

THE ENVIRONMENTS OF THE UPPERMOST MIOCENE VERTEBRATES FROM DERȘIDA (NORTHWESTERN ROMANIA, SĂLAJ COUNTY)

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Abstract. *Few are known about the Uppermost Miocene vertebrate faunas in Rumania. Such discoveries are very scarce in our country. An exception is Derșida, locality situated in northwestern Rumania, in Sălaj County. An extended section is exposed on the Peșterii Valley, north to the village. The Miocene assemblage refers mainly to large herbivores (deinotheri, mastodon, tridactyl horses, rhino, cervidae), but also to a small sized hyena (Ictitherium). The small fauna is restricted just to a single representative, the beaver Dipoides. Only a large, probably terrestrial turtle documents the reptiles. This assemblage is considered here as Late Pontian (MN 13). The fossils originated from representatives of at least two habitats: a forested habitat and an open grassy one, inter-leaved. Probably the forests bordered the rivers, while the grassy environment was located somewhat further.*

Keywords: *Uppermost Miocene, NW Rumania, mammals, reptile, environments.*

Rezumat. Habitatetele faunei de vertebrate Miocen terminale de la Derșida (NV României, jud. Sălaj). *Asociațiile de vertebrate Miocen terminale sunt puțin cunoscute în România, în principal din cauza rarității unor astfel de descoperiri. O excepție o constituie fauna de la Derșida, localitate situată în NV țării, în jud. Sălaj. Aflorimente relevante pot fi observate pe Valea Peșterii, la nord de sat. Asociația de vertebrate se referă îndeosebi la o serie de mamifere ierbivore mari (deinotheri, mastodonți, cai tridactili, rinoceri, cervide), dar și la un reprezentant al carnivorelor, o hienă de mici dimensiuni (Ictitherium). Fauna mică este reprezentată exclusiv de câteva resturi de castor (Dipoides). Doar câteva fragmente de carapace dovedesc prezența unei țestoase de talie considerabilă, probabil terestră. Această asociație o interpretăm ca revenind Ponțianului superior (MN 13). Fosilele dovedesc existența a cel puțin două habitate: un habitat împădurit, însoțit la o oarecare distanță de întinderi deschise acoperite de ierburi. Probabil pădurile bordau cursurile de apă ale unui sistem fluvial, iar întinderile ierboase se găseau la o oarecare distanță de acestea.*

Cuvinte cheie: *Miocen terminal, NV României, mamifere, reptile, paleomedii.*

INTRODUCTION

Uppermost Miocene vertebrates are extremely scarce in our country, mainly because convenient taphonomic environments for preserving such teeth and bones did not frequently occur. However, among the few localities of this kind from our country one can notice Derșida (Bobota commune) in northwestern Rumania, in Sălaj County (Fig. 1). This village is located nearby the road E81, connecting Zalău to Satu Mare.

GEOLOGICAL SETTING

At Derșida Uppermost Miocene deposits are exposed, the most extended sections being located on the Peșterii Valley, north to the village (marked F on Fig. 1).

PAUCĂ (1954) was the first to report these deposits and their fossil mollusks, followed soon by MAXIM & GHIURCĂ's (1960, 1963, 1964) contributions on same topics. Some few vertebrate remains collected from the same levels were studied only several years after (MACAROVICI & JURCSÁK, 1968; JURCSÁK, 1973, 1983). After 1980's, there was no any additional study on these faunas. Two decades after CODREA et al. (2002) retrieved the fossil-bearing sites, adding some new vertebrate taxa as well as sedimentological data, pointing out an Uppermost Miocene fluvial system environment in a distal-plain setting, with lakes or ponds within the floodplain. Its lithology consists of fine-grained clastic deposits interleaved with detrital complexes, with thicknesses of ten of meters (Fig. 2), dominated by sandstone and sand. These arenite sheets are forming hilly heights. Among them, on Balotă's Hill a Neolithic settlement was unearthed, bearing interesting artefacts made among others on fossil mollusks (JURCSÁK, 1984).

