Analysis of Plant Remains from the 31RK222 site

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Introduction

Archaeological plant and animal assemblages represent only a small fraction of what was originally used and deposited by humans in open-air settings. Natural and cultural taphonomic processes can significantly modify organic remains, resulting in recovered assemblages that differ dramatically from the original deposits. As archaeologists, we examine collections that have undergone a series of processes—from the original collection of plants and animals by humans from the natural environment, to food preparation, cooking, discard, animal and insect scavenging, burial, decay, and weathering, to the eventual recovery of food residues by archaeologists. As a result, these food remains cannot be interpreted at face value. Instead, standard methodological procedures for sampling, quantification, and analysis allows us to make sense of botanical assemblages. Here we report on the identification and analysis of the archaeobotanical assemblage from the 31RK222, North Carolina with occupations possibly dating to the Middle Woodland period (2 samples).

Recovery and Preservation Bias

Formation processes, or the ways in which an artifact or feature entered the archaeological record, are an important consideration in archaeobotanical analysis. In general, seeds may enter the archaeological record: 1) through gathering, cooking, or other processing activities; 2) by being incidentally brought to the site alongside a comestible and thrown away; 3) having been gathered for non-food purposes and discarded as waste; 4) as an inclusion in dung used for building material or fuel; 5) or blown in or accidentally brought back as a rider (see Hubbard 1976). These scenarios provide cultural and environmental context for the entry of plants into the archaeological record. The mode in which a plant is collected, transported, processed, used, and discarded will influence its entry and abundance in the archaeological record (see Dennel 1976; Miksicek 1987; Minnis 1981).

We must also consider how the botanic remains were preserved, as preservation impacts the composition of the archaeobotanical record. Macrobotanical remains in exposed environments will decompose rapidly due to biological, chemical, and weathering processes. However, archaeological plant remains may be preserved at an archaeological site: 1) in an extremely dry environment; 2) in an extremely wet (anaerobic) environment; or 3) through carbonization (Pearsall 1988). Dry preservation (desiccation) occurs in areas where the continual absence of moisture inhibits the development and growth of bacteria, fungi, and other microorganisms that assist in decomposition. Recovering desiccated remains from archaeological excavations is rare, but when encountered they often provide a more complete inventory of plants than the carbonized assemblage. In wet environments, water saturation (waterlogging) will create conditions that inhibit the growth of microorganisms and thus slow decomposition, resulting in remarkably preserved botanical remains; in extremely dry or wet environments, the favorable conditions for preservation often create unique challenges, such as the recovery of a preponderance of dense materials from a site. Finally, preservation through carbonization, in which organic material is converted into an inorganic matter, is the most commonly encountered vector of plant preservation worldwide (e.g., Hastorf and Popper 1988; Wright 2010) and is the most likely form of plant remain to be recovered in the Eastern Woodlands of North America.

The type or portion of plant that is recovered is also relevant to a discussion of preservation and formation processes of botanic remains in archaeological sites. Comestibles and other food-related items that have non-edible parts (e.g., maize cobs, nutshell) are often

discarded into the fire as fuel (see Minnis 1981) or used as a tool. The discarded inedible portions may survive into the archaeological record depending on their density. For example, nutshell, which tends to be denser than the edible parts (e.g., nutshell, dense seeds), has a higher likelihood of surviving the process of carbonization and thus being preserved in the archaeological record than a maize cob because they are more fragile than nutshell. On the other hand, edible portions of plants that are often consumed whole (e.g., beans, maize kernels) or raw (e.g., fruits), are less likely to enter into the archaeological record, though accidents do occur and are patterned (see Yarnell 1982). In this situation, coprolites may provide the only direct evidence of a consumable/consumed taxon.

Methods of Quantification

Quantitative methods in archaeobotany have developed significantly over the past several decades (see Hastorf and Popper 1988; VanDerwarker 2010). The most common methods used by archaeobotanists for recording and quantifying plant remains are raw (absolute) counts and weights. Absolute counts and weights are unstandardized data and may reflect differential preservation, sampling, local environmental conditions, or other factors. These measures are a useful way to display original data as it was collected by the archaeobotanist and may be used by other researchers for comparative analysis. However, raw counts and weights are not appropriate for direct evaluation due to problems of comparability between plant taxa because they do not control for preservation biases and sampling error (see Miller 1988; Popper 1988).

One way to avoid the problems of absolute counts and weights is by using the ubiquity measure (Pearsall 2000:212-16; Popper 1988:60-64). This method of standardization calculates the percentage of samples in which a taxon is present relative to the total number of samples. The taxon is considered present whether there are 1 or 1,000 specimens, and the same frequency score is given no matter the count. For example, if maize is present in 6 of 10 samples, it receives a ubiquity score of 60%. This is an excellent means for dealing with differential preservation, as plants that may be overrepresent or underrepresented due to taphonomic processes have the same influence when present. Ubiquity is also useful for investigating spatial and temporal patterns of plant use within similar contexts, though the results but may be less meaningful when comparing contexts of differential deposition or use.

