Recent excavations at CA-ALA-566 revealed an intermittently used campsite consisting of a late Holocene occupation and one of the few mid-Holocene components known in the San Francisco Bay Area thus far. This study focuses upon the late Holocene occupation and the role of ephemeral campsites in settlement patterns in the San Francisco East Bay. Examination of seasonality patterns at ALA-566 as compared to bayshore mounds in a framework of localized environmental shifts guide the analysis of settlement distribution throughout the East Bay and the changes thereof observed at the onset of the Late period.

The archaeological record of the San Francisco Bay Area is rich with densely settled village sites that have facilitated a better understanding of prehistoric California. These larger sites have been the focus of archaeological investigations for more than a century and consequently have had a large impact on understandings of past settlement systems. The important role played by small sites, such campsite or processing locales, has also been recognized by archaeologists for many years. However, these sites are more difficult to identify, and are rarely the subject of large scale of data recovery excavations. Recent data recovery excavations at CA-ALA-566 (hereafter referred to as ALA-566), obtained macrobotanical samples from a short-term campsite, which provides an opportunity to examine the role such sites played in the regional settlement system through time.

A notable variation in settlement pattern started from the latter phases of the Middle period (200 B.C.–A.D. 1265 [Dating Scheme D: Groza et al. 2011]) and continued into the Late period. The East Bay shoreline was characterized in the Middle period by the proliferation and sustainment of dense shell mounds and villages. In the East Bay Hills, on the other side of the large alluvial plain that comprises most of the East Bay, evidence of prehistoric occupation is noted by several bedrock mortar sites. This is particularly true throughout the Dublin Canyon, which is the conduit from the bayshore and plain to the eastern interior valleys (which have also been densely settled). Compared to the well-recorded bayshore and interior, the archaeological picture of the East Bay plain is sparse, despite numerous water sources and abundant riparian corridors well-suited to support human settlement.

Studies of seasonality of site occupation are consistently contributing to the understanding of population movements including the variables that compelled such seasonality. The late Holocene occupation at ALA-566 is dated to the onset of the Medieval Climatic Anomaly (MCA), a time of intermittent severe droughts spanning from approximately A.D. 800 to 1350. Ecological studies demonstrate increased salinity throughout the bay/estuary during the MCA (Ingram and Malamud-Roam 2013), while dietary changes, metabolic stress, and increases in interpersonal violence have been observed in human skeletal remains from this period (Pilloud 2006; Schwitalla and Jones 2012). The role of ALA-566 in the landscape is considered within this climatic framework.

THE SITE: CA-ALA-566

Site Background

Located at the border of Castro Valley and Hayward in the San Francisco East Bay (Figure 1), ALA-566 was first identified in 1997 by Caltrans archaeologists during environmental compliance work
for a proposed bypass project (Gmoser 1998). In 2015, data recovery was conducted at the site by Caltrans and Garcia and Associates in preparation for sale of the parcels previously acquired for the bypass project. Radiocarbon dating to define temporal components at ALA-566 consisted of 11 dates run on cultural material recovered from the site (Table 1). This revealed that the site was occupied in two primary pulses: a deeply buried Middle Holocene (Early period, ~2100-600 B.C.) occupation and a Late Holocene occupation ranging from Phase 4 of the Middle period (MP4) to Phase 1 of the Late period (LP1) (A.D. 750-1520), with a hiatus of approximately 4,000 years. The following discussion will focus on the late Holocene occupation.

The late Holocene occupation of ALA-566 consists of an intermittently used campsite represented by several thermal features and a sparse deposit of dietary refuse and lithic manufacture debris. The thermal features are constructed of layers of fire-affected rock (FAR) and conform to the descriptions of earthen ovens in the thermal feature typology developed by Thoms (2008, 2009) and Black and Thoms (2014). These earthen ovens, built for slow and lengthy cooking, and ideally sized to feed only a few individuals suggest that the site was inhabited by small groups for brief periods of time. The lithic tool kit was comprised primarily of expediently produced core and flake tools made of locally available materials. The paucity of faunal remains speaks also to the intermittent nature of site use.

