Appendix E:
Rooted in the Past: Paleoethnobotany of Huu7ii

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Introduction

Archaeological data offer insights into the mechanisms of cultural change in indigenous populations along the Pacific coast of North America. Long associated with environmental shifts, some of these changes were sufficiently extensive to bring about the abandonment of villages that had been occupied for thousands of years. Understanding social and economic systems among ancient populations is integral to interpreting complex patterns of cultural change and stasis. Archaeologists working along the western coast of North America analyze artifact assemblages, site locations, features, and faunal remains to investigate cultural sequences. However, data about plant remains have not typically been part of these studies, despite the region's rich ethnographic record of plant use and the development of new technologies for examining such use in the past (Lepofsky et al. 2001; Lepofsky and Lyons 2003; Turner 1995, 2003). Ignoring botanical remains in archaeological studies results in the loss of their potential contributions to the understanding of past cultural patterns (Bonzanni 1997; Pennington and Weber 2004).

Paleoethnobotanical research at Huu7ii was designed to address the archaeological history of plant use at a shell midden site on Diana Island, in Barkley Sound on western Vancouver Island. Plant remains recovered from samples collected at Huu7ii (DfSh-7), an ancient Huu-ay-aht village, were examined in order to describe the taxonomic composition of edible, medicinal and other plants recovered from spatially and temporally distinct areas of the site. Sample collection occurred during major archaeological excavations, sponsored by the Huu-ay-aht First Nation, in 2004 and 2006. Subsurface and radiocarbon testing at the site indicates that the cultural assemblages preserved in shell midden extend from several centimetres below the ground surface to a depth of over three meters, reflecting thousands of years of human activity.

The proposed research into the paleoethnobotanical record of DfSh-7 included evaluating the depositional and environmental preservation history of the assemblage by examination of evidence of plant use at a variety of spatial and temporal scales. Research was designed to identify periods of change and continuity in the use of plant taxa throughout the site. Results would be used to inform attempts to characterize changes observed in the archaeological record by linking them to community-level changes in the use of the site at different points in time. Recovery and examination of plant materials, in conjunction with the analyses of the artifact and faunal assemblages, could provide a fuller picture of this ancient village of the Huu-ay-aht people, which was abandoned about 400 years ago after several millennia of occupation.

Previous Work

This project is within the traditional territory of the Huu-ay-aht First Nation in eastern Barkley Sound. One hundred and forty-two archaeological sites have been recorded within a 9 km radius of Huu7ii, including habitation sites, defensive sites, and resource extraction sites, according to the British Columbia Archaeology Branch's Remote Access to Archaeological Data (RAAD) database. Many of these sites, including Huu7ii, were identified during the Ohiaht (Huu-ay-aht) Ethnoarchaeological Project (Williamson and Mackie 1984). Although significant archaeological research has taken place in Barkley Sound (Inglis and Haggarty 1986; McKechnie 2005; McMillan 1999; McMillan and St. Claire 2005), the Huu7ii Project was the first large-scale excavation in Huu-ay-aht traditional territory.

No paleoethnobotanical studies have been completed for the Barkley Sound region to date. Elsewhere along the Northwest Coast, however, paleoethnobotanical research at a few archaeological sites has returned interesting results along with indications of areas where additional research is needed (Lepofsky and Lyons 2003; Lepofsky et al. 2000, 2001; Losey et al. 2003; Lyons and Orchard 2007; Martindale and Jurakic 2004). Lyons and Orchard (2007:28) describe the current state of paleoethnobotanical research along the Northwest Coast as "a relatively young field that is in the proc-

ess of developing methodological conventions and establishing the range and sophistication of questions that can be asked of the data."

Paleoethnobotanical Analysis

Several sources of bias pertain to the paleoethnobotanical record. Depositional bias must necessarily be considered at all archaeological sites. Resources are usually gathered some distance away from habitation features. Some utilized plants, such as trail foods, never make it into the archaeological record. This type of bias represents a non-random data loss for which there is no correction (Pearsall 2000:244–245).

