# Sampling at Çatalhöyük:

# The Theory and Methodology of Archaeobotanical Sampling

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# Chapter 1: Introduction

Archaeobotany is the study of past human populations through their interaction with the plant world. In the past plants have provided the basic materials for human existence such as food, shelter, fuel, clothing and tools (Hastorf and Popper 1988: 1). Today, even with the development of metals and artificial materials, humankind still relies on the plant world to fulfil many of these same needs. Because of the important role that plants play in all peoples' existence, archaeobotanists are able to investigate a wide range of archaeological subjects, from subsistence patterns, past environments and landscapes, to political change and symbolic behaviour. Archaeobotany can also address methodological issues, such as stratigraphy and chronology (Asch and Asch Sidell 1988). The universality of human reliance on the plant world also means that archaeobotanical research can be carried out in all areas of the world and in all time periods. Therefore archaeobotanical research provides an important link to past human populations and their cultures.

While archaeobotany has the potential to provide archaeologists with valuable and exciting information about the past, this potential is only realised through sampling. Sampling is a necessary part of extracting archaeobotanical remains from a site and "the way those samples are selected on site will influence every later phase of the analysis and interpretation" (van der Veen 1985: 166). Therefore, careful consideration of sampling methodology and theory is integral to archaeobotanical research. This paper will consider the current theory and methodology of archaeobotanical sampling for the most common form of preservation for archaeobotanical material, carbonised macroremains. To

# Chapter 2: The History of Archaeobotanical Sampling

Archaeobotanical remains have been recognised as part of the archaeological record for the last two centuries. Interest in archaeobotany started in the 19th century with Kunth's study of desiccated material from Egyptian tombs in 1826 (Pearsall 2000: 4) and later Heer's analysis of waterlogged material from Swiss lakeside villages in 1866 (Pearsall 2000: 4). These studies set the trend for archaeobotany up until the later part of the 20th century. During this time archaeobotany was, for the most part, concerned with the larger macroremains from sites which could be seen during excavation with the unaided human eye. In most cases, plant remains were collected as they were noticed during excavation from contexts likely to be associated with plants, such as hearths, middens and storage features. Analysis and interpretation were limited to listing taxa present at a site and reconstructing past subsistence patterns (Pearsall 2000).

The advent of flotation in the 1960s changed the way archaeologists approached archaeobotany. Flotation was brought to archaeologists' attention with Struever's 1968 article "Flotation Techniques for the recovery of Small-scale Archaeological Remains". This now common technique uses water to separate plant remains from soil (Pearsall 2000:15). Frank Hole's archaeobotanical reports from Ali Kosh demonstrate the dramatic effect flotation had on the recovery of plant remains. He wrote "our preliminary report on the 1961 season states confidently that 'plant remains were scarce at Ali Kosh'. Nothing could be further from the truth. The mound is filled with seeds top to bottom. All that was 'scarce' in 1961 was our ability to find them" (Hole *et al* 1969: 24)). With flotation archaeologists began to appreciate the vast quantity of plant remains preserved

# Chapter 3: Why Sample?

A sample is "a relatively small quantity of material, or an individual object, from which the quantity of the mass, group or species which it represents may be inferred" (O.E.D. 1989). To take a sample within the framework of a well-planned sampling strategy takes much effort, time and consideration. So why sample? There are several good reasons for employing a sampling strategy during archaeobotanical research. First, plant remains tend to be very small, often less then 1mm in size, and therefore extremely difficult to see with the naked eye during excavation (Orton 2000: 148). The example of Ali Kosh given above clearly demonstrates this. Sampling allows archaeologists to recover archaeobotanical material that may not have been noticed during excavation. This justifies processing the excavated soil for botanical remains, but why actually sample and not process all the soil from the site? Why take a small amount and infer the characteristics of the whole from it? There are three answers to this question; time and manpower, money, and redundancy of information.

There is often not enough manpower and time to process all the soil from a site or to carry out the later stages of analysis and interpretation. Extracting archaeological plant remains from soil is a laborious process involving excavation, flotation and documentation in the field, as well as analysis and interpretation in the laboratory. For most projects processing everything is simply not feasible. Archaeobotanists can cut down the time and manpower needed by sampling the plant remains from a site. The second reason for sampling, cost, is closely related to time and manpower. Processing the entire soil content of a site would not only require excess amounts of manpower and time,

# Chapter 4: Archaeobotanical Sampling

An archaeobotanical sampling strategy is the foundation of any archaeobotanical study and therefore deserves careful consideration prior to the start of excavation. The first step in designing a sampling strategy is to outline its goals. While each project will have its own research questions and goals, there is also posterity to consider. An archaeobotanical sampling strategy must not only meet the goals of the current project but also possible future research as well. Therefore "the design of a sampling strategy must obtain, as efficiently as possible, both a representative and reliable sample of the range of variation that is involved at any scale of archaeological inquiry" (Gamble 1978: 325). With this data the sampling strategy can serve the widest range of possible needs in the present and future. By designing a sampling strategy that functions on the three levels of the region, the site and the laboratory this should be feasible.

## The Regional Level

Archaeologists do not excavate sites in a vacuum. Instead, the discoveries of one site are placed in the context of the surrounding region and the rest of the world. In order to make sound qualitative and quantitative comparisons between data from different sites, there must be comparable sampling strategies. Recently archaeobotanists have become well aware of the importance and difficulties of designing compatible sampling strategies (Jones 1991: 56). How can sampling strategies be designed so that archaeobotanical assemblages can be compared across sites and regions? To do this one must first be

is taken at a low level of intensity it is impossible to regain the information lost. Archaeobotanists can remove sampling bias from site to site by maintaining consistent sampling strategies. In doing so, preservation patterns and bias, as well as cultural variation, will be revealed (Dennell 1977: 362).

