Dataset

# 3D models related to the publication: A heavyweight early whale pushes the boundaries of vertebrate morphology

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**Abstract**
The present 3D Dataset contains the 3D models analyzed in Bianucci et al. 2023, A heavyweight early whale pushes the boundaries of vertebrate morphology, Nature. These include bones of the holotype of new species *Perucetus colossus* (MUSM 3248), as well as the articulated skeleton of *Cynthiacetus peruvianus* (holotype, MNHN.F.PRU10). The latter was used to estimate the total skeleton volume of *P. colossus*.

**Keywords:** Archaeoceti, Basilosauridae, bone mass increase, Eocene, pachyosteosclerosis

Submitted:2023-05-04, published online:2023-08-04. https://doi.org/10.18563/journal.m3.187

## INTRODUCTION

We describe a new species of basilosaurid whale from the Yumaque member of the Paracas Formation (late Eocene, East Pisco Basin, Peru). It is known from one partial skeleton, comprising 13 vertebrae, four ribs and the right innominate (see Table 1 and Fig.1A-C). We provide textured surface models for all the elements (except three less well-preserved ribs). To estimate the new species' total skeletal volume, we used a surface model of the most complete basilosaurid, the holotype of *Cynthiacetus peruvianus* (MNHN.F.PRU10, Otuma Formation, latest Eocene, East Pisco Basin; Martínez-Cáceres, Lambert, and Muizon 2017; Fig.1D). The latter was modified (with Blender 3.0.1) to 1. fit the dimensions of the new species; and 2. make additional estimations editing the modified model to match the skeletal composition of other well-known basilosaurids.

## METHODS

The specimens were surface scanned: textured models of the vertebrae of *Perucetus colossus* (MUSM 3248) were acquired with a SHINING EinScan Pro HD, and the rib and innominate were scanned with an Artec Eva scanner; the skeleton of *Cynthiacetus peruvianus* (holotype, MNHN.F.PRU10) was also digitized with an Artec Eva scanner. Models were simplified for exportation with Meshlab (quadratic edge collapse decimation; Cignoni et al., 2008). Rendering of the models was done with Blender in orthographic view (Fig. 1). For the model of the specimen of *C. peruvianus*, which is mounted and on public display, a number of technical concessions had to be made to achieve the final results. First, areas hidden by the supporting structure and other surfaces not accessible to the scanner (cervical vertebrae too tightly packed, articular surfaces of the centra, neural canal of the vertebrae, internal portions of the skull) were reconstructed using the mesh filler tool of Geomagic Wrap 2021 taking into account the curvature of the surrounding mesh. Furthermore, due to the pedestal of the specimen, its position in the gallery and the thinness of certain elements, the appendicular skeleton was reconstructed in part by symmetrizing the best reconstructed right or left portions (depending on the situation). Consequently, if the final 3D model is considered to be faithful to the original specimen, it may not be relevant for morphometric analyses or any other approach requiring too much geometric precision.

## ACKNOWLEDGEMENTS

Guillaume Billet (curator, MNHN, Paris) is warmly thanked for helping with the management of the data related to the holotype of *Cynthiacetus peruvianus*, a specimen under his care. Grant sponsor: Stan Wood Award from the Palaeontological Association. Grant sponsor: University of Pisa. Grant number:

