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# Reassessing the Chronology of the Glen Annie Canyon Site (CA-SBA-142)

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**I**N 1964, Owen (1964; Owen et al. 1964) presented important data on the chronology and context of the Glen Annie Canyon site (CA-SBA-142), a 7,300-year-old shell midden located adjacent to the Goleta Slough on the Santa Barbara coast (Fig. 1). In these publications, Roger Owen challenged traditional views that early Millingstone groups were relatively sedentary and exploited a limited range of vertebrate resources (e.g., Wallace 1955). Instead, Owen claimed that Millingstone groups were highly nomadic and exploited a diverse range of vertebrates, including a variety of land mammals, sea mammals, and fishes.

Owen's interpretation stimulated a debate on the nature of Millingstone adaptations on the southern California coast, including commentary published in both national (Warren 1967; Owen 1967) and local publications (Curtis 1965). Judging from the citations of his work in subsequent publications (Harrison 1964:346; Harrison and Harrison 1966; Warren 1968; Greenwood 1972:92; Grant 1978:519; King 1981:134; Chartkoff and Chartkoff 1984; Moratto 1984:129-130; Glassow et al. 1988; and others), Owen's conclusions had a major impact on perceptions of southern California prehistory, and even contributed to the debate on the antiquity of maritime adaptations (e.g., Osborn 1977:159).

Although his interpretations of the adaptation represented by the CA-SBA-142 data have been disputed (e.g., Curtis 1965; Warren 1967), to our knowledge Owen's

chronology for the site has never been questioned. Our recent research at several early sites of the Santa Barbara Channel (Glassow 1981; Colten 1987; Erlandson 1988a) led us to suspect that aspects of the Glen Annie assemblage derived from a much later occupation. We evaluated this possibility by radiocarbon dating additional shell samples from the site and examining aspects of Owen's data. The results indicate that a number of traits that Owen (1964; 1967), Curtis (1965), and others attributed to the Millingstone (or Early) Horizon probably are associated with occupation dating to the late Holocene. In this paper, we present our evidence for a revised site chronology and examine the implications of the data for understanding early adaptations on the California coast. To place our discussion in perspective, a brief review of the CA-SBA-142 research and the debate that followed is required.

## CA-SBA-142 RESEARCH BY OWEN AND OTHERS

CA-SBA-142 was investigated by a University of California team directed by Roger Owen. The excavation was one of the first such studies of a Millingstone site on the Santa Barbara coast that used relatively modern methods for the recovery of artifacts and faunal remains. Excavation focused on a small area of a site estimated to cover five acres or more (Owen 1964:210). Test pits were excavated in both burial and nonburial areas. Remnants of a partially destroyed

