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Early/Middle Period Subsistence Changes at SBA-1, Rincon Point, Coastal California

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ANALYSIS of faunal remains from SBA-1, located at Rincon Point, southeast of Carpenteria, California, produced important insights into changes in marine resource exploitation between the Early and Middle periods of Santa Barbara Channel prehistory. The data were collected during a limited testing program in the midden area of the site in the spring of 1980. Detailed analyses of the recovered material provided evidence for intensive exploitation of sea mammals and significant shifts in fish and shellfish procurement, as well as confirmation of the importance of fine screening of midden contents. The following is a brief summary of the faunal analyses presented in the project report (Kornfeld et al. 1980) and an expansion of these analyses to provide a comprehensive picture of subsistence changes at SBA-1.

BACKGROUND

Rincon Point appears to have been continuously occupied from the Early Period onward, and as many as ten archaeological sites have been identified in the vicinity. These sites include several large cemeteries, the site of the historic village of Shuku (VEN-62, east of Rincon Creek), and SBA-1 (on top of the hill west of the creek). At one time all of these sites were referred to as SBA-1, but many have since been renumbered. The site presently identified as SBA-1 was occupied at least twice, during portions of the Early Period and again during the Middle Period (King 1980: 8).

Archaeological investigations at Rincon Point began in 1878, when Stephen Bowers undertook excavations on behalf of the U. S. National Museum. He excavated at least four different cemeteries in the area between 1878 and 1884 and noted that unknown persons had excavated there before him (Bowers 1884).

Ronald Olson conducted excavations in the SBA-1 midden in 1928. The artifacts recovered indicate that the site was occupied during the Early Period between approximately 4000 B.C. and 3000 B.C., and again during an early phase (M2a) of the Middle Period (ca. 600 B.C.-1 B.C.) (King 1980). Olson noted a change from a predominance of metates and manos in the lower part of the midden to one of mortars and pestles in the upper portion (Olson 1930: 8). The 1980 stratigraphic section revealed abrupt changes in cultural material density, soil color, and shell valve size about 103 cm. below the surface of the midden. These differences likely correspond to the two major periods of occupation (Serena 1980: 12).

1980 EXCAVATIONS

The 1980 testing program was primarily designed to identify areas of archaeological

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sensitivity, define site boundaries, and assess impacts and mitigation alternatives. The testing included auger holes, backhoe trenches, excavation units, and column samples. The analyses reported here are based on samples primarily from a stepped 25x25-cm. column sample from the intact midden. Although the analyses of the material from this column provided valuable information on resource utilization and subsistence at SBA-1, the samples are very small and the results must be considered preliminary.

The top of the midden at the location of the column was approximately 220 cm. below the ground surface at the top of the seacliff. It was overlain by a layer of clean sterile sand about 70 cm. thick. On top of this was a layer of dark brown sand about 100 cm. thick containing a low density of shell and chipped stone. This layer was capped by about 50 cm. of loose sand with historic debris and iceplant.

Shellfish

Analysis of the shell was performed by Serena (1980: 1-15). Standard mass samples (250 g.) of shell from alternate 10-cm. levels of the column sample were sorted and identified to provide an adequate but manageable sample.

The distribution of shell in the midden was not uniform. In the Middle Period levels shell density was 297.0 kg./cubic meter, while in the Early Period levels the density was only 128.6 kg./cubic meter. This density change is quite abrupt and is associated with a change in soil color. In addition, the mean valve size of mussel shell appears to be larger in the lower levels (Serena 1980: 3, 8).

In both the Early- and Middle-period levels mussel (*Mytilus californianus*) made up by far the largest percentage of shell, but secondary species utilization appears to have changed between these periods. Early Period secondary shellfish include lagoon and estuary species such as the hardshell mud clams (*Chione undatella* and *Chione californiensis*), pecten (*Argopecten aequisulcatus*), and Washington clam (*Saxidomus nuttalli*). In the Middle Period levels these species are partially replaced by rock-dwelling mollusks and crustaceans, including platform mussels (*Septifer bifurcatus*), chitons of the genus *Mopalia*, and goose barnacles (*Pollicipes polymerus*) (Serena 1980: 8-10). This suggests a shift in shellfish collection away from lagoon and estuary species.

