar is 221 mm, the lamellar frequency is 5.43 and the average thickness of the enamel layer is 3.31 mm (Tab. 2). The morphodimensional features presented correspond to those presented in the literature in the  $M_3$  case of *Mammuthus meridionalis*.

The first molar from the front of the right mandible branch (177c) has an anterior talon and five worn off plates. Similar to the first molar implanted on the left hemimandibula, the posterior talon is flattened by the molar eruption positioned in the posterior part. The piece has the maximum measured length of 120.34 mm, the calculated lamellar frequency is 4.15 and the average thickness of the enamel layer is 3.05 mm. The molar that is in the process of eruption has 12 plates. The P1 plate is medium worn off, while the following three plates have meridionaloid forms on the occlusal surface. In the case of the last three erupted plates, island forms were observed on the occlusal surface. The maximum measured length of the molar is 215 mm, the calculated lamellar frequency is 5.58, and the enamel has an average thickness of 3.31 mm (Tab. 2). These values indicate the presence of an  $M_3$ , which leads to the conclusion that the molar placed in the anterior part is an  $M_2$  is extremely worn off, similar to that seen with the  $M_2$  implanted on the left mandible.

Stancu et al. (1969) present this mandibular branch as having implanted  $M_1$  and  $M_2$  and assign the piece (no. of inventory 177) to the *Archidiskodon meridionalis* species. Based on morphological and morphodimensional comparisons with the material presented in the Maglio study (1973), the mandibular branch (no. of inventory 177) presents both  $M_2$  and  $M_3$  and belongs to the species *Mammuthus meridionalis*. Also, comparisons with the Laws (Laws, 1966) study allowed the age of the specimen to be determined at approximately  $39 \pm 2$  years (Tab. 5).



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**b. Căteasca, Argeș County:** a left  $M_3$  (no. of inventory 2,561/M) and a right  $M_3$  (no. of inventory 2,562/M) (Tab. 2).

The molar with the inventory number 2,561/M was discovered in 2005 and consists of an anterior talon and 10 plates, broken in the posterior area (Plate 1). The P1-4 plates are moderately worn and have folded enamel in the middle part. The P5 plate has island-like forms of wear, which indicate a low degree of use. The last plates in the back of the molar are still eruptive. The lingual edge of the tooth is convex, and the maximum length of the piece is 200 mm. The molar fragment has a width of 73.5 mm, the thickness of the enamel layer is 3.26 mm, the lamellar frequency of 5 and the hyposodonty index is 150.84 (Tab. 2). Measurements indicate that the left  $M_3$  appertains to *Mammuthus meridionalis*.

The piece with the inventory number 2,562/M was found in 2005 and it is very well preserved, with 12 plates, posterior and anterior talon (Plate 1). The lingual edge is convex, and the maximum molar length is 230 mm. The calculated lamellar frequency is 5.22, the width is 72.4 mm, the hyposodonty index was calculated at 152.35 and the thickness of the enamel layer is 3.22 mm (Tab. 2). Measurements reveal that the piece belongs to a mature individual and is an  $M_3$  right. The place of origin, dimensions and shape reveal that  $M_3$  with no. of inventory 2,562/M is the counterpart of 2561/M, the two molars thus coming from the same individual of *Mammuthus meridionalis*.

**c. Colonești, Olt County:** a left mandibular fragment with implanted  $M_2$  and  $M_3$  (no. of inventory 179), a left  $M^2$  (no. of inventory 2,544/M) and a right  $M^2$  or  $M^3$  (no. of inventory 191) (Tab. 2).

Hemimandibula with no. of inventory 179 was discovered at Colonești in 1959 and was initially described by the Apostol and Stancu (Apostol & Stancu, 1968) as coming from an individual of *Archidiskodon meridionalis*. As a preservation method the fossil material was subsequently, treated with a layer of aracet type adhesive. The molar located in the anterior part of the hemimandibula is completely preserved, showing seven plates and both talons. The dental piece has the convex lingual edge (Plate 1). The occlusal surface of the plates has a high degree of wear, as opposed to ones of the rear molar, which is in the process of eruption. The lamellar frequency is 4.14, and the maximum molar length is 169 mm, the thickness of the enamel layer measured is 2.96 mm and the maximum width is 49.53 mm. The molar from the back part holds only six plates and an anterior talon. In the case of the latter, the maximum height is 84.29, the hyposodonty index is 169.56, and the calculated lamellar frequency is 5.69 (Tab. 2). Measurements performed on molars implanted on hemimandibula confirmed that the two molars are  $M_2$  and  $M_3$ , as identified by Apostol and Stancu in 1968. The analysed piece was attributed to the *Mammuthus meridionalis* species. Following comparisons with the Laws (Laws, 1966) study, the age of the specimen was estimated at  $30 \pm 2$  years (Tab. 5).

**d. Drăganu, Argeş County:** two fragments of right mandible with implanted  $M_2$  and  $M_3$  (no. of inventory 178 and 180) (Tab. 2).

A fragment of mandibula (no. of inventory 178) was discovered in the vicinity of Drăganu in 1958. The piece is in very good conservation status and has two molars, of which the one from the back is in the process of eruption, while the molar from the front is in use. The molar implanted in the previous part holds 10 plates and both talons. The labial edge has a curvature directed towards the outside of the mandibular branch (Plate 2). The PI-IV plates are at an early stage of wear, having island-like forms on the occlusal surface. The other plates are fully in use. The lamellar frequency is 5.13, the maximum length measured is 195 mm, and the average thickness of the enamel layer is 3.04 mm, while the hyposodonty index was calculated at 64.80 (Tab. 2). As a result of the measurements, it was established that the molar from the anterior part is an  $M_2$ , and the one on the back is a right  $M_3$  of *Mammuthus meridionalis*. The probable age of the specimen is  $26 \pm 2$  years (Tab. 5) (Laws, 1966, Jachmann, 1988).

