The Organization of Domestic Space in Late Prehistoric Owens Valley Households

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Previously, one of us Eerkens (2004) has proposed that between 1500 and 700 B.P. inhabitants in Owens Valley shifted from a village-based, communal living pattern to a smaller-scale nuclear family-based one. This process was linked to a rise in population and a concomitant increase in privatized seed use. We test this proposal by examining the artifact and residue evidence from two prehistoric houses in Owens Valley excavated in 2006 and 2007. We examine data from stable isotope ratios (C and N), total C and N, and obsidian and bone densities.

Archaeologists have long been interested in the evolution of social systems; in particular, the evolution from simpler and more egalitarian social forms to more complex and hierarchically organized ones has attracted much attention (Binford 1980). Often, these studies rely on more general observations about ancient societies, for example, examining macro-scale patterns in settlement organization or comparing samples from general midden contexts. Recent approaches have focused on micro-scale approaches like examining patterns in bioarchaeological signatures of individual burials and/or examination of individual houses. This latter approach has revealed important details about such transitions that larger macro-scale analyses cannot address.

Owens Valley, in Eastern California (Figure 1), appears to have witnessed just such a transition in the course of prehistory. It has been argued by some (e.g., Bettinger 1989; Bettinger and Baumhoff 1982) that a transition from simple to more complex societies happened in the most recent part of prehistory in Owens Valley, during the last 1,500 years. However, a small-scale account of this transition had yet to be carried out. In this study, we take a household approach, examining micro-scale residue and artifact data from two ancient house floors to test the hypothesis of this transition. In the process, we hope to highlight more detailed information about the organization of space within houses, and how these patterns relate to social organization. Eventually, by looking at these organizational schemes, we might be able to reconstruct the causes of these transitions; what portends the shift from an open, communal society to a privatized one? Recognizing the micro-patterns of the shift in the archaeological record is the first step in answering this question.

BACKGROUND

Owens Valley is located in eastern California. Lying in the rain shadow of the Sierra Nevada Mountains (rising over 4,000 m), the valley receives approximately 5-6 cm of rain per year. The average winter temperature is a high of 13ºC, and a low of -4ºC; during summer, the average high is around 35ºC, with lows at 13ºC. Lying in the rain shadow of the Sierra Nevada Mountains (rising over 4,000 m), the valley receives approximately 13-15 cm of rain per year. The valley is technically part of the Great Basin geographic province. Thus, there is no outflow from the valley, and all water entering the valley drains internally, flowing into now-dry Owens Lake at the southern end of the valley. Runoff from the Sierra Nevada Mountains kept the valley well-watered, and the people living there did not face the same water access problems as other Great Basin and desert dwellers.

Owens Valley prehistory is generally divided into five time periods: Paleoindian (11,000-7000 B.P.), Little Lake (7000-3250 B.P.), Newberry (3500-1500 B.P., characterized by Elko points), Haiwee (1500-650 B.P., characterized by Rose Springs points), and Marana (650 B.P. to contact, characterized by Desert Side-notch and Cottonwood points) (Bettinger and Eerkens 1999; Bettinger et al. 1991; Eerkens et al. 2008). The shift from atlatl to bow-and-arrow technology is seen in the later projectile points. The

