

Pathologies in the Fauna

The fossil fauna of Langebaanweg (now the West Coast Fossil Park), which is situated on the west coast of South Africa and dates to around 5-5.2 million years, is well-suited to document the global climate and environmental changes that were taking place during the Late Miocene, Early Pliocene transition. Earlier studies of this fauna revealed the presence of pathologies in some of the animals. Pathologies are useful indicators of health-status in some species and may be used to provide information on the life-style and environment in which the animal lives. For her PhD, Tamara Franz-Odendaal studied the extent of dental pathologies in several ungulate species from the Muishondfontein Pelletal Phosphate Member (MPPM) at Langebaanweg (see The geology at Langebaanweg for more information on the various geological members), and used this analysis, together with stable isotope analyses (see The use of isotopes in palaeontology and archaeology), to obtain fresh insights into the local palaeoenvironment during the Early Pliocene.

A morphological examination of over 3000 teeth showed that several species have a high prevalence of enamel hypoplasia, a developmental tooth defect that typically manifests as the result of systemic stress in captive zoo animals. A detailed investigation of the location and nature of enamel hypoplasia in *S. hendeyi* mandibular teeth indicated that the deciduous teeth and the upper portion of the first molar do not have enamel defects. This suggests a stress-free *in utero* period. Enamel hypoplasias were also found in the continually erupting hippopotamus tusks indicating that systemic stress was experienced during adult years as well as during the growing years of life. Many teeth have more than one defect per tooth crown suggesting that stress events were episodic. Irregular tooth wear was also observed in some animals. Defects in second and third molars of *S. hendeyi* were evaluated using high-resolution $\delta^{18}\text{O}$ sequences from across extant giraffe and sivathere tooth crowns. Results indicate that i) the weaning behaviour of the extinct sivathere occurs at a similar ontogenetic age to that in extant giraffes and that defects at the base of the second mandibular molar are not related to weaning. These defects together with those in the later erupting permanent dentition are therefore most likely associated with changing environmental conditions during the Early Pliocene, and ii) the presence of enamel hypoplasia on a tooth crown appears to correlate with periods of drought and increased aridity.

Another possibility which has not been completely ruled out is that there were excessive amounts of fluoride in the drinking water at Langebaanweg. This can also lead to tooth deformation and is another explanation for the pathologies observed in many of the Langebaanweg animal species.

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and

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