REVISITING CA-VEN-1, A CLASSIC MILLINGSTONE SITE ALONG THE SANTA MONICA COASTLINE, CALIFORNIA

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Perception and interpretation of Millingstone sites have often been colored strongly by early investigations of these settlements. Using an updated paradigm of the coastal migration theory can offer some new insights into redefining older interpretations of early coastal Millingstone sites. By asking broader research questions, we can elucidate new data from settlements of seemingly confusing or at least contrasting Millingstone occupations in different geographical locations. I use newer data from the Little Sycamore site to show how broader research questions and new data collection methods can influence site interpretation, which aids in the accurate analysis of these early Millingstone components and sites. An accurate assessment of Millingstone can only occur using modern recovery techniques and broader research questions in order to overcome deficiencies in earlier investigations.

What is Millingstone? Millingstone is a fascinating and perplexing aspect of prehistoric culture. Millingstone has been defined as many different things: from a horizon (Wallace 1954), to an adaptation (Basgall and True 1985; Jones 1991), a culture (Jones 2008; True 1958), and a tradition (Warren 1967). In each instance, there was a goal to better define Millingstone into something that transcended a regional variant. In California, Millingstone has a long history marked by numerous scholarly publications. Beginning in the late 1920s (Harrington 1928; D. Rogers 1929; M. Rogers 1929), this research has examined sites in various areas of California stretching from Santa Barbara to San Diego. It has led to many different regional variations of Millingstone: Oak Grove, La Jolla, Sayles, Pauma, Lake Berryessa, and the Topanga complex. These regional manifestations of Millingstone have been used to further define, at times, slight variations in Millingstone. These variations range from slight subsistence changes to slight chronology differences. The tool kit varied little regionally.

BACKGROUND

Wallace (1954) was the first archeologist to test CA-VEN-1 and attempt to define Millingstone as a horizon. The classic features of this site are the characteristic manos and metates, which are common tools at Millingstone sites. Many other tools were also present, including hammer stones, scrapers, beads, and bone tools. Some other artifacts were present, but usually in significantly lesser quantities, including pestles, mortars, projectile points, cores, discoidals, cogged stones, and stone pendants. Another feature was the flexed human burials that were found in these sites (Harrington 1928; Peck 1955; D. Rogers 1929; Wallace et al. 1956; and many others). The tool kit varied little regionally (Heizer and Lemert 1947; Treganza and Malamud 1950; Walker 1951; Wallace et al. 1956). It led Wallace to characterize this as "a simple people with a meager toolkit" (Wallace 1954: Wallace et al. 1956). Certainly most artifacts in Millingstone people's toolkit are not highly stylized, with one notable exception.

Wallace was one of the first to try to compare the regional variations of Millingstone within a larger and broader definition. Since many of the regional manifestations of Millingstone were so similar, it seemed logical to better define it. Before and after, many scholars seemed to emphasize the regional variation rather than the broader view of Millingstone (Kowta 1969; D. Rogers 1929; M. Rogers 1929; True 1958; True and Baumhoff 1985). This, I believe, has set back Millingstone research. Ironically enough, as later manifestations of Millingstone were discovered (i.e., Sayles and Lake Berryessa), those researchers were quick to note the similarity with Millingstone in other areas (Kowta 1969; True and Baumhoff 1985, 1985; True et al. 1979). Yet later research tended to emphasize these regional "differences," to better define the regional variation, rather than better define the broader example of

Millingstone statewide. So these regional variations have come and gone, to some extent. Some of these regional variations still linger, and many are still cited.

