PRELIMINARY PALEOETHNOBOTANICAL ANALYSIS AT G-995 LA CHIRIPA, COSTA RICA

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Venicia Slotten
Anthropology Department, UC Berkeley
venicia_slotten@berkeley.edu

During June 2019 I worked with the Proyecto Prehistorico Arenal to conduct paleoethnobotanical investigations at La Chiripa (G-995 LCh), an ancient domestic structure that has been preserved archaeologically by the eruption of Arenal volcano approximately 3,500 years ago and was excavated in July of 2018. La Chiripa is located west of Arenal volcano, in the highlands of northwestern Costa Rica. The region is subject to frequent volcanic activity, resulting in clear ash deposits between periods of human occupation, with abandonments, ecological recovery, and re-occupations after each eruption. This is exemplified at La Chiripa, with occupation of the site spanning approximately 3,000 years (circa 1450 BCE to 1300 CE).

In July 2018, I assisted with archaeological excavations and was in charge of the collection and analysis of any ancient plant remains preserved on the floor surface of the house structure as well as within all cultural strata encountered in excavations. Five types of paleoethnobotanical collection strategies were implemented during the 2018 field season in order to recover botanical remains: flotation, wet screening, manual hand-picked collection, phytolith, and pollen. These samples were collected from all cultural strata and any volcanic tephra stratum encountered directly above any cultural stratum. The number of samples collected per strata is displayed in Table 1 below. All samples were taken from 1x1m quadrants and labeled with their distance from the site datum based on their south west corners.

Type of Collection	Number of Samples per Strata						
	AR 16-15	UN 54	AR 14-9	UN 60	UN 61	Post Holes of UN 61	Total
Flotation	17	21	6	23	84	14	**165**
Water Screening	18	21	-	20	-	-	**59**
Manual (Hand Picked)	-	16	-	70	13	-	**99**
Phytolith	18	22	6	23	23	15	**107**
Pollen	4	6	6	6	4	-	**26**

Table 1. Quantity and type of paleoethnobotanical samples collected from G-995 La Chiripa.

Soil samples were collected throughout excavations to recover the larger macrobotanical remains such as seeds and wood charcoal that can later be identified based on their morphological and anatomical characteristics. Water flotation eases the separation of plant materials from soil in the excavations because organic remains will float to the top when submerged in water. This is the best way to recover macrobotanical remains because most seeds are too small to be seen with the naked eye while excavating.

To gather data, I constructed a machine assisted flotation system that used pressurized water flow (tap pressure) to agitate the soil matrix within water. This machine was a SMAP-style water flotation tank (Figure 1) and allows for a detailed recovery of any organic materials preserved below the surface. Water flows continuously into the 55-gallon tank via a hose connected to a water tap. The water exits directly beneath the heavy fraction basket, which was lined with a mesh screen. Water exits the tank as overflow into a light fraction bucket, whose bottom is also lined with mesh screen material. Because a mesh screen fine enough for a detailed recovery was not obtainable in Tilaran, mesh cloth (0.2 mm opening) was placed both in the light fraction collection bucket and the inner basket of the tank for the heavy fraction. Any organic material within the soil samples placed into the inner basket will float up to the surface and exit the top opening and will be collected in the mesh fabric lining the light fraction bucket.

Figure 1. The SMAP-style flotation tank constructed to process soil samples at G-995 La Chiripa.

Samples designated for flotation were taken as a composite from each square meter of excavation and were instructed to be 10 liters each in volume (Figure 2). However, in order to get a finer resolution of the floor of the structure, samples taken from UN 61 were from each 0.5 meter square and were 5 liters in volume. Additional samples were taken from cultural features, such as the concentration of boiling stones in UN 60 (Feature 1), the possible hearth in UN 61 (Feature 2), the entryway into the structure in UN 61 (Feature 3), and the postholes of the structure in UN 61.

Each sample's volume was measured again before being deposited into the flotation tank in order to ensure an accurate measurement of each sample. This revealed that the range of sediment volume collected by excavators was actually between 8 and 11 liters. Each sample was carefully deposited into the flotation tank, gently agitated by water pressure, and visible carbonized remains floating in the water were encouraged either by hand or with the assistance of a hose to exit the tank and be collected in the light fraction bucket. The flotation process for each sample lasted between 30 minutes and 2 hours; the time necessary for each sample varied based on the size of the sample and the abundance of carbonized material. An average of eight samples were floated per day. The water in the flotation tank was always emptied and refilled at midday to keep the buildup of silt at the bottom of the tank to a minimum. Ten

samples had 100 poppy seeds (*Papaver somniferum*) added before being processed with flotation, in order to test the recovery rate of the flotation process. The results of this recovery test are not yet calculated.

