Dataset

3D models related to the publication: Dental morphology evolution in early peratheriines, including a new morphologically cryptic species and findings on the largest early Eocene European metatherian.

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Abstract
This contribution contains the three-dimensional models of the most informative fossil material attributed to both *Peratherium musivum* Gernelle, 2024, and *Peratherium maximum* (Crochet, 1979), respectively from early and middle early Eocene French localities. These specimens, which document the emergence of the relatively large peratheriines, were analyzed and discussed in: Gernelle et al. (2024), Dental morphology evolution in early peratheriines, including a new morphologically cryptic species and findings on the largest early Eocene European metatherian. https://doi.org/10.1080/08912963.2024.2403602

Keywords: France, Herpetotheriidae, molars, systematics, Ypresian

Submitted: 26/11/2024, published online: 06/01/2025. https://doi.org/10.18563/journal.m3.255

INTRODUCTION

The subfamily Peratheriinae includes all Cenozoic European herpetotheriid metatherians known to date (Ladevèze et al., 2020; *Peratherium* and *Amphiperatherium* genera), which are characterized by the conservative morphology of their tribosphenic molars. Most of their intrasubfamilial relationships are unclear so far (Ladevèze et al., 2012; Gernelle et al., 2024b). *Peratherium musivum* Gernelle, 2024 is currently the second oldest peratheriine species. It was approximately two times larger than the earliest species of this subfamily, spanned part of the time interval between the MP7 and MP8+9 reference level and shares morphological characters with the largest early Eocene metatherian, *Peratherium maximum* (Crochet, 1979) (Gernelle et al., 2024b). We present here the 3D digital models of six key specimens of *Pt. musivum* and *Pt. maximum*, from three French fossiliferous localities (Table 1). *Peratherium musivum* is best documented in the Southern France Rians fauna, by four isolated molars (Fig. 1A-H, L) representing two successive upper (Fig. 1A-D; M1-M2) and two successive lower (Fig. 1E-H; m1-m2) molar loci (Gernelle et al., 2024b). The Rians specimens were first allocated to two *Amphiperatherium* taxa (Godinot, 1981). The M3 holotype of *Pt. musivum* (Fig. 1I-K), first attributed to an indeterminate *Peratherium* species by Crochet (1980), is from the Northern France locality of Soissons, thereby showing that *Pt. musivum* was likely present somewhat simultaneously in Northwestern and Southwestern European faunas, alongside other contemporaneous European metatherian species (Gernelle et al., 2024a, 2024b). During molar occlusion, the protocone of upper molars contacts the talonid basin of lower molars at the termination of the power stroke (Fig. 1L; Crompton and Hiiemae, 1970). Early peratheriine species notably differ from one another in molar features concerning the relative size of the protocone – talonid basin functional complex, which is relatively larger in *Pt. maximum* (Gernelle et al., 2024b: tables 5-6). The peratheriine hemi-mandible from the middle early Eocene fauna (∼MP8+9) of La Borie (UM-BRI-17; Fig. 2), found and prepared by one of us (DT), documents the first known occurrence of *Pt. maximum* in Southwestern Europe, and is the single known specimen of this species with associated teeth. The relatively large size of the posterior alveolus of the m2, in addition to the elongate shape of lower molar alveoli (Fig. 2B), are informative characters regarding the generic systematics of early peratheriines (Gernelle et al., 2024b: table 4). The peratheriine specimens are permanently housed in the collections of the Muséum National d'Histoire Naturelle (MNHN), for those from Soissons and Rians, and of the Université de Montpellier (UM), for the hemi-mandible from La Borie (Table 1).

