APPROACHES TO THE INVESTIGATION, ANALYSIS AND DISSEMINATION OF WORK ON ROMANO-BRITISH RURAL SETTLEMENTS AND LANDSCAPES

A REVIEW

PAPER 6: FAUNAL REMAINS

Martyn Allen

1.1 Faunal remains, or zooarchaeological remains, are commonly represented by bones from mammals, birds and fish, though they can also include the preserved remains of skin, fur, feathers, mollusc shells (both marine and terrestrial), and insects. All of these classes of find can undoubtedly shed light on past human practices and environmental contexts, but due to limited space, this section will focus on the recovery, analysis and reporting of animal bones.

1.2 Best Practice Guidelines for the study of animal bones have been recently published by Historic England (Baker and Worley 2014). Their document provides a thorough overview of how to undertake zooarchaeological work, elaborating on the production of research frameworks, standards for the analysis of bone, and how best to present and archive data. The following section echoes some of the key messages highlighted by the guidelines. Here, however, the overall aim is to consider the issues arising from the synthesis of zooarchaeological data which have been gathered as part of the *Rural Settlement of Roman Britain* project. The resulting dataset is fundamental for addressing questions relating to herd management, the exploitation of primary and secondary products, hunting and fishing, and meat consumption. Livestock husbandry, alongside arable farming, formed the economic basis of late Iron Age and Roman Britain, and our understanding of the agricultural economy is dependent on our ability to synthesise data generated from the analysis of faunal assemblages. Unfortunately, varying levels of preservation and recovery, the use of different recording criteria, and inconsistent reporting, mean that some data are incompatible. These issues are reviewed here, in light of the experiences gained through working on the project, and suggestions are offered which might improve the situation in order to maximise knowledge for archaeologists and value for money for the developer.

2. Recovery

Preservation

2.1 From the outset, the successful recovery of suitable animal bone assemblages is constrained by the underlying geology, and more importantly, the pH level of the surrounding soil (Fig. 1). In broad terms, animal bone assemblages preserve best on the alkaline chalk and limestone geologies of the east Midlands and central-southern England, and most poorly on the acidic geologies of north-west south-west England and Wales (Fig. 2). The variation means that archaeologists working in different areas of the country may need to apply different sampling strategies for the recovery of animal bone (Fig. 3). However, excavators should also be aware of localised variations, such as on the coastal plain of West Sussex which is characterised by sandy and clay-based soils. These are generally unsuitable for bone preservation. Comparisons between animal bone data from sites on the coastal plain with those on the South Downs, only a few kilometres to the north, are greatly affected by differential soil conditions.

