Holotype specimen of *Donrussellia magna*, an adapiform primate from the early Eocene (MP7) of Southern France

RAMDARSHAN A.<sup>a,b</sup>, GODINOT M.<sup>c</sup>, BEDECARRATS S.<sup>d</sup> and TABUCE R.<sup>**</sup><sup>a</sup>

<sup>a</sup> Institut des Sciences de l’Évolution de Montpellier, Université Montpellier, CNRS, IRD, Cc 064; place Eugène Bataillon, 34095 Montpellier Cedex 5, France
<sup>b</sup> Université de Poitiers - UFR SFA, iPHEP UMR CNRS 7262, Bât B35 - TSA 51106, 6 rue Michel brunet, 86073, Poitiers Cedex 9, France
<sup>c</sup> EPHÉ, Sorbonne Universités - CR2P – MNHN, CNRS, UPMC-Paris6, Muséum national d’Histoire naturelle, 8 rue Buffon, CP38, 75231 Paris Cedex 05, France
<sup>d</sup> Université de Bordeaux, CNRS, MCC, UMR 5199 PACEA, Allée Geoffroy St Hilaire, Pessac Cedex, France

*corresponding author: rodolphe.tabuce@univ-montp2.fr*

Abstract: This project presents a µCT dataset and an associated 3D surface model of the holotype of *Donrussellia magna* (UM PAT 17; Primates, Adapiformes). UM PAT 17 is the only known specimen for the species and consists of a well-preserved left lower jaw with p4-m3. It documents one of the oldest European primates, eventually dated near the Paleocene Eocene Thermal Maximum.

Key words: Adapiformes, Holotype, Early Eocene, Primates, Southern France

Submitted 05.06.2015, accepted 18.06.2015. doi: 10.18563/m3.1.2.e2

© Copyright Anusha Ramdarshan June 2015

### TECHNICAL AND SPECIMEN-RELATED PARAMETERS

<table>
<thead>
<tr>
<th>Specimen inventory number</th>
<th>UM PAT 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species</td>
<td><em>Donrussellia magna</em></td>
</tr>
<tr>
<td>Repository institution</td>
<td>Université Montpellier, ISE-M</td>
</tr>
<tr>
<td>3D data acquisition institution</td>
<td>ISE-M-MRI Xray µCT</td>
</tr>
<tr>
<td>3D data acquisition method</td>
<td>X-ray µCT</td>
</tr>
<tr>
<td>3D data acquisition facility model</td>
<td>SkyScan 1076</td>
</tr>
<tr>
<td>3D data acquisition operator</td>
<td>R. Lebrun</td>
</tr>
<tr>
<td>Voxel size of original dataset</td>
<td>0.036<em>0.036</em>0.036 mm</td>
</tr>
<tr>
<td>Author of derived 3D surface model</td>
<td>S. Bédécarrats and R. Lebrun</td>
</tr>
</tbody>
</table>
| Model IDs                 | M3#17, UM PAT 17 (surface model)  
M3#18, UM PAT 17 (µCT dataset) |
| Short description         | 3D surface file model and µCT dataset of UM PAT 17. The teeth (and roots) were manually segmented. |

*abbreviations used: UM: Université Montpellier; PAT: Palette*

### METHODS

The teeth of *Donrussellia magna* were separated manually from the mandibular bone within a labelfield module of AVIZO 7.1 (FEI), using the segmentation threshold and brush tools (see Figure 1 for a representation of the 3D model in labial orientation). The two meshes representing the teeth and the mandibular bone are provided in .PLY format, and as such can be opened with a wide range of freeware. Additional files specific to ISE-MeshTools software (Lebrun, 2014) are provided in order to visualize the mandible and its associated teeth in standard orientation.

### SYSTEMATIC PALAEONTOLOGY

Order: **PRIMATES** Linnaeus, 1758
Suborder: **EUPRIMATES** Hoffstetter, 1977
Infraorder: **ADAPIFORMES** Hoffstetter, 1977
Family: **NOTHARCTIDAE** Trouessart, 1879
Subfamily: **CERCAMONINAE** Gingerich, 1975
Genus: **DONRUSSELLIA** Szalay, 1976

*Donrussellia magna* Godinot, 1987

Holotype: UM PAT 17, a left lower jaw preserving p4-m3.

Type locality: Palette, Early Eocene, department of Bouches-
du-Rhône, Southern France. The locality of Palette is dated close to MP7 (MP, Mammal Paleogene reference level) (see Marandat et al., 2012; Yans et al., 2014).