The geological age of Derșida deposits was a rather vexed question. Some geologists as MACAROVICI & JURCSÁK (op. cit.) considered them as Pontian, while TERZEA (1983) as Dacian. However, TERZEA's opinion was questioned by RĂDULESCU & SAMSON (1995) who estimated the vertebrate samples originating from this locality too scarce for indicating a clear MN unit. On the other hand, some others, as PAUCĂ (op. cit.) or MAXIM & GHIURCĂ (op. cit.) elected a less definite solution, indicating only the "Pliocene".

THE MIOCENE VERTEBRATES FROM DERȘIDA

Beside the data issued from sedimentology and invertebrate faunas, the vertebrates from this locality yield interesting data on the environments.

The majority of fossils belong to the large mammals. The smaller ones are rather rare and the micromammals are for instance missing at all from the fossil record. This situation is a result of a peculiar taphonomic frame: most of the teeth and bones collected by us accumulated in a small sized channel fill (lateral extension on less than four meters, half meter maximum thickness), rather in its basal lag, mixed with broken mollusk shells and quartzite clasts (Fig. 3, 4). A lot of these fossils were broken while they were carried by the water streams. In such circumstances, one can presume

a hydrodynamic grading before their burial and therefore, a selected composition of the oryctocoenosis. In this manner, representatives originating from various terrestrial environments mixed into the same deposit.

Some other remains, mainly the ones belonging to the large mammal representatives, were unearthed by our forerunners from an upper level on the same valley, just few meters above the mentioned channel. There, one can still observe sandstone and gray clay interleave, the last bearing numerous mollusk shells belonging mainly to *Unio wetzleri flabellatiformis* MIK. (Fig. 5).

Among proboscideans, there is the large-sized deinothere *Deinotherium proavum* EICHWALD, 1835 (= *D. gigantissimum* ȘTEFĂNESCU, 1892; for the species' name priority see CODREA, 1994), documented by an atlas and a lower jaw fragment. A fragmentary skull was also collected by MAXIM and GHIURCĂ, but it was completely broken while the preparation works at Cluj-Napoca University in 1960's. The large atlas is indicating an evolved specimen. The size-increasing tendency along deinotheres' Miocene evolution was remarked since long time ago (e.g. GRÄF, 1957).

Concerning the Middle Miocene – (?) Pliocene deinotheres, there are opinions either to join *D. proavum* with *D. giganteum* KAUP, 1828 in a single species (e.g. ROGER, 1896; ATHANASIU, 1907; HARRIS, 1978; HUTTUNEN, 2002), or to consider them as separate species (GÖHLICH, 1999). In our viewpoint, the last approach seems to be more credible.

The number of *D. proavum* finds in our country is rather low. One can mention here Ștefănescu's "*D. gigantissimum*" finds from Găiceana or Mânzați (1891, 1895, 1899, 1910). Both localities had been reported as Meotian ones, but in our opinion - as well in others (BACHMAYER & ZAPFE, 1972) - this age would need more arguments. As one of us pointed out (CODREA, 1994), other finds as the ones from Vernești (ATHANASIU, op. cit.) or on the Elan Valley in Moldova, refer to localities practically devoid of accurate stratigraphy.

An overview on the *D. proavum* finds from Hungary (KRETZOI, 1982) reveals exclusively Upper Miocene ("Baltavarium") localities, more exactly the Pontian *s.s.* (*sensu* STEVANOVIĆ, 1951) and not older ones. In these circumstances, one doubts once more the stratigraphic data originating from Moldova. But, on the other hand *D. thraceiensis* KOVACHEV & NIKOLOV, 2006 (in our opinion, a junior synonym of *D. proavum*), is reported to originate from "Meotian" deposits from Ezerovo, in Bulgaria (KOVACHEV & NIKOLOV, 2006), where the deinothere is reported in association with *Gomphotherium angustidens* (CUVIER, 1817).

