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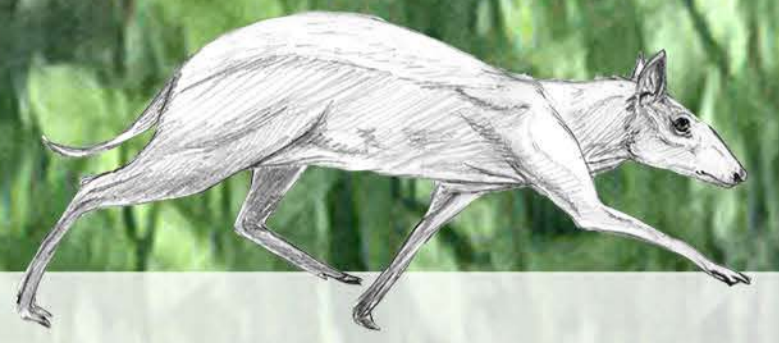
Cainotheriidae (Mammalia, Artiodactyla) from Dams (Quercy, SW France); phylogenetic relationships and evolution around the Eocene-Oligocene transition (MP19-MP21).



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Introduction

Cainotheriidae are a family of small artiodactyls known in the fossil record from the late Eocene to the middle of the Miocene in western Europe. Unlike many groups of European endemic ungulates that extinct at the end of the Eocene or shortly after the Eocene-Oligocene transition (Grande Coupure, Stehlin 1906), Cainotheriidae diversified during the Oligocene (Blondel 2005). Their evolutionary history around the Grande Coupure remains however poorly documented especially due to the scarcity of available eocene remains; besides, the modalities of their evolution are unclear. A great abundance of cainotheriids remains has recently been found in the fossiliferous karstic network of Dams (Quercy, Tarn-et-Garonne, France). The latter notably presents two fills which brackets the Eocene-Oligocene transition: DAM1 (MP19, late Eocene) and DAM3 (MP22, early Oligocene). It allows us to review the systematics of Cainotheriidae and to discuss the dynamics of their diversity during the Eocene-Oligocene transition. The phylogenetic position of Cainotheriidae within Artiodactyla also remains an open question. Based on the abundant material of Dams, we propose here the first formal phylogenetic analysis of Cainotheriidae.

Material and methods

Material:
 - 270 (dental) specimens of DAM1 (MP19) and 152 of DAM3 (MP22) were measured.
 - The Cainotheriidae of Dams are compared with material from other localities of Quercy dated from the superior Eocene to the superior Oligocene.

Character matrix:
 - 73 characters including 43 originals.
 - 23 species of artiodactyls:
 * internal group = 8 taxa representing all genera of Cainotheriidae
 * branch group = 13 (Ruminantia, Tylopoda, endemic taxa)
 * external group = 2 not closely related Dichobunoidea

Phylogenetic analysis:
 - Matrix established on NDE 1.0 (Page, 2001)
 - Phylogenetic analysis was performed with PAUP* version 4.0a161 (Swofford, 2002)
 - Heuristic search (TBR, 1000 reps, 10 tree / reps.)