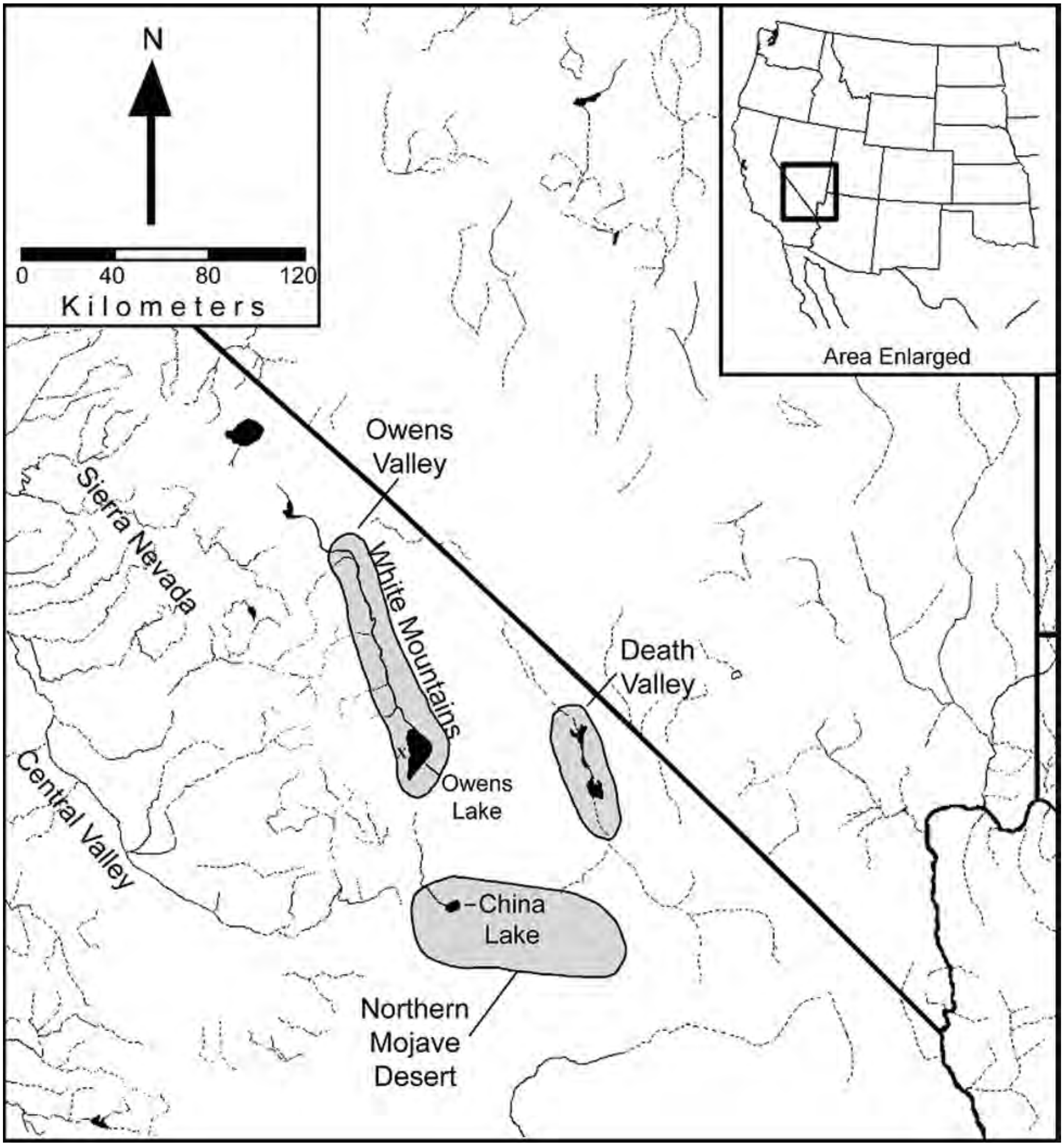

Figure 1. Owens Valley in California, and location of sites, marked by "x" next to Owens Lake.

houses examined in this study come from the Haiwee and Marana periods, between which the shift towards privatization is especially evident. Both periods are marked by the use of bow-and-arrow technology (Bettinger and Eerkens 1999). With regards to mobility during the Haiwee, there appears to have been a shift towards a "spatially confined" seasonal round, including more intensive resource exploitation and reduced residential mobility. Like the earlier Haiwee period, the Marana saw intensive local resource use, but accompanied by an increase in privatization, greater degrees of territoriality, and an increase in brownware pottery (Eerkens and King 2002).

Table 1. Radiocarbon dates for INY-3806.

Context	Date	Lab Number
House Floor 2	1400	Beta- 113508
House Floor 2	1490	Beta- 135414
House Floor 1	1340	Beta- 135413
House Floor 3 (hearth)	1160	Beta- 113510
Hearth (Feature 6)	1180	Beta- 113509
Agglomerated charcoal	1160	Beta- 41115
Agglomerated charcoal	1600	Beta- 38751

This study focuses on two house floors from two spatially and temporally distinct sites in the southern part of the valley (Figure 1). Both sites lie close to Owens Lake and were investigated by Nichole Reich and Jelmer Eerkens with the UC Davis field schools in 2006 and 2007.

CA-INY-3806 lies on the main channel of Cottonwood Creek. Three houses were located at the site during earlier excavations in the early 1990s (Eerkens 2003). House Floor 2 is the subject of this study, and was radiocarbon dated to over 1400 B.P. Table 1 gives the radiocarbon dates from the site. The first two dates are from the house included in this study. Combined with obsidian hydration and temporally diagnostic projectile point and shell bead styles, the radiocarbon evidence suggests INY-3806 was occupied exclusively during the first half of the Haiwee period (Eerkens 2003).

The second site has not yet been assigned a permanent trinomial, but has been given the temporary designation of “Site-11.” Site-11 lies on a minor channel of Cottonwood Creek, less than 2 km north of INY-3806. A large circular depression was excavated, revealing the presence of a semi-subterranean house floor. A single radiocarbon assay from this floor returned a date of 650 ±36 (AA81038).

Approach

In southern Africa, Kent (2003) examined patterns in economics of sharing in five societies of Kalahari Bushmen. She found that sharing (or non-privatized resource use), in addition to guarding against resource scarcity, reinforced egalitarian social bonds. Such wide sharing tends to lead to a homogenous archaeological record, where houses tend to have the same suite of materials spread uniformly across the floor.

