

New Dates and Data from Archaic Malibu with Some Regional Considerations

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Abstract

Recently synthesized data indicate that the Shobhan Paul Site (CA-LAN-958), located on a bluff overlooking the Pacific in the City of Malibu, was continuously occupied for 3000 years from 8200 to 5100 years before present (BP) and was never reoccupied after that time. Even though this occupation extended from the Early into the Middle Holocene, the archaeological assemblage reflects a remarkably unchanging lifeway. A persistent pattern of crude, minimally modified cobble tools and simple grinding implements characterizes the site as a single-component early Milling Stone Horizon occupation. Dietary evidence reveals a near total reliance on shellfish gathered from the open coast below the bluff for animal protein. These findings are in sharp contrast with coeval coastal sites where exploitation of mammals, birds, and fish is found along with transition into a wider variety of grinding implements typical of the Middle Holocene.

The Site and the Excavations

CA-LAN-958 was first recognized as an early Milling Stone Horizon site based on an array of distinctive, minimally modified lithic materials (Salls 1995). No radiocarbon dates were obtained when that assessment was made, nor had the faunal collection been analyzed to fully characterize the lifeway of the site's inhabitants. Here we remedy those deficiencies by presenting newly obtained radiocarbon dates confirming the site's antiquity and by describing and analyzing the vertebrate and invertebrate remains recovered from the site. Finally, we consider how this site is consistent with or differs from other Early and Middle Holocene sites in this region in an effort to explore the diversity of early Milling Stone lifeways in coastal southern California.

CA-LAN-958 is located on a south-facing slope of a marine terrace in the Santa Monica Mountains in the City of Malibu immediately adjacent to Steep Hill Canyon (Fig. 1). The northern portion of the site is fairly level, but the southern portion slopes at approximately 30 degrees toward the shore (Fig. 2). The site is now about 250 meters inland from the shore, but at the time of its initial occupation, it may have been as much as one kilometer from the shoreline as extrapolated from P. Porcasi et al. (1999:2).

After three site surveys (Bove 1978, Day 1979, Chace 1980), Phase II testing was conducted in December 1987 followed by Phase III mitigation excavations in spring 1988. The Salls 1995 report and this article present data compiled from both the 1987 and 1988 excavations. Overall, 68 1 meter by 1 meter (m) units (31.7 m³) were excavated (Figs. 2 and 3). A bioturbation analysis (P. Porcasi 1995a:9-11) concluded that site stratigraphy had not been significantly compromised, but downslope movement in the southern portion of CA-LAN-958 suspected by Salls (1995:1) is confirmed by the present analysis.

Nearly 2000 chipped and ground stone artifacts were collected during the excavations and were described in the Salls 1995 report (P. Porcasi 1995b, J. Porcasi 1995). Although large quantities of shell and a few bone fragments were collected, these were not reported before now.

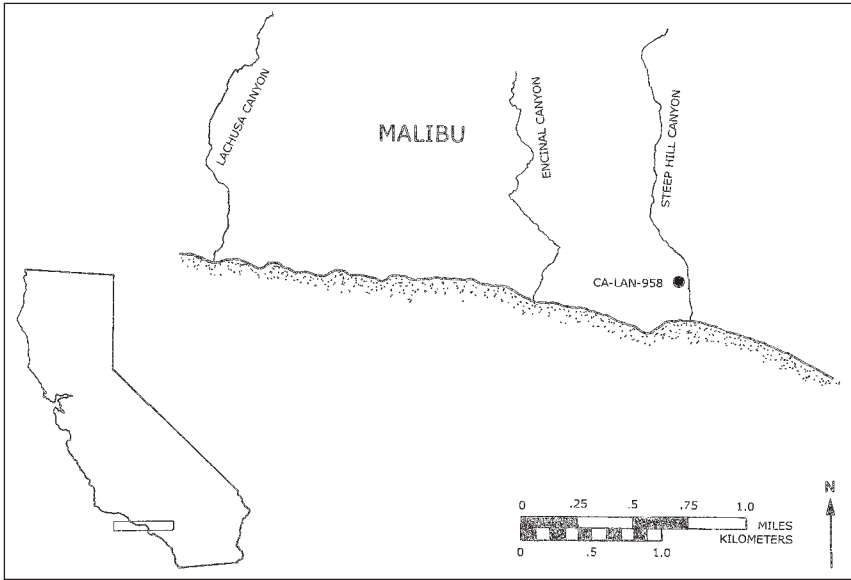


Fig 1. Map showing location of CA-LAN-958.

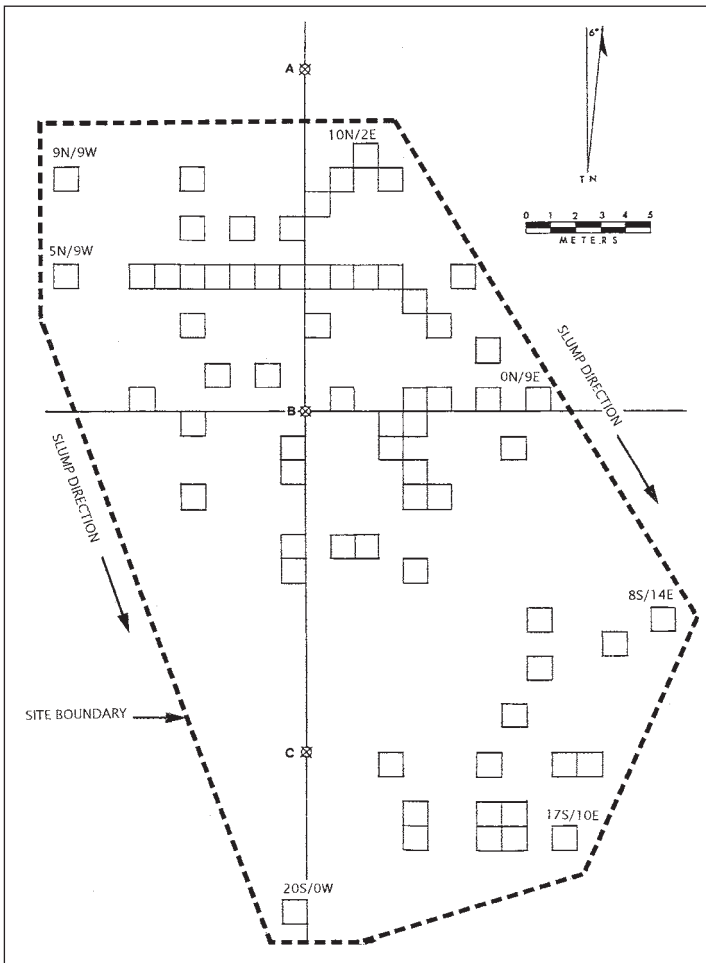


Fig 2. CA-LAN-958 site plan.



Fig. 3. Unit 0S/3 & 4E with large metate exposed.