Discovered in 1956, the piece with no. of inventory 180 is a fragment of right mandible that shows two implanted moles. In the case of the molar implanted in the anterior part (180a), PI and PII have island forms on the occlusal surface. The remaining four plates are extremely worn off. The molar has a curvature directed towards the outside of the horizontal branch of the mandibula (Plate 2). It has the maximum measured width of 77.53 mm and the thickness of the enamel layer is 3.50 mm. The lamellar frequency was calculated at 4.09 (Tab. 2). The molar implanted in the posterior part of the hemimandibula (180b) is in the process of eruption and is composed of 10 plates and anterior talon. None of the plates allowed the measurement of the thickness of the enamel layer because of the early extent of eruption in which the molar is found. The lamellar frequency is 5.56 and the total molar fragment length is 180 mm (Tab. 2). Following the measurements made, it was found that 180a is an extremely worn off  $M_2$  and 180b is an  $M_3$ . The comparisons based on the morphological criteria presented by Laws (Laws, 1966) and the corrections applied by Jachmann (Jachmann, 1988) allowed the approximation of the age of the individual to  $26 \pm 2$  years (Tab. 5).

**e. Drăgășani, Vâlcea County:** two right  $M_3$  (no. of inventory 184 and 187) (Tab. 2).

The piece with no. of inventory 184 is a molar fragment formed of only three plates and a small part of a fourth plate. It was discovered near Drăgășani in 1957. The dental fragment was described by Apostol and Stancu (Apostol & Stancu, 1968) as a right  $M_2$  of *Archidiskodon meridionalis*. From a morphological point of view, the labial edge and the occlusal surface are slightly concave (Plate 2). The length of the molar is 68.5 and the lamellar frequency is 4.38 mm (Tab. 2). The enamel layer is 3.49 mm thick and has a slightly deformed cut in the medial part. The morphological and morphodimensional analyzes revealed that the fragment belongs to an individual of *Mammuthus meridionalis* and is a right  $M_3$ .

The molar fragment with no. of inventory 187 discovered in 1957 near the town of Drăgășani, was originally described by Apostol and Stancu (Apostol &

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Stancu, 1968) as an  $M_2$  of *Archidiskodon meridionalis*. The piece is formed of an anterior talon, four plates, and a rest of a fifth plate (Plate 2). The occlusal surface presents a slight concavity, seen also in the margin of the labia. These morphological features indicate the inferior dextral position of the molar. The enamel has rare folds, and the degree of wear of the plates is high. The lamellar frequency is 3.17, the average thickness of the enamel is 3.40 mm and the maximum measured length is 110.31 mm (Tab. 2). The measured values indicate that the analysed piece is an  $M_3$  of *Mammuthus meridionalis*.

**f. Mălureni, Argeş County:** an upper jaw fragment with left  $M^1$  and  $M^2$  (no. of inventory 2,264), a left  $M_3$  (no. of inventory 2,265) and a right  $M_3$  (no. of inventory 2,266) (Tab. 2).

The piece with no. of inventory 2,264 was discovered in the Deposits from the Valea Lată, near the village of Mălureni, Argeş County, in 2006. The upper jaw fragment presents two implanted molars. In the anterior part there is a rest from a molar (2264a), made up of three plates and posterior talon (Plate 3). The plates have a high degree of wear. The thickness of the enamel is 2.60 mm, and the lamellar frequency was calculated at 3.39 (Tab. 2). The molar located at the rear (2264b) is composed of nine plates and an anterior talon (Plate 3, 10g, h). The enamel has more pronounced folds in the middle part, and its average thickness is 3.50 mm. Only the P4 and P5 plates are in an early stage of use, while the other plates from the rear are not erupted. The lingual edge is convex (Fig. 3) and the maximum width is 85.56 mm. The lamellar frequency is 6.12 and the hyposodonty index is 114.41 (Tab. 2). As a result of the comparisons made with the specialized papers it was pointed out that 2264a is an  $M^1$  and 2264b is a left  $M^2$ . The most likely, the specimen was  $20 \pm 1$  years old (Tab. 5) (Laws, 1966, Jachmann, 1988).

Molar with no. of inventory 2,265 (Plate 3) consists of 12 plates, but only five of them are put into use. The piece comes from the deposits from the Valea Lată area, Mălureni commune, Argeş County and was discovered in 2006. The occlusal surface and the labial edge are concave. These aspects indicate the sinister position of the lower molar. The hyposodonty index is 165.75 and the maximum length is 260 mm (Tab. 2). The thickness of the enamel layer (3.35 mm) and the low lamellar frequency (4.62) indicate that the left  $M_3$  belongs to an individual of *Mammuthus meridionalis*. The plates' morphology denotes that the individual was about  $32 \pm 2$  years (Tab. 5).

The piece with no. of inventory 2,266 (Plate 3) was discovered in 2006, in the Valea Lată area, Mălureni, Argeş county. It is well preserved with 10 plates and posterior talon. The occlusal surface is convex and the talons have a medium degree of wear and folded enamel. The average enamel thickness is 3.99 mm. The maximum length of the molar is 150 mm and the maximum tooth width is 90.33 mm (Tab. 2). Morphodimensional analysis denotes that the right  $M_3$  belongs to a specimen of *Mammuthus meridionalis*.

**g. Mănicești, Băiculești commune, Argeș County:** an  $M^2$  or  $M^3$  (no. of inventory 2,548/M) (Tab. 2).

**h. Merișani, Argeș County:** a left  $M^3$  (no. of inventory 183), an  $M^3$  (no. of inventory 185) and a left mandibular fragment with  $M_3$  (no. of inventory 2,558/M) (Tab. 2).

The left hemimandibula was found in the deposits of the Merișani area, Argeș County and has an implanted molar (no. of inventory 2,558/M, Argeș County Museum). It is composed of 10 plates and both talons (Fig. 3). The P1-III plates have a lower level of wear than those from the back, and the enamel of the plates have a sharp marked fold on the posterior margin. The molar is 205 mm long and 73.76 mm wide, and the molar hypsodonty index is 99.80. The thickness of the enamel layer is 3.23 mm and the lamellar frequency is 4.88 (Tab. 2). These dimensions lead to the conclusion that  $M_3$  belongs to a specimen of *Mammuthus meridionalis*. The morphology of the tooth shows that the probable age of the adult specimen of *Mammuthus meridionalis* was  $47 \pm 2$  years (Tab. 5).