Another remains concern a mastodont, reported by JURCSÁK (op. cit.) to *Anancus arvernensis* (CROIZET & JOBERT, 1828). Surprisingly, from the same locality he mentioned also "*Mastodon (Bunolophodon) longirostris* Kaup", based only on an apical tusk fragment. The presence of this species would be unlikely in Derșida, because it was extinct earlier in Europe, i.e. MN 11 (GAZIRY, 1997). In fact, the fossil that JURCSÁK used is irrelevant for a species determination.

These proboscideans are peculiar for environments where the forested areas were alternating with open forest, or even grassy areas (ATHANASSIOU, 2004). Probably the forested areas bordered the river courses, where marshy places occurred too (preferred by deinotheres; HARRIS, 1978; TSOUKALA & MELENTIS, 1994), while the open ones were situated somewhere further. This kind of environment is in agreement with the sedimentological data too.

The most numerous fossils collected until now belong to hipparions. However, nearly all available data refer to isolated teeth, and not to cranial or postcranial bones. In these circumstances, the physiognomy of the animal can be hardly sketched. One can only estimate middle-sized hipparions, probably belonging to a single species. It could be related to *Cremohipparion mediterraneum* (ROTH & WAGNER, 1855), but a clearer systematic position would need further more detailed studies, based on more fossils. If the Derșida hipparion is close to the mentioned species, one can relate it rather to open habitat (SCOTT et al., 2005). Perhaps, it could deal also with intermediate habitats.

In spite of several successive diggings on this site, rhinoceros remains could not be retrieved. Therefore, one can mention only the presence of these large herbivores in the assemblage.

The artiodactyls are also scarce. The presence of *Procapreolus* is rather sure, as well as the one of unnamed bovidae. *Procapreolus* could be interpreted as a forest dweller, as the modern representatives of *Capreolus* are.

The carnivores are documented by few *Ictitherium* teeth, assigned to *I. panonicum* KRETZOI, 1952 (KRETZOI, 1952). This small hyena probably lived on open habitats, covered by grasses. Obviously, the carnivore diversity should be higher – if we are thinking to some other late Miocene localities, but for instance no other representatives had been found in Derșida.

The scarcest fossils in Derșida belong to rodents. Only the beaver *Dipoides* can be documented until now in this assemblage. Smaller taxa are completely missing, probably because of taphonomic reasons. *Dipoides* was mentioned only from Oradea - Dealul Viilor (JURCSÁK, 1983a), a Dacian locality according to TERZEA (op. cit.). However, RĂDULESCU & SAMSON (op. cit.) appreciated as doubtful this geological age considering the faunal evidence less indicative.

Non-mammal vertebrates are extremely rare. We can mention only some fragmentary carapace bones originating from a large, probably terrestrial turtle.

CONCLUSIONS

The vertebrates from Derșida document the latest Miocene (MN 13) in this region of our country. In Rumania, these assemblages are extremely rare, mainly due to the low number of localities, which yielded such faunas. Even

scarce, the faunal list point out at least two main habitats: forested areas, probably bordering the water streams (where deinotheres, mastodonts, cervids and beavers were the dwellers) and open grassy areas, probably located somewhat further (documented by hipparions, bovids, hyaenas). The teeth and bones of both representatives were mixed together, carried by water streams. Sometimes, this mobilization was aggressive, as many of these remains had been broken before their burial.