Chronology

Table 1 presents newly obtained ^{14}C dates from CA-LAN-958, and Fig. 4 shows the units/levels from which dated samples were taken. All dates are based on single marine shell specimens and are corrected for isotopic fractionation. Early Holocene occupation of Shobhan Paul is indicated by two dates between 8200 and 6860 cal BP. Continued occupation of the site into the Middle Holocene is indicated by the 5469-5248 cal BP date from an upper level (10-20 cm). All radiocarbon samples are from the primary deposit at the top of the knoll.

Salls (1995:6) originally termed CA-LAN-958 a “Middle Period occupation.” It is likely, however, that when he included the term “archaic” (1995:1),

“Middle Archaic” was intended. This is certainly more appropriate. As shown in Chartkoff and Chartkoff (1984:96) and as described by Warren (1968:2), the Middle Archaic encompasses the Milling Stone Horizon as part of the Encinitas Tradition, which agrees with Salls’ (1995:6) interpretation. The term “Middle Period” as used by King (1981) and as depicted in Moratto (1984:125) brackets 1000 BC-AD 1100 and clearly is not archaic. CA-LAN-958 radiometric dates are much more consistent with the Archaic Period as described for the Santa Barbara area which spans 5500-3000 BC (Olson 1930) (even though Olson did not base his chronology on radiocarbon dates). The CA-LAN-958 dates also conform to the Lower Archaic as defined by Fredrickson (1974:45).

The chronological context of this site as presented by these few dates is not straightforward: an older date (8200-7940 cal BP at 50-60 cm, Unit 3S-5E) occurs above two more recent dates (7220-6860 cal BP at 60-70 cm in Unit 3S-4E and 5448-5127 cal BP at 90-100 cm in Unit 9N-9W). In general, the 5000-BP levels become shallower moving from the northwest quadrant to the southeast quadrant. This suggests that slumping along the east-west midline of the site toward the southeast (Fig. 2) shifted upper levels of soil to the southeast, reducing the depth at which the 5000-BP levels are encountered. In addition, the reversal of the Level 6 and 7 dates (Units 3S-5E and 3S-4E) may be an effect of small sample error, minor site disturbance, or topographical or depositional differences between the two adjacent units. It is also possible that these two samples were taken at the boundary of Levels 6 and 7 (i.e., at or near 60 cm depth), so they may date a single depositional context ranging from 6860-8200 BP. Because little is known of the rate of deposition and because a span of more than 1300 years is involved, this is entirely speculative. Regardless of dating inversions, however, the overall range of 8200-5100 BP is definitive for the site.

Unit (cm)	Shell/Cat.No.	Date* (Cal BP)	Lab No.
0S/4W (40-50)	Pismo Clam/1551	5450-5060	Wk-11054
3S/4E (60-70)	Scallop/825	7220-6860	Beta-165819
3S/5E (50-60)	Abalone/78	8200-7940	Beta-164086
0S/3E (10-20)	Pismo Clam/1247	5469-5248	Wk-11220
9N/9W (90-100)	Pismo Clam/2043**	5448-5127	Wk-11221

Table 1. CA-LAN-958 Radiocarbon Assays.

*Two-sigma calibration.

** AMS measurement by IGNS (NZA-15808).

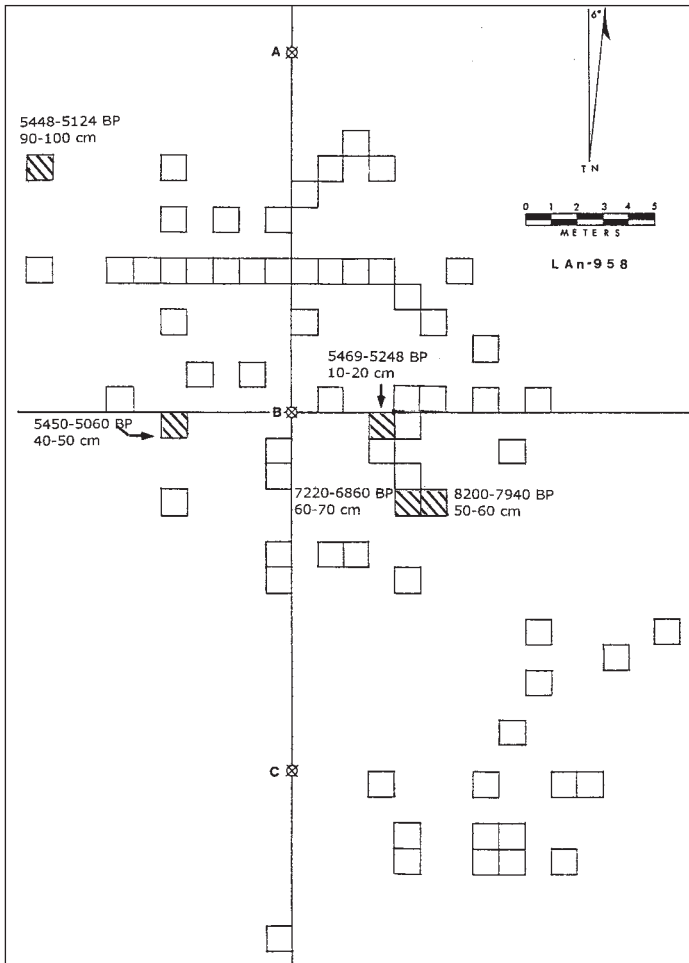


Fig. 4. CA-LAN-958 site plan showing locations of dates.

Faunal Data

Invertebrates

The CA-LAN-958 archaeofaunal collection is almost entirely marine shellfish. A total of 15,680.33 g of shell was recovered (56,857 fragments). The invertebrate collection, identified by Salls and the excavation crew, is made up primarily of California mussel (*Mytilus californianus*) (56%) and Pismo clam (*Tivela stultorum*) (37%), with small quantities of barnacle (*Balanus* sp.), olive shell (*Olivella biplicata*), black turban snail (*Tegula funebris*), and abalone (*Haliotis* spp.) (Table 2). One olive shell collected in the south portion of the site at 40-50 cm had been worked into a bead.

Exploitation of mussel and Pismo clam followed a consistently increasing pattern over time with mussel being the predominant species until the most recent time of occupation, when use of clam overtook mussel (Fig. 5). The above finding is not unusual in California coastal archaeology. Deposits of mussel shell are frequently found at the deepest (earliest) levels of California coastal sites where they are often replaced by less preferred species over time (Garlinghouse 2000:176-177).

Since nearly all the shellfish collection is mussel and Pismo clam, it is apparent that the occupants of Shobhan Paul flourished as gatherers of immediately accessible shoreline resources. The California mussel is easily gathered from near-shore rocks, and the Pismo clam is gathered by digging in sand along the surfline of open coasts. Both of these shellfish habitats would have been available on the stretch of beach downslope (within one kilometer) from CA-LAN-958. Small quantities of species which prefer protected embayments or even estuaries are also found (e.g., *Protothaca staminea*, *Clinocardium nuttalli*, *Donax* spp., etc.), suggesting that such habitats were present near the site and were also frequented at the time of habitation.