METHODS

The six peratheriine specimens were scanned by one of us (KG) using a µ-CT-scanning station EasyTom 150/Rx Solutions (Montpellier RIO Imaging [MRI], ISEM, Montpellier, France), with a resolution between 8 and 9 µm, except for the M1 MNHN.F.RI296 (Fig. 1C-D), scanned with a resolution of 6.6 µm. The 3D surfaces were extracted semi-automatically from the five isolated molars of *Pt. musivum* (Fig. 1) using

Inv nr.	Taxon	Description	Collection
MNHN.F.SN122	*Peratherium musivum*	right M3	MNHN, Paris
MNHN.F.RI220	*Peratherium musivum*	left M2 (partial)	MNHN, Paris
MNHN.F.RI296	*Peratherium musivum*	right M1 (partial)	MNHN, Paris
MNHN.F.RI368	*Peratherium musivum*	right m2	MNHN, Paris
MNHN.F.RI385	*Peratherium musivum*	left m1	MNHN, Paris
UM-BRI-17	*Peratherium maximum*	right hemi-mandible with p1-p3, m1-m3 alveoli, and m4	ISEM, Montpellier

Table 1. List of 3D models of *Peratherium musivum* specimens from Soissons (SN) and Rians (RI), and of *Peratherium maximum* from La Borie (BRI). Collections: Muséum National d'Histoire Naturelle, Paris (MNHN) for Soissons and Rians specimens; Université de Montpellier, France (UM) for the specimen from La Borie.

the segmentation threshold selection tool of Avizo® 9.3. The M2 MNHN.F.RI220 (Fig. 1A-B) and the m2 MNHN.F.RI368 (Fig. 1E-F) have been oriented, and their protocone and talonid basin have been put in occlusion (Fig. 1L) using the MorphoDig open-source 3D freeware (Lebrun, 2018). Regarding the hemi-mandible UM-BRI-17 (Fig. 2), a pre-segmentation of the cheek teeth and dentary of one slice every 5-10 slices was performed, employing the lasso, magic wand and blow selection tools of Avizo® 9.3. The smart interpolation tool of the online platform Biomedisa (Lösel et al., 2020) was used to complete the segmentation. The 3D surface models, visualized with Avizo® 9.3, are provided in .ply format and can therefore be opened with a wide range of freeware (e.g., MorphoDig).

ACKNOWLEDGEMENTS

We acknowledge Guillaume Billet (MNHN) for the loan of specimens from the MNHN mammals' collection, under his care. We are also thankful to Vincent N. Pernègre (MNHN), who managed the allocation of the MNHN specimen number of the holotype of *Peratherium musivum*. Three-dimensional data acquisition was performed using the micro-computed tomography (µ-CT) facilities of the MRI platform member of the national infrastructure France-BioImaging supported by the French National Research Agency (ANR-10-INBS-04, 'Investments for the future'), the labex CEMEB (ANR-10-LABX-0004) and NUMEV (ANR-10-LABX-0020). This research was financially supported by a PhD thesis funding from the French Ministry of Higher Education, Research, and Innovation, and in part by the ANR project EDENs (ANR-20-CE02-0007). This is ISEM publication n° 2024-x.

