

# Methodological approaches towards the quantification and identification of charcoal samples retrieved from archaeological sites

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**Summary:** *The National Roads Authority (NRA) awarded funding to the authors to conduct a PhD research project entitled 'Quantifying woodland resource usage in the Irish midlands using archaeological and palaeoecological techniques'. Pollen cores from a lake and a small hollow as well as charcoal and wood samples from 86 archaeological excavations are being used as indicators of woodland resource usage. There are two main questions addressed. Are we identifying a representative sample set from archaeological sites and are we identifying enough or over-identifying charcoal fragments from each sample in order to determine wood function, wood use and reconstruction of surrounding woodlands? Two charcoal data sets, ranging in date from the Neolithic to the Post Medieval Periods, are currently under investigation where mean saturation points and proportion saturation points of taxa are recorded and graphed. Initial results from the saturation point profiles for taxa diversity indicate that there is little variance in saturation points between time period, site type and short and long term charcoal deposits. Mean saturation points are also lower than expected for most site types evaluated. Further work is on-going using a variety of statistical packages; the data from the 500 samples and these results will be discussed in this paper.*

**Key words:** *Ireland, woodland resource usage, methods, saturation curves*

## INTRODUCTION

This project aims to determine the optimal sampling effort by archaeologists to determine the identity and relative abundance of wood and charcoal samples found during excavations. In this regard there is no definite sampling and identification strategy employed on archaeological excavations and in post excavation analysis in Ireland. Previous studies and recommendations from France (Chabal *et al.*, 1999), England (Keepax, 1988; Asouti, 2001) and Pompeii, Italy (Veal, 2009) will be discussed and compared to results from this study.

## ARCHAEOLOGICAL BACKGROUND

The charcoal data have been sourced from excavations carried out in the midlands of Ireland along the route of the new 57-km- N6 Kilbeggan–Athlone Dual Carriageway. Archaeological investigation identified over 86 archaeological sites reflecting approximately 6,000 years of human activity in the area (Fig. 1).

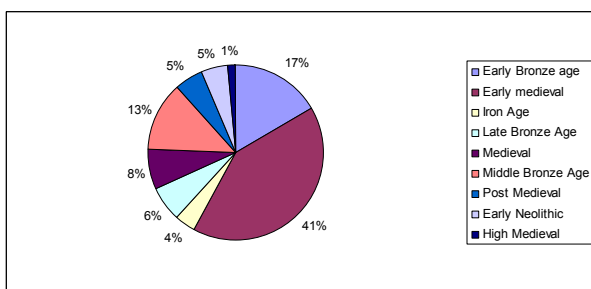


FIGURE 1. Site types represented in the data set.

## RESULTS AND ANALYSIS

Two data sets are analysed. Five hundred samples from the first data set have been analysed and up to fifty fragments from each context/sample have been identified, where present (Fig. 2). This data will be statistically analysed to aid in the production of optimal sampling recommendations pertaining to archaeological sites.

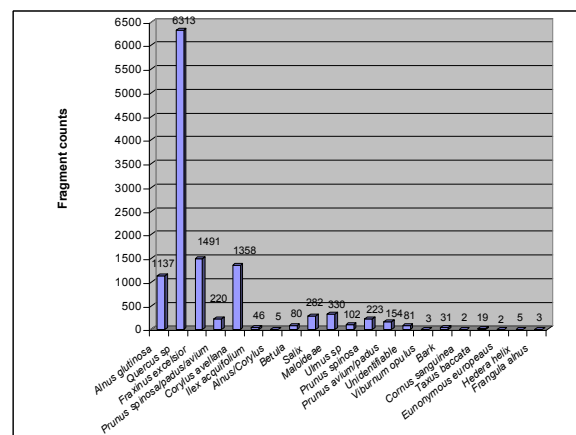


FIGURE 2. Identifications from 500+ samples within the study area. This information will be used to determine optimal sampling procedures.

The second data set which includes the graphing of saturation points (Fig. 3), mean saturation points (Fig. 4) and proportion saturation points of taxa types from 79 samples and 5400 identified charcoal fragments are outlined below. An optimum count of 100 fragments per sample was identified. Results as shown in Figure 3 and

4 records the variation in saturation points across the range of sites/samples investigated. Saturation points range from 1 – 86 after which no new taxa are identified.