Mammals and Fish

A total of 50 vertebrate specimens (27.63 g) were recovered overall. Considering the long occupancy of the site and the volume of matrix excavated (31.7 m³), this paucity of mammal and fish bone is remarkable. Fish species were identified by Salls and his excavation crew. However, otoliths listed in the field catalog were apparently removed from the curated collection. Mammal identifications by the field crew were reviewed for accuracy and corrected as necessary by one of the authors (J. F. Porcasi).

A few gopher (*Thomomys bottae*) elements, unidentified small mammals (probably rabbits), and unidentified larger mammal fragments were found, along with a small number of teleost (bony fish) cranial elements (otoliths/teeth), and a single shark tooth. Only one non-cranial fish element (a fin ray) was recovered. This lack of fish and other small animal elements may be due in part to the use of 1/4 inch rather than 1/8 inch mesh for screening, as well as to preservation factors. The overall scarcity of bone (including larger fragments that would have been recovered by the larger mesh) suggests that vertebrates played an insignificant role in the subsistence pattern at this site.

Among the larger mammal fragments recovered were one astragalus (a tarsal or ankle bone) and a tooth of the black-tailed (mule) deer (*Odocoileus hemionus*), and a single phalange fragment of an otarid (eared seal) – probably California sea lion (*Zalophus californianus*). Table 3 presents the mammal remains and Table 4 presents the fish remains. Other prey classes (e.g., birds, reptiles, etc.) are entirely absent.

The paucity of vertebrate remains at CA-LAN-958 is remarkable, yet it is consistent with the general characterization (Wallace 1955) of the Milling Stone Horizon. Other coastal sites reflect the same constrained subsistence pattern. For example, the dietary evidence at pericoastal Cross Creek (CA-SLO-1797)

Taxon	Common name	NISP	Weight (g)	Percent
<i>Mytilus californianus</i>	California mussel	45,307	8795.54	56
<i>Tivela stultorum</i>	Pismo clam	10,906	5838.10	37
<i>Balanus</i> sp.	Barnacle	269	63.52	<1
<i>Tegula funebris</i>	Black turban snail	118	45.07	<1
<i>Olivella biplicata</i>	Purple olive	23	13.64	<1
<i>Haliotis cracherodii</i>	Black abalone	100	215.52	1.37
<i>Haliotis corrugata</i>	Pink abalone	2	161	1.0
<i>Haliotis</i> ssp.	Abalone, unident.	1	1.20	<1
<i>Protothaca staminea</i>	Littleneck clam	30	8.86	<1
<i>Hinnites giganteus</i>	Rock/giant scallop	4	367.41	2.34
<i>Acmaea fenestrata</i>	Notoacmea limpet	18	2.21	<1
<i>Argopecten aequisulcatus</i>	Speckled scallop	1	24.02	<1
<i>Chama arcana</i>	Agate chama	2	10.9	<1
<i>Chione undatella</i>	Wavy chione	4	0.50	<1
<i>Chione</i> sp.	Chione, unident.	1	0.20	<1
Chiton	Chiton, unident.	1	0.03	<1
<i>Conus californianus</i>	California cone	1	1.85	<1
Decapoda	Crab	1	0.10	<1
<i>Stenoplax conspicua</i>	Conspic. chiton	43	10.29	<1
<i>Pododesmus cepio</i>	Abalone jingle	1	0.24	<1
<i>Zirfaea pilsbryi</i>	Rough piddock	2	2.60	<1
<i>Pseudochama exogyra</i>	Reversed chama	3	68.6	<1
<i>Megathura crenulata</i>	Keyhole limpet	1	0.30	<1
<i>Clinocardium nuttallii</i>	Basket cockle	1	43.1	<1
<i>Donax gouldii</i>	Bean clam	1	0.70	<1
<i>Donax</i> ssp.	Bean clam	2	0.21	<1
<i>Ostrea lurida</i>	Native oyster	3	2.40	<1
<i>Lottia gigantea</i>	Owl limpet	1	0.70	<1
Limpet	Limpet, unident.	7	1.12	<1
<i>Septifer bifurcatus</i>	Platform mussel	3	0.31	<1
Total		56,857	15,680.24	

Table 2. Summary of CA-LAN-958 Shellfish Remains. (Percentages based on weight.)

Taxon	Common Name	No.	Specimen
Mammal, small	Mammal, small	15	Unident. frag or longbone
Mammal, unident.	Mammal	4	Unident. frag or longbone
Mammal, large	Mammal large	3	Unident. frag or longbone
<i>O. hemionus</i>	Mule deer	2	Astragalus and tooth
Otarid	Eared seal	1	Phalange fragment
<i>Thomomys bottae</i>	Pocket gopher (probably intrusive)	8	Mandibles, femur, tibia, vertebra
Total		33	

Table 3. CA-LAN-958 Mammal Remains. (These identifications supercede those in the 1995 report.)

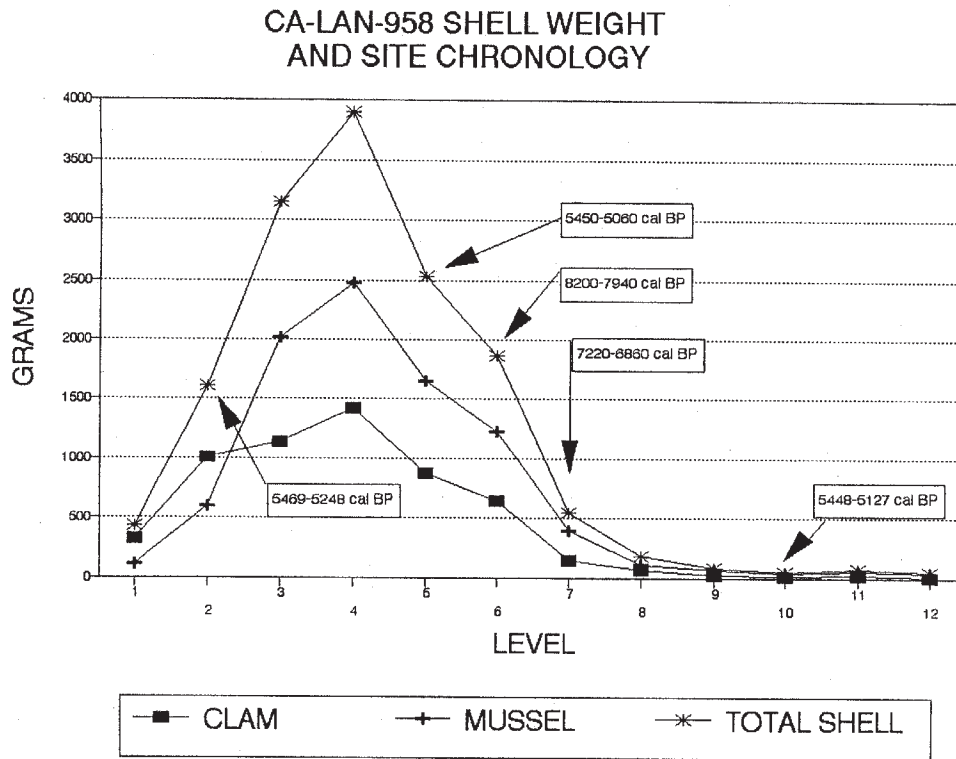


Fig. 5. CA-LAN-958 shell weight and site chronology.