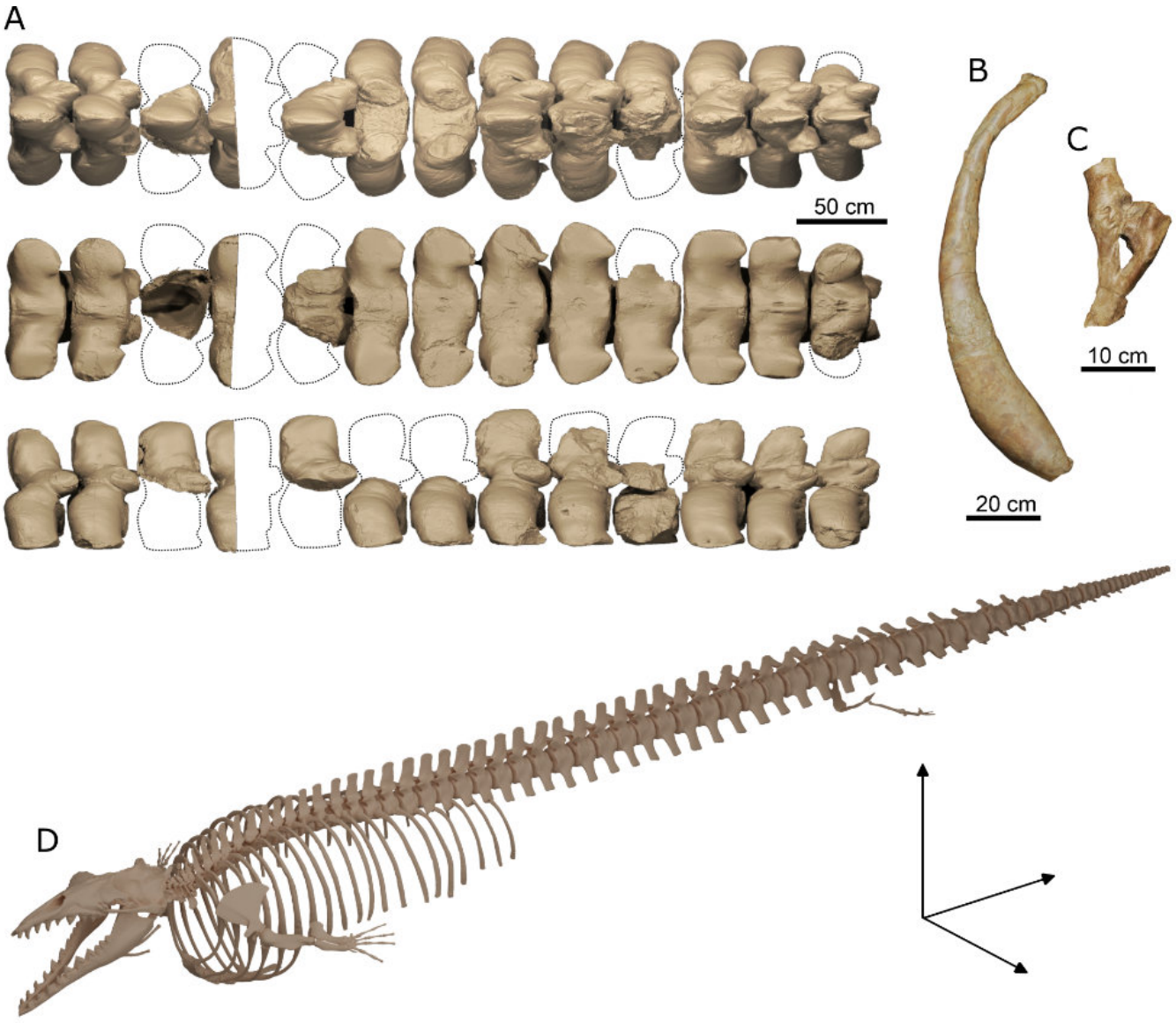


**Figure 1.** Overview of the surface models. A-C. Holotype of *Perucetus colossus* (MUSM 3248) vertebrae (A) in dorsal (top), ventral (middle), and right lateral (bottom) views; right rib (B) in anterior view; right innominate (C) in lateral view. D. Holotype of *Cynthiacetus peruvianus* (MNHN.F.PRU10) in antero-dorso-left lateral view; the three arrows each represents 1 m.


ISSN: 2274-0422

| Inv nr. | Taxon | Description | Collection |
|---|---|---|---|
| MUSM3248 | *Perucetus colossus* | Thirteen vertebrae, rib, and innominate of *Perucetus colossus* (holotype). | MUSM, Lima |
| MNHN.F.PRU10 | *Cynthiacetus peruvianus* | Articulated skeleton of the holotype of *Cynthiacetus peruvianus* | MNHN, Paris |

**Table 1.** List of models. MNHN: Muséum national d'Histoire naturelle (Paris, France); MUSM: Museo de Historia Natural, Universidad Nacional Mayor de San Marcos (Lima, Peru).

PRA_2017_0032. Grant sponsor: University of Camerino. Grant number: FAR 2019, STI000102.

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