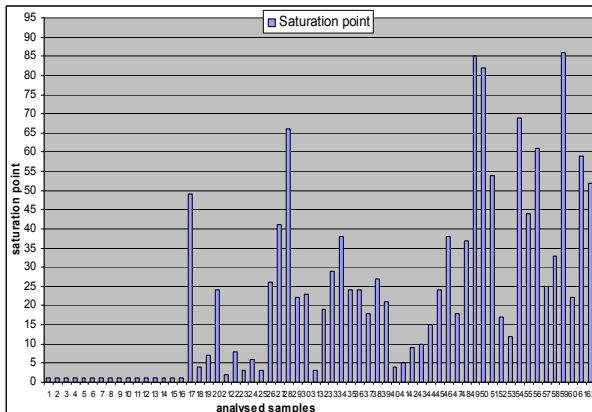


FIGURE 3. Saturation points for all samples analysed for fragment count/taxa diversity analysis.

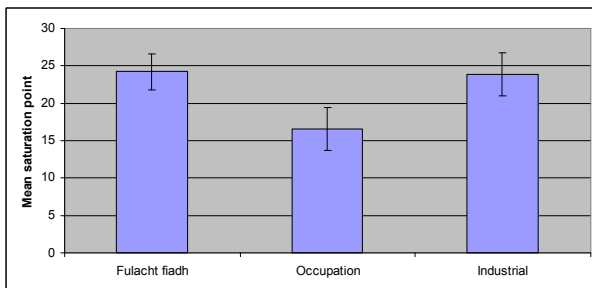


FIGURE 4. Mean ( $\pm$ SE) saturation points of three site types analysed from the area

Mean saturation points for three site types commonly excavated in Ireland (Fig. 3) are graphed above with standard error bars also denoted (Fig. 4). *Fulacht fiadh* are the most frequent archaeological pre-historic site found in Ireland and may have had varied functions including cooking troughs, sweat house and bathing areas. Occupation sites relate to both Bronze Age habitation sites as well as Medieval dated ringforts while industrial sites include kilns, charcoal production pits and metalworking activity. Results show that mean saturation points for taxa diversity occurs under 25 fragments for all site types analysed.

## DISCUSSION

When mean saturation points are plotted for site types and time periods a notable consistency between variables is recorded. The mean saturation points centre on 25 fragments which is lower than expected. Current practice in Ireland is to identify 50 fragments per sample where possible. The low saturation points may be related to lower taxa diversity both within the samples and in the surrounding woodlands of Ireland. The results are unexpected when compared with minimum recommended fragment counts from other studies in countries elsewhere (Keepax, 1988; Chabal *et al.*, 1999; Asouti 2001; Veal 2009).

Previous studies by Keepax suggest a minimum of one hundred charcoal fragments should be identified to

produce a meaningful dataset but this is not always possible or allowable within current budgets. Chabal *et al.* (1999: 66) suggest a minimum of 250 fragments per level, with 400-500 fragments considered as the optimal subsample while Asouti (2001) recommends an intermediary count at 150 – 200 fragments. Veal's (2009) recent PhD on charcoal quantifications from Pompeii (where 3911 fragments were identified) and where saturation curves were completed suggests that saturation points tended to occur between 60 and 80 fragments before the saturation curves levels out (Veal, 2009: 87). A recurring theme throughout the previous cited studies is that over-identification of individual samples does not compensate for identifying sufficient samples from an archaeological site or level/period therefore further statistical analysis on the analysed 500 samples will provide direction as to the optimal sample analysis per site for the detection of woodland resource use in Ireland. These studies will then be amalgamated with the results from pollen analysis completed from the area for this project.

## CONCLUSIONS

Consistent results across all time periods and site types are revealed when the mean saturation points for taxa present within archaeological charcoal samples are plotted.

A further 500 samples and 12,000 charcoal fragments will be statistically analysed to inform researchers and stakeholders alike as to the optimum sampling strategy for a variety of archaeological sites. These issues will be discussed in detail at the conference in September. The results will inform sampling strategies on future road schemes and large infrastructural projects in particular as the NRA is the funding body for this research. These results and recommendations are particularly important within current financial constraints.

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