Taxon	Common Name	No.	Specimen
<i>Genyonemus lineatus</i>	White croaker	1	Otolith
<i>Isurus oxyrinchus</i>	Mako shark	1	Tooth
<i>Paralabrax nebulifer</i>	Barred sand bass	1	Basioccipital
<i>Sebastes chlorostictus</i>	Greenspotted rockfish		Otolith
<i>Sebastes paucispinus</i>	Bocaccio	1	Otolith
<i>Sebastes sp.</i>	Rockfish	2	Otolith, finray
<i>Sciaenidae</i>	Croaker	2	Otoliths
<i>Semicossyphus pulcher</i>	California sheephead	4	Otolith, teeth
<i>Seriphus politus</i>	Queenfish	1	Otolith
Teleost	Unident. bony fish	3	Otoliths
	Total	17	

Table 4. CA-LAN-958 Fish Remains.

is consistent with the CA-LAN-958 findings. With dates as early as 10,000 BP (Fitzgerald 2000:58, T. Jones et al. 2002:217), CA-SLO-1797 is the earliest Milling Stone site yet found in California, and, like CA-LAN-958, it produced a subsistence pattern based almost entirely on invertebrates. At Cross Creek, however, the invertebrates were primarily bay or estuarine species. The few projectile points recovered at Shobhan Paul indicate that some hunting did occur. But the terrestrial faunal remains do not reflect this. The scarcity of projectile points is typical of the early Milling Stone culture and consistent with Cross Creek findings as well.

On the other hand, some coeval coastal sites such as nearby CA-VEN-1 (Dallas 2003, 2004) and CA-SLO-2 (Greenwood 1972), have yielded large quantities of vertebrate remains that indicate broad spectrum foraging activities.

Dietary Reconstruction

Shellfish can satisfy dietary needs for protein, especially when combined with carbohydrates from milled vegetable products (Erlandson 1991:99). However, assessing the nutritional yield of a diet based almost entirely on shellfish can be difficult (Erlandson 1988a, 1988b:106-107; 1989:17). Several multiplier factors have been developed for converting shell weight to edible flesh weight based on experimental weighings of modern specimens (Erlandson 1994:58-59; Exler 1987; Tartaglia 1976:164). Occasionally shell Minimum Numbers of Individuals (MNIs) are used to establish edible flesh estimates, again based on weight estimates from modern samples. Since these techniques are somewhat provisional and differ considerably, dietary reconstructions based on these methods can only be taken as rough estimates.

A somewhat more intricate method for estimating nutritional value of archaeological invertebrates based on an allometric formula is presented by Reitz and

Wing (1999:224). This method provides more accurate estimates because it is "biologically based" (Reitz and Wing 1999:304, 314). Their analytical method relies on weight of the archaeological shell, rather than whole specimens, applied in the following statistical regression formula:

$$Y = a + bX$$

where Y is the estimated sample biomass (i.e., meat yield) in kilograms contributed by the archaeological specimens for a taxon or a category of taxa, X is the weight of the archaeological specimens for a taxon or a category of taxa, a is the Y-intercept of the linear regression line, and b is the slope of the regression line. Constants for a and b are presented for various classes of animals, including marine invertebrates, by Reitz and Wing (1999:72).

Because the allometric method allows direct comparison of any and all the various resources found at the coastal sites based on the weight of the archaeological specimens, it is applied in this research. As Reitz et al. (1987:304, 314) note:

Use of allometric models places original body mass predictions on a more sound biological basis and makes calculations of "average" weight unnecessary.... Where nutritive values of the subsistence effort or estimates of the original live weight are the goal, use of allometric equations promises to provide the most accurate and useful estimates, because it is biologically based. Allometry can provide the most accurate estimate of the relative contribution of species in subsistence strategies and is a useful tool that can be used to overcome the shortcomings of bone count, bone weight, and MNI.

In the bone weight method referred to above, archaeological meat yields are based on known bone sizes and body weights of curated reference specimens.

This is termed the “linear dimension-based allometry method” (Jackson 1989:604), and the weaknesses of such a technique are obvious and have been detailed by Grayson (1979:224-227), Jackson (1989:602), and Reitz and Wing (1999:228-230). To avoid these weaknesses, the bone weight method employed in the present research is based on weight of the archaeological specimens themselves (rather than curated specimens). This avoids basing meat yields on the assumption that a single bone or shell fragment represents an entire animal (i.e., an MNI) when, in fact, the single specimen may reflect only a small portion of an animal. The archaeological shell-to-meat or bone-to-meat ratio method used here estimates the amount of meat adhering to only those fragments actually recovered rather than to unquantified numbers of individual organisms. As Jackson (1989:603-604) notes:

The bone weight:biomass allometric method is attractive because it promises a means of comparing quantities of archaeological bone fragments that represent taxa of very different sizes and shape by using taxon-specific relationships between skeletal weight and total bodyweight.... Thus, unlike methods based on the calculation of MNI or the linear

dimension-based allometry method, bone weight allometry allows the use of otherwise ignored portions of the data set in the analysis.

Table 5 presents allometrically derived nutritional estimates for the two dominant species (mussel and clam) in the CA-LAN-958 collection. Table 6 presents allometrically derived flesh weight estimates for the total dietary resources used at the site.

Table 5. Estimated Flesh Weights from Pismo Clam and Mussel. (Allometrically derived. Weights in kg.)

Level	Clam	Mussel	Total
1	0.48	0.23	0.71
2	1.05	0.74	1.79
3	1.14	1.68	2.82
4	1.32	1.93	3.25
5	0.95	1.47	2.42
6	0.77	1.20	1.97
7	0.28	0.55	0.83
8	0.16	0.27	0.43
9	0.08	0.16	0.24
10	0.05	0.11	0.16
11	0.07	0.15	0.22
12	0.04	0.12	0.16

Table 6. Flesh Weight of Resources at CA-LAN-958.

Resource	Shell/bone (g)	Flesh (kg)	*
Shellfish	15680.33	6.77	6.77
Fish	1.58	0.02	0.01
Mammals	26.0	0.49	0.34

Shell/bone weight in g; flesh weight in kg.
 *Mammal flesh weight 70% per White 1953; fish flesh weight taken as 50%.
 No conversion factor required for shellfish.