**The Site Level**

There are many considerations to be made at the site level when designing a sampling strategy. All of these considerations are based around that fact that an archaeobotanical sample is a cluster sample. A cluster sample is a sample that selects group or cluster of units instead of individual units (Orton 2000). Because of the minute size of most archaeobotanical remains, it is not possible to individually remove each seed from the soil. Also, the seed dispersal characteristics of plants and their fragile nature means there is no way to guarantee that each seed or plant fragment is independent from other seeds and fragments (Orton 2000: 149). As a result, archaeobotanists sample for spatial units of soil that contain clusters of plant remains instead of sampling for independent botanical units. Therefore the archaeobotanist must decide where to collect the soil, how much soil to collect, how to collect the soil and finally how to process the soil.

Deciding where to collect one's samples is a major part of a sampling strategy and over the years five different approaches to context selection have developed; total sampling, interval sampling, probabilistic sampling, purposive or judgmental sampling, and no sampling at all (Jones 1991: 57). No sampling at all will result in an extremely biased and limited collection of plant remains and therefore should not be considered.

Probabilistic sampling avoids this problem because it allows for the selection of contexts as sampling units. Probabilistic sampling, otherwise known as random sampling, is "sampling in which the probability that the sample reflects the population from which it came can be statistically assessed" (Jones 1991: 55). This type of sampling strategy works well on shallow open area sites where "large areas have been stripped and a clear idea of the variety and number of features is apparent" (Gamble 1978: 333). Unfortunately interval sampling of this type becomes impossible to carry out on deep stratigraphy since the sampling frame is unknown (Gamble 1978: 333). Because of this it is not possible to randomly select features to sample.

The use of purposive or judgmental sampling is one solution to not knowing the sampling frame prior to excavation. With this kind of sampling the archaeobotanist uses his or her expertise to select features or contexts for sampling as they arise during the excavation (Pearsall 2000: 68). While judgmental sampling can be an effective and economic form of sampling, it also has the potential to provide a very biased sample (Jones 1991: 55). Simply sampling what looks interesting, such as hearths and middens, will not provide a representative sample of the archaeobotanical remains from a site. Because of this, judgmental sampling is often not advocated (Jones 1991: 55, Pearsall 2000: 69). But for sites where blanket or probabilistic sampling are not possible, judgmental sampling is the best alternative. In these cases the archaeobotanist must think carefully about the reasons behind their unit selection and insure a range of cultural and non-cultural deposits are included (Lennstrom and Hastorf 1995: 702). By drawing on previous knowledge of the site or similar sites, as well as selecting a range of different contexts, judgmental sampling can provide an effective sample of a site.

differences. Scatter samples produce a higher diversity, ubiquity and density of charred remains, while bulk samples produce more specific spatial data (Lennstrom and Hastorf 1992). Because bulk and scatter samples have similar results, both strategies are viable, though bulk samples are recommended when detailed spatial comparisons are planned. Also, comparisons between contexts sampled in different ways can contain bias due to the lower density, diversity and ubiquity for bulk samples. Lennstrom and Hastorf (1992) have recommended avoiding this by employing one strategy consistently while taking duplicate samples where necessary.

Finally, the archaeobotanist must decide how to process the samples. Since flotation became central to archaeobotanical sampling in the 1960s, a range of flotation methods have been developed and adjusted to different sites and environments. These methods range from simple manual techniques through mechanised machines to the use of chemicals to aid the flotation process. There is not space here to describe them all but there are several publications dedicated to their individual merits and drawbacks (see Pearsall 2000 and Watson 1976). When choosing one of these flotation techniques, the archaeobotanist must insure the chosen flotation method is suitable for the water sources available, and that it supplies the recovery rate and sampling intensity required. With the choice of a flotation method, the archaeobotanist's sampling strategy is complete at the site level.

**Laboratory Level**

# Chapter 5: An Introduction To Çatalhöyük

In order to illustrate the current theory and methodology of archaeobotanical sampling, I will turn to the sampling strategy at Çatalhöyük. Since 1996 an extensive archaeobotanical sampling regime has been applied to the excavations at Çatalhöyük. For the past 4 years I have been a member of the archaeobotany team there and have helped to implement this sampling strategy. While there are several areas on the site being excavated by teams from different countries using a variety of methods, the same sampling strategy has been used throughout the site. Here, I will focus on the sampling strategy as it has been implemented in the BACH (Berkeley Archaeologists at Çatalhöyük) area, the area of the site that has been excavated by the University of California, Berkeley since 1997. Six years into the excavations in the BACH area an assessment of the archaeobotanical sampling may help indicate the success of the sampling strategy thus far and suggest helpful alterations for the future. This case study will examine the sampling methodology in the BACH area and attempt to determine if the sampling strategy at Çatalhöyük provides a "representative and reliable sample of the range of variation that is involved at any scale of archaeological enquiry" (Gamble 1978: 325).

Çatalhöyük, located in the Konya plain, is one of the largest and most well known of the Anatolian Neolithic sites (Figure 1). It was an extended and long-lived settlement with over 1000 years of occupation, from 6800 to 5700 BC (Hodder 1996). While it is not the subject of this paper to relate the detailed archaeology of Çatalhöyük, I will briefly

work, while identifying the plant taxa used on site and some of the subsistence patterns of the mound's inhabitants, did not provide information on such topics as spatial patterning, crop processing, the surrounding environment or the details of daily activities.