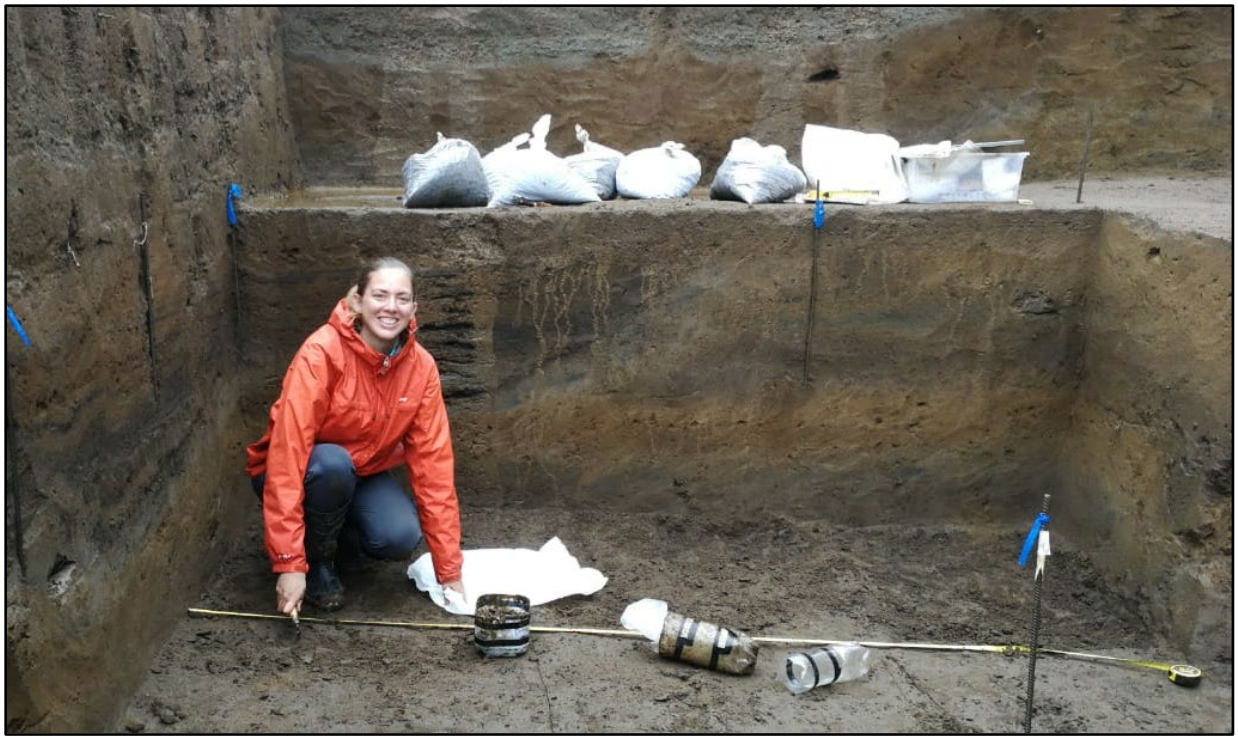

Figure 2. Image of author collecting samples designated for flotation from each square meter of UN 60 using a trowel, brush, and plastic bottles for the measurement of sample volume.

Once a soil sample is processed using water flotation, it results in two fractions: 1) a light fraction which contains any material that floated and was subsequently collected off the top of the tank (small botanical remains), and 2) a heavy fraction of material that sunk to the bottom of the collection tank (often contains tiny stone artifacts, ceramics, and additional botanical material). Both fractions were collected in cloth mesh that was hung on a clothes-line in the shade to dry after flotation was completed.

The 2019 field season was crucial in completing the flotation process of soil samples collected previously and also to sort the heavy fraction of the macrobotanical samples. Eighty-five heavy fraction samples were analyzed during the 2019 field season. Each sample was passed through a series of geological sieves (3mm, 2mm, and 1mm) and subsequently analyzed using a low-powered AmScope stereomicroscope (20x-40x) and an LED lamp. All sizes greater than 1mm were sorted with any present botanical remains being extracted, weighed, recorded, and stored for future identification at the UC Berkeley McCown Archaeobotany Laboratory. Sediment less than 1 mm was not analyzed from the heavy fraction due to time constraints.