CA-LAN-958 Lithic Artifacts

The cobble-based flaked and ground stone artifacts collected from CA-LAN-958 are reported in detail in the earlier site report (P. Porcasi 1995b; J. Porcasi 1995). They are reviewed briefly here. Figure 6 plots the deposition of lithic artifacts relative to shell over time. Considering that the scale in Figure 6 is logarithmic, a significant event is indicated about 5400 BP (Stratum 4) when the exploitation of shellfish reaches its maximum while the quantities of both groundstone and chipped stone decline. The latter trend suggests that use of resources other than shellfish diminished during this period, reducing the number of tools employed for hunting and seed-grinding.

Groundstone

CA-LAN-958 yielded 85 complete *manos* and 105 *mano* fragments, 5 complete *metates* and 45 *metate* fragments, 9 abrading stones, and 26 unidentified ground stone fragments. Slab *metates* comprise 47% of the identified *metates*. The enormous slab shown in Figure 7 is more than 50 cm long. The remainder of the *metates* consists of shallow-basin (36%) and deep-basin (17%) types. Uniface *manos* comprise 23% of the identified handstones, biface *manos* 63%, triface *manos* 9%, quadri-face *manos* 4%, and continuous *manos* 1% (Fig. 8). Most of the ground stone is made of sandstone (78.9%), schist (13.5%), or andesite (5.6%). All the ground stone materials are from local sources. No ground stone tools typical of the Middle Holocene (e.g., mortars, pestles, or bowls) were recovered.

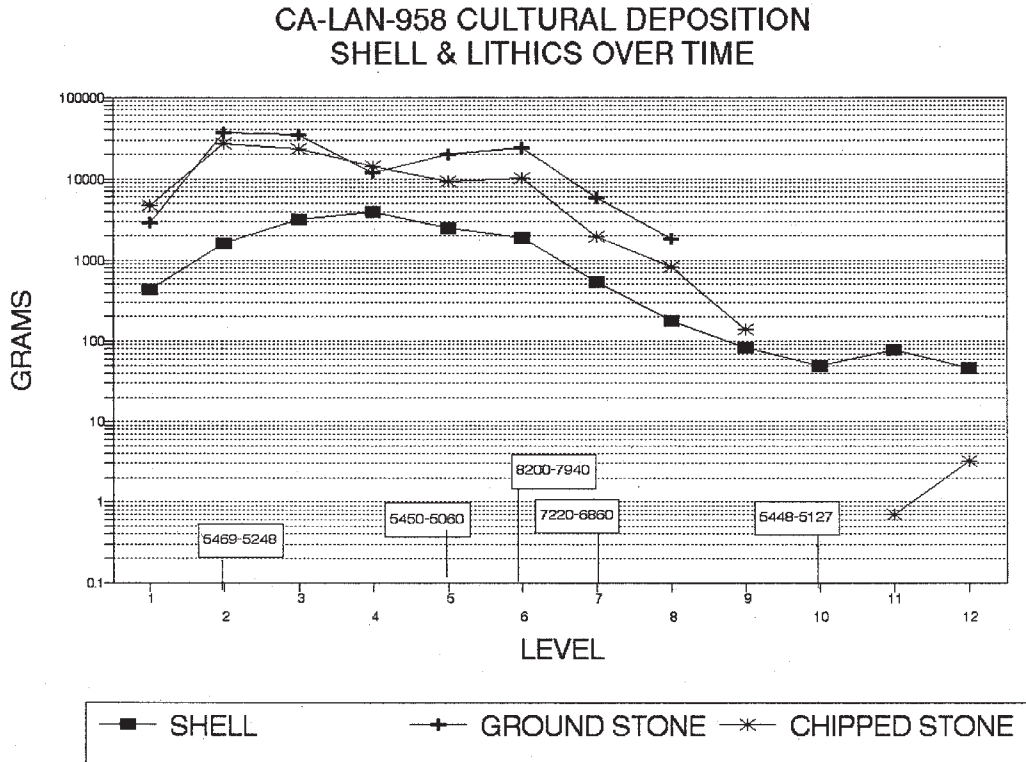


Fig. 6. CA-LAN-958 cultural deposition: Shell and lithics over time.

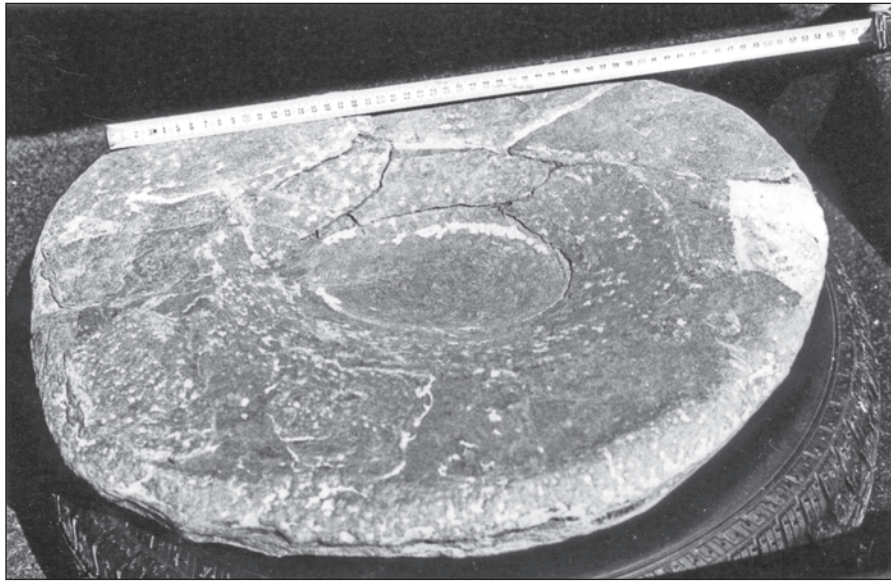


Fig 7. Large blue schist metate (Catalog No. 1748); 54.5 cm long, 42 cm wide, 9 cm thick, 34 kg.



Fig. 8. Manos from CA-LAN-958.

Chipped Stone

CA-LAN-958 produced 1,626 chipped stone artifacts, consisting of 494 utilized flakes and tools and 1,132 pieces of debitage. The total weight of the flaked stone is more than 117.5 kg. However, about 60 of these artifacts are also accounted for in the ground stone collection because they are *manos* which had secondary use as cores, choppers, or hammerstones. Thirty-six types of chipped stone artifacts are identified (J. Porcasi 1995:58,62-63). Some of these tools retain their original cobble morphology (e.g., anvils, choppers, or hammerstones). The majority, however, are flaked or worked from sizable cobbles to produce functional surfaces or cutting edges. By far the most common worked tools are scrapers (Fig. 9), identified in several different sizes (presumably for different tasks), and scraper subtypes or multiuse tools such as scraper/planes, scraper/choppers, etc. (Fig. 10).

