

# EARLY MIOCENE *MEGACRICETODON* AND *DEMOCRICETODON* (CRICETIDAE, RODENTIA) FROM THE VALLÈS-PENEDÈS BASIN (CATALONIA)

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## BULLET-POINTS ABSTRACT

- *Democricetodon* and *Megacricetodon* species are present during the early Miocene in the Vallès-Penedès Basin.
- The first occurrence of both genera *Democricetodon* and *Megacricetodon* in the Basin mark the beginning of the MN4.
- These species are key for establish a high-resolution local biozonation and correlated to other European Basins.

## INTRODUCTION

The cricetodontine genera *Democricetodon* Fahlbusch, 1964 and *Megacricetodon* Fahlbusch, 1964 are the first modern cricetids to disperse into Europe. *Democricetodon* is first recorded during the late MN3, whereas *Megacricetodon* does not appear until MN4 (Agustí et al., 2001; Hilgen et al., 2012). These cricetids dispersed after the extinction of the archaic cricetids *Pseudocricetodon* (Thaler, 1969) and *Eucricetodon* (Thaler, 1966), which had characterized the Oligocene, and quickly became dominant in the rodent faunas. *Megacricetodon* and *Democricetodon* have been widely used in biostratigraphical and biochronological scales for the early and middle Miocene all along Europe, the occurrence of their different species being the basis for the definition of high-resolution local biozones (e.g. Van der Meulen et al., 2012; Kálin & Kempf, 2009; Prieto & Rummel, 2016). In this work, we review the early Miocene record of *Megacricetodon* and *Democricetodon* in the Vallès-Penedès Basin (Catalonia, NE Iberian Peninsula). The early Miocene part of the record of this basin has been little studied in comparison with middle to late Miocene one.

## MATERIALS AND METHODS

Between 2011 and 2017 the early Miocene outcrops were systematically surveyed resulting in the discovery of several new localities (Casanovas-Vilar et al., 2016). In addition, some of the classical sites were sampled using modern methods, including screen-washing, thus allowing for the recovery of remarkably rich microvertebrate samples (Jovells-Vaqué et al., 2018). The described material is housed at the Institut Català de Paleontologia Miquel Crusafont in Sabadell (Barcelona, Spain).

## SYSTEMATIC PALAEOLOGY

Order Rodentia Bowdich, 1821

Family Cricetidae Fischer, 1817

Genus *Democricetodon* Fahlbusch, 1964

*Democricetodon hispanicus* Freudenthal, 1967

Figs. 1A-D

The m1 present a characteristic bean-shaped anteroconid. The anterior valleys of the lower teeth are closed and reduced. The mesolophid varies from long to short in m1 and m2 (Figs. 1B-C) but is completely absent in the m3. This ridge is more frequently short to medium length, being generally longer in the m1 than m2. The sinusid is wide and slightly proverse in the m1 and m2, while in m3 is moderately retroverse. The M1 show a simple round anterocone (Fig. 1A). The mesoloph varies from short to medium length in M1 and M2. The anterosinus is reduced in M2 and M3 due to the reduction of the anteroloph.

*Democricetodon* cf. *decipiens* Freudenthal & Daams, 1988

In Vilobí del Penedès and les Escletxes del Papiol sites besides *D. hispanicus* a second, larger species of *Democricetodon* is represented by a few specimens. These fit within the size range of *Democricetodon decipiens*. In addition they show some of the diagnostic traits of this species such as the presence of shorter mesolophids than *D. hispanicus*.

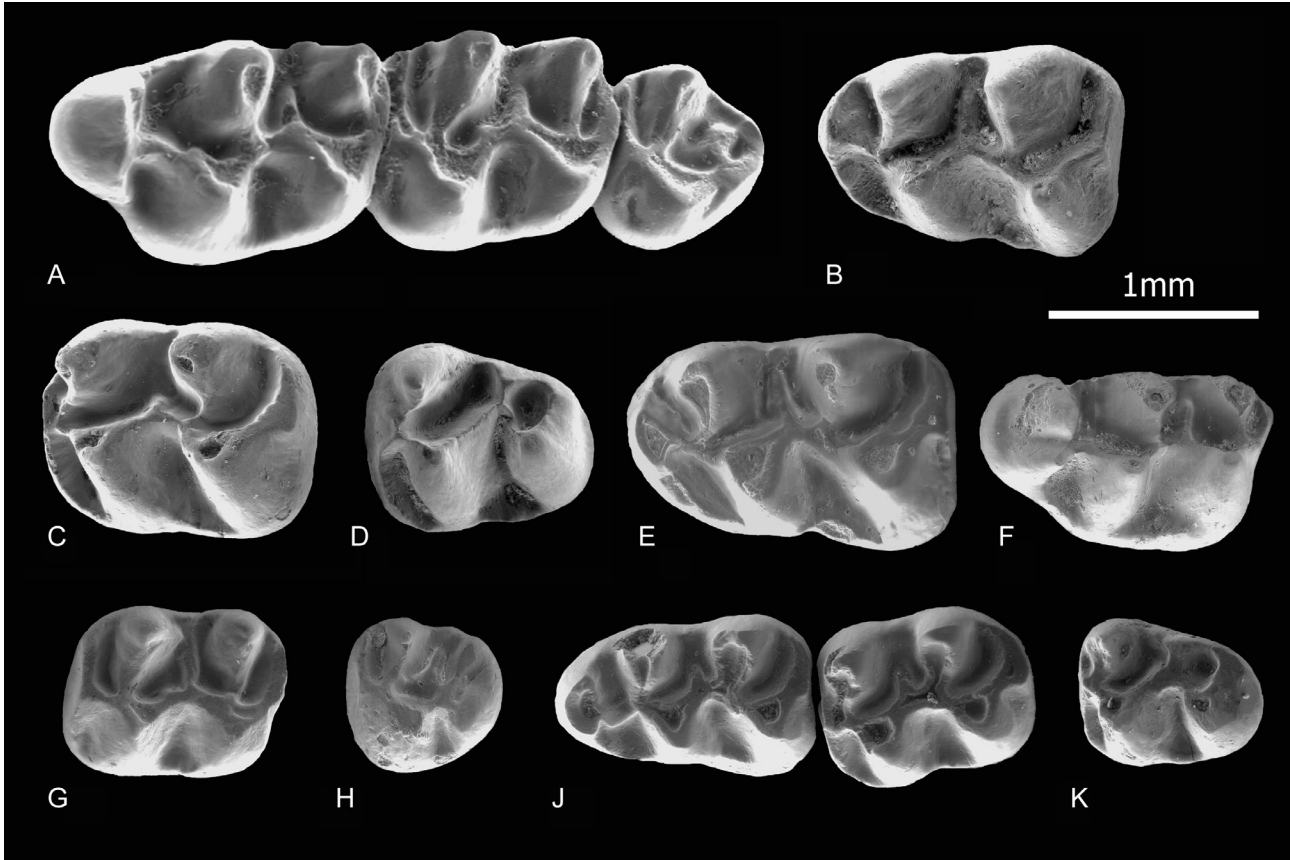
*Democricetodon* cf. *moralesi* Van der Meulen et al., 2003

