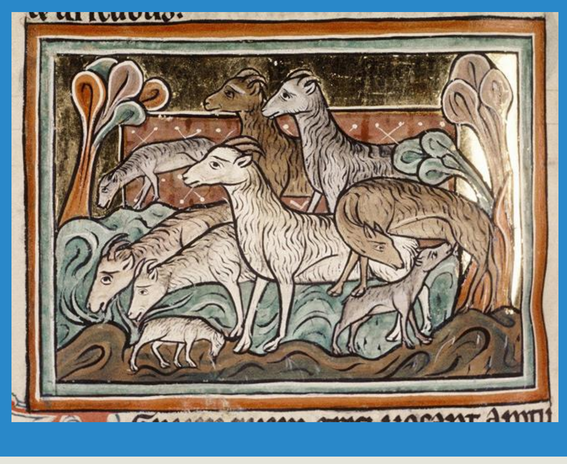

# Beyond Counting Sheep:
## an interdisciplinary review of faunal assemblages in the British pastoral landscape

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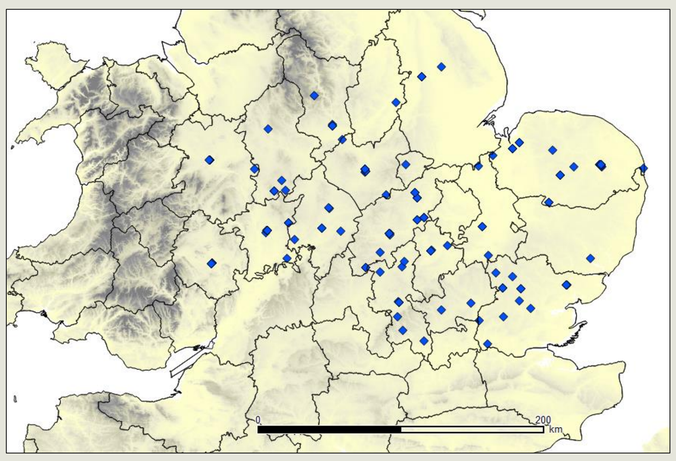
## Research Question

The following case study is part of an ongoing PhD thesis which explores methods of computational archaeology to address zooarchaeological challenges. The results presented here demonstrate the value of information visualization in the interpretation of British wool production based on the analysis of faunal remains.

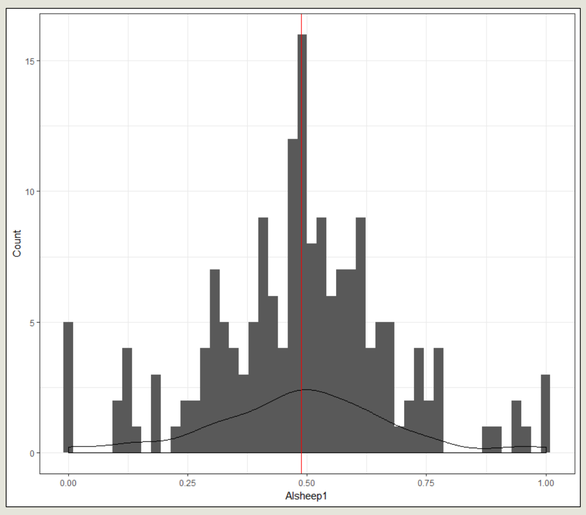



This case study includes 116 Medieval sites containing 176 assemblages from Central England (retrieved from the Archaeology Data Service, in Albarella and Pirnie, 2008). Indices of abundance are compared using Exploratory Data Analysis (EDA) in order to discover patterns in the data that would otherwise be difficult to identify.

Intensification of sheep husbandry in relation to the expansion of wool production in Britain during the Medieval period is difficult to quantify in the archaeological record. Patterns of change in relative abundance of faunal assemblages may be obscured due to the complexity of archaeological data. Multiple methods of analysis integrating zooarchaeology and computational archaeology should be considered.

## Methodology

The limitations of data that was accessible from the review of Central England does not allow the incorporation of multiple indices for analysis. Therefore, the abundance index (AI) for sheep/goat (per Lyman, 2003) is calculated as a ratio of NISP, where:
AIsheep1 = ∑NISPshgt/∑NISPshgt+NISPcattle.