The somewhat unique tool kit for Millingstone is evident in how virtually all previous researchers noted the distinction between Millingstone and later cultures (Peck 1955; True 1958; Walker 1951; Wallace 1954). This tool kit has often been described as simple, meager, expedient, and functional (Wallace et al. 1956). The tools are not stylized, nor did they change much throughout the occupation period. The one exception noted by many researchers is the crescent. This seems to be the one artifact that evolved through the Millingstone into distinct artifact styles (Mohr and Fenenga 2010). Possibly the most ubiquitous artifact identified in the Millingstone horizon is the crescent. Not found in all Millingstone sites but found in enough to be clearly identified with Millingstone, crescents still confound us today. They are also found on the Channel Islands, where Millingstone culture is evident but lacks milling stones (Erlandson 2013). We finally have useful typologies for crescents, though we have yet to discern their function (Fenenga 1984; Mohr and Fenenga 2010). Are they tools that were used to hunt waterfowl, as on the Channel Islands (Erlandson, personal communication 2013), or are they some sort of artistic artifact that served some still unknown function or simply functioned as an artistic expression (Mohr and Fenenga 2010)? There are still several working hypotheses to be tested. We now have a better understanding of the age of crescents, thanks to cladistics, and that clearly puts them within the chronology of Millingstone in its broader context (Mohr and Fenenga 2010:59-63). The fact that these artifacts have been known for over a century and yet that their function is still a mystery hampers a better understanding of Millingstone as well. Why are crescents found at some sites and not others? Why are they so widespread, and why are there so many styles, if they are functional tools? No other Millingstone artifact evolved into so many different styles.

As many researchers have noted, it is difficult to elucidate data on the social structure and behavior of the Millingstone people (Glassow et al. 2007:195). Researchers disagree about interpreting some aspects of their culture. For example, were they sedentary or mobile? Were they truly egalitarian, and was there a division of labor by sex? Did they speak the same language? From where did they originate? What we do know is that they had a preferred method of human burial. They did bury their dead. It was burial in a flexed posture. They may have had some belief in the afterlife, as some burials have grave goods or funerary objects in association. These can vary from tools to shells, to stones, to ochre. It used to be thought that the inhabitants were highly mobile, as many early hunter/gatherers were. However, several researchers, notably Glassow (1991) and Dallas (2001, 2004), have noted indications that imply at least semisedentism for Millingstone people, based on their subsistence strategy dominated by marine resources, the length of continuous occupations, and the lack of significant imported plants from outside the local environment of the residential base site. They also seemed to prefer local rock sources for tools, with rare exceptions. Postdepositional forces and the age of the deposits certainly hamper our ability to discern many of these human behaviors or any social structure, based on what is left in the archeological record many thousands of years later.

Postdepositional Forces

Certainly a better understanding of Millingstone has been hampered by postdepositional forces such as sea level rise, coastal erosion, and bioturbation (Glassow et al. 2007). The exact effect and combined effects of all these forces are still unknown, but they have probably caused many of the early components to be lost to the sea, and have also mixed components, such that their original position is suspect. Bioturbation has muddled the strata, such that most artifacts are not in their original positions, at least vertically (Erlandson and Rockwell 1987). This effect hampers site interpretation, as we cannot deduce with certainty which artifacts are from which level and hence are directly related to each other (Erlandson 1991). We can infer stratigraphy in a general sense, based on the tool types and with the help of radiocarbon data, but much of that is mixed (Dallas 2001; Erlandson 1991; Glassow et al. 2007). To some degree, that argues for a more general interpretation of Millingstone, rather than a more specific level-by-level interpretation. It also makes deducing the terminal date for Millingstone much more

difficult, as the data tend to reduce in quantity, rather than change dramatically at one specific level. In some residential bases, this is more pronounced, but not in all sites.

Wallace missed a small but important interval of Middle-period occupation or activities at VEN-1 (Wallace et al. 1956). This is reflected in the beads in the assemblage, a slightly greater quantity of mortars and pestles, and maybe a change in the burial pattern (to reburial pits with disarticulated bones). These later beads were mixed in with Millingstone components. King (1967) first noted this fact, comparing VEN-1 with the Sweetwater Mesa site. It is not long term occupation at VEN-1, but it is still discernible. What it might be evidence of, is the occupation of site VEN-86 next to VEN-1 across the Little Sycamore drainage. While not formally living at VEN-1, they might have been conducting activities there. The inhabitants could be burying their dead at VEN-1 or moving older burials at VEN-1 to new locations. It could also reflect periodic but not regular occupation of VEN-1 later in time. It is striking to note that these forces might make it impossible even for a skilled researcher to note a short-term occupation event. But again it points out the problem of significant postdepositional forces altering the strata, such that a researcher might doubt what is found, due to where it is found. But King has examined mortuary data in detail, and this can be an aid in discerning these confusing postdepositional forces (King 1990). It identifies certain artifacts as distinct time-markers, making it easier to define cultural events by artifact types if not by stratigraphic changes. This change in the burial pattern is also clearly a change in the culture. It emphasizes the importance of discerning cultural patterns such as mortuary or burial pattern(s) for each culture or period of occupation within each site.