Wiessner (1982) extended this hypothesis to predict patterns in the archaeological record, noting that it’s possible to reconstruct ancient economic patterns based on material remains found in the archaeological record. In her estimation, looking at multiple data sets from a site is essential in order to reconstruct both the “organization around resources and the organization around other persons in social relations of production” (Wiessner 1998:172). This is why we take a multivariate perspective: by looking not only at material remains like bone and obsidian, but also pH and various isotopic analyses, we can piece together the organization of these sites with better resolution. Wiessner proposes that societies practicing non-communal behaviors (evidenced in the archaeological record by storage) would have a more closed site plan, with closed-in, separate eating and storage areas. More communal societies (represented by Wiessner as those who “pool risk”) would have more open site organization, allowing neighboring tribe members to see what their peers are doing and allowing potentially greater degrees of interaction, with less spatial seclusion. These are the two competing patterns we expect to see in the sites discussed.

Our work in Owens Valley draws on these studies to generate predictions for the archaeological record based on patterns of sharing or non-sharing, and by extension, social organization. Our goals were twofold. The first was to see if the boundaries of each house floor could be clearly delineated: was there a clear artifactual and chemical difference between the interior and exterior of both houses, and do these differences confirm the boundaries as noted during excavation? Second, we wanted to see if there was a marked difference in the use of space between the two floors as related to social and communal organization. In the earlier house, we expect to see a more homogenous use of space, meaning a range of activities performed across the house floor, with little space specifically designated for particular activities. Indeed, many of the activities may have taken place outside the house, in view of other people living in the community.

In the later house, we expect a more heterogeneous organization of space and a broader range of activities taking place within the house. These patterns would lead to a house floor with well-defined activity areas visible in the archaeological and chemical records.

We suggest that patterns in organic and artifact materials will reflect such uses of space, allowing us to address issues of social organization and privatization. A move towards privatization between the two periods has previously been suggested based on other data (Eerkens 2004); the spatial heterogeneity of floors is a way to test this. By looking at the soil chemistry across an ancient living space, we can see which activities were happening inside an ancient house versus outside of it, and how they were distributed spatially.

While the methods we use are fairly new, there have been a few forays into isotopic analysis of soil and sediment elsewhere. For example, Commisso and Nelson (2008) examined $\delta^{15}N$ values and their correlation to activity areas in Medieval Norse farms in Denmark. Similarly, Parnell et al. (2002) looked at phosphorus and trace metals to reconstruct eating and craft-working areas in a large Maya-region living/working complex.

CA-INY-3806

After initial exposure of a small section in 1991, INY-3806 was revisited in 2006. Figure 2 shows the location of excavation units from the 1991 and 2006 excavations. A larger section of the house floor was re-exposed in 2006 in six contiguous 2-by-1-m excavation units. The floor was not fully exposed, but based on the previously excavated sections, a roughly square or rectangular-shaped house is suggested, with sides of 4.5 m (N-S) and 5.5 m (E-W).

After exposing the floor, small sediment samples were taken at regular intervals from the actual floor and directly outside it. These sediment samples comprise the sample from which artifacts and organic residue subsamples were drawn. The average sample weight for each sediment sample was 836 g, approximately 15 by 15 by 15 cm.

Site-11

Site-11 was excavated with a single unit in 2006 and then revisited in 2007 and more intensively sampled. The focus of the investigation was on a large circular depression, thought to be the remains of a semi-subterranean house. In addition, several units were also placed outside the depression: a single unit was excavated next to a nearby bedrock milling station, and two small rock-lined pit-hearths were also bisected with excavation units.

Three radiocarbon dates taken from this site show it was continuously occupied beginning about 650 ybp. The house itself dates to 650 ±36, while two near by rock rings were dated to 198 ±35 and 152 ±3, though not in direct association with the house (AA81038).

Although other areas of the site were investigated, the excavation of the floor consisted of two 2-by-1-m units and two 1-by-1-m units (see Figure 2b). A1-by-1-m test unit had also been excavated the previous year (2006). Like INY-3806, the floor was sampled at regular intervals across the exposed house floor. The approximate average sample weight was similar to that of INY-3806. Based on the exposed sections, we believe the house was circular in shape and about 5 m in diameter.

