Dataset

# 3D models related to the publication: Infrasonic and ultrasonic hearing evolved after the emergence of modern whales

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**Abstract**
This contribution contains the 3D models of the bony labyrinths of two protocetid archaeocetes from the locality of Kpogamé, Togo, described and figured in the publication of Mourlam and Orliac (2017) https://doi.org/10.1016/j.cub.2017.04.061.

**Keywords:** archaeocete, Artiodactyla, bony labyrinth, cochlea, Lutetian

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## INTRODUCTION

The 3D models presented here are part of the protocetid whales specimens retrieved from the Lutetian bone bed of Kpogamé-Haotoé (Togo, 46 - 43 Ma; Cappetta and Traverse, 1988; Gingerich and Cappetta, 2014) and described by Mourlam and Orliac (2017a, b). The detailed study of the bony labyrinth of two specimens from this locality: i) the isolated petrosal UM-KPG-M 164 referred to as ?*Carolinacetus* sp., and ii) the skull fragment UM-KPG-M 73 referred to as Protocetidae indeterminate (morph $\gamma$), represents the first description of the bony labyrinth morphology of protocetid whales (see Table 1, table SI 1, and Fig. 1). Protocetid whales are transitional taxa between terrestrial and fully aquatic cetaceans and are a key for determining the hearing abilities of early whales. Based on qualitative (ancestral state reconstruction of discrete characters) and quantitative (principal component analysis) studies of the cochlear morphology of these specimens, Mourlam and Orliac (2017b) propose a new picture of the early evolutionary history of hearing in whales. They demonstrate that the cochlea of early cetaceans was close to that of their terrestrial relatives and that specialization to extreme hearing abilities observed today in modern whales (infrasonic or ultrasonic hearing in Mysticeti or Odontoceti respectively) occurred after the emergence of fully aquatic whales, in Neoceti.

## METHODS

The 3D surface of the bony labyrinth of the left isolated petrosal UM-KPG-M 164 was extracted slice-by-slice manually with AVIZO 9.0 (Visualization Sciences Group) with the limited range only option of the brush tool. We extracted the digital casts of the bony labyrinth of the petrosal of the skull fragment UM-KPG-M 73 slice-by-slice manually with the limited range only option of the brush tool of AVIZO 9.0. The rather low contrast of the CT scan acquisition, and the presence of sediment and recrystallization in the cavities are responsible for the rather low quality of the resulting model. The 3D surface models are provided in .vtk format, and can therefore be opened with a wide range of freeware. Additional flag files specific to ISEMeshTools (Lebrun, 2014; Lebrun and Orliac, 2017) are provided in order to visualize the 3D labelled models in standard orientation.

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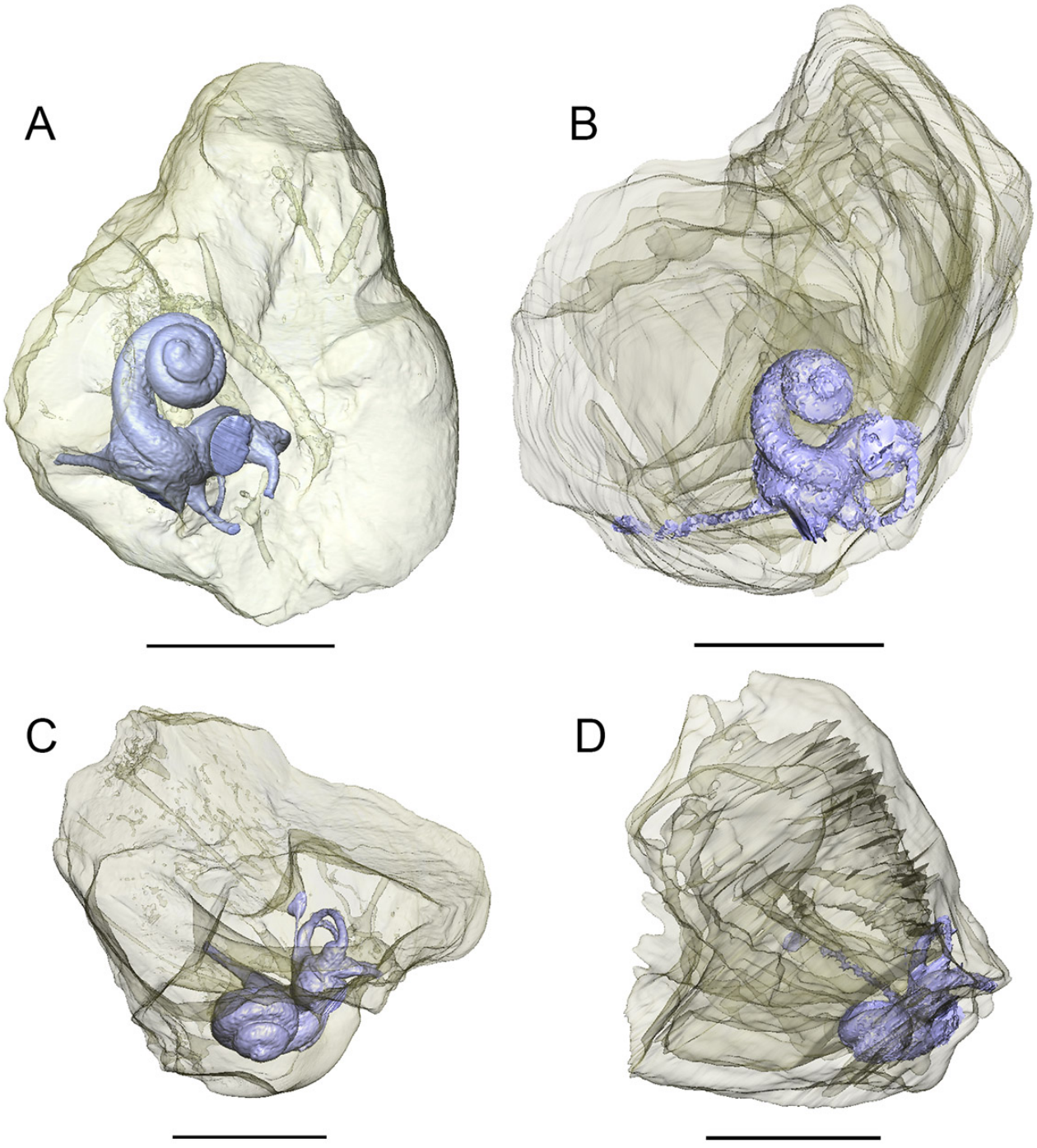


**Figure 1.** In situ location of the bony labyrinth of (A, C) ?*Carolinatus* sp. (UM-KPG-M 164), and (B, D) Protocetidae indeterminate (morph $\gamma$, UM-KPG-M 73), viewed through a translucent rendering of the petrosal bone. (A-B) ventral view, (C-D) anterior view. Scale bar = 10 mm. 3D surfaces of the petrosal bones are available at MorphoMuseuM (Mourlam and Orliac, 2017c).


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| Model IDs | Taxon | Description | µCT voxel size | µCT operator | 3D model author |
|---|---|---|---|---|---|
| M3#149_UMKPG-M164 | *?Carolinacetus indet.* | bony labyrinth | 36µm | M. J. Orliac | M. J. Mourlam |
| M3#150_UMKPG-M73 | Protocetidae indet. (morph $\gamma$) | bony labyrinth | 140µm | C. Charles | M. J. Orliac |

**Table 1.** List of associated models. All models stand as labelled three-dimensional reconstructions.

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