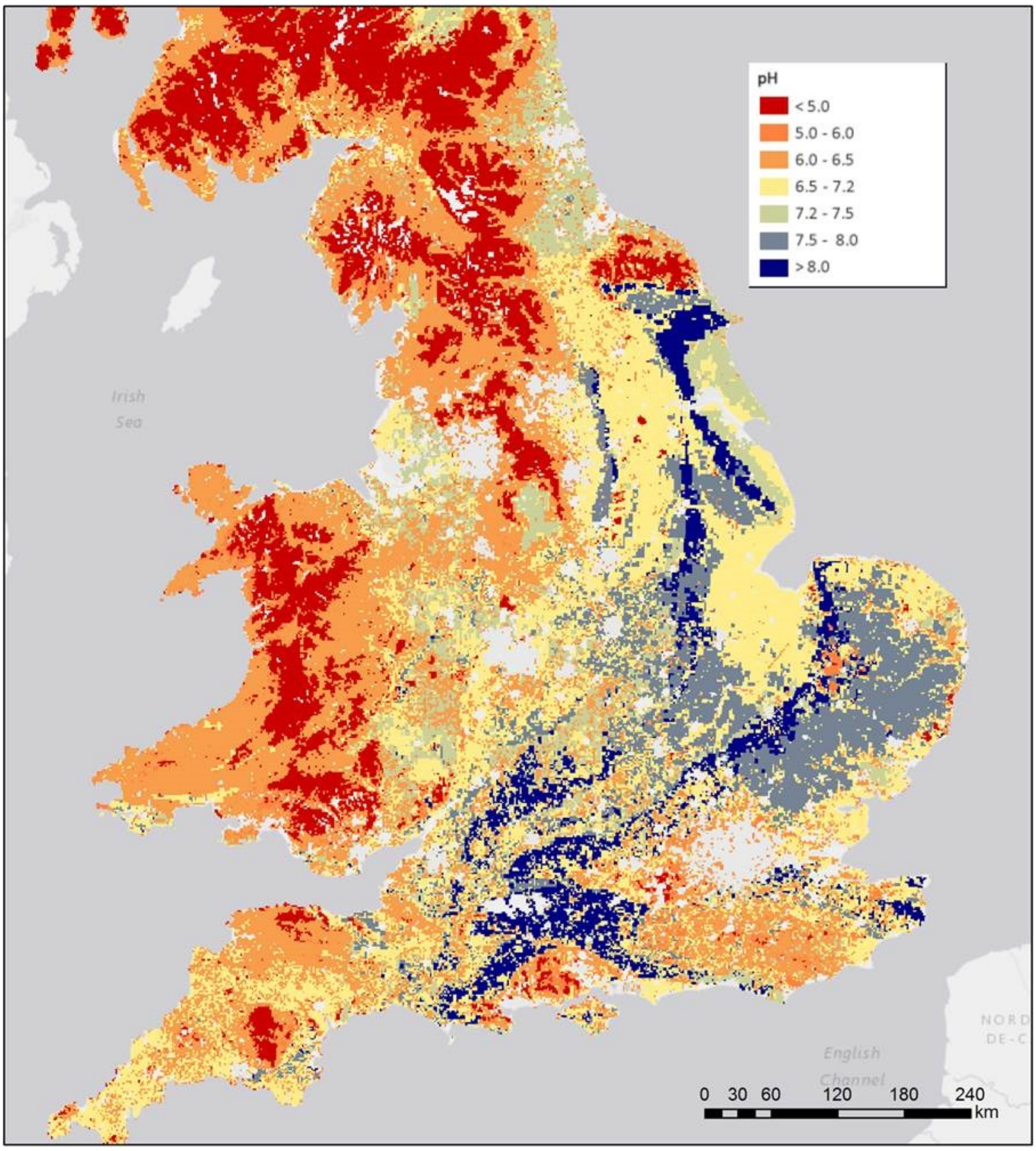

Figure 1: Map of soil pH (acidic soils shown in red and alkaline soils shown in blue) © NERC Centre for Ecology and Hydrology

Sample Sizes

2.2 The analysis of animal bones has tremendous potential for studying diet, livestock husbandry, seasonal exploitation, pet-keeping, carcass-processing, craft-working, and religious/ritual animal exploitation. Zooarchaeologists have often debated what a suitable minimum sample size is for answering questions relating to any of these issues. Larger samples are required to reliably examine the relative abundance of livestock on sites and in regions, as small assemblages will not be truly representative of farming practices. Studies have shown that species and skeletal element proportions can vary considerably between different settlement features, such as ditches and pits (Maltby 1985; Wilson 1996). Undoubtedly, the area excavated will have a significant effect on the quantity of material which can be recovered (Fig. 4).

2.3 However, the assumption that faunal assemblages must be of a certain (usually large) size to be informative is somewhat misleading. The most important factors are contextual integrity and reliable, high-resolution dating. Valuable cultural and environmental information can be gathered from ritually-deposited remains or the identification of rare species, while small taphonomic and biometric datasets can be pooled together and synthesised to generate robust results. It is also important to consider the geographic location of the site; in areas with few zooarchaeological assemblages even small samples may have great potential (Fig. 5). One area of zooarchaeological study which has been rapidly developing in recent years is the application of scientific techniques (e.g. mDNA and isotope analysis—see below), and these are not dependent on the recovery of several thousand bone fragments. Regardless of size, it is imperative that animal bone assemblages are recorded in a standardised manner, so that the resulting datasets are compatible and accessible.

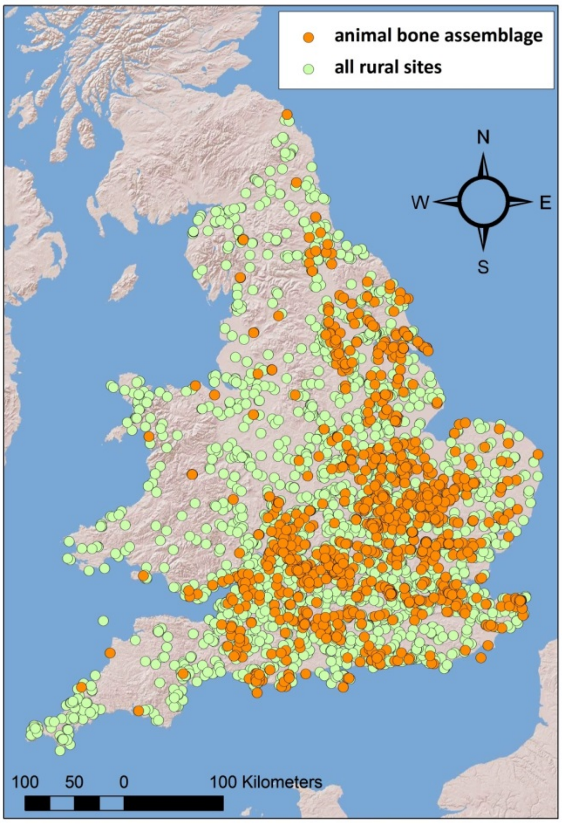

Figure 2: Distribution of animal bone assemblages from Roman rural sites in England and Wales

Sieving

2.4 It is well known that dry sieving and environmental floatation can dramatically increase the recovery of small bones, such as those from very young (neonatal) animals and smaller taxa such as rodents, amphibians and fish. Without these remains, key information about livestock breeding, seasonal exploitation and the environment may be missed.