The new archaeobotanical program that commenced in 1995 hopes to fill in some of these gaps in our knowledge of plant use at Çatalhöyük. Archaeobotany has had a key role in the creation of the new excavation's methodology and interpretation. "Since the beginning of the new excavations at Çatalhöyük, paleoethnobotany has played an important role in the interpretation of the site by developing a methodology for collecting and processing the site's plant remains" (Matthews, Hastorf and Ergenekon 2000). Anne Butler formed this sampling strategy at the start of the new excavations in 1995 Christine Hastorf, who took over as head of the archaeobotanical research in 1996, further refined it and has continued to develop and oversee the strategy in all areas of the site to the present.

material from the heavy residue is then analysed and united with its respective light residue. One hundred percent of each light and heavy fraction is sorted when possible. For some of the larger samples the fractions are split into a more manageable size using a riffle box to insure the randomness of the split. Finally the data derived from the samples is stored in paper form and entered into the Çatalhöyük archaeobotany database (Asouti *et al.* 1999).

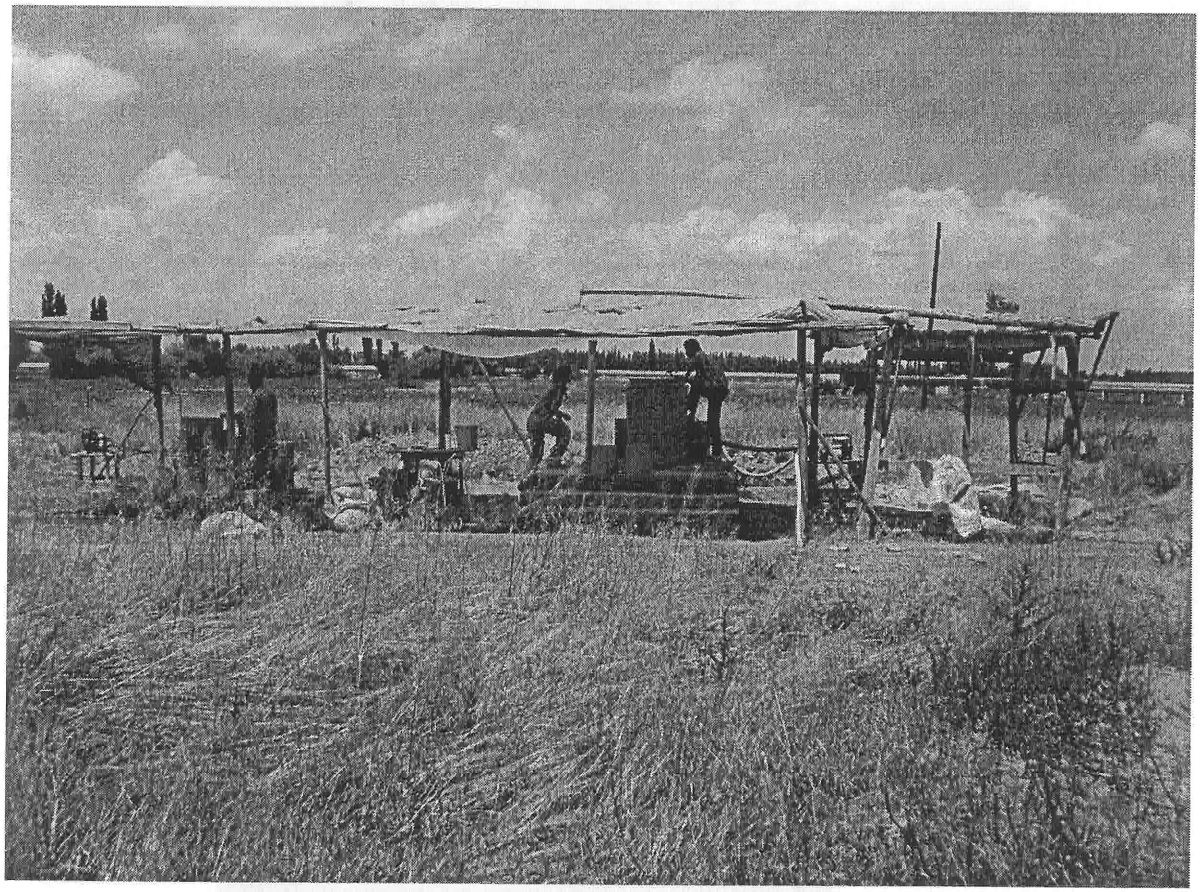

**Figure 1: The flotation area at Çatalhöyük.**

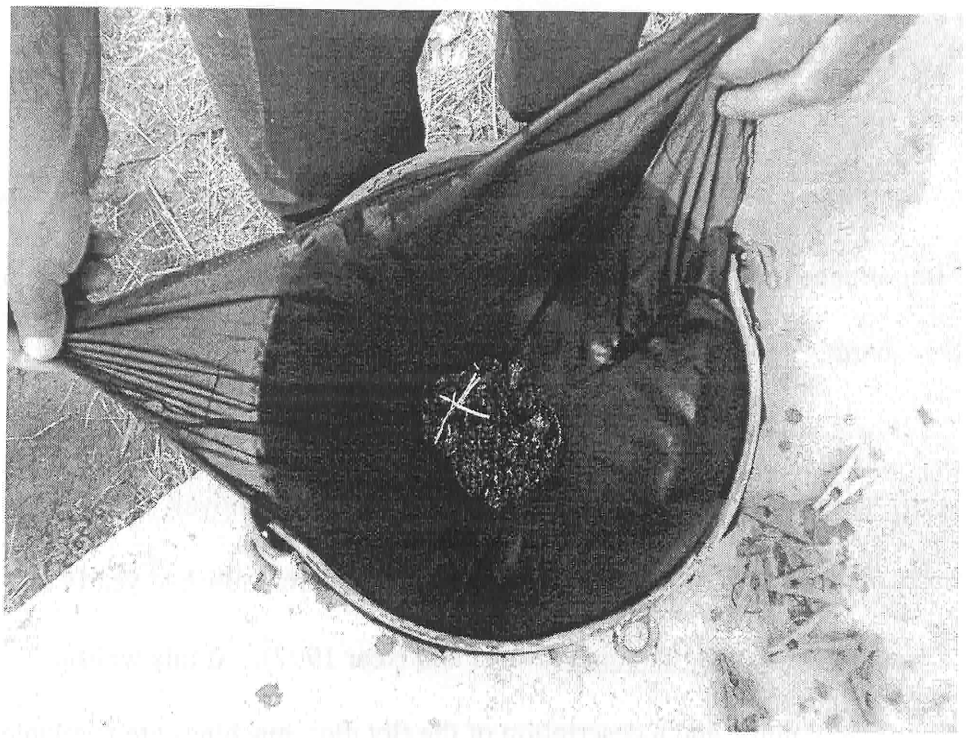

**Figure 4: The 0.17 mm mesh used to capture the light residue.**

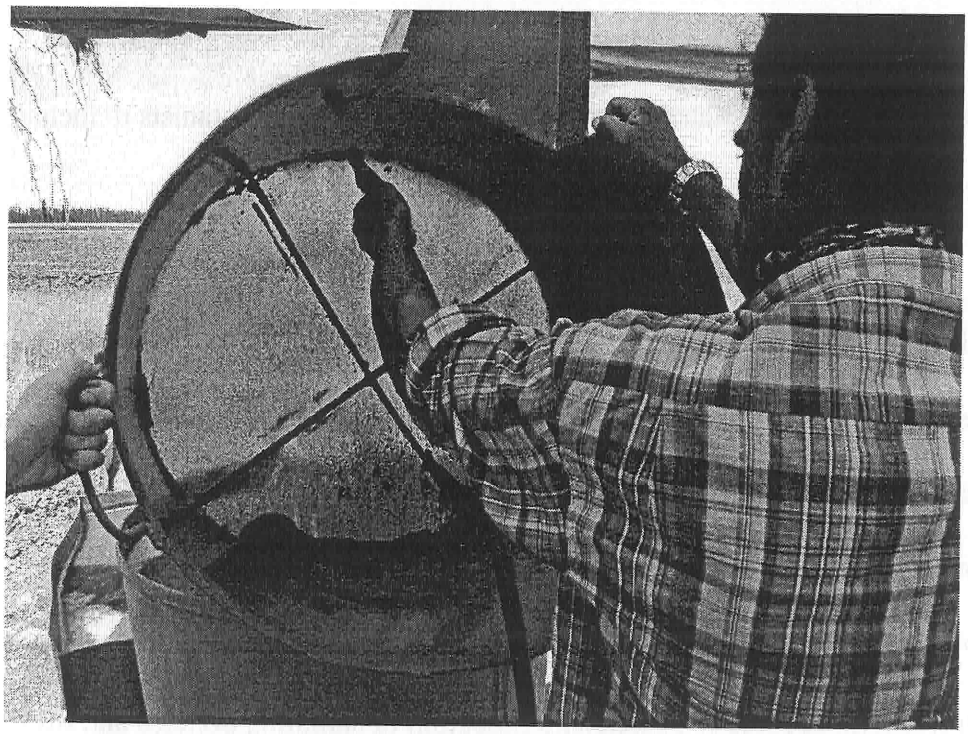

**Figure 5: The 0.5 mm mesh used to capture the heavy residue**

information on their sampling is available for comparison. For example, at Suberde no archaeobotanical samples were taken at all, and as a result, the only evidence of plant remains from the site is three clay impressions (Asouti and Fairbairn 2002: 183, Bordaz 1977). At Canhasan III and Asiklihöyük mechanical flotation was used (French et al 1972, van Zeist and de Roller 1995:181). Pinarbasi's sampling strategy most closely resembles the strategy employed at Çatalhöyük, and for good reason. The excavations at Pinarbasi are part of the Çatalhöyük research project and therefore there has been an attempt to tie together the two site's sampling strategies. At Pinarbasi 40 litre samples are taken from each context as part of a blanket sampling strategy. They are floated using a flotation machine built to the same specifications as the machines at Çatalhöyük with 0.3mm meshes for the light residue and 1mm meshes for the heavy residue (Watkins 1996: 51). Of these sites, Çatalhöyük, Pinarbasi and Canhasan have been the most extensively sampled (Asouti and Fairbairn 2002: 183, Watkins 