Dataset

3D models related to the publication: Systematic contribution of the auditory region to the knowledge of the oldest European Bovidae (Mammalia, Ruminantia)

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Abstract
The present 3D Dataset contains the 3D models analyzed in Mennecart, B., Duranthon, F., & Costeur, L. 2024. Systematic contribution of the auditory region to the knowledge of the oldest European Bovidae (Mammalia, Ruminantia). Journal of Anatomy. https://doi.org/10.1111/joa.14132.

Keywords: bony labyrinth, CT-scan, *Eotragus*, Petrosal bone, *Pusillutragus*

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INTRODUCTION

Today, the Bovidae family is the most species-rich among large herbivorous mammals. While their success may be related to their adaptation to drier conditions (Mennecart et al. 2022), the origin of this clade remains enigmatic. Only a few species are known from the late Early Miocene (approximately 18-17 Ma), appearing almost simultaneously in Asia, Africa, and Europe. The phylogeny of these earliest bovids, whether part of the crown or stem group, has been a topic of intense debate for decades. This debate primarily stems from the reliance on horn shape, an organ significantly influenced by ontogeny, allometry, and sexual dimorphism (Bibi & Taylor 2022). In their article, Mennecart et al. (2024) examine the ear region (petrosal and bony labyrinth) of the oldest known European Bovidae (Table 1). These bovids were previously classified under the generic name "*Eotragus*". The description of specimens from various ages clearly shows ontogenetic differences in the shape of the petrosal (Figure 1). However, the bony labyrinth itself suggests a close relationship between the two species *Eotragus artenensis* from Langenau (Early Miocene, Germany) and *Eotragus clavatus* from Sansan (Middle Miocene, France) (Figure 1). Through the study of the ear region, a new bovid species has been described and further confirmed by dental material: *Pusillutragus montrealensis* Mennecart, Duranthon & Costeur, 2024 (Figure 1). Mennecart et al. (2024) have proposed to take as holotype the petrosal bone and its enclosed bony labyrinth (models available here), since the latter is a structure that does suffer neither from a strong ontogeny nor strong sexual dimorphism. The overall shape of the bony labyrinth in *Pusillutragus montrealensis* is more derived than in *Eotragus*, providing additional insights into early bovid evolution.

METHODS

The specimens examined in this study are housed at the Muséum de Toulouse (MHNT, France), the Natural History Museum Basel (NMB, Switzerland), and the State Museum of Natural History Stuttgart (SMNS, Germany). The two *Pusillutragus montrealensis* specimens correspond to an adult isolated right petrosal (Holotype MHNT.PAL.2015.0.2261.4) and a juvenile isolated left petrosal (Paratype MHNT.PAL.2015.0.2261.9). Similarly, the two *Eotragus clavatus* ear regions correspond to an isolated left petrosal (NMB San.15055) and a juvenile isolated right petrosal (NMB San.15056). Due to difficulties in the reconstruction, only NMB San.15056's bony labyrinth has been reconstructed. The anterior canal of NMB San.15056 is missing due a break in the mastoid area. The one specimen of *Eotragus artenensis* (SMNS-P-41625) is a partial skull. Its right petrosal and left bony labyrinth have been reconstructed. The X-ray microtomography acquisition was performed using a nanoCT® system nanotom® (phoenix x-ray, GE Sensing & Inspection Technologies GmbH, Wunstorf, Germany) hosted at the Department of Biomedical Engineering, University of Basel, and the Bavarian Natural History Collections (Staatliche Naturwissenschaftliche Sammlungen Bayerns, Germany). The scanning resolution ranges from 20 µm (NMB San.15056) to 50 µm (MHNT specimens) (see Table 1). A total of 1440 equiangular radiographs were taken over 360° using an accelerating voltage of 170 kV and a beam current of 30 mA. We digitally segmented the petrosal and the bony labyrinth using AVIZO LITE 9.0, employing both manual and automatic segmentation techniques. The 3D surface models are provided in .ply format, which can be opened with a wide range of freeware.

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Inv nr.	Taxon	Description	Collection
MHNT.PAL.2015.0.2261.4	*Pusillutragus montrealensis*	Right petrosal, bony labyrinth, stapes. Holotype specimen.	MNHT, Toulouse
MHNT.PAL.2015.0.2261.9	*Pusillutragus montrealensis*	Left petrosal and left bony labyrinth. Paratype specimen.	MNHT, Toulouse
SMNS-P-41625	*Eotragus artenensis*	Petrosal (right), bony labyrinth (left)	SMNH, Stuttgart
NMB San.15056	*Eotragus clavatus*	Right petrosal and right bony labyrinth	NMB, Basel
NMB San.15055	*Eotragus clavatus*	Left petrosal	NMB, Basel

Table 1. List of models. MNHT : Muséum de Toulouse, Toulouse, France. NMB: Naturhistorisches Museum Basel, Basel, Switzerland. SMNH :State Museum of Natural History, Stuttgart, Germany.