The Macrobotanical Sample

The macrobotanical assemblage was by far the most productive dataset obtained from ALA-566. Though few artifacts were recovered from feature contexts, charred plant remains were abundant and provided the basis upon which to build assumptions of seasonality of occupation and the nature of site
use. Macrobotanical remains were analyzed by Dr. Eric Wohlgemuth and Angela Arpaia of Far Western Anthropological Research Group, Inc. (Wohlgemuth and Arpaia 2017). In general, the macrobotanical assemblage illustrated that, while the gathering and processing of nuts was the primary use of plant resources, plant use changed through time, particularly on a seasonal scale, which in implies transient site occupation wherein storage of foodstuffs was not practiced.

The MP4 was the time of the most diverse plant usage and of high reliance upon small seeds in proportion to nuts. This period was also the site’s most active, as indicated by the greatest number of features. The MP4 plant assemblage was marked by the highest ubiquity (percentage of flotation samples in which a taxon is found vs. all samples) and diversity of small seeds and a broad range of nuts including acorn, buckeye, and hazel (Tables 2 and 3). Spring and fall appear to have been the dominant occupational seasons during the MP4. A shift is seen in the Middle-Late Transition (MLT) (A.D. 1096) assemblage, with less emphasis on spring-ripening plants and heightened use of summer small seeds and fall nuts. By the LP1, the wide range of nuts gave way to a focus on hazel and a predominantly summer occupation. The broader pattern demonstrated by the macrobotanical assemblage reveals a direct relationship between the intensity of site occupation and plant use: macrobotanical density and diversity is higher during greater occupation intensity, and lower during low occupational intensity.

### ALA-566 in Regional Context

Resource intensification is evident between the MP4-LP1 periods in the East Bay, in part represented by an increase in small seed exploitation (Wohlgemuth 1996; Wohlgemuth et al. 2017). After prolific plant use in throughout the Early period, plant use in shell mounds declined around 850 B.C., followed by another surge around 950 A.D. (Wohlgemuth and Arpaia 2017). Conversely, there is no increase in plant use intensification in interior East Bay sites, likely owing to the ease of access and year-round availability of shellfish (Wohlgemuth 2004). Intensity of occupation and diversity of plant use ALA-566 are at their apices during the MP4 rise in plant use at the shell mounds. The increase in small seed exploitation at ALA-566 during the late Holocene is similar to with what is consistently observed in interior East Bay and South Bay shore sites datasets.
Table 2. Macrobotanical Samples and Counts from ALA-566.

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Analyzed Samples</th>
<th>Liters of Sediment</th>
<th>Number of Identified Specimens</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nutshell</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dietary</td>
</tr>
<tr>
<td>Late Period Phase 1</td>
<td>1</td>
<td>16.2</td>
<td>65</td>
</tr>
<tr>
<td>Middle/Late Transition</td>
<td>2</td>
<td>26.3</td>
<td>472</td>
</tr>
<tr>
<td>Middle Period Phase 4</td>
<td>6</td>
<td>85.2</td>
<td>659</td>
</tr>
<tr>
<td>Early Period</td>
<td>12</td>
<td>142.9</td>
<td>89</td>
</tr>
<tr>
<td>Total Archaeological</td>
<td>21</td>
<td>270.6</td>
<td>1,285</td>
</tr>
</tbody>
</table>

Note: nd - data not available.

Table 3. Macrobotanical Ubiquity by Time Period.

