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

A REVIEW

PAPER 7: THE RECOVERY, REPORTING AND ANALYSIS OF PLANT MACROFOSSILS

Lisa Lodwick

1. Introduction

1.1 Charred, waterlogged and mineralised plant remains can provide vital insights into the farming economy, diet, settlement activities and vegetation of Roman rural settlements, and datasets produced through developer-funded excavation have contributed to valuable new insights into Roman Britain (Van der Veen et al. 2008). The recovery of plant macrofossils from rural Roman excavations in Britain has been standard practice for several decades, through the processes of bulk sampling, flotation and laboratory analysis. There is much standardisation in the use of recovery techniques and identification terms producing comparable datasets. However, the quality of archaeobotanical data produced, especially since the instigation of PPG16, has been criticised (Van der Veen et al. 2007). The main challenges in current practice are the quality of the datasets in terms of sample size and number, and the availability of raw data. Current guidelines on plant macrofossils are within the Historic England Environmental Archaeology guidance (Campbell et al. 2011), with a focus on sampling rather than analysis and reporting. Research priorities for Roman Britain are laid out in Van der Veen et al. 2007.

2. Field Practice

2.1 The distribution of plant macrofossils within an archaeological site is dependent on geographical and archaeological factors, which must be considered when deciding bulk sample size. Charred plant remains occur at lower densities on clay, gravel and periodically wet soils, and in areas of lower scale crop-processing in the past, such as the north and south-west. Here large bulk samples (40L+) are needed. Calcium-phosphate mineralisation is rare in rural Roman Britain, appearing restricted to calcareous geologies such as at Kilverstone, Thetford (Ballantyne 2006). This form of preservation provides the best dietary evidence, and excavators should be alert for cessy type deposits. Waterlogged preservation, occurring in permanently anoxic conditions, is limited to areas with perched water tables, river gravel terraces and floodplains or coastal areas, such as the Thames and Ouse Valleys (Robinson 1992). The distribution of calcium-phosphate mineralised and waterlogged plant remains is very localised, hence it is vital that specialists have an input into the written scheme of investigation for excavation (Campbell et al. 2011, 5).

2.2 Bulk samples must be taken from single contexts, and from a range of feature types. For instance, it is important to not focus sampling just on corn-dryers, but also include the surrounding features. A recurring problem is that bulk samples are too small for the recovery of sufficient charred plant remains to undertake the type of data analysis which can inform upon questions of past farming practice (for a detailed discussion see Van der Veen et al. 2007, 203-4). Considering the data collected for the second volume of the Roman Rural Settlement Project (Allen et al. forthcoming), the most common sample volume was 6-10L, followed by 1-5L (Fig. 1). Only 8% of samples were greater than 20L. In many cases, the small sample size meant too few items were present for samples to contribute to crop-choice, crop-processing and crop cultivation analysis. In contrast, when visibly rich deposits of charred plant remains are encountered, for instance in corn-dryer flues or storage deposits of cereal grain, multiple small samples are preferable, such as on a grid system (eg. the corn-dryer at Grateley (Campbell 2008)). This way, the specialist can achieve the desired number of plant items (c. 400) without the need for time-consuming sub-sampling in the lab, which often produces complex data tables.

