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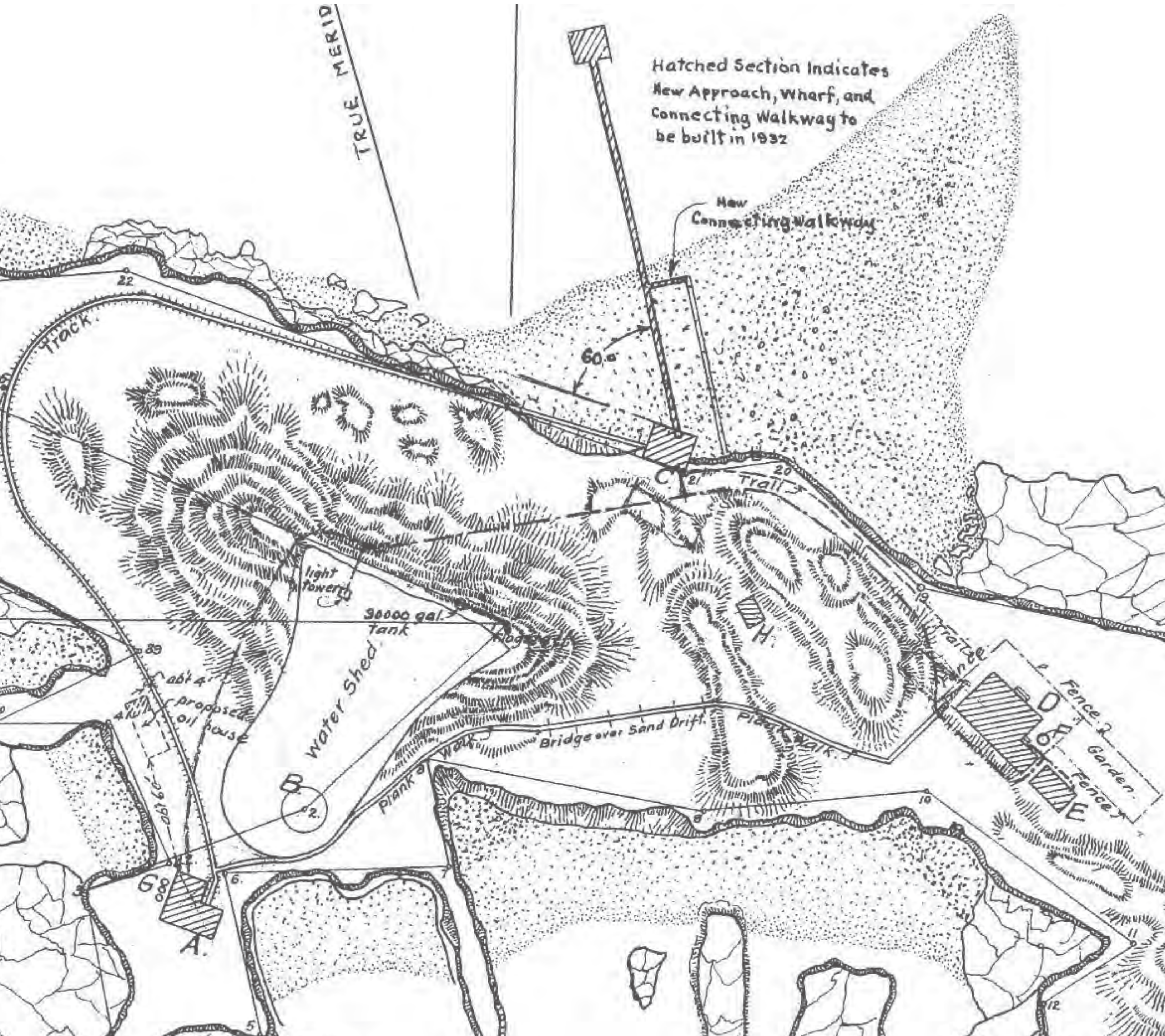
ARCHAEOLOGY AND HISTORY IN AÑO NUEVO STATE PARK



ARCHAEOLOGY AND HISTORY IN AÑO NUEVO STATE PARK

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Part I: Archaeological Investigations

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Archaeology, History and Museums Division

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Publications in Cultural Heritage, Number 26
Archaeology and History in Año Nuevo State Park
By William Hildebrandt, Jennifer Farquhar, Mark Hylkema, and Matt C. Bischoff
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Image Opposite Page: Fog Signal Building looking South, Unknown Date
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PREFACE

This volume marks the return of the long dormant Department of Parks and Recreation California Archaeological Report series. Although we have renamed the series *Publications in Cultural Heritage* to be more inclusive of all manner of cultural resources reports, we have retained the series numbering sequence. Thus, we are proud to present No. 26 *Archaeology and History in Año Nuevo State Park*. This report presents an archaeological site report from CA-SMA-18 and historic documentation of the Año Nuevo Island Light Station. These two cultural resources are both imperiled by one of the most popular attractions in the California State Parks system, a large colony of northern elephant seals (*Mirounga angustirostris*), as well as a somewhat smaller group of California sea lions (*Zalophus californianus*).

The damage to these resources is due to the sheer size and sometimes aggressive behavior of the elephant seals. Male seals can grow to 16 feet in length and weigh 6,000 pounds. Since 1961, when these seals first established their breeding colony at Año Nuevo, their population has steadily increased and now number in the thousands. They have subsequently pushed inland, obliterating archaeological deposits in the fragile sand and destroying vegetation which helped to stabilize those deposits from wind erosion. The sometimes violent territorial battles between male seals produce similar damaging results. The damage is particularly evident at CA-SMA-18, which lies near the center of their rookery.

Over at the Light Station, elephant seals and sea lions have taken up residence in the interior of the light keeper's home. The combined effects of the sea mammals, the harsh open ocean environment, and mid-twentieth century vandalism have taken their toll on the complex, and it is rapidly deteriorating.

For these reasons, both CA-SMA-18 and the Light Station were the focus of Department of Parks and Recreation (DPR) cultural grants. In 2004, a grant from the Cultural Stewardship Program was awarded to Santa Cruz District Archaeologist Mark Hylkema, who used the funding for salvage excavations, material analyses, and reporting of these activities at the prehistoric site. This work was completed with the assistance of Far Western Anthropological Research Group, Inc., Albion Environmental, the University of California Santa Cruz, and many volunteers.

A year later, funding from the Cultural Resources Management Program was granted to California Park Staff Historian Matt C. Bischoff to provide an historic context of the Año Nuevo Light Station and conduct an evaluation of its eligibility for listing to the National Register of Historic Places.

Presented within this volume are both reports. Each is important as they document, and therefore help to preserve, two rapidly diminishing stories of the human history of Año Nuevo: that of its original inhabitants, and that of the American Period lighthouse keepers and their families who kept watch over a dangerous coastline.

Richard Fitzgerald
Editorial Advisor

PART I:
ARCHAEOLOGICAL INVESTIGATIONS

Introduction

Año Nuevo State Reserve has a very high density of prehistoric archaeological sites. Previous archaeological surveys have identified more than 30 sites within a one-mile radius of the point. These include large habitation areas, small shellfish processing camps, and flaked stone tool production locations, the latter made possible by the Monterey chert outcrops exposed along the local sea cliffs. Archaeological excavations at some of these sites reveal evidence for human habitation extending back at least 3,000 years (Hylkema 1991, 2002), while data from nearby sites push these occupations back to 6000 cal BP (Jones and Hildebrandt 1990).

One of the most important aspects of the Año Nuevo archaeological record is the butchered remains of northern fur seal (*Callorhinus ursinus*) in some of the prehistoric sites. Northern fur seals (NFS) traditionally give birth and breed on islands within the Bering Sea of Alaska. During fall and winter, females and juveniles are known to migrate as far south as central California, but stay out at sea for the duration of their trip. Analyses of prehistoric archaeological collections from the central and northern California coast, however, indicate that these behavioral patterns have not remained constant throughout the Holocene (Gifford-Gonzalez et al. 2005; Hildebrandt 1984; Hildebrandt and Jones 2002). One of the most important discoveries of northern fur seal bones occurred at Año Nuevo, where they have been found at multiple sites, particularly CA-SMA-218 (Hylkema 1991). Their populations appear rather strong until around 1500-1000 BP when they begin to decline (including at Año Nuevo), and the reasons for their demise have sparked a great deal of debate among archaeologists, leading many to re-evaluate traditional views of Native American hunting practices (Gifford-Gonzalez et al. 2005; Hildebrandt and Jones 2002; Jones and Hildebrandt 1995; Lyman 1989, 1995, 2003).

The unexpected occurrence of northern fur seals in California archaeological sites has now caught the attention of the biological community. Many in the field are reluctant to believe that the seals could have occupied near shore habitats in California due to the rigid behavioral and migratory patterns exhibited by modern populations. Due to the building scientific interest in the subject, a three-day *International Workshop on Northern Fur Seal Ecology, Biogeography, and Management in Historical Perspective* was held in 2004 at the University of California (UC), Santa Cruz under the direction of Diane Gifford-Gonzalez. It included field biologists, oceanographers, geneticists, and archaeologists from Russia, Alaska, Canada, Mexico, and the

United States, who were led on a tour of Año Nuevo. The purpose of the gathering was to organize an interdisciplinary team of experts to improve our knowledge of the Holocene natural history of this animal by applying modern approaches to species identification, stable isotope analysis, radiocarbon dating, and extraction of ancient DNA. Preliminary results of this research have been published through a variety of outlets (e.g., Burton 2000; Burton et al. 2001, 2002; Gifford-Gonzalez et al. 2005), and will be the subject of more detailed discussion in subsequent sections of this report.

Site CA-SMA-18 dates between 1300 and 1200 cal BP and initial visits to the site indicated that it could contain northern fur seal bones. We know the age of the deposit based on radiocarbon dates obtained from shellfish collected from the site (Newsome, personal communication 2005). Cabrillo College has also performed some preliminary excavations at the site, providing useful information on the depth and structure of the deposit. Unfortunately, however, elephant seals have recently established a rookery on the mainland of Año Nuevo and are currently destroying the site. Judging from the rate of disturbance observed over the last couple of years, the site will probably be completely gone in a few years.

It is critical to realize that the archaeological record is one of the only places we can obtain data on the Holocene history of northern fur seals. This rich source of historical information is of international importance, as the behavior and population dynamics of this animal are currently being used to help measure the overall health of the northern Pacific Ocean ecosystem.

With these considerations in mind, a salvage excavation was conducted at SMA-18 on October 29-31, 2004. It was directed by Hildebrandt, Hylkema, and Farquhar, and partially funded through a California Department of Parks and Recreation Cultural Stewardship Grant, as well as with the volunteer labor of numerous people, including several individuals associated with Far Western Anthropological Research Group, Inc., Albion Environmental, and UC Santa Cruz. The following pages document the results of this field effort.

RESEARCH CONTEXT

The prehistoric record of Año Nuevo is best documented at three sites: SMA-218, -238, and -97 (Figure 1). These sites were excavated as part of Hylkema's graduate research at San Jose State University; the results of this work are reported in his M.A. thesis (Hylkema 1991) and in a more recent publication (Hylkema 2002). A few other sites have been excavated over the last few years by Hylkema and colleagues from Cabrillo College, but the analysis of these materials has not yet been completed. As a result of this situation, the following discussion will focus on the three reported sites.

Four major time periods are recognized in the local area: Middle Holocene (8000-5500 cal BP), Early Period (5500-3000 cal BP), Middle Period (3000-900 cal BP), and the Late Period (post 900 cal BP). The earliest component at Año Nuevo was discovered at SMA-218, where the deposit dates to between 2600 and 2300 cal BP, dating to the earliest portion of the Middle Period. Site SMA-97 corresponds to the Late Period with a radiocarbon date of 775 cal BP, while SMA-238 is later still, ranging between about 180 and 300 cal BP. The Middle Period component at SMA-218 produced a very narrow artifact assemblage dominated by bifaces, preforms, and projectile points (95.6%) to the near-exclusion of everything else (Figure 1). Hylkema's (1991) analysis of these materials indicates that people arrived at the site with large quantities of early stage Monterey chert bifaces and reduced them down to finished implements, including numerous contracting-stemmed projectile points. This reduction sequence is documented by a very large sample of artifacts, including 93 (43.3%) Stage-3 bifaces (i.e., items that have been substantially thinned), 68 (31.6%) preforms/Stage-4 bifaces (i.e., thinned items with initial pressure flaking), and 54 (25.1%) finished projectile points and fragments.

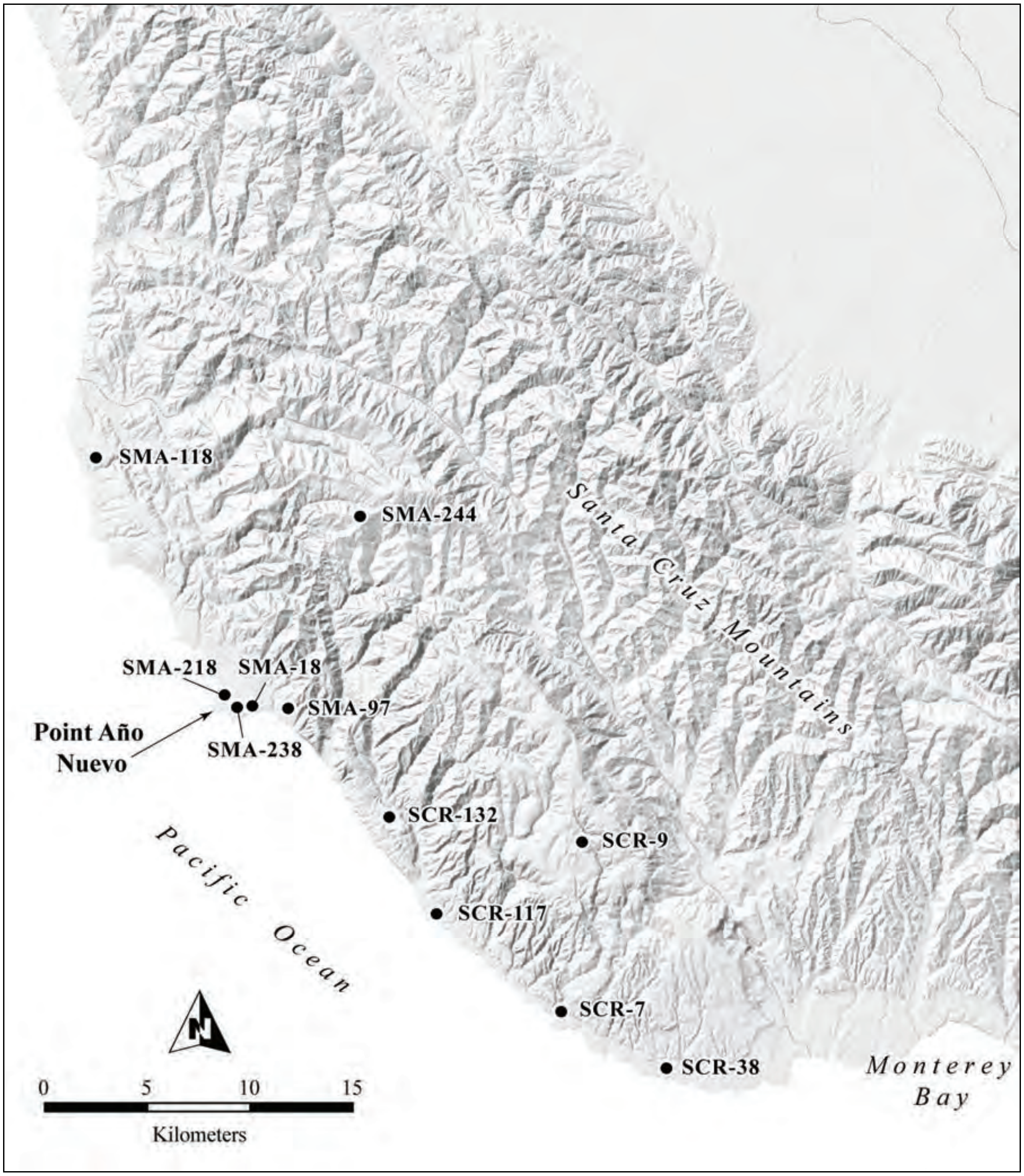


Figure 1. Distribution of Key Outer Coast Sites in the Año Nuevo Area.

Mammalian faunal remains from SMA-218 are quite specialized, particularly with regard to northern fur seal remains (Table 1). Northern fur seal makes up 95.9% of the marine mammal assemblage, and 72.8% of the entire assemblage (i.e., when deer/elk and rabbits are included in the analysis). The narrow focus on the production of hunting implements and the killing and butchering of northern fur seals is very unusual for central California, and clearly represents specialized, logistically organized group whose residential base was located elsewhere.

Archaeological findings from the Late Period sites are completely different from SMA-218 (Table 1), as both deposits produced more diversified artifact assemblages. Although SMA-238 had a paucity of flaked stone tools, it yielded an abalone pendant; several bone tools, pitted stones, grooved/notched stones, and a minimal amount of milling gear. An even more diversified assemblage was found at SMA-97, as the full range of artifacts one would expect from a large-scale residential base were recovered (i.e., shell beads, bone tools, milling gear, and flaked stone implements, including obsidian lanceolates;

Table 1. Archaeological Findings from Key Sites at Año Nuevo.

	CA-SMA-218 (2600-2300 CAL BP)	CA-SMA-238 (300-180 CAL BP)	CA-SMA-97 (775 CAL BP)	TOTAL
ARTIFACTS				
Abalone Pendant	-	1	-	1
Shell Beads	1	-	8	9
Bone Tools	2	6	6	14
Pitted Stones	1	5	-	6
Grooved/Notched Stones	-	8	3	11
Pestles	-	1	5	6
Mortars	-	-	3	3
Millingslabs	1	-	1	2
Bifaces [a]	93	-	7	100
Preforms [b]	68	-	6	74
Projectile Points	54	-	16	70
Other Flaked Stone Tools	6	1	2	9
Total	*226*	*22*	*57*	*305*
FAUNAL REMAINS				
Northern Fur Seal	142	nd	24	166
California Sea Lion	-	nd	7	7
Harbor Seal	1	nd	9	10
Sea Otter	5	nd	8	13
Rabbits	26	nd	27	53
Deer/Elk	21	nd	26	47
Total	*195*	*nd*	*101*	*296*

Notes: [a] Predominately Stage 3; [b] Predominately Stage 4; nd – No data.

see Table 1). Faunal remains were not collected from SMA-238, as this outer coast deposit had been contaminated with bone from the modern elephant seal rookery. Faunal remains were collected from SMA-97 and are fully consistent with the artifact assemblage, as they are much more diversified than those from SMA-218. Northern fur seal represent only 50.0% of the marine mammal remains, and 23.8% of the overall assemblage—the latter decline due to a significant increase in the importance of terrestrial game.

The radical difference between SMA-218 and the other two sites indicates that major changes took place at Año Nuevo sometime after 2300 cal BP and before 800 cal BP, an interval that roughly corresponds to the Middle Period. Due to the absence of a Middle Period component at Año Nuevo, we have added additional data from seven nearby sites to see if the expanded sample sheds light on the land-use changes observed. Five sites are located in outer coast settings within 15 miles of Año Nuevo (SMA-118, SCR-7, -32, -38, and -117; Fitzgerald and Ruby 1997; Hylkema 1991, 2002; Jones and Hildebrandt 1990, 1994), while the other two are at nearby areas on the interior (SMA-244, SCR-9; Hylkema 1991, 2002). It should be emphasized that this larger sample does not include all the data collected from this area, as additional information exists from a variety of nearby coastal and interior sites. These data, however, are derived from informal surface collections (e.g., major portions of SCR-7) or from excavations that have not been fully reported (e.g., SCR-20), and need further work before they can contribute to the local prehistory.

The earliest evidence for occupation near Año Nuevo comes from Sand Hill Bluff (SCR-7) where a Middle Holocene component was investigated and reported by Jones and Hildebrandt (1990). A discrete buried component yielded a radiocarbon date of 6140 cal BP. The small artifact assemblage (limited to Locus 1, Stratum 2) was dominated by bifacial tools, but did include some shell/bone tools and milling gear (Table 2). Mammalian faunal remains, though not plentiful, included a diversified set of both terrestrial and marine game (but not northern fur seals), perhaps reflecting a relatively mobile, generalized adaptation. The significant presence of Franciscan chert in the assemblage, which was probably obtained from sources well into the interior, supports a wide-ranging land-use strategy.

The Early Period is represented by SCR-38 which dates to about 4000 cal BP (Jones and Hildebrandt 1994). It is located only a few miles south of SCR-7, and includes several bifaces and projectile points, augmented by a significant frequency of shell/bone tools, pitted/grooved stones, and milling gear (Table 2). Faunal remains are quite sparse, but are limited to artiodactyls and rabbits (no marine mammals were found). Use of interior habitats is indicated by the significant presence of Franciscan chert, as well as by the charred remains of manzanita and gray pine (both from interior habitats). These findings probably reflect short-term residential occupations by small mobile groups that used both interior and coastal habitats during a wide-ranging seasonal round.

Site SCR-9 becomes occupied about 1,000 years later (ca. 2900-2700 cal BP), and almost overlaps with the Middle Period occupation of SMA-218 (ca. 2600-2300 cal BP). As mentioned above, SMA-218 appears to be a specialized, logistically organized hunting camp probably linked to a major residential base. Site SCR-9 appears to be a good candidate for this residential site, as it contains large numbers of shell/bone tools, milling gear (including mortars and pestles), flaked stone implements, as well as numerous domestic features (including mussel roasting pits and human burials, Table 2). Mammalian faunal remains are dominated by deer, but marine mammals are also present, and include a

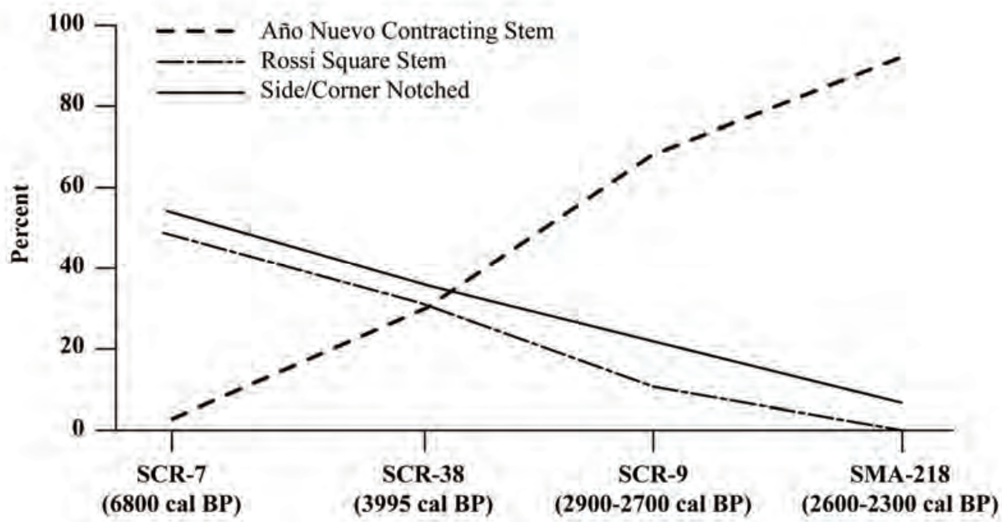
Table 2. Summary Data from Sites in the Año Nuevo Area.

Area	Coastal Sites								Interior Sites		
Period & Site:*	Middle Holocene SCR-7	Early Period SCR-38	Middle Period SMA-218	Middle Period SCR-132	Late Period SMA-97	Late Period SMA-238	Late Period SMA-118	Late Period SCR-117	Middle Period SCR-9	Late Period SMA-244	Total
Shell/Bone Tools	1	4	2	3	14	7	-	3	64	11	109
Pitted/Grooved Stone	-	4	1	5	3	13	18	3	2	1	50
Milling Gear	2	6	1	1	9	1	2	2	45	7	76
Bifaces/Points	26	31	215	13	29	-	-	3	70	5	392
Subtotal Tools	29	45	219	22	55	21	20	11	181	24	627
Northern Fur Seal	-	-	142	1	24	ND	1	-	13	1	182
California/ Stellar Sea Lion	1	-	-	2	7	ND	3	-	2	-	15
Harbor Seal/Sea Otter	1	-	6	6	17	ND	89	2	13	1	135
Rabbits	4	2	26	2	27	ND	2	2	-	11	76
Deer/Elk	2	3	21	12	26	ND	4	29	522	17	636
Subtotal Faunal Remains	8	5	195	23	101	0	99	33	550	30	1044
Total	*37*	*50*	*414*	*45*	*156*	*21*	*119*	*44*	*731*	*54*	*1,671*

Note: * MH – Middle Holocene;; SCR-7 (6140 cal BP); SCR-38 (3995 cal BP); SMA-218 (2600-2300 cal BP); SCR-132 (1236 cal BP); SMA-97 (440 cal BP); SMA-238 (850-250 cal BP); SMA-118 (1330-1200 cal BP); SCR-117 (500-250 cal BP); SCR-9 (2900-2700 cal BP); SMA-244 (600 cal BP); nd – No data.

significant amount of northern fur seal for the first time in the region (46.4% of the marine mammal bone). These data, which match-up well with SMA-218, could reflect the origin of a more residentially stable system settlement in the region, where major habitation areas were set up on the interior close to important plant resources (e.g., acorns), while coastal resources were obtained by logistically organized groups who transported then back to the interior.

Although this scenario makes good sense with the data at hand and is consistent with similar settlement pattern shifts elsewhere in California (Hildebrandt and McGuire 2002), it is important to note that SCR-9 is slightly older than SMA-218, and this difference in age can be seen in a shifting mix of projectile point types that were used in the area over time (Figure 2). Beginning with the earlier components at SCR-7 and -38, the small sample of projectile points recovered from controlled excavations show equal amounts of side/corner-notched and Rossi square-stem points, but a near-absence of Año Nuevo contracting-stemmed forms (Hylkema's ongoing review of surface assemblages generated from these two sites by local collectors mimic these patterns). After 2900 BP, however, square-stemmed (10.7%) and notched points drop in frequency (21.4%) at SCR-9 relative to Año Nuevo contracting-stemmed points (67.9%). Finally, after 2600 BP, when SMA-218 becomes occupied, contracting-stemmed points become dominant (96.4%), while the others essentially fall out of the record.



Año Nuevo...	-	0.0%	1	33.3%	19	67.9%	27	96.4%	47
Rossi Square...	1	50.0%	1	33.3%	3	10.7%	-	0.0%	5
Side/Corner...	1	50.0%	1	33.3%	6	21.4%	1	3.6%	9
	2		3		28		28		

Note: Greater numbers of these points have been recovered by local collectors and their relative frequencies parallel those presented here. Hylkema is currently analyzing these collections as part of a larger project.

Figure 2. Relative Frequency of Key Dart Point Types from Single Component Excavated Contexts in the Año Nuevo Area.

Despite the abundant and interesting findings from SCR-9 and SMA-218, information from the remainder of the Middle Period (i.e., 2300-900 cal BP) is limited to a single coastal site: SCR-132. This site has a radiocarbon date of 1236 cal BP and a small artifact assemblage that is more diverse than that found at SMA-218, probably signaling a return to a residential use of the coast. Flaked stone tools make up 59.1% of the tools, but are accompanied by shell beads, pitted stones, grooved/notched stones, and a single handstone. Faunal remains are also relatively diverse, with terrestrial game comprising 60.9% of the overall assemblage; northern fur seals are represented by only a single specimen.

Our Late Period sample includes the two sites already mentioned at Año Nuevo (SMA-97 and -238), and three additional deposits, two on the coast (SMA-118 and SCR-117) and the other on the interior (SMA-244). The Año Nuevo sites appear to reflect a rather complete pattern of residential activities (particularly at SMA-97). The small assemblage from SCR-117 is also relatively diversified, but shows a dominant presence of deer bone, and a near-absence of marine taxa (including a complete absence of northern fur seal). Site SMA-118, in contrast, looks like a short-term fishing/hunting camp that is rich in faunal remains and pitted/grooved stones, but little else (although it does contain human burials). Site SMA-244 is composed of a small but diversified artifact assemblage (probably reflecting a short-term residential base), and a faunal assemblage dominated by artiodactyls and rabbits. The range of data produced by these sites seems to reflect a relatively high degree of settlement differentiation, including residential sites on the coast and the interior, as well as more specialized resource acquisition activities in certain areas. A high level of inter-site variability is also revealed by the faunal remains, as SMA-118 is dominated by harbor seals and sea otters. These animals are also significantly present at SMA-97, and make up 75.2% of the composite Late Period sample. Northern fur seal are found in lesser frequencies (17.7%), but their presence shows that they were not totally depleted from the local area.

DISCUSSION

The foregoing review indicates that prior to 3000 cal BP the coast (e.g., SCR-7, -38) was used by mobile foraging populations who probably spent a significant portion of the year on the interior within Santa Clara Valley. During their stay on the coast, they hunted a wide range of marine and terrestrial game, but not northern fur seals. During the early phases of the Middle Period (roughly 2900-2300 BP), a major village was established on the interior (SCR-9), while the coast was used by groups of logistically organized hunters who focused on the harvest of northern fur seals (SMA-218). Although the radiocarbon dates from the interior village and specialized fur seal hunting camp do not line-up perfectly, they probably indicate that a "collector-like" system of settlement was in place at this time (Binford 1980).

