Species Analysis of Leather Objects and Manufacturing Offcuts from Vindolanda, UK

Elizabeth M. Greene[1], Rhiannon Stevens[2], Barbara Birley[3], Gillian Taylor[4]

1. University of Western Ontario, Canada; 2. University College London, UK; 3. The Vindolanda Trust, UK; 4. Teesside University, UK

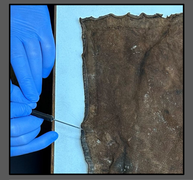
Roman Leather & Project Objectives

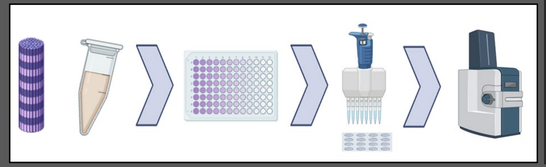
The Roman fort at Vindolanda on the northern frontier in Britain has produced the largest assemblage of archaeological leather from anywhere in the Roman empire. The leather assemblage spans over 300 years of occupation and includes numerous different types of artefacts, including tent panels, shoes, equipment, and manufacturing offcuts, offering an excellent opportunity to examine the characteristics of leather used in the Roman period in Britain. This initial study looks predominantly at tent panels, manufacturing offcuts (pictured right), and a few shoes.

Roman tents were made of seventy-seven large panels, carefully stitched together to prevent rainwater penetration. Visual analysis of the leather skin pattern in past studies has suggested panels were made predominantly from goatskin (van Driel-Murray 1990). An estimation of the total number of goatskins in use by the Roman Army is approximately 10,000 per legion, resulting in the total live goats needed per year at 1.5 million (Groenman-van Waateringe 2009).

Primary objectives: Apply ZooMS (Zooarchaeology Mass Spectrometry) techniques to: 1) Roman tent panels to confirm or deny their manufacture from goatskins; 2) manufacturing offcuts to determine the primary animal types used in leather manufacturing; 3) shoes to determine if different leather species were used for specific parts of a shoe.

Sampling Strategy





Leather samples were carefully taken from under the folded seam of the tent edge (see images left and right) where the least potential for contamination existed. Small holes show the precise stitch line of a French seam clearly on the edge of the tent panel, which ensured a watertight connection when the tent was assembled.

Using ZooMS species determination was completed for 8 Roman tent panels, 67 manufacturing offcuts, and 4 shoes. The tent panels were dated to the earliest period of occupation at Vindolanda (ca. 85-90 CE). The manufacturing offcuts and the shoes were from varied deposits at Vindolanda from occupation period 6B, dated to the early 3rd century.

All samples were analysed in triplicate. ZooMS sample methodology was followed from Welker *et al.,* 2015. and Buckley *et al.,* 2009.

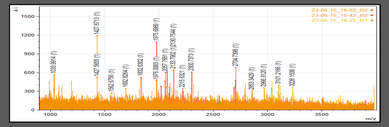
Preliminary Results

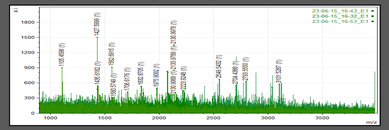
Tent samples yielded peptides for level identification of *bos taurus* (cowhide) and *ovis aries* (sheep hide). From the eight panels, three panels were determined to be *bos taurus* and five *ovis aries*. The viable samples of manufacturing offcuts, which were excavated from varied deposits from the 6B occupation period (ca. 200-211 CE), all yielded peptides from *bos taurus.*

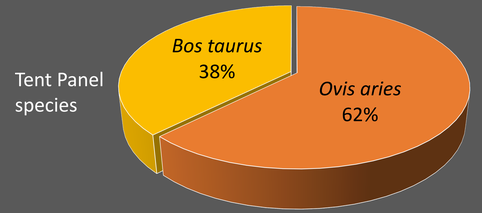
The reliability of ZooMS has been confirmed by many studies, thus although the literature has suggested Roman tent panels were manufactured from goatskin, these results indicate that there was a much greater reliance on cattle and sheep hides rather than goat hides in general use between the late 1st and the early 3rd centuries CE.

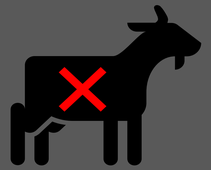
These results also show that visual morphology inspection and interpretation of leather for identification is not a reliable method for at least some archaeological leather.

These preliminary results contribute to our understanding of the Roman economy on the frontier and animal species used in Roman leather manufacturing.









Four shoes were sampled with the objective to determine if different types of leather were used for discrete shoe components. All shoes were from Period 6B (ca. 200-211 CE) levels. Samples from two shoes were viable (pictured above) and the following components of the shoe were sampled: outer sole, insole, midsole, uppers, and strapping thongs. All parts of the shoe, including the thick outer sole and the thin supple leather of the shoe uppers, yielded peptides of *bos taurus*. The results show complete reliance on cowhide in manufacturing offcuts, as well as in finished products such as shoes, in the early-3rd century.

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Impact & further considerations

Excavations at Vindolanda have returned vast assemblages (>7500 items) of vegetable-tanned leather that has already been typologically documented and described.

The application of proteomics can inform us about the Roman economy, as well as changes and trends in leather production, from ca. 85-370 CE. These results link to furthering our understanding of agricultural practices on the very edges of the Roman empire. Some further questions for future analysis include:

Do these results require re-evaluation of the supply of the Roman army, especially for sites on the frontier?

Does species choice for tents and other objects change through different occupation periods?

Does the waterlogged burial environment impact and influence the outcomes of palaeoproteomics?

Is climate change impacting quality and quantity of leather found during excavation?

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Contact Information:
Elizabeth Greene: egreene2@uwo.ca; Gillian Taylor: g.taylor@tees.ac.uk