Some more recent studies indicate that there was minimal gender differentiation in acquiring food resources (McGuire and Hildebrandt 1994:43). Most researchers of Millingstone have been unable to define this behavior in any meaningful manner. Some of this difficulty could be a result of middle-range theory limitations in the particular study. Glassow et al. (2007:196) have perceptively noted that the picture of settlement is still incomplete and is no doubt biased, in that many of the more ephemeral Millingstone sites are lost or unrecognized and hence our view is mostly based on the residential base camps like VEN-1. Sites slightly inland from the coast have not been discovered in any quantity or tested to understand the role they played in settlement patterns. One inland site that seems to be linked to the coast is SBA-485. Glassow et al. (2007) have noted that this site yielded side-notched projectile points and flaked stone tool waste that were also found at the Aerophysics site (SBA-53).

One of the most interesting aspects of Millingstone, apart from crescents, may be related to trade or exchange systems. Recent data are again noting that many Millingstone people traded or exchanged goods over a large area. For example, it is evident now that the Santa Barbara Channel people traded shell beads to the San Diego area in historic times (Zepeda 2004). Early bead trade from Santa Barbara has been shown in exchange with the Great Basin 6,000-7,000 years ago (Bennyhoff and Hughes 1987). Trade has been known for a long time for Millingstone (Fewkes 1896). Many have noted trade with the Southwest (King 1990) and with other areas within California for obsidian, probably furs, salt, shellfish, fish, asphaltum, pine-pitch, and other goods (Gifford 1949; Heizer 1978). This is interesting, as it indicates a fairly regular interaction sphere with other areas for desired goods. If this is true and is as widespread as it appears, then it might argue for a more complicated exchange system or interaction sphere, which is more similar to later ethnographic tribal groups (Heizer 1978).

VEN-1 was first excavated by Wallace in the early 1950s. This excavation was noteworthy not so much for any special techniques employed but for the significance of the cultural findings at the site. Millingstone artifacts had been found before, as noted above (Harrington 1928; D. Rogers 1929; M. Rogers 1929; Walker 1951). However, the preliminary findings were noteworthy for the great number of stone tools recovered and the number of human burials noted in two distinct burial styles. Several other minor things were noteworthy, such as Wallace indicating that *Mytilus edulis* was the dominant shellfish recovered, which is an uncommon species along the outer California coast. He noted the lack of significant quantities of faunal remains, projectile points, and flaked stone tools. The latter was not unusual in Millingstone sites. What Wallace showed was that Millingstone appeared to have a widespread geographic distribution, but also within a specified time interval. Hence, a later Wallace publication

detailed his determination of Millingstone being a "horizon" (Wallace 1954). He and other contemporary scholars (Peck, Heizer, Lemert, Treganza, Malamud, True, and many others) were unable to date the occupation interval, noting that the occupation lasted for quite some time, although they could not absolutely determine the time interval. This was before ^{14}C dating was a common practice. In most cases, excavations in recent decades are pushing this "horizon" further back in time and even into much later periods (Byrd and Raab 2007; Dallas 2004; Erlandson 1991; Fitzgerald 2000; Fitzgerald and Jones 1999; Glassow et al. 2007; Kowta 1969; True and Baumhoff 1985; and many others).

RESEARCH ISSUE

One of the problems associated with many of these earlier studies is that they were conducted in the 1940s and 1950s (sites such as LAN-1, LAN-2, Malaga Cove, Zuma Creek/Zuma Mesa, VEN-1, etc.) when the theoretical paradigms and recovery methods were quite different than today. Most of the sediments recovered were not even screened but were broadcast, for example. About a decade ago, when I planned to reexamine VEN-1, I approached VEN-1 as a study to evaluate the site in light of today's research questions and recovery techniques. One question I asked was this: Did the earlier recovery techniques affect the artifact assemblage so that it biased the interpretation of Millingstone? I was not trying to judge Wallace or anyone else on their earlier work, just to determine if VEN-1's artifact assemblage was complete and accurate. What I discovered was that it was not complete or accurate (Dallas 2004). The findings will be examined in detail below.