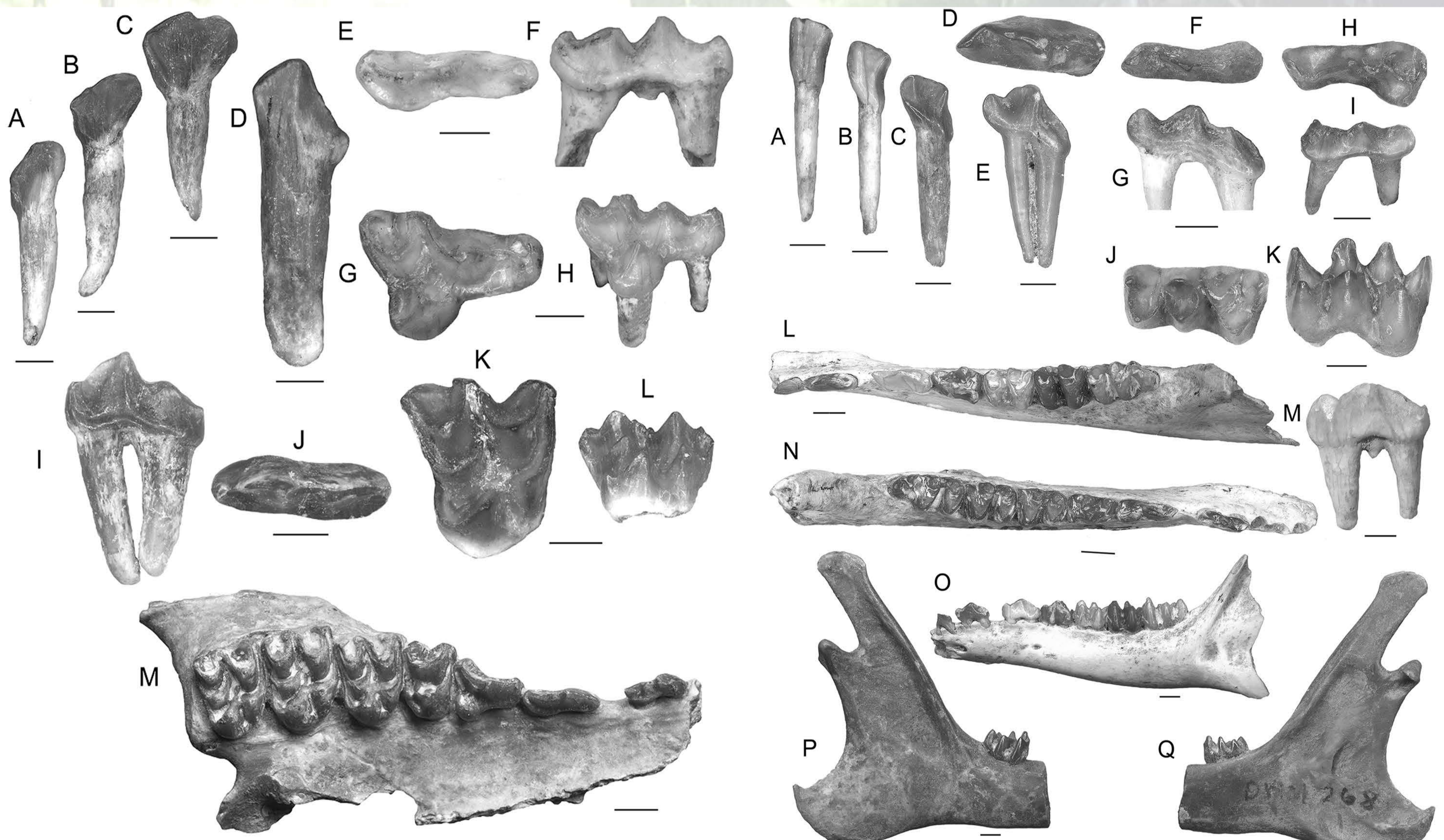


Figure 1. Material of the upper dentition of *Paroxacron valdense*. A, right I3; B, right I2; C, right I1; D, right upper canine; E, F, right DP1-2; G, H, right DP3; I, J, left P1; K, L, right DP4; M, right maxillar fragment with P1/-M3/. Lingual view: A, B, C, D, F, H, I, L. Occlusal view: E, G, J, K, M. Scale 1 mm.

Figure 2. Material of the lower dentition of *Paroxacron valdense*. A, right I/1; B, I/2-3 right; C, right lower canine; D, E, right P/1; F, G, right DP/1; H, I, left DP/2-3; J, K, left DP/4; L, left mandibular fragment with P/1-M/3; M, left P/3; N, right mandibular fragment with P/2-M/3; O, left mandibular fragment with P/1-M/3; P, Q, right mandibular fragment with M/3. Lingual view: A, B, C, E, G, I, Q. Occlusal view: D, F, H, J, L, N. Buccal view: K, M, O, P. Scale 1 mm.

Cainotheriidae present at Dams

- DAM1: presence within an extremely abundant material of a single species: *Paroxacron valdense*.
 - DAM3: presence within a less abundant but more diverse material of five species: *Paroxacron* sp., *Paroxacron bergeri*, *Plesiomeryx cadurcensis*, *Plesiomeryx huerzeleri*, *Caenomeryx cf. procommunis*.