Sometime between 2300 and 1000 cal BP, there was a major change in settlement organization, as residential sites were established on the coast during the Late Period (e.g., SMA-97) and there was a significant decline in the hunting of northern fur seals. Unfortunately, however, archaeological data from this crucial (2300-1000 cal BP) interval are quite sparse, limited to a small number of items from SCR-132. It follows, therefore, that developing a better understanding of the later phases of the Middle Period should be a research priority at Año Nuevo. As will be discussed in more detail below, the deposits at SMA-18 fall within this temporal interval, providing added significance to the information generated by this project.

CA-SMA-18 Site Report

Site SMA-18 is situated on a low-lying dune only 320 meters north of the tip of Año Nuevo (Figure 3). It lies behind a series of larger dunes located to the northwest which provide shelter from the prevailing winds that come from that direction. It is exposed to the ocean on the south, where the shoreline is only 60 meters away; winds are usually calm from the south unless a winter storm is passing through the area.

A relatively thick accumulation of grasses and shrubs recently covered SMA-18, stabilizing the dune sediments and holding the archaeological deposit intact. Although it is difficult to know the history of vegetative cover on the site since its abandonment more than a thousand years ago, it is abundantly clear that it has been severely disturbed by elephant seals during the last decade. As the elephant seal populations have expanded, so have their breeding grounds and haulout areas. Elephant seal movement over the local landscape has not only removed vegetation from portion of the site, which leads to erosion, but their behavior is also reworking the archaeological deposit itself.

At the time of the 2004 excavations, intact deposits covered an area of about 15 x 15 meters. Reduction in the size of these deposits is clearly evident at the site, particularly along its eastern margins where an eroded profile is exposed and the deflated archaeological materials lie scattered across the inter-dune depression to the east (Figure 4).

FIELD METHODS

Fieldwork began with the establishment of a grid across the primary midden deposit. The grid was oriented at 324 degrees, as opposed to true or magnetic north, to follow the morphology of the dune. Two trench lines were then created, one on the eastern margin of the deposit and the other on the western side. Each trench line was ten meters in length, and contained five 1-x-2-meter excavation units (Figure 5; Table 3). Because the archaeological deposit was quite shallow and appeared to represent a single component occupation, excavations went to a depth of 40 centimeters below surface using two 20-centimeter levels. Excavations used both 1/8- and 1/4-inch screens, switching techniques every other unit along the two trench lines. All cultural material was collected from both 1/8- and 1/4-inch screens, with the exception of shellfish which were obtained from the column samples. The 1/8-inch samples (along with the column samples) will be used for finegrained analyses (e.g., faunal, plant macro-fossils), while the entire sample (i.e., material from all excavation techniques) will be used to build the artifact assemblage.

Figure 3. Overview of CA-SMA-18.

Figure 4. Eroding Eastern Margin of CA-SMA-18.

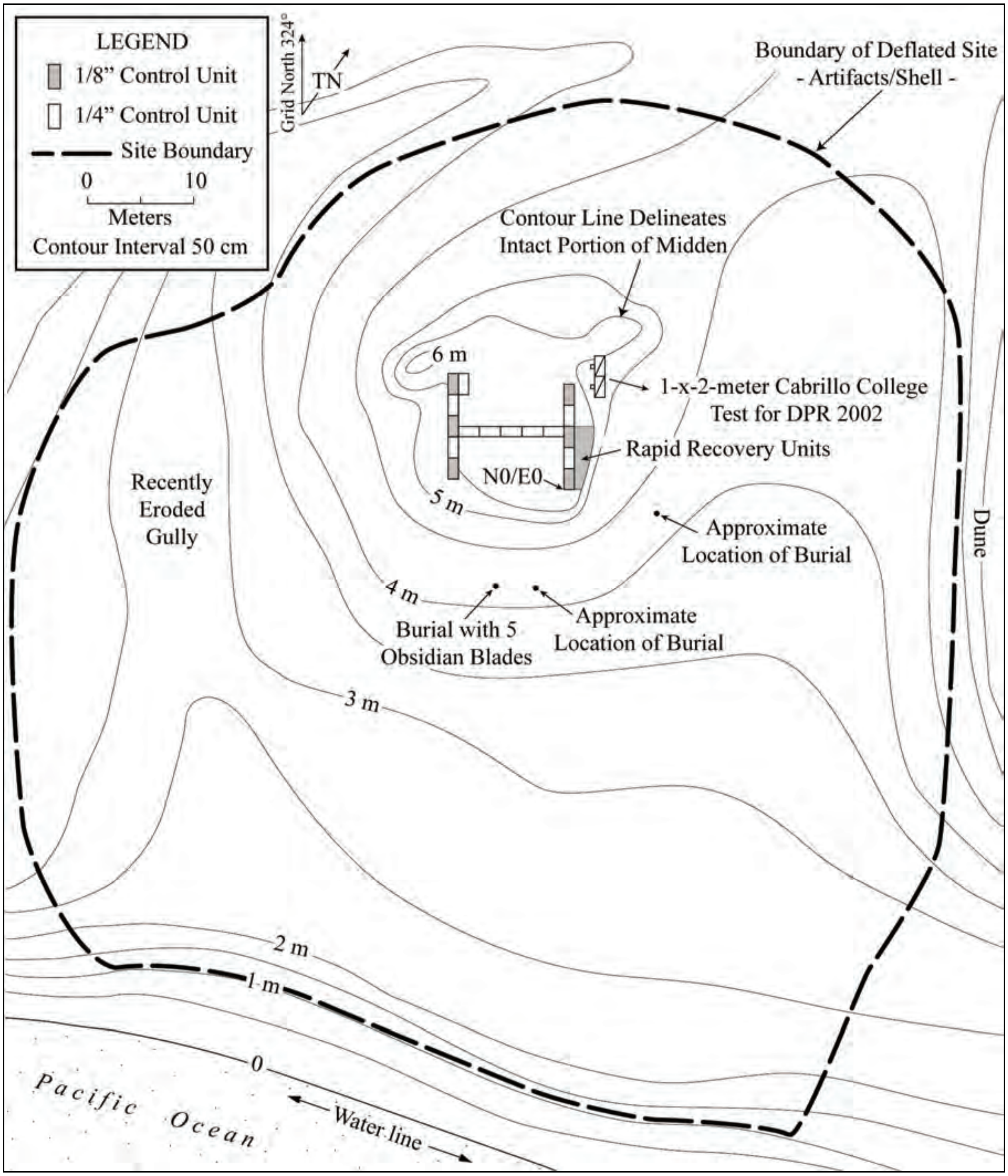


Figure 5. Site Map for CA-SMA-18.

Once the two north-south trench lines were completed, an east-west trench line was excavated between them (Figure 5). Given the large volume of 1/8-inch samples already obtained from the site, all five of the east-west 1-x-2-meter units were processed with 1/4-inch screen. This was also the case for an additional unit placed at the north end of the western trench line (N9/W10); it was excavated in response to finding four bone tools in the

Table 3. Fieldwork Summary at CA-SMA-18.

	1/8-INCH	1/4-INCH	RAPID RECOVERY	CUBIC METERS
N0/E0	0-40	-	-	0.8
N4/E0	0-40	-	-	0.8
N8/E0	0-40	-	-	0.8
N1/W11	0-40	-	-	0.8
N5/W11	0-40	-	-	0.8
N9/W11	0-40	-	-	0.8
N2/E0	-	0-40	-	0.8
N6/E0	-	0-40	-	0.8
N5/W2	-	0-40	-	0.8
N5/W4	-	0-40	-	0.8
N5/W6	-	0-40	-	0.8
N5/W8	-	0-40	-	0.8
N5/W10	-	0-40	-	0.8
N9/W10	-	0-40	-	0.8
N3/W11	-	0-40	-	0.8
N7/W11	-	0-40	-	0.8
N0/E1	-	-	0-20	0.4
N2/E1	-	-	0-20	0.4
N4/E1	-	-	0-20	0.5
Total	-	-	-	*14.1*

adjacent unit (N9/W11). The final three units excavated during the 2004 field effort were used to sample the baulk between the north-south trench line and the erosional cut along the eastern margin of the deposit. This work occurred during backfilling and was designed to quickly sample for formal artifacts and facilitate stabilizing the remaining deposit (i.e., modify the erosional cut to a less extreme angle of repose). This deposit was sampled using a rapid recovery technique, where the sediments were passed through 1/4-inch screen and only formal tools were collected. These units were irregularly shaped and extended down to only 20 centimeters, as they were designed to sample only the intact deposit remaining in this disturbed area.

Four column samples were also collected from across the site. They measured 20-x-20-centimeters and were excavated to a depth of 40 centimeters in ten-centimeter levels. Finally, two flotation samples were collected from two fire affected rock features. All of these samples have been subjected to flotation procedures, where plant macrofossils are obtained from the light fraction, and fish bone and shellfish are collected from the heavy fraction. The heavy fraction was passed through graduated screens, with fish and shellfish collected from the 1/8- and 1/4-inch sub-samples, while only fish bone was obtained from 1/16-inch screens.

Most of the material from the hand excavation units was initially screened at the site and then moved to a field lab for sorting. The field lab was set up in an old barn at park headquarters where Farquhar directed the volunteer personnel. All material collected at the field lab was taken to the Albion Environmental lab in Santa Cruz for cataloguing and subsequent analyses. All column and flotation samples were transported whole to the Far Western lab in Davis for processing. The plant macrofossils were analyzed by Wohlgemuth at Far Western, while the shellfish and fish were transported to Albion and UC Santa Cruz, respectively, for analysis.

SITE STRUCTURE AND CHRONOLOGY

The following discussion reviews the structural and chronological aspects of the SMA-18 deposit. We begin with a description of the stratigraphic profiles and cultural features revealed by the excavations, and then discuss how the radiocarbon dates and other chronological indicators relate to these structural characteristics. Based on these relationships, inferences as to the age of the archaeological deposit can be made.

Stratigraphic Profiles

Stratigraphic profiles were drawn for both of the north-south trench lines (Figure 6). Both trenches exposed a black (5Y 2.5/1) “A” horizon of sand with a loose massive structure (Figure 6 and Figure 7). This soil horizon contains all the archaeological material in the site deposit and is reflected by the numerous flecks of shellfish visible in the profile. The dark, organic-rich color of the horizon is probably the outcome of both anthropogenic and natural processes, as charcoal from human fires combined with a long-term presence of stable vegetation can result in this level of discoloration. Portions of this soil/midden horizon are covered with modern aeolian sands, while it bottoms-out on a lower “C” horizon of light yellowish brown (2.5Y 6/3), unweathered, aeolian sand. The “A” and “C” horizons are separated by an irregular, wavy boundary and the lower “C” horizon sands also have a loose massive structure.

The absence of a “B” horizon probably indicates that the soil is not very old; otherwise the lower horizon would have been cemented by minerals moving down the profile and discolored by weathering. It is also important to stress that there is no physical stratigraphy within the primary soil/midden horizon, making it unlikely that discrete temporal components can be separated according to depth. The lack of vertical stratigraphy is also supported by the high degree of rodent activity that has occurred at the site, which is documented by the rodent runs exposed in both profiles.

Features

Two features were discovered at the site—both are simple concentrations of fire-affected rock (Figure 8). Feature 1 was found in unit N5/W11 and is a tight cluster of fist-sized cobbles surrounded by a more dispersed scatter of stone. Some of the rocks were visible on the surface, and all were restricted to the upper ten centimeters of the deposit. Although the soil directly associated with the feature was quite dark and filled with shellfish, it was indistinguishable from the surrounding deposits exposed in the unit. No formed artifacts were associated with the feature. A flotation sample was collected directly below the rocks and yielded a small amount of wild cucumber, hazel nut, and a variety of small seeded taxa. A more detailed accounting of these materials is provided below (see *Charred Plant Remains* on page 31).

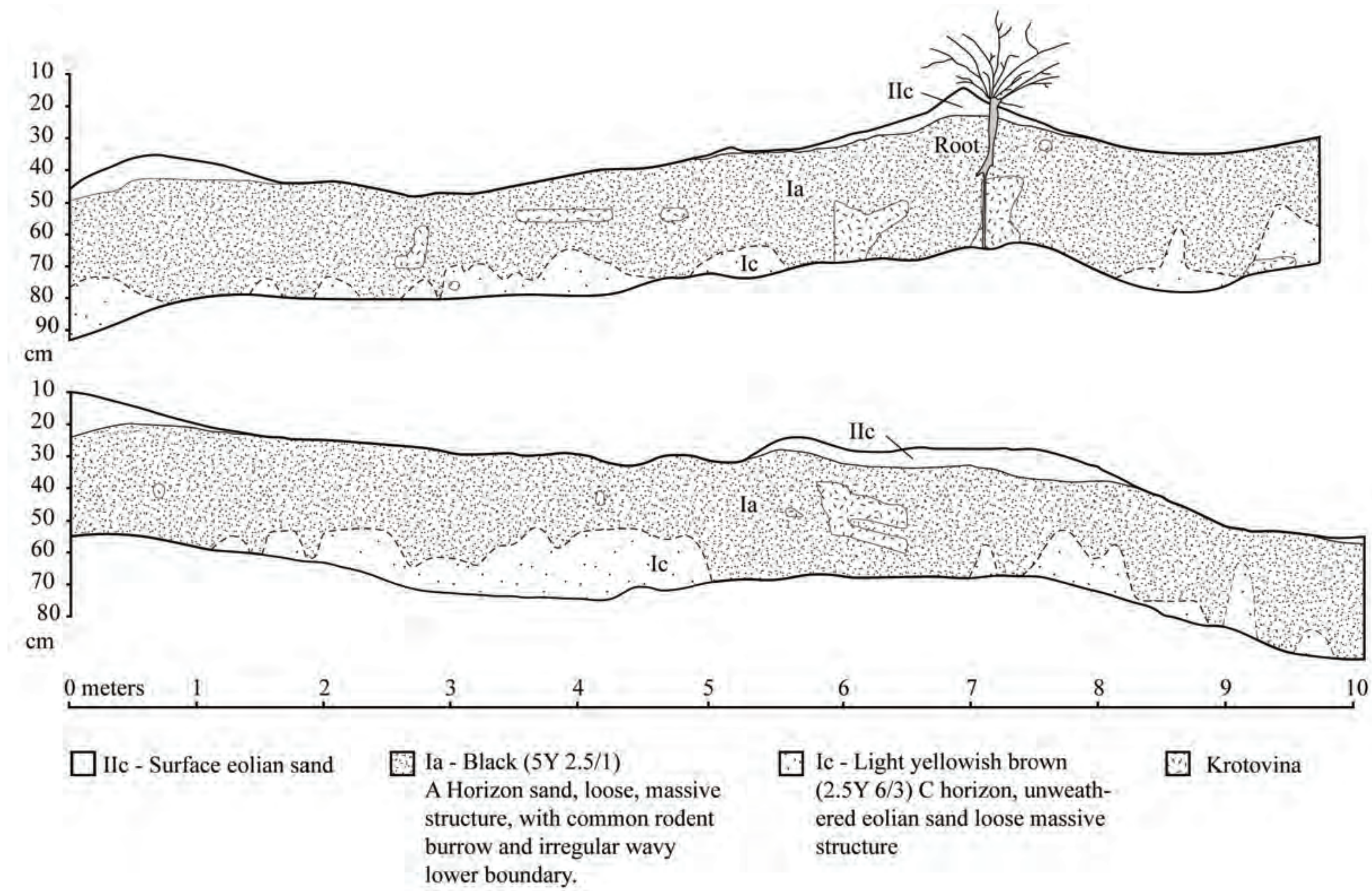


Figure 6. Stratigraphic Profiles from CA-SMA-18.

Figure 7. Unit Excavations at CA-SMA-18.

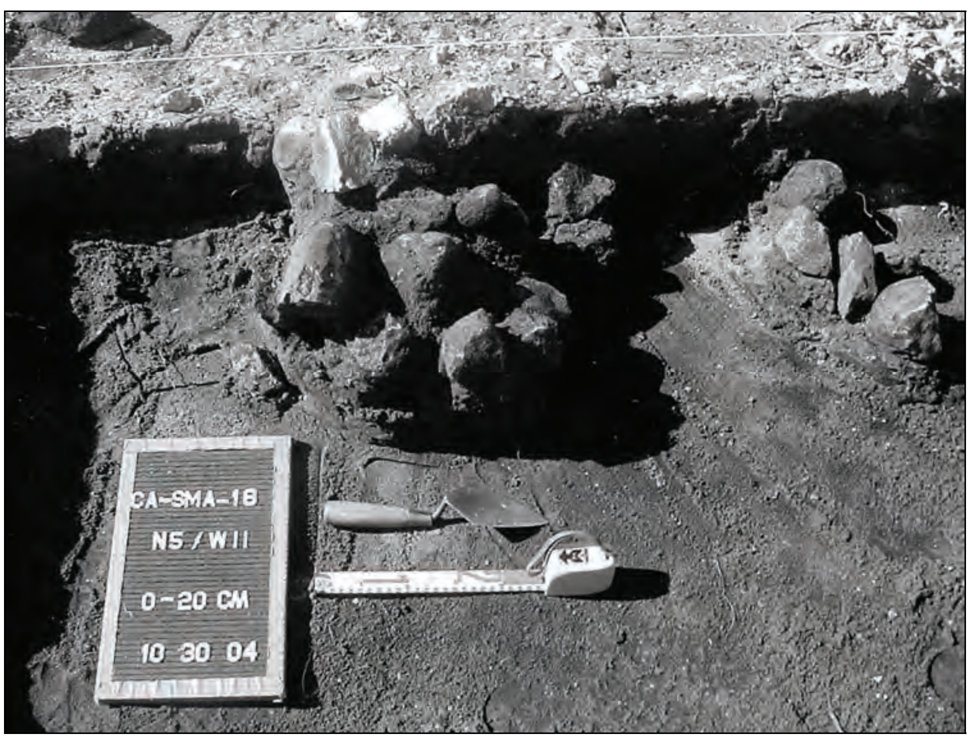


Figure 8. Feature 1 at CA-SMA-18.

Feature 2 was found in the rapid recovery unit N4/E1. It was also composed of about 15 fist-sized fire-affected rocks in a 50-x-50-centimeter area. The rocks were concentrated between five and 15 centimeters below surface and were associated with two milling slabs. Charcoal rich soils were discovered immediately below the rocks, and a flotation sample yielded acorn, wild cucumber, bay, and pine nuts, as well as brome grass seeds.

Radiocarbon Dates

Nine radiocarbon dates have been obtained for the site, all by Seth Newsome and Paul Koch as part of their ongoing research focusing on climatic reconstruction and the antiquity of northern fur seal hunting on California's central coast (Table 4). Six dates come from single mussel shells collected from the surface, and they produced a tight cluster ranging between about 1300 and 1150 cal BP. Three charcoal dates range between about 1300 and 1200 cal BP. Because of the shallow and homogeneous nature of the SMA-18 deposit, we believe these surface-derived dates provide an accurate age estimate for the occupation. This conclusion is supported by additional radiocarbon dates obtained directly from subsurface northern fur seal remains (see *Vertebrate Faunal Remains* on page 33).

Table 4. Radiocarbon Dates from CA-SMA-18.

Sample Number	Material	Radiocarbon Age (BP)	Adjusted Range (cal BP)*	Median Probability (cal BP)
LLL18(2) MC001	Shell	1990±40	1264-1361	1314
LLL18(3) MC002	Shell	1970±40	1249-1346	1296
LLL18(5) MC003	Shell	1810±40	1082-1215	1145
LLL18 MC004	Shell	1855±30	1149-1253	1193
LLL18 MC005	Shell	1980±30	1262-1344	1304
LLL18 MC006	Shell	1895±35	1179-1275	1228
18-CA	Charcoal	1250±35	1080-1274	1201
18-CB	Charcoal	1435±35	1292-1386	1332
18-CC	Charcoal	1340±35	1179-1212	1276

Notes: *Adjusted range = 1 sigma for shell and 2 sigma for charcoal.

Shell Beads

Thirty-five *Olivella* shell beads were recovered from SMA-18 (Figure 9). Most (n=34) belong to the A Series (*Olivella* Spire-Lopped; Bennyhoff and Hughes 1987). They consist of nearly complete shells with spires removed perpendicular to the body axis. Spires may be broken off or ground down, or naturally worn. This general bead class is broken down into three size categories based on maximum diameter of the shell across the body axis: A1a (Small Spire-Lopped) = 3.0-6.5 millimeters; A1b (Medium Spire-Lopped) = 6.51-9.5 millimeters; A1c (Large Spire-Lopped) = 9.51-14.0 millimeters. The SMA-18 collection includes 13 A1b beads and 20 A1c beads. All of the artifacts appear to be end ground rather than chipped or broken off. According to Bennyhoff and Hughes (1987), A1b and A1c have no temporal significance.

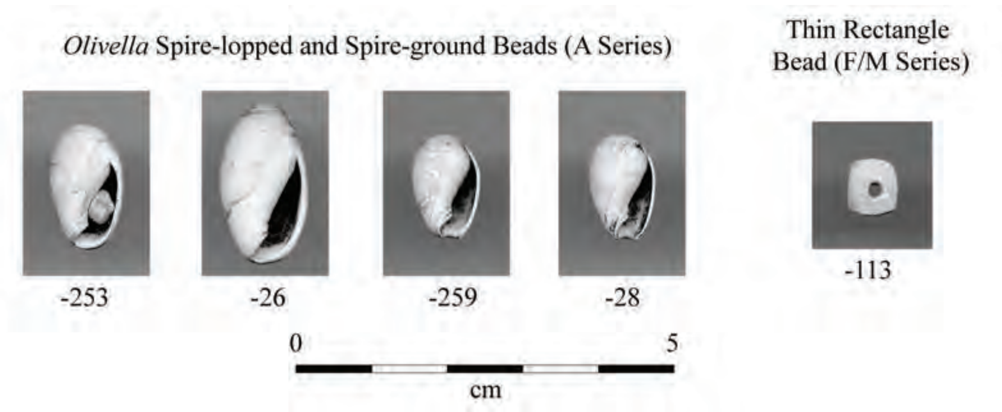


Figure 9. Shell Beads from CA-SMA-18.

An additional A Series bead (Specimen -321) is classified as an Oblique Spire-Lopped, its spire ground off diagonally. With a diameter of 8.1 millimeters, the bead is classified as an A2b (Medium Spire-Lopped). Bennyhoff and Hughes indicate an Early Period emphasis for this variant in central California; in southern California specimens are placed in the Early-Middle transition and Early Middle Period (Bennyhoff and Hughes 1987:119).

One final bead (Specimen -113) is tentatively identified as a Class M (Thin Rectangle), found in excavation unit N5/W2. This class is described as thin, rectangular or square beads with central or end perforation usually drilled conically from the interior. The piece measures 7.4 x 6.7 millimeters; it is 1.0 millimeter thick and has a perforation of 1.7 millimeters. Heavy polish on the outer surface obfuscates growth lines making orientation of the bead difficult; it is uncertain whether the bead is longer than wide (possibly a M1a Normal Sequin) or wider than long (possibly a M1d Wide Sequin). Normal Sequins are a marker for Phase I of the Late Period (1100-500 BP) in central California, while Wide Sequins are associated with the Middle/Late Transition (1300-1000 BP), which corresponds to the radiocarbon dates obtained from the site (Bennyhoff and Hughes 1987:140-141).

Problems with the classification of M series beads have also been encountered at other sites in the region, particularly with regard to certain morphological characteristics. Most notable are the slightly rounded corners and slightly bulging sidewalls; Class M beads typically have sharp corners and flat ventral surfaces. The discovery of a number of similar shaped specimens from SCL-690 in Santa Clara Valley has led to the development of a new category, Incipient Sequin (F/M). Classification is based largely on morphological characteristics mentioned, as well as the bead's angularity index, the percentage difference between the measured diagonal length of a bead, and the projected length (if its corners were sharply angled). Incipient Sequins are proposed to have an angularity index ranging from 83 to 86%, compared to Normal Sequins which range from 87 to 100%. The angularity index for Specimen -113 is 84.2%.

Component Definition

Time sensitive artifacts are very rare at SMA-18. Temporally diagnostic projectile points are limited to a single lanceolate form which tends to date to the Middle Period (see

Artifact Inventory below). Although the vast majority of shell beads could date to a variety of time periods, the F/M specimen is also a Middle Period indicator. These two artifact types are consistent with the radiocarbon dates which cluster between about 1300 and 1200 cal BP, and indicate that SMA-18 is a single component deposit dating to the Middle Period. As a result of this finding, the following data sets are presented as a single analytical unit, and differentiated only according to excavation sample strategy (i.e., differential screen size). Those interested in the exact provenience of individual artifacts are directed to the catalogue in Appendix A.

ARTIFACT INVENTORY

A relatively wide range of artifacts were recovered during the excavations at SMA-18 and appear to represent a multi-activity residential occupation (Table 5). Flaked stone tools are the dominant artifact class at the site, and include projectile points, bifaces, drills, and flake tools, as well as manufacturing-related materials such as cores, assayed cobbles, and debitage. Ground stone items are also present, including a mortar, pestles, handstones, a variety of battered stone implements, grooved and notched stones, and a stone bead. Bone artifacts are represented by awls, needles, a gorge, spatulas, indeterminate polished items, and two pendants—the latter used for personal adornment. Additional non-utilitarian objects include the 35 *Olivella* beads.

A significant number of artifacts that had been previously surface-collected from the site over the years were added to the analysis. They are also described below.

Flaked Stone Tools and Debitage

Site SMA-18 produced a diverse accumulation of flaked stone tools, including two projectile points, 12 bifaces, six drills, 61 cores, 31 flake tools, two core tools, and seven assayed cobbles (7.8 artifacts per cubic meter of excavation). Debitage was moderately dense with 3,650 flakes recovered from all excavation units (258.8 flakes per cubic meter); density was greatest in the northwest part of the site in unit N9/W10 (382 flakes per cubic meter), and somewhat lower to the southeast in N0/E0 (192.0 flakes per cubic meter).

Monterey chert is the most common lithic material recovered, however, small quantities of undifferentiated chert, quartzite, igneous rock, and obsidian were also found. Deposits of Monterey banded chert are ubiquitous in the area, mainly occurring as large tabular cobbles in the vicinity of Año Nuevo State Park. Smaller rounded cobbles or nodules are also found in mudstone deposits along beaches and stream channels to the north and south of the Park. Igneous, quartzite, and cryptocrystalline rock are also locally available, although Franciscan cherts are often found on the interior east of the San Andreas Fault. The few pieces of obsidian probably came from either the Napa source area, or the eastern Sierra Nevada (e.g., Casa Diablo).

Projectile Points

Two projectile points were recovered, making up less than 2% of the assemblage. Specimen -393 is an unidentifiable proximal fragment made from Monterey chert (Figure 10). The point exhibits a single perverse/twisting break across the midsection, indicating that it was broken during manufacture. Bifacial micro-chipping, step-fracturing, and edge-flaking along one margin suggest that this portion of the tool was used as a cutting

Table 5. Artifact Inventory from CA-SMA-18.

MATERIAL	1/8-INCH UNITS	1/4-INCH UNITS	RAPID RECOVERY	SURFACE	TOTAL
FLAKED STONE					
Projectile Points	-	1	-	1	2
Bifaces	4	5	-	3	12
Drills	4	1	-	1	6
Flake Tools	14	16	-	1	31
Cores	27	30	1	3	61
Core Tools	-	-	-	2	2
Assayed Cobbles	4	3	-	-	7
Debitage	1,464	2,183	3	-	3,650
GROUND STONE					
Battered Stones	3	4	1	8	16
Handstones	1	-	1	2	4
Pestles	-	-	-	2	2
Bowl Mortar	-	-	-	1	1
Grooved/Notched Stones	2	5	1	10	18
Pitted Stones	1	1	-	13	15
Ornament	1	-	-	-	1
BONE ARTIFACTS					
Awls	4	2	-	2	8
Needles	-	-	-	2	2
Gorge	-	-	-	1	1
Spatulas	-	-	-	4	4
Polished	-	2	-	2	4
Pendants	1	1	-	-	2
SHELL ARTIFACTS					
Beads	22	13	-	-	35

implement. No evidence of reworking was noted. The second point (Specimen -11) was recovered on the site surface (Figure 11). The specimen is a nearly complete lanceolate point made from obsidian. It exhibits a single perverse/twisting break across the tip section, indicating that the piece was broken during manufacture. An unidentifiable break cuts across a small part of the distal end. Bifacial step-fracturing and grinding/dulling was noted along one margin, suggesting that this portion was used as a cutting tool. It exhibits a small amount of reworking, limited to flaking along a broken margin just below the perverse/twisting break. Five additional obsidian lanceolate points were salvaged from a burial that eroded out of the deposit in 1998. They were not available for this analysis.

