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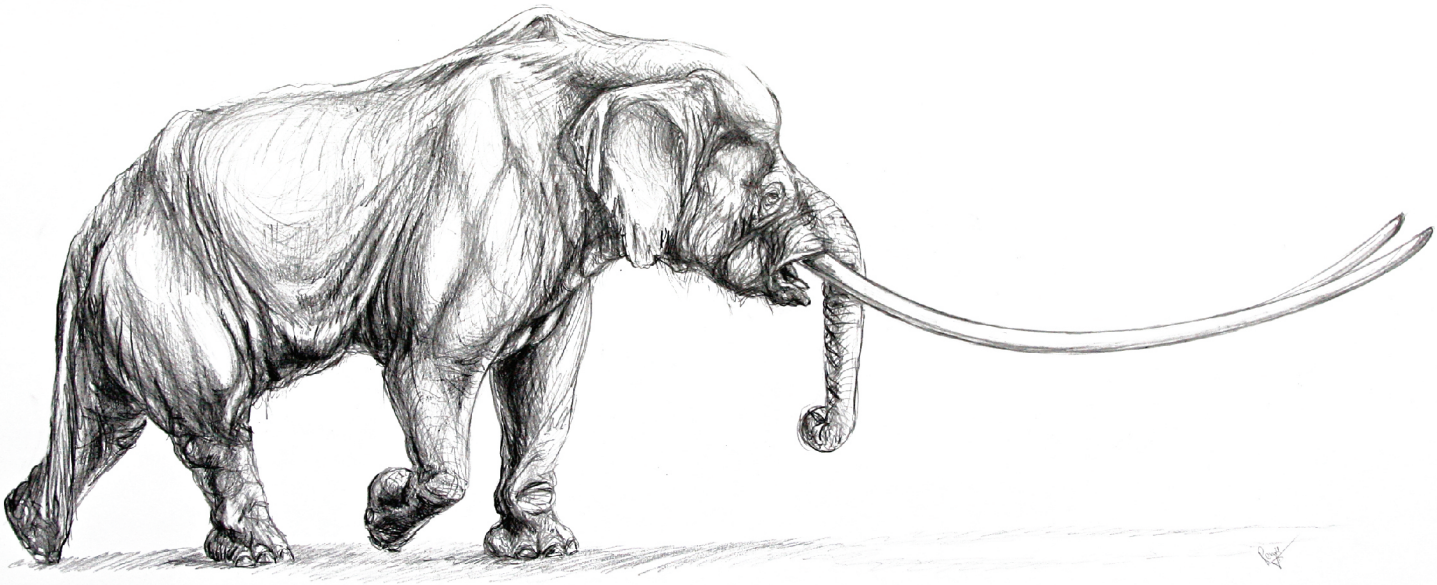

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ABSTRACT BOOK

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Feeding habits of South American gomphotheres (Proboscidea, Gomphotheriidae): a comparative study of proboscidean's paleodiet diversity in the Quaternary

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The study of paleodiet can elucidate dietary patterns of ancient organisms as well as their occupied niche, ecological plasticity, and the paleoclimatic/ paleoenvironmental aspects of their former habitat. Currently there are few published studies that focus on reconstructing the paleodiet of South American gomphotheres. Therefore, this contribution aims to: (i) recognize the feeding habits of *Cuvieronius hyodon* (Fischer, 1814) and *Notiomastodon platensis* (Ameghino, 1888) from low magnification of tooth enamel microwear features, and (ii) compare the dietary diversity between Quaternary proboscideans of South America with those from North America and Europe.

We have selected 21 teeth of *C. hyodon* and *N. platensis*. All specimens were upper and lower second permanent molars with wear stages 2-4 (Simpson and Paula-Couto, 1957). N. platensis specimens are from Brazil (Itaboraí/ Rio de Janeiro [IR] and Toca do Garrincho/Piauí [TP]) and Argentina (Buenos Aires and Santiago del Estero). While, *C. hyodon* is from Bolivia (Tarija). This material is housed at the main paleontological collections in the Americas.