The apparent changes in the exploitation of shellfish species are difficult to interpret. The increased procurement of rocky intertidal species and a small rise in *Mytilus* percentage could be related to changes in the condition of the Rincon Creek estuary. The reduction in mean size of *Mytilus* from the Early to the Middle Periods might then reflect increased predation pressure (Serena 1980: 12-13). The changes could, however, simply be related to general broadening of the maritime resource base at the site, perhaps in response to human population growth.

Fish

Fish remains from the 1/16-inch and larger mesh screen samples at SBA-1 were analyzed by John R. Johnson (1980). It is noteworthy that the recovery of vertebrae and other diagnostic fish elements from the 1/16-inch mesh samples dramatically increased the numbers of identifiable fish species over what would have been available if only the 1/8-inch and larger mesh samples were used. Fourteen of the 21 species at the site were identified from vertebrae, and use of this skeletal element substantially enhanced the information on species and numbers of fish at the site. Through analysis of otoliths, teeth, and vertebrae, patterns of differential preservation and calculations of minimum numbers of individuals (MNI) for several species were made (Johnson 1980: 5-7). This clearly demonstrates the importance of fine screening and identification of as many different skeletal elements as possible for the interpretation of prehistoric fishing strategies.

Johnson (1980: 6-7) noted that some 65 percent of the estimated 8,700 vertebrae recovered were Clupeids (sardines and/or herring) and calculated that up to 1,122 individuals could be represented in the analyzed sample. The Clupeids could not be more accurately identified, but the presence of either sardines or herring in the site in such numbers has implications for debates regarding fishing strategies as well as for the question of changing ocean temperatures.

As with the shellfish, there was an abrupt change in the fish remains between the upper and lower levels. The density of fish bone, in particular Clupeid vertebrae, was considerably higher in the Middle Period levels (469.1 g./cubic m.) than in the Early Period levels (225.3 g./cubic m.) (Johnson 1980: 16). This suggests a significant increase in the exploitation of fish, especially Clupeids, during the Middle Period.

There is evidence of considerable sophistication in fishing technology throughout the occupation of SBA-1. Fish from four habitat zones are present in both the Early- and Middle-period levels (Table 1). This is paralleled by the increasing elaboration of fishing equipment found archaeologically in the Santa Barbara Channel area (Glassow 1980a, Tartaglia 1976). These developments imply that more effort was being put into procuring increasingly more expensive marine resources during the Middle Period. Conspicuously absent from the SBA-1 midden, however, are the large pelagic fish such as swordfish and large sharks commonly found in Late Period sites (Johnson 1980: 17).

Fitch (1969) analyzed midden samples from the slope of Rincon Hill (SBA-119), estimated to date from 2000 B.C. to 1000 B.C., and Huddleston and Barker (1978) recovered and analyzed samples from the historic village, VEN-62, east of Rincon Creek. Both studies relied mainly on the identification of otoliths and teeth. These authors found that the earlier sample contained only sparse fish remains and few deep water species. The Historic Period midden, however, contained a large variety of fish remains, including many pelagic sharks and swordfish (Huddleston and Barker 1978).

Mammals, Birds, Reptiles

The examination of non-fish bone was performed by Kim R. Lawson (1980: 1-7). Bone from the 1/8-inch and larger screens was sorted into the following categories: sea mammal (pinniped); large, medium, and small terrestrial mammal; bird; reptile; and unidentifiable. These were further divided into burnt and unburnt categories.

Throughout the depth of the column, pinnipeds appear to have made up the largest proportion of the mammals eaten by the inhabitants, with deer and other large mammals next in importance. Small mammals, such as rabbits and rodents appear to have been of secondary importance, while birds and reptiles appear to have been only occasionally eaten. A concentration of deer (*Odocoileus* cf. *hemionus*) bone was found in Unit 2, located about 90 meters east and downslope from the column sample, but the column itself contained almost no large or medium-sized terrestrial mammal remains. It did, however, have relatively abundant pinniped and small mammal bone.

In common with many environmental reports the Rincon Technical Report provides relatively detailed examinations of particular facets of the archaeological record at the site, but does not attempt to tie these together systematically into a comprehensive picture. This is due to the way such projects must be structured, with management and time concerns overriding less pragmatic research objec-

Table 1
HABITAT ZONE EXPLOITATION AT SBA-1

Habitat	Species Recovered	Fishing Method
Near shore, off sandy beaches	white croaker, surfperch, jacksmelt shovel-nosed guitarfish	Beach seines
	Pacific mackerel, barracuda, shallow-water sharks	Hook and line
Shallow, rocky coastal areas	senoritas, rockfish, jack mackerel, pile perch	Hook and line
Kelp beds	bonito, yellowtail, jack mackerel, sheephead, Pacific mackerel, surfperch	Hook and line from boats
Off shore beyond kelp	soupfin shark	Hook and line from boats

tives. It is possible, however, to make use of the data presented in the Rincon report to provide a broader view of the subsistence changes between the Early and Middle periods at SBA-1.