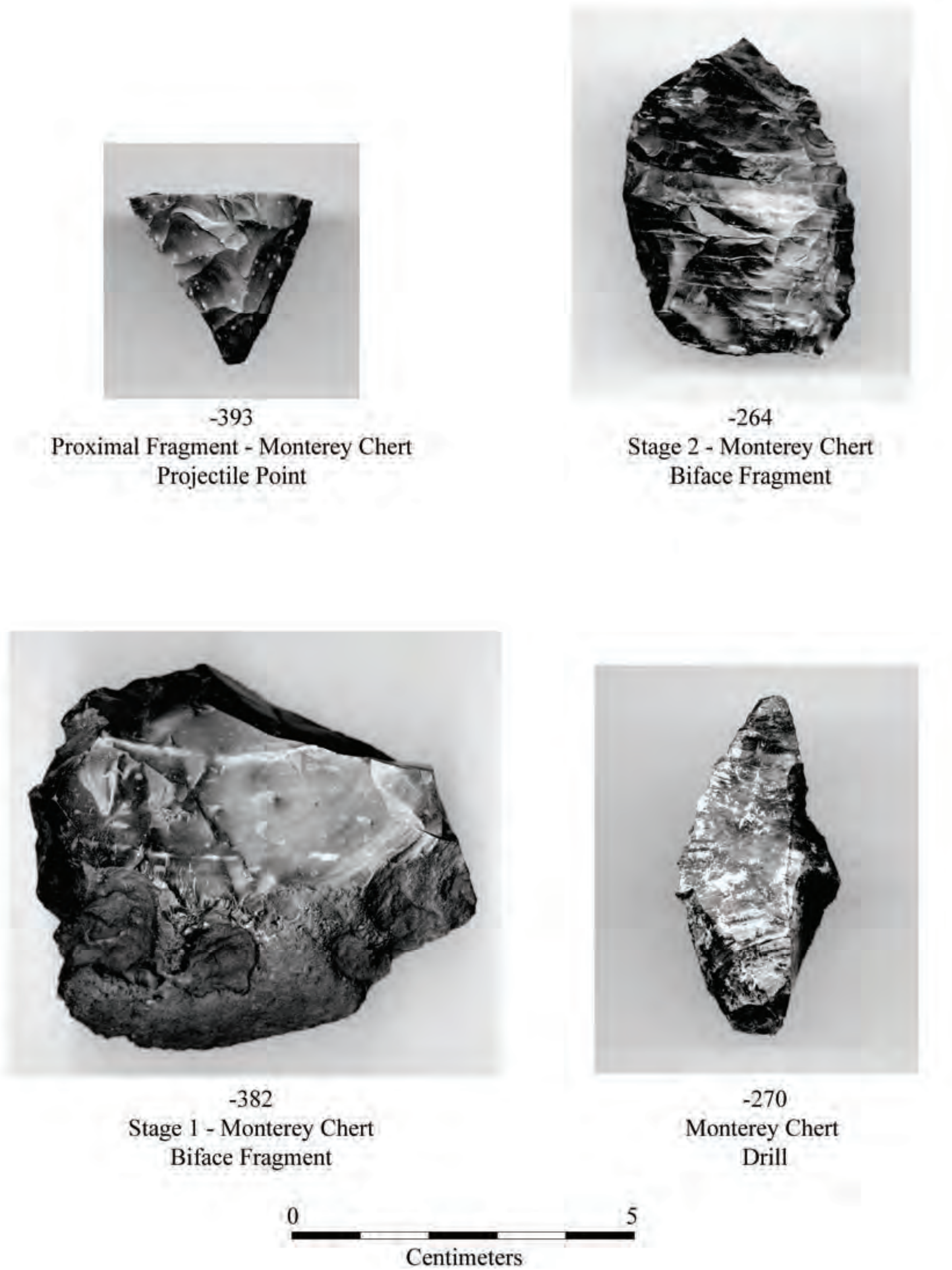


Figure 10. Selected Flaked Stone Tools from CA-SMA-18.

Bifaces

Twelve bifaces were recovered from the deposit, comprising 9.9% of the flaked stone tool assemblage (Figure 10 and Figure 11). Ten are made from Monterey chert and two are obsidian; five are whole or nearly complete, three are margin segments, and two are end fragments, one is a mid-section, and one is an indeterminate fragment. Most appear to

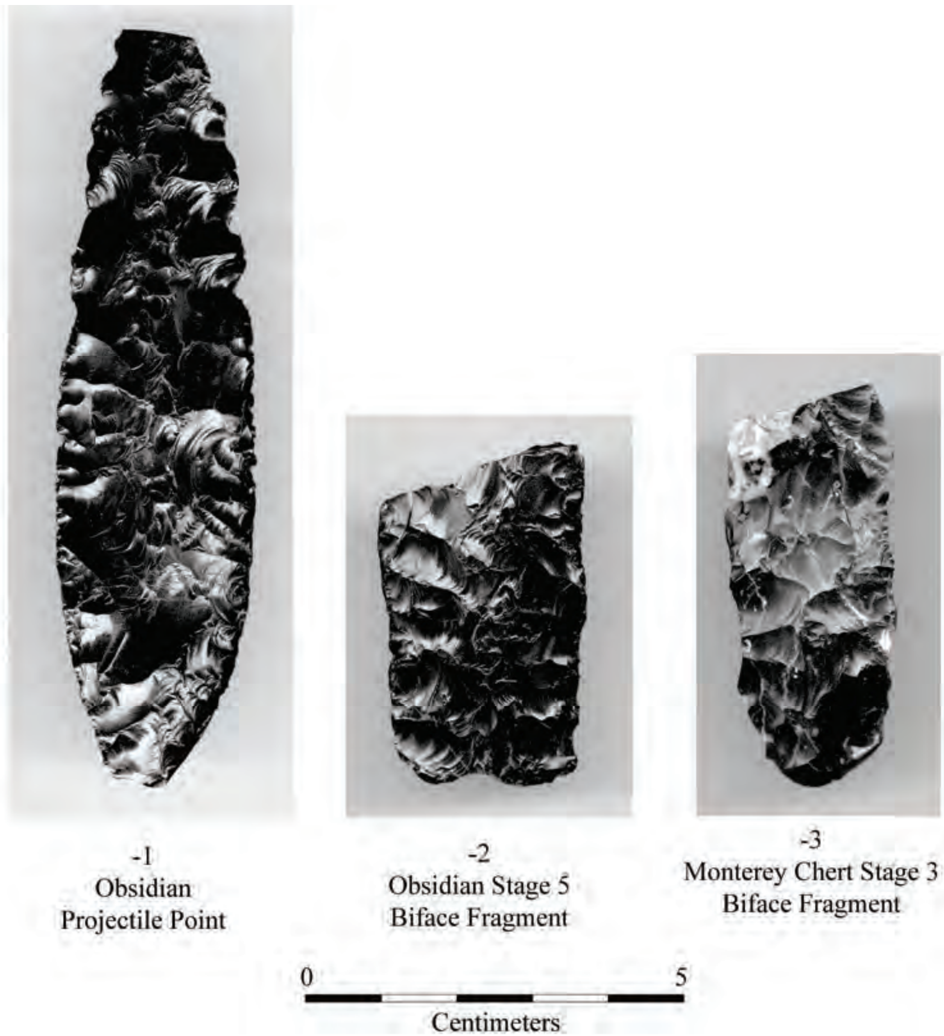


Figure 11. Surface Collected Artifacts from CA-SMA-18.

be dart- or blade-sized, with the excavation sample measuring 46.4-63.3 millimeters long, 33.6-65.4 millimeters wide, and 14.7-20.6 millimeters thick. Nearly all (n=9) are manufactured from flake blanks. Most of the bifaces (n=8) are early stage forms (Stage 1-2); three were determined to be middle stage (Stage 3), and one was a Stage 5 fragment. Use wear was limited to three specimens. One Stage 2 exhibited bifacial micro-chipping and step-fracturing indicating use in cutting activities, while a Stage 3 specimen showed unifacial micro-chipping, step-fracturing, and edge-flaking suggesting use as a scraping implement. Two bifaces (Stage 2 and Stage 3) exhibit evidence of reworking.

Drills

Six drills/perforators were recovered from SMA-18 (see Figure 10). All are made from Monterey chert and include four whole or nearly complete specimens, and two distal fragments. Three artifacts appear to have derived from previously worked bifacial forms, while the other three are manufactured on flakes. All exhibit bifacial wear along bit segments (micro-chipping, step-fracturing, and edge-rounding).

Cores

Cores are the most common artifacts at SMA-18, accounting for 50.0% of the assemblage. All artifacts are made from Monterey chert. Most forms are complete (n=40), however, four end fragments, three interior pieces, and 14 margin sections were also recovered. The core assemblage represents a range of morphological types, most of which are considered expedient forms (i.e., have unprepared platforms and unpatterned flake scars). Core types include unidirectional (n=17), bi-directional (n=6), multidirectional or unpatterned (n=24), bifacial (n=2), and bipolar (n=2). Ten of the cores were too fragmented to determine orientation.

Cores were manufactured from a variety of raw material forms including tabular cobbles (n=20), globular cobbles (n=6), angular cobbles (n=3), rounded cobbles/pebbles (n=7), split cobbles (n=2), and large flakes (n=4). Nineteen were too fragmented to determine original form.

About one-third of the cores (n=22) have a single platform, with flake removals ranging in length from 13.7 to 44.3 millimeters. Most of the other cores exhibit multiple flaking platforms, with flake removals ranging from 11.4 to 41.9 millimeters in length. Battering and bifacial step-fracturing was noted on one bifacial core.

Formed Flake Tools

Also recovered from SMA-18 are two formed flake tools, making up 1.8% of the flaked stone assemblage. Both are made from Monterey chert and include a secondary cortical flake and a complex interior percussion flake. The cortical flake tool (Specimen -168) is complete and measures 41 millimeters long, 45.5 millimeters wide, and 18.5 millimeters thick. A single convex-shaped edge exhibits unifacial wear indicative of use in scraping activities. The complex interior flake tool (Specimen -56) is also complete, measuring 57.0 millimeters long, 32.0 millimeters wide, and 16.1 millimeters thick. The flake has two straight worked margins; both with unifacial wear suggesting use as a scraping implement.

Simple Flake Tools

Simple flake tools were relatively abundant, representing 23.7% of the flaked stone tool assemblage (n=29). Specimens were recovered from all parts of the site. Most are whole or nearly complete forms (n=25), three are distal ends, and one is a margin fragment. All are made from Monterey chert, with whole specimens ranging in length from 23.6 to 74.9 millimeters. Nearly two-thirds of the tools were made from cortical flakes or shatter (n=19); the collection also includes tools made from interior percussion flakes (n=6); biface thinning debris (n=1); and indeterminate percussion flakes (n=3).

Most of the tools have a single working edge (n=23), 21 have unifacial wear, and two exhibit bifacial wear. Wear patterns indicate tools were commonly used a scraping implements, and rarely as cutting tools. A variety of edge shapes were observed including straight (n=17), concave (n=2), convex (n=3), and s-shaped (n=1). Spine-plane angles range between 25 and 65 degrees. Both bifacially worked specimens have light bifacial micro-chipping, step-fracturing, and edge rounding along straight or convex edge. Spine-plane angles measure between 35 and 40 degrees.

Six simple flake tools exhibit multiple working edges. Two specimens have unifacial wear along two straight margins, one has unifacial wear on a straight and a beaked margin, a third tool has unifacial wear a straight and a concave margin. One tool contains both unifacial and bifacial wear on a straight and a convex margin. The last specimen has three working edges; each is straight with unifacial wear. Spine-plane angles fall between 35 and 70 degrees.

Flaked Cobble Tools

Two artifacts recovered from the surface of SMA-18 were classified as flaked cobble tools, sometimes referred to as chopper tools. Specimen -57 is a split metasedimentary cobble with bifacial flake removal observed along the broken edge. The cobble is highly weathered, obscuring use-wear patterns; however, a light amount of battering was noted along the flaked margin. Specimen -58 is a split sedimentary cobble with unifacial flake removals located along one broken edge. Light battering was noted along one part of the flaked margin.

Assayed Cobbles

Seven assayed cobbles were recovered from SMA-18; specimens were not concentrated in one area, rather were distributed across all parts of the site. All items are Monterey chert. Artifacts are variable in mass, ranging from 107.7 to 522.4 grams. Each specimen exhibits one or two flake removals, most likely representing efforts to test raw material for suitability for tool manufacture.

Debitage

The debitage assemblage is composed of 3,650 flakes from all units excavated. Nearly two thirds (n=2,183) were recovered from 1/4-inch dry-screened units, with an additional 1,464 retrieved from 1/8-inch dry-screened units, and three rapid recovery units. The assemblage is dominated by locally available Monterey chert (n=3,613), but also contains igneous rock (n=30), obsidian (n=2), quartzite (n=1), and undifferentiated cryptocrystalline stone (n=4).

In order to characterize the technological profile, all debitage from the 1/8-inch dry-screened units, as well as samples from two 1/4-inch units in the northwest portion of the site (N7/W11 and N9/W10) were chosen for in-depth analysis. A total of 2,277 flakes representing 62.4% of all debitage were size sorted and analyzed (Table 6). Normally, 1/8-inch screened samples are chosen for technological analysis because they are more likely to contain small-sized flakes commonly lost in large size mesh. A sample of 1/4-inch screened units was included in this study to see if differences in technological profiles could be discerned. As indicated in Table 6, variation between the 1/8- and 1/4-inch profile was minimal, allowing for the combination of both categories for analysis.

In general, analyzed flakes from all material classes (except obsidian) are medium to large in size, with over two thirds of the assemblage (n=1,575) sorting into the three largest size classes (2.0-3.0, 3.0-5.0, and >5.0-centimeter diameters). Data clearly indicate that very small flakes (<1.0 centimeter in diameter) are quite rare (5.3%).

Turning to the technological profile, flakes from SMA-18 reflect a limited range of reduction activities, which seems to have centered on the earliest stages of core reduction. Nearly three-quarters of the debitage collection are decortication flakes (Table 7). Interior flakes, representing later stages of core reduction, are less evident, representing only 16.7% of the assemblage. Biface manufacturing debris is extremely rare, represented by only 6.2% of the collection.

The technological profile, in conjunction with flake size attributes, clearly signifies that reduction activities focused on the reduction of locally available Monterey chert cores, presumably for the production of cores and usable flakes. The high number of expedient chert cores and simple flake tools supports this hypothesis, and further, illustrates the expedient nature of on-site production activities. Some larger sized flakes appear to have been selected for use as bifacial tool blanks, as indicated by the presence of several flake-based, early stage bifaces. On-site reduction of these tools was minimal; discarded bifacial tools include manufacture failures as well as a few specimens that appear to have been used as tools prior to discard. Overall, the data seems to imply that locally available chert cobbles were minimally reduced on-site to produce useable flakes, which in turn were used expediently on site and discarded. Limited bifacial tool manufacture is evidenced by a low occurrence of bifacial tools and associated debris. While it is possible that additional blanks were produced and transported off site prior to further reduction, the very low proportion of bifacial debitage does not support this hypothesis.

Discussion

The diverse array of flaked stone tools recovered seems to indicate a broad range of processing tasks were carried out at SMA-18. While the moderately dense accumulation of tools and debitage suggests manufacturing activities were of some importance, the rather low ratio of chert debitage to tools (32:1) indicates activities were somewhat limited.

The debitage collection characterized by medium to large size decortication and interior flakes in association with cores and simple flake tools strongly implies that reduction activities were expedient in nature, focused on early stage cobble reduction and core shaping tasks. The low ratio of biface thinning and finishing flakes also indicates that little energy was expended in manufacture and maintenance of bifacial tools. Manufacturing activities appear to have centered on locally available lithic sources, with very little evidence for import of extra-local material (i.e., Franciscan chert and obsidian).

Ground Stone

Site SMA-18 contained a diverse ground stone assemblage composed of two pestles, one bowl mortar fragment, four handstones, 16 battered cobbles, 15 pitted stones, 18 grooved/notched stones, and one possible ornament. Artifact density is about 1.5 tools per cubic meter of excavation.

Pestles

The SMA-18 collection includes two pestle fragments. The first (Specimen -11) is a well-shaped end fragment made from sandstone (Figure 12). The intact end is ground and pecked, and retains a convex shape. The shaft is also well-shaped (ground and pecked), forming four distinct facets. Each facet exhibits a single pitted area, most are circular in shape. Interestingly, the center of each pitted area is located about the same distance (44.6-

Table 6. Debitage by Flake Type and Size from CA-SMA-18.

MATERIAL	1/8-INCH UNITS	1/4-INCH UNITS	TOTAL
FLAKE TYPE			
Primary Decortication	70	17	87
Secondary Decortication	417	183	600
Simple Interior	49	21	70
Complex Interior	42	19	61
Linear Interior	3	-	3
Early Biface Thinning	27	18	45
Late Biface Thinning	4	1	5
Early Pressure Flakes	8	-	8
Bipolar	2	-	2
Fragment, Cortical Flake	272	191	463
Fragment, Simple Interior	52	17	69
Fragment, Complex Interior	46	19	65
Cortical Shatter	61	16	77
Angular Percussion	8	1	9
Indeterminate Percussion (whole)	1	-	1
Indeterminate Pressure (complete)	2	8	10
Indeterminate Pressure (broken)	26	6	32
Indeterminate Percussion (broken)	374	296	670
SIZE CLASS			
<1.0	97	24	121
1.0-2.0 cm	315	266	581
2.0-3.0 cm	461	272	733
3.0-5.0 cm	459	189	648
>5.0 cm	132	62	194
Total	*1,464*	*813*	*2,277*

Table 7. Debitage by Technological Category from CA-SMA-18.

CATEGORY	1/8-INCH UNITS	1/4-INCH UNITS	TOTAL
Decortication	759	391	1,150
Interior	192	76	268
Biface Thinning	31	19	50
Pressure	36	14	50
Shatter	69	17	86
Total	*1,087*	*517*	*1,604*

-11
Pestle
0 5
Centimeters

-10
Mortar
0 10
Centimeters

Figure 12. Surface Collected Milling Gear from CA-SMA-18.

48.6 millimeters) from the intact end of the tool, possibly functioning as finger grips for greater control in grinding tasks. The second pestle (Specimen -12) is a sandstone end fragment, shaped by a pecking. The intact end exhibits rather limited grinding and pecking, with less shaping than Specimen -11.

Bowl Mortar

A single bowl mortar fragment (partial rim, wall, and base) was recovered from the surface of SMA-18 (see Figure 12). The vessel is made from sandstone and exhibits pecking on interior and exterior surfaces. The interior surface is slightly ground and has an irregular texture.

Handstones

Four handstone fragments were recovered from SMA-18. Specimen -47 is a margin fragment manufactured from an unshaped mudstone cobble. The tool retains one slightly convex ground surface that has been pecked. Specimen -347 is a shaped margin fragment made from a sedimentary material. A single convex ground surface with irregular polish was observed. Specimen -13 is an end fragment, manufactured from an unshaped granite cobble. The tool retains one flat surface that has been ground smooth and appears polished. Specimen -14 is also an unshaped granite cobble; the tool exhibits one slightly convex ground surface with polish.

Battered Cobbles

Sixteen tools were identified as battered cobbles, all showing light to heavy battering on one or two surfaces. Raw material includes Monterey chert, mudstone, undifferentiated sedimentary stone, quartzite, granite, and igneous rock. Specimens were distributed across all parts of the site.

Pitted Stones

Fifteen tools are identified as pitted cobbles. All are unshaped cobbles; seven specimens are whole or nearly complete forms and eight are fragments. Most are made from relatively soft sedimentary stone including sandstone (n=4), mudstone (n=2), shale (n=1), undifferentiated sedimentary material (n=7), and one specimen made from granite.

Six of the pitted stones have a single modified surface. Central pit depressions vary widely, ranging in depth from 0.6 to 5.7 millimeters. Two of these exhibit secondary modification (additional pecking on end of cobble). No other wear was noted.

Nine specimens exhibit two pitted surfaces. Central depression measurements range from relatively deep (8.6 millimeters) to very shallow (0.4 millimeters). No additional wear or modification was observed.

Grooved and Notched Stones

The ground and battered stone assemblage also includes eighteen grooved and notched stones. Eleven specimens have been notched with light to moderate pecking on two opposing margins and may have been used as net sinkers, while the others which have grooves around the circumference of the stone are thought to be sinkers for hook-and-line fishing (Figure 13; Hylkema 1991). Three specimens exhibit additional pecking on flat faces, indicating that the tools also served as pitted or anvil stones.

-35
Pitted Stone

-282
Grooved Stone

-284
Drilled Stone

0 5
Centimeters

Figure 13. Pitted, Grooved, and Drilled Stone Artifacts from CA-SMA-18.

Most of the artifacts are made from relatively soft sedimentary rocks (n=14); three were made from igneous stone, and one from granite. The collection includes seven complete specimens and one end margin. Artifacts are similar in size with ranges of 60.8-88.1 millimeters long, 44.8-67.9 millimeters wide, and 29.0-43.3 millimeters thick.

Miscellaneous Items

Finally, the ground stone collection includes one piece of modified stone (Specimen -284), possibly a remnant stone bead or ornament recovered from unit N9/W11(see Figure 13). The item is a small, perforated sandstone fragment that appears to have been drilled from one side. The diameter of the hole measures 4.2 millimeters.

Discussion

A wide range of subsistence-related tasks are represented by the ground stone and battered stone assemblage. The grooved and notched stone tools, although rather simple implements themselves, are linked to the manufacture of more complex items (e.g., nets, hook and line fishing gear) used to catch fish in a variety of marine habitats. The pitted stones and battered cobbles also reflect marine resource use, but are simple tools probably used to process shellfish. Use of terrestrial foods is reflected by the mortar, pestles, and handstones, which were probably used to process acorns and other smaller-seeded plant foods.

Bone Artifacts

Several bone artifacts were recovered from SMA-18, including awls, needles, a fish gorge, pendants, spatulas, and a series of miscellaneous polished pieces.

Pendants

Two apparent bone pendants were recovered (Figure 14). The larger piece (Specimen -154) is a marine mammal bone fragment (midsection), with a single, bi-conically drilled hole at one end (3.7 millimeters diameter). The piece is fairly weathered but there is no evidence for additional modification such as polish or striations. The second smaller bone pendant (Specimen -322) was manufactured from an unidentified small mammal bone fragment. A small bi-conically drilled hole is located on one end of the artifact (2.4 millimeters diameter); the other end is broken off. The piece is heavily burned, obscuring other potential modification such as polish or striations.

Bone Tools

Nineteen pieces of modified bone were recovered from SMA-18. Several appear to be awls (n=8). Specimen -287 is nearly complete measuring 109.9 millimeters in length. The piece, made from an unidentified large mammal bone, has been heavily worked, exhibiting polish and striations (parallel to long axis of the bone), and has a slightly rounded distal end. Evidence of post-depositional burning and rodent gnawing is evident. Specimen -123 is also nearly complete—the awl has a slightly tapered distal end and the proximal end is missing. Manufactured from an unidentified large mammal bone, the piece has been extensively polished and smoothed. A third awl (Specimen -234) is a distal fragment; the end narrow and pointed. Modification includes extensive polish; post depositional burning is also evident. Specimen -52 is a distal end of an awl made from unidentified large mammal bone. The

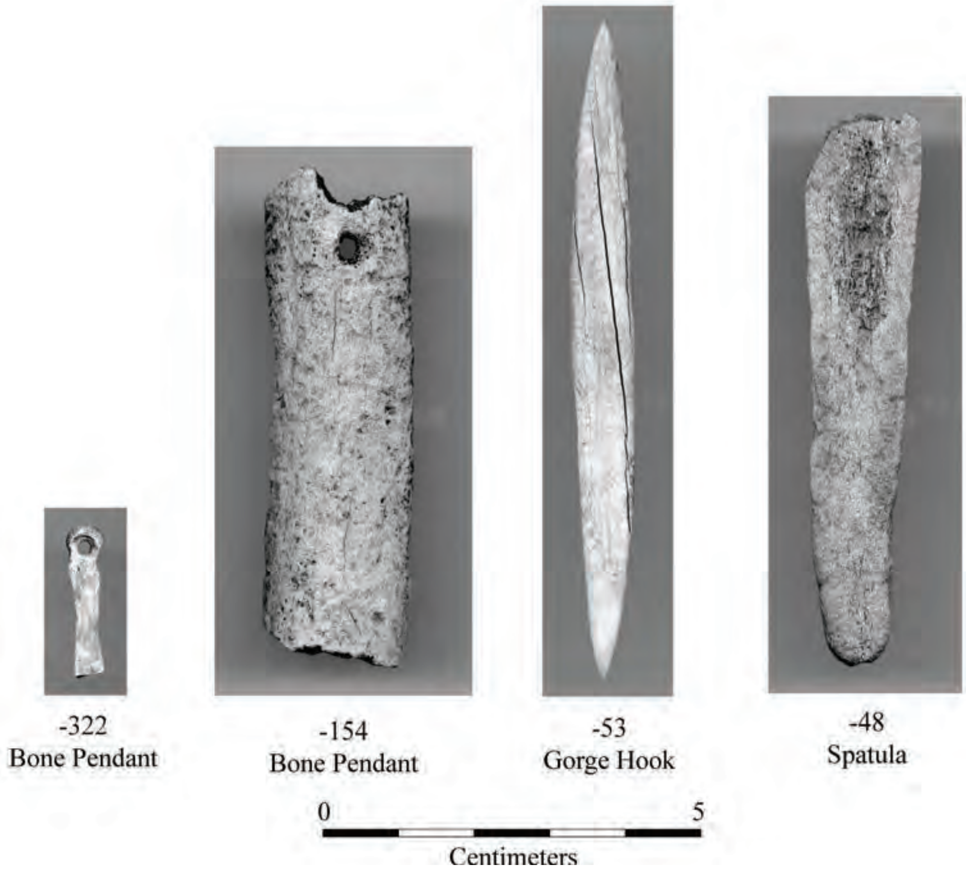


Figure 14. Bone Artifacts from CA-SMA-18.

heavily polished end is slightly tapered and exhibits extensive rounding and smoothing. Specimen -115 is also a distal end fragment, manufactured from a piece of mammal bone. Modification is limited to the slightly tapered tip that exhibits limited rounding and smoothing. Specimen -288 is a proximal and midsection fragment, also likely to have functioned as an awl. Manufactured from an unidentified large mammal bone fragment, the long narrow piece has extensive polish. Specimen -54 is an end fragment measuring 54.6 millimeters long, 8.4 millimeters wide and 4.1 millimeters thick. The piece is heavily polished and has a pointed distal, or working end. Specimen -51 has a working end that is thicker and more rounded than the tool previously described. The piece measures 41.7 millimeters long, 8.8 millimeters wide and 5.3 millimeters thick. Light polish was observed.

Two possible needles were identified; Specimens -46 and -47 are both distal fragments exhibiting sharp, pointed tips. The former measures 72.3 millimeters long, 11.5 millimeters wide, and 3.2 millimeters thick; the later measures 39.4 millimeters long, 7.1 millimeters wide, and 3.9 millimeters thick. Both appear to be polished, with striations parallel to long axis of the bone.

An apparent fish gorge (Specimen -53) was also collected. The complete tool measures 86.8 millimeters long, 8.4 millimeters wide and 4.2 millimeters thick. The piece is bi-pointed, exhibiting light polish.

Four items were identified as spatulas based on presence of slightly tapered, flat, rounded ends. Two specimens (Specimens 1-4 and -52) exhibit heavy polish and burning, while the remaining two (Specimens -48 and -49) are lightly polished and are not burned.

Two additional pieces of modified bone were also recovered, their morphology differing from the awls previously described. Specimen -348 is a large marine mammal bone that has been heavily polished. The distal portion is extensively shaped, with the end tapering slightly and rather flat and round. This specimen was possibly used as a pry or a scraper. The complete artifact measures 13.44 millimeters in length. Specimen -142, a distal end fragment, is also flat and rounded, extensively shaped and polished. The tool is too incomplete to ascertain function. Lastly, Specimens -50 and -55 are polished bone fragments too incomplete to ascertain function.

Red Ochre

A total of 10.2 grams of red ochre was recovered during the excavations. Most of the material (7.3 grams) came from the eastern part of the site in unit N5/W2. An additional 2.4 grams was found in EU N9/W10 in the northwestern site area. The remaining 0.5 grams came from N5/W8, in the central site area.

CHARRED PLANT REMAINS (BY ERIC WOHLGEMUTH)

The multi-activity character of SMA-18 is also reflected by the floral and faunal remains. Subsistence resources obtained from a variety of marine and terrestrial environments are represented in the site, and are fully consistent with many of the artifacts discussed above (e.g., net sinkers and small schooling fish, milling gear and multiple seed taxa). These assemblages can also yield information on season of occupation, providing additional insights regarding land-use strategies during this important period of Año Nuevo prehistory.

Methods

Charred plant remains were recovered from Features 1 and 2, and the four column samples obtained from the midden. These samples were processed using a manual flotation method described by Wohlgemuth (1989). Light fraction was collected using 0.4-millimeter (40 mesh/inch) screen, while heavy fraction was washed through 1.0-millimeter mesh. Light fractions were sorted to the 0.7-millimeter size grade, and all seed and fruit constituent were identified by Wohlgemuth; wood charcoal was collected but not identified.

Results

Although plant macro-fossil densities are relatively low, a great deal of diversity is reflected by the assemblage (Table 8). The nut crops are dominated by acorn (*Quercus* spp.), wild cucumber (*Marah* spp.), and bay (*Umbellularia californica*), followed by trace amounts of hazelnut (*Corylus cornuta* var. *californica*), Buckeye (*Aesculus californica*), and pine nut (*Pinus radiata*). Acorn, bay, and hazel nut were probably obtained from the mixed hardwood forest located about one kilometer into the interior, while Monterey pine nuts could have been collected closer from the pine forest near Highway 1; wild cucumber grows in multiple settings, including along the edge of the forest. With the exception of wild cucumber, which is harvested in early summer, the remaining nut crops were collected in

Table 8. Charred Plant Remains from CA-SMA-18.