1996: 51). The sampling strategies in the Central Anatolia region span the whole range of sampling possibilities, from blanket, high intensity sampling to no sampling at all. Çatalhöyük's sampling strategy, at the blanket, high intensity end of this range, is compatible with the other sites' strategies, and the resulting data, with a little adjustment to take into account lower intensities of sampling at other sites, can easily become compared across the region.

Whether a sample is representative or not relies heavily on its volume. Too small a volume will not capture the characteristics of a context and too large a volume will provide redundant information. Currently 30 litre samples are being taken at Çatalhöyük, but this was not always the case. At the start of the project the standard sample volume was 60 litres (Butler 1995) but in 1996 it was decreased to 40 litres (Hastorf 1996) and then decreased again in 1997 30 litres (Hastorf and Near 1997). This adjustment in sample volume shows the fine tuning of the Çatalhöyük sampling strategy over time. With the archaeobotanical data from the first and second seasons, the archaeobotanical team were able to reduce the volume size and reducing processing time while still providing a representative sample.

While 30 litres is the goal volume for soil samples, this goal is not always possible in the field. From 1997 to 2001 1165 soils samples were taken and floated from the BACH area. Figure 6 shows the distribution of these samples' volume size. The smallest sample taken was 0.01 litres while the largest was 132 litres. The average sample volume is 9.03 litres, well below the goal of 30 litres. Only 19 of the 1165 samples actually have a volume of 30 litres. From this information it seems that Çatalhöyük's sampling strategy is not being adhered to, but a closer look at the situation provides a reason for the small sample volume average. The context volume dictates the sample volume for the smaller contexts. Many contexts do not contain thirty litres of soil so only what is present can be collected. Of course, some of the variation in sampling volume is due to human error. Sample volume is estimated in the field by filling two 15 litre buckets with soil and this predictably cause fluctuations in volume size. Human error also accounts for some of the extremely large samples taken, such as the 132 litre

sample. This comes from the misconception that larger samples provide more information. When a context is deemed important, people often tend to think larger samples are better. But as we have seen larger samples often provide redundant information.