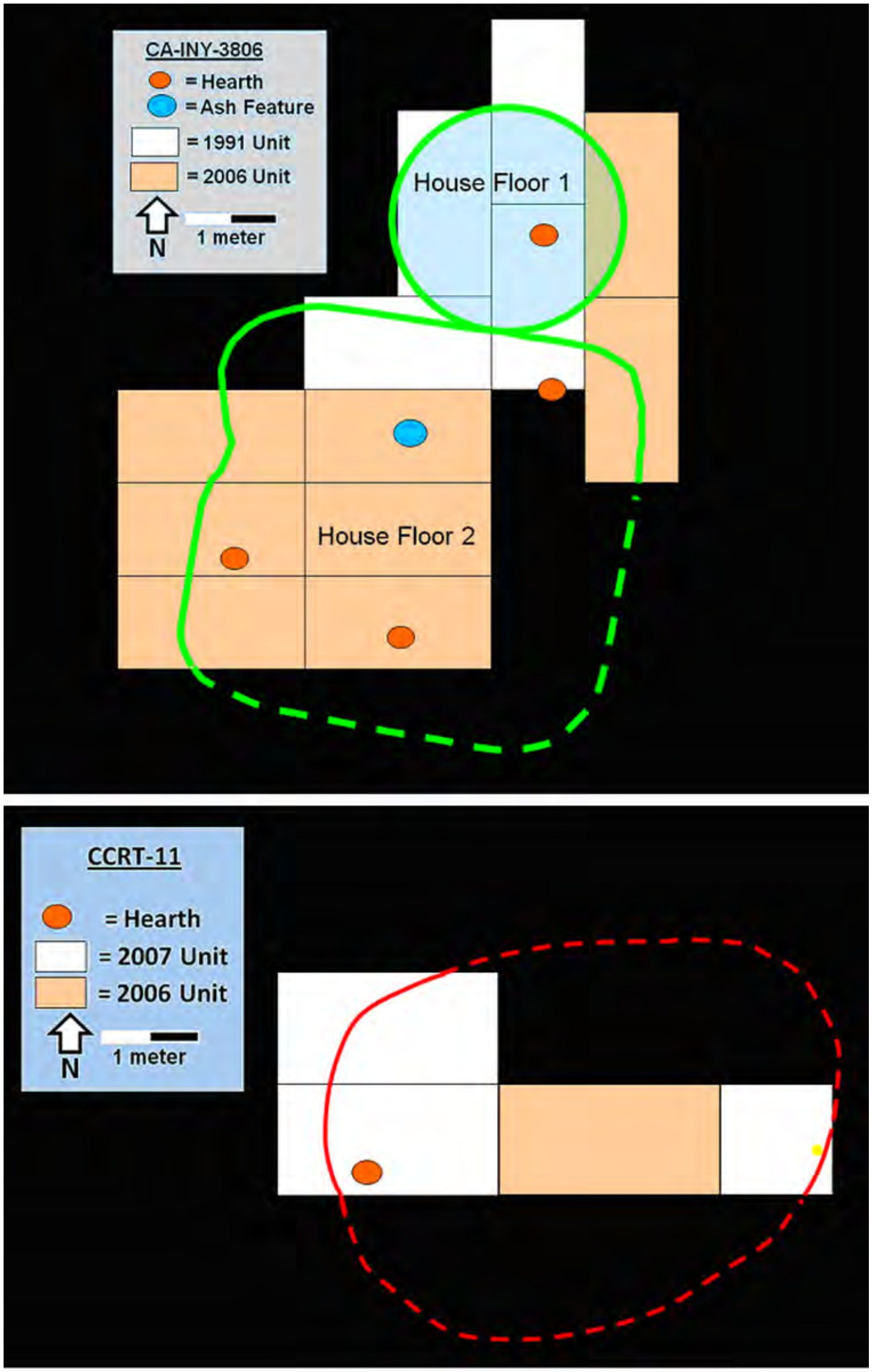

Figure 2. (above) Excavation plan at CA-INY-3806, showing two house floors. House Floor 2, square structure, is the focus of this study. (below) Excavation plan at Site-11, showing the section of the house excavated. The 2007 units represent the location of the sediment samples for this study.