Feature		1	2	-	-	-	-	Total
Unit		N5/W11	N4/E1	N2/E0	N9/E1	N6/W8	N3/W10	
Depth (cm)		10-20	5-15	20-30	20-30	20-30	20-30	
Volume (liters)		10.4	9.8	8.0	7.3	10.1	8.1	
NUTS								
Quercus spp.	Acorn							
Count		-	4	8	5	-	-	17
Mg		-	2.1	64.5	13.4	-	-	80.0
Marah spp.	Wild cucumber							
Count		1	1	1	-	4	1	8
Mg		0.6	1.8	1.0	-	1.5	0.2	5.1
Umbellularia californica	Bay							
Count		-	6	4	2	1	-	13
Mg		-	5.1	3.8	1.2	0.4	-	10.5
Aesculus californica	Buckeye							
Count		-	-	1	1	-	-	2
Mg		-	-	0.7	0.8	-	-	1.5
NUTS								
Corylus cornuta var. *californica*	Hazel nut							
Count		1	-	-	-	-	-	1
Mg		1.7	-	-	-	-	-	1.7
Pinus cf. *radiata*	Monterey Pine							
Count		-	1	-	-	-	-	1
Mg		-	0.1	-	-	-	-	0.1
Total								
Count		*2*	*12*	*14*	*8*	*5*	*1*	*42*
Mg		*2.3*	*9.1*	*70.0*	*15.4*	*1.9*	*0.2*	*98.9*
WOOD CHARCOAL (GRAMS, TO 1 MM)		3	15	12	8	8	4	46
SMALL SEEDS								
Bromus spp.	Brome	-	2	-	-	-	-	2
Chenopodium spp.	Goosefoot	-	-	2	-	-	-	2
Galium spp.	Bedstraw		1	-	1	-	-	2
Lupinus spp.	Lupine	3		-	-	-	-	3
Phacelia spp.	Phacelia	-	1	-	-	-	-	1
Salvia spp.	Sage	-	-	1	-	1	-	2
Scirpus spp.	Tule	-	-	-	4	-	-	4
Vulpia spp.	Fescue	-	-	-	1	-	-	1
Genus Total		*3*	*4*	-	-	-	-	*7*

Table 8. Charred Plant Remains from CA-SMA-18 *continued*.

Feature		1	2	-	-	-	-	Total
Unit		N5/W11	N4/E1	N2/E0	N9/E1	N6/W8	N3/W10	
Depth (cm)		10-20	5-15	20-30	20-30	20-30	20-30	
Volume (liters)		10.4	9.8	8.0	7.3	10.1	8.1	
SMALL SEEDS CONT.								
Asteraceae	Sunflower family	2	1	-	-	-	-	3
Cyperaceae	Sedge family	1	1	-	-	-	-	1
Fabaceae	Bean family	5	1	1	-	-	-	7
Poaceae	Grass family	8	4	4	-	1	1	18
Rosaceae	Rose family	-	1	2	-	-	-	3
Family Total		*19*	*12*	-	-	-	-	*31*
Unidentified seeds		2	1	2	1	4	-	10
Unidentified seed fragments		5	7	2	5	1	2	22
PINE CONES AND NEEDLES								
Cone Scales		many	many	many	many	many	many	many
Cone Cores		-	4	-	-	-	-	4
Needle Fragments		1	-	-	-	1	-	2

the fall, and could have be stored and used through the winter. Given the high frequency of pine cone scales recovered from the site, combined with the near-absence of pine nuts, probably indicates that the cones were transported to SMA-18 with seasoned firewood (after the nuts were gone), and the nuts made minimal contribution to the diet.

Small seed densities are also low, but represented by a diversified mix of taxa (see Table 8). Most of the sample includes species that are locally present within the coastal scrub community (e.g., brome grass [*Bromus* spp.], goosefoot [*Chenopodium* spp.], lupine [*Lupinus* spp.], sage [*Salvia* spp.]), and the seeds from these plants would have been collected in the late spring and summer. One exception to the pattern is the recovery of tule [*Scirpus* spp.] seeds, which indicates the use of a wetland habitat, perhaps from the faultline seep that has been converted into Green Oak Reservoir.

The combined sample of nuts and small seeds indicates that the inhabitants of SMA-18 collected plant foods from multiple habitats, some located a significant distance into the interior. These resources were harvested during the fall, late spring, and summer, indicating a multi-season occupation of the site.

VERTEBRATE FAUNAL REMAINS (BY JEAN C. GEARY, DIANE GIFFORD-GONZALEZ, KENNETH W. GOBALET, AND JEREME GAETA)

Overall, the fauna from SMA-18 represents a broad spectrum of animal resource acquisition of terrestrial and marine mammals, shorebirds, and an array of fish species. It provides a case of the relatively late occurrence of the northern fur seal, *Callorhinus ursinus*, on the San Mateo coast, including the suggestion of a nearby breeding population. With more than 4,200 bone specimens, the fauna gives no compelling evidence for the presence of Steller sea lion, *Eumetopias jubatus*, in the area, which historically was reported for Año Nuevo in considerable numbers. Only one bone of the northern elephant seal, *Mirounga angustirostis*, was found in the assemblage, supporting its absence from the region until recent historical times. The SMA-18 fish fauna offers the first evidence that coho salmon, *Oncorhynchus kisutch*, may be indigenous to the San Mateo region coastline in prehistoric times. Bird fauna is dominated by the murre, *Uria aalge*, a species experiencing much diminished numbers in its locally restricted breeding range today. While many species present in the SMA-18 fauna are resident in the Año Nuevo area on a year-round basis, some bird species and fish suggest a fall-winter occupation, while the remains of newborn and slightly older northern fur seals suggest an occupation that included the months of June through November. Despite the high proportion of large mammal species and of fatty bird species, rabbits, especially the cottontail, *Sylvilagus*, dominate the faunal assemblage. Low rates of human food processing marks and high rates of canid damage on their bones raise questions about their handling and the purpose of their acquisition.

This chapter is divided into four major sections: an overview of zooarchaeological methods, a brief descriptive summary of results, discussion in more detail of implications of the results, and finally a section placing the materials from SMA-18 into the broader view of greater California and Monterey Bay historical and human ecology.

Methods

Radiocarbon dates on *Mytilus* single-shell samples from SMA-18 strongly suggest that it is a single-component site dating to the late Middle Period (Hylkema's Año Nuevo Phase). Therefore, all faunal samples from the site were analyzed as an aggregate. To enhance and standardize the SMA-18 faunal data analysis, vertebrate specimens from the October 2004 excavation were aggregated with those from four earlier excavations in 2002, 2003, and 2004, plus surface finds collected by Hylkema. Some specimens included in this report were originally identified by Tom Garlinghouse of Albion Environmental. The present analysis reviewed all specimen identifications and added these to the database, along with additional data on bone surface modifications from those specimens.

History of Sorting and Identification

From April to June 2005, preliminary sort and identification of the October 2004 sample was carried out by an undergraduate independent study group from the University of California at Santa Cruz who had taken Diane Gifford-Gonzalez's "Osteology of Mammals, Birds, and Fish" course the previous term, under her supervision. In addition to sorting items in level bag lots into groups by taxon and elements, undergraduate Ben Curry conducted a systematic sort of column sample sets under 10x magnification to find remains of very small fish. These were bagged in lots and sent, along with other fish specimens to Ken Gobalet. This painstaking extraction of small fish elements from the column sample fraction resulted in major gains in recovery of smaller fish species, as will be discussed in *Results* on page 37.

From July through December 2005, again under the supervision of Diane Gifford-Gonzalez, undergraduate faunal analysts Ben Curry and Patrick Omeara did further sorting and identification of mammal specimens. Materials from 2002, 2003, and 2004 excavations, plus surface finds were incorporated into the analysis.

Bird specimens from the October 2004 were identified by Jean C. Geary, who used reference specimens in the Museum of Birds and Mammals, San Jose State University, and the Museum of Vertebrate Zoology, University of California, Berkeley, to identify the archaeological sample. Subsequent to Geary's analysis, about 200 additional specimens originally identified by Garlinghouse were found in collections from earlier excavations; these were entered into the database with the Garlinghouse identifications.

In September 2005, fish specimens from the October 2004 sample (numbering more than 1,168 specimens) were sent for analysis to Dr. Ken Gobalet, California State University, Bakersfield, for identification, and are here reported separately by Dr. Gobalet and Jereme Gaeta under *Results* on page 37. During the later 2005 review of the 2002-2004 excavation samples, 21 more bags of about 1,630 fish elements (mainly vertebrae) were discovered. These are assumed to be an essentially random sample of the single-component site, so that the sample analyzed by Gobalet is thought to be representative of SMA-18 as a whole. These were not received by Gobalet in time for this report, but they are now in Gobalet's lab for identification and of special interest because of the presence of steelhead and coho specimens in the October 2004 sample.

In addition to bone elements recorded as part of the archaeofaunal sample, 54 skeletal elements of a newborn elephant seal were recovered from the surface during the October 2004 excavation. These are very light in color compared with excavated bone specimens and were most likely derived from a spatially coincidental recent death on the surface of the site of a young-of-the-year elephant seal from the present colony. These elements were not recorded as part of the assemblage.

All provisional mammal specimen identifications were reviewed by Gifford-Gonzalez, and she definitively identified artiodactyl, pinniped, and cetacean specimens. Mammal specimens were identified with reference materials in Gifford-Gonzalez's laboratory; the Department of Anthropology's osteology collections; the Museum of Vertebrate Zoology, University of California, Berkeley; the Burke Museum of Natural History and Culture, University of Washington; and the National Marine Mammal Laboratory, NOAA-Seattle.

Bone Surface Modification Analysis

Bone surface modifications, burning, and weathering were assessed for mammal bones, and the first two categories for bird bones (Table 9). It should be noted that Behrensmeyer's (1978) weathering stage criteria apply only to the organization of bone tissue of larger mammals. Surface modifications were initially identified using a 10x binocular loupe, then if necessary verified with 20x light microscope.

Lyman and Fox (1996) have criticized use of Behrensmeyer weathering stage codes to determine how long bones lay exposed to the elements before burial. Their experimental observations have shown that different skeletal elements of the skeleton proceed through Behrensmeyer's five broadly defined stages of disintegration at different rates, so a single mammal skeleton can appear variably weathered. However, bones from one skeleton in the same microenvironment are seldom more than two weathering stages apart. Thus, weathering stages can be used at a grosser level to study processes of site formation, which was deemed relevant to SMA-18, as it was deposited in a dune field. If the bone sample included specimens showing weathering stages widely separated on the weathering scale, this would suggest that the bones were exposed to the elements for a longer span time. Conversely, if most specimens cluster around a mode of weathering stages predicted by

Table 9. Data Fields Used in the Analysis and Recording of Mammal and Bird Faunal Specimens from CA-SMA-18.

Variable	Content Type/Range	Reference
Element	-	1977
Portion	-	1977
Side	Left/right/axial/indeterminate	-
Taxon	-	1986
Size	For less specific Taxa (e.g., Large Bird, Medium Bird)	-
Age Class	Neonate to Aged, indeterminate	-
Sex	For pinnipeds, some artiodactyls, male, female, indeterminate	-
Cut mark intensity	Number of marks	1995, 1983
Scrape intensity	Number of marks	1983
Chop mark intensity	Number of marks	1995
Fracture on fresh bone	Presence/Absence	1985
Fracture on weathered bone	Presence/Absence	1985
Impact Notch	Number of marks	1988
Counterblow	Number of marks	1988
Anvil Damage	Number of marks	1988
Burn color	Munsell color codes	1984
Burn modification	Nominal: crazed surface, exploded, calcined, vitrified	-
Carnivore tooth modification: pit	Number of marks	1981
Carnivore tooth modification: puncture	Number of marks	1981
Carnivore tooth modification: furrow	Number of marks	1981
Carnivore tooth modification: crenellation	Number of marks	1981
Carnivore tooth modification: scooping-out	Number of marks	1981
Carnivore stomach acid etching	None, light, medium, heavy	1990
Rodent gnawing	None, light, medium, heavy	1990
Root-etching	None, light, medium, heavy	1990
Behrensmeyer weathering stage	Unburnt mammal bones	1978
Bone color (unburnt)	Munsell color codes	-
Bone tool part?	Yes/No	-

Notes: 1977 – Modified from Gifford & Crader (1977); 1978 – Modified from Behrensmeyer (1978); 1981 – After Binford (1981); 1983 – After Shipman & Rose (1983); 1984 – After Shipman et al. (1984); 1985 – After Johnson (1985); 1986 – After Gifford-Gonzalez and Wright (1986); 1988 – After Blumenschine & Selvaggio (1988); 1990 – After Andrews (1990); 1995 – After Fisher (1995);

models presented by Lyman and Fox (1996), this would suggest a shorter duration of site formation. It should be noted that Gifford-Gonzalez used an adaptation of the Behrensmeyer system, with an additional stage designation termed, "Not Greater than Stage 2." The reason for using this category is that unpublished thin-section research by Behrensmeyer and

Gifford-Gonzalez has shown that microscopic cracking and flaking of a bone specimen's outermost layer can be so complete as to be imperceptible to examination by the naked eye. Thus, a conservative approach to identifying stages 0, 1, and 2 was taken by opting for this special code for buried bones. This approach, though yielding a grosser level of definition is still useful for site formation research, as most bone element in temperate to tropical climates move from Stage 0 to 2 within a year or two. The hallmarks of stages 3 and 4 are so strikingly different that there is no risk of mistaking these elements for a Stage 0-2 category.

Data from all bird and mammal bones were recorded in two forms. Data was initially recorded on formatted data tags printed on acid-free cardstock, and were bagged together with each specimen in a resealable 20-mil plastic bag. The same data was recorded in a customized FileMaker Pro© database. Data fields and variables recorded are given in Table 9. Jereme Gaeta and Ken Gobalet recorded fish data in Microsoft Excel. All quantification in this report is based on NISP (number of identified specimens). Data from mammals, birds, and Gobalet's report on fish are presented separately in subsequent sections.

Results

Analytical results will be presented briefly in text, tabular, and diagrammatic form, deferring discussion for the subsequent sections. The section begins with taxonomic representation and then moves to human and non-human bone modifications.

Taxonomic Representation

More than 4,467 vertebrate elements were processed: mammals constituted about 50% of these, birds 10%, fish over 26%, small snakes 0.3%, and the remaining 13% of specimens were too fragmentary to assign to a specific vertebrate class (Table 10; Figure 15). Many specimens originally assigned to "indeterminate" categories in the Albion analyses were identified to species or zoological family level. With comparative specimens, it was possible to assign many specimens originally identified to "pinniped" in earlier analyses to a specific taxon. This was especially helpful in the case of northern fur seals (NFS), in which males were represented by less readily identifiable fragments.

Table 10. Summary of All Vertebrate Fauna Analyzed from CA-SMA-18.

TAXON	NISP	%
Mammals	2,289	51.2
Birds	437	9.8
Fishes	>1,168	26.1
Snakes	14	0.3
Indeterminate Vertebrate	559	12.5
Total	*>4,467*	*100.0*

Notes: "Indeterminate Vertebrate" category is predominantly highly comminuted vertebrae and long bones possibly derived either from medium-large birds or leporids.

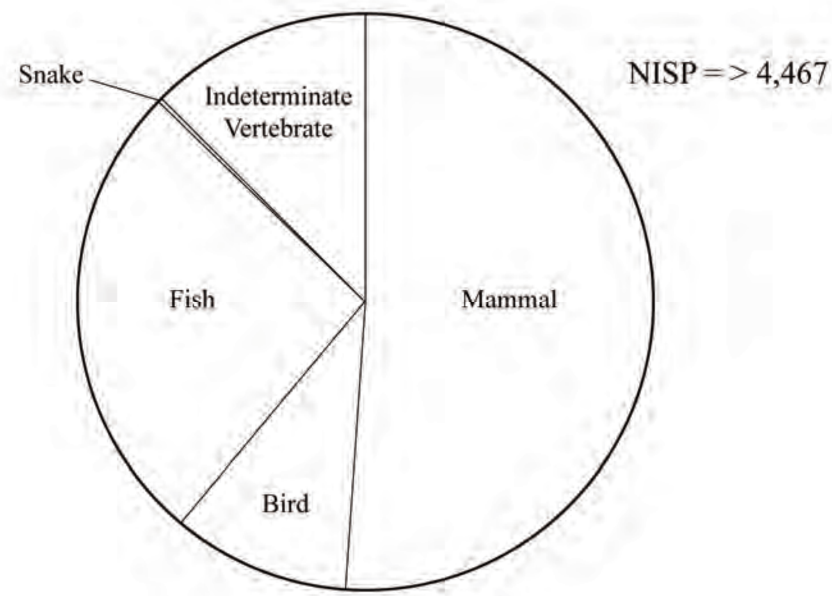


Figure 15. Vertebrate Fauna by General Class or Subclass from CA-SMA-18.

Note: Snakes are represented by vertebrae of garter snake.

Mammals

Five mammal taxa of widely differing body sizes and economic value account for 81% of all taxonomically identifiable mammals from SMA-18 (Table 11; Figure 16): northern fur seal (*Callorhinus ursinus*), sea otter (*Enhydra lutris*), mule deer (*Odocoileus hemionus*)/medium ruminant, brush cottontail (*Sylvilagus bachmani*), and pocket gopher (*Thomomys talpoides*). These most common taxa vary tremendously in body size, in their calorie and fat yields per carcass, and in significant economic by-products. The remaining 17 identified species are represented by relatively few elements.

Rabbits and jackrabbits (*Lepus californicus*) are the most abundant taxa, constituting 38% of identifiable specimens, and cottontails (*Sylvaligus bachmani*) account for nearly all of these (Table 11). These are exceptionally lean animals with some useful fur.

The next most common taxon, comprising 18.5% of identifiable specimens, are medium-sized ruminants, that is, mule deer and more fragmentary specimens that might have come from either deer or pronghorn antelope (*Antilocapra americana*). Given the present-day proximity of prairie habitats on the coastal plain north of Año Nuevo and inland in the Gazos Creek drainage, it was judged possible that pronghorns, an open country browser known from SCR-7 (Jones and Hildebrandt 1990), might also be present at SMA-18. All artiodactyl specimens were closely compared to both mule deer and pronghorn antelopes, however no specimens could be assigned to the latter taxon. Therefore, it is highly likely that the less identifiable "medium ruminant" sample derives mainly from mule deer (Table 11). Antler is well-represented among cervid elements at 13%, although some was in poor condition when recovered.

Table 11. Identifiable Mammal Specimens from CA-SMA-18.

LINNAEAN TAXON	COMMON NAME	NISP	%
PINNIPEDIA	***SEALS AND SEA LIONS***		
Callorhinus ursinus	Northern fur seal	99	9.3
Arctocephaline indeterminate	Indeterminate fur seal	12	1.1
Zalophus californianus	California sea lion	12	1.1
Otariid indeterminate	Indeterminate eared seal	29	2.7
Phoca vitulina	Harbor seal	5	0.5
Mirounga angustirostris	Northern elephant seal	1	0.1
Pinniped indeterminate	Indeterminate pinniped	5	0.5
CETACEA	***WHALES, DOLPHINS, PORPOISES***		
Phocoena phocoena	White-sided dolphin	1	0.1
cf. *Eschrichtius robustus*	cf. Gray whale	2	0.2
CARNIVORA	***CARNIVORES***		
Enhydra lutris	Sea otter	67	6.3
Mephitis mephitis	Skunk	5	0.5
Mustela frenata	Weasel	1	0.1
Urocyon cinereargenteus	Gray fox	1	0.1
Canis spp.	Coyote and/or dog	6	0.6
Ursus arctos horribilis	Grizzly bear	1	0.1
Procyon lotor	Raccoon	1	0.1
Terrestrial carnivore indeterminate	Indeterminate terrestrial carnivore	4	0.4
RUMINATA	***RUMINANTS***		
Cervus canadensis	Elk	27	2.5
Odocoileus hemionus	Mule deer	48	4.5
Medium ruminant indeterminate	Deer/Pronghorn sized ruminant	123	11.5
LEPORIDAE	***RABBITS AND HARES***		
Sylvilagus bachmani	Brush cottontail rabbit	388	36.4
Lepus californicus	Black-tailed jackrabbit	6	0.6
Leporid indeterminate	Indeterminate rabbit or hare	19	1.8
RODENTIA	***RODENTS***		
Neotoma fuscipes	Dusky-footed woodrat	26	2.4
Perognathus spp.	Indeterminate pocket mouse	1	0.1
Peromyscus spp.	Field mouse	8	0.8
Microtus californicus	California mouse	33	3.1
Thomomys talpoides	Pocket gopher	97	9.1
Rodentia indeterminate	Indeterminate rodent	38	3.6
Total (of 2,289 mammal specimens)		*1,066*	*100.0*

Notes: Identifications by Diane Gifford-Gonzalez, Tom Garlinghouse, Ben Curry, and Patrick Omeara.

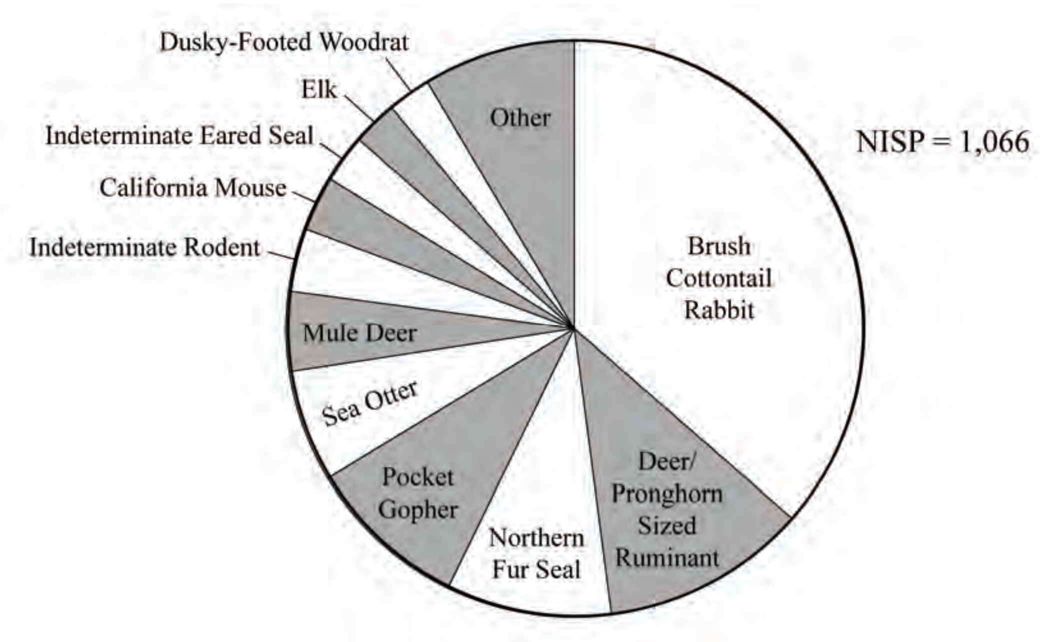


Figure 16. Identifiable Mammal Specimens from CA-SMA-18.

Northern fur seals elements constitute slightly over 9% of identifiable specimens. If the more fragmentary "indeterminate fur seal" fragments are added to those more identifiable specimens, the taxon accounts for over 10% of identifiable specimens. This species has high nutritional value for its fatty flesh and fat deposits but is renowned for its rich pelt, which vastly enhances its economic value. The sample includes neonates, older young-of-the year, subadult females, adult females, and a few subadult and adult males (Figure 17), representing the second discovery of *Callorhinus* males of breeding age in central California.

The unusual presence of northern fur seals on the central coast of California, the subject of considerable discussion in the archaeological literature, will be discussed in more detail below.

Pocket gophers (*Thomomys talpoides*) nearly equal fur seals in specimen abundance. Given their burrowing habits and apparent taste for archaeological sites (Erlandson 1984), occurrence of this taxon might be discounted as intrusive to the site. However, 23% of pocket gophers specimens show heat alteration to their bones, mainly on the nasal, maxillary, and frontal bones of the cranium and associated teeth, which experiment has shown to display burning when they are roasted. Thus, they appear to have been incorporated into SMA-18 by humans.

At 6.3% of identifiable specimens, sea otters are less common than NFS in the aggregate sample (see Table 11). Less valuable for their flesh and fat than for their pelts, these animals would have satisfied some nutritional needs while supplying a valuable commodity. About a quarter of sea otter NISP derive from neonates, younger and older juveniles, suggesting these animals were acquired with their mothers. Sea otters have the highest representation of burning of all species, suggesting a different handling by human hunters (see *Results* on page 37).

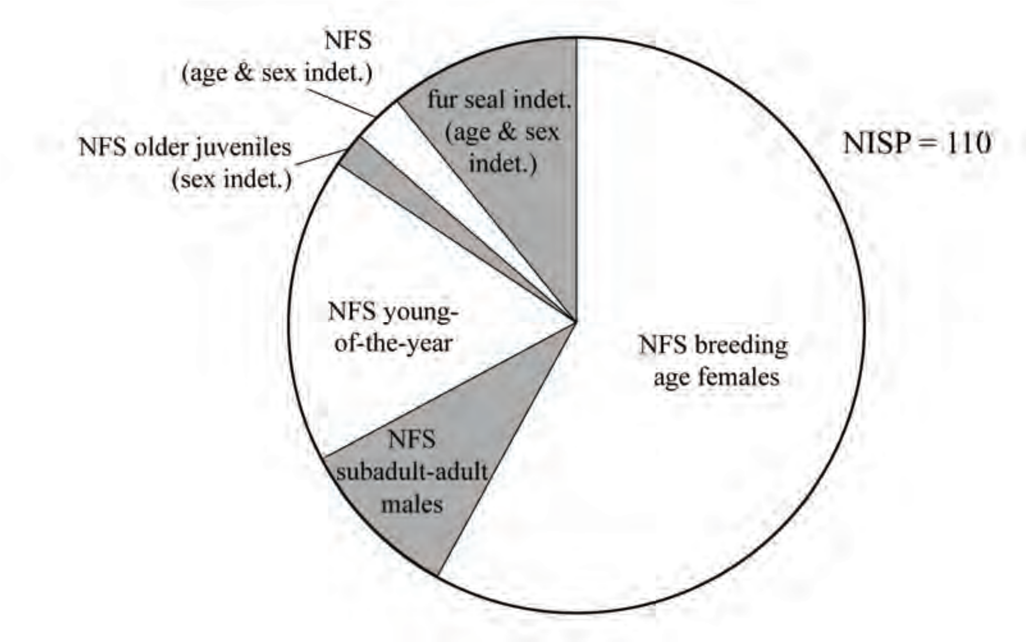


Figure 17. Northern Fur Seal plus Indeterminate Fur Seal Specimens Displayed by Age/Sex Categories from CA-SMA-18.

Other pinniped species are less common. Eared seals (*Otariidae*) are represented in the form of California sea lion (*Zalophus californianus*), with no bones of Steller sea lion (*Eumetopias jubatus*) identified in the sample. True seals, either harbor seal (*Phoca vitulina*) or the northern elephant seal (*Mirounga angustirostris*), together make up less than 1% of identifiable specimens (see Table 11). Implications of these findings for subsistence, settlement, and changes in these over time will be discussed below.

Another 1,223 mammal elements were not identifiable to taxon, but of these about half could be assigned to general size classes (Table 12). The majority of such specimens

Table 12. Less Identifiable Mammal Specimens from CA-SMA-18.

Less Identifiable Size Class	Mammal Body Size Equivalences	NISP	%
Mammal size indeterminate	Mammal size undeterminable	646	52.8
Extremely large mammal	Whale	6	0.5
Very large mammal	Male NFS, CA sea lion, elk, dolphin	62	5.1
Large mammal	Female NFS, puma, mule deer	163	13.3
Medium mammal	Coyote, raccoon, bobcat	174	14.2
Small mammal	Rabbit, larger rodents	164	13.4
Very small mammal	Smaller rodents, mole, shrew	8	0.7
Total		*1,223*	*100.0*

Notes: Identifications by Diane Gifford-Gonzalez, Tom Garlinghouse, Ben Curry, and Patrick Omeara. Total of 2,289 mammal specimens. NFS= Northern fur seal.

derive from the three size classes that encompass most of the identifiable taxa (small, medium, large). The "small" category might be even larger, had the analysts been better able to distinguish the numerous (NISP=559) comminuted long bone shaft fragments of rabbits and jackrabbits from those of medium to large birds. Given that these might include either mammals or birds, they were assigned to the "Indeterminate Vertebrate" category (see Table 12).

Birds (Jean C. Geary and Diane Gifford-Gonzalez)

Bird taxa represented in the sample of 191 identifiable elements are diverse, and for the most part are species of the open ocean shore and nearby coastal habitats. These include rare visitors such as Northern fulmar (*Fulmaris glacialis*), albatross species (*Diomedea* spp.), and eider (*Somateria* spp.), as well as rare elements of golden eagle (*Aquila chrysaetos*) and California condor (*Gymnogyps californianus;* Table 13; Figure 18). While most bird taxa are represented by only a modest number of identifiable specimens, over 43% of NISP were of the family Alcidae, and the vast majority of these (34% NISP) are from the common murre (*Uria aalge*). Implications this avifauna for environment, seasonality, and human subsistence will be discussed in a subsequent section.

Another 125 avian specimens could not be identified taxonomically, but over half of these could be sorted to size (Table 14). However, in contrast to the case of less identifiable mammals, the majority of less identifiable birds are extremely fragmentary elements of songbirds smaller than the preponderance of identifiable bird species. As noted above, the "Indeterminate Vertebrate" category (Table 14) probably includes some medium to large bird long bone diaphysis fragments.