Differential preservation of botanical macroremains after deposition is the greatest concern for data interpretation. Macroremains are those that can be seen with the unaided eye or under minimal magnification. Taphonomy plays a large role in which questions can usefully be asked of paleobotanical remains. Taphonomic processes described by Schiffer (1987) have comprised the major framework for paleoethnobotanists, who have focused specifically on carbonized plant parts, especially seeds (Krebs 1989; Lyons and Orchard 2007; Pearsall 2000; Pennington and Weber 2004). Charring or carbonization renders plant remains unsusceptible to microbial activity, leaving mechanical processes as the only threat to survival in the archaeological record.

The most common preservation situation is that only material that was accidentally or purposely burned is preserved. Since fuel plants and food plants that require cooking or heating are more likely to become charred, they are more likely to preserve in archaeological contexts. The factors affecting likelihood of preservation are non-random since certain types of remains are always more likely to become accidentally charred and preserved than others. Although it is not possible to prevent differential preservation, its effects can be mitigated in interpretation by considering this "preservation factor" (Pearsall 2000:244–245).

Since most macroremains are preserved through human activity that led to charring, they often play a central role in interpreting the plant component of diet and the interrelationship between people and plants. Charred remains, though more plentiful and better preserved than uncharred plant materials, tend to be more difficult to identify since charring can distort the shape and size of some seeds (Johannessen 1988; Pearsall 2000:501–504). Krebs (1989), Lyons and Orchard (2007), and Pearsall (2000) further suggest that uncarbonized plant materials are subject to a variety of preservational challenges. Moisture, soil pH, temperature, insect and rodent activity, bacteria, fungi and various other factors can differentially preserve uncharred remains. For this reason, many researchers have not expected uncharred remains to persist in an archaeological context (Lepofsky 2004:376). However, recent studies on the Northwest Coast have demonstrated that uncarbonized materials, especially seeds, do preserve, even in the absence of extraordinary circumstances of preservation such as waterlogging, freezing or highly arid conditions (Cybulski 1992; Losey et al. 2003; Martindale and Jurakic 2004).

Paleoethnobotanical investigations at three Haida shell midden sites (Lyons and Orchard 2007) provide valuable information regarding taphonomic processes which encourage or discourage preservation of both charred and uncharred plant remains, especially seeds. Results proved that uncarbonized seeds and needles can persist for long periods in archaeological contexts within shell middens. A major concern when considering uncharred seeds and other plant remains, however, is whether they were deposited culturally or naturally. The authors suggest this new information indicates that the status of uncharred seeds in midden formations requires further investigation to address their presence and their usefulness as economic indicators (Lyons and Orchard 2007:42–45).

Identification of botanical remains in archaeological sites has contributed substantially to our knowledge of human activities through time. Charred, desiccated, or waterlogged wood, wild plant seeds, fruit pips, nut shells and cultivated plants are among the macroremains that are most frequently recovered. Once these remains are collected and analyzed, the data may be used to reconstruct or interpret land-use patterns, including plant foraging or plant production; patterns of plant utilization; trade practices and diet; and environmental changes brought about by human or climatic influences (Bryant and Dering 2000:424; Pearsall 2000:11; Johannessen 1988).

One further area of interest related to paleoethnobotanical research is a perceived gender bias in archaeology. Since animal remains are the result of hunting and fishing, activities that have traditionally been attributed to males, it is possible that plant remains, which have traditionally been viewed as the result of women's work, have lacked study due to a gender gap exhibited throughout decades of archaeological investigation (Adovasio et al. 2007;

Brumbach and Jarvenpa 2007; Nelson 2006). Although the gender gap in archaeological work has been closing in recent years, new avenues and methods of inquiry are required in order to fully understand the contribution that women, and plant materials, made to indigenous lifeways. The use of various parts of trees for food, clothing, basketry, tools, twine, fishing nets, housing and other daily requirements is only one example of intensive plant use. Paleoethnobotanical research is likely to provide additional insights into "women's work," and thus division of household labour and resource exploitation, along the Northwest Coast.