Four partial or complete projectile points were recovered, two side-notched and two leaf-shaped (Fig. 11), in addition to a preform and a fragmentary midsection. As noted by Fitzgerald (2000:70-71, 118), side-notched points were originally thought to have been a feature of the Middle Holocene, but there is growing evidence that these points may be earlier. The leaf-shaped points found at this site are thick and crudely formed, unlike those diagnostic of later periods.

Discussion

Wallace's (1955:219-220) description of the Milling Stone Horizon lifeway is an enduring cornerstone of culture history in California. He noted that it was characterized by the simplest types of milling tools along with a general lack of skillfully made artifacts such as projectile points, bone tools, or shell items. He also observed a fundamental scarcity of mammal,



Fig. 9. Typical scrapers from CA-LAN-958.



Fig. 10. Special scrapers with formed "handles."

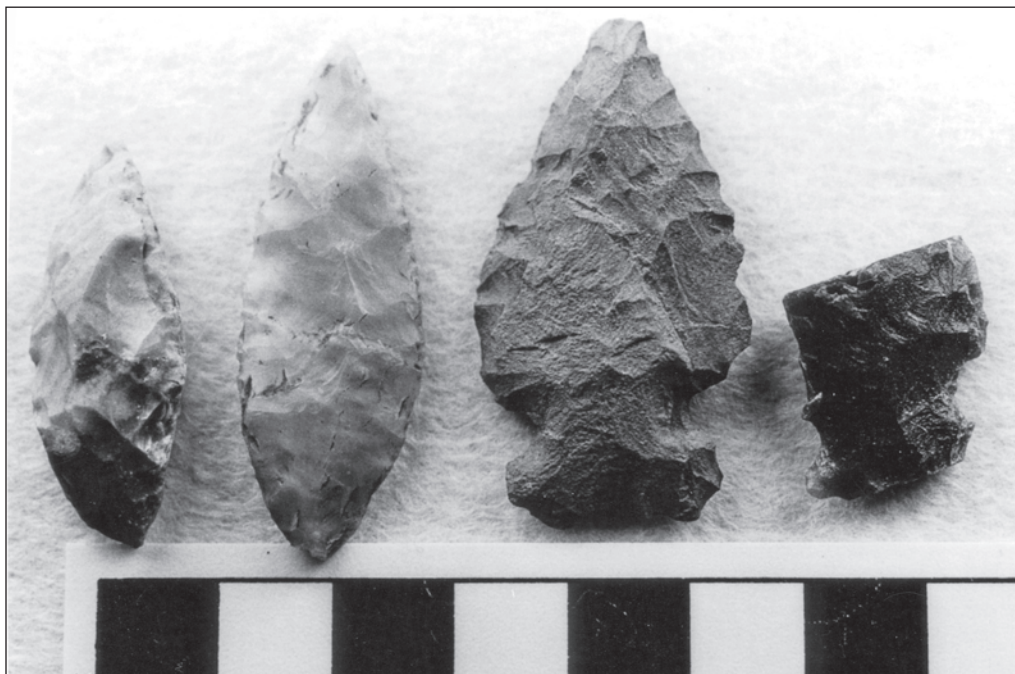


Fig. 11. Projectile points from CA-LAN-958. (centimeter scale)

bird, and fish bone. Wallace believed that the Milling Stone "Horizon" began about 5500 BC (7500 BP) (Moratto 1984:125). This beginning has more recently been pushed back to about 10,000 BP with the finds at Cross Creek (Fitzgerald 2000:58, Fitzgerald and Jones 2003:396, T. Jones et al. 2002:217).

Milling Stone sites yield no food storage containers, and Milling Stone people are generally described as more or less sedentary food collectors with a specialized reliance on seed grinding for daily sustenance (Wallace 1955:219). Coastal occupations and sites traditionally included in the rather generalized Milling Stone grouping are Oak Grove (Glen Annie SBA-142 and Mescalitan Island SBA-46) on the Santa Barbara coast (Owen et al. 1964; Rogers 1929; Orr 1943, 1952); Little Sycamore (VEN-1) in Ventura County (Wallace 1954; Wallace et al. 1956; Dallas 2000, 2004); Topanga (LAN-1/2) (Treganza and Malamud 1950); Parker Mesa (LAN-215) (King 1961); and Zuma Creek LAN-40 (Peck 1955) in Los Angeles County; and the La Jollan shellmounds in San Diego County (Rogers 1945; Warren 1967a). Fig. 12 shows the locations of some of the Milling Stone sites discussed here.

New findings, however, may justify a broadening of the way the Milling Stone lifeway is conceptualized. For example, a notable feature of CA-LAN-958 is that, while a continuous occupation beginning about 8200 BP and lasting until about 5100 BP is found, there is no emergence of typical Middle Holocene patterns or artifacts at the site. This sets CA-LAN-958 apart from many other coastal Milling Stone sites where distinctive Middle Holocene artifacts such as mortars, pestles, stone bowls, and fishhooks commonly overlay the earlier, simplest types of milling tools (i.e., *manos* and *metates*). The later implements, assumed to be associated with acorn processing (Glassow 1992:120), are characteristic of the Early-to-Middle Holocene transition, approximately 7000-6000

BP (Erlandson and Colten 1991:1) or possibly as late as 5000 BP (Glassow 1997:86-88).

As new data accumulate, it becomes apparent that the Milling Stone lifeway was quite variable. Some recently reported sites on the Central Coast (San Luis Obispo and Santa Barbara Counties), as well as in more northern counties (Erlandson 1994; Erlandson and Colten 1991; T. Jones 1991; D. Jones et al. 2002; Fitzgerald 2000; Fitzgerald and Jones 1999, 2003), have Early Holocene dates and are typified by intensive harvesting of invertebrates for protein along with milling of chaparral vegetation and coastal scrub for carbohydrates. Commonly these sites are adjacent to extant or former estuaries, lagoons, embayments, or stream-fed canyons where a variety of invertebrates could be exploited. Even at coastal loci, however, fish bone is sparse and when found tends to represent near-shore or estuarine species. Remains of mammals or birds are extremely limited in such sites. Cross Creek (CA-SLO-1797) typifies such a site. With dates as early as 10,000 BP (Fitzgerald 2000:58, Fitzgerald and Jones 2003:396, T. Jones et al. 2002:217), Cross Creek presents a crude lithic pattern combined with the earliest milling tools found in California and subsistence based almost entirely on invertebrates for protein.