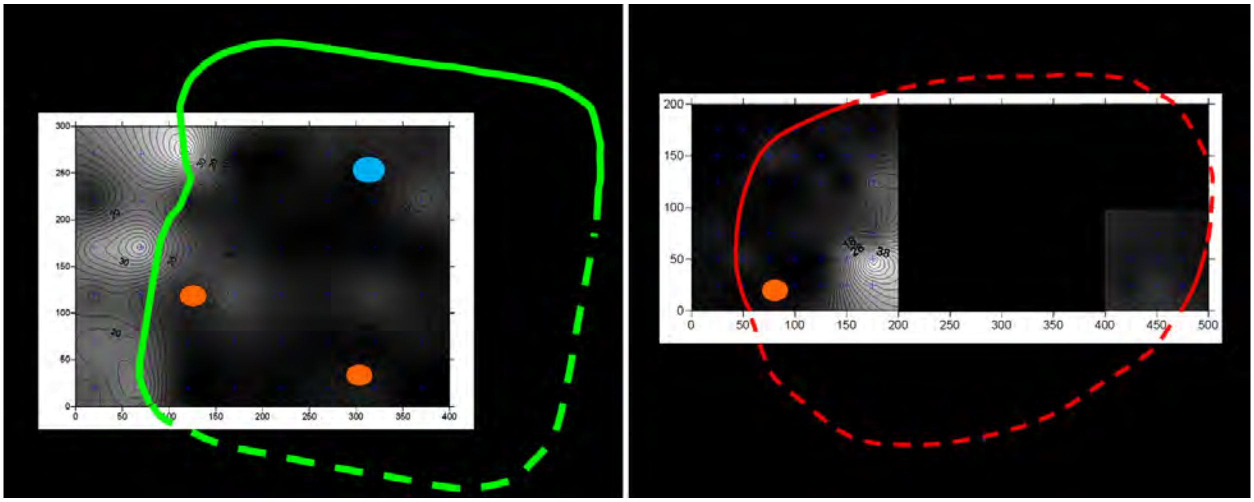

Figure 3: Density of bone at INY-3806 (left) and Site-11 (right).

METHODS

Screening and Weighing

Sediment samples were screened through 2-mm, 1-mm, and 0.5-mm screens. Each screen fraction was sorted separately. Obsidian debitage and bone were the most common cultural constituents and were separately counted and weighed. Approximately 4 g of fine fraction (i.e., sediment finer than 0.5 mm) was taken at this time. This fine fraction comprises the sediments used for the carbon and nitrogen analyses described below.

Isotopic Analysis

For the isotopic analysis, about 1 g of fine fraction of each sample was ground even finer by mortar and pestle. The sample was then immersed in a 50:1 ratio of water:hydrochloric acid (15M) solution. The purpose of this was to dissolve all inorganic carbon from the sample, so that our analyses could focus on organic carbon only. The samples were then baked at 60°C for 24-48 hours to evaporate the remaining solution. Between 30 and 40 mg of each sample was weighed out into small tin caps and sent to the UC Davis Stable Isotope Facility for testing (http://stableisotopefacility.ucdavis.edu/). We tested for Total C, Total N, and $\delta^{13/12}$C and $\delta^{15/14}$N.

RESULTS

Bone Density

Although neither house was excavated and sampled in its entirety, we can begin to see the differences in the distribution of bone between these two sites. At INY-3806 (Figure 3, left side), there is a clear difference visible between the interior and exterior of the house. Bone density is much higher externally, indicating that either most food preparation and disposal happened outside the structure or that the INY-3806 house was systematically cleaned prior to abandonment. Within the INY-3806 structure, there are higher-density "hotspots" (12 bone fragments per sample was the mean, and with 52 the highest value) but density values don't vary considerably across the floor. By contrast, Site-11 density values (Figure 3, right side) are more concentrated at specific points within the house, especially a bone concentration west (left) of center in the house, and little bone was found outside the floor. However, the contrast between interior and exterior space are less well demarcated than at INY-3806.

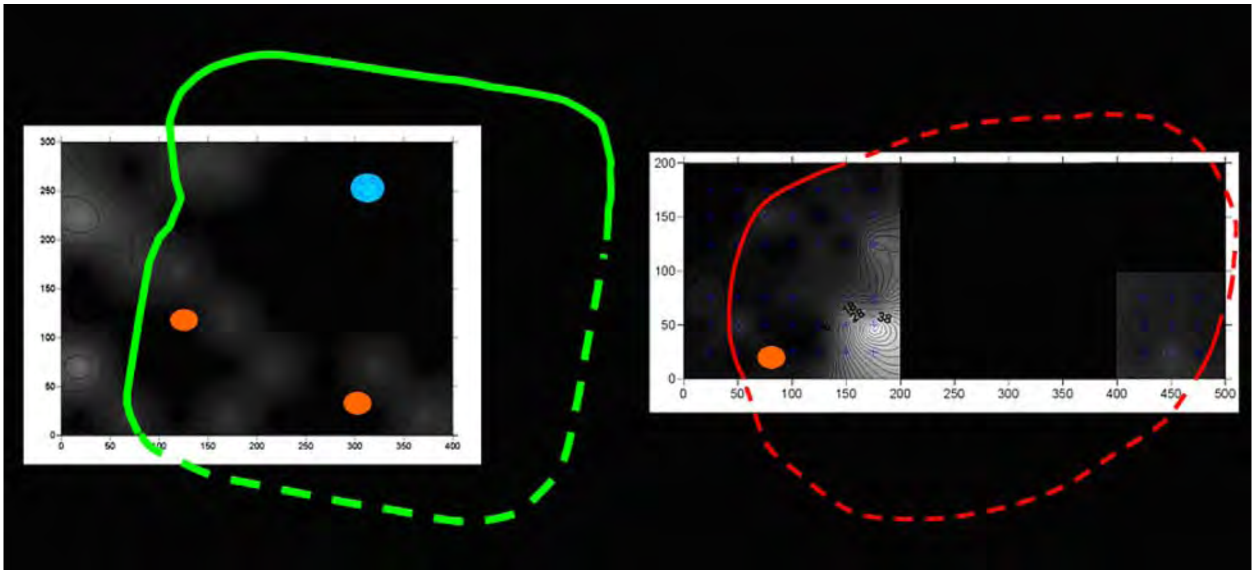

Figure 4. Density of obsidian at INY-3806 (left) and Site-11 (right).