What is it that separates Millingstone from other early cultures? In summary, probably three main things distinguish it: (1) human burial pattern, (2) general toolkit, and (3) subsistence strategy. In more recent studies, we could postulate a few other noteworthy aspects: (1) a unique artifact, the crescent, (2) the use of boats, (3) a consistent settlement pattern, and (4) an adaptive strategy that still is unclear. For some time, many researchers noted that certain Millingstone sites seemed to vary from others. For example, inland sites seemed to rely more on terrestrial mammals than on the shellfish of the coastal sites. Hence, for example, different names were given to these manifestations, such as Pauma complex, Topanga complex, Sayles complex, and Lake Berryessa.

How important was this variation? It is difficult to totally determine this, as the environments in these regional variations of Millingstone are notably different and hence it would require an adaptation to adjust to different food resources. Many of the faunal food resources (such as fish and sea mammals) were probably dressed, so that the bone was not brought back to their camp and hence is missing from the assemblage. Again, many of these earlier excavations were using different recovery techniques. Certainly one could argue that these people adjusted to their environment(s) and that they had a successful strategy as they survived for thousands of years—at least 8,000 years, and in some areas longer than that (Jones 2008). Certainly their presence in these varied environments is testimony to that success. The facts that their subsistence was broad-spectrum, their toolkit was varied and simple, and these people were mobile (at least logistically) again seem to support their longevity and success. No other culture survived this long and within such a widespread area in California. Specialized hunter/gatherers or niche people often struggle to adapt to changing environmental conditions (Diamond 2011). Often it is not necessarily the environment that is to blame; their culture and their approach to resource procurement and the environment usually is more to blame for their demise or collapse (Diamond 2011). These Millingstone people adapted to a wide variety of geographic zones, through many episodic changes in the environment.

VEN-1 is an interesting classic Millingstone site. It has similarities with sites in the same general area: Zuma Creek/Zuma Mesa, and LAN-92. It has similarities with sites outside the northern bight region: in San Diego (University House, SDI-4669) and on the Channel Islands (SMI-261). Why is this so? Why do sites in such distant and varied environments often yield such similar findings in subsistence, toolkits, and burial patterns? I believe it is due to the nature of Millingstone and the Millingstone people. It is because Millingstone people were so widespread. It is because they formed a general, broad-based

culture. It is more than just a regional pattern, as we have shown and as noted by many researchers (Basgall and True 1985; Jones 2008; Wallace 1954; Warren 1967; and many others).

DATA

While my examination of VEN-1 was more modest than Wallace's excavation, I discovered many intriguing finds. Not the least was the discovery of a now-extinct faunal species, *Chendytes lawi* (Dallas 2004; Jones et al. 2008). That discovery led a team of researchers to publish an article detailing the extinction of this species (Jones et al. 2008). The discovery of an early carbonized acorn shell fragment could have been early experimentation with acorns for food (Dallas 2004). It was also discovered that the site was significantly older than previously thought: 8,400 years before the present, rather than 6,900 years (Dallas 2001). The people who occupied the site had a broad-based diet that was dominated by marine resources (64-75 percent). Finally, while previously it was thought that Millingstone people did not fish (Peck 1955; Wallace 1954; Wallace et al. 1956), I determined that fish were a significant component of the diet at VEN-1 (Dallas 2001, 2004, 2013) and at another nearby site, LAN-92 (Mealey and Dallas 1995). I have also hypothesized that other similar sites, like Zuma Creek/Zuma Mesa, would have yielded similar subsistence results if those sites had survived and had been tested with modern recovery techniques, such as flotation (Dallas 2013).

I have argued that the approximate diet of the inhabitants may have been as follows: fish, 22 percent; shellfish, 30 percent; terrestrial mammals, 16.5 percent; sea mammals, 14 percent; and plants, 17.5 percent. Plant use is difficult to determine because so few plant remains survive in most Millingstone sites, but by deciding the other components, one can approximate the contribution of plant resources. This diet relates to the Millingstone occupation of VEN-1. Terrestrial mammals were significant with small-to-medium mammals dominating. Shellfish is present in abundance, with one species clearly dominating: *Mytilus californianus*. Only one other taxon, barnacle, is present in any significant quantity. This differs from Wallace's findings, which indicated that *Mytilus edulis* dominated the shellfish component at VEN-1, with smaller quantities of abalone (*Haliotis fulgens*), barnacle, clam (*Chione undatella*), turban snail (*Tegula* sp.), Moon snail (*Polonices* sp.), and *Schizthaerus nuttalli* (sic) (Wallace et al. 1956). The implication of the finding of *Mytilus edulis* earlier might be there had been an estuary or embayment at the mouth of the Little Sycamore Creek at some point and that the environment had changed through time. However, this was not the case; there is no evidence of such an occurrence.