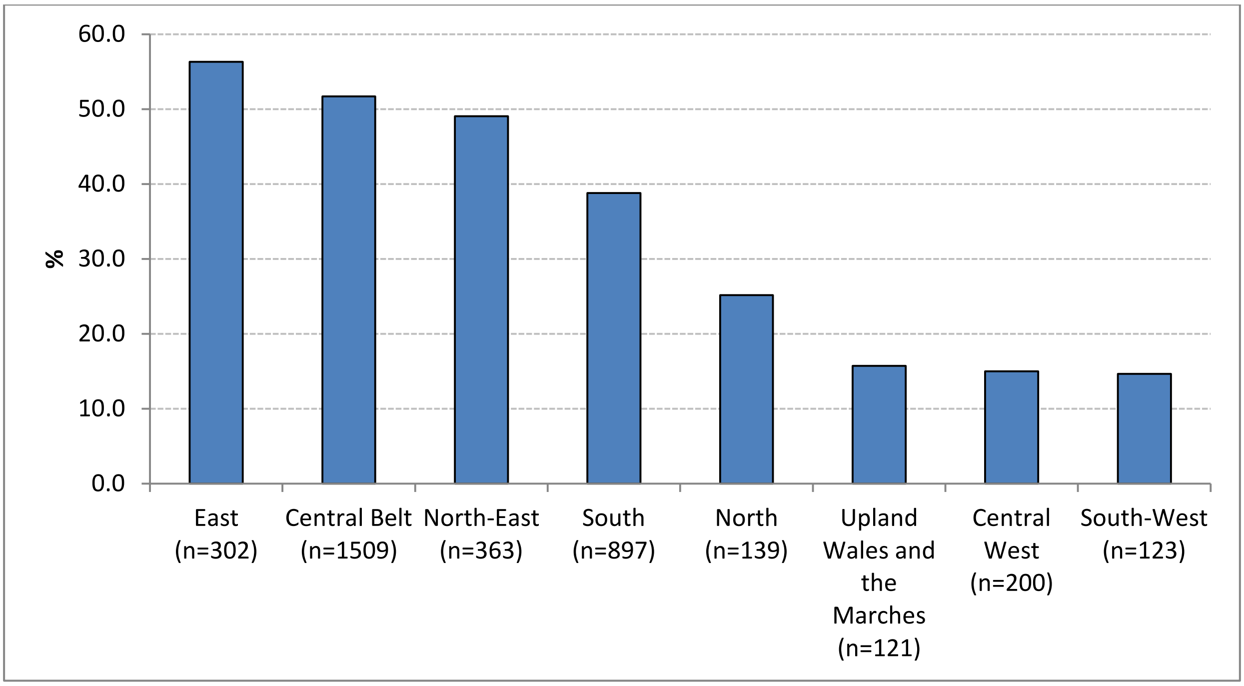

Figure 3: Percentage of sites with quantified animal bone assemblages in each region

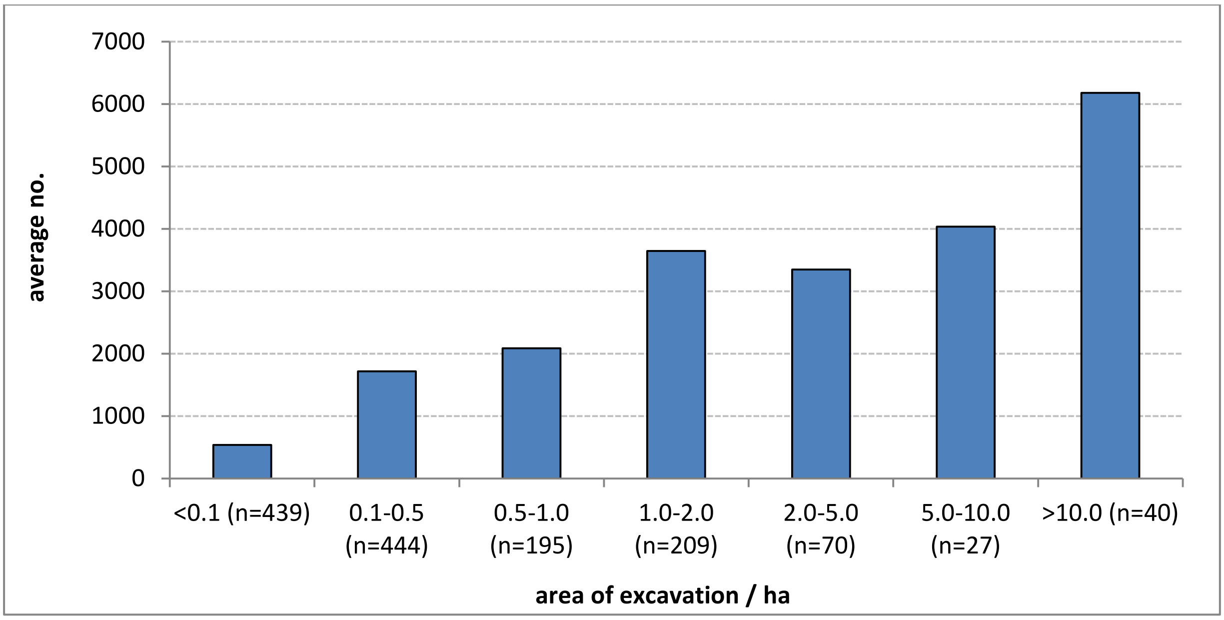

Figure 4: Average number of animal bone fragments recovered per area of excavation