In order to assess whether the sample volume of 30 litres actually provides representative archaeobotanical data on each context, I have tested the redundancy of four samples with the 4 different volume sizes of 3 litres, 14 litres, 29 litres and 57 litres. Each light fraction has been divided into quadrants and each quadrant sorted, following the Phase II sorting methodology of Çatalhöyük outlined above. Figures 7 show the cumulative total of the counts as each quadrant is averaged in. If a sample contains too little information and is therefore not representative of a context, one would expect the counts to fluctuate from with the addition of each quadrant. If a sample is representative one would expect the counts to "settle down" after the third or fourth quadrant is averaged in. Finally if a sample is representative but overly large, one would expect it to reach redundancy early on and the counts to fluctuate little as each quadrant is averaged in.

From Figure 7 it is obvious neither 3 litres no 14 litres provide enough archaeobotanical material to be representative of their respective contexts. In the 3 litre sample the counts for all materials never "settle down". The same is true for flotation number 3409, the 14 litre sample. There are signs of "settling down" in the 29 litre sample, though the cereal and glume base counts continue to fluctuate somewhat even with the 4th quadrant averaged in. This suggests that fact that even 30 litres might be too small a volume to provide a representative sample. But how many more litres does one need? The 57 litre sample, Fl. 4679, shows sure signs of "settling down". After the third quadrant is averaged in the counts seems to reach redundancy, indicating that 57 litres is too large a volume for the sampling at Çatalhöyük. From this comparison of Phase II counts it can be gathered that a representative volume size lies somewhere between 30 and 57 litres.

In order to see if this hypothesis is supported by the Phase III counts for these 4 samples, I have also compared the seed and pulse taxa present in the quadrants of these four samples. Figure 8 shows the results. Again, the 3 and 14 litre samples show no signs of settling down. This time, the 29 litre sample is also somewhat unsettled. Only the 57 litre sample shows signs of "settling down" and even it has still has some fluctuation, though mainly in the unidentifiable seed fragment category. The Phase III counts seem to follow the same pattern as the Phase II counts. Only four samples have been looked at here, not enough to show whether the fluctuation in the quadrants are significant, but they suggest that a closer look at sample volume is warranted at Çatalhöyük. A continuation of this study with a larger group of samples may support the tentative conclusion here that while 30 litres probably provides a representative sample of the more common taxa and

