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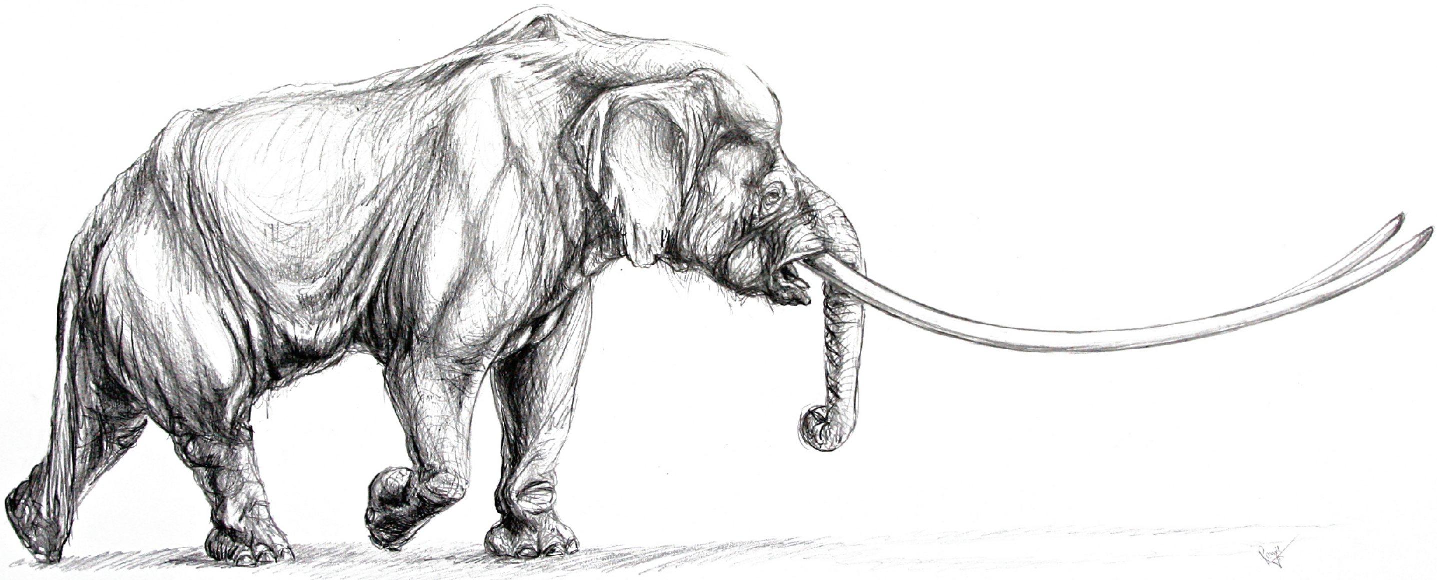

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ABSTRACT BOOK

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Anatomy of a *Notiomastodon platensis* (Gomphotheriidae, Proboscidea) calf skull using CT-scan and 3D reconstruction

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Computed tomography (CT) is one of the best techniques to analyze internal structures of fossils due to its non-destructive nature. CT scans can be studied individually or used for three dimensional reconstructions (Sutton, 2008). There are few studies using non-invasive techniques describing cranial structures of young fossil proboscideans (Mashchenko et al., 2005; Aguilar, 2011). In this study, we recognized and described the cranial (internal and external) structures of a *Notiomastodon platensis* calf using CT scans and 3D reconstitution.