In order to examine changing patterns of subsistence at the site the relative dietary importance of various types of fauna must be compared using some common measure of dietary importance. The method used here follows Glassow and Wilcoxon (Glassow 1980b: 6-7); Glassow and Wilcoxon 1979) and uses the weight of bone or shell in the sample to calculate the amount of edible meat it represents. Various researchers have described the relationship between skeletal weight and body and/or edible meat weight, and developed ratios or formulae to approximate body or meat weights from bone or shell weight (Phrange, Anderson, and Rahn 1979; Wing and Brown 1979; Tartaglia 1976: 170; Glassow and Wilcoxon 1979: 36). Skeletal weight/meat weight calculations allow comparisons when only gross classes of faunal remains (i.e., fish vs. sea mammal) are available. This approach also maximizes the utilization of the available faunal material and compensates for varying degrees of fragmentation in the bone or shell (Glassow 1980b: 6).

Due to the wide range of relative food values of meat from different species, the edible meat weight is not, in itself, a good comparative variable. It was therefore used as the basis for calculating the amount of protein represented in the sample. Protein is particularly important as a primary dietary requirement in human nutrition and so is an excellent variable for comparisons of relative subsistence contribution, especially if it can be argued that plant foods provided a significant proportion of the total caloric intake. Protein value can be expressed as a proportion of the edible meat weight or in terms of the grams of protein available. Table 2 gives the bone/shell weight to edible meat weight and protein conversions used here.

Obviously, many problems exist in making these kinds of transformations on archaeological data and the results should be viewed with caution. This is especially true in light of the small size of the sample examined here. For example, the extrapolated high density of sea-mammal protein in the 103-113 cm. level might represent only the skeletons of one or two animals discarded in this spot. With a larger sample, MNIs could help to resolve such problems. It is argued, however, that the conversions are the best approximations of the values possible and that, as they are being used for comparisons within the same unit, they are valid for the following analyses.

Table 3 shows the results of these conver-

Table 2
MEAT WEIGHT AND PROTEIN CONVERSION FACTORS

	Ratio of Shell/Bone to Edible Meat Weight	Protein Percentage
SHELLFISH (*Mytilus californianus*)	1:0.332 (Glassow and Wilcoxon 1979: 36)	11.6 (Sidwell 1981: 130)
FISH	1:27.7 (Tartaglia 1976: 170)	19.7* (Sidwell 1981: 37-119)
SEA MAMMAL	1:24.2 (Glassow and Wilcoxon 1979: 36)	19.4** (Osborn 1977: 152-153)
OTHER MAMMAL	$\text{Log bodywt} = \frac{\text{log skelwt} + 1.2147}{1.09}$ (Wing and Brown 1979: 128) Edible wt = .655 bodywt (Wing and Brown 1979: 132)	21.0 (Watt and Merrill 1975: 51, 65 items 1842, 2405)

*Mean for 12 of the fish species found at Rincon or same Genus.
**Mean of five sea-mammal species.

sions using data from Tables 9.2, 10.1, and 11.3 from the Rincon Technical Report (Kornfeld et al. 1980). The weights of bone and shell include all materials from the 1/16-inch and larger screens, but complete data were available only for alternate levels of the column sample.

The protein density (in g./1,000 cubic cm.) is graphed by level (Fig. 1). There is a general increase in density from the top to the bottom of the midden, except for a distinct drop-off in the lowest level (143-153 cm.). The latter represents the contact with the underlying clay horizon and is mainly made up of material from rodent holes extending into the clay. It will be disregarded in the following discussions.

In general, sea mammals and shellfish appear to have contributed the largest percentages of protein to the diet in all levels. They are also the components of the subsistence which appear to fluctuate most. Fish appear to have provided a relatively stable source of protein throughout the site occupation, contributing between 15 and 20 percent of the meat protein in most levels.