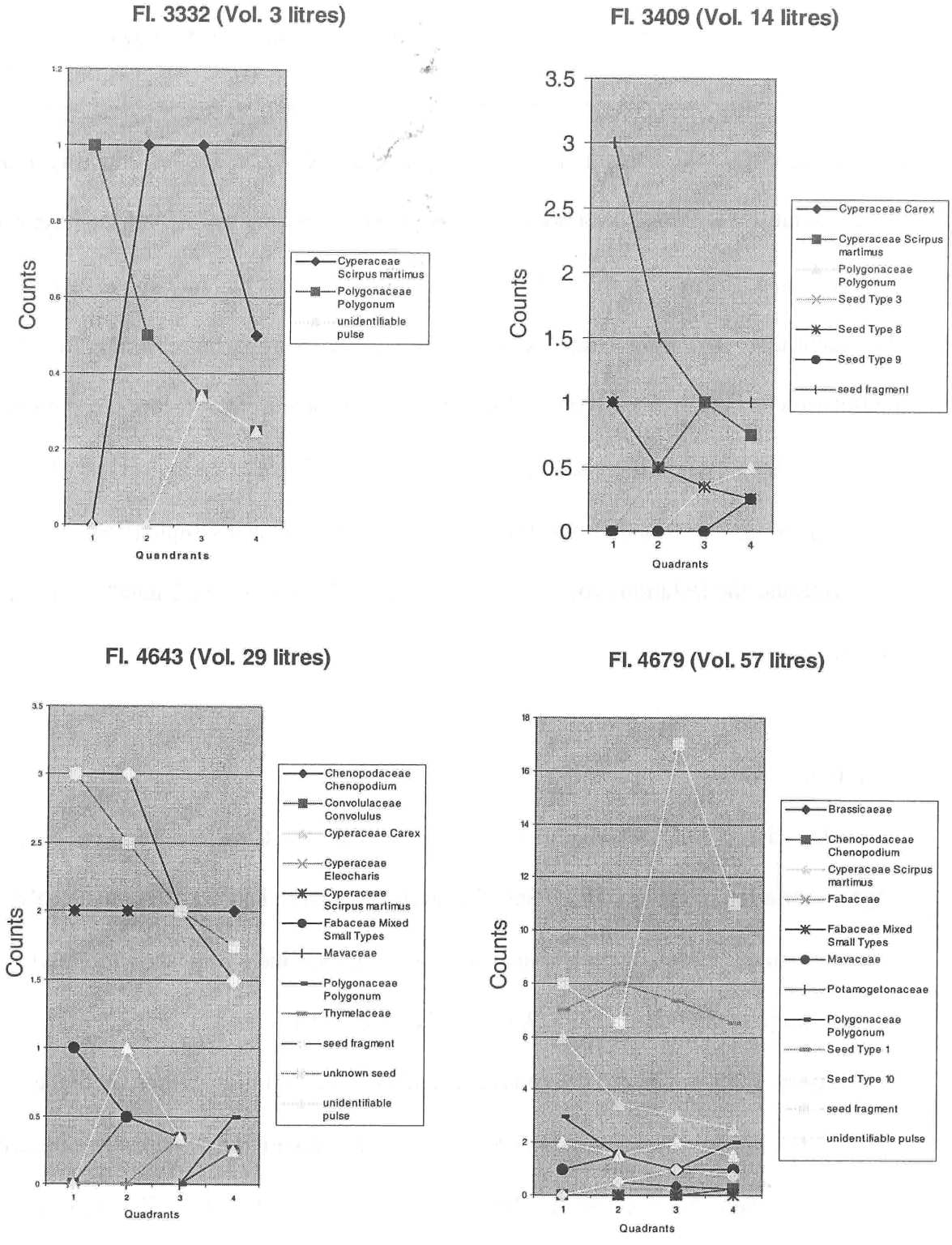


**Figure 8: Redundancy test for seed taxa.**

look in detail at one context in order to establish whether the sampling strategy is capable of providing detailed spatial data at such a micro-level.

Botanical remains are not deposited evenly across a site and so are present in different densities from context to context. A sampling strategy should therefore be able to pick up on the variation in densities that occur across a site. In order to demonstrate that the sampling strategy at Çatalhöyük is able to do this, I have compared the densities for the 21 samples. The densities of these samples were calculated by dividing the total weight in grams of all the charred botanical material in a sample by its volume in litres (see Table 5). In 1999 Fairbairn and Kennedy introduced a density ranking system into the Çatalhöyük sampling strategy. According to this ranking system, a density of $< 0.2$ grams per litre is low, a density between 0.2 and 1 gram per litre is moderate and a high density has $> 1$ grams per litre of botanical remains (Asouti et al. 1999). Figure 9 demonstrates that a mix of low, moderate and high densities are present in the 21 samples. From this it is clear that the blanket sampling and volume size at Çatalhöyük is sufficient to uncover any variation in density of botanical remains at the site.

A comparison of crop processing remains also supports this. Each step in grain processing produces different crop products and by-products (Hillman 1983: 1). I have compared the proportions of cereal, spikelet fork, glume base and rachis in the 21 samples in order to see if the sampling strategy has uncovered variation in the ratio of these plant parts. All counts have been standardised to counts per litre of soil in order to remove any bias imposed by differences in sample volume. Figure 10 show the results of this comparison. There is obviously a difference in the proportions of these grass plant parts from sample to sample. Some are dominated by cereal such as fl. 3414, while

others have higher quantities of glume bases, such as fl. 4059 and spikelet forks, such as Fl. 4001. This comparison shows that not only is the sampling strategy providing a sample of the variation in densities present at the site, it is also uncovering patterns in the distribution of different plant parts. This data can be used later to uncover important information, such as the stages of crop processing that were taking place on site.

The comparison of densities and grass plant parts has demonstrated that the sampling strategy provides a sample of the variation across the BACH area. In order to determine whether it also can provide a sample of the variation in plant remains contained in one feature, I will now focus on 4 samples from Feature 170, a plastered platform along the East wall of Building 3. Building 3's interior has been constantly re-built and re-plastered over its life history. It has 5 distinct phases, and each of these phases has many layers of plastering and alterations (Stevanovic and Tringham 2001). Therefore detailed spatial information is necessary to understand the changes that took place in the building. Figure 11 compares the Phase II results for Fl. 3204, a layer of occupation debris, Fl. 3414, the second plaster floor on the platform, Fl. 4048, the fourth plaster floor on the platform and Fl. 4679, a layer of packing between two floors on the platform. All counts have been standardised to counts per litre. While the major components of all four samples are cereal, chaff and seeds, there is some variation in the proportions of these materials in each sample. For example, unlike the other 3 samples, Fl. 3414 has more seeds than chaff. Also Fl. 3204, Fl. 3414 and Fl. 4679 have small amounts of other materials, such as pulse, parenchyma, nutshell and hackberry. The comparison of these four samples does show a low level of variation in the plant parts present between these four different layers of Feature 170. The fact that Çatalöyük's sampling strategy is

# Chapter 9: The Laboratory Level

The Archaeobotany team at Çatalhöyük has taken many samples since the start of the sampling strategy in 1995. Because of this huge numbers of samples have been process and await analysis. From the BACH area alone 1165 samples have been taken from 1997- 2001. An examination of the archaeobotany database reveals only 152 entries for the BACH area. Of these only 53 have been sorted to the phase II level. None of the samples have been fully sorted to phase III. The small amount of sample analysis is in part because the post-excavation study of them has just begun. Over the next year more will be analysed (Tringham pers. comm). But even with a full study of these samples only a small portion of them will be analysed. Is the blanket sampling strategy therefore a waste of time and money? While some would argue yes, it is important to remember that the unsorted samples are available for future archaeobotanists (Figure 12). In the future new questions can be asked of the material and the unsorted samples may be utilised to answer them.

**Figure 12: Samples waiting to be analysed**

sample, archaeobotanical studies can provide play an important role in understanding the past.

French, D. H., G. Hillman, S. Payne and R. Payne, 1972. Excavations at Can Hasan III 1969-1970, in E. S. Higgs (ed.), *Papers in Economic Prehistory*, 181-190. Cambridge: University Press.

Hastorf, C. A. and J. Near, 1997. Archaeobotanical archive report, in I. Hodder and the Çatalhöyük Research Trust (eds.), *Çatalhöyük 1997 Archive Report.* Online: http://catal.arch.cam.ac.uk/Archive_rep97.html

Hastorf, C. A. and Popper, V. S. (eds.), 1988. *Current Paleoethnobotany.* Chicago: The University of Chicago Press.

Helbaek, H., 1974. First Impressions of the Catal Huyuk plant husbandry. In *Anatolian Studies*, **14**, 121-123.