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Common Name</th>
<th>Early Period</th>
<th>Middle Period Phase 4</th>
<th>Late Holocene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesculus californica</td>
<td>Buckeye</td>
<td>66.7%</td>
<td>100.0%</td>
<td>88.9%</td>
</tr>
<tr>
<td>Corylus cornuta var. californica</td>
<td>Hazel</td>
<td>91.7%</td>
<td>83.3%</td>
<td>88.9%</td>
</tr>
<tr>
<td>Quercus spp.</td>
<td>Acorn</td>
<td>83.3%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Umbellulararia californica</td>
<td>Bay</td>
<td>41.7%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td><strong>Marah spp.</strong></td>
<td>Wild cucumber</td>
<td>66.7%</td>
<td>83.3%</td>
<td>88.9%</td>
</tr>
<tr>
<td>Small Seeds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amsinckia spp.</td>
<td>Fiddleneck</td>
<td>16.7%</td>
<td>100.0%</td>
<td>66.7%</td>
</tr>
<tr>
<td>Calandrinia spp.</td>
<td>Red maids</td>
<td>16.7%</td>
<td>16.7%</td>
<td>11.1%</td>
</tr>
<tr>
<td>Chenopodium spp.</td>
<td>Goosefoot</td>
<td>33.3%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Clarkia spp.</td>
<td>Farewell to spring</td>
<td>-</td>
<td>83.3%</td>
<td>88.9%</td>
</tr>
<tr>
<td>Datura spp.</td>
<td>Jimsonweed</td>
<td>-</td>
<td>83.3%</td>
<td>55.6%</td>
</tr>
<tr>
<td>Deschampsia spp.</td>
<td>Hairgrass</td>
<td>-</td>
<td>83.3%</td>
<td>77.8%</td>
</tr>
<tr>
<td>Galium spp.</td>
<td>Bedstraw</td>
<td>-</td>
<td>83.3%</td>
<td>88.9%</td>
</tr>
<tr>
<td>Trifolium spp.</td>
<td>Clover</td>
<td>-</td>
<td>83.3%</td>
<td>88.9%</td>
</tr>
<tr>
<td>Vulpia spp.</td>
<td>Fescue</td>
<td>-</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>All Identified to Genus</td>
<td></td>
<td></td>
<td></td>
<td>50.0%</td>
</tr>
<tr>
<td>All Identified to Family</td>
<td></td>
<td></td>
<td></td>
<td>75.0%</td>
</tr>
<tr>
<td>Roots</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorogalum spp.</td>
<td>Soaproot</td>
<td>58.3%</td>
<td>83.3%</td>
<td>77.8%</td>
</tr>
</tbody>
</table>
SEASONALITY IN THE EAST BAY LANDSCAPE

Seasonality data helps us understand how populations moved around between and within landscapes. Diachronic fluctuations in the types and frequencies of utilized plants can be corroborated with paleoenvironmental conditions, intersite and intrasite changes in subsistence and technology, and other variables to elucidate relationships between sites and site types across the landscape. At a site, such as ALA-566, where there is a general dearth of faunal remains, macrobotanical data was extraordinarily valuable in reconstructing the timing of occupation.

While macrobotanical data is the most commonly used indicator of seasonality, geochemical analysis of shellfish remains also provide valuable insights (Eerkens et al. 2013, 2014; Finstad et al. 2013; Schweikhardt et al. 2011). The current body of research primarily concerns shell mound sites, of which the seasonality of occupation is essential to the current discussion of the role of ALA-566 in East Bay settlement patterns. Month-at-death studies of *Macoma nasuta* shells recovered from Late period CA-CCO-297 indicate peak claming times during early summer and early winter (Eerkens et al. 2014). Similar peak clamping times were observed at Middle period CA-ALA-17 (Culleton et al. 2009). Late period components of sites in the Richmond locale, CA-CCO-295 and CA-CCO-290, exhibited peak times of mussel-gathering primarily in the late spring, summer, and fall (Finstad et al. 2013).

It is evident from the aforementioned studies that peaks in shellfish gathering activities occurred in East Bay shell mounds in the summer, fall, and early winter, but only occasionally in the spring. In contrast, seasonality of occupation during the MP4 component of ALA-566 alternates with the shellfish-derived seasonality data of East Bay shell mounds, with peak occupation occurring during the spring and fall (although fall was a prime mussel-gathering season in the Richmond locale). By the LP1, seasonality of ALA-566 begins to converge with that of the shell mounds, with an emphasis on summer occupation and retention of some fall and spring use. Table 4 summarizes seasonality at ALA-566.

