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# Early Late Miocene *Chilotherium* (Perissodactyla, Mammalia) from Pogana (Scythian Platform)

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**Abstract.** In Eastern Romania, Late Miocene sequences can be followed on the Scythian Platform. In several localities vertebrate remains are present, like in Pogana (Vaslui District) on the left bank of Tutova River, where there are grey clay and sand document fluvial environments that evolved around Kersonian/Meotian boundary, probably on top of Păun Formation. Carried by water streams, most of the teeth and bones found in these rocks were long rolled before burial, exposing broken and rounded margins. Among them, most relevant are some *Chilotherium* teeth. The presence of these rhinoceros in the early Late Miocene of Moldova has to be considered an evidence of the arrival in the oriental area of the Dacic Basin (Siret-Bug Land), of immigrants of eastern or south-eastern origins.

**Key-words:** Late Miocene, rhinoceros, *Chilotherium,* Scythian Platform, Romania.

## Introduction

On Scythian Platform (Săndulescu 1984), the last sedimentary megasequence refers to the Middle Miocene-Pleistocene time span (Ionesi 1994). Numerous exposures illustrating this geological history are located on south-western side of the Bârlad Plateau, on Tutovei Hills. These hills range from the Siret to the Bârlad rivers, limited to the north by Racova Valley, and by Siret Plain to the south.

This area became worldwide notorious in vertebrate paleontology due to the first finding of a nearly complete skeleton of *Deinotherium proavum* Eichwald, 1835 (= *D. gigantissimum* Ştefănescu, 1891), the largest and last representative of the European dinotheres lineage. This dinothere skeleton was unearthed at the end of 19th century (1890-1894) from sands with rather poorly known stratigraphy (? Meotian) exposed near Mânzaţi village (Zâmboanga Ibăneşti commune in Vaslui District) by Gregoriu Ştefănescu, former professor at the University of Bucharest (Ştefănescu 1891, 1895, 1899; Codrea 1994).

In the same area, 20 km southwest of Mânzaţi and 15 km northwest of Bârlad town at Pogana, there is a small local sand open pit casually mined by natives. This open pit is located near the district road 243, on the left bank of Tutova Valley, the main river stream from Tutovei Hills (Fig. 1). From these sands, we collected several fossil teeth and bone fragments. Within this sample the most representative are two rhinoceros teeth, documenting the genus *Chilotherium*. The fossils are curated at "Vasile Pârvan" Museum, Natural Science Branch in Bârlad (abbreviated VPM).

## Geological setting

Like in Moldavian or Moesic platforms (Ionesi 1994), in the Scythian Platform only the exposures of the last sedimentary megasequence are available for direct examination in the field. The Bârlad area illustrates the Late Sarmatian/Meotian boundary. Due to the peculiar monocline structure dipping northwest to southeast, the Meotian is cropping out only on the peaks of the Bârlad Plateau on interfluves, while on lower altitudes one can observe only the older Kersonian deposits.

Kersonian sediments were already reported by Sevastos (1922) who mentioned "Sarmatian molluscs" found in clays. Jeanrenaud (1971) stressed out that the Kersonian rocks occur as narrow stripe-like exposures parallel to the river streams from Tutovei Hills, gradually dipping southward under the cover of Meotian rocks. The basal Kersonian is not cropping out in Bârlad area, therefore the Bessarabian/Kersonian boundary cannot be observed. In this region, a deltaic de-

posit dominated by sand and clay occurs to the top of the Kersonian sediments, belonging to the Păun Formation (Jeanrenaud 1961). Later, surprisingly, Ionesi et al. (2005) used the name "Balta-Păun Formation", without defining a stratotype [*sic!*] at Balta: "As Balta locality is located on the left side of the Nistru River, we can not establish a stratotype" (pg. 430). Therefore, we will use the name introduced by Jeanrenaud (1961).

Jeanrenaud (1971) placed the Kersonian/Meotian boundary at the level of Nuțasca-Ruseni andesite tuff that he initially named "Nuțasca – Ruseni Horizon" (Jeanrenaud 1961). In fact, this tuff was earlier reported by Sevastos (1922). It refers to three banks of tuffaceous sandstones, 2 - 4 m thick each one, interbedded by marl sands and clays. Well represented on north-western areas of Tutovei Hills, this marker level is by far less clear in others regions, where the tuff is replaced by tuffaceous sands. To the east, the amount of volcanic input gradually decreases, passing on tuffaceous sandstone or sands, as illustrated on the geological map drawn by Macarovici & Jeanrenaud (1958). There, the Nuțasca-Ruseni Tuff is rather indistinct. Therefore, on the geological map published by the Romanian Geological Institute (folio 22 Bârlad, responsible editor: E. Saulea, 1967), these deposits are marked as belonging to "Kersonian-Meotian" time span. This approach is, in our opinion, more realistic for this area.