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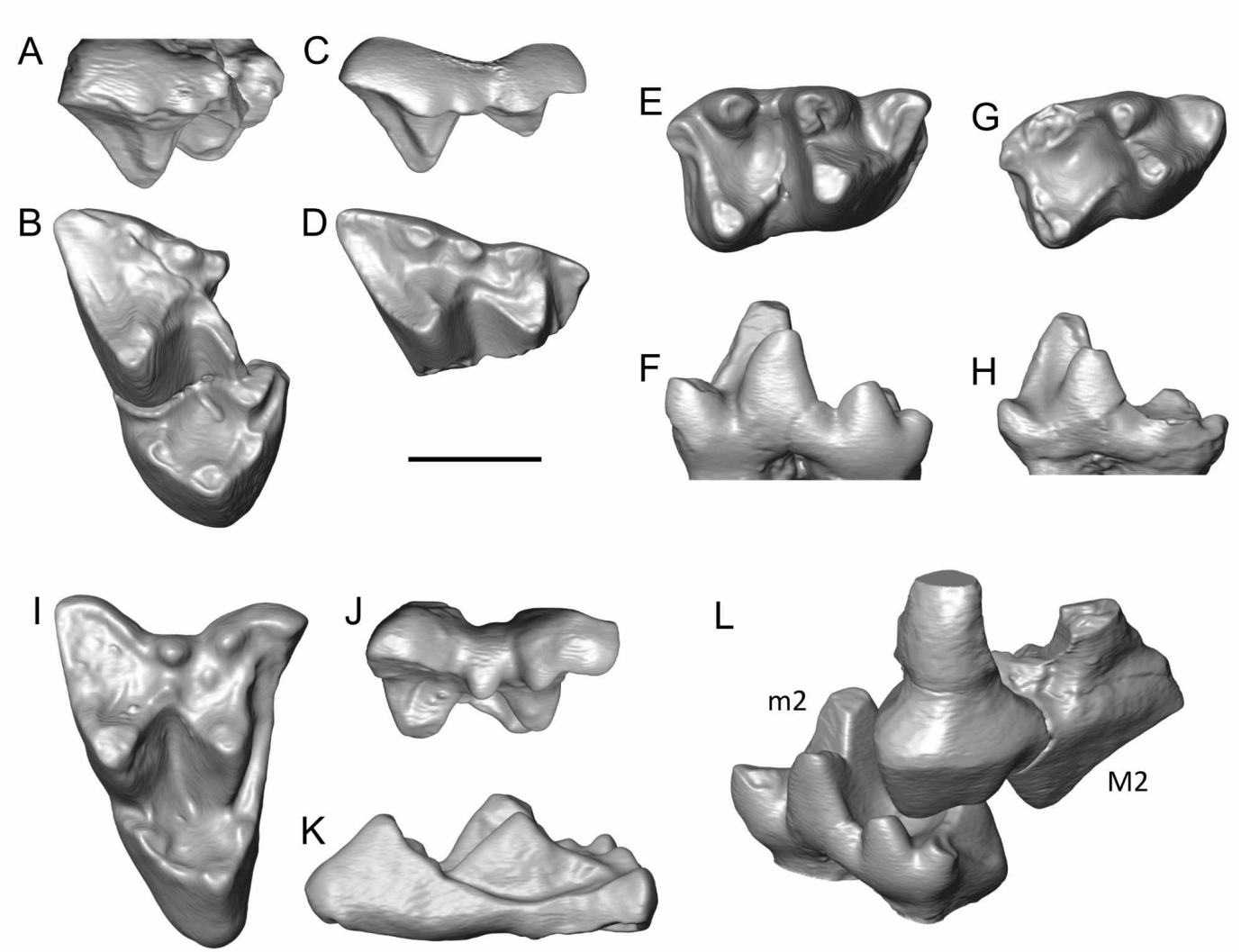

Figure 1. Three-dimensional models of isolated upper and lower molars of *Peratherium musivum* from Rians in Southern France (A-H, L) and Soissons in Northern France (I-K), both in the time interval between MP7 and MP8+9 reference levels. **A-B**, MNHN.F.RI220, partial left M2 in reverse labial (A) and occlusal (B) views. **C-D**, MNHN.F.RI296, partial right M1 in labial (C) and occlusal (D) views. **E-F**, MNHN.F.RI368, right m2 in occlusal (E) and lingual (F) views. **G-H**, MNHN.F.RI385, left m1 in reverse occlusal (G) and lingual (H) views. **I-K**, MNHN.F.SN122, holotype, right M3 in occlusal (I), labial (J) and mesial (K) views. **L**, M2 MNHN.F.RI220 and m2 MNHN.F.RI368 with occluding protocone and talonid basin in distolingual view (reversed for MNHN.F.RI220). The scale bar equals 1 mm.

