Assessing Reworking and Stratigraphic Provenance of Bones from Scladina Cave, Belgium

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Prehistoric bones and teeth are extremely valuable resources for both life history (in-vivo) and diagenetic (ex-vivo) information. Taphonomy is the study of the ex-vivo processes and resulting alteration a biological organism undergoes from the time of its death until its discovery. Depositional and post-depositional taphonomic processes cause the mixing of remains that were originally interred during different events, forming time-averaged deposits. Observations of both macro- and microscopic [1] and histological [2] diagenetic alteration help assess the depositional history of bones at prehistoric sites. At Scladina Cave, such studies have demonstrated the relationship between physical alteration of remains and their original sedimentary contexts. Quantitative geochemical methods are being developed to modernise this approach. These are based on the assumption that the ex-vivo diagenetic alteration of bone, mostly occuring during early diagenesis, reflects the chemistry of pore waters present in its original depositional environment [3,4].

Cave bear (*Ursus spelaeus*) bones from Scladina Cave were analysed for trace elements with LA-ICP-MS to assess the geochemical variability between different contexts at this site. Trace element characteristics of bones from different contexts at Scladina are geochemically distinct. Although all material plots in a similar location in $(La/Sm)_n$ vs $(La/Yb)_n$ space [4], rare earth element concentrations, the shape of diffusion profiles, and the extent of La and Ce anomalies vary between bones from different sedimentary environments. Sedimentary contexts also exhibit different amounts of inter-sample variability that is indicative of mixing between facies. This provides a framework for assessing the degree of time-averaging (i.e., reworking) in bone assemblages that also might help to identify the original sedimentary context of reworked bones. Such an approach is especially important for remains that cannot be radiocarbon dated or at sites where sedimentary relationships are not clear.

[1] Madgewick & Mulville (2015) *J. Archaeol. Sci.* **53**, 255-263. [2] Turner-Walker and Jans (2008) *Palaeogeogr. Palaeocl.* **266**, 227-235. [3] Trueman & Benton (1997) *Geology* **25**, 263-266. [4] Trueman *et al.*, (2006) *Geochim. Cosmochim. Ac.* **70**, 4343–4355.