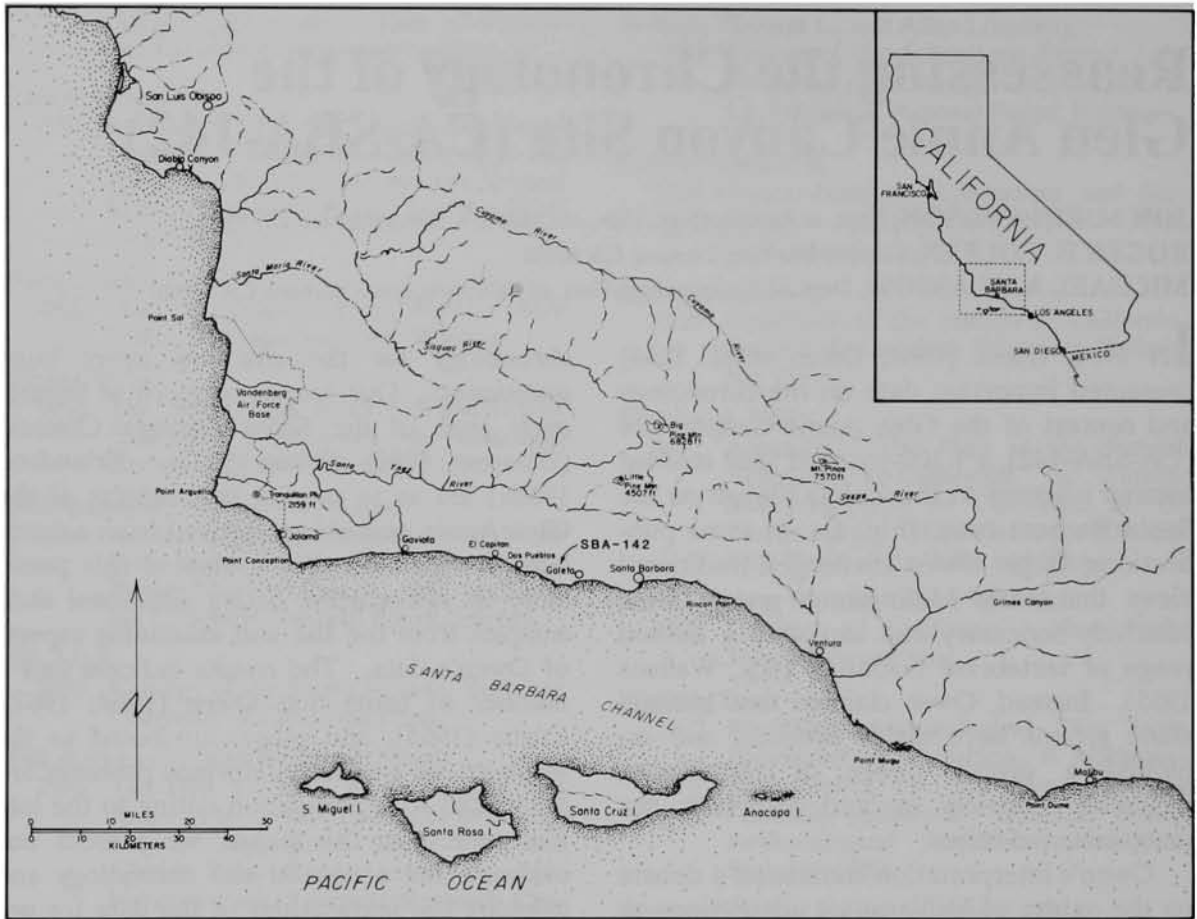


Fig. 1. Location of CA-SBA-142.

cemetery containing eight burials were explored. Many of the interments were associated with cairns of manos and metates. Other than these ground stone tools, shell lenses, and a few shell beads, there were few demonstrable burial associations.

Excavations at CA-SBA-142 resulted in the recovery of a variety of ground stone, chipped stone, bone, and shell artifacts (Table 1). Predominant among these were manos and metates, hammerstones (mostly core hammers), bone awls (38), *Dentalium* shells (19), spire-removed *Olivella* shell beads (65), and clam disk beads (12). Also recovered were lesser quantities of projectile points and other biface fragments, gravers,

charmstones, pestles, drills, bone "flakers" (3), rectangular *Olivella* shell beads (3), a well-made serpentine bowl, and a serpentine disk bead (Owen et al. 1964).

The faunal remains, although incompletely analyzed, were equally diverse. Shell analysis identified 27 taxa (Curtis 1965), primarily estuarine species that once were abundant in the nearby Goleta Estero. Vertebrate remains included a variety of marine taxa, including fish, seal, sea lion, and possibly dolphin (Owen et al. 1964:493). Terrestrial vertebrate remains were dominated by deer, rabbit, and rodents (Curtis 1965:11), although badger, fox, turtle, and bird remains also were identified (Owen et al. 1964:492).<sup>1</sup>

Table 1  
AREAL AND VERTICAL DISTRIBUTION OF SELECTED ARTIFACT TYPES AT CA-SBA-142<sup>a</sup>

Artifact Class	General Surface	Site Grading	Burial Area <sup>b</sup>			Nonburial Area					Site Totals
			0-6	6-12	12-clay	0-6	6-12	12-18	18-24	24-30	
Points/blades	4	-	3	1	2	-	2	-	-	1	13
Knives	1	-	-	-	1	-	-	-	-	-	2
Drills	-	-	1	1	-	-	1	-	1	-	4
Hammerstones	-	5	-	5	21	-	-	6	3	1	41
Gravers	-	2	4	2	1	-	2	1	-	-	12
Scraper planes	2	-	1	2	3	-	2	1	-	-	11
Flake tools <sup>c</sup>	10	24	14	12	14	9	7	7	3	4	104
Manos	7	12	1	7	77	1	1	7	16	3	132
Metates	6	3	-	3	84	-	1	5	10	9	121
Pestles	-	3	-	-	-	-	1	-	-	-	4
Bowls	-	1	-	-	-	-	-	-	-	-	1
Charmstones	-	4	-	-	-	-	-	-	-	1	5
Shell ornaments	-	-	4	6	10	-	2	15	4	-	41

<sup>a</sup> Artifact counts per level, including fragmentary specimens, from Owen et al. (1964:487-489).