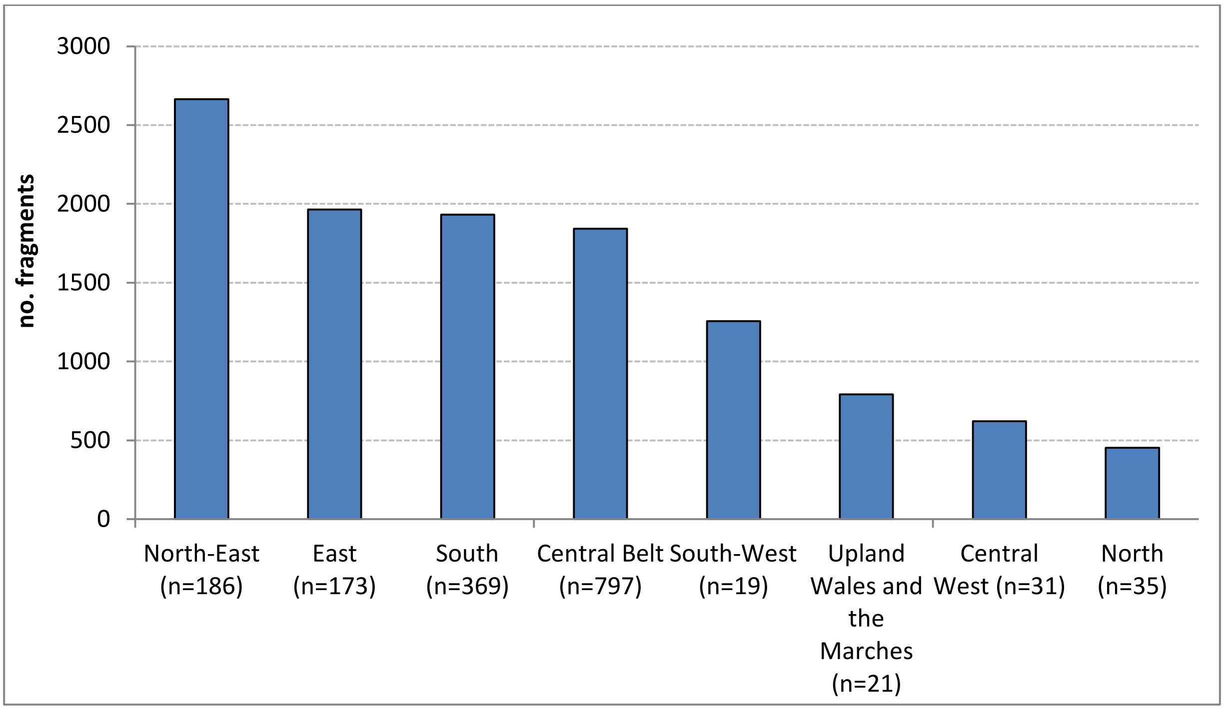

Figure 5: Average number of animal bone fragments recovered per site in each region

2.5 It is often surprising how many reports (including some quite recent examples) do not specify whether an animal bone assemblage has been sieved. This ought be a basic requirement for all faunal reports, which should also detail the number and volume of samples collected and the mesh sizes used (e.g. >4mm, >2mm, etc.). The use of sieving for the recovery of animal bone assemblages appears to vary considerably in different areas of England and Wales, particularly in regions which are poorly represented by faunal remains (Fig. 6). However, the situation has markedly improved over time, particularly since 1990 (Fig. 7).

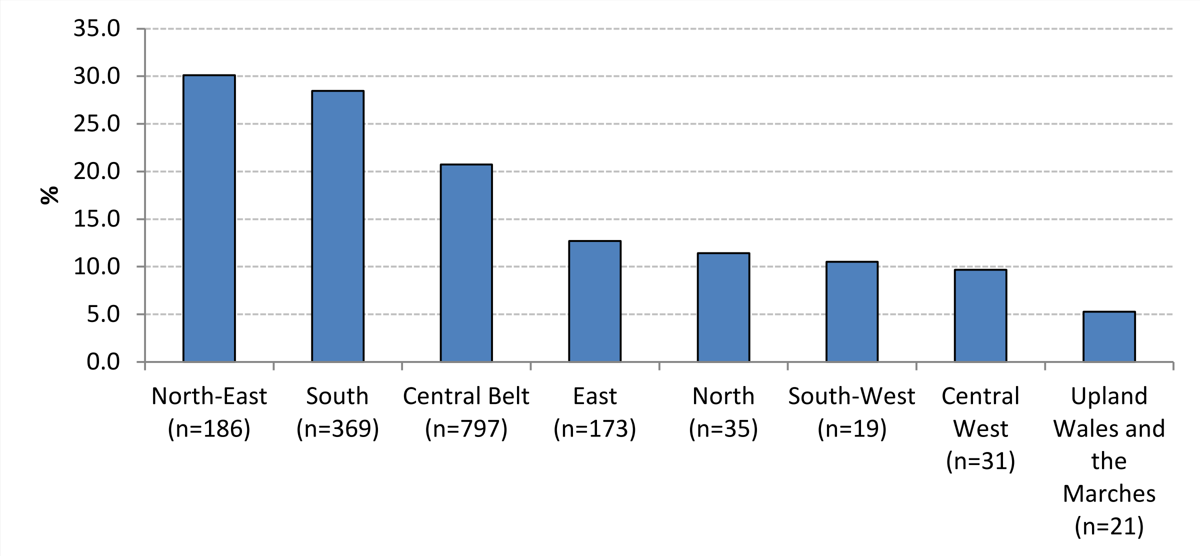

Figure 6: Percentage of assemblages recorded as being sieved in each region (either dry sieving or environmental floatation)