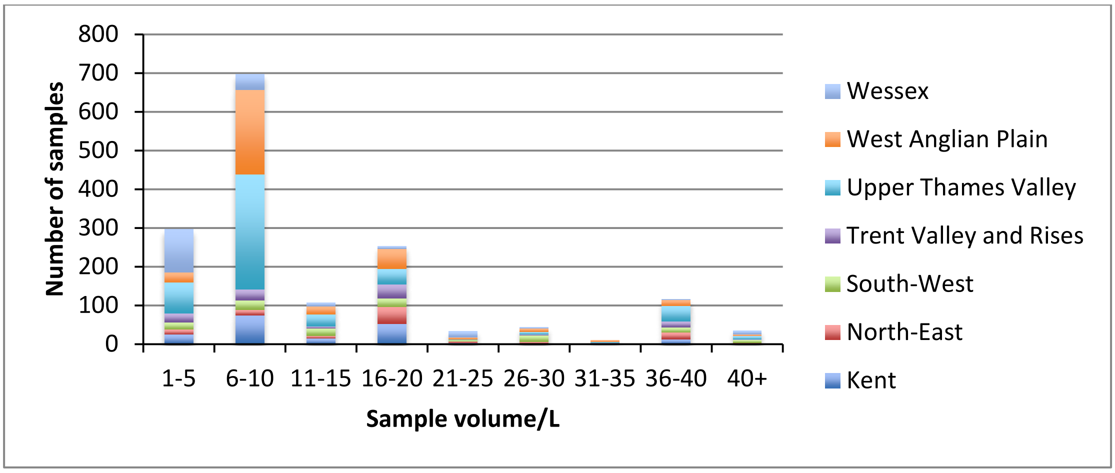

Figure 1: Bar chart showing the number of samples per sample volume range.

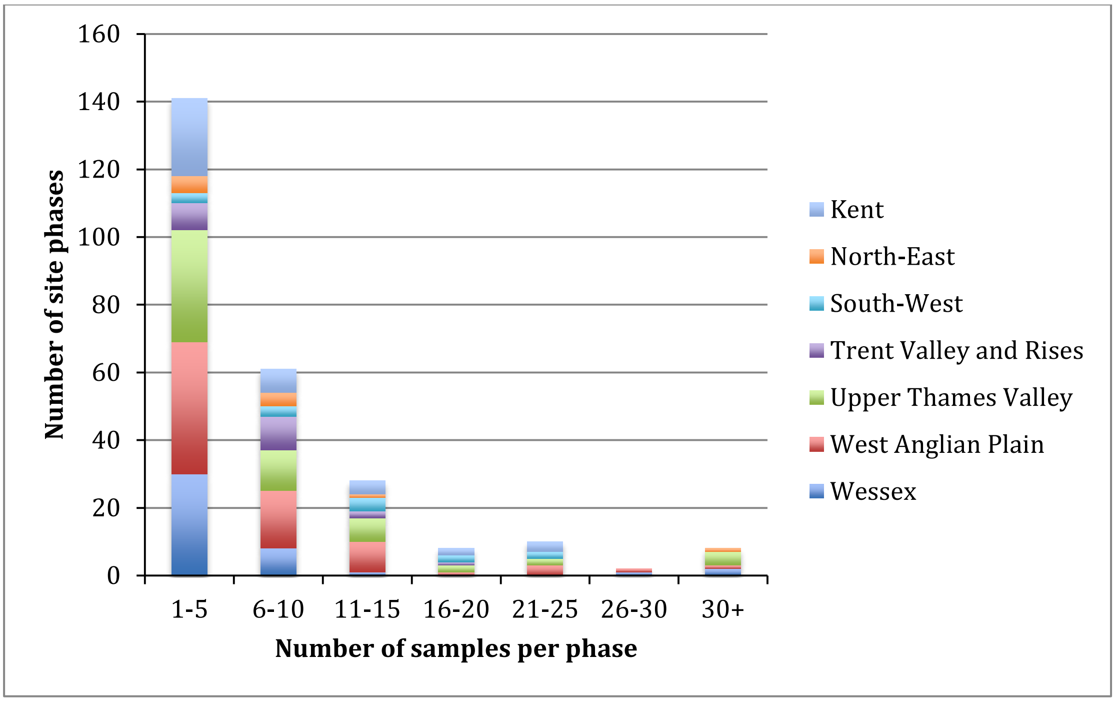

Figure 2: Bar chart showing the number of site phases per range of sample number.

2.3 Beyond the volume of individual samples, the number of samples per site is also a major issue for maintaining quality. The minimum number of samples analysed should be 30 per chronological period (ie. Early Roman, Mid Roman) (Van der Veen et al. 2007), which is likely to be prohibitively expensive for developer-funded sites. Even a target of 10 samples, which would enable basic frequencies of taxa per phase to be calculated is rarely achieved. Fig. 2 shows that at the highest number of site phases (141) only 1-5 samples were analysed per phase, followed by 61 site phases with 6-10 samples. Just 9 site phases had 30 or more samples, most of which were partly (Abingdon Vineyard - Stevens 1996) or wholly (Grateley South – Campbell 2008) research funded. Whilst small assemblages can be useful in the less intensively studied regions of Britain, it is impossible to evaluate the wider significance of single sample assemblages. Whilst these can contribute to quantitative regional synthesis (eg Parks 2012), they provide few insights into the interpretation of the individual settlement within the site report. A baseline of 10 quantified samples per phase would be preferable, even when samples contain sparse plant remains. Providing evidence of low-scale crop-processing activity requires negative (samples with few plant remains) as well as positive evidence. In terms of broader research questions, it would be preferable to analyse samples whose proportions appear to represent an unmixed crop-processing stage, such as glume base or glume wheat grain dominated. It is these samples and their weed seeds which can provide vital insights into farming practice (e.g. see Bogaard 2004). Once bulk samples have been processed, the resulting dry flots are small and stable, and could be archived for future research.