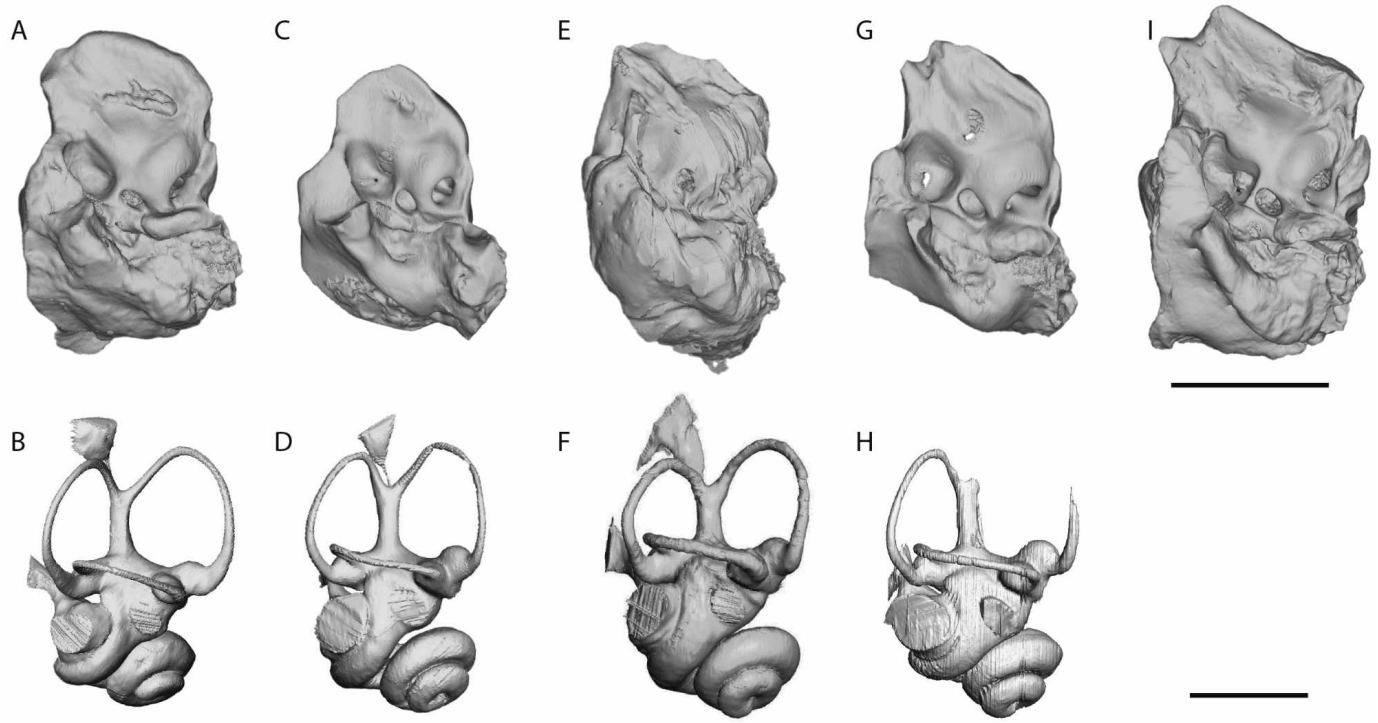

Figure 1. Ear region of the oldest European Bovidae. Petrosal and bony labyrinth of respectively *Pusillutragus montrealensis* (**A** & **B** MHNT.PAL.2015.0.2261.4, holotype; **C** & **D** MHNT.PAL.2015.0.2261.9, paratype, mirrored), *Eotragus artenensis* (**E** & **F** SMNS-P-41625, **F** mirrored), and *Eotragus clavatus* (**G** & **H** NMB San.15056; **I** NMB San.15055, mirrored). Scale bare is 10 mm for the petrosals and 5 mm for the bony labyrinths.

sils in Montréal-du-Gers over the years. Grant sponsor: Swiss National Science Foundation. Grant number: 200021_178853; 200021_159854/1; P300P2_161065; P3P3P2_161066.

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