The microwear analysis was performed following Solounias and Semprebon (2002) and Green et al. (2005). The analyzed teeth were free of taphonomic damage to the enamel of the metaloph/metalophid occlusal surfaces of both postrite

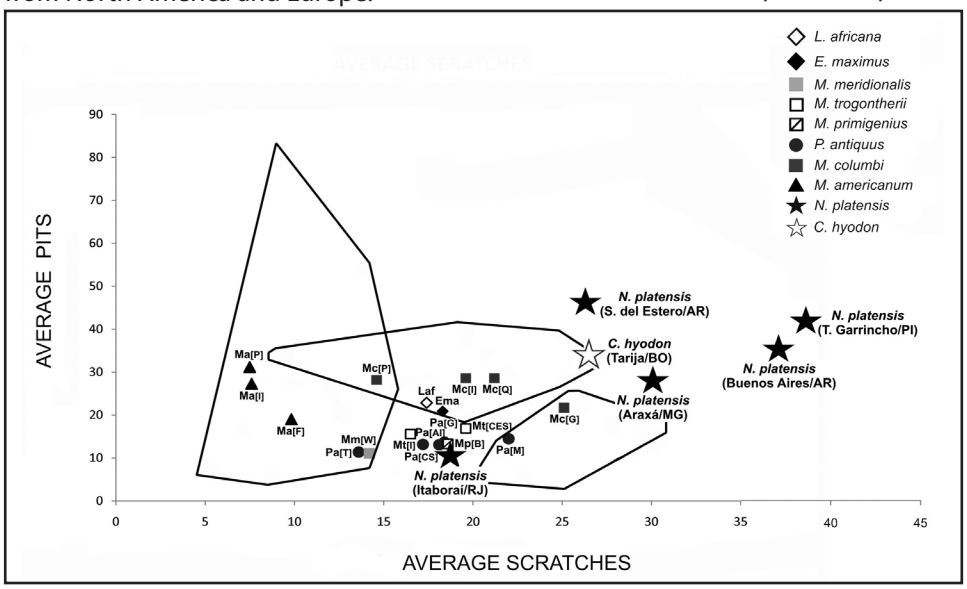

Fig. 1. Scatter plot of average scratches and pits of the South American gomphotheres compared with modern and extinct proboscideans from North America and Europe (Green et al., 2005; Rivals et al., 2012).

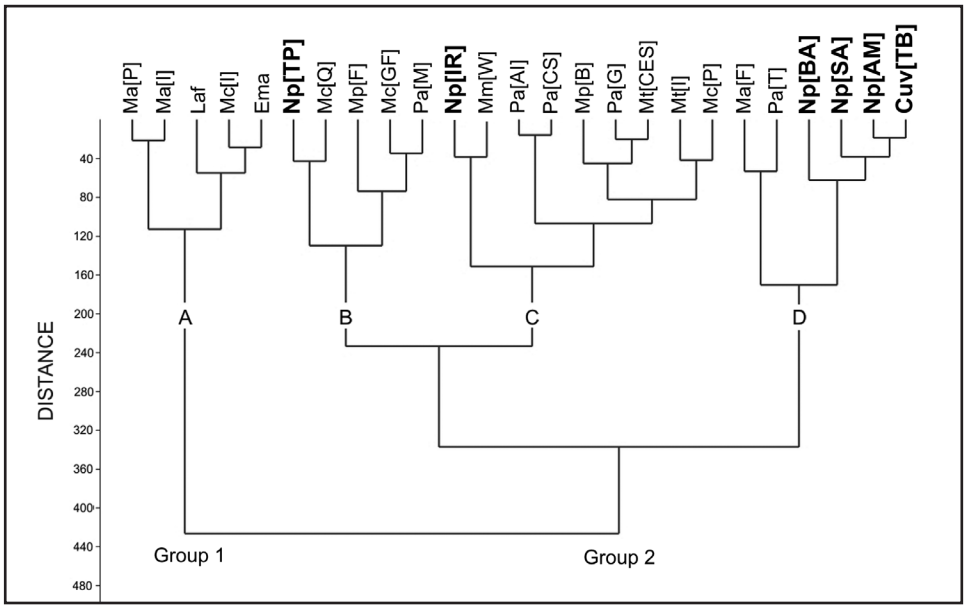

Fig. 2**.** Hierarchical cluster analysis using all microwear variables of the South American gomphotheres compared with modern and extinct proboscideans from North America and Europe (Green et al., 2005; Rivals et al., 2012).