Fossil macroflora was reported by Barbu (1934) and freshwater snails by Macarovici (1955). Over this level there are fluvial green clays, sandy clays and sands, the latter prevailing. The highest peaks in the southern part of the region are built up on these rocks of continental origin, which can reach about hundred meters in thickness. Pleistocene river terraces are covering the Miocene deposits.

Fluvial deposits are available for study in the Pogana sand open pit, which yielded the fossil vertebrates (Fig. 2). According to the geological maps (Jeanrenaud 1961, Ionesi et al. 2005), these deposits are early Late Miocene, close to the Kersonian/Meotian boundary. Here, the Nuțasca-Ruseni Tuff cannot be observed in the outcrops. A basal compact yellow-greenish clay layer of 1.5 m thickness is overlain by oblique laminated sands with channel fill lens-like accumulations made of coarse sands and sub-angular mud clasts issued by the intra-formational erosion. The vertebrate remains were collected from the lens-like deposit, from its basal lag. The teeth and bone fragments had been rolled before their burial, exposing rounded margins, the majority being heavily damaged. Besides vertebrates, there were also freshwater molluscs (*Unio* sp.) shells, also broken. The upper part of this deposit is fining upward, where fossil vertebrates were not observed. These deposits could belong to the Păun Formation, but this assignation needs more evidence. Therefore, we consider these rocks as Kersonian-Meotian (Fig. 1). About half meter of soil covers the Miocene sands.

**Systematic Palaeontology**

Order Perissodactyla Owen, 1848
Family Rhinocerotidae Gray, 1821
Genus *Chilotherium* Ringström, 1924
Sub-genus *Chilotherium* Ringström, 1924

***Chilotherium* sp.** (Fig. 3 - 1, 2)
Two teeth are documenting this rhinoceros at Pogana, one left M2 (VPM – P/355) and one right p4 (VPM – P/354). The nomenclature and way of measurements follow Guérin (1980). Measurements (mm).

M2: Length = 50.0; Anterior width = 58.0;
h = 32.5;
p4: Length = 35.4; Anterior width = 21.0;
Posterior width = 20.0

*Description.* The upper molar is the most diagnostic. It preserves the crown, excepting the metaloph ending, which is broken. All roots are broken too. The advanced wear is specific for a mature individual. The ectoloph is waved, showing large paracone and metacone folds. The lowest crown basis is located between the anterior and posterior roots. From this point, the enamel is ascending both on mesial and distal directions. Strong pressure marks can be seen both on mesial and distal sides, but on the first one the enamel was completely removed during the animal lifetime. The protocone is strongly constricted, both mesially and distally. A strong, rounded crochet is present. The antecrochet contacts the mesial metaloph wall, completely closing the median valley. At this wear stage their enamel walls remain separate, but they fuse at their bases. Small enamel pillars are present inside the median valley. The post-fossette is shallower compared to the transverse valley, with oblong ovate outline. On each side cingulums are present: the obliquities of the anterior and posterior ones are specific for hypsodont teeth. On labial and palatal sides the cingulums are weak,

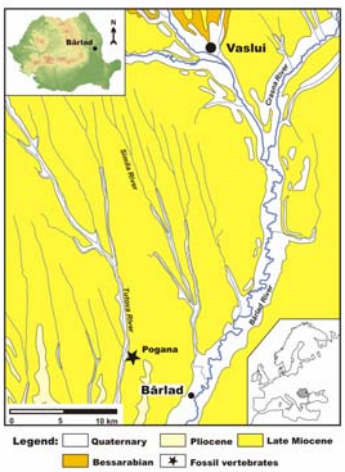


**Figure 1.** Location of Pogana locality (Vaslui District) on the geological map.

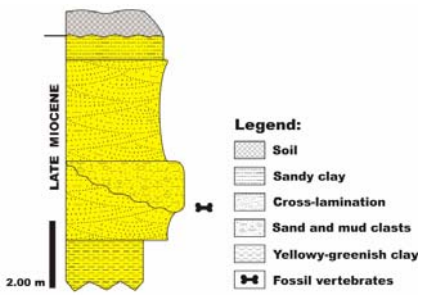


**Figure 2.** Lithostratigraphic log of the fluvial deposits at Pogana.


**Figure 3.** *Chilotherium* sp., Pogana, early Late Miocene: **1**. – left M2 ; **2**. – right p4 ; occlusal views.

completely missing at the opening of the median valley.

The lower premolar preserves only the crown, the roots being broken, pre-burial. The tooth is extremely worn on both trigonid and talonid prisms, exposing rectangular outline. Strong mesial and distal pressure marks are present, on both sides the enamel being completely removed. The transverse valleys are extremely reduced: only a small vestigial area is documenting the anterior one. However, the presence of a lingual cingulum is obvious. On the labial side such a cingulum is missing.

## Comparison and discussion

*Chilotherium* representatives are extremely rare reported in Romania. All the specimens mentioned until now are originating exclusively from areas

located outside the Eastern Carpathians, in Moldova. These reports concern only two localities: Bacău (Rădulescu & Şova 1987) and Reghiu (Rădulescu et al. 1995, Ştiucă 2003).