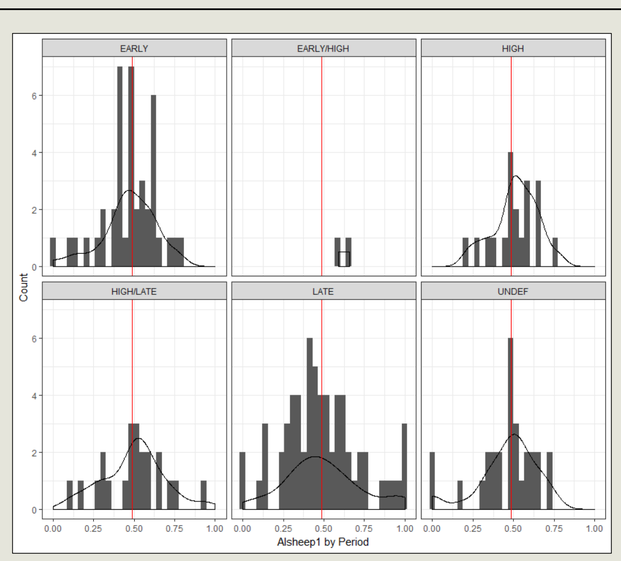



All data analysis and visualization was completed using the R statistical package (R Development Core Team, 2008), an open-source software environment built specifically for statistical computing. The general trend of the data is to cluster around the central tendency (mean = 0.487, indicated by the red line), with two smaller, distinct groupings at the highest and lowest 20% of the range.

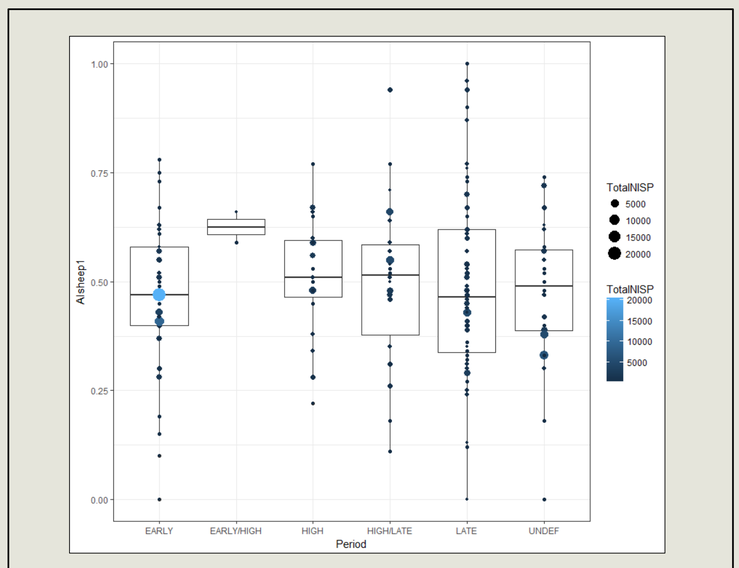
**Zooarchaeological methods often incorporate basic visualization but do not further explore patterns in the data beyond the interpretation of graphs, like the histogram above. The application of multiple methods of visualization is essential to exploratory analysis.**

## Results

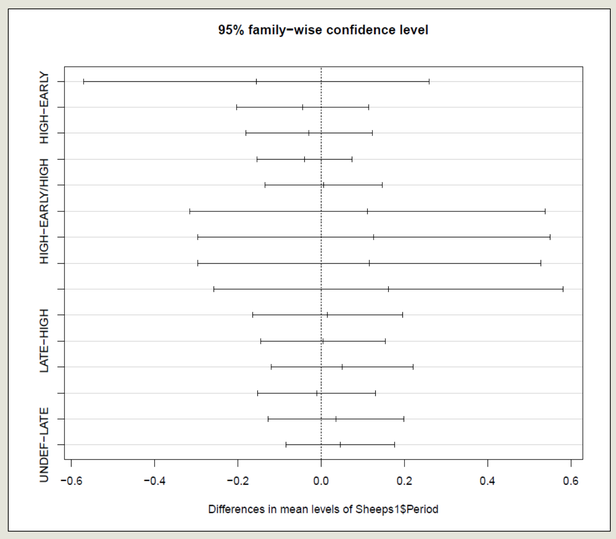
Quantification of variation in samples, and the relationship of this variation to multiple factors (such as chronological, social, or environmental change) is the main focus of this project. Assemblages were subset into Medieval Periods based on rough chronology, with some values falling in-between Periods, and sites within a broad chronology categorized as 'Undefined.'