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REFERENCES

- ATHANASSIOU A. 2004. *On a Deinotherium (Proboscidea, Mammalia) finding in the Neogene of Crete (Greece)*. Carnets de Géologie. Letter 2004/05: 1-7.
- ATHANASIU S. 1907. *Contribuțiuni la studiul faunei terțiare de mamifere din România*. Anuarul Institutului Geologic al României. I. București. **1**: 129-186.
- BACHMAYER F. & ZAPFE H. 1972. *Die Fauna der altpliozänen Höhlen-und Spaltenfüllungen bei Kohfidisch, Burgenland (Österreich)*. Annalen des Naturhistorischen Museum in Wien. Wien. **76**: 19-27.
- CODREA V. 1994. *A priority issue: Deinotherium proavum Eichwald or Deinotherium gigantissimum Stefanescu?* In: The Miocene from the Transylvanian Basin-Romania. Cluj-Napoca: 105-110.
- CODREA V. A., FĂRCAȘ CRISTINA, SĂSĂRAN E., DICA P. E. 2002. *A Late Miocene mammal fauna from Derșida (Sălaj district) and its related paleoenvironment*. Studia Universitatis Babeș-Bolyai, Geologia. Special issue 1. Cluj-Napoca: 119-132.
- GAZIRY W. A. 1997. *Die Mastodonten (Proboscidea, Mammalia) aus Dorn-Dürkheim 1 (Rheinhessen)*. Courier Forschungs-Institut Senckenberg. Frankfurt an Mein. **197**: 73-115.
- GÖHLICH URSULA. 1999. *Order Proboscidea*. In: RÖSSNER G. E. & HEISSIG K. (eds.) The Miocene. Land Mammals of Europe. Dr. Friedrich Pfeil. München: 157-168.
- GRÄF I. E. 1957. *Die Prinzipien der Artbestimmung bei Dinotherium*. Palaeontographica A. Stuttgart. **108**: 131-185.
- HARRIS J. M. 1978. *Deinotherioidea and Barytherioidea*. In: MAGLIO V. J. & COOKE H. B. S. (eds.). Evolution of African Mammals. Harvard University Press. Cambridge: 315-332.
- HUTTUNEN K. 2002. *Systematics and taxonomy of the European Deinotheriidae (Proboscidea, Mammalia)*. Annalen des Naturhistorischen Museum in Wien. Wien. **103A**: 237-250.
- JURCSÁK T. 1973. *Răspândirea Mastodonților la Vest de Munții Apuseni*. Nymphaea. Oradea. **1**: 313-341.
- JURCSÁK T. 1983. *Răspândirea Proboscidiienilor în Nord-Vestul României*. Nymphaea. Oradea. **10**: 65-85.
- JURCSÁK T. 1983 a. *Archidiskodon meridionalis (Nesti) din Villafranchianul de la Oradea*. Nymphaea. Oradea. **10**: 87-142.
- JURCSÁK T. 1984. *Obiecte de podoabă de origine sudică în așezarea de epoca bronzului de la Derșida (jud. Sălaj)*. Acta Musei Prolissensis. Zalău. **8**: 111-119.
- KOVACHEV D. & NIKOLOV I. 2006. *Deinotherium thraceiensis sp. nov. from the Miocene near Ezerovo*. Plovdiv District. Geologia Balcanica. Sofia. **35**(3-4): 5-40.
- KRETZOI M. 1952. *Die Raubtiere der Hipparionfauna von Polgárdi*. Annales Instituti Geologici Publici Hungarici. Budapest. **40**(3). 42 S.
- KRETZOI M. 1982. *Wichtigere streufunde aus der Wirbeltierpaläontologischen Sammlung der Ungarischen Geologischen Anstalt (7. Mitteilung)*. Magyar Állami Földtani Intézet Évi Jelentes 1980-RÖL. Budapest: 385-394.
- MACAROVICI N. & JURCSÁK T. 1968. *Asupra unui Hipparion din Plicenul de la Derșida (Sălaj)*. Analele Științifice ale Universității "Al. I. Cuza" din Iași (Serie Nouă). Secțiunea II, (Științe Naturale), b, Geologie-geografie. Iași **14**: 101-104.
- MAXIM I. AL. & GHIURCĂ V. 1960. *Forme noi de moluște din Pliocenul superior de la Derșida (Sălaj)*. Comunicările Academiei R.P.R. București. **10**(7): 595-605.
- MAXIM I. AL. & GHIURCĂ V. 1963. *Varietăți de forme la Unio wetzleri flabellatiformis Mik. din Pliocenul de la Derșida-Sălaj*. Studii și cercetări Geologie. București. **1**(8): 13-33.
- MAXIM I. AL. & GHIURCĂ V. 1964. *Variations de formes chez Unio wetzleri flabellatiformis Mik., dans le Pliocène de Derșida-Sălaj*. Revue Roumaine de Géologie, Géophysique et Géographie. Série Géologie. Bucarest. **8**(1-2): 11-20.
- PAUCĂ M. 1954. *Două specii de fosile rare din Pliocenul Bazinului Sălaj*. Comunicările Academiei R.P.R. București. **5**(7-8): 397-400.
- RĂDULESCU C. & SAMSON P.-M. 1995. *The mammals of the Dacian*. In: Chronostratigraphie und Neostatotypen, Neogen der Zentrale Paratethys, Bd. X. Dacien (eds: FL. MARINESCU & I. PAPAIAPOPOL). București: 506-518.
- ROGER O. 1896. *Verzeichnis der bisher bekannten fossilen Säugetiere*. Naturwissenschaften Vrehadlungen für Schwaben. Und Neuburg. Augsburg. **32**: 272.
- SCOTT R. S., BERNOR R. L., RABA W. 2005. *Hipparionine Horses of the Greater Pannonian Basin: Morphometric Evidence from the Postcranial Skeleton*. Palaeontographia Italica. Pisa. **90**: 193-212.