Obsidian Density

Obsidian density (all debitage) is less definitive than bone. The INY-3806 densities (Figure 4, left side) were low overall, varying only between 0 and 2. Notably, all of the occurrences of 2 or more flakes are from outside the house, and overall, debitage is more numerous outside the house than inside (per unit area). At Site-11, overall concentrations (Figure 4, right side) were much higher, varying within the floor (averaging 2, and ranging as high as 7). As with bone, there were once again specific hotspots inside the house. The figure suggests three loci of higher concentration, places where flintknapping activities appear to have been undertaken. Debitage outside the house occurs at approximately even concentrations, and the division between floor and non-floor is not readily apparent from the figure.

INY-3806 Carbon Isotopes and Total Carbon

Carbon isotope testing performed for INY-3806 revealed interesting results (Figure 5). The house boundary can be clearly seen in both total carbon and carbon isotopes. The house exterior displays enriched levels of $\delta^{13}C$, but overall lower levels of C than the floor. Interestingly, there is relatively little overlap between noted hearth features (solid circles) and high or low carbon points. There is an anomalous ashy, "hardened earth" feature in the upper right area that did correlate to an abnormal carbon reading. Also of note is the string of anomalous readings moving diagonally up towards the upper right corner of the house. This series of readings shows overall high levels of C but depleted levels of $\delta^{13}C$.

INY-3806 Nitrogen Isotopes and Total Nitrogen

Nitrogen readings are less definitive (Figure 6). The edge of the house floor is still well defined in the total N map, but less so in the nitrogen isotope map. However, there are some interesting anomalies, especially in the upper left corner of the house, as indicated by a high-N feature combined with an enriched isotope signature. No physical feature was noted in the house at this location during excavation. Though N usually burns off, this anomaly coincides with a C anomaly, which could be a thermal feature missed by the excavation team.

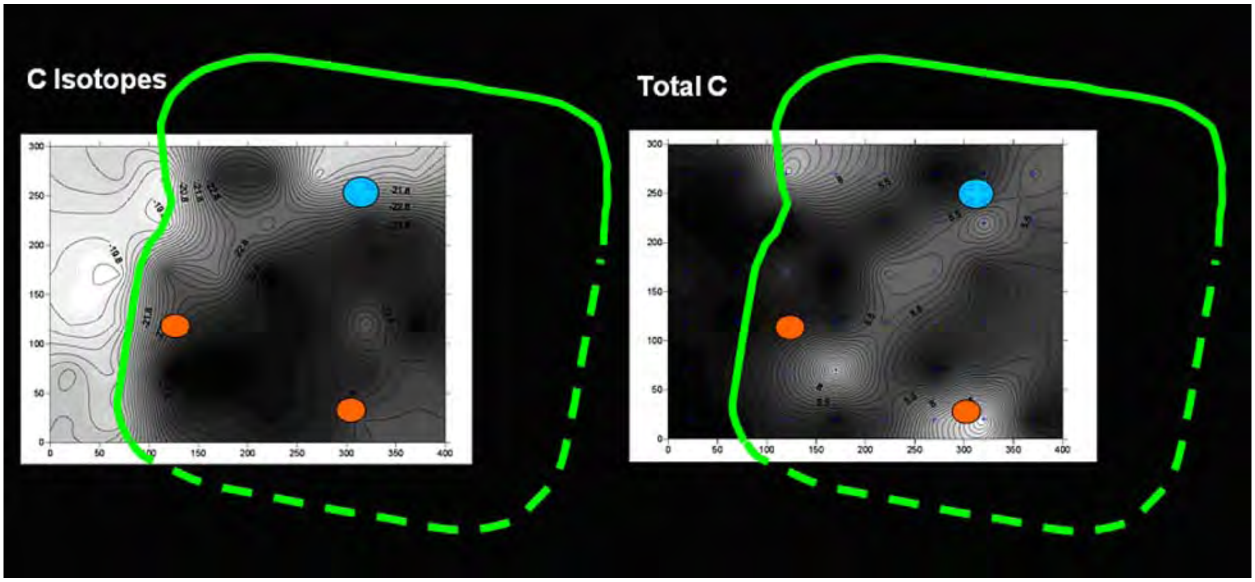

Figure 5. INY-3806 distribution of $\delta^{13}C$ (left side) and total C (right side).