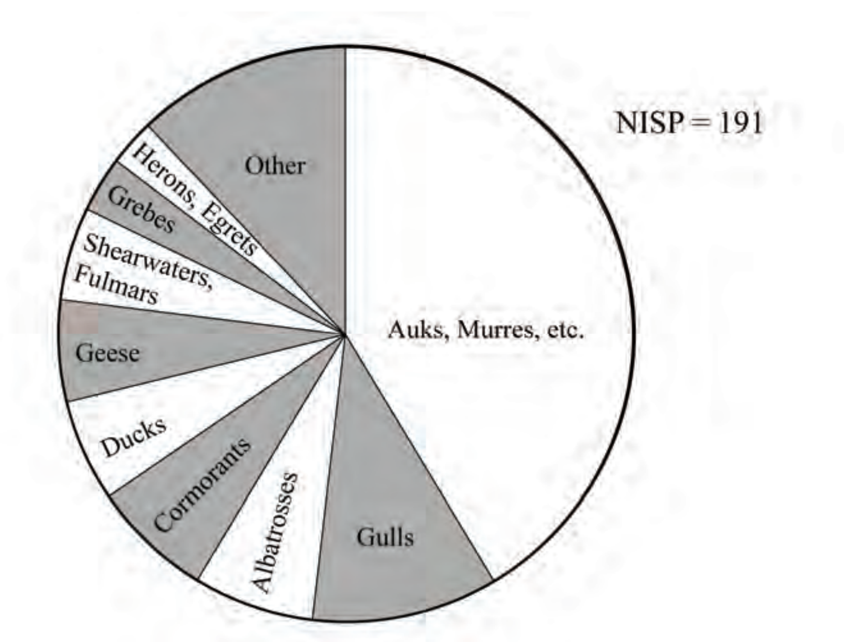


Figure 18. Identifiable Birds Grouped by Family from CA-SMA-18

Table 13. Taxonomically Identifiable Birds from CA-SMA-18.

LINNAEAN TAXON	COMMON NAME	NISP	%
ARDEIDAE	***HERONS, EGRETS, BITTERNS***	3	1.6
Ardea herodias	Great blue heron	1	0.5
Botaurus lentiginosus	American bittern	1	0.5
ANSERIDAE	***DUCKS AND GEESE***		
Aythya spp.	Bay ducks	2	1.0
Aythya valisineria	Canvasback	1	0.5
Melanitta perspicillata	Surf scoter	2	1.0
ANATINAE	***DABBLING DUCKS***	1	0.5
Anas spp.	Duck indeterminate	3	1.6
Anas americana	American widgeon	1	0.5
Anas platyrhynchos	Mallard	1	0.5
ANSERINAE	***GEESE***	1	0.5
Chen spp.	Goose indeterminate	5	2.6
Chen rossii	Ross's goose	2	1.0
Somateria spp.	Indeterminate Eider	3	1.6
CHARADRIIFORMES	***PLOVERS***	1	0.5
LARIDAE	***GULLS***		
Larus spp.	Indeterminate gull	5	2.6
Larus californicus	California gull	1	0.5
Larus canus	Mew gull	1	0.5
Larus occidentalis	Western gull	12	6.3
cf. *Larus glauscesens*	Glaucous-winged gull	1	0.5
ALCIDAE	***AUKS, MURRES, GULLEMOTS***	1	0.5
Ptychoramphus aleutica	Cassin's auklet	12	6.3
Uria aalge	Common murre	62	32.5
Aethia cristatella	Crested auklet	1	0.5
Fratercula cirrhata	Tufted puffin	2	1.0
Cepphus columba	Pigeon guillemot	1	0.5
PROCELLARIIDAE	***SHEARWATERS, FULMARS***		
Puffinus griseus	Sooty shearwater	7	3.7
cf. *Puffinus tenuirostris*	Short-tailed shearwater	1	0.5
Fulmarus glacialis	Northern fulmar	2	1.0
DIOMEDEIDAE	***ALBATROSSES***		
Diomedea spp.	Indeterminate albatross	2	1.0
Diomedea albatrus	Short-tailed albatross	10	5.2
Diomedea immutabilis	Laysan albatross	1	0.5
PELECANIDAE	***PELICANS***		
Pelecanus spp.	Indeterminate pelican	1	0.5
Pelecanus occidentalis	Brown pelican	3	1.6

Table 13. Taxonomically Identifiable Birds from CA-SMA-18 *continued*.

Linnaean Taxon	Common Name	NISP	%
Phalacrocoracidae	***Cormorants***		
Phalacrocorax spp.	Indeterminate cormorant	5	2.6
Phalacrocorax penicillatus	Brandt's cormorant	6	3.1
Phalacrocorax pelagicus	Pelagic cormorant	2	1.0
Gaviidae	***Loons, etc.***	1	0.5
Gavia immer	Common loon	1	0.5
Gavia stellata	Red-throated loon	2	1.0
Podicipedidae	***Grebes***	2	1.0
Podiceps nigricollis	Eared grebe	3	1.6
Aechmophorus occidentalis	Western grebe	1	0.5
Strigiformes	***Owls***	1	0.5
Bubo virginianus	Great horned owl	2	1.0
Tyto alba	Barn owl	1	0.5
Falconiformes	***Eagles and Hawks***	1	0.5
Buteo jamaicensis	Red-tailed hawk	1	0.5
Aquila chrysaetos	Golden eagle	1	0.5
Catharidae	***American Vultures***		
Gymnogyps californianus	California condor	1	0.5
Phasianidae	***Fowl-Like Birds***		
Callipepla californica	California quail	2	1.0
Passeriformes	Indeterminate songbirds	2	1.0
Corvidae	***Crows, Ravens***		
Corvus brachyrhynchos	American crow	1	0.5
Corvus corax	Raven	1	0.5
Total		191	100.0

Notes: Identification by Jean C. Geary, Tom Garlinghouse, and Diane Gifford-Gonzalez. 316 specimens total.

Table 14. Less Identifiable Bird Specimens from CA-SMA-18.

Less Identifiable Size Class	Bird Body Size Equivalences	NISP	%
Bird size indeterminate	Size undeterminable	57	45.6
Extremely large bird	Condor, albatross	1	0.8
Very large bird	Goose, crane, heron	1	0.8
Large bird	Egret, duck, grebe, crow	-	-
Medium bird	Thrush, jay	64	51.2
Small bird	Smaller songbird	-	-
Very small bird	Hummingbird, wren	2	1.6
Total		*125*	*100.0*

Notes: Most identifications by Jean C. Geary, others by Tom Garlinghouse and Diane Gifford-Gonzalez. Of a total of 316 bird specimens.

Fish (Kenneth W. Gobalet and Jereme Gaeta)

The fish remains identified from archaeological site SMA-18 were evaluated with the use of the comparative osteological collection housed in the Department of Biology, California State University, Bakersfield. The identifications were made by Gaeta and checked when necessary by Gobalet, who is responsible for accuracy. The names used in this report follow the fisheries standard of Nelson et al. (2004).

For the most part, the fishes represented at SMA-18 are as expected and consistent with the fishes known from this region of the Central California Coast (Table 15; Figure 19). There are, however, some species identified for the first time from the coastal section of San Mateo and Santa Cruz counties: Pacific sardine (*Sardinops sagax*), northern anchovy (*Engraulis mordax*), members of the smelt family (*Osmeridae*), Pacific hake (*Merluccius productus*), northern clingfish (*Gobiesox meandricus*), and a kelpfish (*Gibbonsia* spp.; Gobalet et al. 2004:Table 1). These species all have been found in numerous other locations in California (Gobalet 2000; Gobalet and Jones 1995; Gobalet et al. 2004). The fact that these species have not previously been detected in archaeological middens is merely a reflection of the limited number of excavations completed on this section of coast and thoroughness of the excavation and recovery. Of particular significance in this regard are the finding of northern anchovy and smelts. Both of these species are small as adults and their bones would be missed without meticulous attention to using fine-meshed screens (1/16-inch and smaller) and microscopic recovery from column samples.

The finding of two vertebral centra from a salmon or trout (*Oncorhynchus* spp.) is highly significant. These elements were subjected to study by three experts to attempt to establish their identity and obtain corroborative opinions (Gobalet 2001). Accord to prior established methodology, Gaeta and Gobalet independently identified both as coho salmon (*Oncorhynchus kisutch*), and the premier authority in the country, Jerry Smith (University of Michigan) identified one as coho and the other as steelhead (*O. mykiss*).

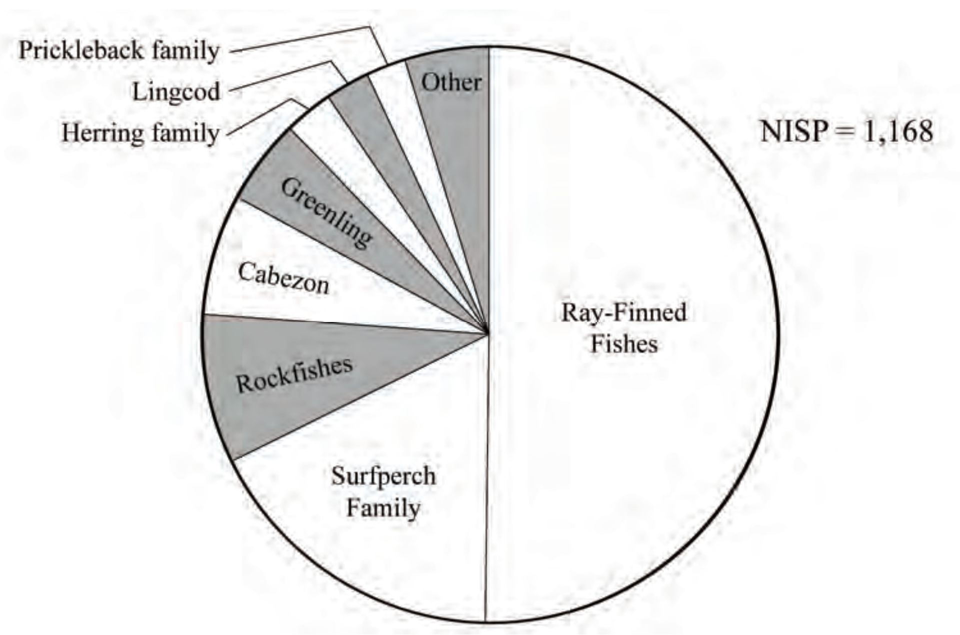


Figure 19. Identifiable Fish by Species and Higher Taxa from CA-SMA-18.

Table 15. Summary of Fish Remains from CA-SMA-18.

LINNAEAN TAXON	COMMON NAME	NISP
Elasmobranchiomorphi	Sharks and rays	1
Triakidae	Smoothhound shark family	1
Actinopterygii	Ray-finned fishes	>583
Clupeidae	Herring family	32
Sardinops sagax	Pacific sardine	3
Engraulis mordax	Northern anchovy	1
Osmeridae	Smelt family	6
Oncorhynchus spp.	Pacific salmon and trouts	2
Merluccius productus	Pacific hake	1
Gobiesox meandricus	Northern clingfish	1
Atherinopsidae	Pacific silversides	7
Scorpaeniformes	Mail-cheeked fishes	9
Sebastes spp.	Rockfishes	98
Hexagrammos spp.	Greenling	56
Ophiodon elongatus	Lingcod	29
Cottidae	Sculpin family	9
Scorpaenicthys marmoratus	Cabezon	79
Embiotocidae	Surfperch family	203
Embiotoca spp.	Striped or black surfperch	2
Stichaeidae	Prickleback family	26
Cebidichthys violaceus	Monkeyface prickleback	2
Xiphister spp.	Rock or black prickleback	5
Clinidae	Clinid family	1
Gibbonsia spp.	Kelpfish	4
Total		*>1,168*

Notes: Analysis by Jereme Gaeta and Kenneth W. Gobalet, February 9, 2006.

The significance of these finds at SMA-18 is that they establish that coho salmon were native to the coastal streams of San Mateo and Santa Cruz Counties, as species spawning in streams near the site, e.g., Green Oaks Creek, Año Nuevo Creek, or Waddell Creek to the south of Año Nuevo. The latter is an especially likely source, because coho are found there today. The only definitive representatives of the salmonid family hitherto defined among archaeological remains south of San Francisco have been steelhead rainbow trout (*O. mykiss*). This finding has important legal, conservation, and management implications (Gobalet et al. 2004), in establishing coho as a native species.

Human Bone Modifications – Mammals

Human modifications to bones can be classed in three categories: cutting tool marks, percussion marks, and heat modification. These will be dealt with in turn here.

Stone cutting tool marks, which may be inflicted during killing, skinning, dismembering, or defleshing, were found on only about 2% of bones (Table 16). This low rate of occurrence is not unusual in faunal assemblages, in which skilled butchers seek to avoid contacting bone with tool edges.

A taxon-specific pattern of the occurrence of tool marks can be discerned in the SMA-18 assemblage. Although rabbits and hares are the most frequently occurring species, only one of their 403 bones shows a cut mark. This is expectable, given that animals of this size can be skinned and dismembered with minimal use of tools. Most cuts, chops, and scrapes are found on fur-bearing marine animals or on medium to large land ruminants, both of which require substantial tool use for removal of their skins, dismemberment, and removal of their flesh (Table 16 and Table 17). Implications of the anatomical placement of cutting tool marks will be discussed below.

Table 16. Cutting Tool Modifications to Mammal Bones and their Probable Functional Correlates from CA-SMA-18.

FUNCTION	CUTS	SCRAPES	CHOPS
Skin	2	-	-
Dismember	12	-	6
Deflesh/skin	9	1	-
Deflesh	11	1	-
Indeterminate	4	-	1
Total	*38*	*2*	*7*

Table 17. Comparison of Human and Non-Human Bone Surface Modifications across Taxa from CA-SMA-18.

TAXON	NISP	BURNT			CARNMOD		CUT		CHOP		PERC	
		#	%	RES.	#	%	#	%	#	%	#	%
Mammal Indet.	1,223	369	30.2	10.5	21	1.7	7	0.6	1	0.1	2	0.2
Sea otters	67	21	31.3	11.7	1	1.5	5	7.5	1	1.5	-	-
Pinnipeds	162	37	22.8	3.2	11	6.8	7	4.3	1	0.6	-	-
Ruminants	218	40	18.3	-1.3	18	8.3	14	6.4	3	1.4	19	8.7
Rodents	209	46	22.0	2.4	1	0.5	-	-	-	-	-	-
Birds	478	74	15.5	-4.2	4	0.8	1	0.2	-	-	-	-
Leporids	418	37	8.9	-10.8	58	13.9	1	0.2	-	-	-	-
Vertebrate Indet.	507	41	8.1	-11.6	-	-	3	0.6	-	-	-	-
Average			*19.6*			*4.2*		*2.5*		*0.5*		*1.1*

Notes: Indet. – Indeterminate; Res. – Residual; CarnMod – Carnivore modification. Reflects differential handling of various mammal groups and birds. The "Mammal indeterminate" category includes highly comminuted bone specimens from medium to very large mammals. The "Vertebrate indeterminate" category includes highly comminuted vertebral and long bone specimens that may derive from either medium to large-sized birds or leporids.

Percussion marks are associated with breaking bones, usually marrow-bearing long bones, for their within-bone contents (see Table 17). They may also appear on cranial and mandibular specimens, depending upon the species. Direct percussion leaves one or more impact notches, where the force of the percussor enters the bone, often detaching conchoidal flakes on the inner surface of long bones. Other percussion traces include stone anvil marks, upon which long bones may be placed to optimize efficient breakage. Anvil marks are pits and striated scrapes inflicted by the anvil surface, as the bone strikes and slides against it during impact. Finally, there is the so-called counterblow, observed as damage caused by force rebounding from a hard surface such as an anvil, and shattering the bone wall as the hard surface of the anvil reenters the bone. This results in shattered fragments detaching from the outside of the bone wall, rather than the inside, similar to those observed at the impact notch.

Nineteen of 129 ruminant artiodactyl specimens (9.6%) display percussion marks, the most common being notches inflicted by hammerstones (see Table 17). Percussion marks all appear on the shafts of artiodactyl longbones, which contain substantial yellow marrow. The incidence of percussion marks on artiodactyl longbones and the high levels of fragmentation of these elements, reflect substantial processing of terrestrial ruminants for marrow.

Burning occurs on about 20% of mammal bones, with the modal color of heat-altered bone being black (carbonized), with a more or less even distribution of colors on either side of this (Figure 20). Shipman et al. (1984) experimentally established that bone subjected to heat progresses through color changes beginning with pale brown. The rates at which bone makes these color transitions cannot be calibrated to precise temperatures. It is

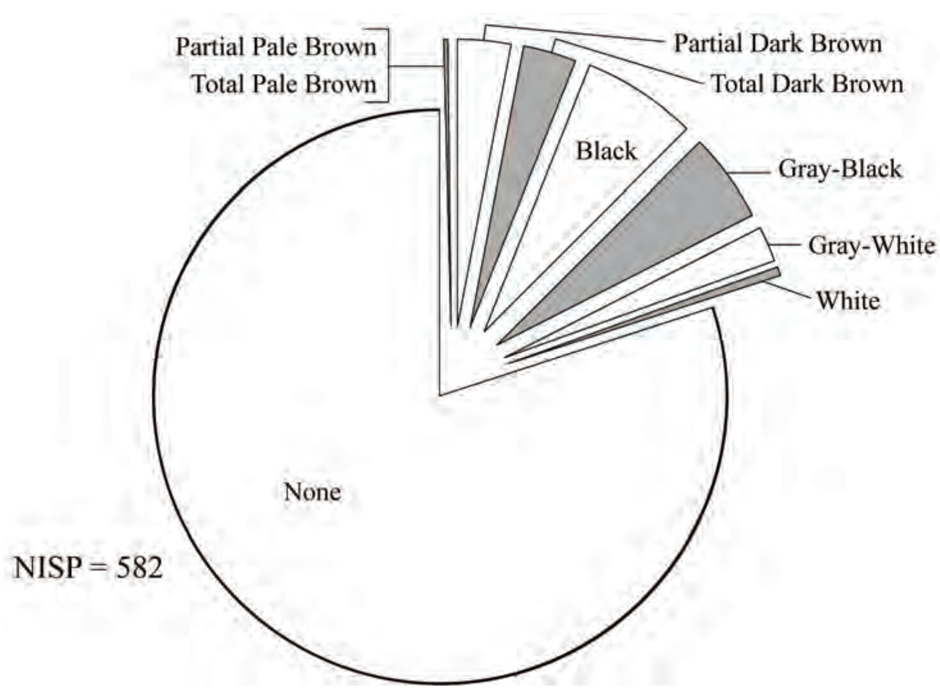


Figure 20. Burning on Mammal Bone from CA-SMA-18.

possible to state an average temperature that must be reached by mammal bone to attain a given color. Black coloration is on average attained ca. 645 degrees Celsius, outside the range of normal culinary activities. Roasting near open flame, the cooking method most likely to burn bone, can char sections of bone exposed directly to high heat, the remainder being protected by the roasting flesh (Gifford et al. 1980; White 1992; Yellen 1977). Another possible route by which bone could be burned is post-depositional exposure to heat from hearths or pit ovens. Experimental work by Stiner et al. (1995) indicates that bones in sediments up to five centimeters directly beneath a fire may develop burning over their entire surfaces.

Given these considerations, it is important to keep in mind that only about 20% of mammal bones show any sign of heat alteration. Looking more closely at how heat alterations affected various taxonomic groupings (see Table 17), it is readily apparent that a significant amount of burning is the result of targeted manipulation of different types of animals by humans, rather than of accidental exposure. The less identifiable component of mammal bones displays heat alteration at about 30%, higher than the identifiable component. This is expectable, given that burning reduces bone flexibility by destroying collagen, rendering elements more likely to break into unidentifiable pieces.

This being noted, it is the case that the rate of burning on highly identifiable sea otter bones (31.3%) is actually higher than on less identifiable mammal bones (see Table 17). All segments of otter bodies are burnt, reflecting a generally uniform treatment of the species' body parts. Pinnipeds, ruminants, and rodents show similar rates of burning (18-22%), despite the great differences in body size. Burning in pinnipeds is more concentrated on elements of the extremities, a pattern also seen at the Moss Landing Hill site (MNT-234). Burning on ruminant bones is more diffuse, although relatively more common on long bone shafts. Burning (23% of total rodent NISP) not only on the bones of gophers but also on those of squirrels, dusky-footed woodrats (*Neotoma fuscipes*), and other rodents concentrates on crania, as typical of roasting the body whole (see Table 17).

By contrast, rabbits and jackrabbits display very low rates of burning (ca. 9%) in comparison to all other mammal taxa, and even to birds (see Table 17). The similarity of the rate of burning in leporids to that of "Vertebrate indeterminate" suggests that this category may be dominated by limb fragments of this taxon rather than of birds, which have two times that rate of heat alteration. Further implications of the differential handling of leporid bodies will be discussed below.

Human Bone Modifications – Birds

Bird bones generally display low rates of human and carnivore bone surface modifications other than heat alteration (see Table 17; Figure 21). Burning occurs on about 15% of bird bones, falling close to the range for rates of most other mammals, except for the outlying taxa, sea otters and rabbits.

Non-human Bone Surface Modifications

Carnivore modifications appear on 94 specimens (see Table 17). Different types of tooth marks sometimes appear on a single bone specimen, as a result of gnawing. The tooth marks on bone specimens fall into the range of coyote or medium-sized domestic dog.

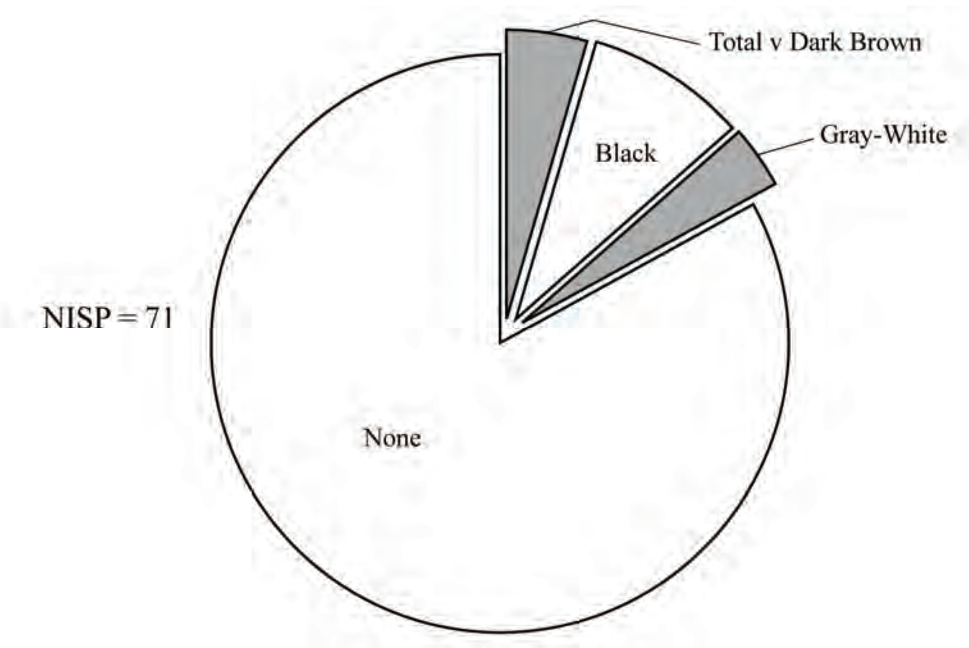


Figure 21. Burning on Bird Bone from CA-SMA-18.

These include: tooth scores (n=31) mainly on the bones of lagomorphs, tooth punctures (n=31) mainly on elements of smaller taxa such as lagomorphs, 13 instances of one of more tooth pits, in this case mainly on bones of pinnipeds and ruminants. There were seven instances of crenellations on compact bone, sensu Binford (1981), all but one of these found on deer or ruminant long bones. Two cases of furrowing of cancellous bone were found on pinniped elements. Notably, the assemblage produced 14 cases of acid etching, mainly on bones of lagomorphs or smaller unidentifiable mammal scraps. Implications of this pattern of carnivore modification and its relation to human modifications will be discussed below.

Only six mammal bones (0.2%) showed any rodent gnawing, in contrast with the substantial representation of rodent bones in the assemblage (see Table 11). This may reflect the lower attractiveness of the Año Nuevo dune habitat to burrowing rodent species, further suggesting the species found in the zooarchaeological sample are largely present due to human agency (see Table 11).

Well over 90% of 1,326 larger mammal specimens assessed displayed weathering between stages 0 and 2 (Table 18; Figure 22). A small fraction of specimens showed the distinctive loss of cortical bone and exposure of osteonal structure typical of Behrensmeyer's Stage 3.

Radiocarbon Dates on Northern Fur Seal Bones

Two direct AMS radiocarbon dates on northern fur seal (*Callorhinus ursinus*) bone collagen were run by the Center for Accelerator Mass Spectrometry (CAMS), Lawrence Livermore National Laboratories, under the supervision of Dr. Tom Guilderson. These dates generally correspond well with the six dates run on single-shell samples of sea mussel (*Mytilus californianus*) at CAMS as part of Gifford-Gonzalez's and Koch's earlier NSF-funded research (see Table 4). One of the two fur seal uncalibrated dates (1850±35 BP) falls in the mode of the shell dates, while the other (2055±35 BP) is somewhat older than most but has a 1-sigma overlap with the oldest of the shell dates (Table 19; Figure 23). Thus, the new dates are concordant with those existing for the age of the site, calibrated to approximately 1330-1200 cal BP.

Table 18. Weathering on Mammal Bone from CA-SMA-18.

WEATHERING STAGE	#	%
Stage 0	22	1.7
Stage 1	30	2.3
Stage 2	9	0.7
Stage Not >2 (see text)	1,209	91.2
Stage 3	55	4.1
Stage 4	0	0.0
Stage 5	1	0.1
Total	*1,326*	*100.0*

Notes: Weathering according to Behrensmeyer (1978) weathering stages. Excluded from analysis: teeth, burned specimens, specimens from leporids and rodents.

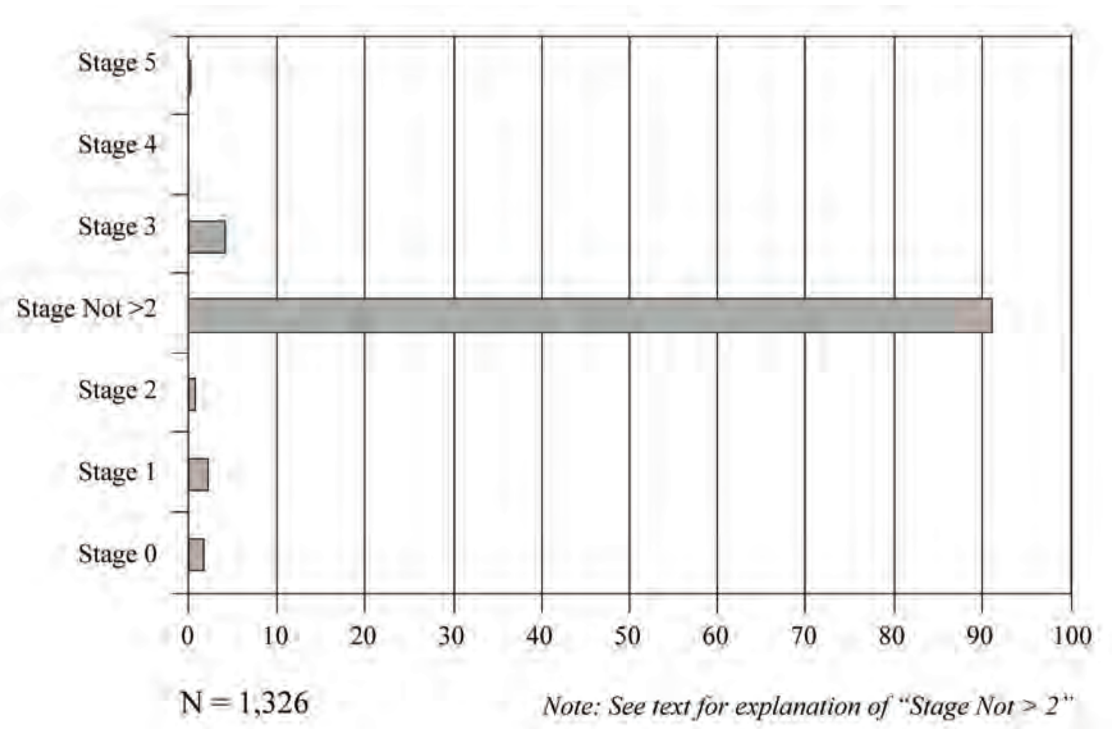


Figure 22. Incidence of Weathering on Bones of Larger Mammals from CA-SMA-18.

Table 19. Radiocarbon Dates Run on
Two Northern Fur Seal Bones from CA-SMA-18.