The density of identified sea-mammal remains ranges from 10.5 to 19.7 g./1,000 cubic cm. in the Early Period component and decreases rather sharply in the Middle Period midden, ranging from 3 to 7.8 g./1,000 cubic cm. The relative contribution of sea mammals to the meat supply ranges from a low of 12.6 percent in the Middle Period to a high of 57 percent of the total protein for one of the Early Period levels.

It should be noted here that the above figures only include the identified sea-mammal bone. As noted by Glassow (1980b: 5) a large portion of the sea-mammal bone in a sample often ends up in an unidentified mammal category due to its tendency to break into small fragments of cancellous bone which cannot be identified. In fact, at SBA-1 it is likely that most of the unidentified bone was sea mammal. It was for this reason that conversion factors for sea mammal were used in calculating the edible meat and protein weights for the unidentified bone. The addition of most of the unidentified bone weight to the sea-mammal category substantially increases the relative importance of pinnipeds in the subsistence evaluation. Given this, sea mammals are now seen to be the single most

Table 3

MEAT AND PROTEIN CONVERSIONS BY FAUNAL CATEGORY AND LEVEL

Level		Shellfish	Fish	Sea Mammal	Other Mammal	Unid. Mammal	Total
UPPER MIDDEN							
	shell/bone	2050.60	5.40	5.20	5.00	9.90	2076.10
	meat	680.80	149.58	125.84	37.32	239.58	1233.12
0- 13	protein	78.97	29.47	24.41	7.84	46.48	187.17
	density	9.72	3.63	3.00	.96	5.72	23.04
	percent	42.19	15.74	13.04	4.19	24.83	100.00
	shell/bone	1894.80	4.70	5.60	3.00	7.20	1915.30
	meat	629.07	130.19	135.52	23.35	174.24	1092.38
23- 33	protein	72.97	25.65	26.29	4.90	33.80	163.62
	density	11.68	4.10	4.21	.78	5.41	26.18
	percent	44.60	15.68	16.07	3.00	20.66	100.00
	shell/bone	1889.40	9.40	4.50	1.00	4.40	1908.70
	meat	627.28	260.38	108.90	8.52	106.48	1111.56
43- 53	protein	72.76	51.29	21.13	1.79	20.66	167.63
	density	11.64	8.21	3.38	.29	3.31	26.82
	percent	43.41	30.60	12.60	1.07	12.32	100.00
	shell/bone	2148.30	7.00	9.40	1.60	3.20	2169.50
	meat	713.24	193.90	227.48	13.12	77.44	1225.17
63- 73	protein	82.74	38.20	44.13	2.76	15.02	182.84
	density	13.24	6.11	7.06	.44	2.40	29.25
	percent	45.25	20.89	24.14	1.51	8.22	100.00
	shell/bone	1856.20	7.20	10.40	1.10	8.30	1883.20
	meat	616.26	199.44	251.68	9.30	200.86	1277.54
83- 93	protein	71.49	39.29	48.83	1.95	38.97	200.52
	density	11.44	6.29	7.81	.31	6.23	32.08
	percent	35.65	19.59	24.35	.97	19.43	100.00
LOWER MIDDEN							
	shell/bone	864.00	3.40	26.20	1.20	8.30	903.10
	meat	286.85	94.18	634.04	10.08	200.86	1226.00
103-113	protein	33.27	18.55	123.00	2.12	38.97	215.91
	density	5.32	2.97	19.68	.34	6.23	34.55
	percent	15.41	8.59	56.97	.98	18.05	100.00
	shell/bone	894.60	5.50	14.00	.50	4.20	918.80
	meat	297.01	152.35	338.80	4.51	101.64	894.31
123-133	protein	34.45	30.01	65.73	.95	19.72	150.86
	density	5.51	4.80	10.52	.15	3.15	24.14
	percent	22.84	19.89	43.57	.63	13.07	100.00
	shell/bone	652.40	2.50	.60	.90	2.50	658.90
	meat	216.60	69.25	14.52	7.74	60.50	368.61
143-153	protein	25.13	13.64	2.82	1.63	11.74	54.95
	density	4.02	2.18	.45	.26	1.88	8.79
	percent	45.73	24.83	5.13	2.96	21.36	100.00

Shell, bone, meat, and protein weight in grams.
Density in grams of protein/1,000 cubic cm.
Percent is of the total protein for the level.

important suppliers of meat protein in the Early Period; and, while declining in importance somewhat, remaining important throughout the Middle Period as well.