- STEVANOVIĆ P. M. 1951: *Pontische Stufe im engeren sinne - Obere Congerienschichten Serbiens und der angrenzenden Gebiete*. Serbische Akademie der Wissenschaften, Sonderausgabe 187, Mathematisch-Naturwissenschaftliche Klasse Beograd. **2**: 1-351.
- ȘTEFĂNESCU GR. 1891. *On the existence of Dinotherium in Roumania*. Bulletin of American Society of Geologie. Washington. **3**: 81-83.
- ȘTEFĂNESCU GR. 1895. *Dinotherium gigantissimum Ștef.* Anuarulu Museului de Geologia și de Paleontologia (1894). București. **1**: 126-199.
- ȘTEFĂNESCU GR. 1899. *Dinotherium gigantissimum Ștef.* Anuarulu Museului de Geologia și de Paleontologia (1896). București. **3**: 110-145.
- ȘTEFĂNESCU GR. 1910. *Dinotherium gigantissimum din Miocenul superior*. Anuarulu Museului de Geologia și de Paleontologia. București. **4**: 6-43.
- TERZEA ELENA. 1983. *Evoluția faunei terestre in Geografia Romaniei*. Editura Academiei. București. **1**. Geografia fizică: 444-450.
- TSOUKALA E. & MELENTIS, J. K. 1994. *Deinotherium giganteum* KAUP (Proboscidea) from Kassandra peninsula (Chalkidiki, Macedonia, Greece). Géobios. Lyon. **27**(5): 633-640.

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Figure captions:



Figure 1. Satellite view on Derșida and Valea Peșterii (marked F).
Figura 1. Imagine satelitară – Derșida și Valea Peșterii (marcată cu F).



Figure 2. Some of the detrital complexes (marked with arrows) from Derșida, including Balotă's Hill.
Figura 2. Câteva complexe detritice (marcate cu săgeți) de la Derșida, inclusive Dealul lui Balotă.



Figure 3. Late Pontian channel filled with mollusk fragments, teeth and bones in Valea Peșterii.
Figura 3. Canal din Ponțianul Superior umplut cu fragmente de moluște, dinți și oase în Valea Peșterii.



Figure 4. Detail on the Late Pontian channel filled with mollusk fragments, teeth and bones in Valea Peșterii (hammer as scale). The arrow marks a *Hipparion* tooth.
Figura 4. Detaliu din canalul ponțianul superior umplut cu fragmente de moluște, dinți și oase în Valea Peșterii (ciocanul geologic, ca scară). Săgeata marchează un dinte de *Hipparion*.



Figure 5. *Unio wetzleri flabellatiformis* MİK. in the Late Pontian from Derșida (hammer as scale).
Figura 5. *Unio wetzleri flabellatiformis* MİK. din Ponțianul Superior de la Derșida (ciocanul geologic ca scară).