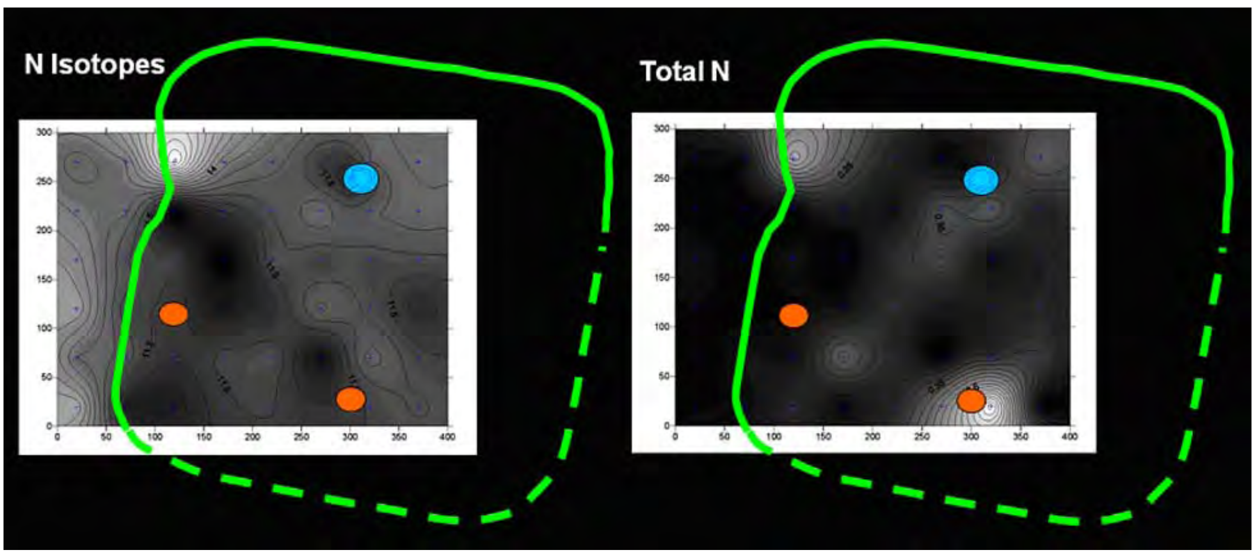

Figure 6. INY-3806 distribution of $\delta^{15}N$ (left side) and total N (right side).

Site-11 Carbon Isotope and Total Carbon

The Site-11 carbon readings show, overall, more anomalies (or hotspots) in both $\delta^{13}C$ and total C (Figure 7). This is what we expected. The hearth feature and possible posthole noted during excavation do not have obvious anomalies associated with them, as we might expect. The posthole possibly does, but not definitively. The edges of the house floor do not appear as clearly here, most probably because there were very few samples taken from the outside of the house floor, which is an excavation issue that will hopefully be addressed by excavation teams in the future.

