Joseph O. WARHAM

MAPPING BIOSPHERE STRONTIUM ISOTOPE RATIOS ACROSS MAJOR LITHOLOGICAL BOUNDARIES

Keywords: Archaeology, geochemistry, precipitation, residential mobility, Sr-isotopes, stream water, TIMS, vegetation

ABSTRACT

Strontium isotope analysis has provided archaeologists with an unprecedented opportunity to study the mobility of humans and animals in the past. However, a lack of systematic environmental baseline data has seriously restricted the full potential of the analytical technique; there is little biosphere data available against which to compare measured skeletal data.

This thesis examines the extent to which geographic variation in biosphere $^{87}Sr/^{86}Sr$ composition can be spatially resolved within the lowland terrain of England, in a geographically and geologically coherent study area. Systematically collected samples of vegetation, stream water and surface soils, including new and archived material have been used. The potential of these sample media to provide reliable estimates of the $^{87}Sr/^{86}Sr$ composition of bioavailable strontium are evaluated under both high-density and low-density sampling regimes, and against new analyses of local archaeological material.

Areas lying south of the Anglian glacial limit, display a pattern of geographic $^{87}Sr/^{86}Sr$ biosphere variation (0.7080–0.7105) controlled by solid geology, as demonstrated by high-density biosphere mapping. Data collected at a wider geographic scale, including above superficial deposits, indicate the dominant influence of re-worked local rocks on the biosphere. These methods have enabled a reclassification of the archaeologically important Cretaceous Chalk domain. Analysis of rainwater and other indicators of atmospheric deposition show that, in this setting, local biosphere variation is not significantly perturbed by atmospheric inputs.

Time-related data from archaeological cattle and sheep/goat tooth enamel suggest that the modern biosphere data can be used to understand livestock management regimes and that these are more powerful than using an average value from the enamel. A more complete understanding of possible patterns of mobility in a group of humans has been achieved through analysis of material from Winchester and comparison with the Chalk biosphere domain.

ACKNOWLEDGEMENTS

I would like to thank the British Geological Survey's British University Funding Initiative (BUFI) and the School of Life Sciences at the University of Bradford for jointly funding this project; I am sincerely grateful to the Division of Archaeological, Geographical and Environmental Sciences (AGES) for awarding me the studentship and giving me the opportunity to pursue doctoral research. It is a great pleasure also to acknowledge the contributions of my supervisors, Dr Janet Montgomery (Durham University, Department of Archaeology), Professor Jane Evans (NIGL), Dr Louise Ander (BGS), Dr David Cotton (AGES), and latterly, Dr Cathy Batt (AGES) and Professor Carl Heron (AGES). It has been a privilege to benefit from their knowledge and experience, their astute guidance, insight and patience.

Fundamentally, this research project could not have been undertaken without access to facilities provided by the NERC Isotope Geosciences Laboratory (NIGL), and the support of the scientists who have made me so welcome at the British Geological Survey (BGS). Accordingly, I would like to thank the Head of NIGL, Professor Randall Parish, for accepting an archaeologist into the fold and, amongst others, Dr Nicola Atkinson, Neil Boulton, Carolyn Chenery, Dr Simon Chenery, Dr Ian Millar, Dr Steve Noble, Aaran Sumner, and Vanessa Pashley. I should also like to thank my office-mates Dr Anglea Lamb and Dr Andrea Snelling, for their constant encouragement during the final phases of the production of this PhD thesis.

This research was also dependent to a great extent on the availability of archived materials, including both environmental samples and archaeological finds. The maintenance of such archives represents a significant commitment on the part of the intuitions and individuals responsible for them, and an important investment for future research. Thus, the Geochemical Baselines and Medical Geology group at the BGS made a substantial contribution to the success of this project. I am grateful to Kate Knights, and Andrea Mills for their assistance in accessing material held within the G-BASE sample archive (Chapters 4 and 5), and also to Dr Andreas Scheib for the training and supervision he provided during the GEMAS geochemical mapping project (Chapter 5). Heath Malcolm and Hayley Guyatt, of the NERC Centre for Ecology and Hydrology (CEH), provided me with access to unpublished data and to samples from the Rural Heavy Metals Monitoring Network, as well as advice on rainwater sampling without which the work presented in Chapter 6 of this thesis would not have been possible.

Thanks are also due to the curators who gave me permission to carry out the destructive analysis of archaeological material (Chapters 7 and 8), as follows: Dr Esther Cameron, Curator of Archaeology for Oxfordshire Museums Service; Brett Thorn, Curator of Archaeology for the Buckinghamshire County Museum; and Helen Rees, Curator of Archaeology for Winchester Museums. I am indebted also to Dr Annia Cerryson and to Dr Jo Buckberry (AGES) for their insights into Early Medieval burial practices, and for providing pre-publication access to their work on the human skeletal material from the site of Old Dairy Cottage (Chapter 8). I would also like to thank James Rackham (The Environmental Archaeology Consultancy), Dr Rebecca Nicholson (Oxford Archaeology) and Dr Fay Worley (English Heritage) for their advice on archaeolzoology.

I owe a debt of thanks to all of my colleagues, academic peers, and friends whose own research, comments and questions have encouraged, challenged and enlightened me in equal measure. My deepest gratitude goes to my family, especially Gemma Martin and my parents, Richard and Ilona Warham, to my brother Peter, and Nana Dorothy; they have provided steadfast encouragement and support throughout my mounting years of study, and at times some much-needed perspective on life beyond the lab, library and laptop.

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