The percentage and density of shell increased during the Middle Period so that shellfish became the most important single element of the diet, generally making up 35

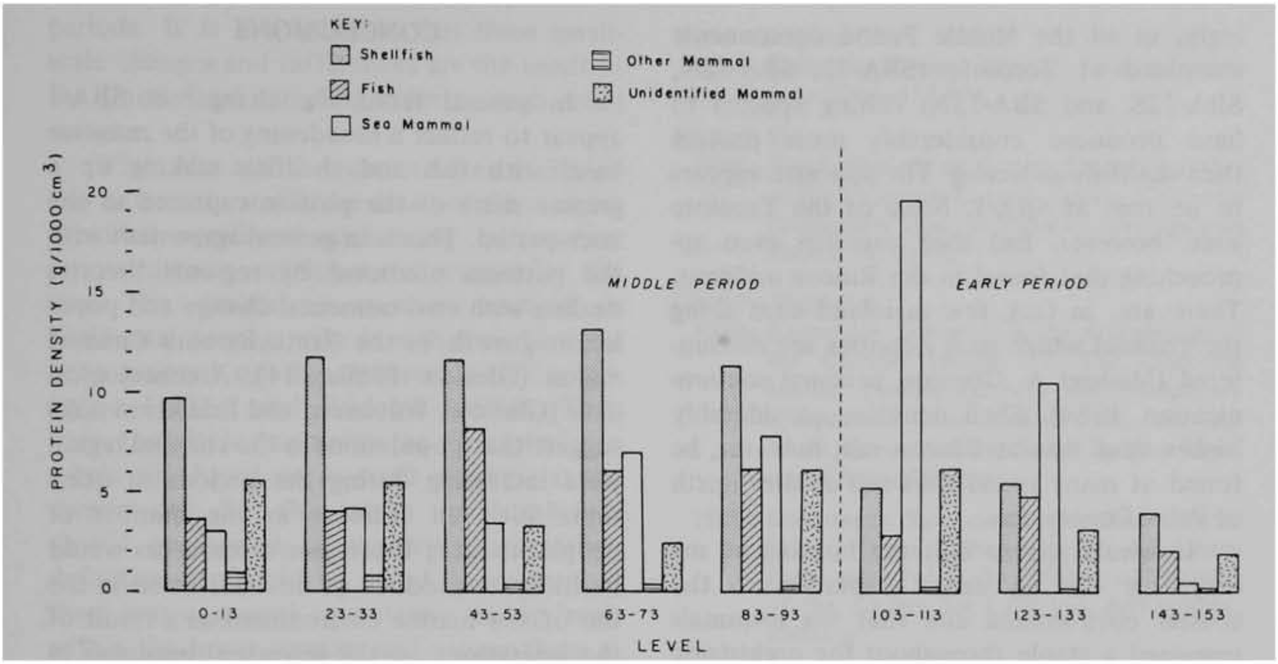

Fig. 1. SBA-1: Protein density by category and level.

to 45 percent of the protein. Shellfish protein density in the lower midden is somewhat over 5.0 g./1,000 cubic cm. while that of the upper meter of deposits ranges from 9.7 to 13.2 g./1,000 cubic cm.

Fish appears to have remained relatively stable within the components, but with somewhat higher densities and percentage representation in the Middle Period component. Its protein density fluctuates between 3.6 and 8.2 g./1,000 cubic cm. in the upper midden and 3 and 4.8 in the lower.

Terrestrial mammals appear to have been a marginal resource. Their protein density never reaches 1 g./1,000 cubic cm. It should be recalled, however, that deer bone was found in concentration in other parts of the site.

It would appear that throughout the Early and Middle periods of occupation of SBA-1 the inhabitants maintained a decidedly marine hunting and fishing adaptation. Our sample indicates that terrestrial mammals, birds, and reptiles represented only small proportions of the diet. The hunting of marine mammals was, however, the source of well over half of the protein intake during the Early Period and between one quarter and one half throughout the Middle Period. This implies the existence of rookeries or haulouts in the area. Extensive features of this type are not known in the area today, although a few seals are reported by local residents to inhabit the rocky areas a mile or so to the north, and the author has often noted seals among the surfers off the point.