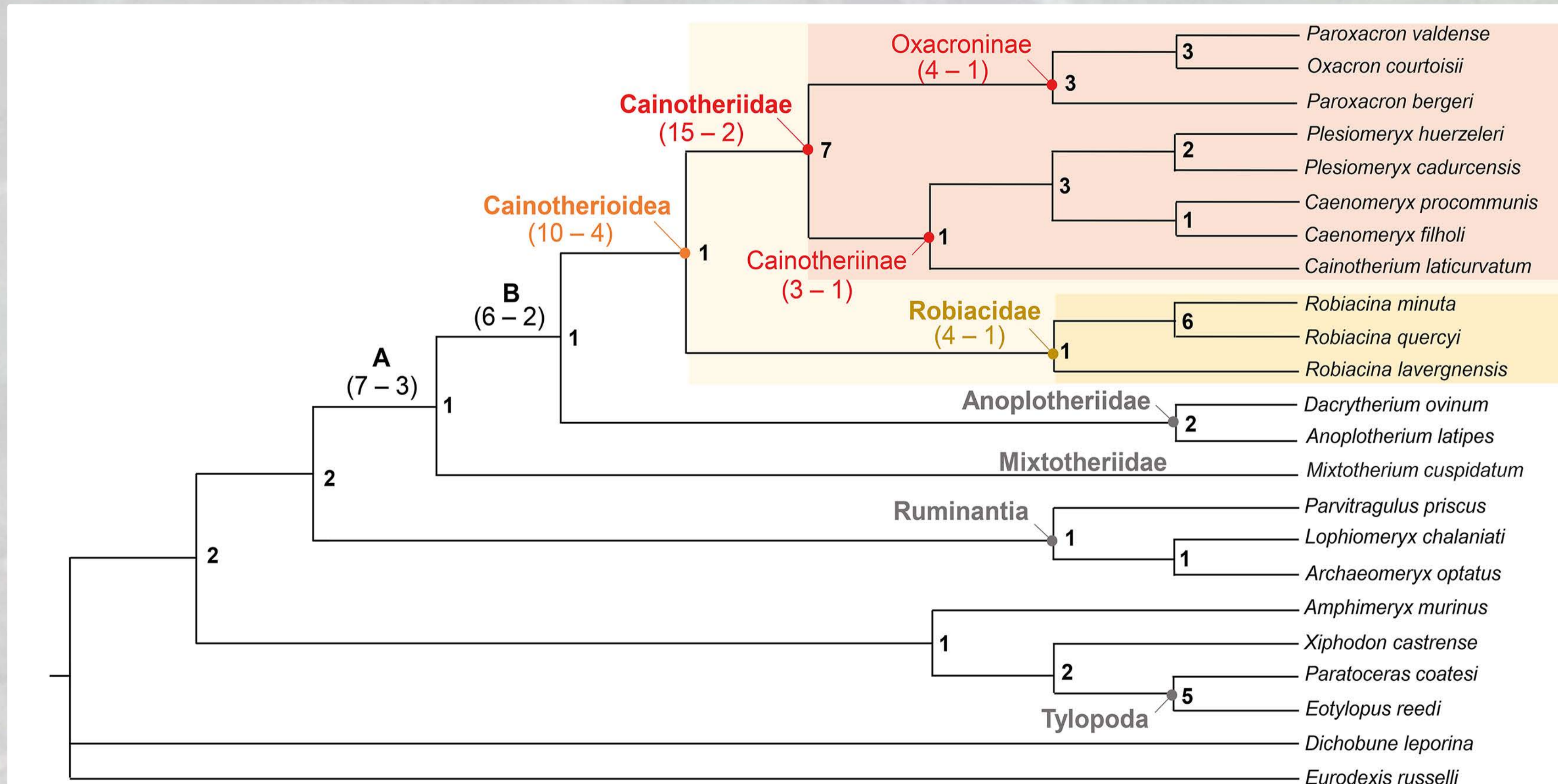


Figure 3. Phylogenetic relationship of Cainotheriidae (N=1; L= 170 ; IC=0,48 ; IR=0,73). Bremer index (IB) is indicated in bold at each node. X (a - b): X, node number; a, number of synapomorphies; b, number of ambiguous characters (Acctran).