More seasonality data is needed from MP4-MLT shell mound contexts to make interpretations with confidence; but if the seasonality of shellfish gathering during earlier periods was similar to that seen in the Late period, alternating seasonality between ALA-566 and the bayshore during the MP4 may indicate a particular schedule for plant and shellfish gathering rounds and, more to the point, a definitive relationship between bayshore populations and those utilizing ALA-566. Eerkens et al. (2013) observed a similar pattern of alternating seasonality between Late period sites CA-SFR-171 and CA-SMA-6, respectively a shell midden and an ephemeral campsite along the western bayshore; as shellfish gathering declined at one site, it accelerated at the other. The subsequent convergence of seasonality patterns between ALA-566 and the bayshore, particularly in light of the pattern that emerges along the San Lorenzo Creek drainage in the late Middle period through the LP1, suggests a change in this relationship.

ENVIRONMENTAL CATALYSTS FOR CHANGE

The spectrum of rapidly changing climatic conditions throughout the Holocene undoubtedly influenced prehistoric adaptation trajectories. It will be useful to remember throughout this discussion the admonishment of prehistoric archaeologists David Meltzer and Ofer Bar-Yosef (2012:219):

> in order to forge viable links between specific climatic and cultural changes…. We must carefully assess at a scale-appropriate level the ecological and climatic conditions specific to a place and time that *could* have had a real-time impact on contemporary groups if climatic changes were happening fast enough that they would have been detectable to humans over the course of just several generations.

Fluctuations in shoreline environs may have been detectable at a generational level, but adaptations to these changes are likely not detectable in the archaeological remains until and unless the adaptation is adopted and applied over long periods of time. The short-term experimental excursions are likely not reflected at all. Examination of ALA-566 and other sites like it in the context of the timing and the nature of environmental fluctuations may aid in the capture of these small-scale adaptations.
Table 4. Nutshell and Small Seed Seasonality by Time Period, ALA-566.

<table>
<thead>
<tr>
<th>Macrofloral Remains</th>
<th>Early Period</th>
<th>Middle Period Phase 4</th>
<th>Middle/Late Transition</th>
<th>Late Period Phase 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUTSHELL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late Summer</td>
<td>72.4%</td>
<td>15.5%</td>
<td>44.3%</td>
<td>78.5%</td>
</tr>
<tr>
<td>Fall</td>
<td>27.6%</td>
<td>84.5%</td>
<td>55.7%</td>
<td>21.5%</td>
</tr>
<tr>
<td>SMALL SEEDS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td>46.2%</td>
<td>71.6%</td>
<td>37.9%</td>
<td>32.7%</td>
</tr>
<tr>
<td>Summer</td>
<td>53.8%</td>
<td>28.4%</td>
<td>62.1%</td>
<td>67.3%</td>
</tr>
</tbody>
</table>

The inception of marshlands along the central eastern bayshore occurred circa 1050 B.C. (Atwater and Hedel 1976; Watson and Byrne 2013). After approximately 850 B.C., a de-emphasis in plant foods in some bayshore sites is evident, likely a response to the ample supply of marshland shellfish (Wohlgemuth 2014; Wohlgemuth and Arpaia 2017). The West Berkeley shell mound is an example of what may be the direct effect of environmental changes upon subsistence obligations. Studies from this site demonstrated a reliance upon oysters, which favor gravel beds, in the first (earlier) half of the mound’s strata, and shifting to clams, which prefer mud flats, in the latter half, a sequence possibly corresponding to Holocene depositional events observed in geoarchaeological studies (Greengo 1975; Dore et al. 2004).

While perhaps not an environmental condition in itself, seismic activity has the potential to influence local environs. Frequent seismic events, experienced by Bay Area residents today, were certainly familiar to native populations. Marsh dynamics may have been influenced by fault activity through the phenomenon of tectonic subsidence, wherein seismic activity lowers the elevation of a landform (Guilbault et al. 1995). Bay Area Holocene salt marshes have undergone an estimated five meters of subsidence throughout the past 6,000 years (Atwater et al. 1977). Examples along the California coast suggest that sudden subsidence events do occur, and may be immediately noticeable in marsh inundation levels (Atwater et al. 1977; Orr et al. 2003; Preuss and Hebenstreit 1996).