High densities of sea-mammal remains have been recorded at other Santa Barbara Channel archaeological sites. Glassow (1980b) examined the protein density of shellfish, fish, and mammals, using conversions similar to those used here, for several site components at the mouth of Tecolote Creek, north of Santa Barbara. In all five sites, mammal remains accounted for the largest proportion of the available protein. Interestingly, in all the Middle Period components examined at Tecolote (SBA-71, SBA-72N, SBA-72S, and SBA-73N) fishing appears to have produced considerably more protein than shellfish collecting. The opposite appears to be true at SBA-1. None of the Tecolote sites, however, had shell densities even approaching that found in the Rincon middens. There are, in fact, few mainland sites along the channel where such densities are encountered (Michael A. Glassow, personal communication 1984). Shell densities considerably higher than that at Rincon can, however, be found at many island sites and at sites north of Point Conception.

It would appear that the hunting of sea mammals was an early adaptation to the coastal environment and that sea mammals remained a staple throughout the prehistoric period even as other sources of protein (i.e., fish and shellfish) became increasingly important. Minimal additions to the hunting technology were required for sea-mammal hunting, and the necessary knowledge of species habits and behavior were easily acquired by people already accustomed to making such observations. As long as distances were not excessive, pinnipeds represented a high-payoff, low-cost resource. It comes as no surprise, therefore, that sea-mammal hunting was an early and long-lasting adaptation along this part of the California coast and the Channel Islands (Glassow 1980a). Fish is a relatively expensive protein source when equipment preparation and technological requirements are considered. Intensification of fish exploitation would likely occur slowly as pressure on other resources made it economically attractive. This may be reflected in the increased density of fish protein and the lower density of sea-mammal protein reconstructed for the Middle Period levels at SBA-1. The same may hold for shellfish exploitation, although the nature of the "costs" is less clear.

CONCLUSIONS

In general terms the changes at SBA-1 appear to reflect a broadening of the resource base, with fish and shellfish making up a greater share of the protein captured in the later period. This is in general agreement with the patterns predicted by regional theories dealing with environmental change and population growth in the Santa Barbara Channel region (Glassow 1980a: 14). Archaeological data (Glassow, Wilcoxon, and Erlandson n.d.) suggest that populations in the channel region were increasing during the periods in question. Such an increase in the number of people utilizing the region's resources would be likely to produce an intensification in the use of the marine environment as a result of the limitations on the terrestrial resources in the narrow coastal zone. The data from SBA-1 appear to show the effects of such intensification.

Somewhat more difficult to account for are the smaller-scale fluctuations in relative utilization of faunal types through time at SBA-1 and the differences between this site and those at Tecolote which date to the same time periods. Temporal changes, such as in shellfish dependence and diversity of species utilization, may be related to changes in the local environments due to eustatic, isostatic, or climatic factors. The observed differences in faunal remains between Rincon and other contemporaneous sites along the channel coast can possibly be explained by differences in local environmental conditions. Any coastal area can be characterized by the presence or absence of rocky intertidal zones, sandy beaches, kelp beds, estuaries, or other physical or biological features. The wide range of possible environments created opportunities for a wide variety of food-gathering strategies within a general maritime adaptation. These opportunities probably account for much of the individual site variation within given time periods. It is also possible that these small-scale changes and differences are the result of the "noise" of sampling error in such small samples.

While the actual excavated area at SBA-1 was extremely small, the detail of the analysis provided significant preliminary information on prehistoric subsistence strategies at the site. The danger of assuming vertical or horizontal homogeneity in a shell midden has been pointed out by Ambrose (1967), Wilcoxon (1981), and Rudolph (1984). They note that it is impossible to characterize a whole site based on as small a sample as the present one. For this reason the data herein should be viewed as suggestive rather than definitive. It should be noted, however, that there was a general consistency among levels within the lower stratum and among those in the upper stratum, which suggests that the data are not without some merit.

In the future, efforts should be oriented toward the recovery of comparable data on a larger scale to provide data on other areas and time periods, to provide more reliable samples of middens, and to delineate past environmental conditions. While the results of this report can only be considered tentative, they provide an interesting and useful example of the types of information that can be gleaned from Cultural Resource Management related data recovery.

NOTE

1. The testing program from which this material is drawn was performed by the University of California, Santa Barbara, Social Process Research Institute, Office of Public Archaeology. I wish to thank Jeff Serena, John R. Johnson, Pandora Snethkamp, Michael A. Glassow, Albert Spaulding, and reviewers for the *Journal* for their comments on the paper.

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