Density is another useful standardizing measure that uses a constant variable, such as soil volume, to create a comparative ratio to assess the relative abundance of plants at the site (Miller 1988; Scarry 1986). To calculate density, the absolute count of plant taxa (numerator) is divided by the total soil volume collected from a sample, context, or site (denominator). Standardizing botanic data using density controls for differences in soil volume between samples and allows for the direct comparison of samples of unequal size. A basic assumption in using this measure is that the larger soil volume sampled, the greater likelihood that (rare) plant remains that will be recovered (Miller 1988:73).

Standardizing by soil volume, however, does not control for the range of non-plant related activities that contribute to the deposit from which the soil sample derives. In other words, the density measure does not consider plant remains in terms of plant-related activities, but rather in terms of all of the activities that are represented in the deposit. Thus, if the analyst is interested in determining the importance of a specific plant relative to the other plants in a sample or context, then density measures may be inadequate. Rather, standardizing by plant weight (standardized count) might be more appropriate (Scarry 1986). Unlike the density

measure, standardizing by plant weight considers the contribution of a specific plant or category of plants solely in terms of plant-related activities. As a result, a plant weight ratio more accurately reflects spatial and temporal differences in plant use. As a quantitative category, plant weight is a sum of weights recorded for all carbonized plant specimens per sample or context. Thus, for each sample, there is a total weight of plant material—this figure is the denominator used to standardize the variable of interest.

Overall, ratios are useful tools that overcome some of the problems of absolute counts. However, it is important to note that ratios reveal only the *relative importance* of plants within depositional contexts, not the contribution of resources to ancient diet (see Scarry 1986). For example, the recovery of 100 nutshells and 10 maize kernels does not necessarily represent evidence that nuts were more important than maize to the diet of residents of a given site; preservation and sampling biases prohibit paleoethnobotanists from making definitive determinations on whether certain taxa were more common or important than others. For the purposes of the present analysis, I focus on a basic qualitative summary of the data, using ubiquity, standardized counts, and relative percent contribution of the taxon to the total botanic assemblage simply because there are too few samples to perform any meaningful quantitative analysis.

Laboratory Procedures

Both the light and heavy fractions of the flotation samples were analyzed. Although the materials from the light and heavy fractions were processed and sorted separately, data from the two fractions were combined for analysis. According to standard practice, the light fractions were weighed and then sifted through 2.0 mm, 1.4 mm, and 0.7 mm standard geological sieves. Carbonized plant remains from both fractions were sorted in entirety down to the 2.0 mm sieve size with the aid of a stereoscopic microscope (10–40 X). Residue less than 2.0 mm in size was scanned for seeds, which were removed and counted. In addition, taxa encountered in the 1.4 mm sieve that were not identified from the 2.0 mm sieve were also removed, counted, and weighed.

Botanical materials were identified with reference to the paleoethnobotanical comparative collection at the University of California, Santa Barbara (UCSB) paleoethnobotany lab, various seed identification manuals (Delorit 1970; Martin and Barkley 1961; Medsger 1966; Minnis (2003), which allowed us to identify the range of taxa native to the region. Taxonomic identification was not always possible—some plant specimens lacked diagnostic features altogether or were too highly fragmented. As a result, these specimens were classified as "unidentified." Once the plant specimens were sorted and identified, counts, weights (in grams) and provenience information were recorded. Wood was weighed but not counted, and no wood identification was conducted. Other than counts and weights, no other measurements were taken on any specimens.

Basic Results

This section presents the results of the identification of the carbonized plant remains from the 31RK222. A total of two flotation samples from this site were sent to UCSB for analysis. Plant data from flotation samples are summarized in Table 1. Raw counts and weights are provided for each taxon; plant weight and wood weight are also provided. All samples were sorted, representing a total plant weight of .02 grams and a total wood weight of .01 grams. Combined, these samples yielded one unidentified plant fragment. No other archaeological

plant remains were present in the samples. Given the low total weight of the samples (.6g and .53g respectively), the low occurrence of plant remains it is not completely unexpected. Due to the lack of identifiable plant remains no further quantitative data presentation or analysis is provided.

Conclusions

Overall, the flotation samples from 31RK222 produced few plant remains. The botanical remains recovered included some wood charcoal and a fragment of a single unidentified plant. As a result, little can be said of how the plant remains add to interpretations of the site.

Table 1. Counts and Weights of Plant Taxa by Sample

Site: 31RK222	**Sample Number**	**354**		**355**	
	T.U.	15		15	
	Feature	1		1	
	Half	N 1/2		S 1/2	
	Strat.	4		4	
	Plant Weight (g)	0.01		0.01	
	Wood Weight (g)	0		0.01	
Common Name	Taxonomic ID	Count	Grams	Count	Grams
Unidentified					
Unidentified		1	0.01		

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