Late Holocene reoccupation of ALA-566 around A.D. 824 coincided with the onset of the MCA. The unstable conditions created intermittent drought and flood conditions that likely made sedentary villages and resource-procurement routines less reliable. In times of drought, heightened salinity effected by the drying of freshwater drainages probably affected bayshore and marsh shellfish and floral stands enough to destabilize local supplies. This may have led larger village clusters to distribute foraging efforts further from home to a) exploit less conveniently located resource stands and b) appeal to trading partners more often for supplementary resource items. During the Middle period in the East Bay, acorns figured most prominently in subsistence strategies alongside a general decline in the use of other plant foods (Wohlgemuth 1996, 2004). The plant assemblage at ALA-566 during the MP4 and MLT demonstrates an increase in the use of small seeds, but not at the expense of nuts, indicating that the introduction of new food exploitation strategies did not replace old ones. This observation reflects the widespread small seed intensification seen in the Late Period East Bay and evidence of early adaptation to the onset of the MCA by way of resource diversification and intensification, possibly in response to acute marsh fluctuations.

**LATE MOVEMENT INLAND**

ALA-566 appears to be associated with a previously hypothesized East Bay movement inland, although whether it was tied to the bayshore settlements or part of an independent expansion is unclear. The aforementioned studies by Eerkens et al. (2013, 2014) support a “fission-fusion” pattern of population distribution wherein populations dispersed during particular seasons and reassembled
afterward. Similarly, Finstad et al. (2013) argue against a pattern of short-term sedentism amongst mounds in the Richmond locale, instead suggesting concurrent occupation of mounds with smaller groups striking out to satellite mounds for gathering excursions. Populations appear to “retreat” upward along freshwater drainages in the Late period, as seen in the Richmond locality, abandoning some larger mounds during the LP1 (Lightfoot and Luby 2002).

The diachronic change in seasonal focus at ALA-566 may be evidence of a movement up the San Lorenzo Creek drainage that may have begun in the latter half of the Middle period. CA-ALA-586 is a shell midden site situated along San Lorenzo Creek approximately three miles to the west of ALA-566, where it straddles the bayshore and inland climes. Site deposits have thus far been dated to 550-710 A.D., placing it from the end of Phase 2 of the Middle Period to the beginning of the MP4 (Tiley 2001; Ryan 2017). CA-ALA-502, approximately one mile to the southeast of ALA-586, is an MLT to Late period village and cemetery site along the creek. CA-ALA-58, a minimally recorded site along the banks of San Lorenzo Creek approximately one-half mile to the south of ALA-566, is situated on the surface of the Holocene-aged alluvial landform in such close proximity that it may be contemporaneous with the late Holocene component of ALA-566. The appearance of other sites along the drainage during and after the late Holocene reinstatement of ALA-566 provided more access points to these riparian stands, possibly explaining the shift in seasonality and the decline in site use seen in the LP1.

A unique hybrid of bayshore and inland subsistence behavior observed at nearby ALA-586 alludes to potential changes in either local resource stands, territorial circumscription, or both, as they often influence one another (Bettinger 2015). This in turn may have initiated the push upstream. Macrobotanical analysis identified heavy exploitation of freshwater marsh resources (Pierce 2001). Also evident is prolific use of Cerithidea, a low-ranked salt marsh shellfish that is more typically seen in sites along the southern bayshore. Exploitation of this species is also evident at ALA-502. Occupants of these sites were evidently accessing a variety of stands, both local and more far-flung; this may indicate either trade with sites to the south (possibly a more lucrative exchange given that southern sites had easier access to what is typically a low-yield animal, and ALA-586 had easy access to acorns without a heavy reliance upon them), or extensification to a pattern of smaller, less desirable resources stands incited by the putative population increase attributed to the later Middle period.