It is noteworthy that when I asked my students in two Archaeology 240 Lab sections at the University of Victoria whether they thought "men's work" or "women's work" would be most obviously represented in typical shell midden deposits, all 35 students replied that "men's work" would be more apparent because stone tools for hunting and large faunal remains are preferentially preserved. Not one student recognised that the shells themselves, which comprise the largest volume of cultural remains at midden sites, are the residue of shellfish gathering, long ethnographically attributed as "women's work."

Previous paleoethnobotanical research noted above indicated that the matrix and column samples collected at Huu7ii could contain macrobotanical remains. Many of the Huu7ii matrix samples had been specifically collected from hearths and other burnt contexts, increasing the likelihood that charred materials could be present. Any recovered plant remains could be identified and analysed, providing data that may, when interpreted, suggest valuable information about ancient populations. Paleoethnobotanical research on the Huu7ii samples could potentially add to discussions concerning cultural change versus stasis, economic diversity of populations at Huu7ii along with mobility versus sedentism, regional land use patterns, possible local environmental fluctuations during the period of occupation, and differential preservation of paleoethnobotanical materials due to taphonomic processes in shell midden sites.

Data Collection

Thirty-three 1- to 3-litre bulk samples of cultural deposits and many random column samples of similar volume were collected during the 2006 excavation, along with nine samples from 2004. All came from within the outline of the largest house platform evident on the site surface. Two general contexts within identified house floors were selected from which to collect samples: in random spatial locations and in locations adjacent to identified hearths. Both were collected at varying depths below the ground surface in order to place them in a temporal framework. This sampling strategy was designed to provide information relevant to the stated objectives of identifying spatial and temporal distribution of plant materials within the excavated house and identifying any differential preservation of botanical materials deposited adjacent to hearths.

In addition, samples were collected from two 2 x 2 m excavation units on a raised terrace inland from the village site. Previous archaeological testing in Barkley Sound indicates that cultural deposits on similar raised terraces behind the main village areas represent earlier occupations at times of higher sea levels (McMillan 2003; McMillan and St. Claire 2005). It was hoped that botanical samples collected from this area would, in part, help to confirm environmental fluctuations indicated in these previous studies.

Methodology

General methodology, including sampling strategy, retrieval of botanical remains from samples, and analysis of recovered materials, adhered to that suggested in scientific literature related to archaeological research on plant remains (e.g., Bryant 2000; Bryant and Dering 2000; Hastorf 1999; Hastorf and Popper 1988; Krebs 1989; Lennstrom and Hastorf 1995; Pearsall 2000). Attempts were made to recover botanical materials from 27 samples through standard flotation methods (Bryant 2000:216–218; Pearsall 2000:29–44) using nesting circular reservoirs with 1.0 mm and 0.21 mm mesh bottoms in a 77 litre container of water. Samples were poured slowly into the reservoir, allowing lighter materials, known as the light fraction, to float to the top, where they can be collected with a hand sieve. Heavier materials, called the heavy fraction, collect in the bottom of the reservoir screen. Both charred and uncharred whole seeds tend to occur in the heavy fraction, while partial seeds often float. All materials collected in the screens and in the hand sieve were subsequently sorted for analysis. Microscopes were used for examination of materials in an attempt to identify particles such as seeds, spores, or other small remains.

The efficacy of manual flotation depends heavily on the skill and consistency of the operators. Flotation was conducted using a standard procedure for

processing the samples to ensure consistency. The same person floated all samples to avoid variation due to differences in operator expertise (Hosch and Zibulski 2003:849–850). Samples were floated and dried only once to avoid deterioration due to repeated washing. All recovered materials were dried indoors under controlled temperatures to avoid degradation of botanicals by sunlight and heat (Pearsall 2000:42–43).