**i. Ștefănești, Argeș County:** a left  $M^1$  (no. of inventory 182), a left  $M_3$  (no. of inventory 181), and a right  $M_3$  (no. of inventory 189) (Tab. 2).

The piece with no. of inventory 189 was discovered in 1968 in the deposits from Valea Mare, Ștefănești, Argeș County. The fully preserved molar has 11 plates and both talons. Both the lingual edge and the occlusal surface are concave (Plate 4), and the P1-4 plates have a more advanced stage than the remaining plates from the posterior part. The piece has a maximum length of 235 mm, and a width of 90.36 mm. The lamellar frequency is 4.68 and the thickness of the enamel layer is 3.65 mm. Molar dimensions (Tab. 2) reveal that the right  $M_3$  originates from a specimen of *Mammuthus meridionalis*. Comparisons with the study of Laws (Laws, 1966) revealed that the probable age of the individual is  $49 \pm 2$  years (Tab. 5).

**j. Zigoneni, Argeș County:** a right  $M1$  (no. of inventory 2,559/M) (Tab. 2).

**k. Dental pieces coming from deposits from uncertain locations.**

The Molar with no. of inventory 2,546/M has 13 plates and both talons (Plate 4). Five plates are in use, of which P1 is more worn off. P2-5 has island features on the occlusal surface, indicating their low usage, and the average thickness of the enamel layer is 3.98 mm. The hypsodonty index is 147.75, while the lamellar frequency is 5.75 (Tab. 2). The specimen from which  $M^3$  originated was  $34 \pm 2$  years of age (Tab. 5).

The molar with no. of inventory 2,552/M (Plate 4) has all six plates in use, and the enamel is poorly folded in the middle area of the plates. The average thickness of the enamel is 3.49 mm and the lamellar frequency is 4.28 (Tab. 2). Following comparisons with the specialty studies, it was determined, that  $M_2$  belongs to a specimen of *Mammuthus meridionalis*, whose age was estimated at  $26 \pm 2$  years (Tab. 5).

The right upper jaw fragment with no. of inventory 2,553/M shows a fully conserved molar and the space where an older tooth was implanted (Plate 4). The first three plates from the posterior part are poorly worn, while the remaining six

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plates are extremely worn. The enamel shows folds both on the posterior part and the anterior one. These are much better highlighted in the middle area of the enamel. The thickness of the enamel layer is 3.56 mm on average and the lamellar frequency is low (3.75). The maximum length of the molar is 240 mm (Tab. 2). The dimensions indicate that M<sup>3</sup> originates from an individual of *Mammuthus meridionalis*. The probable age of the specimen from which the dentate rest originates was  $45 \pm 2$  years (Tab. 5).

A right mandible fragment (no. of inventory 2,560/M) holds an implanted premolar that is completely preserved (Fig. 4). Out of the eight plates, six are fully in use. They have a folded enamel. The lamellar frequency is 5.94 and the average thickness of the enamel layer is 2.03 mm. The maximum length is 134.57 mm and the width is 55.27 mm (Tab. 2). Morphodimensional analyzes indicate that the tooth implanted on the right mandible is a DM<sub>4</sub>. The juvenile specimen from which the premolar originated was  $8 \pm 1$  years old (Tab. 5).

In order to confirm the taxonomic affinity of the analysed dental pieces and to compare the results with other materials from the specialized works, two tables were made in which the average values obtained for M<sup>3</sup> (Tab. 3) and M<sub>3</sub> (Tab. 4) fully preserved are shown along with the ones presented in the studies of Maglio (Maglio, 1973) and Baygusheva and Titov (Baygusheva & Titov, 2012).

Table 2 - The dimensions of the pieces attributed to the species *Mammuthus meridionalis* within the collection of Argeș County Museum.

| No. | No. inv. | Dental type        | P     | L      | W     | H      | LF   | ET   | HI     | Location                 |
|-----|----------|--------------------|-------|--------|-------|--------|------|------|--------|--------------------------|
| 1.  | 177a     | M <sub>2</sub> sin | 5     | 118.9  | 77.37 | 30.36  | 4.21 | 2.64 | 39.24  | Bascov, Argeș County     |
| 2.  | 177b     | M <sub>3</sub> sin | 12x   | 221    | 76.42 | 63.44  | 5.43 | 3.31 | 83.01  | Bascov, Argeș County     |
| 3.  | 177c     | M <sub>2</sub> dex | 5     | 120.34 | 78.04 | 25.18  | 4.15 | 3.05 | 32.27  | Bascov, Argeș County     |
| 4.  | 177d     | M <sub>3</sub> dex | 12x   | 215    | 72.21 | 48.33  | 5.58 | 3.31 | 66.93  | Bascov, Argeș County     |
| 5.  | 178      | M <sub>2</sub> dex | 10    | 195    | 75.31 | 48.8   | 5.13 | 3.04 | 64.80  | Drăganu, Argeș County    |
| 6.  | 179a     | M <sub>2</sub> sin | 7     | 169    | 49.53 | 84.29  | 4.14 | 2.96 | 170.18 | Colonești, Olt County    |
| 7.  | 179b     | M <sub>3</sub> sin | 6x    | 105.54 | 49.71 | 84.29  | 5.69 | -    | 169,56 | Colonești, Olt County    |
| 8.  | 180a     | M <sub>2</sub>     | x6    | 146.63 | 77.53 | 62.1   | 4.09 | 3.50 | 80.10  | Drăganu, Argeș County    |
| 9.  | 180b     | M <sub>3</sub>     | 10x   | 180    | 50.2  | 119.2  | 5.56 | -    | 237.45 | Drăganu, Argeș County    |
| 10. | 181      | M <sub>3</sub> sin | x9x   | 165    | 87.31 | 127.47 | 5.45 | 3.67 | 146.00 | Ștefănești, Argeș County |
| 11. | 181      | M <sub>3</sub> sin | x9x   | 165    | 87.31 | 127.47 | 5.45 | 3.67 | 146.00 | Ștefănești, Argeș County |
| 12. | 182      | M <sup>1</sup> sin | x8x   | 109.03 | 71.65 | 87.31  | 7.34 | 3.21 | 121.86 | Ștefănești, Argeș County |
| 13. | 183      | M <sup>3</sup> sin | x3x   | 70.16  | 83.95 | 83.75  | 4.28 | 3.79 | 99.76  | Merișani, Argeș County   |
| 14. | 184      | M <sub>3</sub> dex | x3.5x | 68.5   | 69.63 | 48.34  | 4.38 | 3.49 | 69.42  | Drăgășani, Vâlcea County |
| 15. | 185      | M <sup>3</sup>     | x5.5x | 90.19  | 67.52 | 60.89  | 6.10 | 3.59 | 90.18  | Merișani, Argeș County   |
| 16. | 187      | M <sub>3</sub> dex | 4.5x  | 110.31 | 77.29 | 35.72  | 3.17 | 3.40 | 46.22  | Drăgășani, Vâlcea County |