CAMS #	Sample Name (SMA-18-)	Unit	Depth (cm)	^{13}C	Fraction Modern	Date $D^{14}C$	^{14}C Age	Adjusted Range (cal BP)	Median Probability (cal BP)
123128	055-01	N4/E0	000-200	-20	0.7910 ±0.0034	-209.0 ±3.4	1885 ±35	1096-1309	1219
123129	324-01	N5/W11	020-040	-20	0.7743 ±0.0033	-225.7 ±3.3	2055 ±35	1279-1496	1372

Notes: Center for Accelerator Mass Spectrometry, Lawrence Livermore National Laboratory, ^{14}C Results, Submitter: Gifford-Gonzalez. 1 – ^{13}C values are the assumed values according to Stuiver and Polach (*Radiocarbon* 1977 (19):355) when given without decimal places. Values measured for the material itself are given with a single decimal place; 2 – The quoted age is in radiocarbon years using the Libby half-life of 5,568 years and following the conventions of Stuiver and Polach (ibid); 3 – Radiocarbon concentration is given as fraction Modern, $D^{14}C$, and conventional radiocarbon age. Backgrounds were scaled relative to sample size.

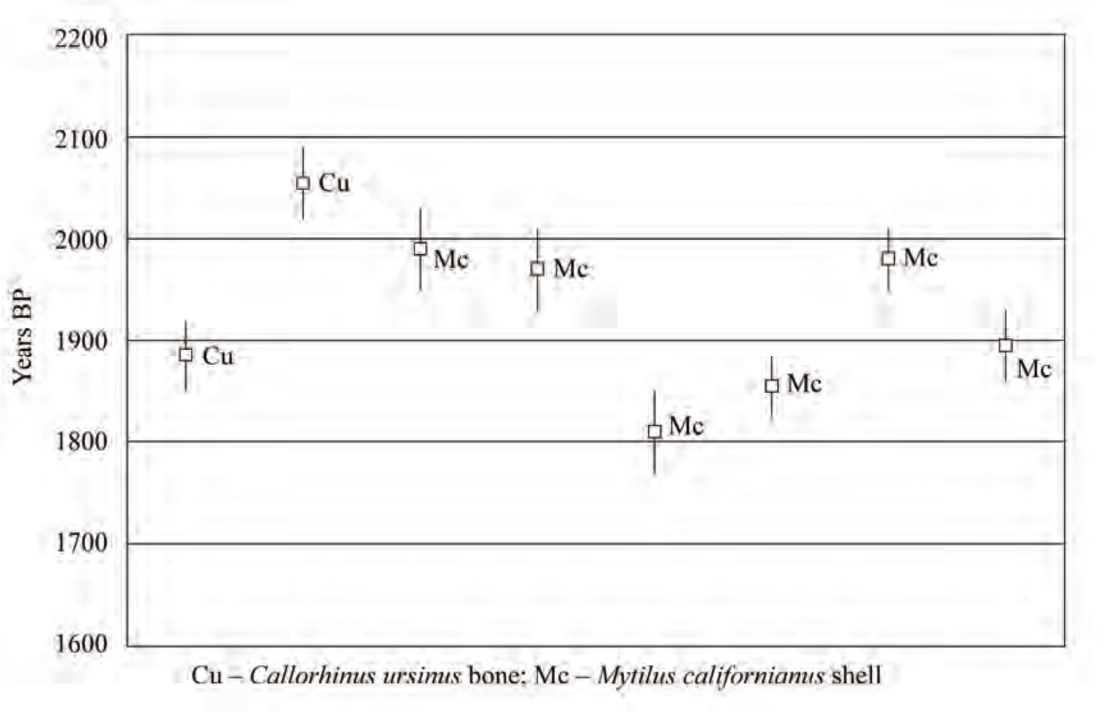


Figure 23. Diagrammatic Representation of
Eight Uncalibrated AMS Radiocarbon Dates from CA-SMA-18.

Note: All dates run by the Center for Accelerator Mass Spectrometry, Lawrence Livermore National Laboratories, under the supervision of Dr. Tom Guilderson.

Discussion

Site Formation

Weathering on the mammal bone component can shed light on SMA-18's site formation. Overall, the vast majority of bone weathering stages at stages 0-2 suggests that the faunal assemblage, and, by implication, the site as a whole, underwent burial within a few years of discard. Some specimens at Stage 3 might reflect a longer span of site formation. However, eolian erosion has been exposing SMA-18 at increasing rates after colonization of Point Año Nuevo by elephant seals, and exposure of its unmineralized bone to the elements could also account for weathering of a few bones to Stage 3.

Seasonality

Some bird, fish, and mammal species can shed light on season of occupation at SMA-18. Many of the SMA-18 bird species are year-round resident species. However, some winter or occasional visitors should be noted, as these strongly suggest a winter occupation and use of this locality. The American widgeon (*Anas americana*), canvasback (*Aythia valisineria*), and California, mew, western, and glaucous-winged gulls (*Larus californicus, L. canus, L. occidentalis,* and *L. glaucescens*) all over winter on the California coast, as do both the common loon and red-throated loon (*Gavia immer* and *G. stellata*) and the eared and western grebes (*Podiceps nigricollis* and *Aechmophorus occidentalis*). The presence of occasional coastal visitors such as the pelagic shearwaters (*Puffinus* spp.), the strictly pelagic northern fulmar (*Fulmaris glacialis*), and members of the albatross family (*Diomedea* spp.) is more likely with winter storms.

Likewise, a few fish species suggest a fall to winter occupation. The northern anchovy (*Engraulis mordax*) is available nearshore in the fall, topsmelt (*Atherinopsidae*) migrate to shallow ocean coasts in the fall and winter, and both steelhead (*Oncorhynchus mykiss*) and coho salmon (*O. kisutch*) spawn in coastal rivers the fall and winter months.

These indicators of seasonality must be balanced with the knowledge that northern fur seals breed on land and would be available for human acquisition mainly from June through November, the breeding span for all modern members of the species in both San Miguel Island and far north Pacific populations. The presence of newborn and somewhat older young-of-the-year indicates that some of the faunal assemblages at SMA-18 accumulated during the summer and early fall.

Cervid antler is sufficiently fragmentary that whether it was acquired as shed antler or as part of hunted male elk and deer cannot be determined. Hence, this possible indicator of seasonality is ambiguous.

Nothing in the foregoing should be taken to argue against a spring habitation of SMA-18. It is simply the case that no unambiguous indication of that season is available in the faunal sample.

Prey Choice and Handling

Taken overall, SMA-18 represents acquisition of a diverse number of species, suggesting a longer sojourn and a broader range of maintenance-directed activities than would a narrow sample of species. Because of prior debates about the role of humans in extirpating northern fur seals (NFS) from central coastal California, the composition of the SMA-18 mammal component is of special interest.

The presence of northern fur seals at SMA-18 reflects a relatively late exploitation of this species during the Middle Period. As noted earlier, this eared seal species is economically important not only for its flesh but also for its pelt. The presence of remains of northern fur seal bones, especially those of unweaned young of the year, in coastal archaeological sites from California, Oregon, Washington, British Columbia, and Alaska, has provoked considerable controversy both among archaeologists and between archaeologists and marine mammal biologists. This will be discussed in greater detail in the final section of this paper. Here a few technical matters will simply be noted. Although the size of the *Callorhinus* sample is small, it suggests a similar pattern of butchery, selective transport, and handling as the much larger sample at the Moss Landing Hill Site (MNT-234). Females (the preponderance of the sample) and younger juveniles are represented by elements from all parts of the skeleton, suggesting that all segments of these size classes were transported to the site. This should not be surprising, since an ungutted female northern fur seal weighs about 60 kilograms, and the young commensurately less.

By contrast, male *Callorhinus* elements are mainly bones of the extremities, including a distal fibula, various carpals, tarsals, metapodials, and phalanges. Given that adult male northern fur seals weigh around 270 kilograms, this pattern of representation probably represents field butchery and discard of their heavy skeletal parts, with transport of stripped meat and flippers back to camp for further processing and consumption. Modern Aleut people consider roasted flippers a delicacy (Scheffer 1948), and the pattern of burning on pinnipeds at SMA-18 may reflect roasting of these body segments. These are the second set of male northern fur seal elements found in the Monterey Bay region, the other set coming from Gifford-Gonzalez's in-progress analysis of the Moss Landing Hill Site fauna.

The representation of male fur seals primarily by bones of the extremities points to the paramount importance of determining species for such specimens. These elements are referred to "Otariid indeterminate" or "Pinniped indeterminate" in many analyses. However, they may be the only evidence for the presence of males of this species in a site and thus cannot be relegated to such less identifiable categories for the sake of analysts' convenience. Working with comparative specimens, Gifford-Gonzalez has found that differences exist among these bone elements of like-sized eared seal species (e.g., male northern fur seal, male California sea lion, female Steller sea lion).

Sea otters, another economically significant species, appear to have been disposed of after burning of its bones at a level exceptional for other species. There is no *a priori* reason why bones of these animals should have been burned considerably more intensively than those of like-sized female fur seals. While there is no way to assess the possibility that this is culturally structured behavior, analysts along the central California coast should collect data on differential handling of *Enhydra*.

The high proportion of cottontail rabbits presents some explanatory challenges, given their much lower nutritional ranking than ruminants or marine mammals. Leporids are especially poor in fats (Speth and Spielmann 1983), begging the question of why inhabitants of the SMA-18 locality were taking a low-ranked prey in such abundance. Several possibilities exist, all admittedly speculative, but at least one is suggested by the differentially distinctive patterns of burning and carnivore modification on rabbit and jackrabbit bones.

One possible explanation for the abundance of cottontail remains at SMA-18 is that if the site were occupied through several seasons of the year, lagomorphs filled protein "gaps" during lows in seasonal availability of other animal foods, such as the red tide months, the approximately eight-month span in which northern fur seals were not accessible, and seasons when migratory waterfowl were absent. Given the relative abundance of plant foods, including storable hard seeds in regional environments, and presence of milling equipment at SMA-18, it is unlikely that people consuming lagomorphs would run the physiological risks of "rabbit starvation" cited by Speth and Spielmann (1983) for consumers of this taxon on a fat- and carbohydrate-poor diet.

A second explanation for leporid ubiquity in the site may be that the many leporid bones at SMA-18 represent foraging activities of subadult members of the group who were learning to hunt and trap small prey and incidentally provisioning themselves and possibly other family members, while adult males focused on encounter and ambush hunting of larger prey (O'Connell et al. 2002).

Finally, the low rates of burning on leporid bones, combine with their very high rates of canid chewing marks and acid alteration (see Table 17), suggests a third possibility. Rabbit bones have less than half the rate of burning displayed by rodent bones, suggesting that this taxon was not roasted, as were squirrels, woodrats, and gophers. Moreover, they display around twice as many carnivore modifications as do the undoubtedly fatter elements of pinnipeds and ruminants. Clearly, rabbits and jackrabbits were handled very differently than were even like-sized mammals or birds, and they were much more likely to fall into the jaws of canids. Initially, it was surmised that the canid tooth marks on bones could equally well have been inflicted by coyotes (*Canis latrans*) as domestic dogs, given the size of the marks and the presence of putative coyote bones in the site (see Table 11). However, presence in the site itself of 14 acid-etched bone fragments from leporids and other mammals reflects on-site defecation by canids, tipping the scale toward domestic dogs. While admittedly speculative, it is possible that the SMA-18 people might have set traps for cottontails on their habitual paths through the brush not as a source of daily animal protein income for themselves but as a low-cost way to provision their dogs.

The preponderance (43.2%) of birds of the Alcidae family reflects preferential taking of an oil-rich bird. At 34%, common murres (*Uria aalge*) are the most abundant bird species in the site; the species both overwinters in the area and has some locally breeding populations. It is a very common taxon in many other regional archaeological sites, including the Moss Landing Hill Site (MNT-234) Primary Midden, where it comprises 12% of a much more diverse estuarine avifauna.

Birds of prey and members of the crow family (*Corvis* spp.) are represented by only a few elements each. These are preponderantly wing elements (six of 11) or bones of the foot (an additional four of the 11), with California condor (*Gymnogyps californianus*) represented by a bone of the jaw. All such elements are known to have been placed in medicine bundles or for other ritual uses by historic-period native Californians, though ethnographic documentation for such is poor for Central California. Thus, there is at least the possibility that the bones of these species did not enter the site as whole animals, or as food species.

Of the six taxonomically identifiable bird specimens displaying cut or scrape marks, three were on wing parts from probable non-food species, the great horned owl (*Bubo virginianus*) (n=1) and the short-tailed albatross (*Diomedea albutrus*) (n=2).

Implications for Human-Pinniped Interactions

The SMA-18 faunal assemblage is relevant both to the local ecology of Año Nuevo area and to broader issues in historical ecology of humans and pinnipeds along the Pacific coast of North America. Archaeological controversies over the meaning of archaeofaunal evidence for eared seal species in areas where they do not haul out or breed in historic-period times are summarized in Hildebrandt and Jones (2002) and Gifford-Gonzalez et al. (2005).

Hildebrandt and Jones (2002) built on their earlier research and collated archaeofaunal data on two time spans; 4000-1500 BP and after 1500 BP. They argue that from 4000-1500 BP, "migratory breeders," that is, eared seal species that seasonally breed gregariously on land, are much more abundant than are "non-migratory breeders," that is, the sea otter and harbor seal, which can breed and birth in the water and in any case do not form dense terrestrial aggregations. After ca. 1,500 years ago, Hildebrandt and Jones argue, the eared seals become rare to absent in all areas lacking offshore islands or rock stacks where they could have some respite from human predation. Northern fur seals represent the most extreme expression of this trend, in that they are common to dominant at sites from Point Mugu north to the eastern Aleutians, but they either disappeared from regions such as the Monterey Bay about 1,000 years ago or were found into the early historic period in Oregon (Lyman 1991) and the Olympic Peninsula (Etnier 2002), when they were extirpated by commercial sealing. Hildebrandt and Jones note that in the Año Nuevo area, which lacked rock stacks or islands prehistorically, SMA-218, with dates around 2900 BP, has a superabundance of *Callorhinus*, but they predict that later sites, of which SMA-18 is one (dates averaging ca. 1900 BP), will have fewer fur seals and other eared seals and a commensurate increase in *Phoca* and *Enhydra*.

Gifford-Gonzalez et al. (2005) review earlier assertions by Hildebrandt and Jones (2002), and Lyman (2003) but addresses another aspect of the controversy sparked by widespread discovery of *Callorhinus* bones in archaeofaunas on the mainland and on large islands: marine mammalogists' deep skepticism about the existence of rookeries south of the Pribilof Islands and Siberia. While Lyman, as well as Hildebrandt and Jones, have made the existence of rookeries on the mainland part of their interpretations, many marine mammal biologists have rejected the possibility that northern fur seals could ever have bred in such settings. Bone stable isotope analysis of middle latitude modern (San Miguel Island) and archaeofaunal samples from California and Oregon has established that females of the prehistoric populations were not feeding and, therefore, did not establish rookeries in these locations, in the far north Pacific (Burton et al. 2001, 2002; Burton and Koch 1999). Despite this finding, a substantial proportion of marine mammal researchers contend that *Callorhinus* bones found their way into coastal sites as "pinniped driftwood," that is, as strandings carried by ocean currents from such large offshore rookeries as San Miguel Island and the Farallons. It is still important for archaeologists to understand and deal with the objections of marine mammal biologists to mainland rookeries at any point in time, as well as to find data based ways of dealing with the possibility that some sites incorporated "pinniped driftwood."

With reference specifically to SMA-18, about 14% of NISP comprises northern fur seals, California sea lions, and less identifiable eared seals. This is much lower than the 95%

Callorhinus NISP at SMA-218 a thousand years earlier (Hildebrandt and Jones 2002:Table 4.5; Hylkema 1991) but a higher proportion than cited for the San Mateo coast in the post-1500 BP period (Hildebrandt and Jones 2002:Table 4.6). Notably for the scenario of replacement of migratory eared seals with resident marine mammals, sea otter is about half as common as eared seals, and harbor seals comprise 0.5% of NISP.

This matter is further complicated by the pattern of dates of occurrence of northern fur seals in the Monterey Bay in general. As noted in Table 19 on page 52, the two direct dates on *Callorhinus* bones from SMA-18 accord well with a ~1800-1900 BP (uncalibrated) date range for the site. Just a few kilometers northwest of SMA-18 lies SMA-218, which is about 1,000 radiocarbon years older. The Moss Landing Hill site, like SMA-218, is dominated by northern fur seals, comprising about 80% of some 12,000 elements distributed over three meters vertically in sand. However, a recent run of ten AMS dates on *Callorhinus* bone specimens drawn from over 100 centimeters of vertical dispersal by CAMS has yielded dates constrained between 2550 and 2375 BP, uncalibrated. Thus, the peaks and valleys of distribution of this species appear to conform to the most general pattern of occurrence predicted by Hildebrandt and Jones but local cases are somewhat temporally variable.

Whatever the ultimate outcome of careful reanalysis of regional archaeofaunas by the senior author and students, it is clear that the occurrence and disappearance of otariids, especially northern fur seals, is likely to be more locally complex than currently sketched.

The notable absence of elephant seals in the archaeological deposit supports documentation of the recent, historical spread of this species to Año Nuevo. The single element found by excavation may equally well derive from a recent death that worked its way into the deposits from the modern elephant seal rookery or truly be archaeofaunal. Lyman (1991) reports rare *Mirounga* elements from faunal assemblages along the Oregon coast, where historic-period records show the presence of occasional vagrant animals. The lack of Steller seal lion, despite historical documentation of a haul-out and breeding site for this species on the north side of Año Nuevo Point in the very recent past (Le Boeuf 1981), support findings in other Monterey Bay archaeofaunas, where they are likewise rare or lacking. A parallel scarcity of California sea lion, today abundant on Año Nuevo Island (Le Boeuf 1981), in the archaeological sample is also striking, and it probably reflects the post-protection historical encroachment of this human-tolerant species into areas formerly occupied by other pinnipeds.

Archaeofaunas such as that from SMA-18 provide invaluable evidence for ecologists who desire to understand the distribution, ecology, and behavior of animal species beyond the reach of historical documents (Jackson et al. 2001; Lyman and Cannon 2004). As such, it represents a vital dataset for exploring the historical ecology of coastal California as well as a chapter in Native Californian history.

INVERTEBRATE REMAINS

Shellfish remains were collected from the four column samples and wet screened through 1/4-, 1/8-, and 1/16-inch screens. The following analysis relies only on the 1/4- and 1/8-inch fraction, as the 1/16-inch fraction was used exclusively for the analysis of vertebrate fish bone. Due to the abundance of shellfish remains at the site, our analysis was limited to a single column sample from unit N2/E0 (Table 20).

Table 20. Shellfish Taxa Recovered from Unit N2/E0, CA-SMA-18.

Scientific Name	Common Name	0-10 cm		10-20 cm		20-30 cm		30-40 cm		Total		
		1/4"	1/8"	1/4"	1/8"	1/4"	1/8"	1/4"	1/8"	1/4"	1/8"	Combined
Mytilus californianus	California mussel	175.0	100.8	329.9	239.8	424.5	195.1	112.9	59.3	1,042.3	595.0	1,673.3
Tegula funebralis	Black turban snail	75.0	47.2	242.4	187.4	267.7	104.6	71.2	42.2	656.3	381.4	1,037.7
Haliotis spp.	Abalone	-	-	-	-	120.1	0.2	-	-	120.1	0.2	120.3
Balanus spp.	Barnacle	2.9	0.4	5.4	2.6	10.3	1.5	3.1	0.8	21.7	5.3	27.0
Polyplacophora	Chiton	11.4	3.4	24.9	8.6	27.5	5.5	3.6	2.2	67.4	19.7	87.1
Acmaeidae	Limpet	0.2	0.2	14.2	0.1	5.6	0.4	0.2	-	20.2	0.7	20.9
Katharina tunicata	Black katy chiton	1.3	0.4	5.3	0.6	2.8	-	0.8	0.6	10.2	1.6	11.8
Pollicipes polymerus	Leaf barnacle	1.2	0.7	3.3	1.5	3.1	1.4	0.8	0.7	8.4	4.3	12.7
Crepidula spp.	Slipper snail	0.3	0.3	4.6	1.5	2.0	0.4	0.3	0.4	7.2	2.6	9.8
Cryptochiton stelleri	Giant Pacific chiton	8.0	-	12.4	-	14.1	-	5.0	-	39.5	-	39.5
Strongylocentrotus spp.	Sea urchin	-	1.3	-	3.5	0.1	3.1	-	0.8	0.1	8.7	8.8
Calliostoma spp.	Top snail	-	-	-	-	-	-	0.2	-	0.2	-	0.2
Olivella biplicata	Purple olive snail	-	-	3.9	0.6	-	-	-	0.2	3.9	0.8	4.7
Buccinidae	Whelk	-	-	0.4	-	-	-	-	-	0.4	-	0.4
Gastropoda	Gastropods	-	0.1	0.3	-	-	-	-	0.2	0.3	0.3	0.6
Bivalvia	Clams	2.1	2.0	6.3	0.2	3.4	0.6	0.6	0.1	12.4	2.9	15.3
Brachyura	Crab	-	0.2	-	-	0.4	0.1	0.2	-	0.6	0.3	0.9
Mollusca	Unidentified shellfish	-	353.5	-	680.4	-	456.3	-	1,18.7	-	1,608.9	1,608.9
Total		*277.4*	*510.5*	*653.3*	*1,126.8*	*881.6*	*769.2*	*198.9*	*2,26.2*	*2,011.2*	*2,632.7*	*4,643.9*

Notes: Weight in grams.

The relative proportions of shellfish species do not differ substantially according to screen size except in a few cases. Sea urchins (*Strongylocentrotus* spp.) are the most extreme case, with their small spines and other body parts being essentially absent from the 1/4-inch sample. This discrepancy also occurs with the barnacle (*Balanus* spp.), but does not seem to be a major problem with other taxa at the site. As a result, the following discussion will rely on the combined totals from both the 1/8- and 1/4-inch fractions.

Mussel (*Mytilus californianus*; 54.8%) and turban snail (*Tegula funebralis*; 34.0%) dominate the assemblage, accounting for almost 90% of the identifiable assemblage. Both of these species live in rocky intertidal habitats and were probably gathered near the point or from the island. Abalone (*Haliotis* spp.) is the next most abundant taxa (4.0%), followed by small (2.9%) and large (1.3%) chitons (*Polyplacophora*) and only trace amounts of 12 other groups. Similar to the mussel and turban snail, most of these animals favor rocky intertidal habitats.

SITE SUMMARY

Radiocarbon dates produced by the excavation and surface collection of SMA-18 indicate that the site was occupied between about 1300 and 1200 cal BP. These field efforts also recovered a diversified artifact assemblage including multiple types of flaked and ground stone tools, bone implements and shell beads.

The flaked stone tool assemblage is composed of projectile points, bifaces, and drills, as well as more expedient flake tools, core/cobble tools, and cores; the vast majority made from locally available Monterey chert. While this mix of artifacts represents the range of hunting and resource processing tasks one would expect from a residential site, the flaked manufacturing patterns indicate that many unfinished implements were roughed-out on the site, and transported elsewhere for later refinement and use. This inference is based on the abundance of early stage biface fragments and early stage reduction debris in the deposit, and a low frequency of finished or near-finished bifaces, late stage thinning debris, and pressure flakes

Ground/battered stone tools include a few handstones, pestles, and a single mortar, all of which signal the processing of plant foods. Grooved/notched stones, pitted stones, and the more expedient battered stone tools are more abundant, and reflect the capture and processing of marine foods. The notched stone probably served as net sinkers, perhaps to control seine nets used to capture small schooling fish, while grooved stones relate to hook and line fishing. Pitted stones are commonly found in coastal settings and are thought to have been used to pound the meat from shellfish such as abalone. Battered stone tools are also probably linked to shellfish processing in some way.

Bone artifacts include awls, needles, and spatulas, as well as objects for personal adornment (e.g., pendants). The more utilitarian-oriented awls and needles were probably used to make and maintain basketry materials and various types of clothing, while the gorge served as a fish hook. Shell artifacts include a pendant and 37 beads, most of the latter composed of the spire-lopped variety; these items also highlight the more artistic side of life at the site.

The broad-based assemblage of tools is complimented by the floral and faunal remains. Plant macro-fossils include nut crops (acorn, bay, and wild cucumber) and a variety of small seeded plants (e.g., brome grass, goosefoot, lupine, sage). This mix of resources reflects the use of multiple habitat types, including forays into the interior mixed hardwood forest, as well as harvesting episodes that occurred during the late spring, summer, and fall.

Vertebrate faunal remains are equally diverse, including marine fish, marine mammals, terrestrial mammals, and birds. Marine fish are dominated by species from rocky bottom and kelp bed habitats (e.g., rock fish [*Sebastes* spp.], cabezon [*Scorpaenicthys marmoratus]*, lingcod [*Ophiodon elongates]*), as well as fishes from more open, sandy bottom areas (e.g., surf perch [*Embiotocidae]*). Small schooling fishes are also present, including significant amounts of bone from the herring family (probably sardine [*Sardinops sagax]*), and lower frequencies of smelts (*Osmeridae*), silversides (*Atherinopsidae*), and anchovies (*Engraulis mordax*). These findings indicate the use of both hook and line, and netting technologies, probably from the shore and with boats used to move through a variety of nearshore habitats. Nets and watercraft were definitely required for the harvest of sardines, as they are a pelagic species that stay out beyond the kelp beds, and do not spawn in nearshore settings.

Although salmon/trout (*Oncorhynchus* spp.) bone is represented by only a few identifiable elements, Coho salmon (*Oncorhynchus kisutch*) is present in the collection (also known as silver salmon). This finding is significant because this is the first time the species has been identified in an archaeological setting south of San Francisco Bay, and may indicate that it spawned in local drainages (e.g., Waddell Creek). If so, this new information could help habitat restoration strategies in the local area.

A smaller but significant number of birds were recovered from the site, with most originating from marine environments. The assemblage is dominated by murres (*Uria aalge*) and a few other pelagic species (e.g., albatross [*Diomedea* spp.], fulmars [*Fulmarus glacialis]*), and probably reflect the collection of animals pushed to shore during large Pacific storms. Nearshore species include pelicans (*Pelecanus* spp.), cormorants (*Phalacrocorax* spp.), grebes (*Podicipedidae*), loons (*Gaviidae*), and gulls (*Laridae*). Use of local wetland areas are reflected by herons and bitterns (*Ardeidae*), and various ducks and geese (*Anseridae*).

The mammal assemblage maintains a high level of diversity, including large numbers of both terrestrial and marine taxa. Terrestrial game is dominated by cottontail rabbits (*Sylvilagus bachmani)*, but also has large contributions from deer (*Odocoileus hemionus*) and elk (*Cervus canadensis*). Northern fur seal (*Callorhinus ursinus*) is major component of the marine mammal assemblage, and the analysis of age-sex data indicates that a rookery may have existed in a nearby area. Sea otter (*Enhydra lutris*) bone is also significantly present, followed by only minimal amounts of other species. Similar to previous studies in the Año Nuevo area, prehistoric evidence for elephant seals (*Mirounga angustirostris*) is essentially absent at the site.

Shellfish were obtained from the rocky intertidal zone, and are dominated by mussel (*Mytilus californianus*) and turban snail (*Tegula funebralis*). These findings probably indicate that shellfish were obtained from areas quite close to the site on a relatively casual, as needed basis.

When all the data sets outlined above are combined, it seems clear that SMA-18 served as a multi-activity residential base. Whether or not it represents a permanent village or a place that saw repeated use over time is difficult to determine with the data at hand, as it appears that much of the site has been destroyed by erosion linked to the modern breeding behaviors of the northern elephant seal. The low frequency of mortars and pestles and the lack of a formal cemetery at this location, however, indicate that the site represents multiple occupational events. Such a conclusion is also supported by the mobility indicators found in the flaked stone manufacturing data.

Regional Implications

The goal of this final chapter is to place the findings from SMA-18 into the larger prehistoric context of the Año Nuevo region. Previous research in the region has identified four major periods of occupation: the Middle Holocene (8000-5500 cal BP), Early Period (5500-3000 cal BP), Middle Period (3000-900 cal BP), and Late Period (post 900 cal BP). Middle Holocene occupations are found at SCR-7 and appear to represent short-term encampments focused on the production of flaked stone tools (largely bifaces) and the hunting of a diverse set of marine and terrestrial game (mostly the latter), and not northern fur seals. This seemingly mobile adaptation appears to include an important interior component, evidenced by the presence of Franciscan chert tools and, to a lesser degree, the emphasis on terrestrial game.

Similar adaptations are reflected by the single Early Period site in our sample (SCR-38), which dates to about 4000 cal BP. It differs from SCR-7 by having a slightly higher frequency of milling gear, grooved/pitted stones, bone tools, and artifacts of shell, perhaps signaling longer-term occupations and a greater marine focus, the latter inferred from the grooved/pitted stone group of artifacts which were used for fishing and shellfish processing. The sparse mammalian faunal assemblage is limited exclusively to terrestrial game, however, and the presence of Franciscan chert tools and interior plant foods (e.g., manzanita and gray pine) probably indicates a mobile system of settlement that included a terrestrial focus.

Everything changes between 2900 and 2300 cal BP. First, a major interior village is established at SCR-9, evidenced by a broad range of domestic artifacts and the first significant presence of mortars and pestles in the area. Second, the highly specialized northern fur seal hunting and butchering camp is formed at SMA-218. Although not exactly synchronous in time, this site complex seems to represent a higher degree of sedentism than was encountered earlier in prehistory, supported by logistical forays to outlying areas, similar to many other parts of California and the Great Basin during this interval (Hildebrandt and McGuire 2002; McGuire and Hildebrandt 2005).