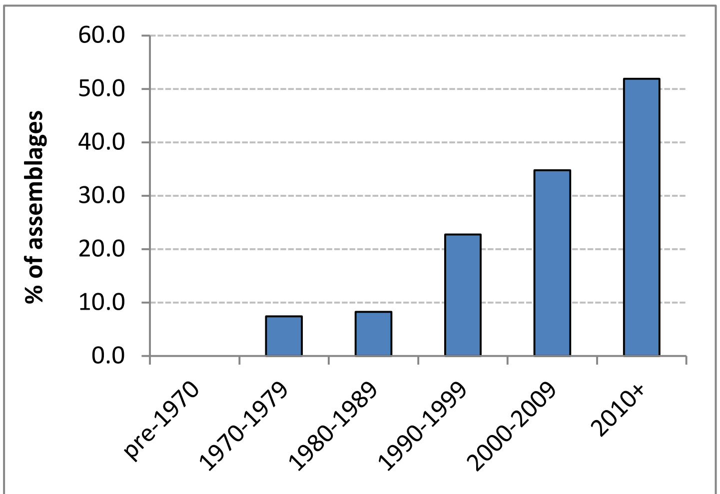

Figure 7: Proportion of sieved assemblages over time

2.6 Environmental floatation is now routinely undertaken on developer-funded excavations, though this is mainly driven by the recovery of macrobotanical remains. It is worth remembering that floatation can dramatically increase the recovery rates of small taxa and smaller bones from larger mammals. Analysis of rodent remains can provide important environmental information, while the recovery of bird and fish bones is also affected (Figs. 8 and 9). This can produce inordinate amounts of material which may require more analysis time (and is, therefore, potentially expensive). Sieving programmes could target particular features, such as cesspits, more effectively if zooarchaeologists are consulted from the outset of projects. This will require a reflexive approach to excavation strategies which will need to be implemented effectively by fieldwork project managers, with the aim of lessening the need to collect large numbers of random samples, becoming more cost-effective as a result.

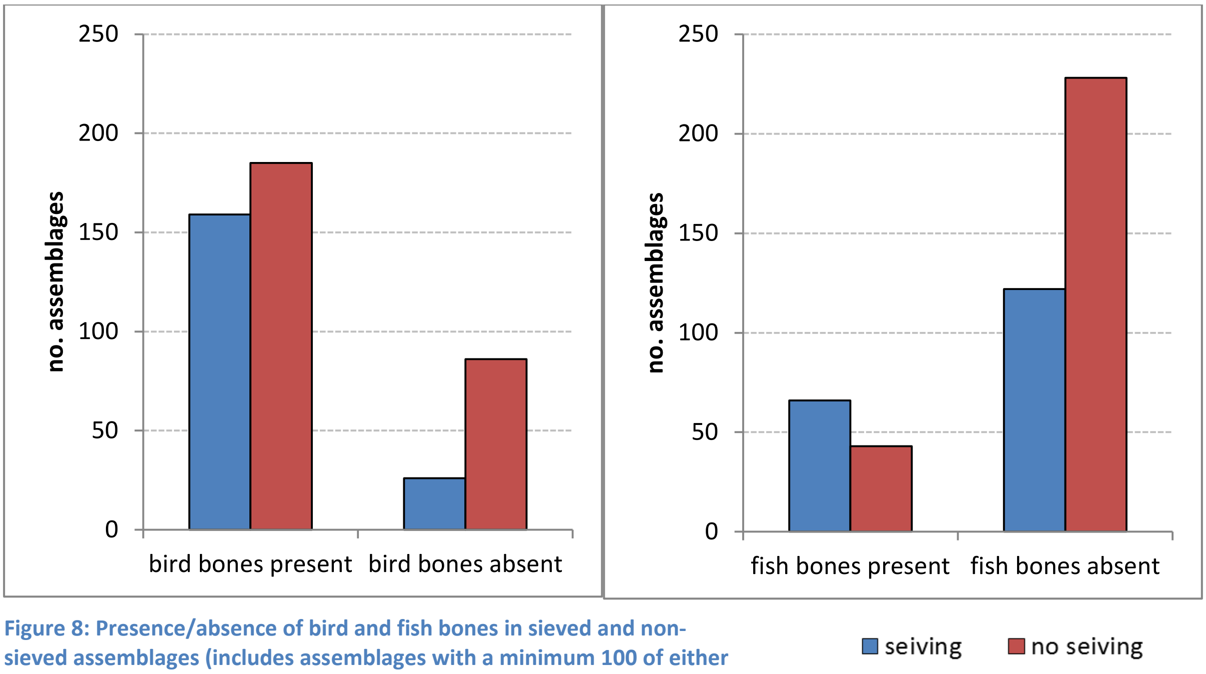

Figure 8: Presence/absence of bird and fish bones in sieved and non-sieved assemblages (includes assemblages with a minimum 100 of either bird or fish bones and sheep/goat + pig)