| No. | No. inv.       | Dental type                        | P     | L      | W     | H      | LF   | ET   | HI     | Location                                    |
|-----|----------------|------------------------------------|-------|--------|-------|--------|------|------|--------|---|
| 17  | 189            | M <sub>3</sub> dex                 | 11    | 235    | 90.36 | 30.58  | 4.68 | 3.65 | 33.84  | Ștefănești, Valea Mare, Argeș County        |
| 18  | 191            | M <sup>2</sup> -M <sup>3</sup> dex | 10x   | 205    | 52.14 | 142.05 | 4.88 | -    | 272.44 | Colonești, Olt County                       |
| 19  | 2,264a         | M <sup>1</sup> sin                 | 3x    | 88.41  | 69.32 | 30.97  | 3.39 | 2.60 | 44.68  | Mălureni, Valea Lată, Argeș County          |
| 20  | 2,264b         | M <sup>2</sup> sin                 | 9x    | 146.97 | 85.56 | 97.89  | 6.12 | 3.50 | 114.41 | Mălureni, Valea Lată, Argeș County          |
| 21  | 2,265          | M <sub>3</sub> sin                 | 12x   | 260    | 75.65 | 125.39 | 4.62 | 3.35 | 165.75 | Mălureni, Valea Lată, Argeș County          |
| 22  | 2,266          | M <sub>3</sub> dex                 | x10   | 150    | 90.33 | 61.38  | 6.67 | 3.99 | 67.95  | Mălureni, Valea Lată, Argeș County          |
| 23  | 2,544/M        | M <sup>2</sup> sin                 | 8x    | 152.78 | 54.71 | 136.53 | 5.24 | -    | 249.55 | Colonești, Olt County                       |
| 24  | 2,545/M        | M <sup>2</sup> sin                 | x10x  | 147.95 | 71.14 | 115.45 | 6.76 | 3.49 | 162.29 | ?   |
| 25  | 2,546/M        | M <sup>3</sup> dex                 | 13    | 226.05 | 84.5  | 124.85 | 5.75 | 3.98 | 147.75 | ?   |
| 26  | 2,547/M        | M <sub>1</sub> dex                 | 5x    | 104.63 | 69.66 | 37.82  | 4.78 | 3.98 | 54.29  | ?   |
| 27  | 2,548/M        | M <sup>2</sup> -M <sup>3</sup> sin | x5x   | 93.57  | 57.48 | 103.95 | 5.34 | -    | 180.85 | Mănicești, commune Băiculești, Argeș County |
| 28  | 2,550/M        | M <sub>2</sub> -M <sub>3</sub> dex | x6    | 110.41 | 77.62 | 99.76  | 5.43 | 2.87 | 128.52 | ?   |
| 29  | 2,551/M        | M <sub>3</sub> dex                 | 5x    | 104.73 | 93.79 | 77.48  | 4.77 | 3.07 | 82.61  | ?   |
| 30  | 2,552/M        | M <sub>2</sub> dex                 | 6     | 140.3  | 67.51 | 51.72  | 4.28 | 3.49 | 76.61  | ?   |
| 31  | 2,553/M        | M <sup>3</sup> dex                 | 9     | 240    | 99.67 | 197.57 | 3.75 | 3.56 | 198.22 | ?   |
| 32  | 2,556/M        | M <sup>2</sup> -M <sup>3</sup> dex | x5x   | 94.59  | 46.38 | 124.69 | 5.29 | -    | 268.84 | ?   |
| 33  | 2,557/M        | M <sup>3</sup> dex                 | x12x  | 121.74 | 77.44 | 98.58  | 9.86 | 3.39 | 127.30 | ?   |
| 34  | 2,558/M        | M <sub>3</sub> sin                 | 10    | 205    | 73.76 | 73.61  | 4.88 | 3.23 | 99.80  | Merișani, Argeș County                      |
| 35  | 2,559/M        | M <sub>1</sub> dex                 | x8    | 120.15 | 59.29 | 92.66  | 6.66 | 3.80 | 156.28 | Zigoneni, Argeș County                      |
| 36  | 2,560/M        | DM <sub>4</sub> dex                | 8     | 134.57 | 55.27 | 43.79  | 5.94 | 2.03 | 79.23  | ?   |
| 37  | 2,561/M (CT/1) | M <sub>3</sub> sin                 | 10x   | 200    | 73.5  | 110.87 | 5.00 | 3.26 | 150.84 | Căteasca, Argeș County                      |
| 38  | 2,562/M        | M <sub>3</sub> dex                 | 12    | 230    | 72.4  | 110.3  | 5.22 | 3.22 | 152.35 | Căteasca, Argeș County                      |
| 39  | 2,563/M        | M <sub>2</sub> -M <sub>3</sub> sin | x5.5x | 84.58  | 54.95 | 102.35 | 6.50 | -    | 186.26 | ?   |
| 40  | 2,564/M        | M <sub>3</sub>                     | 3x    | 48.42  | 63.39 | 72.97  | 6.20 | 3.66 | 115.11 | ?   |
| 41  | 2,565/M        | M <sub>3</sub> sin                 | 4x    | 74.37  | 86.89 | 77.39  | 5.38 | 3.54 | 89.07  | ?   |
| 42  | CD805          | M <sub>3</sub> dex                 | x7.5  | 185    | 99.38 | 59.86  | 4.05 | 4.08 | 60.23  | ?   |