2.4 The processing of bulk samples by flotation is standard practice in Britain. It is vital that details of recovery method continue to be detailed in reports, and minor variations in flot and residue mesh size are observed. Ideally, a 0.25mm flot mesh should be used, although sometimes 0.5mm is necessary based on sediment size. Too often, reports do not state whether plant remains were also extracted from heavy residues, where the majority of fruit stones and nutshell will be recovered. Flotation has further benefits in the recovery of small mammal bones, fish bones and small finds, and provides often the only volumetric data from an excavation.

3. Analysis

3.1 The current guidelines provide only summary guidance on the analysis and reporting of environmental remains (Campbell et al 2011, 8), with elaboration on the contents of data tables provided in Van der Veen et al. 2007, 203-4, 7-8. Archaeobotanical reports in final publications are generally very good at identifying cultivated and wild plant remains to the appropriate level (crops following Zohary et al. 2012, Table 3). Whilst different floras are often used, with resulting differences in nomenclature (eg. Clapham et al. 1962; Stace 2010), as long as the full Latin binomial and flora used are stated, datasets can be compared. Numerous categories are often used to describe charred cereal remains eg. *Triticum* cf. *spelta/dicoccum*. These should always be explicit to rule out negatives, eg. *T. spelta/dicoccum* grain makes clear that a grain is not free-threshing wheat, whilst *Triticum* sp. includes a wider range of possibilities. Where time is limited, it is preferable from a research perspective to have the major crops identified to crop level (barley, spelt, emmer), without the nuances of hulled/non-hulled, twisted/straight, cf. /definite, but with detailed weed seed identifications. There is much variation in the level to which identification of difficult wild taxa are taken, such as Poaceae (grass) and *Carex* (sedges), and also the terminology used to identify items such as culm nodes (cereal culm; cereal type; cereal/Poaceae) and large pulses (*Vicia*/*Pisum*, *Vicia/Pisum/Lathyrus*). The Historic England Archaeobotanical Working Group is the venue where any consensus on these types of identifications could be reached. Identification should preferably be undertaken with access to a full reference collection of modern seeds, the location of which should be stated. Fully quantified data needs to make clear which crop items have been counted, eg. separating the glume base (n=2) and spikelet (n=1) category. Beyond identification to crop or wild plant, where possible, quantification should include evidence for taphonomic details, namely germination and evidence for insect attack. A full assessment of malting activity can only occur where the precise number of germinated grains and coleoptiles per sample are stated. Further morphometric measurements used to be commonly recorded on charred cereal remains. Considering advances in geometric morphometrics (Ros et al. 2014), any useful identification of landraces or sub-species will rely on reanalysis of archived plant remains. Along with the developing application of biomolecular techniques to plant macrofossils, namely aDNA and crop stable isotope analysis (Bogaard et al. 2013; Brown et al. 2015), it is increasingly likely that archived plant remains will be used for analysis.

3.2 A further stage in analysis is the identification of intrusive or residual material (Pelling et al. 2015). Any early introductions (rye, cultivated oat, imported plant foods) and late occurrences (einkorn, large proportions of emmer) should be radiocarbon dated to confirm that they do not derive from much earlier or later activity. Funds should be assigned for radiocarbon dating following the assessment stage. The presence of modern roots and seeds in non-waterlogged deposits must be commented upon, for instance the volume/ml of roots being a useful measure (Lower Cambourne – Stevens 2009). Any significant records of exotic new plant foods should be securely identified, preferably with a photographic or drawn record, and also radiocarbon dated to rule out the presence of intrusive material.