Additional macrobotanical analysis at ALA-586 by Wohlgemuth et al. (2017) demonstrates a summer and fall focus with a far higher frequency of plant processing than that observed anywhere along the eastern bayshore with the exception of CCO-297 in the Richmond locale. Also notable, and in contrast with sites along the East Bay shoreline, is the fact that acorns contributed minimally to the overall nut assemblage. Wohlgemuth et al. (2017) interpreted ALA-586 as a base site from which gathering excursions in the hills were launched, allowing access to a greater variety of nut stands, as opposed to sites lining the bayshore, where nut crops, primarily acorns, were likely traded in from upland populations. These gathering excursions very likely may have been conducted at least partially at ALA-566. Wohlgemuth et al. (2017) cite Early period CA-ALA-312 as a situational parallel, where nut crops in the hills were easily accessible but acorns were a small contribution to the plant assemblage.

The latest occupation of ALA-586 and earliest of ALA-566 overlap (though minimally); this may be a consequence of minimal sampling conducted thus far at ALA-586, or may signify an abandonment of ALA-586 and a settlement thrust upstream. These scenarios are not mutually exclusive; if a later component is eventually identified at ALA-586, there remains the above-described evidence of Late period settlement increase along San Lorenzo Creek.

**LANDSCAPE CONNECTIVITY**

Why ALA-566, one of the farthest of the San Lorenzo Creek sites from the bayshore, was settled first, as appears to be the case using the currently available suite of evidence, may be explained by its proximity to the western entrance to the Dublin Canyon and thereby to the inland valleys. Ecological opportunity in concert with sociopolitical and territorial impetus likely drew the line of settlement from the
bayshore to the western entrance of the Dublin Canyon. It is reasonable to assume that, in times of
environmental and population flux, constraining group size while extending the reach of alliances with other
groups would have been a beneficial and perhaps natural progression. Seizing the opportunity to establish
command over portions of the riparian corridor populations along San Lorenzo Creek would have gained
them an advantage in the landscape not only through control of valued nut crops, but through proximity to a
communication chain and travel corridor that may have ultimately led to the interior East Bay valleys. ALA-
566 and CA-ALA-60, a short-term camp and bedrock mortar site to the east of ALA-566 (Bard et al. 1989;
Miller 1982) are particularly well-placed to serve as resting camps along the journey. CA-ALA-43
(Hampson 1987), at the eastern edge of the Dublin Canyon, may have served a similar function to those
traveling west through the canyon. Throughout the canyon are several bedrock mortar sites, suggesting a
routine of riparian gathering along the creek, traveling and processing foods along the bedrock facilities
through the canyon, and possibly meeting at these canyon sites to exchange goods.

Ecological conditions to the south of the San Lorenzo Creek corridor likely facilitated
connectivity to populations along the southern bayshore as well. Activity along the Hayward Fault created
a high-water table throughout the East Bay plain that created freshwater springs and their attendant
willow groves known as sausals. These features would have provided well-appointed rest stops as well as
plentiful willow resources, and may have made travel throughout the plain more attractive, encouraging
communication between the populations of the creek corridor and the South Bay.

CONCLUDING REMARKS

ALA-566 was likely a function and agent of a settlement transition in the East Bay that began
shortly before the detectable onset of the MCA and continued into the Middle period. Fluctuations in
sensitive marsh stands along the bayshore and limitations of freshwater influx downstream wrought by
drought conditions may have inspired the move of smaller populations upstream along San Lorenzo
Creek, a trend that continued into the Late period and was possibly inspired by socioeconomic and
territorial demands that compelled the settlement of new niches and resource extensification. This pattern
is in line with previously postulated models of the distribution of smaller groups across the landscape, a
phenomenon that becomes apparent through examination of seasonality data and the timing of seasonal
occupation of larger bayshore settlements in relation to smaller inland sites.

Macrobotanical and shellfish gathering data indicate that seasonal occupation of ALA-566
alternated with that of bayshore site in the MP4, but converges during the LP1. This appears to support
the dispersal model, wherein groups are present across the landscape throughout most of the year; in the
case of the San Lorenzo Creek sites, this may have afforded increased economic agency through a
network of controlled riparian stands as well as extended communication networks between the bayshore
and the interior valleys, which would have been beneficial during a time of environmental instability in
the region. Further research will demand increased visibility of small, ephemeral sites that capture
temporary and experimental adaptations that may not be evident in dense, established sites. It will be
valuable to reevaluate this analysis as the body of shellfish seasonality data is expanded.

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