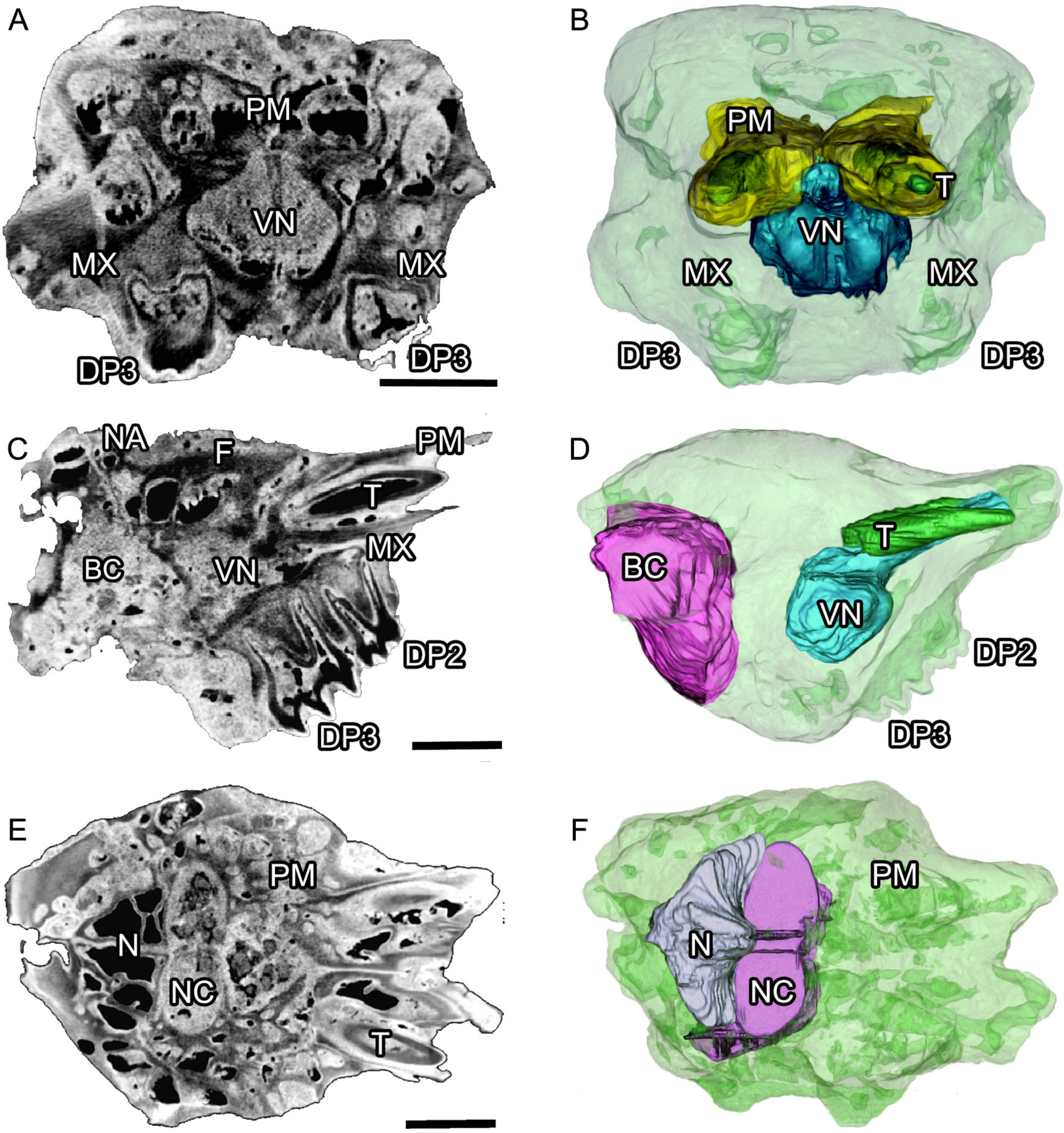

Fig. 1. Computed tomography images (A, C and E) and 3D reconstruction of skull structures of the *Notiomastodon platensis* calf MHN-33 (B, D and F). **A**, Frontal section showing the erupted molars, maxillary (MX) and premaxillary (PM) bones and vomeronasal apparatus VN); **B**, Frontal view of the 3D reconstruction showing premaxillary bones (yellow), tushes (T) inside de alveolar pocket (green) and vomeronasal organ (blue); **C**, Lateral left section showing the nasal (N), frontal (F), premaxillary and maxillary bones, vomeronasal apparatus, frontal lobes of the brain cavity (BC), nasal aperture (NA) and teeth (deciduous left tusk, DP2 and DP3); **D**, 3D reconstruction on lateral view showing vomeronasal apparatus (blue), deciduous tusks (green) and frontal lobes of the brain cavity (fuchsia); **E**, Dorsal section showing the right deciduous tusk, nasal and premaxillary bones and nasal cavity (NC); **F**, 3D reconstruction on dorsal view showing nasal bones (gray) and nasal cavity (purple). Scale bar equals 5 cm.