Preliminary results of the heavy fraction do show that preserved botanical remains were abundant throughout the contexts samples at La Chiripa (Figure 3). However, twelve out of the eighty-five heavy fraction samples did not yield any preserved botanical remains, the majority of which came from AR 16-15 which was not a layer that was culturally inhabited so this is not surprising. The other seventy-three samples yielded mostly wood charcoal fragments, with some of them also containing maize (*Zea mays*)

cupules, a common bean (*Phaseolus* sp.) cotyledon, nutshell fragments, and some unidentified seeds (Figure 7). Seven maize cupules were identified from the heavy fraction samples, three coming from UN 60 and four from UN 61. Of the maize cupules found within UN 61, two were found within post holes and one was within Feature 2 (a possible hearth). The common bean cotyledon was from UN 60. Two nutshell fragments were found within Feature 2 in UN 61, and another came from UN 60.

The unidentified seed pictured in Figure 3(D) was the most common botanical remain recovered from the heavy fraction samples other than wood charcoal. Twenty-one of these unidentified seeds were recovered, coming from various strata (UN 54, AR 14-9, UN 60, and UN61 including post holes). The ubiquity of this seed throughout multiple cultural occupations at La Chiripa may be indicative that this specimen is intrusive. Alternatively, it could indicate continued use of this plant throughout time at the site. Further analysis, including identification and radiocarbon dating, could explain its presence in more detail.

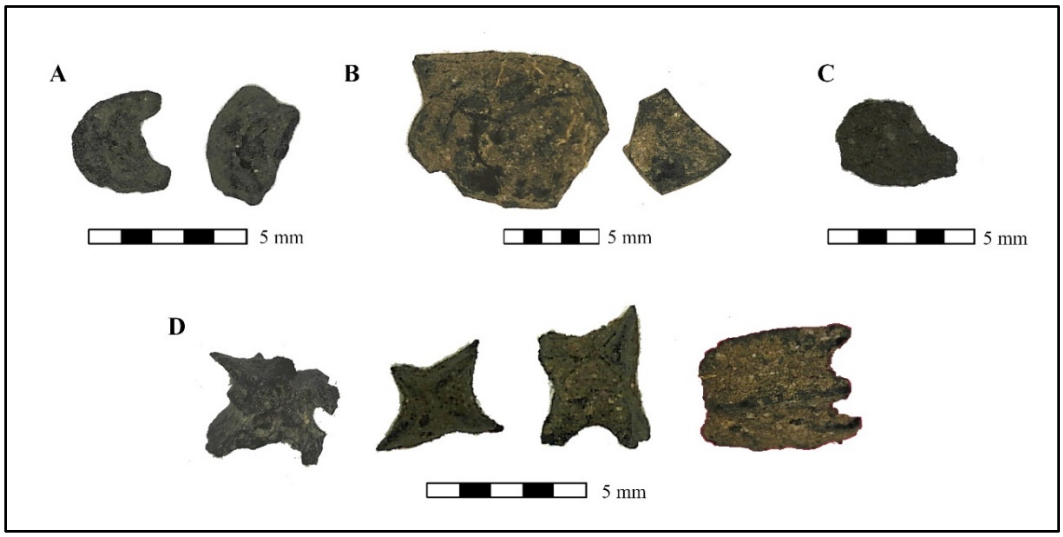

Figure 3. Macrobotanical remains other than wood charcoal recovered from the heavy fraction: A) *Zea mays* cupules, B) Unidentified nutshell, C) *Phaseolus* sp. cotyledon, D) Unidentified seeds.

Analysis of the paleoethnobotanical samples is a long process that I will undertake at Berkeley for the next several years since it involves hours of microscope work and identification of plant material. The botanical results collected at La Chiripa will be combined with research from other members of the archeological team, who focus on lithic, ceramic, organic residue, chronology, volcanology, and spatial analyses. All of this information will combine and work together to depict the past lives of Prehispanic Central Americans.

Acknowledgements: I would like to thank the project directors Payson Sheets and Ricardo Vazquez for allowing me to join this important project and collect botanical samples that could greatly contribute towards our understanding of this site. I am grateful to the entire excavation crew for being patient with the collection process and helping to transfer the heavy soil samples back to Tilaran, even in less than ideal weather conditions. Andres Mejia Ramon helped manage collection of the paleoethnobotanical samples. Both Margoth Salguera and Julio Sanchez helped to operate the flotation tank and provided much welcomed company during long days of sample processing.