

# Reconstructing the Biology of Extinct Horses from Hard-Tissue Histology: The Case of a South African Hipparionine <sup>†</sup>

Carmen Nacarino-Meneses\* and Anusuya Chinsamy

Department of Biological Sciences, University of Cape Town, Cape Town 7700, South Africa

\* correspondence: carmen.nacarino@gmail.com

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**Abstract:** The microstructure of bones and teeth records individual growth and development in the form of incremental lines. In fossil bones, these features can be studied to infer important life history traits of extinct species, including growth rate and age at sexual and skeletal maturity. In fossil teeth, the analysis of incremental lines allows the estimation of rates and timings of tooth formation. Since mammalian dental development and biological events such as weaning are tightly correlated, estimations of dental formation time permits the reconstruction of the pace of life of prehistoric vertebrates. Here, we present the results obtained from the histological analysis of bones and teeth of *Eurygnathohippus hooijeri*, an endemic hipparionine horse from the early Pliocene (5.2 Ma) site of Langebaanweg (South Africa). We studied 4 metapodials (two III-metacarpals and two III-metatarsals), 2 femora, as well as 3 first lower molars and 2 third lower molars to reconstruct key features of its life history, including size at birth, growth rate, age at skeletal maturity and age at reproductive maturity. Our results revealed that this African horse followed a slow life history schedule, in which weaning and maturity occurred later as compared to similar-sized extant and extinct equids. Size at birth was comparable to that of large-bodied Miocene European equids, and newborn foals of *E. hooijeri* were likely smaller than those of extant and extinct *Equus*. Interestingly, we deduced different rates of growth from the bones and teeth, which raises the question about which of these mineralised tissues more accurately depicts the general growth rate of extinct vertebrates.

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