I also determined that the toolkit of the Millingstone people was more varied than previously thought and that it included manos, milling stones, hammer stones, bone tools, beads, scrapers, and stone pendants, along with a few less important artifacts (Dallas 2001, 2013). The bone tools are dominated by bone gorges used in fishing, with awls also being present. Bone tools represented about 29 percent, followed by manos (20 percent), beads (15 percent), hammer stones (7 percent), cores (7 percent), pestles (7 percent), scrapers (7 percent), stone pendants (5 percent), milling stones (3 percent), and projectile points (<1 percent). The major differences between my results and the findings of Wallace et al. (1956) were increases in the percentages of worked bone, beads, and stone pendants, and a decrease in milling stones recovered. It is unlikely that the decrease in milling stones is significant; with my limited testing, features that would yield these artifacts were just not encountered. However, it is likely the increases in the other artifact categories are significant, with the smaller-mesh screens and flotation augmenting the yields. It is clear that with the larger-mesh screens, some broadcast recovery, and the lack of wet screening in the earlier excavation (Wallace et al. 1956), many of the smaller classes of artifacts and fauna were underrepresented in the assemblage. Why is this significant? The interpretation of the activities that were occurring at VEN-1 changes markedly with the new data. The increase in fish remains and bone tools (gorges) indicates that fishing was important. Without these data, it would not appear to be of any consequence (Wallace et al. 1956).

Fish were not considered a staple in the Millingstone diet in the earlier study at VEN-1, though Wallace noted that 10 percent of the fauna recovered were fish (Dallas 2001; Wallace et al. 1956). He

probably thought that the small quantity of remains (n = 33) was not significant. Wallace noted that "the main economic interest of the Little Sycamore inhabitants was not in hunting or fishing but in the collection of shellfish and wild plants" (Wallace 1954:112). He also stated that "fish appear to have been rarely caught and eaten" (Wallace 1954:113). However, I found 600 fish bones in one 1-x-1-m unit (Dallas 2000) and more in subsequent units (Shabel 2011). Most of the previous studies on significant Millingstone sites have come to a similar conclusion as Wallace (Peck 1955; Walker 1951; Wallace et al. 1956). Other sites are similar to VEN-1, such as SLO-165, where the Millingstone components have been found along with fish remains (Mikkelsen et al. 2000). Viewing the combined faunal data and bone tool data, fish were clearly an important component of the diet at VEN-1 (Dallas 2001). The breadth of fish species and genera recovered also reflects more focus on fishing (Dallas 2001, 2004). This is important in that it indicates that, with the use of boats, the inhabitants of VEN-1 had logistical mobility, which would have been useful in hunting sea mammals and in fishing in more environmental zones.

Given the lack of significant quantities of exotic plants or tool materials, at least semisedentism is indicated. The use of the site as a burial site would also indicate that people are returning to this site regularly as a residential base. There are also features such as floors, hearths, cooking areas, rock clusters, and burials with milling stones that further reflect long-term or regular use (Dallas 2004; Wallace et al. 1956). The inhabitants probably alternated occupation with another nearby prehistoric site, LAN-92, as the two sites have slightly different radiocarbon occupation dates, indicating possible alternate living site locations (Dallas 2001; Mealey and Dallas 1995).