<sup>b</sup> Measurements in inches.

<sup>c</sup> Flake tool category includes items previously classified as "flake knives," "scrapers," and "used flakes."

Table 2  
RADIOCARBON DATES FROM CA-SBA-142<sup>a</sup>

Laboratory Number	Provenience	Association	Uncorrected C <sup>14</sup> Age B.P.	C <sup>13</sup> /C <sup>12</sup> Age Adjustment	Estimated Calendar Date B.P.
UCLA-605	Pit 3, 12-18"	With burial 6	6,880 ± 120	7,310 ± 122	7,520 ± 127
UCLA-606	Pit 4, 17"	With burials 1, 2, 3	6,980 ± 120	7,410 ± 122	7,595 ± 127
UCLA-607	Pit 4, 12"	Over burials 1, 2, 3	7,270 ± 120	7,700 ± 122	7,910 ± 127
UCLA-608	Pit 18, 24-30"	Nonburial area	6,380 ± 120	6,810 ± 122	7,125 ± 127
Beta-25150	Pit 17, 6-12"	Burial area	1,490 ± 80	1,910 ± 80	1,250 ± 87
Beta-25151	Pit 18, 6-12"	Nonburial area	4,490 ± 80	4,920 ± 80	4,880 ± 87

<sup>a</sup> All samples of estuarine or marine shell; UCLA dates have been adjusted by adding 430 ± 20 years, an average for isotopic fractionation adjustments for marine shell samples from the Santa Barbara coast (Erlanson 1988a:27).

Owen's CA-SBA-142 chronology was based on the analysis of four samples of estuarine or marine shell by the UCLA Radiocarbon Laboratory (Table 2). These produced dates ranging between 6,380 ± 120 and 7,270 ± 120 radiocarbon years B.P. (Owen 1964:210-211), equal to approximately 7,100 and 7,900 calendar years ago (Stuiver et al. 1986). Each of the samples contained multiple shells, so the dates represent average ages for the shell fragments analyzed. The three older dates came from

shells associated with burials, while the youngest came from near the base of the midden in the nonburial area.

Owen believed that the Glen Annie assemblage resulted from multiple occupations occurring prior to 6,300 radiocarbon years B.P. (Owen et al. 1964:478). His interpretation of the radiocarbon dates was concerned primarily with differences in the dates associated with the burials and with the base of the midden in the nonburial area. Owen (1964:212) did note that "the uppermost

inches of the midden may be considerably more recent than any of the dates so far obtained would indicate," but in characterizing the assemblage, he clearly identified it with the Millingstone (Oak Grove) Horizon:

At the time 4SBA-142 went to press, it was Oak Grove--the first detailed site report on a previously inadequately described, but widely discussed archaeological manifestation. Glen Annie was, and perhaps still is the "type-site" for Oak Grove! Like it or not, then, for the hard-headed archaeologist--to the degree that interpretations are to be constrained by published description--"Oak Grove" and Glen Annie are synonymous [Owen 1967:238].

Later, Curtis (1965:14) summarized various aspects of the artifactual and faunal assemblages from the site and concluded that the entire assemblage was consistent with an early Millingstone occupation spanning a considerable period.

Owen used the diversity of artifact types and faunal taxa at CA-SBA-142 to question traditional views of Millingstone subsistence, arguing that early subsistence patterns were more diverse and hunting played a more important role than recognized previously. Although he believed shellfish were the main source of animal protein for the early residents at Glen Annie (Owen 1964:212), the diversity of vertebrate remains and the abundance of projectile points also pointed to the presence of an "effective hunting practice."