4. Reporting and Data Archiving

4.1 The final report must contain a detailed methodology statement (see Pelling 2008 for an example), results and interpretation. Fully quantified sample level data must be available. In too many cases, fully quantified sample data are completely absent, even when multiple pages of discussion on the results are included within a monograph length publication (Atkins et al. 2014), or a journal article focussed on the interpretation of the charred plant remains (Helm and Carruthers 2014). Quite often, semi-quantified assessment data are published. Beyond counts per sample, data tables must includ volume data. The density of charred plant remains has recently been argued as an important way to approach the scale of crop-processing (Van der Veen and Jones 2006). Out of 204 reports consulted for Volume 2 of the Roman Rural Settlement Project (Allen et al. forthcoming), 52 did not contain any volumetric data, including very recent publications such as the East Kent Access Road (Hunter 2015). Data tables must also include sample number, context number, feature type and phase for the data to be useable. Too often some of this information is missing, or data tables have been incorrectly formatted at the editing stage to make them unusable (eg Pelling 2009). Whilst published data tables often lack desired information from an archaeobotanical perspective, they are also often far too dense and impenetrable (eg. with 88 categories Stevens 2009) to provide useful information to the non-specialist.

4.2 The Archaeobotanical Computer Database (Tomlinson and Hall 1996) did provide an initial way for datasets to be collated, and has made a major contribution to numerous pieces of synthetic research (eg Van der Veen et al. 2008), but it is not viable to separate data archiving from the initial project. It is considered here that the best way forward is a dual system, whereby the full archaeobotanical data table is archived in a spreadsheet form or .csv, and a summary table is published in the final report. The first of these could soon become standard practice once plans to use the ARBODAT database system (Kreuz and Schäfer 2002) are realised (Pelling and Campbell pers. comm.). Data tables containing standardised identification terms would be archived by the specialist, avoiding any subsequent editorial deletions within the final publication. The in-text summary table could include, for instance, the frequency and total sum of standardised crop and weed categories per phase (eg. Ballantyne 2013), although this is reliant on sufficient samples being analysed per phase.

4.3 Beyond the presence of raw data, developer-funded reports are often lacking in any useful analysis and interpretation of the data. Even large assemblages, such as Lower Cambourne or Springhead, are discussed largely through qualitative observations. Where quantitative analysis is present, a wide range of different summary statistics is used, prohibiting comparison between reports. Any graphical analysis is typically based on the categories of ‘grain’, ‘chaff’, and ‘weed’ which are well established as not useful categories for understanding the analysis of past crop-processing activity (Van der Veen and Jones 2006). Spatial analysis of sample composition is rare. Useful information of the spatial organisation of site activities was gained from spatial analysis of charred plant remains at Langdale Hale (Ballantyne 2013). Discussion sections of reports often elaborate on individual taxa, for instance the link between *Anthemis cotula* and heavy ploughing (Stevens 2009), or *Pinus pinea* (stone pine) cones and ritual activity (Pelling 2008). Analytical categories are available, such as standard crop-processing ratios (Van der Veen 2007, Table 987), British Ellenberg numbers (Hill et al. 2004), National Vegetation Communities (Rodwell 1991-2000), or biological indicator groups (Hall and Kenward 2003) which, if used, would allow the easier comparison and improved research contribution of developer-funded reports. Currently, budgets are too small to enable specialists the time to undertake such analysis. With waterlogged and mineralised plant remains, a multi-proxy approach is vital to understanding assemblages, and further efforts must be made to enable data-sharing and communication between specialists working on the same features.

5. Conclusion

5.1 In order for archaeobotanical reports to inform upon questions beyond those of the main cereal crops present at a site (Fulford and Holbrook 2011, 340), datasets must be improved in quality (number of items and number of samples) and availability (full quantified data tables). Whether the detailed analysis of the resulting data happens within the developer-funded report, or within subsequent research is up for debate. The fact that bulk sampling of excavations of rural Roman settlements has been systematically applied, producing a large quantity of comparable data, is a great success. However, to ensure the time and funds invested in taking and processing bulk samples can contribute the most value and insights into Roman rural settlement, the quality, availability and analysis of plant macrofossil data have to improve.

Lisa Lodwick, University of Reading l.a.lodwick@reading.ac.uk

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