RESEARCH ISSUES

Chronology

Looking at radiocarbon dates associated with Millingstone components for the state as a whole, the range is wide. Some geographic areas overlap, and others have younger periods of occupation. One noteworthy example from a recent publication by Glassow et al. (2007:193-194) noted that in the northern bight, occupation for Millingstone started at 7000-6500 B.C., began expanding, and then ended about 5000 B.C.. There are some problematic implications with this end date of about 7000 B.P. in the northern bight for Millingstone. The first is that many of the classic Millingstone sites in the northern bight have yielded dates younger than the terminal 7000 B.P. date proposed: sites such as Malaga Cove (6500 B.P.), Zuma Creek (maybe 8000-6000 B.P.), LAN-92 (7350-6940 B.P.), SBA-96 (7590-5940 B.P.), SBA-97 (7920-6200 B.P.), SBA-2067 (4230, 4300 B.P.), LAN-267 (6870-6310 B.P.), VEN-1 (8400-6500 B.P.), and SBA-142 (7270-6380 B.P.), just to name a few. These classic Millingstone sites all have dates or dated components that are younger than the 7000 B.P. end of Millingstone proposed by Glassow et al. (2007), and hence portions of their components or all of them, would no longer fit within the "horizon period" for Millingstone. Yet these sites have all helped to define the Millingstone by burial pattern, tool kit, subsistence, settlement pattern, and/or dated components in the literature through the years (Dallas 2001, 2004; Erlandson 1991; King 1967; Mealey and Dallas 1995; Peck 1955; Walker 1951; Wallace 1954; Wallace et al. 1956; Warren 1967; and many others).

Many geographic areas of Millingstone culture yield dates younger than those alluded to above. However, Millingstone culture could include all these sites by extending the terminus date to 6500 or 6000 B.P. in the northern bight. In San Diego and other areas such as Los Angeles and San Bernardino, the dates for Millingstone are much younger, going to at least 3000 B.P. (Kowta 1969; True 1958). In the northern bight, we still need to include all these classic Millingstone components, or it is very unclear how to define Millingstone and date many of these components. If these components are not Millingstone, what are they? The tool kit is the same, the burial pattern is the same (unless the reburials date to this time), and the subsistence is the same. For the northern bight, I believe we just need to revise the chronology for Millingstone to be slightly younger, terminating about 6500 or 6000 B.P. In the northern portion of the southern bight, for example in Los Angeles, the dates for Millingstone are

significantly younger (ca. 5950-2450 B.P.), as they are in San Diego and other areas (10,000-3000 B.P. or later).

The oldest dates for Millingstone keep being extended back in time. While Millingstone used to be thought of as only about 5,000 years ago, with the use of modern radiocarbon dating, the dates continue to be extended back in time to over 10,000 B.P. at certain sites (Fitzgerald 1998; Jones et al. 2007:135-138). There are numerous implications from these data. One is that at many of the classic coastal Millingstone sites, the early components have probably been lost to rising sea levels and coastal erosion. Also, Millingstone, rather than being a short-term culture anomaly, has become an important focus of early California settlements as well as early settlements in general (Erlandson 1994, 2002; Erlandson et al. 2007). Certainly any culture that lasts even 8,000 years is important in any cultural scheme.

Hypothesis

There is one hypothesis that at this moment lacks resolution or even testing. It is a hypothesis that, while it has been debated, has not been tested in any credible manner. It is possible that Millingstone reflects two separate and distinct cultures at the same period, which reflect Millingstone's somewhat inconsistent data set. Millingstone could be a mix of a Desert-like group of plant eaters and hunters, plus a group of coastal travelers who were dependent on marine resources. The marine-based coastal travelers are best represented on the Channel Islands and along the California coast. The artifacts of both of these "cultures" may be mixed and hence unsortable (Erlandson 1991; Glassow et al. 2007). This is possible, but it seems unlikely. There are not two complete sets of contrasting tool kits at Millingstone sites that are mutually exclusive. There are a few artifacts that are mutually exclusive, like bone gorges and projectile points. The one is seemingly representative of a maritime culture, and the other seems related to a hunting culture. The quantity of projectile points at Millingstone sites is extremely low, however. Projectile points are not found in any significant quantity, except in a few instances in Santa Barbara County and San Luis Obispo County. There are also a few crescents. However, it needs to be remembered that we still have yet to decipher the function for crescents (Mohr and Fenenga 2010:114). Also, we do not find large quantities of crescents at Millingstone sites. Coastal traveler sites, which also lack manos and milling stones, are rather few in number on the mainland currently, but are best represented by Duncan's Landing/Point: SON-348/H (Schwaderer 1992).