Based in part on the range of nearly 900 years in his radiocarbon dates, Owen (1964, 1967) argued for a lengthy but intermittent use of the site by nomadic hunter-gatherers. In doing so, he challenged traditional views that settlement during the Millingstone Horizon was relatively sedentary (e.g., Wallace 1955; Curtis 1965; Warren 1967):

. . . it is difficult to believe that the ancient inhabitants of the Santa Barbara coast, or those of any portion of the Pacific coast during the Early Horizon, were any more sedentary than,

for example, the Alacaluf of southern Chile--that is to say, not at all. It might be suggested that the notion of "sedentary" hunters and gatherers is a convenient fiction agreed upon by some southern California archaeologists [Owen 1964: 212].

#### A REASSESSMENT OF THE CA-SBA-142 CHRONOLOGY

There is little reason to doubt that the burials and associated features excavated by Owen et al. at CA-SBA-142 date to the early Millingstone Horizon. However, the accepted site chronology for the entire assemblage is based on three dates from shells directly associated with these early burials and one from shells removed from the base of the midden. Thus, the selection of radiocarbon samples is biased towards the earliest occupation of the site and may not address adequately the possibility of much more recent site occupations. Furthermore, in a midden heavily disturbed by rodent burrowing and farming activities (Owen et al. 1964:454), radiocarbon dates on scattered shells are susceptible to contamination by mixing of components (Erlandson and Rockwell 1987).

Our suspicion that CA-SBA-142 contained a considerably more recent component is based on three patterns in the data reported, but not considered by earlier investigators. First, the vertical distribution of shell from various molluscan taxa varied within the midden (Fig. 2). Shells of *Chione* (Venus clam) increased in relative abundance toward the top of the deposit, while those of *Mytilus* (mussel) and *Saxidomus* (Washington clam) decreased. Since *Chione* dominates shellfish assemblages from late Holocene sites around the Goleta Estero, we suspected that the upper layers of CA-SBA-142 might date to the same time period.

Second, shell-to-bone weight ratios in the control units increased dramatically from top to bottom of the midden (Table 3). Shell-to-bone ratios from the lower and upper