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Table 3 - The morphodimensional values of  $M^3$  of *Mammuthus meridionalis* in the Argeş County Museum collection compared to the data of the same species presented in the works of Maglio (Maglio, 1973), Baygusheva and Titov (Baygusheva & Titov, 2012).

| $M^3$     | Dental pieces from the Argeş County Museum Collection | Maglio, 1973 | North Caucasus, Russia (Baygusheva & Titov, 2012) |
|-----------|---|--------------|---|
| P         | 9-13  | 11-14        | 12-14   |
| $m_a$ (N) | 11 (2)  | 12.8 (33)    | 12.67 (6)   |
| L         | 226.0-240.0   | 228.8-317.1  | 253.0-327.0                                       |
| $m_a$ (N) | 233.0 (2)   | 273 (32)     | 284.40 (5)  |
| W         | 84.5-99.6   | 85.6-126.4   | 104.0-121.0                                       |
| $m_a$ (N) | 92.6 (2)  | 104.8 (39)   | 114.17 (6)  |
| H         | 124.8-197.5   | 100.2-141.8  | 125.0-172.0                                       |
| $m_a$ (N) | 161.21 (2)  | 122.7 (30)   | 148.5 (2)   |
| LF        | 3.75-5.75   | 3.7-6.1      | 4.25-5.0  |
| $m_a$ (N) | 4.75 (2)  | 4.9 (40)     | 4.79 (6)  |
| ET        | 3.56-3.98   | 2.6-4.1      | 2.7-3.6   |
| $m_a$ (N) | 3.77 (2)  | 3.3 (36)     | 3.08 (6)  |
| HI        | 147.7-198.2   | 93.8-152.7   | 119.0-140.0                                       |
| $m_a$ (N) | 173.0 (2)   | 125.6 (25)   | 132.0 (2)   |

Table 4 - The morphodimensional values of  $M_3$  of *Mammuthus meridionalis* in the Argeş County Museum collection compared to the data of the same species presented in the works of Maglio (Maglio, 1973), Baygusheva & Titov (Baygusheva & Titov, 2012).

| $M_3$     | Dental pieces from the Argeş County Museum Collection | Maglio, 1973 | North Caucasus, Russia (Baygusheva & Titov, 2012) |
|-----------|---|--------------|---|
| P         | 10-12   | 10-14        | 12-16   |
| $m_a$ (N) | 11 (3)  | 12.1 (19)    | 13.2 (5)  |
| L         | 205-235   | 212-306      | 258-322   |
| $m_a$ (N) | 187.7 (3)   | 266.3 (18)   | 299.67 (3)  |
| W         | 72.4-90.3   | 69.1-119.4   | 90-110.8  |
| $m_a$ (N) | 76.7 (3)  | 97.2 (36)    | 101.56 (5)  |
| H         | 73.6-110.3  | 75-152       | 102-147   |
| $m_a$ (N) | 92.0 (2)  | 115 (17)     | 127.33 (3)  |
| LF        | 4.68-5.22   | 3.5-5.9      | 5.0-5.75  |
| $m_a$ (N) | 5.6 (3)   | 4.6 (36)     | 5.31 (4)  |
| ET        | 3.22-3.65   | 2.4-4.1      | 3.15-3.5  |
| $m_a$ (N) | 3.4 (3)   | 3.4 (33)     | 3.28 (4)  |
| HI        | 99.8-152.3  | 107.8-165.5  | 100-144   |
| $m_a$ (N) | 126.1 (2)   | 126.4 (14)   | 121 (3)   |

Table 5 presents dental pieces with relevant morphological features in order to determine the ontogenetic stage of the specimens from which they originated.

Table 5 - Ontogenetic conditions determined on the basis of the dental material of *Mammuthus meridionalis* from the Argeş County Museum Collection, compared to the data of Laws (Laws, 1966) and Jachmann (Jachmann, 1988).

| No. | No. inv. | Dental type                    | Ontogenetic study<br>(Laws, 1966; Jachmann, 1988) |
|-----|----------|--------------------------------|---|
| 1.  | 2,560/M  | DM <sub>4</sub> dex            | 8±1 years   |
| 2.  | 2,264    | M <sup>2</sup>                 | 20±1 years  |
| 3.  | 178      | M <sub>2</sub> dex             | 26±2 years  |
| 4.  | 180      | M <sub>2</sub> -M <sub>3</sub> | 26±2 years  |
| 5.  | 2,552/M  | M <sub>2</sub> dex             | 26±2 years  |
| 6.  | 179      | M <sub>2</sub> sin             | 30±2 years  |
| 7.  | 2,265    | M <sub>3</sub> sin             | 32±2 years  |
| 8.  | 2,546/M  | M <sup>3</sup> dex             | 34±2 years  |
| 9.  | 177      | M <sub>2</sub> -M <sub>3</sub> | 39±2 years  |
| 10. | 2,553/M  | M <sup>3</sup> dex             | 45±2 years  |
| 11. | 2,558/M  | M <sub>3</sub> sin             | 47±2 years  |
| 12. | 189      | M <sub>3</sub> dex             | 49±2 years  |

## CONCLUSIONS

The Argeş County Museum Collection holds a large number of Elephantidae fossils. Following the morphodimensional analyzes, the 42 dental pieces from 10 fossiliferous sites were attributed to the species *Mammuthus meridionalis*. The majority of the dental pieces come from the central part of the county, from the proximity of the Argeş River middle course (5 fossiliferous sites) belonging most likely to the deposits of the Căndeşti formation. The most of the discoveries occurred by accident mainly due to anthropogenic intervention in the area (e.g. Argeş River regulation works, gravel pits, construction of houses). The abundance of the fossil material and the distribution of the sites from which the analysed parts originate indicate that *Mammuthus meridionalis* was very adaptable, being a common presence in the Argeş County during Neogen-Pleistocene.