It does not appear that there is a mix of a true hunting culture with another that is maritime-focused. Apart from the economy focused on marine resources, it does not appear that hunters could survive on what they hunted (about 16.5 percent) and what was gathered (plants, about 20 percent). The hunters would only have about 36 percent of the diet needed to survive and probably would be deficient in fat, carbohydrates, and protein. This would be a recipe for certain cultural disaster. Any change in the environment would have been certain disaster for the culture and death to the people. This is negated by the known success of Millingstone people: over 8,000 years of occupation (Jones 2008:145). If the Millingstone toolkit had lots of projectile points and bone gorges, one could make a hypothetical case for two separate cultures with two distinct subsistence goals. Millingstone, however, seems to have been heavily weighted to the marine resource end and maybe somewhat towards plants. Everyone agrees that hunting was not a major focus (Jones 2008; Wallace 1954; Wallace et al. 1956; and many others).

Interpretation

Finally, much has been made of the quantities of milling stones and manos found in these sites. However, remember there is a long time frame that goes along with those numbers at most sites, which argues against the dominance of plant gathering tools providing huge segments of the Millingstone subsistence. Hundreds of milling stones and manos at a site occupied for, say, 2,000 years (or longer!) does not imply an overreliance on plant resources. Granted, it is usually the only surviving component of the equation (stone tools versus plant remains), but it is intriguing at the least. Wallace's finding of 116 milling stones at VEN-1 translates to 0.058 milling stones per year—certainly not a significant quantity

for even a family or an extended family. Would one milling slab have lasted and satisfied a family or more for 20 years of continuous use? It seems unlikely. Glassow has estimated the average size of a Millingstone group would have been about 50 people (Glassow 2013).

CONCLUSION

At the outset, it was asked, "What is Millingstone?" Millingstone was a culture, whose people inhabited large portions of California from about 11,000 to 3,000 radiocarbon years before present (in certain areas, somewhat later; probably earlier in Santa Barbara County, terminating at about 6000 B.P.). It was a culture without boundaries that existed before later ethnographic boundaries, a broad-based hunter-gatherer group that ranged over a vast and varied geographic area (from the North Coast range to the Central Valley, to the San Francisco Bay Area, and down to San Diego). It had a subsistence based predominantly on marine resources (shellfish, fish, and sea mammals, 64-75 percent), at least on the coast. The Millingstone people were semisedentary, yet they had logistical mobility with boats, traded freely over significant distances, and displayed a very successful culture (by age and geographic distribution). Their tool kit, while fairly simple, included hammer stones, milling stones, manos, bone gorges, awls, cores, scrapers, crescents, beads, cogged stones, stone pendants, and a few projectile points, mortars, discoidals, gorgets/heating stones, and pestles. They did practice a distinct flexed human burial pattern. There is some evidence of later intrusive reburial pits, but dates from these features are still lacking, although they probably postdate the Millingstone culture (Peck 1955; Walker 1951), based on the artifacts in association.

Their diet was not as dependent on plants as previously supposed (Peck 1955; Wallace et al. 1956; and many others). Plants, seeds, and bulbs probably accounted for 20 percent or less of their subsistence. This dependence probably varied by the seasonal availability of the plant resources in the area. Some would argue otherwise, but information in the next decade will probably solve this question. We will probably never be able to directly attribute this to the collected data, as so little plant material survives that long. The tenuous data available at the moment, based on numbers of manos and metates, while seeming to be suggestive, looks less supportive when considered in context. At VEN-1 for example, all that was recovered from 2-4-liter flotation samples were a *Poaceae* grass seed, some *Marah macrocarpus* (wild cucumber) seeds, and a carbonized *Quercus* sp. nutshell (Martin and Popper 1999). This *Quercus* sp. fragment was radiocarbon-dated to 6780 B.P., which could be evidence of early experimentation with oak acorns as a food source (Dallas 2001:12-13). Even with larger flotation samples, few plant remains are usually found, and more will likely not be found. Terrestrial mammals probably contributed about 16 percent of the total diet. Birds and reptiles were insignificant components, although at some Millingstone sites this pattern varies (Jones et al. 2007). Despite the long history of scientific inquiry into Millingstone culture, Millingstone and its people continue to intrigue and challenge us to understand the culture, its people, and their lifestyle even today.

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