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First mammal species identified from the Upper Cretaceous of the Rusca Montană Basin (Transylvania, Romania)

Première identification d'une espèce de mammifère du Crétacé supérieur du bassin de Rusca Montană (Transylvanie, Roumanie)

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ABSTRACT

Multituberculate mammals are scarce in the Late Cretaceous of Europe, being recorded exclusively from the Maastrichtian terrestrial deposits of the Haţeg and Transylvanian basins, in Romania. Moreover, they all belong to the endemic and primitive cimolodontan family Kogaionidae. Here, we report multituberculate teeth originating from the Maastrichtian fluviatile sediments of the Rusca Montană Basin (Occidental Carpathians, Poiana Ruscă Mountains). This is the westernmost occurrence of these Cretaceous mammals in Romania. These teeth are assigned to *Barbatodon oardaensis*, the smallest Cretaceous kogaionid species. This study presents the first occurrence of this species outside the Metaliferi sedimentary area (southwestern Transylvania, Romania). The distribution of Romanian Maastrichtian kogaionids is also discussed.

Mots clés :
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RÉSUMÉ

Les mammifères multituberculés sont rares dans le Crétacé supérieur d'Europe et sont connus exclusivement dans les dépôts continentaux du Maastrichtien, dans les bassins de Haţeg et de Transylvanie, en Roumanie. De plus, ils appartiennent tous aux Kogaionidae, une famille endémique de Cimolodonta primitifs. Nous signalons ici des dents de multituberculés provenant des sédiments fluviatiles du bassin de Rusca Montană (Carpates Occidentales, monts Poiana Ruscă). C'est l'occurrence la plus occidentale de ces mammifères crétacés en Roumanie. Ces dents sont attribuées à *Barbatodon oardaensis*, la plus petite espèce de kogaionidé du Crétacé. Cette étude présente la première occurrence de cette espèce à l'extérieur de la zone sédimentaire Metaliferi (Sud-Ouest de la Transylvanie, Roumanie). La répartition des kogaionidés du Maastrichtien de Roumanie est également discutée.

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1. Introduction

Multituberculate mammals occurred early in the European fossil record and they evolved for a long period of time on the old continent. For many years, the Late Jurassic (Kimmeridgian) Guimarota Coal Mine of Portugal was the earliest known European locality with multituberculates (see Kielan-Jaworowska, 2013). However, Kermack et al. (1998) described some multituberculate-like teeth from the Middle Jurrasic (Bathonian) of England. Butler and Hooker (2005) revised the material of Kermack et al. (1998) and assigned some of these allotherian teeth to the geologically oldest known multituberculates, which belong to the families Kermackodontidae and Hahnotheriidae. Moreover, if *Mojo usuratus* from the Latest Triassic (Rhaetian) of Belgium (Hahn, 1987; Hahn et al., 1989) were to be confirmed as a multituberculate mammal, then the history of Mesozoic multituberculates in Europe would begin even far earlier.

Since the Late Jurassic, multituberculate mammals were abundant in Europe (Kielan-Jaworowska et al., 2004, and references therein). Guimarota Coal Mine is the richest locality yielding the most diverse multituberculate mammals of Europe. Albionbaataridae and mainly Paulchoffatidae representatives were described from this locality (Hahn's references, in Kielan-Jaworowska et al., 2004). In the Early Cretaceous, the European multituberculates were distributed in Britain and on the Iberian Peninsula, the diversity of the families being even higher than in the Late Jurassic. From Britain, the families Eobaataridae (Simpson, 1928; Sweetman, 2009), Plagiaulacidae (Cope, 1884; Falconer, 1857; Kielan-Jaworowska and Hurum, 2001; Owen, 1871; Simpson, 1928), Albionbaataridae, Paulchoffatiidae and Pinheirodontidae (Kielan-Jaworowska and Ensom, 1992, 1994) have been reported. From the Iberian Peninsula, the families Eobaataridae (Crusafont Pairó and Adrover, 1966; Hahn and Hahn, 1992, 2001), Paulchofatiidae (Hahn and Hahn, 1992; Kielan-Jaworowska et al., 2004), Pinheirodontidae (Canudo and Cuenca-Bescós, 1996; Hahn and Hahn, 1999), a family *incertae sedis* (Kielan-Jaworowska et al., 2004), and *Iberica hahni* (Badiola et al., 2011), of unclear family position, have been described. After this period of high diversity of the Early Cretaceous, the only multituberculates reported to date from the Late Cretaceous are those from the Haţeg and Transylvanian basins, Romania (Fig. 1), all belonging to the endemic and primitive cimolodontan family Kogaionidae (Codrea and Solomon, 2014; Codrea et al., 2002, 2009, 2012a, 2012b, 2014; Csiki and Grigorescu, 2000; Csiki et al., 2005; Rădulescu and Samson, 1996, 1997; Smith and Codrea, 2015; Smith et al., 2002; Solomon et al., 2016; see Table 1 for details). The kogaionids survived the Cretaceous/Cenozoic boundary events, being found in the Paleocene at Jibou (Romania; Gheerbrant et al., 1999; Table 1), but also in France, Spain, and Belgium (De Bast and Smith, 2016; Peláez-Campomanes et al., 2000; Vianey-Liaud, 1979, 1986). However, they were replaced around the Late Paleocene by the world-widely distributed North American Neoplagiaulidae (Vianey-Liaud, 1986), the latter being the last family occurring in Europe before the extinction of the multituberculates from the old continent during the Eocene.