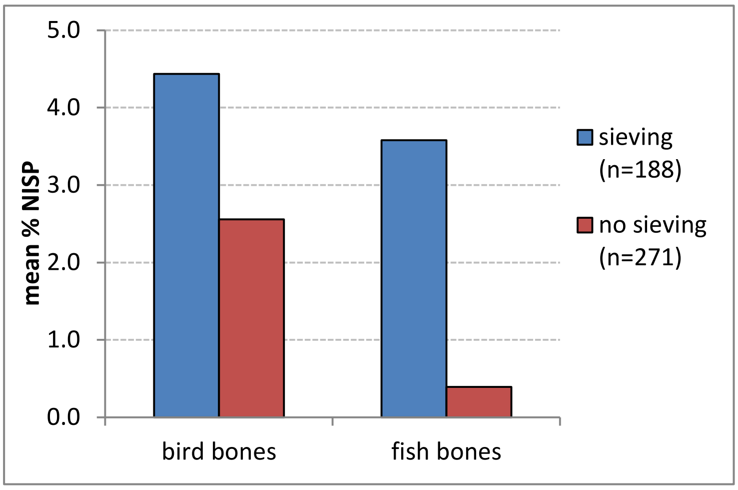

Figure 9: Frequency of bird and fish bones in sieved and non-sieved assemblages (bird and fish bones calculated as percentages of bird or fish and sheep/goat + pig bones)

Dating

2.7 One of the biggest issues for zooarchaeologists lies in accurate dating of animal bone assemblages. It is increasingly recognised that amalgamating data together as merely 'Roman' severely impedes our ability to examine change over time. While the situation is improving, nearly a quarter of all the faunal assemblages with over 100 identified specimens cannot be dated any more accurately than between the mid–first century A.D. and the end of the fourth century (Fig. 10).

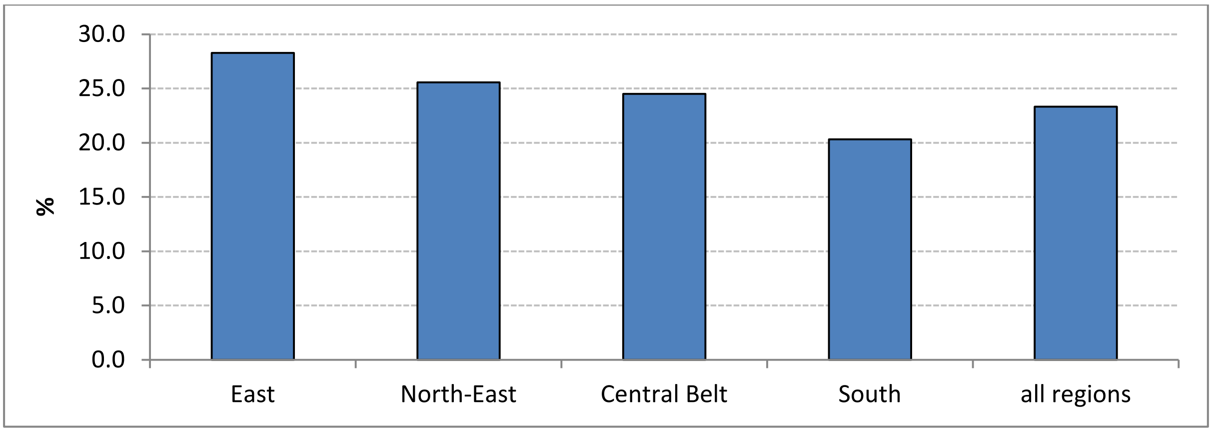

Figure 10: Frequency of assemblages which have been dated as 'Roman' (c. AD50-400)

2.8 Radiocarbon dating is obviously a primary means for dating a site (see Holbrook in Paper 2), but it is also important for the independent dating of faunal assemblages, particularly at Roman sites which do not produce many finds. This is particularly important in northern and south-western England and Wales. Radiocarbon dating should also be more routinely employed on sites where levels of intrusion and residuality are a potential problem (e.g. Hammon 2011).

3. Analysis

3.1 Although animal bone assemblages can vary in size and level of preservation, standardised recording methods are fundamental for comparing evidence for animal exploitation between different sites. One of the most crucial aspects of zooarchaeological work is to create datasets which are compatible and accessible. If this does not happen, archaeological contractors (and their clients) may be spending money on analysis which is only of limited use. Standardisation should be exercised in all areas of analysis, though the following section details some of the most important areas.

Identification

3.2 Identifying an animal bone to species is the basis of all zooarchaeological analysis. However, some species are particularly difficult to distinguish. Sheep and goats are perhaps the most common identification issue for most specialists working on Romano-British material. Many specialists rely on the presence of horncores and deciduous fourth premolars, which are relatively diagnostic, or on measurements of the distal metapodia to distinguish between the two species. It is often simply assumed that most ovicaprid bones derive from sheep. However, this means that our understanding of goat exploitation is quite poor. Equally, the identification of foxes, wolves and wild boar suffer due to their similarity to dogs and pigs, while the economic importance of mules and donkeys in Roman Britain is also poorly understood because of their similarity to horses (Johnstone 2004).