The large quantities of simple milling tools and crudely flaked cobble tools found at CA-LAN-958 (P. Porcasi 1995b; J. Porcasi 1995) resemble those at Cross Creek, but are later in time. Furthermore, the CA-LAN-958 archeofauna parallels the shellfish-based pattern at Cross Creek, but with a localized (and later) adaptation to a marine rather than estuarine ecology. The people of the Shobhan Paul Site appear to have been almost exclusively beachcombers subsisting on large quantities of near-shore marine shellfish and milled vegetation while the people of Cross Creek used milled vegetation primarily and harvested estuarine shellfish 10 to 12 kilometers from the site. Vertebrate bone is so scarce in both collections that

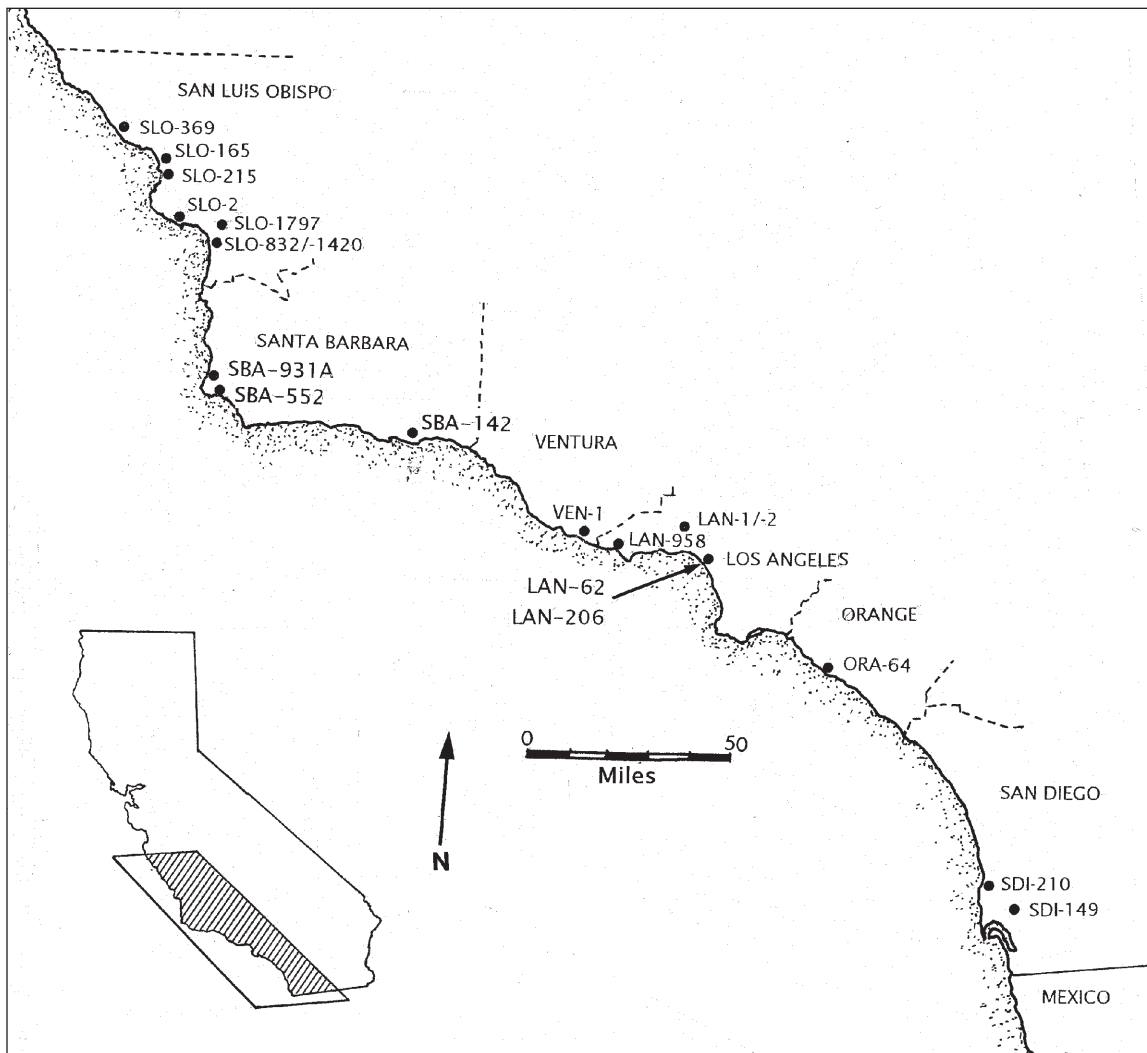


Fig. 12. Map of some sites mentioned in the text.

use of mammal, bird, or fish resources must have been opportunistic at best.

The early radiocarbon dates from both Cross Creek and Shobhan Paul reveal that occupations of these Milling Stone sites temporarily overlapped and were coeval with other more generalized Early Holocene sites characterized by exploitation of diverse resources (i.e., mammals, birds, and fish as well as invertebrates and vegetal materials). For example, Diablo Canyon

(CA-SLO-2) (Greenwood 1972) and the San Dieguito settlements in the southern coastal counties, e.g., the Harris Site (CA-SDI-149) (Warren 1967b), have much less specialized subsistence patterns, producing evidence of widely diverse resource exploitation. Neither of these sites yields milling artifacts in their earliest levels, even though the earliest components are sometimes termed Milling Stone (Greenwood 1972).

The synchronicity of these variable Early Holocene lifeways (Milling Stone with shellfish-gathering nonhunting, coeval with hunting cultures) on the California coast raises issues of immigration patterns and affiliations. The shellfish-gathering, nonhunting lifeway may represent a distinct coastal immigration or a settlement pattern in which only the most optimally accessible and reliable resource (shellfish) is exploited.

Several additional sites with Early Holocene dates have recently been reported on the southern and central coast, lending new insight into the regional variations in Milling Stone cultural patterns. For example, only 6 miles north of CA-LAN-958, the Little Sycamore site (CA-VEN-1), described long ago as a definitive Milling Stone site by Wallace (1954) and Wallace et al. (1956), has recently been reexplored, yielding Early Holocene radiocarbon dates overlapping those from Shobhan Paul (Dallas 2000, 2004) and producing cultural content which departs from the previous constituents of a “classic” Milling Stone site. Subsistence data from CA-VEN-1 reveal an economy based on intensive exploitation of fish, marine and terrestrial mammals, birds, and shellfish (primarily mussel) (Dallas 2004). Early use of acorns (6780 ± 110 BP) (Beta 167264) is also found there.

The Glen Annie Canyon site (CA-SBA-142) was described by Owen et al. (1964) as a type site for the Oak Grove variant of the Milling Stone Horizon in Santa Barbara County. Yet, on the basis of more recently acquired radiocarbon and faunal data, it is now clear that Glen Annie was not a typical Milling Stone site as described by Wallace (1955) because relatively large quantities of estuarine, near-shore, and deep water fish remains were recovered (Colten 1991:83-85, 87-88). Other Santa Barbara County sites present evidence in support of the traditional definition of the Milling Stone Horizon. In a review of several Santa Barbara County coastal sites, Erlandson (1991:100) found that intensive shellfish harvesting and milling of

collected seeds long predated hunting or fishing along this portion of the coast.