**Diagnosis [after Godinot et al., 1987: p275]**: D. magna is significantly larger than *D. provincialis*. Teeth in the two species are very close in morphology. The p4 talonid is shorter than in *D. provincialis*. The third lobe of the m3 is shorter and broader than that of *D. provincialis*, and it is isolated by a deep transversal groove.

**Description**: UM PAT 17 is a well-preserved left lower jaw with p4-m3. It was first described by Godinot (in Godinot et al., 1987), who noted several key differences that distinguish this specimen from other *Donrussellia* species: measurements, size of the m1-2 entoconid, morphology of the m3 terminal lobe, which is isolated from the hypoconid by a transversal groove. The dentary is almost complete, showing the coronoid process. The top of the articular condyle is at the level of the posterior prolongation of the alveolar line, which is curved. Our observations on the µCT virtual slices and on the segmented 3D surface model of the mandibular bone confirm that the angular process of *Donrussellia magna* is well-preserved, and has a rounded outline (see Fig. 1), which stands in contrast with the straight and long angular process of the early Eocene omomyiform *Teilhardina asiatica* (see Ni et al., 2004). The symphyseal region is strongly inclined anteriorly [for a detailed description, see Godinot et al. (1987)].

**DISCUSSION**

Cercamoniines represent a European radiation of adapiform primates, possibly also present in Asia. They are closely related to the North American notharctines. Initially not very diverse during the early Eocene, a rapid diversification yielded a wide ecological spectrum of cercamoniines during the middle Eocene, with body masses ranging from 60g (*Anchomomys quercyi*; Ramdarshan, 2011; Ramdarshan, et al., 2012 a and b) to 4000g (*Protoadapis brachyrhynchus*; Fleagle, 2013) and varied diets based on insects, fruit, leaves and gums (Ramdarshan, 2011; Ramdarshan et al., 2012 a). However, this group almost disappears at the same time as adapids (i.e., *Microadapis, Adapis, Leptadapis*) appear in the European fossil record; exceptions are the tiny anchomomyins, which survive longer (e.g., Godinot, 1998; Marigó et al., 2013).

Among the first members of the adapiform radiation, *Donrussellia* is the most primitive cercamoniine genus (Godinot, 1978, 1998; Rose et al., 1994), and is registered in the fossil record during the earliest Eocene in several European localities considered close to MP7 with *D. lusitanica* from Silveirinha, Portugal (Estravis, 2000), *D. provincialis* from Rians, Provence, Southern France (Godinot, 1981), and *D. magna* from Palette. The youngest currently known species, *Donrussellia gallica*, is from Avenay (reference level MP 8+9) (Russell et al., 1967). The genus *Donrussellia* was first described by Szalay (1976), based on material originally referred to the ommomyid *Teilhardina* as *Teilhardina? gallica* by Russell et al. (1967). However, differences with other *Teilhardina* species led Szalay (1976) to describe a new genus. Better material and the description of the new species *D. provincialis* confirmed the validity of this genus and showed it to be an adapiform (Godinot, 1978). The discovery of UM PAT 17, a nearly complete lower jaw, increased the number of species of the genus, its size range, and completed its anatomical knowledge. *Donrussellia magna* remains however only documented by the holotype, and the morphology of its upper dentition is unknown to date. Godinot (1992 and 1998) proposed that *D. magna* and *Cantius* shared a suite of derived characters suggesting that these two taxa are probably closely related. This hypothesis remains tentative in the absence of more material but the subgenus *D. (Palettia) magna* was erected to reflect this relationship (Godinot, 1992). In fact, Godinot (1998) suggested that if the upper molars further separated *D. magna* from *D. provincialis* from a morphological standpoint, a new separate genus, *Palettia*, should be erected for this taxon. This would furthermore raise the question of the dispersal of three instead of two adapiform genera at the PETM. However, more evidence is needed to support such an idea; a convergence with *Cantius* in some dental characters of a large species of *Donrussellia* is possible.

**ACKNOWLEDGEMENTS**

We are grateful to S. Jiquel and B. Marandat for giving access to the specimen. 3D Data presented in this work were produced through the technical facilities of the MRI platform and of the labEx CeMEB. We thank R. Lebrun for help with microtomography. We are grateful to M. Orliac and L.
HOLOTYPE SPECIMEN OF Donrusselia magna

Marivaux for their helpful comments and suggestions. This is publication ISEM 2015-123.

BIBLIOGRAPHY