Also, a variation of the ontogenetic stages was observed to the specimens from whom the studied dental pieces originated, the values being between 8 and 49 years.

Generally, the state of preservation of the pieces varies from those in fragmentary state to complete teeth found in good condition for preservation.

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The dental material of *Mammuthus meridionalis* present in the collection of the Argeș County Museum highlights the importance of the fossil pieces in the museum collections, thus contributing to the enrichment of taxonomic data.

### ACKNOWLEDGMENT

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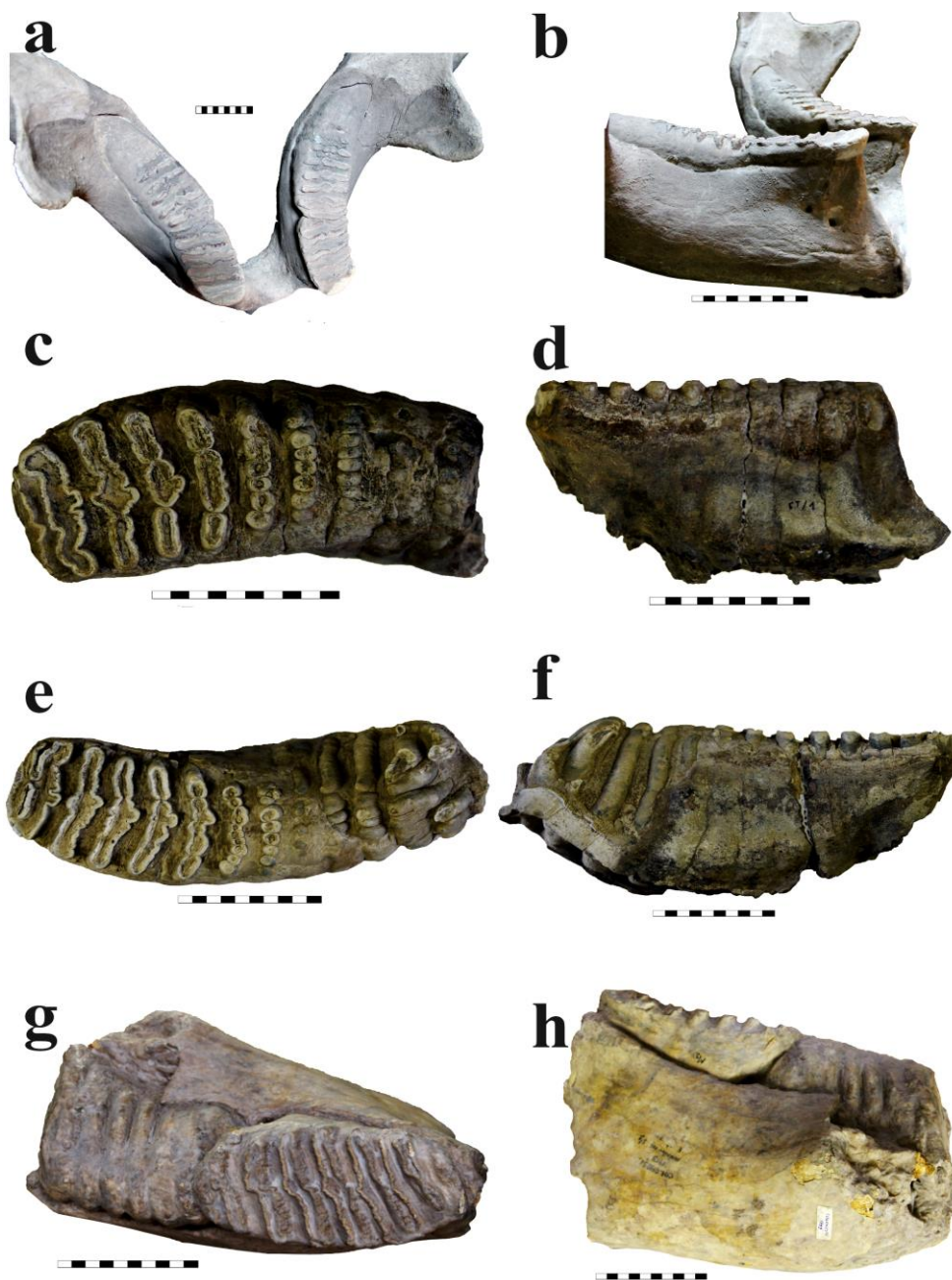


PLATE 1 - *Mammuthus meridionalis*. 177, mandible with implanted  $M_2$  and  $M_3$ :  
**a.** occlusal view; **b.** lateral view; 2561/M,  $M_3$  sin: **a.** occlusal view; **b.** lingual view;  
 2562/M,  $M_3$  dex.: **c.** occlusal view; **d.** labial view; 179, mandible fragment with implanted  
 $M_2$  and  $M_3$ : **e.** occlusal view; **f.** lateral view. Scale: 10 cm.