ISSN: 2274-0422

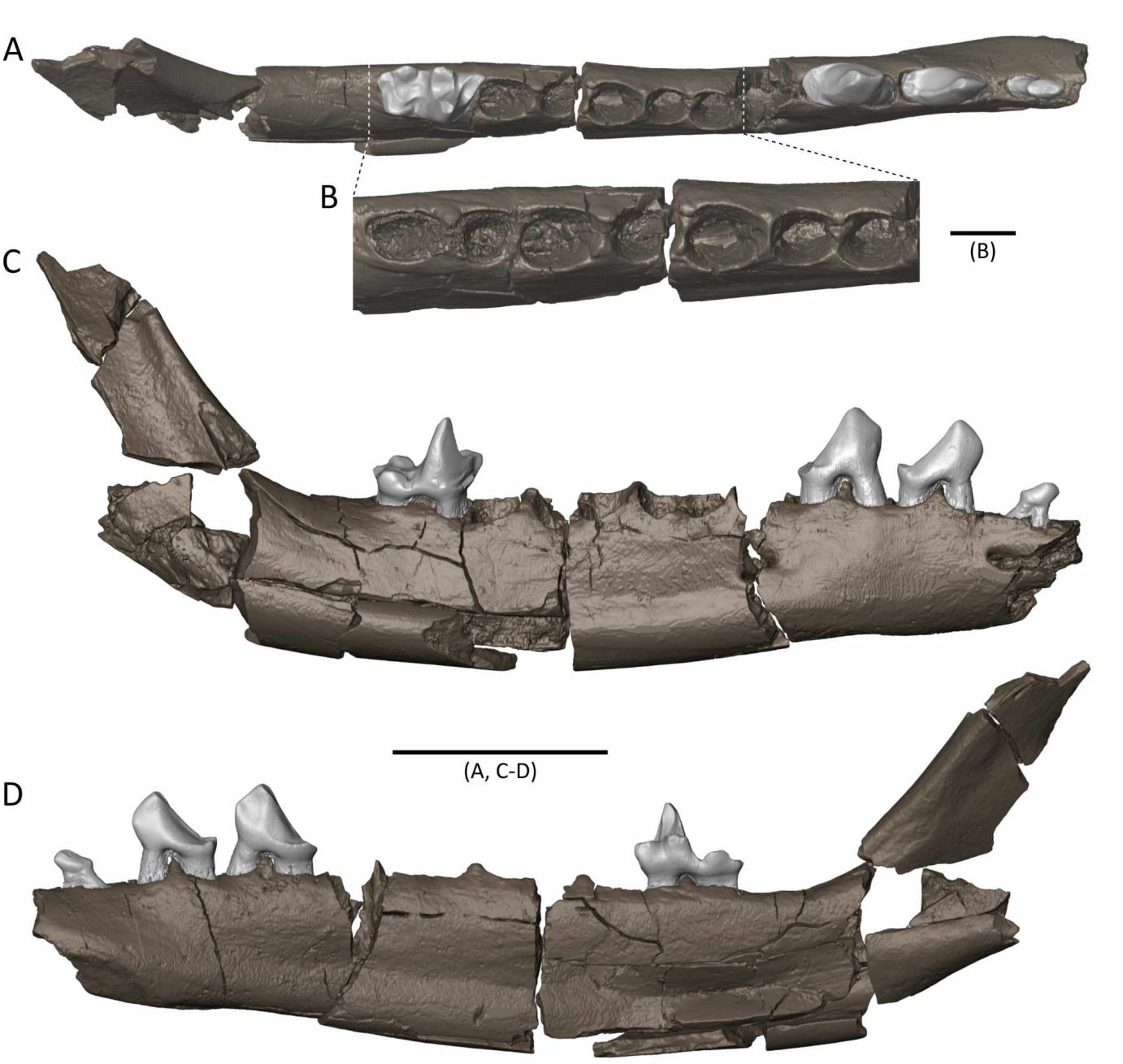

Figure 2. Three-dimensional model of the right hemi-mandible UM-BRI-17 with p1-p3, m1-m3 alveoli, and m4, of *Peratherium maximum* from La Borie (Lauragais, Southern France; ~MP8+9). **A**, Occlusal view. **B**, Occusal view with a close-up on m1 to m4 alveoli (with m4 removed). **C**, Lateral (labial) view. **D**, Medial (lingual) view. Scale bars equal 1 mm (B) and 5 mm (A, C-D).

ISSN: 2274-0422