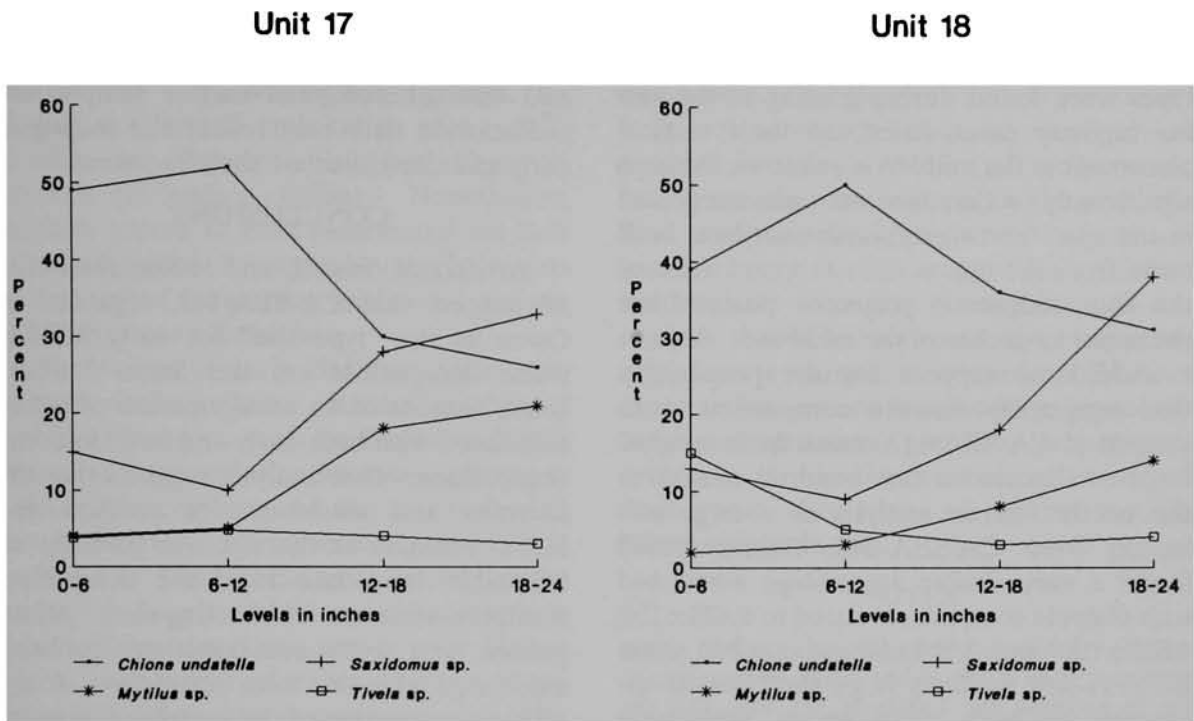


Fig. 2. Vertical distribution of the remains of major shellfish taxa in Control Pits 17 and 18, CA-SBA-142 (data adapted from Owen et al. [1964:495]; based on 1/4-in. screen recovery).

**Table 3**  
**SHELL-TO-BONE WEIGHT RATIOS**  
**FOR CONTROL UNITS AT CA-SBA-142<sup>a</sup>**

	Unit 17			Unit 18				
	0-6	6-12	12-18	0-6	6-12	12-18	18-24	24-30
Bone weight	108	201	177	45	96	195	132	22
Shell weight	845	2,669	12,883	451	815	2,049	5,163	1,879
Shell-bone ratio	8:1	13:1	73:1	10:1	9:1	11:1	39:1	85:1

<sup>a</sup> All weights in grams and depths in inches. Data adapted from Owen et al. (1964:497-499).

portions of the deposit are typical of early and late Holocene sites of the Santa Barbara coast, respectively. Quantitative estimates of the protein yield of faunal remains from two "control" units (wet-screened through 1/8-in. mesh and sorted in the laboratory) suggest that vertebrates contributed nearly 80% of the animal protein represented. These figures contradict Owen's belief that

shellfish dominated the protein yield of the site fauna and differ radically from dietary reconstructions for early Holocene sites elsewhere on the California coast (Glassow 1985, 1988; Erlandson 1988b).

Finally, certain artifact types present at the site are more typical of assemblages post-dating 5,000 B.P., especially contracting-stem and side-notched points, pestles,



well-made bowls, and polished serpentine objects. Unfortunately, many of these artifact types were found during grading of the site for highway construction, so their vertical placement in the midden is unknown. Perhaps significantly, within the test units excavated at the site, the two serpentine artifacts both came from the upper 12 inches, and three of the four diagnostic projectile points from the upper six inches of the midden.

Additional support for the proposition that temporally discrete components were present at CA-SBA-142 comes from another large site located a few hundred meters to the north. In an analysis of a large collection from CA-SBA-143, Colten (1987) found a very similar assemblage associated with discrete components dated to  $6,620 \pm 150$ ,  $4,820 \pm 90$ , and  $2,960 \pm 90$  radiocarbon years B.P. A few artifacts (e.g., shell beads) diagnostic of even more recent prehistoric occupation also were present at CA-SBA-143.

To evaluate our proposition that both early and late Holocene occupations occurred at CA-SBA-142, we submitted two samples of *Chione* shell from the upper levels of the site for radiocarbon dating. Since the upper six inches of the midden were disturbed (Owen et al. 1964:471), both samples were taken from the 6-12-in. level. The first consisted of three shell fragments from Pit 17, located in the burial area defined by Owen et al. (1964). These shells were relatively unweathered and retained the color of fresh shells, a trait rarely found on *Chione* from older middens on the Santa Barbara coast. As expected, this sample (Beta-25150) produced an uncorrected radiocarbon date of  $1,490 \pm 80$  years B.P., equal to  $1,250 \pm 87$  calendar years ago (Table 2), confirming the presence of a late Holocene component at the site. A sample (Beta-25151) of 13 *Chione* fragments (nine weathered, four unweathered) from the nonburial area produced an uncorrected date of  $4,490 \pm 80$  radiocarbon

years B.P. ( $4,880 \pm 87$  calendar years ago). Given the combination of both weathered and unweathered shell in this sample, the radiocarbon date may reflect the mixing of early and late Holocene shell fragments.<sup>2</sup>

