3D models related to the publication: late Middle Miocene caviomorph rodents from Tarapoto, Peruvian Amazonia.

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Abstract

This contribution contains the three-dimensional digital models of a part of the dental fossil material (the large specimens) of caviomorph rodents, discovered in upper Middle Miocene detrital deposits of the TAR-31 locality in Peruvian Amazonia (San Martín, Peru). These fossils were described, figured and discussed in the following publication: Boivin, Marivaux et al. (2021), Late middle Miocene caviomorph rodents from Tarapoto, Peruvian Amazonia. PLoS ONE 16(11): e0258455. https://doi.org/10.1371/journal.pone.0258455

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INTRODUCTION

We present here the three-dimensional (3D) digital models of a set of dental fossil specimens of caviomorph rodents (Fig. 1, Table 1) that were unearthed in Miocene detrital sediments deposited on the left bank of the *Río Mayo*, near the town of Juan Guerra (Tarapoto district), in the San Martín Department, Peru (Western Amazonia). The fossil bearing locality, named TAR-31 (Tarapoto locus n° 31) is situated beneath the *Puente de Colombia*, and consists of a 15 cm-thick microconglomerate. Wet-screening operations of 550 kg of sediments have yielded a diverse assemblage of aquatic and terrestrial vertebrates, including fishes, anurans, turtles, crocodiles, a small passerine bird, and mammals such as marsupials (Stutz et al., 2022), hoofed mammals, xenarthrans, a sirenian, bats, a primate (Marivaux et al., 2020), and rodents (Boivin et al., 2021). The fossil material consists primarily of bone fragments and tens of isolated teeth (and few fragments of mandibles and maxillae preserving teeth). Caviomorph rodents are the most abundant mammalian remains. They include dental remains (primarily isolated teeth, but also fragments of a mandible and of a maxillary) and a well-preserved ankle-bone (astragalus). All the rodent material was described and partly figured in Boivin et al. (2021). Fossil specimens of small size (isolated teeth) were photographed using a scanning electron microscope (SEM), whereas the largest specimens (mandibular and maxillary fragments, and the astragalus) and isolated high-crowned teeth were scanned by X-ray microtomography (μCT-scan) for obtaining the three-dimensional digital models (3D surface renderings; see Methods below) presented here. Among the largest specimens, there is a well-preserved fragment of left mandible preserving three teeth

(dp4, m1, and a portion of incisor), which was attributed by Boivin et al. (2021) to the tiny chinchilloid *Microscleromys paradoxalis* (Fig. 1A-B). A fragment of left maxilla bearing two worn teeth (P4-M1 or M1-2) was also discovered and referred to as the tiny adelphomyid octodontoid *Ricardomys longidens* (Fig. 1C-D). Large isolated and high-crowned teeth of a medium-sized chinchilloid referred to as "*Scleromys*" sp. (Boivin et al., 2021) were also recovered at TAR-31 and scanned (Fig. 1E-M). Among the largest taxa recorded at TAR-31, is a cavioid, which is documented by a single tooth (isolated right p4) and referred to as Caviidae gen. et sp. indet. (Fig. 1N). Finally, a single foot-bone of rodent was recovered and scanned. It corresponds to a left astragalus that was tentatively attributed by Boivin et al. (2021) to a tiny taxon such as *Microscleromys* sp. 2 (Fig. 1O-P). These few aforementioned dental and postcranial specimens of caviomorph rodents, together with numerous other dental specimens, have allowed to report a typical rodent community illustrating the Laventan SALMA (South American Land Mammal Age), i.e., late Middle Miocene (Marivaux et al., 2020; Boivin et al., 2021; Stutz et al., 2022). This rodent fauna from Peruvian Amazonia (TAR-31) is strikingly similar to that recorded farther north in Colombia, at La Venta (Walton, 1990, 1997). This new record from Peruvian Amazonia represents the southernmost record of these rodent lineages, thereby underscoring the widespread distribution of these mammals at that time, along the northwestern edge of the Pebas Mega-Wetland System. The fossil specimens are permanently housed in the collections of the Vertebrate Paleontology Department of the *Museo de Historia Natural e Universidad Nacional Mayor San Marcos* (MUSM) in Lima, Peru.