3.3 In Roman Britain, a number of species are thought to have been introduced for the first time, some of which were perhaps considered exotic. The identifications of fallow deer at Fishbourne (Sykes *et al*. 2006) and pheasants at Barnsley Park (Noddle 1985) have implications for how elites organised and managed their surrounding landscapes, while the presence of such animals provides important information regarding long distance movement and exchange.

3.4 As shown above, the recovery of small taxa is largely dependent on sieving. The presence of frog or mice bones may seem unremarkable; however, these small vertebrates can provide useful information about human behaviour and environmental conditions. Reptiles and amphibians are highly sensitive to climatic changes, while rodents are adapted to live in particular habitats. If more attention is given to the analysis of small taxa, then more nuanced interpretations of the use of specific features on Roman sites can be attained (for good examples, see O'Connor 2000, 123–6).

3.5 These are but a few examples, but it is important that zooarchaeologists attempt to identify such species and specify when they are absent.

Quantification

3.6 Quantification is crucial for comparing animal bone data from different sites. There are numerous methods of quantifying faunal assemblages, from basic fragment counts to calculating minimum numbers of individuals (MNI). NISP (number of identified specimens) is the most commonly used method. This is essentially a fragment count, though there are several different counting systems which can produce NISP data, such as bone zones, the 'epiphyses only' method, or Davis' rapid recording method (see Baker and Worley 2014, 30, fig. 20). Regardless of which system is used, it is essential that zooarchaeologists are explicit about the methods used in their reports.

3.7 One of the most consistent problems in presenting quantification data concerns associated bone groups. These are animal bones which are articulated, such as a whole limb or a partial skeleton. If each bone in the group is individually counted and added to the overall assemblage, certain species can be vastly over represented. Recently, zooarchaeologists have tended to isolate associated bone groups from the remainder of the assemblage. This appears to be a good solution to the problem. Additional data tables providing fuller details of these finds are also preferable and excellent examples can be found in reports from Wattle Syke, West Yorkshire (Richardson 2013) and Shiptonthorpe, East Riding (Mainland 2006). However, in some cases this is impractical, such as at Oakridge, Hampshire, where an extraordinary assemblage of domestic and wild animals had been deposited in a Roman well over a period of several centuries (Maltby 1994). Here, it was impossible for the zooarchaeologist to separate each animal bone group. Clearly, each faunal assemblage must be quantified and reported in the most appropriate manner possible.

Ageing

3.8 Ageing data can provide information on livestock exploitation strategies and can indicate whether an emphasis was placed on secondary products, such as wool, dairy or traction. There are two main types of ageing data: epiphyseal fusion and dental eruption and wear. Epiphyseal fusion concerns the closure timings of the proximal and distal epiphyses to the shafts of long bones. This occurs when the animal reaches skeletal maturity, though there is some variation between the closure timings of different bones. Therefore, a single bone can only reveal whether an animal was older or younger than a certain age when it was killed.

3.9 Dental eruption and wear provides a more accurate estimation of age, and there is a variety of different methods available for cattle, sheep and pig (Grant 1982; Halstead 1985; Maltby 1979; O'Connor 1988; Payne 1973). This is not the place to explain how these work in detail, but put simply the eruption timings of premolars and molars occur within known age ranges, while the amount of wear found on the occlusal surface of these teeth is also thought to increase at a consistent rate. Recent work on living cattle and sheep populations has provided more accurate data which show how these wear stages relate to the absolute ages of livestock (Jones 2006; Jones and Sadler 2010).

3.10 Constructing mortality profiles is very popular with zooarchaeologists. It is a relatively simple way of moving beyond what proportions of livestock were present at a site to establishing how they may have been farmed. However, because there are numerous methods, there is no universal consensus on which to use. In addition, many workers convert their raw data into more simple age categories. As a result, datasets are very varied and only partially compatible. Ideally, a single method should be used by all researchers, and the raw data should always be made available.

Biometrics

3.11 Measurements of animal bones can be used to examine body size and shape, with implications for differentiating between species, breed and sex whilst also providing information relating to age, nutrition, climate and pathology.

3.12 Collecting bone measurements is time-consuming; however, the rewards of doing so are potentially great. Albarella *et al*. (2008) carried out a detailed biometric study of several species from Elms Farm, Heybridge, Essex. The results were remarkable, showing distinct changes in livestock size during the early Roman period. This was only accomplished through the collection of an extensive biometric dataset from a large faunal assemblage, but it should stand as an example of what can be achieved with a well-dated sample if clearly defined research questions are integrated with project designs from an early stage.

3.13 Standard measurements for mammals predominantly follow the criteria of Von den Driesch (1976) and Cohen and Serjeantson (1996) for birds, with occasional extras added from other sources (e.g. Payne and Bull 1988). It is vital that zooarchaeologists use the established criteria and state which have been used in their methods. In some reports, there are instances of measurements being taken without reference to standard methodologies. For example, the articular breadth of the distal tibia is not the same as Von den Driesch's standard distal tibia breadth (Bd). Slight deviations from the most commonly used criteria can render entire datasets utterly useless for comparative purposes.