Prior to processing any samples, a test for flotation recovery rates similar to that suggested by Pearsall (2000:93–94) was performed. In order to test recovery rates, 50 charred poppy seeds were added to 0.5 litre of sterile potting soil. The test samples were processed as if they were from an archaeological context. Recovered seeds were counted and examined to determine whether loss or damage has occurred and whether any procedures need modification prior to examination of actual samples. Three separate tests were performed, resulting in the recovery of 45, 43, and 46 whole poppy seeds, with partial/broken seeds identifiable in each test. All whole seeds were contained in the heavy fraction. As the tests confirmed methodological efficacy for recovery of botanical remains, flotation of Huu7ii samples was initiated as described. The procedures for recovery of macrobotanical remains follow those listed by Pearsall (2000:32–33).

Processing Samples (Adapted for one person acting as "agitator" and "pourer")

1. Ensure equipment is clean and the flotation tank has settled and is free of debris. Add water to tank if necessary.
2. Organize soil samples to be processed:
   a. Check that soil sample is easily friable, break up any lumps of soil.
   b. Do not soak soil prior to flotation, even if soil is hardened into lumps, as soaking often destroys delicate samples.
3. Assemble all materials for processing on a table with the flotation tank set up beside it. Include the following:
   a. Indelible pen for labelling
   b. Waterproof paper and pencils for bag labels as backups
   c. Newspaper for heavy fraction samples and muslin for light fraction samples
   d. Clipboard and Flotation Forms
   e. Measuring device
   f. Drying rack (set up in advance in secluded area)
   g. Flats for storing heavy fraction
4. Select a sample and fill out provenience information on Flotation Form. Ensure you have the whole sample (some are only 1 L but some are 3 L).
5. Label the muslin cloth and newspaper with sample name (e.g., E17 N10 Level 130–140).
6. Measure 0.5 litre of soil to be floated using a graduated measuring cup and enter information on form.
7. Spread out muslin cloth for light fractions and newspaper for heavy fractions on table.
8. The "agitator" immerses the flotation bucket to about half its depth in the flotation tank and begins agitation. Agitation should be in circular motion, with the bucket held level, turning clockwise 90°, then counter clockwise 90°.
9. The "pourer" now slowly pours ONLY 0.5 litre of the sample into the flotation bucket, while continuing agitation. The remainder of the sample must be retained for possible additional testing.
10. When most of the soil has worked through the bucket, the "agitator" stops agitating and drops the bucket down so that the water is within 5 cm of the top and scoops the botanical material floating on the surface with the hand sieve.
    a. Scooping is done in S curves over the surface with the scoop help upright pushing as well as scooping the remains.
    b. The scoop is emptied by rapping the hand sieve on the muslin.
    c. Repeat until most floating material is removed.
    d. If scooping is delayed the bucket must be agitated to keep anything from being carried out the bottom of the screen.
11. The "agitator" raises the buck to agitation level and resumes agitation again. Repeat Step 10 until negligible material rises to the surface.
12. A series of shallow scoops are done when the sample is almost complete. The agitator raises the bucket in and out of the water, forcing semi buoyant material to rise just off the screen, then scoops these materials up. Repeat until no charcoal or material remains.
13. The 'agitator" consolidates the heavy fraction. Dip the bucket in and out of the water at a slight angle, concentrating material on the screen at on end. Empty the consolidated material on the newspaper by tapping the bucket out and remove any stray pieces gently by hand.
14. Carefully gather up the edges of the muslin cloth containing the light fraction and hang

to dry on the rack. Ensue the cloth is labelled with the sample name. Carefully fold over the newspaper with the heavy fraction and stack in flats. Ensure the newspaper is labelled with the sample name.