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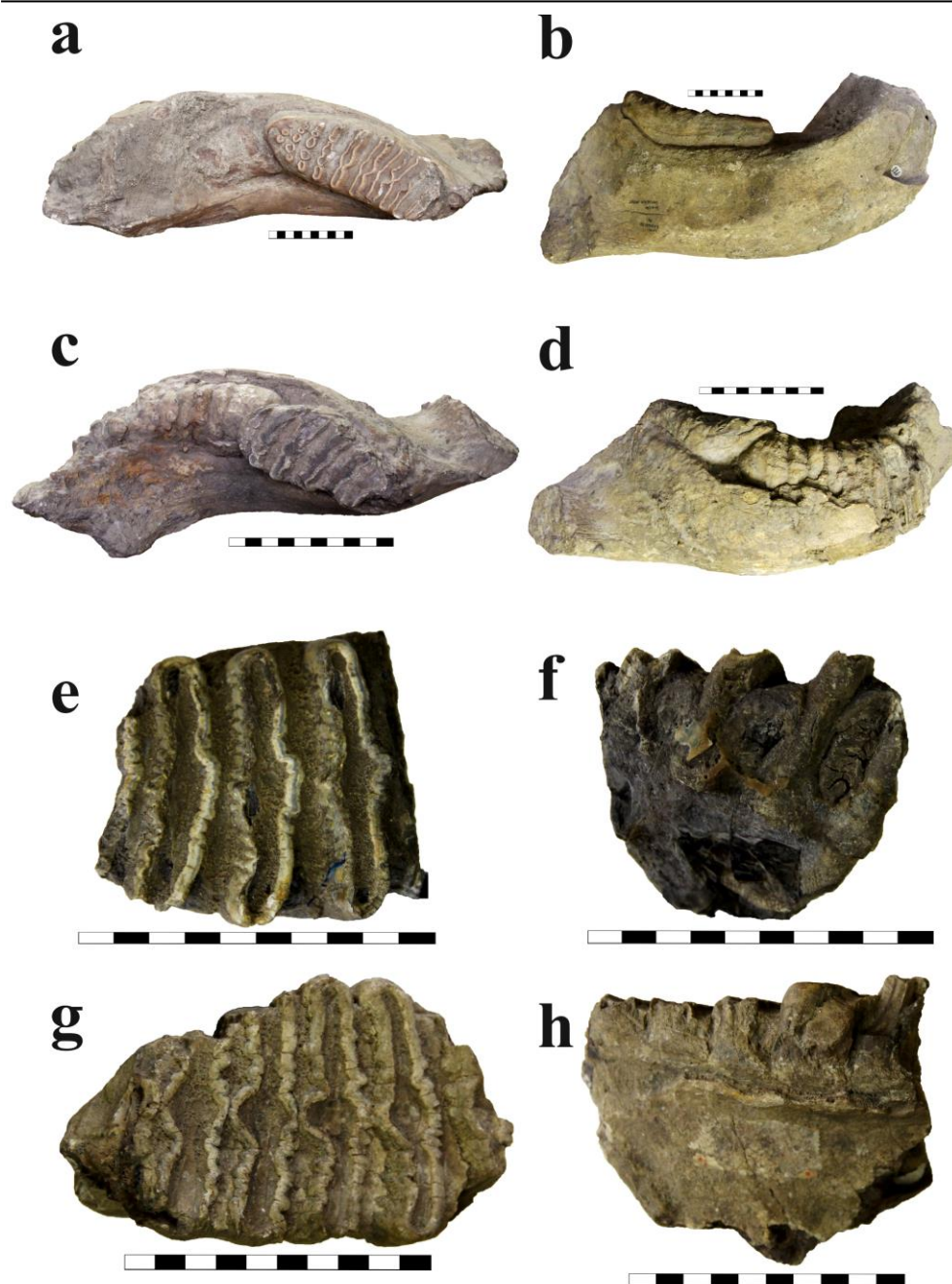


PLATE 2 - *Mammuthus meridionalis*. 178, right mandibular branch with M<sub>2</sub> and M<sub>3</sub>: **a.** occlusal view; **b.** lateral view; 180, right mandibular branch with M<sub>2</sub> and M<sub>3</sub>: **c.** occlusal view; **d.** lateral view; 184, M<sub>3</sub> dex: **e.** occlusal view; **f.** labial view; 187, M<sub>3</sub> dex: **g.** occlusal view; **h.** labial view; Scale: 10 cm.