The analyzed specimen (MHN-33) is a fragmented skull from Lapa do Caetano, Minas Gerais State, Brazil, and it was part of the paleontological collection of the Universidade Federal de Minas Gerais, Brazil. Unfortunately, in 2012 the specimen was stolen and has not been located yet. However, a 3D model and CT scans of the specimen were fortunately made prior to its loss, allowing the execution of this study. The CT scans were performed at the Hospital Universitário Pedro Ernesto (Rio de Janeiro, Brazil) and the 3D reconstruction was produced using the software Mimics CT slices of frontal, lateral/sagittal and ventral views were analyzed and both internal and external structures were compared with extant young specimens of elephants (Gregory, 1903; Van der Merwe et al., 1995; Shoshani et al., 2006) and *Mammuthus primigenius* (Mashchenko et al., 2005).

We observed that MHN-33 is slightly deformed, fragmented on its ventraldorsal portion and lacks the parieto-occipital region, including the occipital condyles and the acoustic meatuses (Fig. 1). The skull is encrusted by sediment on the rostral region, which covers the proximal part of premaxillary bones, the nasal aperture, the right incisor alveolus, and the nasal and frontal bones.

On frontal view, the premaxillary bones are horizontally wide and dorsoventrally narrow at the medial region (Fig.1A, 1B). Between the tush alveoli and the nasal cavity, ca. 60 mm of the premaxillary bone is pneumatized. The upper deciduous tusks (tushes) are visible inside the alveoli and have open roots. Both tushes are small (the left one measures 77 mm in length and the right one 73 mm in length). The left tush is partially erupted and the right tush and its alveolus are totally covered with sediment and fragmented medially (Fig.1B).

The vomeronasal apparatus is anteroventrally displaced, positioned between the proximal part of the maxillary and premaxillary bones (Fig.1C, 1D). On its rostral portion there is an elongated duct placed between the incisor process of the maxillary and premaxillary bones, identified as the vomeronasal cartilage by comparisonwith *Loxodonta africana* (Göbbel et al., 2004). On coronal view, the vomeronasal organ is well-developed and bilobated, reaching the nasal cavity distally (Fig. 1C). This degree of development may be related to high chemoreception sensitivity (Johnson & Rasmussen, 2002). On sagittal view, the nasal cavity is distinctive, extending from the nasal aperture to the fragmented ventrodistal portion of the skull, behind the palatine bone (Fig. 1E, 1F). The entire nasal cavity is filled with sediment. On dorsal view, the nasal aperture is oval shaped and narrow at the medial portion (Fig. 1F).

The place where the frontal lobes are positioned is the only preserved portion of the brain cavity. This portion is located posterior to the nasal cavity and ventral to the nasal and frontal bones (Fig. 1D). On sagittal view, the *N. platensis* frontal lobes are similar to those of *L. africana* (Shoshani et al., 2006).

The nasal, maxillary and anterior parts of the frontal bones are poorly pneumatized when compared to older individuals of *N. platensis* (Alberdi et al., 2002). Two erupted molars in each hemi-arcade are in use and the maxillary bones have well developed sinus which reach the distal part of the tush alveoli. The DP2 are bilophodont, and the DP3 and DP4 are trilophodonts with the posterior loph always larger than the anterior one. Both left and right DP2 are worn with adjacent enamel figures on all cusps. DP3 are worn only at the protoloph. Both DP4 are still forming inside the alveolar pocket (Fig. 1C). The observed degree of tooth wear, based on Laws (1966), suggests that this was a very young individual of approximately six months old.

The use of CT scans and 3D reconstructions for paleontological studies are increasing, but some aspects need to be improved, such as taphonomic processes. Our next steps in this study are: 1) to conduct a taphonomic analysis on this specimen through the CT scans; and 2) to compare the identified anatomy of this calf with adult specimens of *N. platensis*.

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