15. Note on the Flotation Form:
    a. Observation or complications during processing
    b. Estimate of charcoal and seed abundance
    c. Remark on what is present in heavy fraction
16. Ensure the flotation bucket and hand sieve are clean before beginning a new sample. If silt and/or other floating materials are visible, use the back-up tank. Carry on with next sample.

Post-Processing Organization

1. Put dry samples into permanent storage containers as appropriate: vials, baby food jars, plastic or paper bags etc., with provenience checked and transferred. Ensure ALL SAMPLES are COMPLETELY DRY to avoid bacteria growth.
2. Place a copy of the Flotation Form with the dry samples and an additional copy in the file folder.

Portions of selected samples were put aside prior to processing as described above in case additional testing was required.

Identification of Macrobotanical Remains/Data Analysis

Comparative collections available for identification include the British Columbia Seed Collection housed at the Royal BC Museum plus the British Columbia Seed Collection and the Archaeological Seed Collection housed at Simon Fraser University. The United States Department of Agriculture's National Resources Conservation Service hosts a complete plant database for the U.S. and Canada, as well as for many other countries and areas (http://plants.usda.gov/index.html). The website includes excellent quality macro photos of seeds, shoots, needles, berries and other plant parts, providing useful comparisons to assist in identifying taxa.

Data from samples associated with features could be compared to those distinct from features to facilitate identification of which plants may have been used for food, medicine, artifact manufacture and other purposes. Areas of food preparation and other plant-related activities may be indicated by the spatial data obtained across the site. Studies suggest that charred plant remains may preserve better through time than non-charred (Lepofsky et al. 2001; Pennington and Weber 2004). Differential preservation would be examined in relation to proximity of the samples to identified hearths or other features which would indicate presence or absence of charring. The described sampling strategy would also assist in determination of which taxa are culturally relevant as opposed to those that are naturally deposited.

Data from both selected and random areas of identified house floors would be compared to facilitate identification of which plants were used for food, medicine, artifact manufacture and other purposes. Data collected from the terrace located inland from the main village would have been compared to that gleaned from samples taken from house deposits in order to assess changes in the vegetation regime of the island due to climatic fluctuations and human activities.

The proposed analysis strategy focused on qualitative identification, which reflects presence versus absence of botanical remains, rather than quantitative comparison of macroremains. Such qualitative analysis may potentially provide important information. If plants which do not grow at Huu7ii or on nearby islands are present in the archaeological record in association with locally collected botanical materials, that information may provide insight into seasonal population movements, diet and subsistence practices, patterns of trade, and past environmental/vegetative regimes. Although seasonality of occupation is most commonly assessed through study of faunal remains, plotting of plants recovered by seasonal and locational availability may also indicate the season of occupation or provide evidence for year-round use (Kristensen et al. 2009; Pearsall 2000:191–192). Ethnographic studies report that some plant foods were less valued than others (Turner 1995); the presence of such marginal resources in the archaeological record may indicate times of climatic shift or other cultural or environmental issues that would prevent utilization of preferred foods.

Results

No botanical materials other than varying size particles of charcoal were recovered by using the standard methodology described above. Microscopic pieces of charcoal were not collected for analysis because large pieces were recovered during excavation. The potting soil test samples containing

charred poppy seeds indicated that the methodology used would recover botanical remains similar to those expected in archaeological contexts. Since none were identified in the actual samples from Huu7ii, it is highly likely that none remain in these deposits due to factors of preservation. To test this idea, the results from Huu7ii were compared to those from the Park Farm Site (DhRq-22), in the Fraser Valley at Pitt Meadows, where numerous paleoethnobotanical remains were collected.