This "collector-like" system of interior sedentism and specialized use of the coast appears to have been short-lived in the Año Nuevo area. Rather than representing a specialized hunting camp designed to serve an interior village, findings from SMA-18 included a highly diversified mix of artifacts and subsistence remains, no doubt signaling a residential use of Año Nuevo between 1300 and 1200 cal BP. Although flaked stone tools remain important like at all of the earlier coastal sites, milling gear plays a larger role in the local economy, and fishing gear (e.g., net sinkers) and specialized shellfish processing implements (e.g., pitted stones) reach higher levels of significance as well. Tool diversity at SMA-18 is also expressed by an expansion in the frequency of bone tools, largely bone awls which were probably used for the production and maintenance of basketry and other domestic items. Significant frequencies of shell beads also emerge for the first time, providing additional evidence for the presence of a residential occupation.

Plant remains from SMA-18 reflect the use of several habitat zones during multiple seasons, while vertebrate faunal remains include a wide variety of fish, some requiring sophisticated netting technology and use of watercraft beyond the kelp zone (e.g., sardines). Several species of marine birds were also recovered, as were a diverse mix of terrestrial and marine mammals. Of particular interest is the continued presence of northern fur seal at Año Nuevo. Although they are less dominant at SMA-18 than at SMA-218 (i.e., they compose 54% of the SMA-18 marine mammal assemblage, compared to 96% at SMA-218), they produced an age-sex profile probably indicating hunting activity at a nearby rookery.

The trend toward increasing settlement stability continues forward into the Late Period, where a residential site dating to 775 cal BP was found at SMA-97 just inside the tree line roughly 1.4 kilometers south of Point Año Nuevo. This site has a diverse assemblage that includes a significant amount of mortars and pestles for the first time on the coast—artifacts that are linked to sedentism or semi-sedentism in central California prehistory. Northern fur seals are also present at the site, and found in frequencies comparable to SMA-18 (i.e., 50% of the marine mammal bone). We don’t know the status of northern fur seals at Año Nuevo sites post-dating 775 cal BP because no faunal data are available, but they are essentially absent at all other Late Period sites in the region. Their presence at SMA-97 is somewhat surprising given their disappearance at many other places along the California coast before this time, and should be further investigated with direct radiocarbon dating of the bones from this site.

NORTHERN FUR SEALS AT AÑO NUEVO

Hildebrandt and Jones (2002) have divided marine mammals into two groups: terrestrial breeders and aquatic breeders. Terrestrial breeders, which include northern fur seals, cannot breed or give birth in the water. Instead, they form large rookeries on offshore rocks and islands where the nursing pups must stay on land for at least three to four months before going out to sea. Aquatic breeders, which include harbor seals and sea otters, can breed and give birth in the water and, therefore, do not form large rookeries. Although terrestrial breeders do not currently form rookeries on the mainland of California, Hildebrandt and Jones (2002) found evidence for their remains at numerous sites along the California coast, including places lacking offshore rocks. Moreover, terrestrial breeder bones tended to be present in only the oldest archaeological sites, and essentially disappeared later in time when they were replaced by harbor seals and sea otters.

Based on these findings, it was concluded that terrestrial breeders actually formed rookeries on the mainland in the prehistoric past. These lucrative resource patches were ultimately eliminated by Native hunters, who were then forced to switch their focus to the more elusive aquatic breeders (sea otters and harbor seals) or take on a more terrestrially oriented adaptation. Hildebrandt and Jones were not able to fully confirm their hypothesis, however, as the presence of a rookery must be documented with age-sex data (particularly the presence of adult males and pups) which they never did. Moreover, in places like Año Nuevo, where northern fur seals were the dominant terrestrial breeders recovered, it was necessary to accept the fact that a resident population of northern fur seals existed in prehistoric California. The latter issue is particularly controversial for the biological community, as the primary breeding area for this animal is currently on the Pribiloff Islands within the Bering Sea, and they are only known to stay far off the California coast when females and juveniles migrate south during the winter.

More recent research by a variety of individuals from UC Santa Cruz (e.g., Burton et al. 1999; Gifford-Gonzalez et al. 2005) indicates that breeding populations of northern fur seals probably did exist along the central California coast. Much of this work has focused on materials from MNT-234, a site located near Moss Landing. Analysis of stable isotope ratios from archaeological specimens indicates that the animals were feeding in mid-latitudes (as opposed to farther north near the Bering Sea). It also appears that the bones of pups have been discovered in the MNT-234 collection: they are the same size as known-age pups collected from the modern Pribiloff Island rookery, and analysis of nitrogen isotope ratios from their bones show they were feeding a one tropic level above the adults—that is, feeding on mother's milk.

Although isotopic analyses have not been completed on the northern fur seals from SMA-18, the age-sex data generated by this project includes neonates and a few adult males. These findings are consistent with those from MNT-234, and probably indicate that a nearby rookery was exploited. This discovery fulfills one of the major goals of the project, and clearly indicates that additional analysis of existing Año Nuevo collections (particularly material from SMA-218 and -97) should be completed in the near future.

Even though it appears that northern fur seals formed rookeries on the mainland, or in other near-shore contexts, there remains an additional problem with Hildebrandt and Jones' (1992, 2002) original hypothesis. If fur seal rookeries existed on the mainland prior to being eliminated by the actions of human hunters, why weren't they eliminated early in the Holocene? This question is particularly relevant for Año Nuevo because we know people were around at least by 6000 cal BP at Sand Hill Bluff, and probably earlier judging from Early Holocene components discovered in the Santa Cruz Mountains and farther south on Monterey Bay. Although we don't have the full Holocene sequence from Año Nuevo proper, we know that northern fur seals were available between at least 2600 and 1200 cal BP based on the findings from SMA-218 and -18.

The rather strange co-occurrence of northern fur seals and humans during the late Holocene has also been noted by Gifford-Gonzalez et al. (2005). They argue that a fur seal rookery, which includes copious amounts of protein, fat, and fur, would have been conducive for local ownership and conservation. In contrast to Jones and Hildebrandt's (1995) arguments for a "Tragedy of the Commons," where pinnipeds were a public good that was inevitably over-exploited due to the inherent lack of conservation practices in these situations, they suggest that such rookeries or haulouts could have been managed by local human populations (see also Lyman 2003). They also speculate that the decline of fur seals after 1000 cal BP may have resulted from a disruption in the local settlement system and inter-group dynamics due to medieval drought conditions, where declining terrestrial conditions may have required a more intensive use of marine resources, leading to the over-exploitation of local fur seal populations.

Data from the Año Nuevo area are largely consistent with these ideas, showing more intensive, long-term coastal occupations after 1000 cal BP. While some fur seal bone was found in the 775 cal BP component at SMA-97, evidence for this animal is essentially absent at other sites in the region after 1000 cal BP. As mentioned above, direct radiocarbon dates on the fur seal bone from SMA-97 should be obtained to verify true age of these findings. Analyses of faunal remains from additional Late Period sites recently excavated by Hylkema at Año Nuevo need to be completed, and will provide the data necessary to ultimately solve this problem.

ELEPHANT SEALS AT AÑO NUEVO

Commercial exploitation of seals and sea lions along the California coast began in the early 1800s and, in some cases, continued until the early 1900s. These animals were initially harvested for their oil and hides and later subjected to bounty hunting in many areas due to a perceived threat to local commercial fisheries. Northern elephant seals, which were originally found in highest densities along southern California and the northern coast of Mexico, were a preferred target of commercial hunters because they were slow and unafraid of humans, and rich in oil. They were hunted intensively for 40 years, and their population history during this interval was summarized by Le Boeuf (1981:296-297):

> By 1860, the population was so depleted that elephant seals were no longer considered an economically feasible source of oil; by 1869 the species was considered virtually extinct. By 1884 no elephant seals were seen anywhere, despite the fact that several museum expeditions made thorough searches to find them. However, in 1899, C. H. Townsend on a collecting expedition for the Smithsonian Institution was surprised to find 8 elephant seals on…Isla de Guadelupe. The museum collector killed seven of the seals.

Aided by legislative protection from the Mexican government in 1922, elephant seals began their rebound along the Baja California coast, and established breeding grounds in the early 1950s on the Channel Islands (San Miguel and San Nicolas), and along the central California coast at Año Nuevo Island by 1961. According to Stewart et al. (1994), the total elephant seal population increased at an annual rate of 6.3% between 1965 and 1991, and began colonizing new areas due to the lack of space at existing rookeries, including the Año Nuevo mainland.

This unbridled expansion of elephant seal populations over the last 30-40 years clearly illustrates their ability to succeed in the absence of human predation. Not only have their populations grown at an astounding rate, archaeological evidence indicates that they are expanding into areas that were rarely used before. Irrespective of time period, these animals are essentially absent from archaeological assemblages north of the Channel Islands (including sites at Año Nuevo; Hylkema 1991:385), and are found at relatively low numbers only at San Nicolas and San Miguel (Hildebrandt and Jones 2002). Moreover, it should be emphasized that their current breeding areas sometimes occur on top of major archaeological sites like SMA-18, clearly showing that their present behavior is completely different than what it was in the prehistoric past (i.e., it seems unlikely that the local Indians would abandon their coastal villages every winter so the seals would have somewhere to breed).

The northern expansion of the elephant seal is particularly anomalous given the unique reproductive behavior of this species. Whereas North American pinnipeds (e.g., Steller sea lion, California sea lion, northern fur seal, southern fur seal) all give birth and breed in early summer, northern elephant seals establish rookeries, give birth, and breed in winter. The winter breeding season aligns more closely with species of the southern hemisphere (Figure 24), probably indicating a more southerly origin for the species. Although the prehistoric archaeological database from Baja California coast is quite limited and sheds little light on this issue, it seems likely that it will reveal a much higher proportion of elephant seal bone than found along the California and Oregon coasts, proving further evidence for the rather strange, historical distribution of these animals.

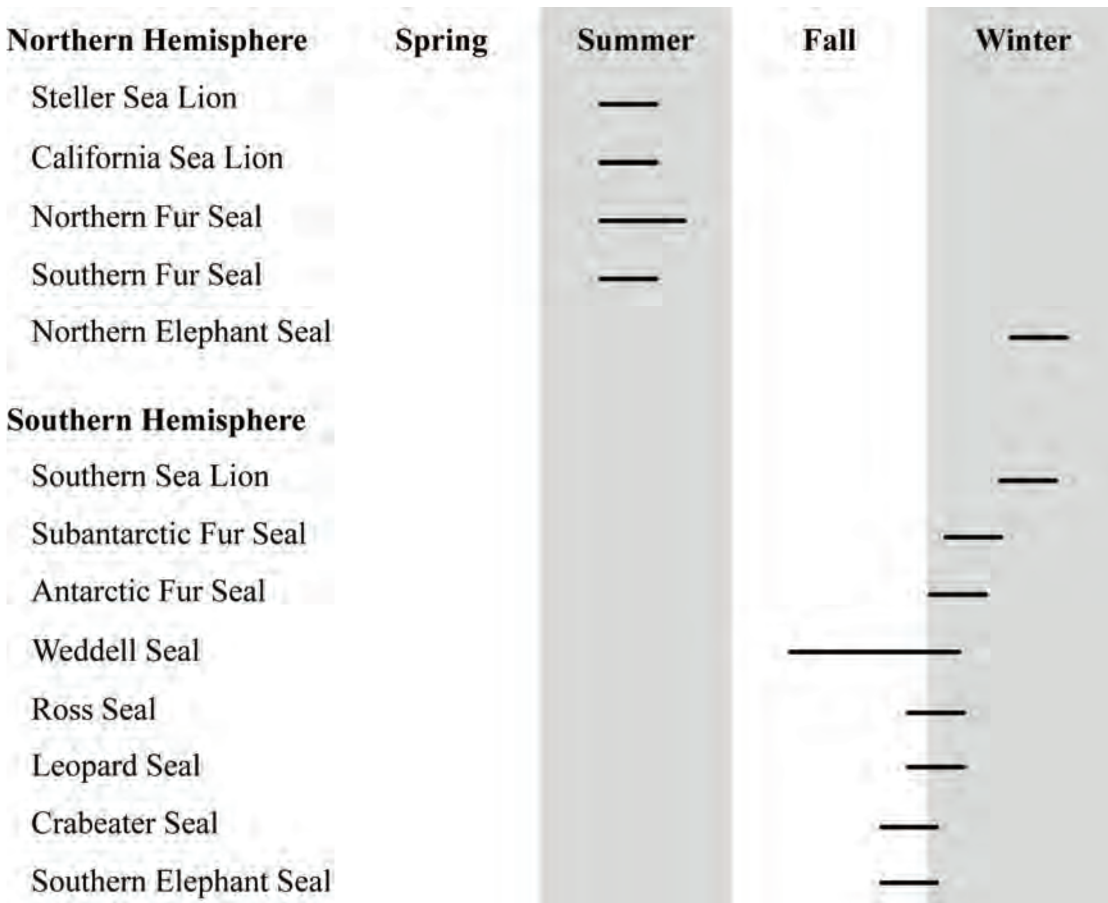


Figure 24. Correlation between Breeding Season and Geographic Distribution of Key Principal Species.

FINAL COMMENTS

Although it is unfortunate that SMA-18 is being destroyed by the modern breeding behaviors of the northern elephant seal, our excavation effort has obtained an outstanding suite of information. The information generated from SMA-18, when combined with data from previous excavations at other nearby sites, has increased our understanding of prehistoric settlement pattern changes along this beautiful stretch of California's coast, and identified several important research issues regarding the impact of Native American hunters on local fur seal populations. While it seems clear that prehistoric peoples contributed to the decline of fur seals along the California coast (Hildebrandt and Jones 2002), data from Año Nuevo and other central coast sites may indicate that this resource was conserved through private ownership for a considerable period of time prior to its demise (Gifford-Gonzalez et al. 2005). The relationship between private ownership and conservation is a major research issue for prehistoric archaeologists working throughout the world (Alvard 2002), and illustrates the wide-reaching importance of the Año Nuevo archaeological record.

It is also important to stress that archaeological sites in this area contain valuable biological information for people interested in historical ecology and modern strategies for habitat/species restoration and management. We have already discussed the international interest in the prehistoric distribution of northern fur seals (see *Introduction* on page 1), and the discovery of Coho salmon at SMA-18 has obvious implications for the current management of local streams. The prehistoric archaeological record is one of the few (if not the only) source(s) of information on the past behavior of pinnipeds and anadromous fishes. There is no Holocene paleontological record available for these animals, and the modern behavior and distribution of northern fur seals, elephant seals, and Coho salmon provide a poor analog for what occurred in the past. Given this situation, it is important for those who are responsible for managing the prehistoric sites at Año Nuevo to consider not only the cultural value of these deposits, but the biological values as well.

PART II: HISTORICAL DOCUMENTATION

Introduction

Operating between 1872 and 1948, the Año Nuevo Island Light Station formed an important part of the aids to navigation along California's coast south of San Francisco (Figure 25). Installed as a result of several catastrophic shipwrecks along the nearby coastline, the station initially contained a fog signal. Later, a light was added, along with an elaborate keeper's dwelling, tramway, dock, boathouse, and various other support facilities. Following the island's abandonment, however, these historic structures were left to deteriorate. Vandalism took an exacting toll, and seals inhabited the interior of the keeper's dwelling. No coordinated efforts were ever made to document or evaluate the historic resources present on the island. Though the historic importance of these buildings was recognized, they were allowed to decay. Maintenance, of course, is very difficult, and funding is limited. Some feared that maintenance, stabilization, or rehabilitation had the potential to negatively impact the animals residing on the island. Nevertheless, the light station complex appeared to be historically significant, potentially eligible for listing in the National Register of Historic

Figure 25. Oblique Aerial Photograph of Año Nuevo Island in the Early 1960s.

Courtesy of California State Parks.

Places as a Historic District. A clearer understanding of the complex's contributing and noncontributing aspects was required. Evaluation of the integrity of the existing buildings was also needed. With this information, better management decisions could be made. This then, was the goal of the current project. Funded by a grant from the California Department of Parks and Recreation, Cultural Resources Division, the project seeks to provide a historic context for the light station complex, as well as a basic level of documentation of the remaining features.

Methods

During the current project, archival research was performed at a variety of federal, state, local, and private institutions. Documentary resources in California Department of Parks and Recreation possession formed the basis for this research, and provided leads for further research. Offices visited included the following:

- Año Nuevo State Reserve, Headquarters
- Archaeology Laboratory, Sacramento
- Central Records, Sacramento
- Central Service Center, Monterey
- Cultural Resources Division Archives, Sacramento
- Northern Service Center, Sacramento
- Santa Cruz District Office, Felton

Following the collection of secondary sources from the above locations, primary research was performed (in person or by mail) at the following repositories:

- California Historical Society, Baker Research Library, San Francisco
- California State Archives, Sacramento
- California State Library, California Room and Government Publications Section, Sacramento
- National Archives and Records Administration, College Park and Suitland, Maryland and Washington, D.C.
- National Archives and Records Administration, Pacific Branch, San Bruno, California
- Redwood City Public Library, Redwood City
- San Mateo County Museum of History and Art, Redwood City
- San Mateo Coast Natural History Association, Half Moon Bay
- University of California, Berkeley, Bancroft Library
- University of California, Santa Cruz, Special Collections Library
- U.S. Coast Guard, San Francisco
- U.S. Geological Survey, Menlo Park
- U.S. Lighthouse Society, San Francisco

In the past, lighthouse keepers and their descendents have provided important information on their experiences on Año Nuevo Island. These recollections were gathered and reviewed during the archival research phase of the project. Attempts to re-contact these people were also made, though unsuccessfully.

FIELDWORK

Although the entire island was surveyed for archaeological resources in 1984, none were found. In 1982, a Historic Resources Inventory was completed for several of the structures on the island (Woodward et al. 1982). Several of the photographs from that inventory project are included in this report in order to illustrate changes occurring to the island since that time. For the current project, two trips were made to the island by the author during April and May 2005. The purpose of these trips was to document the remaining historic resources on the island. Photographs were taken of each of the structures and features, locational data was gathered (using a handheld GPS unit), and measurements of some of the standing buildings were made. The goal of this fieldwork was to document the structures to the level of the DPR 523A and B records. Unfortunately, access to the island is limited due to sensitive bird and pinniped species residing there. The keeper's dwelling, in particular is off limits for most of the year. For the rest of the island, access is only allowed via a recently constructed boardwalk, in order to not disturb several species of birds.

Historic Context

Various means by which to warn and direct mariners have been used since man first ventured into the open water. Though early warnings systems often consisted of signal fires on promontories overlooking the water, lighthouses themselves have been in use since ancient times. The first recorded lighthouse was at Alexandria Egypt, built in 285 B.C. In North America the first lighthouse was built on Brewster Island in Boston Harbor in 1716 (Welts 1969).

In the United States today, there are numerous types of lighthouses and light stations representing many architectural styles. The country, in fact, has the largest number of lighthouses, which are also the most architecturally diverse of any country in the world.

Though their origins were in simple lamps, eventually the following features would encompass the aids to navigation used throughout the country:

- Manned lighthouses
- Unmanned lighthouses
- Sound signals (fog signals)
- Range lights (pairs of lights)
- Daymarks (beacons)
- Lightships (floating light stations)
- Buoys

U.S. Lighthouse Service

During the pre-federal period, lighthouses were owned and operated by the individual colonies and successor states. They were largely paid for by assessments on ships coming into port. In order to discontinue the act of states assessing others unfairly, Congress placed the jurisdiction of lighthouses under control of the Treasury Department in 1789. An act of August 7, enabled the states to transfer their lighthouses and lighthouse sites to the federal government, and vested their oversight in the Secretary of the Treasury. Secretary of the Treasury Alexander Hamilton personally reviewed contracts as well as the appointment of keepers before sending the documents to President Washington for his signature. Responsibility for the U.S. Lighthouse Service (the name given to federal lighthouse operations and lighthouse site maintenance) was delegated by the Secretary of the

Treasury to the Commissioner of Revenue in 1792. In 1820, Stephen Pleasonton, the Firth Auditor of the Treasury, was assigned the responsibility of the administration of the nation's lighthouses and other aids to navigation. He administered the U.S. Lighthouse Service for the next 32 years. The number of lighthouses grew dramatically during this period.

Initially, lights themselves consisted of lamps with wicks that needed constant tending, with the lamps themselves needing to be trimmed every few hours. By 1810, a lighting system was developed by Winslow Lewis that consisted of lamps and reflectors that provided a great improvement over earlier lighting. Utilizing what was known as an Argand lamp, Lewis' light consisted of a parabolic reflector system that provided a brighter light and used less oil than previous lights. They were installed soon thereafter in most U.S. lighthouses. Unfortunately, the U.S. government would become so wed to this design, that latter improvements would not be adopted for many years thereafter.

Under the U.S. Lighthouse Service, the nation was divided into eight districts, with a naval officer assigned to each. The officer examined the condition of existing lighthouses and made recommendations for sites for new ones. As the result of numerous complaints, Congress commissioned an investigation into the country's lighthouse system. The investigation determined that many of the nation's lighthouses were poorly maintained. Further, it was noted that new advances were not being implemented. While U.S. lighthouses used the Argand lamp and parabolic reflector system, most European countries had adopted the new Fresnel lens (Figure 26). Invented in 1822, by Augustin Fresnel, the lens was far superior to any previous lights. It contained a single lamp with prisms at the top and bottom that refracted the light such that it emanated from the lens in a narrow sheet. The light was also intensified at the center by a powerful magnifying glass. The result was a bright, narrow sheet of concentrated light. Unfortunately, the federal government stubbornly stuck with the older, inferior Lewis-developed lamp, greatly hampering the abilities of the country's lighthouses. Another problem besetting the nation's lighthouses was the lack of a notification system that would inform mariners of new navigational aids, or changes in the existing array. For these reasons, the U.S. was far behind most European countries. In an effort to improve the system, a 9 member Lighthouse Board was created in the Department of the Treasury by an act of August 31, 1852. Oversight of the nation's lighthouses was transferred, October 9, 1852, to this board.

U.S. Lighthouse Board

The Lighthouse Board was composed of those who performed the earlier investigation, including prominent military officers and civilian scientists. Soon thereafter, the country was divided into twelve lighthouse districts, each with an inspector. The Lighthouse Board attempted to play "catch-up," by applying new technologies to the country's lighthouses. Fresnel lenses were installed, and more advanced construction techniques were used on the light stations. Advances in the technology of fog signals were developed, providing each with a unique sound. The new technology was soon applied to those in service, as well as those under construction. The first lighthouse on the west coast was also built during this period. Over the next several decades, the Lighthouse Board succeeded in standardizing the nation's lighthouses, improving their technology, and creating a group of professional lighthouse keepers (National Park Service 2001).

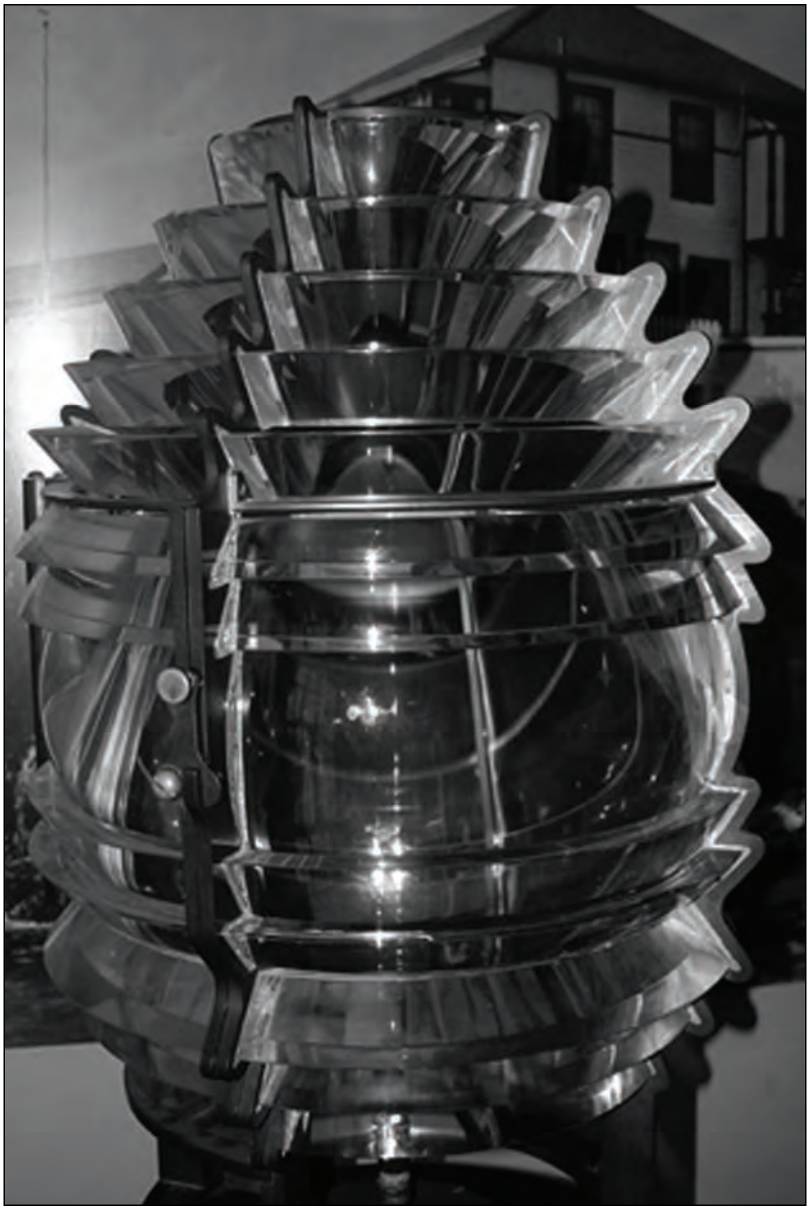


Figure 26. Fresnel Lens from the Angel Island Lighthouse.

BUREAU OF LIGHTHOUSES

The Lighthouse Board was transferred to Department of Commerce and Labor on February 14, 1903. The board was re-organized and re-designated the Bureau of Lighthouses by an act of July 27, 1910. The Bureau hired a number of civilians, replacing military officers in many important roles. As a result, the agency became more civilian in nature. President Taft selected George R. Putnam to serve as the head of the new bureau. Over the next 25 years, Putnam strove to improve the technology of the country's aids to navigation, the number of which more than doubled during his tenure.

The Bureau of Lighthouses was assigned to the Department of Commerce when the latter was separated from the Department of Labor on March 4, 1913. During World War I, several technological advancements contributed to the automation of lighthouses, which eventually precluded the need for human occupancy of the stations. Improvements such as automatic radio beacons, automatic time clocks, photo electric-controlled alarm devices, and battery-powered buoys changed the nation's aids to navigation into an automated system. By the late 1920s, most light stations had electricity, which further reduced the number of staff required to run them (National Park Service 2001).

U.S. COAST GUARD

The Bureau of Lighthouses was abolished on July 1, 1939, with its functions transferred to the U.S. Coast Guard. The Coast Guard had been established on January 28, 1915, within the Treasury Department, merging the Revenue Cutter and the Life Saving Services (Table 21).

Table 21. Jurisdiction over U.S. Lighthouses.

DEPARTMENT OF THE TREASURY
Lighthouse Service (1792-1852)
Revenue Marine Division (1843-49, 1871-94)
Revenue Cutter Service (1894-1915)
Life Saving Service (1871-1915)
Steamboat Inspection Service (1852-1903)
Bureau of Navigation (1884-1903)
Bureau of Customs (vessel documentation functions only, 1942-1966, to USCG)
DEPARTMENT OF COMMERCE AND LABOR
Lighthouse Board (1903-1910)
Bureau of Lighthouses (1910-1913)
Steamboat Inspection Service (1903-1913)
Bureau of Navigation (1903-1913)
DEPARTMENT OF COMMERCE
Bureau of Lighthouses (1913-1939, functions to USCG 1939)
Steamboat Inspection Service (1913-1932)
Bureau of Navigation (1913-1932)
Bureau of Navigation and Steamboat Inspection (1932-1936)
Bureau of Marine Inspection and Navigation (functions relating to vessel inspection, navigation, and merchant seamen, 1936-1942, to USCG)

Several new technologies were proven during World War II, including radar and radio. These developments, joined together with the development of short-range aids to navigation (SHORAN) and long-range aids to navigation (LORAN), lighthouses became increasingly obsolete. By the end of the war, the Coast Guard sought to automate as many of the lights as possible. This was accomplished for several reasons, including reduction of cost, removing personnel from isolated and hazardous locations, and making billets for reprogramming. This effort was partially successful, and by 1962, only 327 lighthouses were still manned. In the mid-1960s, the Lighthouse Automation and Modernization

Program (LAMP) further reduced the need for lighthouses and their personnel. Under this program the Coast Guard utilized automated beacons in place of the traditional lighthouse towers. With personnel no longer occupying the old stations, many fell into disrepair. Animal infestation, moisture intrusion, rust, corrosion, and vandalism all took their toll. By 1990, all but one lighthouse (Boston Lighthouse) had been completely automated.

In the ensuing years, the Coast Guard began to construct aids to navigation on steel structures or buoys, instead of inside the lantern of a traditional lighthouse tower. As such, the old buildings themselves were further neglected and abandoned. Only through grass-roots efforts have many historic light stations been preserved. Increasingly, the Coast Guard leased the buildings to interested historical groups, and has transferred lighthouses to other agencies (National Park Service 2001).