In Bacău (Bacău District) an Upper Miocene large mammals assemblage (including *Choerolophodon pentelici* Gaudry & Lartet, 1856, *Aceratherium incisivum* Kaup, 1832, *Hipparion* sp., Palaeotraginae cf. *Samotherium* sp. and *Chilotherium* sp.) was recovered during the excavations of a thermopower plant, along the Bistriţa River, in grey silty clays and fine sands laying at 8-12 m depth. The *Chilotherium* remains concern only some fragmentary jaws bones and teeth, as well as some scattered limb bones. The Bacău specimens were described (Rădulescu & Şova 1987) as intermediate between the more hypsodont *C. sarmaticum* Korotkevich, 1958 from Berislav (Late Sarmatian) and the less hypsodont *C. kowalevskii* Pavlow 1913 from Grebeniki (Early Meotian; both localities in Ukraine). The single available data about these fossils were published only as a preliminary note without descriptions, measurements, and poorly illustrated. After, all these fossils seem to be lost as long as we could never retrieve any in the paleontological collection of the Natural Science Museum in Bacău.

The situation of *C.* cf. *sarmaticum* from Reghiu (Vrancea District) is similar. Scattered mammals remains were recovered from fluvial sandstone channel fills exposed on the banks of Milcov River. Apart this rhinoceros, the assemblage includes a dozen other taxa, both of large and small mammals (Rădulescu et al. 1995). According to Ştiucă (2003), this locality could belong to MN 11 unit, but Spassov et al. (2006) and Geraads & Spassov (2009) agree that it could be even older, i.e. MN 10. The fossils were curated at the collection of the "Emil Racoviţă" Institute of Speleology in Bucharest, but they also seem to be lost or at least, mislaid (Emanoil Ştiucă, oral communication). There are no detailed measurements available.

Another report of "*Chilotherium (Acerorhinus) zernowi*" in the Middle Sarmatian (MN 9) at Scheia (Iaşi District; Trelea & Simionescu 1985) was a wrong assignation, this fossil belonging to *A. incisivum* (Codrea 2000). In these circumstances, Pogana is the third locality with *Chilotherium* in Romania.

In the absence of enough data about these rhinoceros in our country, comparisons may be done only with fossils originating from contiguous regions. The Pogana specimens are of larger size compared either to *C. sarmaticum* from Berislav (Korotkevich 1958 a, b, 1970; late Vallesian or early Turolian), or to *Chilotherium* (*Eochilotherium*) *kiliasi* Geraads & Koufos, 1990 (late Vallesian or early Turolian: Geraads & Koufos 1990, Fortelius et al. 2003, Geraads & Spassov 2009). From the latter species, it differs by the absence of cement on the crown. The Pogana teeth are closely comparable to *C. kowalevskii* Pavlow, 1913 from Grebeniki (Meotian, MN 10; Pavlow 1913-1914, Korotkevich 1970, Vangengeim & Tesakov 2008, Geraads & Spassov 2009) either on morphology or size, excepting the hypsodonty that seems be somewhat higher in Pogana compared to the Ukrainian locality (Korotkevich 1970).

## Conclusions

Part of Aegean-Pontic region, the Scythian Platform is bearing evidence of the *Chilotherium* presence in early Last Miocene. At Pogana, fluvial sedimentation took place probably at Kersonian/Meotian boundary. Inside the channel fills scattered vertebrate remains occur sometimes, but their preservation is usually poor, the bones and teeth being broken and rolled. In spite of this situation, some teeth are documenting the presence of a *Chilotherium* close to *C. kowalevskii,* a species firstly described from Grebeniki.

*Chilotherium* has to be considered in Romania as an early Late Miocene newcomer, which arrived rather from the east, or possibly from the south-east, following the borders of the Dacic Basin as far as the Siret-Bug Land (Popov et al. 2004). However, this second trail is less credible, as long as such rhinoceros fossils are missing from Meotian areas exposed on the western side of the Dacic Basin. The Carpathians seem to have acted as a barrier against their western expansion because there is no trace of these rhinoceros in Transylvania (Codrea 2000). Missing until now from the Upper Sarmatian fossil records from Romania, this genus has a greater diversity on territories located on the Western side of Prut River (Ionesi et al. 2005). In Moldova, it is difficult to establish how long *Chilotherium* lasted in the Late Miocene, because the post-Meotian deposits had accumulated in environments less favourable for fossil vertebrate preservation.

Usually, *Chilotherium* representatives had been related to marshy environments, but Ringström (1924), Geraads et al. (2002), Geraads & Spassov

(2009) consider them as open landscapes dwellers. In Pogana, the Upper Miocene fluvial sedimentation is indicative for marshy areas too, spread either on the floodplain, or nearby the river banks. Doubtlessly, a more complete vertebrate assemblage could offer a key for reconstructing the terrestrial Upper Miocene environments in this region.

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