Samples from the Park Farm Site were examined for botanical remains by a team of archaeologists, including this author, in 2009. Exactly the same flotation methodology was used for Park Farm and for the Huu7ii samples. Results from the Park Farm research, presented by Kristensen et al. (2009:31–32), are repeated, in part, below:

> Samples for paleoethnobotanical examination were collected from various features including hearths, clay lined pits, pits and living floors across DgRq 22 … Of the 47 samples selected for examination, most were associated with charred soils, fire modified rock, charcoal, burned bone or other similar contexts. In order to create a control baseline for ubiquitous plant materials, the remainder were chosen from archaeological contexts that were not directly associated with any features … The average thickness of intact archaeological deposits from which the samples were collected is approximately 47 cm and represents a timeframe of 3,900 to 4,840 years before present … Botanical materials were recovered in all samples through standard flotation methods (Bryant 2000; Pearsall 2000) using a circular reservoir with a 1.6 mm mesh bottom in a 77 l container of water.

In addition to various seeds, paleoethnobotanical analysis at the Park Farm site led to the recovery of numerous black, spherical, microscopic spores identified as coming from weedy, invasive plants, including bracken fern (*Pteridium aquilinum*). The fresh shoots and the rhizomes of the bracken fern were common foods on the Northwest Coast (Turner 1995). In addition, fern leaves were used to cover fire-heated stones in earth ovens and for steaming foods (Barnett 1955). However, these spores can be accidentally introduced to the archaeobotanical record by various methods such as natural transfer from wind and rain or human transfer on clothing and feet (Kristensen et al. 2009:200). As a result, these decay-resistant spores may occur almost ubiquitously in deposits containing botanical remains.

Archaeobotanical remains, especially spores, were recovered at the Park Farm site in levels radiocarbon dated to as early as 4230 ± 40 cal BP (Kristensen et al. 2009:Appendix P). Since no seeds or spores were recovered from the Huu7ii samples, despite the use of the same techniques of analysis, differential preservation of organics between the two sites seems likely. Differences in acidity versus alkalinity in the site deposits may be the key factor. The Park Farm samples tested acidic, with all but one (at pH 5.5) providing pH values of 6.0 (Spurgeon 1994:100). In contrast, all pH values for the Huu7ii samples measured 8.0, which is alkaline to about the same degree as sea water.

As mentioned, only half of each Huu7ii sample was floated using the methodology described above. The remainders were retained in case further examination was needed. In order to rule out the possibility that extant botanical remains were destroyed during the flotation process, 0.5 litres of the remainder of each sample was intensively examined. Methodology consisted of placing two tablespoons of matrix into a small hexagonal lab dish, then removing large identifiable particles (e.g., lithic clasts, shell fragments, lumps of charcoal, etc.). Small amounts of water were gently added until the matrix was covered and particles began to float. All contents of each tray were closely examined under a microscope, with cloudy water removed through a fine sieve and fresh water added until all constituents were clearly visible. Matrix elements were removed from the dish after examination to provide better visibility of remaining particles. Even after this thorough examination, no archaeobotanical remains other than charcoal were identified.

Discussion

Paleoethnobotanical recovery, identification, analysis, and interpretation have the potential to offer new avenues of inquiry into economic systems, societal change, environmental reconstruction, and gender issues. The matrix and column samples collected during archaeological excavation at Huu7ii (DfSh-7) presented an opportunity for such paleoethnobotanical research. Much of the site analysis has been completed, providing strong spatial and temporal frameworks to help situate additional information. Analysis of the faunal assemblage, shellfish remains, artifacts, features and other data are reported elsewhere in this volume.

It was hoped that a paleoethnobotanical analysis could have been integrated with these other lines of inquiry to provide a fuller understanding of Huu-ay-aht diet, land use, and social organization. Unfortunately, these goals were frustrated by the lack of preserved macrobotanical remains in the Huu7ii deposits.

Although no paleoethnobotanical remains were recovered from the Huu7ii matrix and column samples, examination of the sediments provides direction for future research. It is postulated that alkaline versus acidic soil pH has contributed to differential preservation of botanical remains. Further research comparing and contrasting archaeobotanical assemblages from inland versus midden sites may inform this hypothesis.

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