Abbreviations: Gomphotheres: **Npl** = *Notiomastodon platensis* ([TP] = Toca do Garrincho/PI, [IR] = Itaboraí/RJ, [AM] = Araxá/MG, [BA] = Buenos Aires/AR, [SA] = Santiago del Estero/AR), **Cuv** = *Cuvieronius hyodon* ([TB] = Tarija/BO). Modern: **Laf** = *Loxodonta africana*, **Ema** = *Elephas maximus*. Extinct: **Mm** = *Mammuthus meridionalis*, **Mt** = *Mammuthus trogontherii*, **Mp** = *Mammuthus primigenius*, **Pa** = *Palaeoloxodon antiquus*, **Mc** = *Mammuthus columbi*, **Ma** = *Mammut americanum*.

Additional letters in the acronyms refer to the localities abbreviations (see Green et al., 2005; Rivals et al., 2012, pp. 3).

and pretrite cusps. For each tooth, these areas were cleaned before casting. The casts were examined under an area of 0.16 mm^2 using a stereomicroscope with 35x magnification. The following microwear scars were observed: scratches (fine, coarse and hypercoarse), pits (small and large), cross scratches, gouges and punctures. The observed patterns were compared to the microwear patterns previously described in the literature for extant ungulates (Solounias and Semprebon, 2002), and modern and Pleistocene proboscideans (Green et al., 2005; Rivals et al., 2012; Asevedo et al., 2012) through scatter plots, hierarchical clusters, ANOVA and Tukey HSD statistical tests.

South American gomphotheres from all the analyzed localities demonstrated generalist feeding habits which may characterize opportunistic behavior (Fig. 1). The specimens of *Notiomastodon platensis* from IR were possibly generalists consuming mainly woody plants. On the other hand, the specimens from the other three localities were especially consuming grasses, possibly complemented with other food items on a daily basis. And *Cuvieronius hyodon* were a generalist whose diet varied seasonally or regionally, similar to some extant and Pleistocene proboscideans.

Significant differences were observed between the generalist paleodiets (ANOVA, $p = 0.000629$). *N. platensis* from Argentina and from TP differs from the IR and the European elephantid *Palaeoloxodon antiquus* (Aguirre, 1969) specimens. The TP *N. platensis* also differs their diet from other European elephantids such as *Mammuthus trogontherii* (Pohlig, 1885) and *Mammuthus primigenius* (Blumenbach, 1799). These differences were evidenced by the high average of scratches and pits present on the teeth enamel of these gomphotheres as a result of great consumption of grasses.

The cluster analysis allowed the recognition of a group having high frequency of pits and scratches plus other mixed textures (Fig. 2, cluster D). On this group, *C. hyodon* and *N. platensis* have similar mixed diets. According to Mothé et al. (2013) both were probably sympatric only in Peru, suggesting a competitive exclusion between them. However, further studies are necessary to corroborate this hypothesis.

The mixed feeder *N. platensis* from TP clustered together with grazers and mixed feeders predominantly grazers. This is supported by the high frequency of pits and scratches with textures ranging from fine to mixed (Fig. 2, cluster B). There is a high similarity of diet between TP *N. platensis* and the North American grazer *Mammuthus columbi* (Falconer, 1857). This supports the idea that elephantid and gomphothere lineages could have competed for food resources. This corroborates the proposal of Lucas et al. (2011) that a possible competition occurred between *M. columbi* and gomphotheres during the Early Pleistocene of North America.

N. platensis from IR grouped with browsers and mixed feeders predominantly browsers. Their microwear scars showed a median frequency of pits and scratches (Fig. 2, cluster C). This is similar to the browsing diet of *Mammuthus meridionalis* (Nesti, 1825) from the Early Pleistocene of Europe. Both specimens apparently had a broad consumption of foliage from woody plants, as evidenced by scratches with mixed textures on dental enamel.

Competition between other sympatric Pleistocene proboscideans for food resources was also identified in our analysis, and corroborates previous studies. The present study shows that the Late Pleistocene South American gomphotheres of the selected localities were generalists that varied their diets according to the available food resources. Also, a possible sympatric competition occurred between species. This behavior was also observed in most species of different proboscidean lineages, except for *Mammut americanum* (Kerr, 1792) that fed only on leafs. Our analysis corroborates previous studies of competitive interactions in the Pleistocene between the North American gomphotheres, elephantids and mammutids, the European elephantids and the South American gomphotheres.

The continuity of this study will allow further inferences for understanding the ecological interactions between the gomphotheres *C. hyodon* and *N. platensis*, and will also provide more detailed data to allow the reconstruction of paleoenvironmental aspects of the Pleistocene of South America.

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