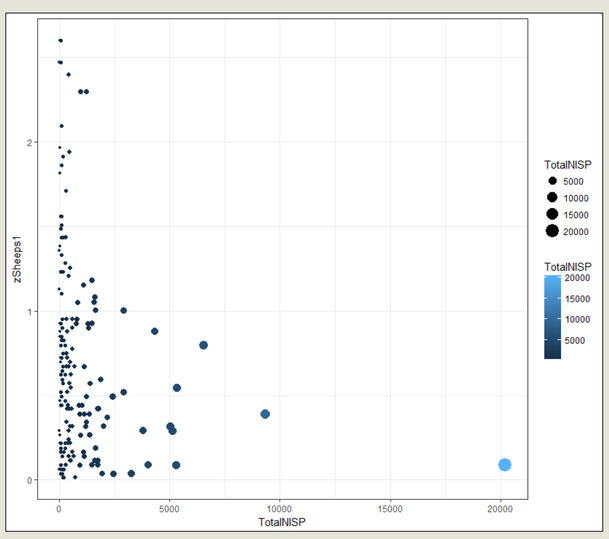

Distribution of AIsheep1 values by Period indicates a change in NISP ratio over time evident in the Late medieval period, as indicated by the increase in the highest and lowest values at each 'tail' of the density curves. This suggests a possible increase in variability of assemblages, including those with proportionally high counts of sheep NISP or high counts of cattle NISP.




Combined scatterplot with box-and-whisker plot illustrates the range of AIsheep1 values by Period, with Total NISP represented. The Late medieval Period stands out as observations are well-spread across the entire range of values; the obvious visual clustering of larger assemblages closer to the median in the Early Period encourages further exploration.




TukeyHSD is often used as a post hoc test for ANOVA to identify differences in the means between the each Period, and is especially useful when the sample sizes are unequal. Results of the confidence intervals demonstrate significant overlap between each Period group; however, further testing for non-parametric distributions is required to fully explore any variation.




Z-scores are computed for all assemblages to quantify the distance of values from the total sample median, and are compared with the Total NISP of each observation. The data shows a relationship between the size of an assemblage, and the diversity of NISP count, which has been confirmed through a test of correlation.

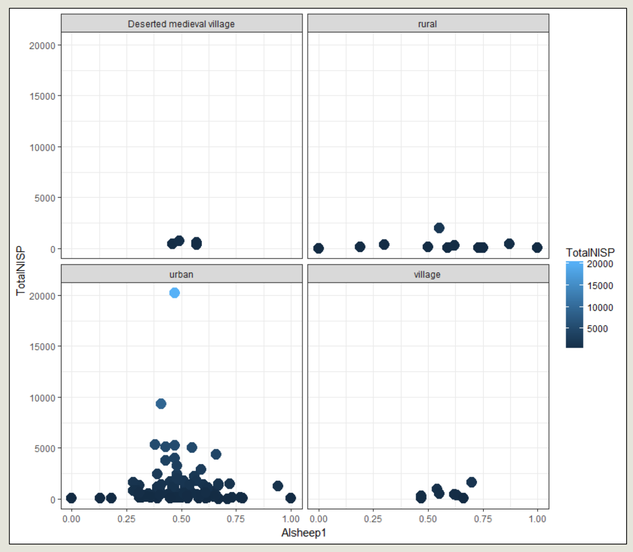
## Discussion and Next Steps

The effect of biases in data must be considered during any analysis. Taphonomy, treatment of carcasses, and differential recovery may all influence NISP counts, thereby skewing relative abundance indices. Despite the prevailing biases, some interesting patterns have emerged in the data, and are worthwhile to further explore. The visualizations above suggest that the effect of assemblage size on the distribution of AIsheep1 values may account for much of the variation between the Late Period sites compared to earlier observations. Testing the strength of this relationship versus the variation due to cultural change is of particular research interest.

**Informational visualization is a useful tool for analysing complex data, but does not need to be complex for interpretation.**

Visualization helps to generate hypothesis and must be followed up with more formal methods of analysis. Computational models will be applied to further understand what factors are generating these patterns, and additional statistical testing is essential in order to establish that the trends are not a result of random occurrence.

Future work continues with the exploration of the relationship between multiple variables and the variation in relative abundance over time. EDA of different parameters may discover new patterns in the data, illustrating areas of archaeological interest. A large number of observations in this data set are from urban assemblages, which tend to represent consumer, not producer, activity; additional data from rural and village sites could be compared with urban assemblages.

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## Further Information

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Results, metadata, and code for this project can be found at: https://github.com/rguildford/icaz.poster