Inv nr.	Taxon	Description
MUSM 4375	*Ricardomys longidens*	Fragment of left maxillary preserving DP4 and M1 (or M1 and M2)
MUSM 4272	”*Scleromys*” sp.	Isolated left upper molar
MUSM 4643	*Microscleromys paradoxalis*	Fragment of left mandible preserving dp4, m1 and a portion of incisor
MUSM 4275	”*Scleromys*” sp.	Isolated right upper molar
MUSM 4273	”*Scleromys*” sp.	Isolated left upper molar
MUSM 4276	”*Scleromys*” sp.	Isolated right upper molar
MUSM 4282	”*Scleromys*” sp.	Isolated right lower molar
MUSM 4281	”*Scleromys*” sp.	Isolated right lower molar
MUSM 4280	”*Scleromys*” sp.	Isolated left p4
MUSM 4277	”*Scleromys*” sp.	Isolated left lower dp4
MUSM 4279	”*Scleromys*” sp.	Isolated right lower dp4 (mesial fragment)
MUSM 4283	Caviidae gen. et sp. indet.	Isolated right lower p4
MUSM 4658	*Microscleromys* sp.2	Isolated left tarsal bone (astragalus)

Table 1. List of models. Collection: Museo de Historia Natural - Universidad Nacional Mayor San Marcos (MUSM), Lima, Peru

METHODS

The dental/jaw specimens and the astragalus figured here were scanned with a resolution of 5.9 µm and 5 µm, respectively, using a µCT-scanning station EasyTom 150/Rx Solutions (Montpellier RIO Imaging [MRI], ISE-M, Montpellier, France). AVIZO 2020.2 (Visualization Sciences Group) software was used for visualization, segmentation and three-dimensional renderings. These fossil specimens were prepared within a "labelfield" module of AVIZO, using the segmentation threshold selection tool. The crown and roots (and in some cases, the bone fragments preserving teeth) of each dental specimen were virtually delimited by manual segmentation. The 3D models are provided in ".ply" format, and thus can be opened with a wide range of software programs (e.g., MorphoDig 1.6.5., an open-source 3D freeware (Lebrun, 2018; https://morphomuseum.com/Pages/morphodig).