Hole, F., K. Flannery and J. Neely (eds.) 1969. *Prehistory and Human Ecology of the Deh Luran Plain.* Memoirs of the Museum of Anthropology, No. 1, University of Michigan, Ann Arbor.

Hodder, I. (ed.), 1996. *On the Surface: Çatalhöyük 1993-95*. Cambridge: McDonald Institute for Archaeological Research.

Hodder, I. (ed.), 2000. *Towards Reflexive Method in Archaeology: the example at Çatalhöyük.* Cambridge: McDonald Institute for Archaeological Research.

Johnson, M., 1999. *Archaeological Theory: An Introduction*. Oxford: Blackwell Publishers.

Jones, M. K., 1991. Sampling in Palaeoethnobotany, in Van Zeist, Wasylikowa and Behre (eds), *Progress in Old World Palaeoethnobotany*. 53-62.

Lennstrom, H. A. and C. A. Hastorf, 1992. Testing Old Wives' Tales in Palaeoethnobotany: A Comparison of Bulk and Scatter Sampling Schemes From Pancan, Peru, *Journal of Archaeological Science*, 205-229.

Lennstrom, H. A. and C. A. Hastorf, 1995. Interpretation in Context: Sampling and Analysis in Paleoethnobotany, *American Iniquity* **60(4),** 701-721.

Matthews, W., C. A. Hastorf and B. Ergenekon, 2000. Ethnoarchaeology: Studies in Local Villages Aimed at Understanding Aspects of the Neolithic Site, in I. Hodder (ed.), *Towards Reflexive Method in Archaeology: the example at Çatalhöyük,* 177-189. Cambridge: McDonald Institute for Archaeological Research.

Mellaart, L., 1964. Excavations at Çatalhoyük, 1963, *Anatolian Studies*, **XIV**, 39-119.

Zeist, W. van, and G. J. de Roller, 1995. Plant Remains from Asikli Höyük, a Pre -Pottery Neolithic site in Central Anatolia. *Vegetation History and Archaeobotany,* **4**, 179-185.

| Unit | Sample No. | Flot No. | Feature No. | Vol. | Cultural Context | >4 and 2 mm wood | cereal |
|---|---|---|---|---|---|---|---|
| **3577** | 2 | 3187 | 606 | 1 | floor | 9 | 387 |
| **3561** | 6 | 3204 | 170 | 81 | occupation debris | 411 | 165 |
| **3592** | 1 | 3239 | 605 | 11 | pit fill | 18 | 13 |
| **6149** | 1 | 3332 | 154/162 | 3 | platform floor | 21 | 50 |
| **6151** | 1 | 3399 | 154/162 | 24 | platform packing | 1413 | 1283 |
| **6142** | 1 | 3409 | 169 | 14 | floor | 40 | 79 |
| **6159** | 3 | 3411 | 169 | 3 | floor | 10 | 38 |
| **6165** | 1 | 3414 | 170 | 18 | platform floor | 118 | 247 |
| **6208** | 2 | 3463 | 620 | 4 | fire installation | 4 | 45 |
| **6212** | 2 | 3487 | 619 | 0.45 | fill | 33 | 15 |
| **6270** | 2 | 4001 | 632 | 1 | Fire Installation | 0 | 2 |
| **6273** | 1 | 4023 | 630 | 2.5 | Fire Installation | 2 | 9 |
| **6299** | 2 | 4048 | 170 | 9 | floor | 11 | 18 |
| **6306** | 2 | 4059 | 643 | 0.5 | Kitchen floor | 25 | 3 |
| **6389** | 16 | 4237 | 643 | 0.5 | floor | 131 | 27 |
| **8191** | 2 | 4563 | 154/162 | 14 | floor packing | 13 | 31 |
| **8200** | 2 | 4593 | 606 | 45 | packing | 258 | 305 |
| **8243** | 2 | 4643 | 646 | 29 | floor | 86 | 269 |
| **8263** | 5 | 4679 | 170 | 57 | packing | 723 | 1022 |
| **8286** | 7 | 4740 | 154/162 | 43 | burial fill | 75 | 66 |

Table 2: Raw counts for Phase II analysis

| Flot No. | Hackberry | Herbaceous Matter | Dung | Rhizome | Unidentified |
|---|---|---|---|---|---|
| 3187 | 1 | 7 | 0 | 2 | 5 |
| 3204 | 0 | 10 | 0 | 0 | 0 |
| 3239 | 1 | 0 | 0 | 0 | 0 |
| 3332 | 0 | 2 | 0 | 0 | 0 |
| 3399 | 0 | 145 | 43 | 4 | 5 |
| 3409 | 0 | 6 | 0 | 0 | 0 |
| 3411 | 0 | 2 | 42 | 0 | 0 |
| 3414 | 9 | 0 | 2 | 0 | 0 |
| 3463 | 0 | 1 | 0 | 0 | 0 |
| 3487 | 0 | 1 | 0 | 0 | 0 |
| 4001 | 0 | 0 | 26 | 0 | 0 |
| 4023 | 2 | 0 | 0 | 0 | 0 |
| 4048 | 0 | 0 | 0 | 0 | 0 |
| 4059 | 0 | 0 | 0 | 0 | 0 |
| 4237 | 0 | 0 | 0 | 0 | 0 |
| 4563 | 0 | 4 | 0 | 0 | 0 |
| 4593 | 0 | 5 | 0 | 0 | 0 |
| 4643 | 1 | 3 | 0 | 0 | 0 |
| 4679 | 0 | 3 | 0 | 0 | 0 |
| 4740 | 0 | 1 | 1 | 0 | 0 |