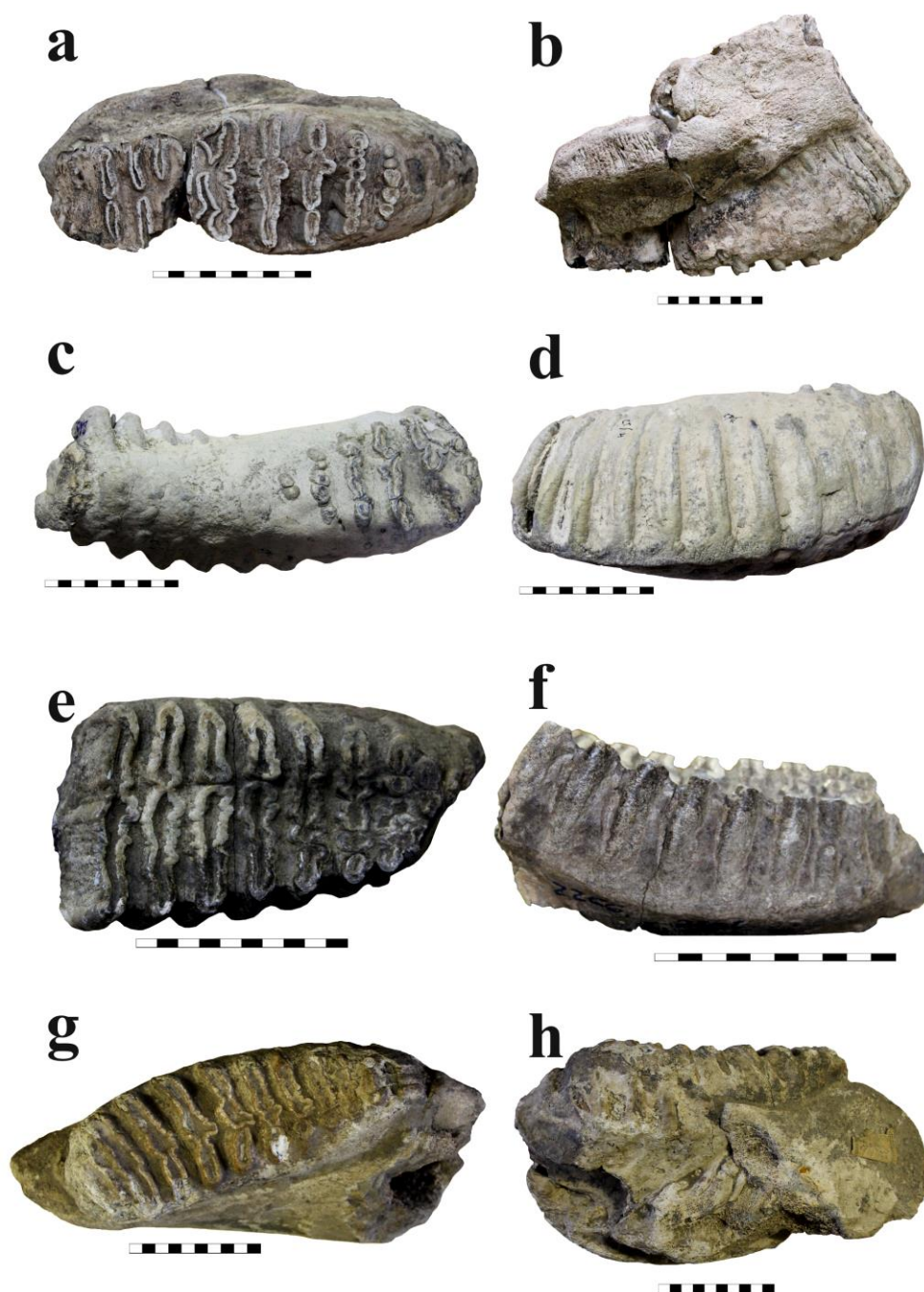


PLATE 3 - *Mammuthus meridionalis*. 2264, jaw fragment with M<sup>1</sup> and M<sup>2</sup>: g. occlusal view; h. lateral view. 2265, M<sub>3</sub> sin: a. occlusal view; b. lingual view; 2266, M<sub>3</sub> dex: c. occlusal view; d. labial view; 2558/M, left mandibular fragment with M<sub>3</sub>: e. occlusal view; f. lateral view; Scale: 10 cm.



DENTAL PIECES OF *MAMMUTHUS MERIDIONALIS* (NESTI, 1825) HOUSED IN THE COLLECTION OF THE ARGEŞ COUNTY MUSEUM

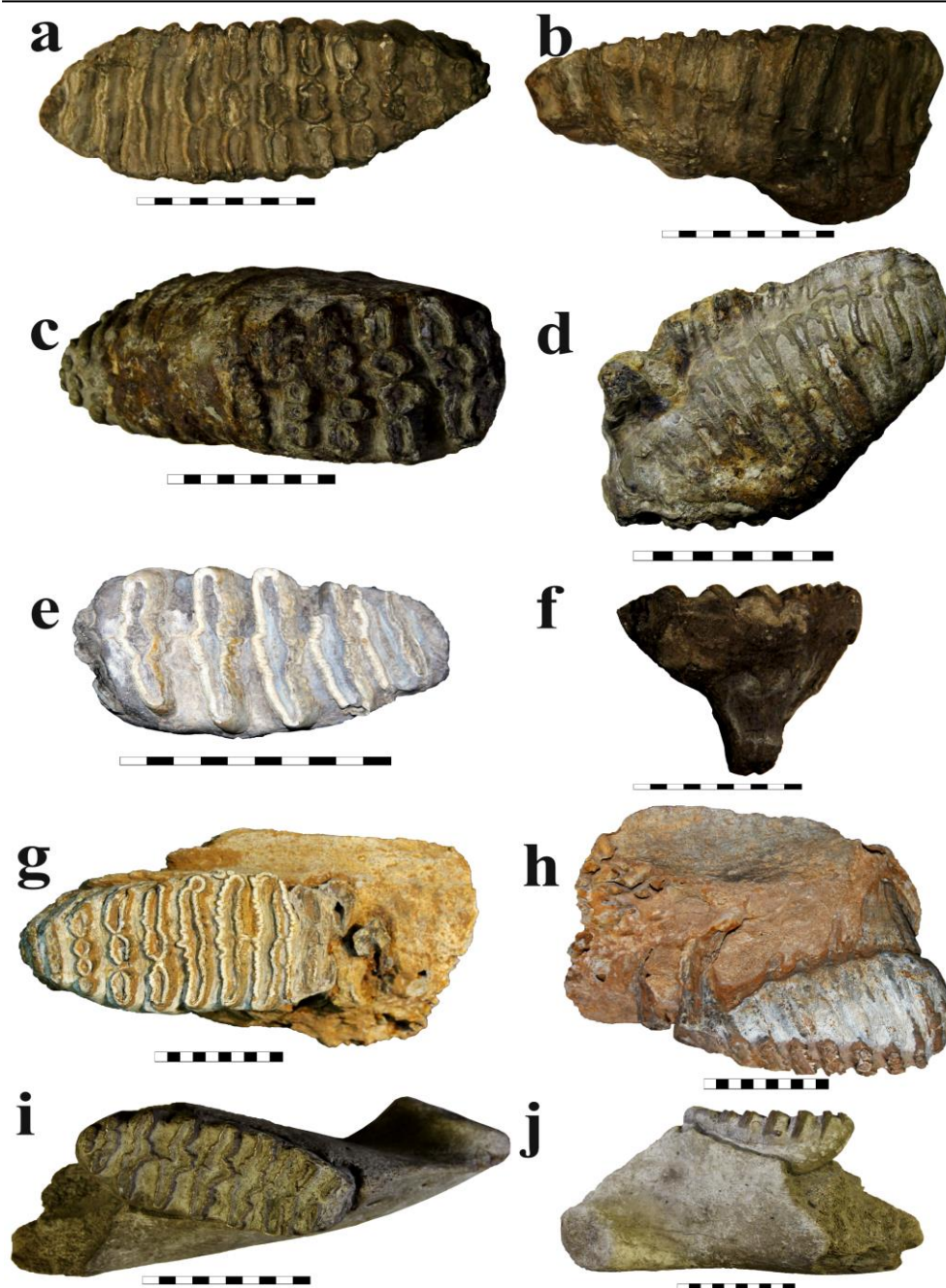


PLATE 4 - *Mammuthus meridionalis*. 189, M<sub>3</sub> dex: **a.** occlusal view; **b.** lingual view; 2546/M, M<sup>3</sup> dex: **c.** occlusal view; **d.** lingual view; 2552/M, M<sub>2</sub> dex: **e.** occlusal view; **f.** lingual view; 2553/M, right maxillary fragment with M<sup>3</sup>; 2560, right mandibular branch with DM<sub>4</sub>: **a.** occlusal view; **b.** lateral view; Scale: 10 cm.