3.14 For particularly small assemblages it may not be worth collecting a wide range of measurements. In these circumstances, it would be better to select only the most commonly occurring elements, such as the distal tibia and the proximal radius. Similarly, if time and costs are an issue for larger assemblages, then the decision to only collect measurements from selected elements would be a sensible solution. However, there must be an agreed consensus amongst zooarchaeologists over which measurements to take as standard. There are many reports where zooarchaeologists choose completely different measurements to record and publish, even ones from the same bone. For researchers aiming to synthesise measurements from different sites, this produces a frustratingly disjointed and incomplete dataset.

Butchery

3.15 In recent years it has become widely accepted that new developments in butchery practice occurred in Roman Britain. This is argued to reflect the appearance of full-time, specialist butchers operating in towns and possibly at military sites (Maltby 2007). However, butchery marks are perhaps one of the most poorly-recorded classes of zooarchaeological data. Our ability to synthesise quantified butchery data from Romano-British sites is almost non-existent. This is partly due to a lack of use of established criteria. Maltby (ibid.) has set out some of the most commonly observed types of butchery found on cattle bones in Roman towns. However, this does not cover all types of butchery found on all species. Lauwerier (1988) has produced highly detailed recording criteria, which could be used more often by zooarchaeologists. The reason why Lauwerier's methods are not employed as standard is perhaps because they are too extensive and make use of complicated recording codes. The way around this may be to develop Lauwerier's criteria so that they are simpler to use, but also incorporate elements of Maltby's work. Only then can a compatible database start to develop.

Scientific Techniques

3.16 In recent years scientific techniques have come to the fore in zooarchaeology. Advances in isotope and ancient DNA analysis are revolutionising our understanding of livestock mobility, habitat use, and husbandry practices. Analysis of strontium isotopes from cattle have shown that the movement of livestock increased considerably between the middle Iron Age and the later Roman period in southern England (Minniti *et al*. 2014). The results perhaps suggest that a more complex network of trade and exchange of livestock developed as a consequence of the expansion of the Roman Empire into Britain. Scientific techniques are relatively expensive, but do not require large samples of animal bones. Isotope and ancient DNA analyses could be feasibly drawn into commercial project designs early on to answer different research questions than those that can be posed through traditional zooarchaeological analysis. If it is possible for commercial units, both in terms of finance and time-scale, for such work to be carried out, even on a small scale, it can lead to potentially novel interpretations of the evidence. In one sense, this allows for units to be more than simply 'data-producers', and would put them in a position where they can maximise knowledge and add value for money. If it is not possible for such work to be carried out, appropriate assemblages must be highlighted to university researchers so that subsequent examination can be undertaken. Of course, this requires that the material is properly archived and accessible.

4. Data Presentation and Archiving

4.1 It is not always possible for raw data to be presented in publications, particularly in journal articles where space for text is limited (see Paper 2). However, access to zooarchaeological data is a key requirement for researchers. Making the associated grey literature report available on the internet is one way around the issue, but this is rarely done in practice. The Archaeological Data Service, University of York, is the obvious repository for archaeological data. The online availability of raw data presented in MS Excel spreadsheets would be far more preferable for researchers, who would not be subjected to manually transcribing data. The archiving of meta-data would also allow for recording methods to be archived, freeing-up up text space in articles and monographs. Rarely is the general reader concerned by technical methodologies, but these are crucial for zooarchaeologists who are aiming to synthesise datasets.

4.2 The precise nature of what data are made available in conventional print publications and what is held in digital archives will no doubt vary between reports, depending on the format. It is possible to be flexible, but ideally all taxa quantification data will be presented in the main report as a minimum. Thereafter, basic statistical summaries (alongside graphs showing the analytical results) can be provided where presentation of the raw data is not viable. These data should always be signposted in the report with clear and accurate instructions on where and how to access them.

5. Conclusion

5.1 The resounding message which comes out of this section on faunal remains is one of standardisation and access to compatible data. Of course, being explicit about recording methods is important; researchers need to know how data have been produced. However, if data from one site are not comparable with data from other sites, the work to some extent represents wasted time and money. The goal here is to maximise knowledge and provide value for money.

5.2 In general, however, the future is positive. Most zooarchaeologists are open to the need for developing and standardising their methods to a greater degree. They understand the need to be more integrative with field archaeologists and other specialists, and there are communication forums which most zooarchaeologists use, such as the well-subscribed, 'Zooarch' mailing list (https://www.jiscmail.ac.uk/lists/ZOOARCH.html). Historic England also administers the Professional Zooarchaeology Group, which runs regular meetings and workshops for its members who come from the commercial and academic sectors. Nonetheless, there is still scope for a more detailed review of recording and reporting standards in zooarchaeology, one which would hopefully lead to a publication which seeks to be a little more prescriptive in certain aspects of data production and presentation.

5.3 There is, of course, also a need to be reflexive, particularly in the commercial sector, as different sites and assemblages raise different problems and opportunities. For this reason, it is important that faunal remains specialists are brought into discussions at the earliest possible stages of project design.

Martyn Allen, University of Reading m.g.allen@reading.ac.uk

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