## CONCLUSIONS

Artifactual, faunal, and radiocarbon data all suggest that CA-SBA-142, regarded by Owen as the "type site" for early Millingstone occupations on the Santa Barbara coast, consists of an amalgamation of refuse associated with both early and late Holocene occupations. Our analysis suggests that the diversity and abundance of artifacts and faunal remains at the site are partially attributable to a late Holocene occupation. Artifacts such as contracting-stem points, pestles, and well-made bowls are probably associated with this later occupation. A significant proportion of the vertebrate remains recovered by Owen et al. may also be derived from the later occupation of the site (Colten 1988). Due to the mixing of at least two components, Owen's interpretations of early adaptation on the California coast must be reevaluated with data from sites other than CA-SBA-142.

A similar situation occurred at another Millingstone "type site," the Little Sycamore Shellmound (CA-VEN-1), described by Wallace (1954) and Wallace et al. (1956). Later, Meighan radiocarbon dated two shell samples from the site, establishing that multiple components ( $6,960 \pm 100$  and  $2,610 \pm 80$  radiocarbon years B.P.) were present at CA-VEN-1 (Breschini et al. 1988:63).

Despite our revision of the Glen Annie chronology, the research and interpretations of Owen et al. remain an enduring contribution to the archaeology of coastal California. In retrospect, Owen was partially correct in his interpretation of the subsistence of early Holocene groups of the Santa Barbara coast. Analysis of faunal remains from several

other early sites of the area suggests a more diversified resource base than originally described for early Millingstone groups, including the limited exploitation of a variety of fishes, sea mammals, birds, and other vertebrates (Erlandson 1988b). Nonetheless, shellfish appear to have contributed the bulk of animal protein consumed by the occupants of these sites, supporting traditional notions of Millingstone subsistence.

The nature of early Holocene settlement patterns is less clear. Recent models of mobility strategies, such as Binford's (1980) forager-collector continuum, more accurately reflect the complexity of the archaeological record than the model (Beardsley et al. 1955) by which the Glen Annie material was judged in 1964. Despite additional research, only four Millingstone sites around the Goleta Estero have been radiocarbon dated, and we know little about the dynamics of early Holocene settlement in the area (Glassow et al. 1988:68). Our analysis suggests that Owen's most recent radiocarbon dates may have been contaminated by younger shells, undermining his argument for a lengthy but sporadic occupation of CA-SBA-142 during the Millingstone Horizon. Given the density and diversity of midden constituents in many early sites, and the presence of large cemeteries at some (Orr 1968:115-129), a pattern of semi-sedentary settlement with high logistical mobility appears to best fit the available data. Recent analysis of three early Holocene sites on the western Santa Barbara coast suggests that both semi-permanent residential bases and satellite camps were used (Erlandson 1988b:283).

Finally, our reanalysis of the Glen Annie chronology points out the care with which relative and absolute chronologies must be constructed for sites of the California coast, an area where both multi-component sites and stratigraphic mixing are common. A more thorough radiocarbon dating of the Glen

Annie assemblage could have defined clearly the late Holocene component at the site and may have altered Owen's conclusions dramatically. A more detailed analysis of vertical patterns in the distribution of artifacts and faunal remains also might have identified the later component, although our insights are based in part on the accumulation of data not available to earlier researchers. As our analysis shows, failure to recognize temporally discrete components within a site can cause serious errors in reconstructing subsistence and settlement patterns, technological evolution, the development of exchange networks, and other issues of interest to California archaeologists.

#### NOTES

1. Recent analysis (Colten 1988) of the faunal remains recovered in Owen et al.'s control pits (17 and 18) identified the remains of six elasmobranchs (angel shark, bat ray, round stingray, shovelnose guitarfish, soupfin shark, and thornback), six teleosts (jacksmelt, giant kelpfish, lingcod, sardine, sheephead, and surfperch), as well as dog, mole, hawk, and snake.

2. Alternatively, the presence of side-notched points in the Glen Annie assemblage (Owen et al. 1964:Fig. 1), types common in Santa Barbara coastal sites dating to the middle Holocene, suggests that this date could identify a middle Holocene component at CA-SBA-142.

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