In this long and nearly complete European history of one of the most successful groups in mammal evolution, the dark and poorly known period is the Late Cretaceous. This paper focuses on the description and identification of some previously reported specimens (P1 and p4; Codrea et al., 2012a) and of new dental specimens (P4, I2 and i1). The P1 (UBB Ng1-02) and p4 (UBB Ng2-01) were briefly described by Codrea et al. (2012a) and assigned to Kogaionidae indet. All this material is assigned to *Barbatodon oardaensis* (Codrea et al., 2014), reported here for the first time in the Upper Cretaceous fluvial deposits of the Rusca Montană Basin (RMB), Romania (Fig. 1).

2. Geological setting

The RMB is an intramontane basin located in southwestern Romania, in the western Carpathians, south of Mureş River. It lays over the rocks of Valea lui Stan and Uria thrusting nappes, both belonging to the Supragetic Nappes erected in the Latest Cretaceous tectogenesis (Balintoni, 1997). Therefore, the sole of this basin concerns various metamorphic rocks, covered by Mesozoic sedimentary deposits (Lower Jurassic–Uppermost Cretaceous; Codrea et al., 2012a, and references therein).

The Latest Cretaceous evolution of this basin concerns a rather long lasting marine realm (Coniacian-Late Campanian; Dincă, 1977; Mamulea, 1955), ended by emersion. After that, only continental environments (?Late Campanian-Maastrichtian–?Paleogene; Pop et al., 1972) have developed, resulted from the evolution of a fluvial system. This marine/continental transition shares similitude with the Haţeg and Transylvanian basins (Codrea and Dica, 2005; Codrea et al., 2010; Grigorescu and Melinte, 2002; Melinte-Dobrinescu, 2010) and even the tectonic evolution of the RMB is very similar to that of the Haţeg Basin (Willingshofer et al., 2001).

The ?Late Campanian-Maastrichtian continental sedimentation concerns the following lithologic units (Maier and Lupu, 1979 in: geological map 1: 50,000, *folio* Băuţar): i. Coarse breccias and conglomerates reworking metamorphic rock fragments, exposed in dominance on large areas on the western side of the basin (Popa et al., 2014); ii. A lower andesitic volcano-sedimentary pile (breccias, tuffs and andesitic agglomerates, pyroxene and olivine andesite lava flows, called the Rusca Andesite, polygenetic breccias and conglomerates with clayish matrix); iii. Sandstone with ignimbrite; iv. Coal bearing sandstone (violet breccias, sandstone, blackish clays, coal); v. An upper volcano-sedimentary pile, with rather similar rocks like in the previous basal one.

The age of all these deposits is considered Uppermost Cretaceous (Maastrichtian), based on the pollen and spores (Antonescu et al., 1983), macroflora (Popa et al., 2014, 2016, and references therein) and vertebrates (Codrea et al., 2009, 2012a; Csiki-Sava et al., 2016; Vasile and Csiki, 2011).

The multituberculate teeth here described were discovered in the easternmost side of the RMB, near Lunca Cernii de Jos at Negoiu, along the Fărcădeana Creek (Fig. 2). Two levels bearing Maastrichtian vertebrates crop out along this creek. The lower one, located on the left side of the creek, consists of black clay and sand, not exceeding few