Fig. 1E

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**Fig. 1.** Scanning electron microscope (SEM) micrographs of the Cricetidae from els Casots site. Modified from Jovells-Vaqué et al. 2017. *Democricetodon hispanicus* Freudenthal, 1967 – A, IPS 45008, right M1-M3 (reversed); B, IPS 45049, right m1 (reversed); C, IPS 45059, right m2 (reversed); D, IPS 19473, left m3. *Democricetodon* cf. *moralesi* Van der Meulen et al., 2003 – E, IPS 45052, left m1. *Megacricetodon primitivus* (Freudenthal, 1963) – F, IPS 44939 right M1 (reversed); G, IPS 44961, left M2; H, IPS 19479 left M3; I, IPS 44950, right m1-m2 (reversed); J, IPS:44992 right m3 (reserved).

An even larger-sized *Democricetodon* species is present at els Casots and la Riera del Morral sites. At els Casots it cooccurs with *D. hispanicus*, whereas at Riera del Morral it represents the only recovered species. This species is larger than both *D. hispanicus* and *D. decipiens*, the few recovered specimens fitting within the range size of *D. moralesi*. The recovered M2 share with *D. moralesi* the presence of a double protolophule in the M2 as well as a short to medium-sized mesoloph/ids.

#### *Democricetodon* cf. *gracilis* Fahlbusch, 1964

Finally, yet another species is present at some sites (els Casots, Vilobí del Penedès, Sant Mamet), although it is represented by very few specimens. These are distinguished because of their small size, below the size range of *D. hispanicus*.

#### Genus *Megacricetodon* Fahlbusch, 1964

##### *Megacricetodon primitivus* (Freudenthal, 1963)

Figs. 1F-J

Small-sized species of *Megacricetodon*. The m1 present a simple rounded anteroconid. The lingual antero-

lophid is reduced, thus resulting in a narrow anterosinusid. The mesolophid ranges from long to short, but is more frequently short to medium length. The M1 (Fig. 1F) shows a deeply split anterocone with a well-defined platform-like anterior cingulum on its base. The protolophule is simple in the M1 and M2. The mesoloph ranges from long to medium length.

#### DISCUSSIONS AND CONCLUSION

The genera *Democricetodon* and *Megacricetodon* first appear simultaneously in MN4 sites of the Vallès-Penedès Basin. In other European basins, such as the Calatayud-Montalbán Basin or the Swiss Molasse Basin, *Democricetodon* is recorded earlier, during the late MN3 (Kälin & Kempf, 2009; Van der Meulen et al., 2012). The situation seen in the Vallès-Penedès might be attributable to the lack of late MN3 sites (correlated to zone B of Calatayud-Montalbán Basin, the type area of the Aragonian mammal age). The species identified in the Vallès-Penedès sites are also recorded in the Calatayud Montalbán Basin, although they are not coetaneous, *D. hispanicus* being restricted to local zone B and *M. primitivus* first occurring in local subzone Ca (Van der Meulen et al., 2012). Local subzone Ca is

also characterized by the coexistence of the eomyids *Ligerimys florancei* (Stehlin & Schaub, 1951) and *Ligerimys ellipticus* (Daams, 1976), which also co-occur in all the Vallès-Penedès sites except els Casots, Vilobí del Penedès and Sant Mamet. These could indicate that the latter localities might be somewhat younger. The fact that they have delivered additional, larger-sized *Democricetodon* species, *Democricetodon* cf. *decipiens* and *Democricetodon* cf. *moralesi*, supports this interpretation. *D. decipiens* characterizes subzone Ca in the Aragonian type area, whereas *D. moralesi* is diagnostic of zone Cb. In the Vallès-Penedès Basin the cricetid succession is not the same, *D. hispanicus* persists for a longer time (well into zone C) and a clear distinction between subzones Ca and Cb on the basis of the cricetid species is not possible. On the other hand, the small-sized *Democricetodon* cf. *gracilis* is not present in the Calatayud-Montalbán Basin, being characteristic of Central Europe (Swiss and Bavarian Molasse basins; see Abdul Aziz et al., 2008; Kálin & Kempf, 2009). Therefore, the Vallès-Penedès cricetid record includes taxa mostly showing affinities with other Iberian basins as well as a minor proportion of forms that evidence connections with Central Europe.

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