Table 2 continued

| | 6159 S.3 Fl. 3411 | 6165 S.1 Fl. 3414 | 6208 S.2 Fl. 3436 | 6212 S.2 Fl. 3487 | 6270 S.2 Fl. 4001 | 6273 S.1 Fl. 4023 |
|---|---|---|---|---|---|---|
| ginaceae | 0 | 0 | 0 | 0 | 0 | 0 |
| sicaceae | 0 | 0 | 0 | 0 | 0 | 0 |
| ıopodiaceae *Chenopodium* | 1 | 2 | 0 | 0 | 0 | 0 |
| olvulaceae *Convolvulus* | 0 | 0 | 0 | 0 | 0 | 0 |
| raceae *Carex* | 0 | 0 | 0 | 0 | 0 | 0 |
| raceae *Eleocharis* | 0 | 0 | 0 | 0 | 0 | 0 |
| raceae *Scirpus martimus* | 0 | 22 | 0 | 5 | 0 | 0 |
| ceae (mixed small types) | 0 | 2 | 0 | 0 | 0 | 1 |
| aceae *Juncus* | 0 | 1 | 0 | 0 | 0 | 0 |
| aceae *Ziziphora* | 0 | 1 | 0 | 0 | 0 | 0 |
| ceae *Hibiscus* | 0 | 0 | 0 | 0 | 0 | 0 |
| ae | 0 | 1 | 0 | 0 | 0 | 0 |
| onaceae *Polygonum* | 0 | 1 | 0 | 0 | 0 | 0 |
| onaceae *Rumex* | 0 | 0 | 0 | 0 | 0 | 0 |
| ıogetonaceae *Potamogeton* | 0 | 0 | 0 | 0 | 0 | 0 |
| aceae *Galium* | 0 | 0 | 0 | 0 | 0 | 0 |
| laceae *Thymelea* | 0 | 0 | 0 | 0 | 0 | 0 |
| wn Type 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| wn Type 3 | 0 | 3 | 0 | 0 | 0 | 0 |
| wn Type 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| wn Type 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| wn Type 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| wn Type 10 | 0 | 0 | 0 | 0 | 0 | 0 |
| ragment | 3 | 30 | 4 | 2 | 0 | 10 |

ıknown seed type is a recognisable type that has not yet been identified as part of any botanical family

3 continued

| | 8263 S.5 Fl. 4679 | 8286 S.7 Fl. 4740 |
|---|---|---|
| aginaceae | 0 | 0 |
| ssicaceae | 1 | 0 |
| enopodiaceae *Chenopodium* | 1 | 0 |
| nvolvulaceae *Convolvulus* | 0 | 0 |
| peraceae *Carex* | 0 | 0 |
| peraceae *Eleocharis* | 0 | 1 |
| peraceae *Scirpus martimus* | 10 | 3 |
| paceae (mixed small types) | 0 | 2 |
| ncaceae *Juncus* | 0 | 0 |
| niaceae *Ziziphora* | 0 | 0 |
| lvaceae *Hibiscus* | 4 | 2 |
| aceae | 1 | 0 |
| lygonaceae *Polygonum* | 8 | 1 |
| lygonaceae *Rumex* | 0 | 0 |
| tamogetonaceae *Potamogeton* | 1 | 0 |
| binaceae *Galium* | 0 | 0 |
| ymelaceae *Thymelea* | 0 | 0 |
| known Type 1 | 26 | 1 |
| known Type 3 | 0 | 0 |
| known Type 7 | 0 | 0 |
| known Type 8 | 0 | 0 |
| known Type 9 | 0 | 0 |
| known Type 10 | 3 | 0 |
| ed Fragment | 44 | 0 |

.n Unknown seed type is a recognisable type that has not yet been identified as part of any botanical family

able 3 continued

| Unit | Sample No. | Flot No. | Vol. | Density with wood | Ranking | Density without Wood | Ranking |
|---|---|---|---|---|---|---|---|
| 3577 | 2 | 3187 | 1 | 0.5019 | moderate | 0.4519 | moderate |
| 3561 | 6 | 3204 | 81 | 0.05239 | low | 0.00683 | low |
| 3592 | 1 | 3239 | 11 | 0.01008 | low | 0.00227 | low |
| 6149 | 1 | 3332 | 3 | 0.076 | low | 0.035 | low |
| 6151 | 1 | 3399 | 24 | 0.47687 | moderate | 0.15579 | low |
| 6142 | 1 | 3409 | 14 | 0.0275 | low | 0.00407 | low |
| 6159 | 3 | 3411 | 3 | 0.08533 | low | 0.05 | low |
| 6165 | 1 | 3414 | 18 | 0.06539 | low | 0.01139 | low |
| 6208 | 2 | 3463 | 4 | 0.00897 | low | 0.00547 | low |
| 6212 | 2 | 3487 | 0.45 | 0.25111 | moderate | 0.04889 | low |
| 6270 | 2 | 4001 | 1 | 0.068 | low | 0.068 | low |
| 6273 | 1 | 4023 | 2.5 | 0.00188 | low | 0.00152 | low |
| 6299 | 2 | 4048 | 9 | 0.01189 | low | 0.00222 | low |
| 6306 | 2 | 4059 | 0.5 | 0.4678 | moderate | 0.0698 | low |
| 6369 | 1 | 4179 | 5 | 0.04818 | low | 0.00918 | low |
| 6389 | 16 | 4237 | 0.5 | 1.2718 | high | 0.0598 | low |
| 8191 | 2 | 4563 | 14 | 0.01092 | low | 0.00278 | low |
| 8200 | 2 | 4593 | 45 | 0.06715 | low | 0.01338 | low |
| 8243 | 2 | 4643 | 29 | 0.02752 | low | 0.0131 | low |
| 8263 | 5 | 4679 | 57 | 0.19376 | low | 0.01586 | low |
| 8286 | 7 | 4740 | 43 | 0.02146 | low | 0.006 | low |

Table 5: Densities - calculated by dividing the >4mm and >2mm total weight in grams by the litre volume of the sample