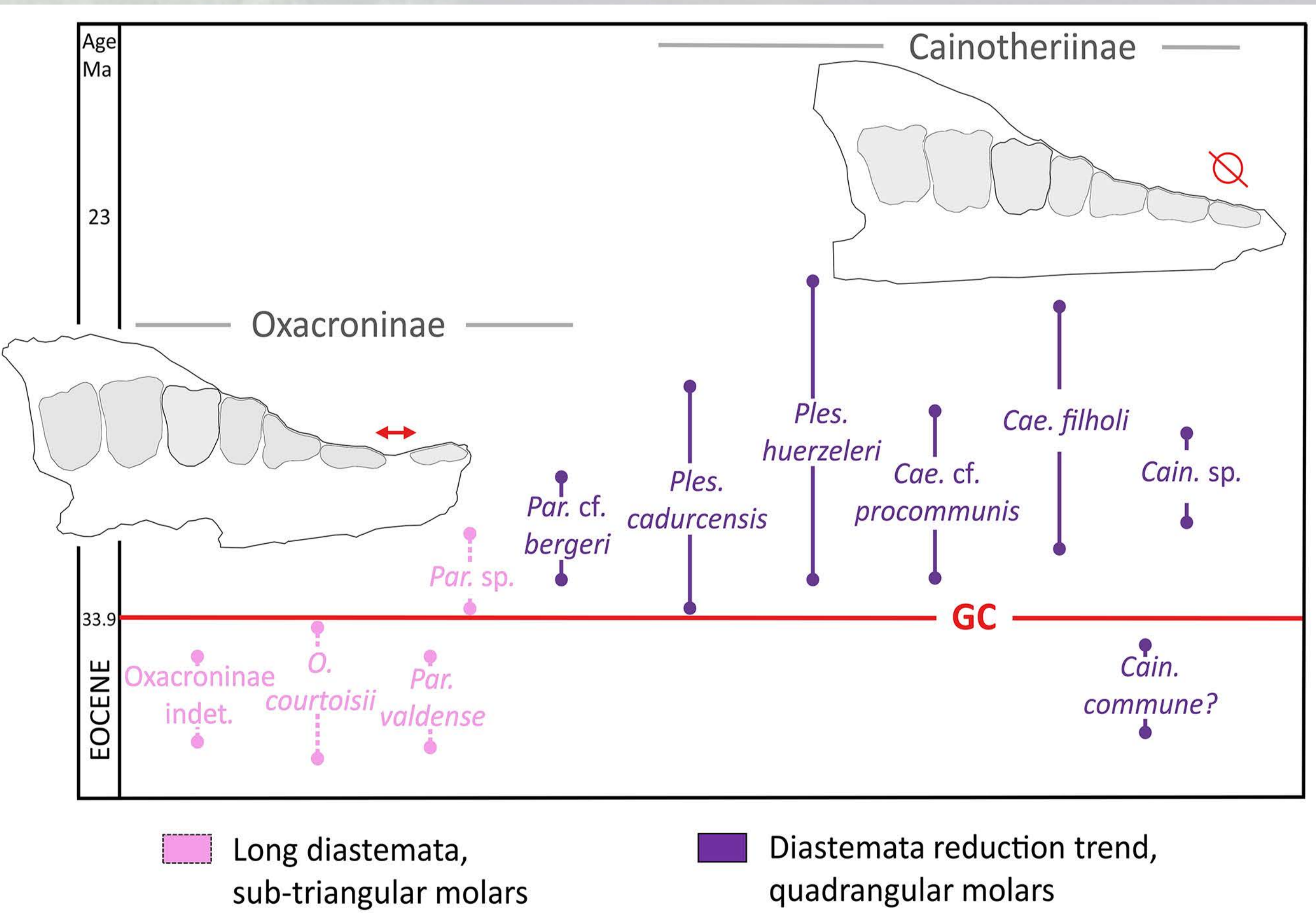


Figure 4. Evolutionary history of Cainotheriidae around the Grande Coupure

Results of phylogenetic analysis

- Monophyly of Cainotheriidae (very robust: 15 synapomorphies), Cainotheriinae and Oxacroninae
- Robiacidae fam. nov. sister group of Cainotheriidae in Cainotherioidea
- Mixtotheriidae and Anoplottheriidae close to Cainotherioidea
- Cainotheriidae phylogenetically closer to Ruminantia than to Tylopoda

Evolutionary history of Cainotheriidae around the Grande Coupure

- Appearance of the first Cainotheriidae species in the Upper Eocene
- Diversification of Cainotheriidae during the lower Oligocene documented in Dams, Cainotheriinae being particularly successful
- Evolutionary trend in Oligocene forms towards an increase of the chewing surface: more quadrangular molars and reduction of diastemata; trend related to environmental changes of the Eocene / Oligocene transition?

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