Glassow (1992:118) assigns two Early Period sites on Vandenberg Air Force Base (CA-SBA-552 and -931A), dated as early as 8500 BP, to the Milling Stone Horizon. However, at CA-SBA-931A, a two-component site, the oldest occupation is dated 9150 ± 160 (uncorrected) (Glassow 1992:199), placing it in the Paleocoastal Period as described by Moratto (1984:104-109). Dietary evidence from this early component is primarily mussel, and there is no evidence of milling (i.e., no groundstone) in this component.

Further to the north, the earliest component at CA-SLO-369 in Cambria provides several radiocarbon dates between 9000 and 9800 BP on a house floor and yields a subsistence based primarily on marine mussels (Parker 2002:1,5). In this regard, it is much like the Shobhan Paul Site, except no milling stones were found there. Although the vertebrate faunal remains were sparse (as at Shobhan Paul and Cross Creek), both large and small taxa were identified as evidence of some hunting.

At CA-SLO-832/1420 in Pismo Beach (ancient Halcyon Bay and estuary), two closely associated sites yielded dates ranging between 9885 and 6006 BP in levels deemed to be a Milling Stone component (D. Jones et al. 2002:54). While the Milling Stone component at CA-SLO-832 produced five fragments of ground stone (one of which is a “mini” mortar probably not used for food), no specific milling tools were identified in what was termed the Milling Stone component at CA-SLO-1420. Other ground stone items were found at these sites, but in mixed cultural contexts. The subsistence pattern at these sites was based on estuarine shellfish, small terrestrial mammals (mainly squirrel and other rodents), and small schooling fish. There is a small quantity of large/medium mammal bone, both marine and terrestrial,

the most common of which is the sea otter (*Enhydra lutris*), indicative of some marine hunting.

Finally, two recently explored Milling Stone sites at Morro Bay, CA-SLO-165 (Mikkelsen et al. 2000) and CA-SLO-215 (T. Jones et al. 2004) yield yet another variation among Early Holocene patterns on the central coast. CA-SLO-165 has a Milling Stone component dated between 8000 and 7200 BP in which estuarine invertebrates and fish are found along with a few terrestrial mammals. The most intensive use of the site, however, was between 5500 and 4500 BP when a more diversified subsistence is shown, including hunting of large mammals both marine and terrestrial. It is also during this later, Middle Holocene component, termed "Early Component" or "Early Period" in the central coast culture history convention (Mikkelsen et al. 2000:19), that milling stones are found.

The other recently reported San Luis Obispo County site, CA-SLO-215 in Morro Bay State Park (T. Jones et al. 2004), yields dates between about 7590 and 6790 BP and is attributed to the Milling Stone period on the central coast. What may be a small mortar fragment and an unquestionable pestle were recovered from this deposit and could indicate greater than expected antiquity for these types of artifacts in this area. However, stratigraphic mixing of this small sample may be a problem. The lack of milling slabs and handstones in the early occupation levels also raises doubt about classification of this component as a Milling Stone occupation. The subsistence remains include estuarine shellfish and fish, small terrestrial mammals, a few birds, and a few large mammals.

Milling Stone Horizon sites in coastal Los Angeles County (i.e., south of CA-LAN-958) clearly differ from those in the central or northern coastal counties. They yield far more diverse collections of mammal, fish, and bird bone, indicating exploitation of numerous taxa attracted to the estuarine and lagoon settings in this area. The Ballona on the west coast of the

City of Los Angeles is an example. There, on bluffs over what is now a silted in estuary and tidal marsh, at least two Early Holocene sites (the Berger Site, CA-LAN-206 and the Loyola-Marymount Site, CA-LAN-62) are found among numerous more recent sites (Altschul et al. 1992). During the early period defined as Wallace's (1955) Horizon I (7000-5000 BP), the Ballona was a wide, exposed embayment. Excavations from the two sites of this period produced low-density shell middens with small quantities of vertebrate remains and one Early Holocene radiocarbon date at each site. Using Wallace's (1955) regional chronology which places Milling Stone Horizon II between 5500 and 3000 BP, Altschul et al. (1992:41-43) restrict evidence of Milling Stone occupation of the Ballona to discoidal stones found at four sites, and they go on to hypothesize that the Ballona was intensively used only after the lagoon formed behind a barrier spanning the embayment. Altschul et al. (1992:375) recognize, however, that their findings fail to address the enigma of why so rich a natural habitat was only intermittently occupied, although they believe that the economy was a diverse mixture of hunting and gathering, with perhaps some reliance on aquatic resources (1992:43).

More southerly Early Holocene sites in Orange and San Diego Counties (e.g., CA-ORA-64, CA-SDI-149, and CA-SDI-210) reveal extensive hunting and fishing economies (e.g., Drover et al. 1983:68-69, Koerper et al. 1991:45-49, Langenwalter 1998:64-82) rather than invertebrate-focused economies. While milling tools are a major element of these southern sites, the use of invertebrates is matched or exceeded by large quantities of vertebrate remains.

Certainly some of the variability of Milling Stone sites along the length of the coast is due to local ecological diversity. It is also possible that highly specialized sites like Shobhan Paul or Cross Creek represent special use or seasonal occupations. However, this may be too simplistic a scenario because fishing and hunting opportunities were as available at Malibu and

Cross Creek as anywhere else on the Southern California coast. It is more likely that the inhabitants at the various specialized sites opportunistically exploited the most easily obtained (i.e., most optimal) resources. The pattern of cultural material from CA-LAN-958 is that of a highly specialized Milling Stone/shellfish-collecting, nonhunting settlement throughout the Early and Middle Holocene.

Conclusions

The Shobhan Paul site both resembles and differs from other Early and Middle Holocene sites, underlining the great variety of lifeways pursued by coastal people throughout prehistory. The Shobhan Paul and Cross Creek sites have many parallel attributes, except for the older age at Cross Creek. They share a simple Early Holocene lithic technology and emphasize shellfish gathering and seed grinding lifeways. Although the people of both sites had access to mammalian, avian, and fish resources, they did not use these as other early people did. The sites were occupied for continuous millennia, and both were unchanging in their lifeways throughout their occupations. These sites provide evidence of being long-term residential situations, yet it is possible that they represent specialized gathering or seasonal loci. Clearly, however, these sites and others mentioned in this research demonstrate that the Milling Stone lifeway was far more diverse, far more long-lived, and wider ranging than previously described. For this reason it is important for archaeologists to explore the possible implications of broad regional syntheses rather than localized cultural patterns. As Chartkoff (2002:18) recently stated:

California archaeology... historically has emphasized development of local sequences of cultural development more than the creation of syntheses that characterize shared cultural patterns among different ethnic groups across regions in the same era... Questions at this high level of generalization can be extremely significant for understanding local cultural

patterns, but they rarely are pursued by California archaeologists, because of the lack of inter-regional integration at that level.

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