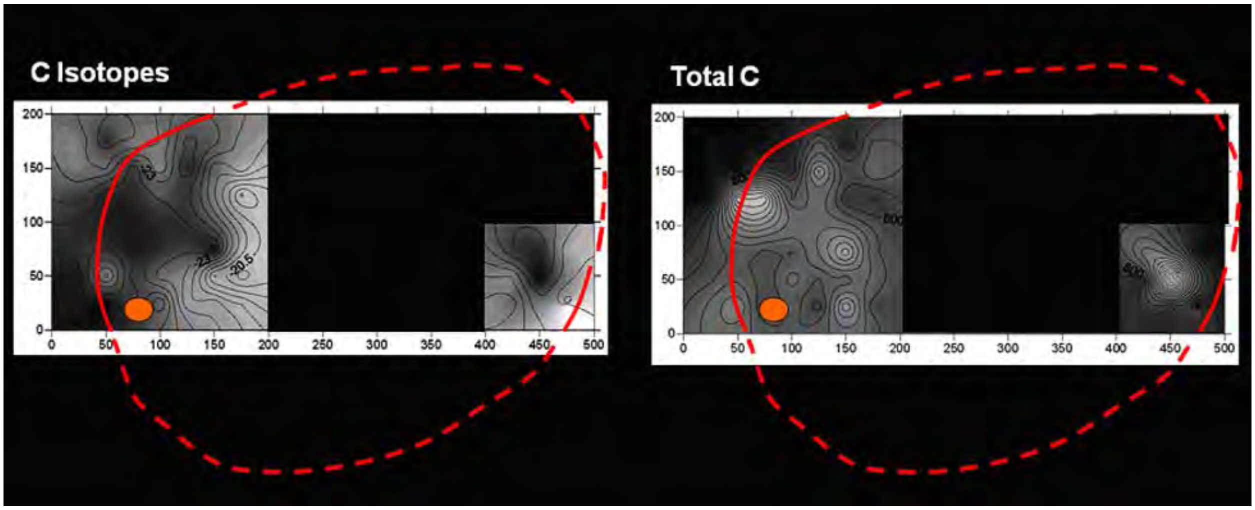

Figure 7. Site-11 distribution of δ^{13}*C (left) and total C (right).*

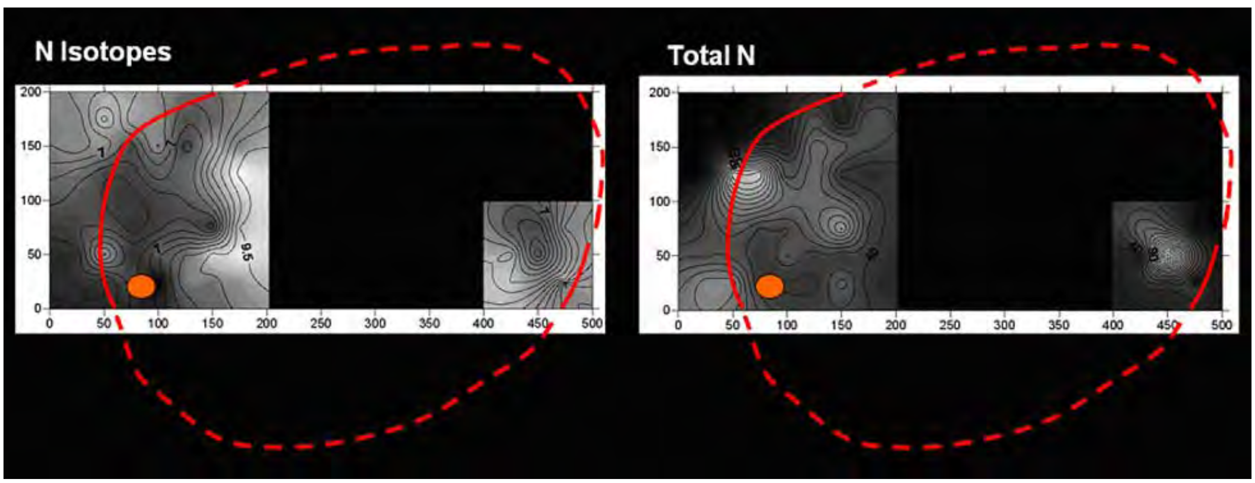

Figure 8. Site-11 distribution of δ^{15}*N (left) and total N (right).*

Site-11 Nitrogen Isotope and Total N

Site-11 Total N and Total C are nearly identical (Figure 8), which tells us that carbon and nitrogen are likely brought in and preserved together, and are likely the remains of the same organic debris. The range of activities that lead to differences in δ^{15}N are unknown. It is possible that food storage could lead to the deposit of this nitrogen isotope, although more research is needed to determine this.

DISCUSSION AND CONCLUSION

At INY-3806, the bone and carbon isotope data clearly show a difference between the interior and exterior of the house floor. The obsidian and nitrogen data were less clear. The house floor itself had relative homogeneity across the floor, which supports a less specialized or formalized use of space. This would be expected of community-oriented social organization, as many activities would occur outside the house. The house floor data point towards a less privatized and open community and social organization, as expected. Of the three noted hearth features on this house floor, only one correlates with a C and N hotspot. The anomaly seen in both C and N in the upper left corner does not align with any noted features. This could indicate a missed feature, or a more subtle activity area that is not readily visible through standard excavation techniques.

At Site-11, the data indicate a more specialized and heterogeneous use of space. The densest bone and obsidian areas were firmly inside the boundaries of the house and in nonoverlapping areas. At this point in time (the Marana period), it appears that many activities moved inside the house, to defined areas of the floor. It looks like there were designated areas for activities like food preparation (which possibly occurred at C and N anomalies) and flintknapping; interestingly, the bone and obsidian maps for this house correlate well: that is, the obsidian hotspot sits firmly in a low-density bone spot, and vice versa. The overall pattern of this house is consistent with a society that has moved towards increasing levels of privatization, with a focus on performing a range of activities inside houses. The house itself is smaller, and space has been more clearly defined in terms of activity range. The isotopic data confirm most of what we suspected: there are pockets of isotopic activity, in smaller, more concentrated areas than we see in the INY-3806 house.

Using the archaeological and chemical records, it is possible to reconstruct the spatial organization of prehistoric houses. The two houses in Owens Valley follow the expected trend away from highly communal living towards less-communal, nuclear-family-based living. Pending XRF data for both house floors may also reveal additional details about the spatial organization of food consumption. As always, more excavations (and sampling) would be prudent to more fully illuminate the suspected patterns. As well, we hope that this study may prompt others to collect similar samples of sediments from living surfaces as they are exposed in the field. Such sampling does not take much additional time once a floor has been exposed, but it can reveal interesting spatial information that traditional excavation techniques may not be able to uncover.

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