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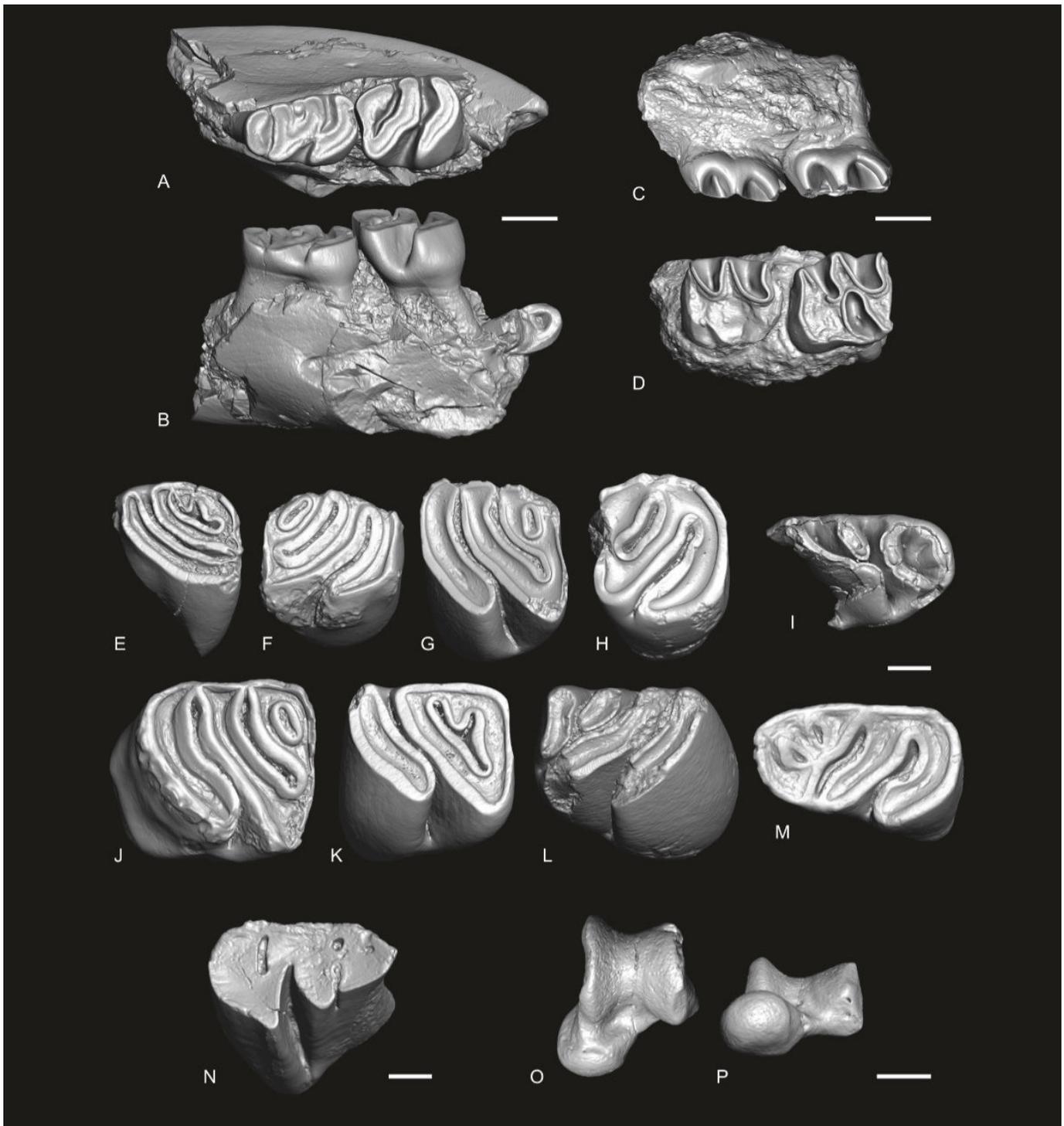
Figure 1. Dental/jaw specimens and astragalus of caviomorph rodents from the late Middle Miocene TAR-31 locality (Peruvian Amazonia). A-B) MUSM 4643, fragment of left mandible preserving the incisor (broken) and dp4-m1 of the chinchilloid *Microscleromys paradoxalis*, in occlusal (A) and buccal (B) views. C-D) MUSM 4375, fragment of left maxillary preserving DP4-M1 (or M1-2) of the adelphomyid octodontoid *Ricardomys longidens*, in lingual (C) and occlusal (D) views. E-M) isolated dental specimens of the chinchilloid "*Scleromys*" sp., in occlusal views: E) MUSM 4272, left upper molar; F) MUSM 4275, right upper molar; G) MUSM 4273, left upper molar; H) MUSM 4276, right upper molar; I) MUSM 4279, mesial fragment of a right dp4; J) MUSM 4282, right lower molar; K) MUSM 4281, right lower molar; L) MUSM 4280, left p4; M) MUSM 4277, left dp4. N) MUSM 4283, right p4 of a Caviidae gen. et sp. indet., in occlusal view. O-P) MUSM 4658, left astragalus attributed to *Microscleromys* sp. 2, in dorsal (O) and distal (P) views. Images are renderings of 3D digital models of the fossil specimens, obtained by X-ray micro-computed (μCT) surface reconstructions (renderings of the segmented surfaces). Scale bars: 1 mm.