Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.10653

Dietary reconstruction of Pleistocene Australian herbivore megafauna using $\delta^{44/42}Ca$ and $^{87}Sr/^{86}Sr$ in fossil enamel

DAFNE S KOUTAMANIS[1], MATTHEW MCCURRY[2], THEO TACAIL[3] AND ANTHONY DOSSETO[1]

[1]University of Wollongong
[2]Australian Museum
[3]Johannes Gutenberg Universität

Presenting Author: dsk996@uowmail.edu.au

Food webs of Pleistocene Australian megafauna have been understudied due to previous lack of a suitable trophic level proxy. Calcium (Ca) isotopes in fossil tooth enamel provide a robust tool for reconstructing food webs. Prior to applying this proxy to extinct fauna with unknown ecologies, it is essential to delineate the Ca isotope composition of primary consumers. To understand dietary behaviours at the base of the Pleistocene Australian food web, we investigated Ca and strontium (Sr) isotope compositions of fossil remains of marsupial herbivores from Wellington Caves and Bingara (New South Wales).

Strontium isotopes suggest small home ranges in both large- and small-bodied taxa. This may indicate rich ecosystems that can support a diversity of taxa. Calcium isotopes in Pleistocene marsupial herbivores cover the same range as those in modern wombats and placental herbivores. Distinct Ca compositions between taxa can be interpreted as dietary niches. Some niches conform to previous dietary reconstructions of taxa and support niche differentiation across Australian herbivores, while others provide new insights into dietary flexibility throughout the Pleistocene. Low Ca isotope values in early-forming teeth may reflect milk consumption. Similar weaning patterns relative to tooth formation in large- and small-bodied herbivores suggest prolonged or late weaning in megafauna in absolute chronology.

The Ca and Sr isotope characterization of different herbivores provides new insights into the dietary behaviour at the first trophic level of food webs that included marsupial megafauna. Furthermore, it provides an isotopic baseline of available prey in Pleistocene Australia. This baseline offers the opportunity to reconstruct dietary behaviour of extinct species and decipher prey-predator relationships. Further Ca isotope analyses on Australian megafauna bear potential to test long standing hypotheses on the drivers of megafauna extinction, such as juvenile overkill and cascade extinction, and can illustrate how the trophic structures influences the sustainability of Pleistocene ecosystems.