FACILITIES

Though often used interchangeably, lighthouse and light station have distinct meanings. The U.S. Lighthouse Service's 1915 definition of a lighthouse was "a light station where a resident keeper was employed." Today, the definition is broader, with lighthouses being structures or towers built in strategic locations to contain and elevate lights. The lights themselves are considered the aids to navigation. Light station refers to not only the lighthouse itself (or the tower for the light), but all the buildings supporting the lighthouse, including keeper's dwelling, cisterns, boathouse; as well as other aids to navigation such as fog signals and their support structures.

In the early years of light stations, facilities generally included the light tower, a dwelling, a garden site, a place to store oil, and some kind of animal husbandry facilities for supplemental food (chicken coop, small cow barn, etc.). This model gradually changed with the increased sophistication of aids to navigation. More support structures were needed as new technologies were brought into play, such as the Fresnel lens and more advanced fog signals. Facilities such as workshops, garages, boathouses, tramways, and fuel storage buildings were required by the 1850s. New employees were also necessary for the operation of the increasingly sophisticated light stations, and additional residences were constructed to house them.

According to some sources, designs of lights and light stations were left to the district in which the station was situated. This responsibility resided with the district engineer, who was to make a personal inspection of each site, then submit plans for the construction. In some cases, however, designs were developed in Washington, D.C. (Roland 1991).

Typical facilities on most light stations are provided below.

Light Tower

Several different construction techniques and styles were used in light towers. Screwpile, caisson, and skeletal tower lighthouses were all technological developments that led to improved light facilities. Today, the various types can be categorized into the following types:

- Wood tower
- Masonry tower
- Wave-swept tower

- Concrete tower
- Cast-iron tower
- Skeletal tower
- Straightpile
- Screwpile
- Crib
- Caisson
- Texas tower

Lighthouses themselves were built with a variety of materials including wood, stone, brick, reinforced concrete, iron, and steel. Brick and stone masonry were the most widespread, as lighthouses had to be built of durable material to withstand harsh conditions. A tower served as a support for the lantern, which housed the light itself. The lantern generally consisted of a round, square, octagonal, or decagonal-shaped enclosure. These were generally made of cast-iron, and were surrounded by a stone or cast-iron gallery with railing. Stairs (of varying types) led to the lantern at the top of the tower. A watch room was in place at the top of the tower where an employee would maintain the light and ensure its proper functioning. The lantern room itself was generally above this room. Other features often included ventilators, lightning-conductor spindles, lantern ladders for cleaning the plates, curtain hooks, and others (U.S. Lighthouse Establishment 1907).

Regional differences affected the type of facilities installed. Lighthouses on the east coast tended to have tall towers to elevate the lens high enough to be visible at sea for several miles. On the west coast, however, shorter towers were built on rocky cliffs, high enough to project out to sea (Figure 27).

Lantern

Prior to the adoption of the Fresnel lens, there was no standard design for lanterns. Early lanterns consisted of thin copper frames holding small panes of glass. Fresnel lenses, which were adopted in the United States by the 1850s, came in seven standard orders or sizes, depending upon the power of light needed (1st order being the brightest). Four sizes of lanterns were established to house these different orders. The lanterns consisted of cast-iron plates, in six, eight, and ten sides, with large panes of glass set in metal panels. One set of these metal panels were hinged to allow access to the lantern. In the late nineteenth century, the helical bar lantern was introduced, which contained diagonal astragals as opposed to the earlier vertical ones. Fuel was brought to the wick for the light in a variety of ways, including what was termed Carcel, Lepaute, and Funck methods (the latter of which was employed at Año Nuevo Island). By the 1850s, fuel used in the lights consisted of whale oil. New kinds of oil were experimented with over the next several years, and by the early 1870s, kerosene began to be used in place of earlier oils. By the turn-of-the-century electricity was tested by the Lighthouse Board in some lighthouses, though it was not until the 1920s that most were completely converted (Holland 1988).

Figure 27. Point Sur Lighthouse, circa 1920s.

Courtesy of California State Parks.

Keeper's Dwellings

Early light stations generally had only one keeper, and as such, one dwelling. Following the creation of the Lighthouse Board in 1852, and the application of the Fresnel lens, more keepers were assigned to each station. Often, the additional housing needs were met with duplex, triplex, or quadplex dwellings. By 1913, however, the Lighthouse Board favored separate housing (as opposed to the attached), following complaints of lack of privacy (Figure 28, Figure 29, and Figure 30). As lighting apparatus grew heavier, towers were often constructed over the keeper's dwelling to provide additional foundational support. Generally, the dwellings adapted to the latest architectural styles, as well as to geographical conditions. However, there are many exceptions to this, particularly in the west.

Oil Houses

Fuel oil was predominantly stored in the lighthouse in the early years, but by the early 1850s it was stored in basements or attached structures (Figure 31). By 1890, however, most lighthouses were using kerosene, which necessitated the construction of separate structures built of brick, stone, or concrete.

Figure 28. Keeper's Quarters at Point Cabrillo Lighthouse, 1924.

Courtesy of California State Parks.

Figure 29. Wood End Light Station, Massachusetts.

Figure 30. William F. Steele (at left) with Paul Fielding, Head Keeper at Pigeon Point Light Station, and Unidentified Man, at Keeper's Dwelling, Unknown Date.

Courtesy of Department of Special Collections, Stanford University Libraries.

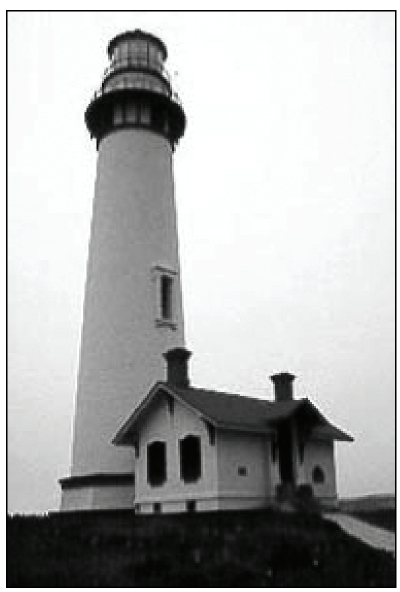


Figure 31. Pigeon Point Lighthouse showing attached Oil Room and Shop Structure.

Courtesy of California State Parks.

Fog Signal Buildings

Designed to assist mariners in heavy fog, fog signals were constructed in those parts of the country where fog was common and prevalent (including much of the west coast). The nation's earliest fog signals were cannons. Fog bells were first employed in the 1820s, which were rung by hand. By the 1850s, other signals were experimented with, including whistles, horns, and trumpets (Figure 32, Figure 33). Eventually (1860s), a mechanical means was developed whereby bells could be rung automatically. The first siren fog signal was used in 1868. By the late nineteenth century, steam-operated whistles were installed in many places. These were fueled by cordwood or coal, which had to be supplied in large volume to the station. Often, up to an hour was required in order to produce enough pressure to sound the whistle. These steam whistles required a great deal of maintenance and periodic care. Each fog signal station sounded its own distinctive sound pattern so that mariners could locate themselves. Following the turn-of-the-century, a Canadian invention known as the diaphone, which were diesel-powered, air-pressure phones that gave off a two-tone sound were also used. Another invention in the 1920s, called a hydroscope, measured moisture in the air, and automatically activated the signal when moisture levels were high. Eventually, electricity was applied to fog signals beginning in the 1920s, greatly reducing the need for their tending. Radar and other electronic aids to navigation eventually made fog signals completely obsolete by the 1970s.

The earliest structures to house the fog signals were wood or iron bell towers. On some stations, the fog signals were installed on the light tower, outside the top of the keeper's dwelling (Figure 34, Figure 35). As signals became more sophisticated, a large amount of equipment was required, including steam or compressed air apparatuses, switchboards, generators, engines, tanks, pumps, and tools. These were housed in the fog signal buildings, located in stand-alone buildings, often barn-like in appearance. They were generally simple in plan and design.

Boathouses

Only those light stations located offshore needed boats, and eventually, the Lighthouse Board authorized the construction of boathouses at some of these stations. Most were simple buildings, with iron rails on which to pull the boats in. Generally, two boats were assigned to each offshore station, which hung suspended from davits on opposite sides of the building. Boats were permitted not only for the daily business of the station, but also for the rescue of fishermen and other kinds of boaters in trouble, as well as downed planes.

Barns and Garages

Some light stations included barns where horses or a cow could be sheltered (Figure 36). Some later stations contained automobile garages. Store houses were also frequently constructed to store equipment, provisions, spare parts, and wood.

Privies

Early stations relied on privies prior to the construction of sewer systems. Many isolated stations relied on privies far longer than those stations closer to urban areas. Most offshore stations, for example, used privies, as the installation of sewer systems was prohibitively expensive. Most of these offshore privies emptied directly into the sea. Like those built onshore, these structures were simple, unadorned one-room facilities usually made of wood.

Figure 32. Fog Signal Building at East Brother Lighthouse, Richmond, California.

Steam whistle is immediately left of large smokestack. Photograph by Nels Stenmark.

Figure 33. Fog Horn Building at Split Rock Light Station, Minnesota.

Photograph by Dave Wobser.

Figure 34. Combination Fog Signal and Lighthouse Building at Point Cabrillo, California, circa 1930s.

Figure 35. Original Fog Signal Building at Pigeon Point, built in 1872.

Courtesy of California State Parks.

Figure 36. Barn at Point Sur, 2002.

Courtesy of California State Parks.

Water Collection and Storage Systems

While some stations were fortunate enough to contain wells or have access to springs, many others did not. To provide water for drinking, washing, and for steam-powered whistles, collections systems were developed. Rain water was collected from the roofs of structures and channeled into reservoirs. Large catch basins (known as water or rain sheds) were used in drier regions where rainfall was light. These catchment basins were made of either cement or brick covered with cement, and were connected to storage cisterns and tanks. Many stations contained water storage tanks generally elevated above the ground on tank buildings.

Tramway/Catwalks

Tracks were constructed to run from landings to the light or other buildings on the station, for purposes of transporting supplies and equipment. Many stations also contained catwalks that provided the keepers with access to the light from their quarters. These were particularly necessary in those stations that were subjected to severe weather.

KEEPERS

Those placed in charge of the lighthouses and stations were known as keepers. They were given strict instructions regarding the lighting, maintenance, and cleaning of the lamps; keeping track of and maintaining stores of oil; absence from the lighthouse; and correspondence with the superintendent. They were forbidden to sell or allow to be sold any liquor on the grounds of the light station. These rigid instructions and requirements were maintained over the years, and enforced by manuals of instruction. Inspectors visited the stations within their districts quarterly. In the *Instructions to Employees of the Lighthouse Service*, written in 1881, strict regulations were set forth:

> The Keeper is responsible for the care and management of the light, and for the station in general. He must enforce a careful attention to duty on the part of his assistants; and the assistants are strictly enjoined to render prompt obedience to his lawful orders…. Light-keepers may leave their stations to attend divine worship on Sundays, to procure needful supplies, and on important public occasions…
>
> Watches must be kept at all stations where there is an assistant. The keeper on watch must remain in the watch room and give continuous attention to the light while he is on duty. When there is no assistant, the keeper must visit the light at least twice during the night between 8 p.m. and sunrise; and on stormy nights the light must be constantly looked after."… He must be careful to prevent waste, theft, or misapplication of light-house property…
>
> Light-keepers must not engage in any traffic on light-house premises, and they must not permit it by anyone else. They must not carry on any business or trade elsewhere which will cause them to be often absent from the premises, or to neglect, in any way, their proper duties…
>
> The visits of the Inspector or Engineer, or of the lampist or machinist, and an account of any work going on or delivery of stores must be noted; as also any item of interest occurring in the vicinity, such as the state of the weather, or other similar matter. The books must be kept in ink, with neatness, and must always be kept up to date [as quoted in National Park Service 2001]

In the section entitled *Care of Lights and their Appurtenances*, detailed instructions were provided on the care of the optics. The keepers were to hang lantern curtains each morning and to wear a linen apron to protect the lens. The lens and lantern glass were to be cleaned daily, and rouge was used to polish it, and a "rotten-stone" to shine the brass. Keepers were required to cut replacement glass for the lantern when necessary. The revolving clockwork and carriage rollers were to be kept properly oiled. The last section, entitled *Allowances of Provisions* included descriptions of provisions for what were considered particularly isolated stations. The allowances, amended in 1883, provided for the following:

- Beef 200 pounds
- Pork 100 pounds
- Flour 1 barrel
- Rice 25 pounds
- Beans 10 gallons
- Potatoes 4 bushels
- Onions 1 bushel
- Sugar 50 pounds
- Coffee 24 pounds
- Vinegar 4 gallons[as quoted in National Park Service 2001]

Standardized logs were developed in which the keepers were to record activities occurring on the station, expenditures, shipwrecks, and other information. By 1852, the appointment of keepers was restricted to those between the ages of 18 and 50, who could read, write, keep accounts, perform routine manual labor, pull and sail a boat, and make minor repairs to structures and equipment. Keepers were frequently retired sea captains. Assistants were often young men with some sea experience. Fog signals required assistants with some mechanical experience. By 1883, keepers were issued uniforms consisting of coat, vest, trousers, and cap in a dark indigo blue color.

LIGHTHOUSES IN CALIFORNIA

No lighthouses had been built in Alta California during the Spanish or Mexican periods. When the territory was added to the United States following the Mexican War, the federal government faced a difficult task in providing aids to navigation along this long and jagged coastline. During the Gold Rush, ship traffic to California ports increased dramatically. The state's population exploded to 255,000 by 1852, and that same year a total of 1,147 ships arrived in the port of San Francisco. Obviously, aids to navigation were necessary, particularly given the rugged nature of the California coast. The U.S. Lighthouse Service petitioned Congress for lighthouses on the west coast, and money was first appropriated for lighthouses in California in September 1850, only a few months after statehood. The U.S. Coast Survey was given the responsibility of determining the actual sites for the new lighthouses. As a result, 16 lighthouses were slated for construction on the west coast, eight of which were to be built in California. Contracts were made with the firm of Gibbons and Kelley. The contract called for a Cape Cod-style structure, consisting of one and one-half stories with the light tower in the middle of the building (Figure 37). The first was built on Alcatraz Island in San Francisco Bay, finally lit on June 1, 1854.

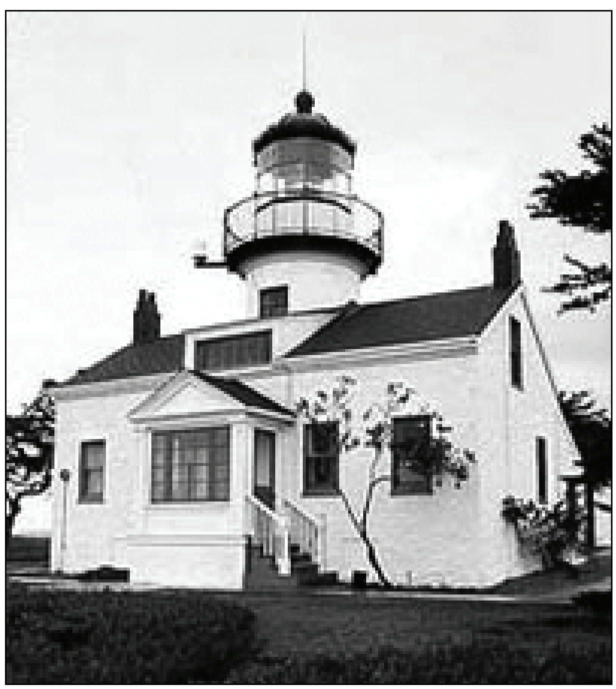


Figure 37. Point Pinos Lighthouse, 1990.

Courtesy of the National Park Service. Photograph by Candace Clifford.

Following the establishment of the U.S. Lighthouse Board, California was included in the area of the 12th District, with headquarters in San Francisco. It appears that the Lighthouse Service did not draw upon local architectural traditions when designing its west coast light stations. The Cape Cod style continued to be applied most frequently. All of the first light stations in the west coast built in the years between 1852 and 1858 in fact used this style. The design for these structures was developed by Ammi Young, a prominent architect who was employed by the Treasury Department.

Año Nuevo Island

SPANISH EXPLORATIONS

The land encompassing what is now California remained largely unexploited during its control by Spain. Nevertheless, the conquest of Mexico during the 1520s, and the development of the port of Acapulco gave the Spanish a base for operations farther north along the Pacific coast. During the 1540s, Portuguese explorer Juan Rodriguez Cabrillo, acting on behalf of the Spanish Crown led the first naval expedition to explore the coast of California, and claim the land for Spain. Cabrillo was in search of a passage between the Atlantic and Pacific, known as the Strait of Anian. His command consisted of two ships (or three depending upon the source), and 250 men. Only a few years earlier, California was thought to be an island, illustrating how limited the knowledge of this area was. After stopping for a short period in present-day Ventura, his party sailed west through the Santa Barbara Channel. Cabrillo broke his arm (or leg) on San Miguel Island that month, the wound never completely healing, and likely became infected. The flotilla continued its explorations of the California coast, ranging as far north as the Russian River. Bad weather forced them back to the well-known safety of the Santa Barbara Channel. The broken arm (or leg), however, eventually got the better of him, and Cabrillo died as a result of the unhealed injury in January 1543 (Schoenherr et al. 1999:266). Cabrillo passed near Año Nuevo, and though some scholars claim he made no note of Año Nuevo point, others claim he called it "Cabo de Nieve" (Snowy Cape). Cabrillo and other subsequent explorers did, however, note the extensive populations of seals and other marine mammals during their journeys through the region.

Cabrillo's and latter expeditions failed to find the riches so manifest in Mexico, and interest in the area soon waned. California was largely left to its original inhabitants, who were scattered in villages along the coast. California waters were, however, regularly visited by Spanish vessels, particularly the huge treasure ships out of the Philippines, which began their rounds during the 1560s.

Sebastian Vizcaino was sent to explore the coast of California in 1602, to locate a good harbor in order to protect Spain's highly prized Philippine shipping routes. His fleet consisted of three ships, which departed Acapulco in January. By December, the party reached the Santa Barbara Channel. Pressing northwards, the fleet eventually came to Monterey Bay. Vizcaino and his fleet reached the Año Nuevo area soon after New Years day of 1603, and the expedition's chaplain and diarist, Father Antonio de la Ascension labeled the point on his map "Punta de Año Nuevo." The expedition, in fact, believed the point was the north end of Monterey Bay (Le Boeuf 1975:1; Holland 1963:149). After Vizcaino's expedition, there was virtually no Spanish exploration of Alta California for over a century and a half.

AMERICAN PERIOD

Following the Gold Rush, large numbers of Americans began arriving in California. In 1850, California became a state, and thousands of acres of rancho property that had been granted to Mexican citizens began to be turned over to Americans. In 1851, Isaac Graham acquired the Rancho Punta de Año Nuevo north of Santa Cruz from the heirs of the original owners (the Castro family). Although he did not live on the rancho, he leased much of the land out for cattle ranching. Some reports claim that he constructed one of the first houses in the area, known thereafter as the Isaac Graham House on Whitehouse Creek. There were very few other buildings in the area at the time.

Because of financial difficulties, Graham was unable to hold onto Rancho Punta de Año Nuevo, and it was sold at public auction in 1862 to John H. Baird, for $20,000. Baird quickly turned the property around to Loren Coburn for $30,000. Coburn had arrived in California in 1851, and built a fortune in the livery business in San Francisco and Oakland. Coburn purchased both Punta de Año and Rancho Butano with his brother-in-law Jeremiah Clark. After largely buying out Clark, Coburn became the owner both of these immense ranches. Coburn was a shrewd businessman and soon leased much of the land to a northern California dairy enterprise operated by the Steele Brothers. The Steele dairies soon thrived along this portion of the coast.

Soon after arriving, the Steele's gave William W. Waddell (who was living in a canyon to the south) a right-of-way across their land in order to build a landing and wharf. Waddell, like others in the area, built a saw mill on his property, and hoped to find a better way to get his lumber to market. Waddell constructed the wharf approximately 500 yards west of Año Nuevo Creek, where the water was deep and there were no dangerous reefs. By 1864, Waddell had completed the 700-foot wharf, complete with swinging chute at the end to serve deep water schooners. By 1867, the wharf was handling two million feet of lumber per year. For the next 13 years, this wharf served Waddell's mill, the Steele's mill, and others in the region. A lumber yard, warehouse, store, and other buildings were built at the landing to the wharf, and soon became known as Waddell's Landing. Lumber was carried in four-horse flat cars, and large bundles of shingles from nearby mills were sent by a slide to waiting schooners (Stanger 1963). As such, Point Año Nuevo served as a shipping location for locally produced lumber as well as dairy products from nearby farms.

A DANGEROUS COASTLINE

Point Año Nuevo, Pigeon Point, and Franklin Point, all presented hazards to ships passing along the coast. They each contain a low profile of rocks projecting into the sea. Point Año Nuevo Point was described aptly by Col. Albert Evans: "It is a place where black reefs of rock rear their ugly gangs, like wild beasts waiting for their prey" (as quoted in Le Boeuf 1981:37). As early as 1853, the U.S. Coast Survey began charting the Pacific Coast, including the area along Point Año Nuevo. Coast Survey Assistant, A.M. Harrison led a partly along the landward side of Monterey Bay. His recommendations (submitted in an 1855 report) included building a lighthouse at Santa Cruz, but perhaps more urgently one at Point Año Nuevo. Harrison expressed the need:

> Point Año Nuevo possesses all the requisites as a site for a guide to Santa Cruz harbor, and would also prove of advantage to vessels in the coasting trade. This point once made, it becomes a matter of little difficulty to reach Santa Cruz; and vessels from the northward, bound to Monterey, and even up and down the coast, would find a light here very serviceable… [as quoted in Perry 1982:20].

While another surveyor, Lt. Commander T.H. Stevens recommended the establishment of a lighthouse on the island, Harrison believed it should be placed on the point on the mainland. This would make it far easier to service. Though other Coast Survey personnel agreed with the recommendations that a lighthouse be built at Año Nuevo, a lighthouse at Santa Cruz was authorized and constructed first. This would not happen until the late 1860s, however. There were several reasons for the delay, including title to the land, the coming of the Civil War, and lack of funding.

With the thriving shipping activity, numerous wrecks occurred along this treacherous stretch of coastline (Table 22). One of the earliest recorded wrecks was the *Carrier Pigeon* on June 6, 1853, and leading to the change in the name of the point from Whale to Pigeon Point. The Carrier Pigeon was a merchant clipper ship, departing from Boston in January 1853, sailing around Cape Horn to the California coast. As thick fog obscured the shoreline, the ship ran aground and eventually broke apart. Although no lives were lost, the entire cargo was. On January 17, 1865, another clipper, the *Sir John Franklin* on its way to San Francisco from Rio de Janeiro broke apart on the rocks between Pigeon and Año Nuevo points. The dense fog made visibility virtually zero, and the ship became lost. A great deal of cargo, including coal oil, hundreds of barrels of spirits, candles, along with cases and bales of other goods floated ashore (*Alta California* 1865 20 January). The crew attempted to reach shore through the treacherous surf, but only three made it. Thirteen died, many of whom were buried on the point. As a result, the site was named Franklin Point thereafter. Amazingly, much of the salvageable cargo was returned to the owners by locals who had collected it from the beach. One of the most infamous wrecks was the *Coya*, on November 24, 1866, which while in deep fog hit a reef and sank quickly. Again, weather was to blame as the ship

Table 22. Shipwrecks near Point Año Nuevo.

Date	Ship	Location	Type
1853	Carrier Pigeon	Pigeon Point	Clipper Ship
1865	Sir John Franklin	Franklin Point	Clipper Ship
1866	Coya	Pigeon Point	British Iron Bark
1868	Hellespont	Pigeon Point	British Ship
1887	J.W. Seaver	Point Año Nuevo	Bark
1896	Columbia	Pigeon Point	Steamer
1913	Point Arena	Pigeon Point	Steam Schooner
1929	San Juan	Pigeon Point	Liner

became lost in the dense fog, and for two days had no visual observation. Only three people out of the thirty on board survived. The victims were also buried at Franklin Point, adjacent to those drowned previously. It was perhaps this wreck more than any other that prompted the call for a lighthouse in the vicinity of Point Año Nuevo.

Government Ownership of the Island

As such, in 1867, a reconnaissance of the coast between Santa Cruz and San Francisco was made in order to determine the locations for lighthouses. One of the places found to be the most critical was Point Año Nuevo. The most likely place for a lighthouse was on the island immediately offshore. Soon thereafter, the island was reserved by the President for lighthouse purposes. Loren Coburn, however, claimed ownership of the island and demanded a large sum for it. Wrecks continued, including the *Hellespont* at Pigeon Point on November 21, 1868. Warning signals were the first safety features installed along the coastline soon after this disaster. The mainland at Point Año Nuevo meanwhile was offered to the government by owners who had recently acquired it, 25 acres for $5,000. Coburn feared that a lighthouse would be built at this location, thereby eliminating any need for his property. As a result, he offered to sell nearby Pigeon Point in 1869 for $5,000. The government, because of its previous dealings with Coburn, was ready to build the station at Point Año Nuevo if any delays in obtaining title to Pigeon Point were anticipated (U.S. Lighthouse Board 1869). Coburn gave in, and finally the island was acquired by deed on May 18, 1870. The government paid Loren Coburn and Jeremiah Clarke (who retained an interest in part of the property) $10,000 for the land, which included two tracts of land at Pigeon Point as well. The deed also provided for a 40-foot right-of-way to the point from the main road, providing the government with access to the island from the mainland.

In 1870 appropriations were made to establish a light at Año Nuevo. Because of delays, the appropriations reverted to the treasury in July of that same year. Beginning in 1871, the government leased the island to Joseph King for $100 per year, to be used for seal hunting only. Finally, in 1872 monies were made available again, and a steam fog whistle, together with a keeper's dwelling was built on the island. The facilities were apparently constructed under the supervision of Phineas Marston, who had also overseen construction of the Pigeon Point Lighthouse (Perry 1999), and several others. The station became operational on May 29 (U.S. Lighthouse Board 1872).

Fog was particularly troublesome along this section of the coast, and a number of light stations began as fog signal stations. A fog bell was placed at Yerba Buena Island in the San Francisco Bay, for example, in 1874, a year before a light was installed there. Another fog signal was installed at Lime Point near the Golden Gate in 1883, eighteen years prior to the establishment of a light there (Holland 1988).

The combination of the fog whistle at Año Nuevo and a coal-oil light at Pigeon Point (built in 1872) were deemed the best way to warn the ships of danger along this stretch of coast. The Lighthouse Board published a notice regarding the new whistle on June 19, 1872, indicating that blasts of fifteen seconds were separated by 45 second intervals (Henry 1872, Figure 38). The wood frame gable building was constructed in an L-shape, with shiplap siding. The whistle required roughly fifty tons of coal per year to keep it operating. This was supplied to the island by ship. Because of the treacherous water surrounding the island, a row

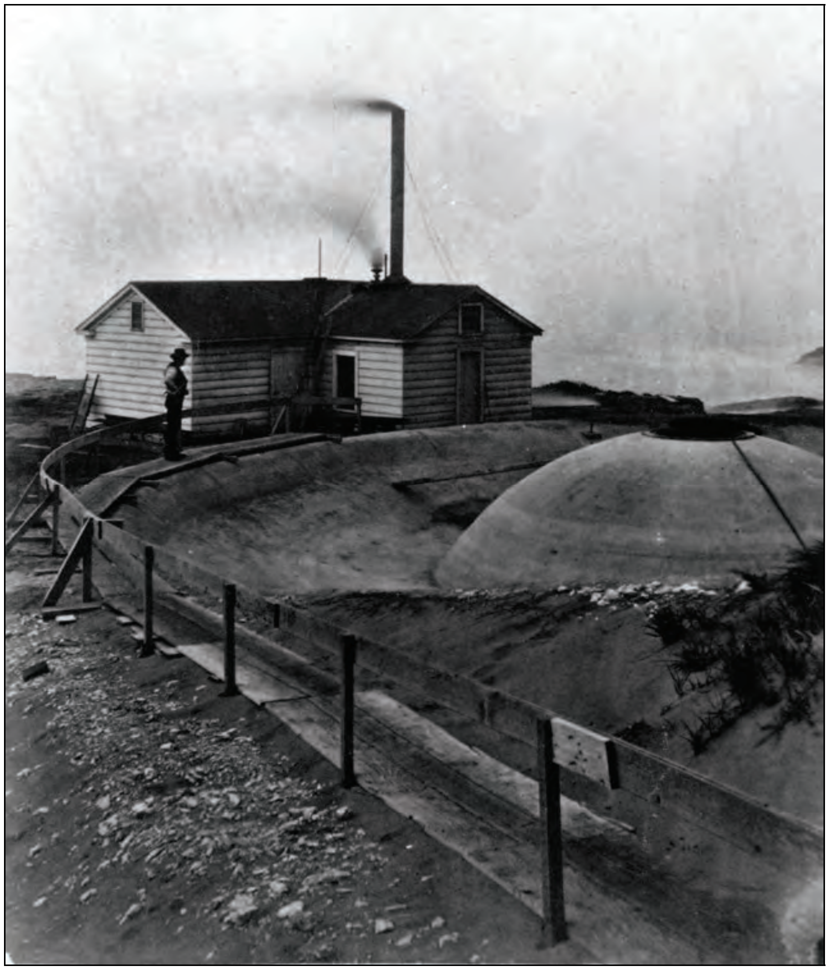


Figure 38. New Years Island Fog Whistle, circa late 1870s.

"New Years Island, fog whistle, blasts of 15 seconds with intervals of 45 seconds."
Courtesy of the California Historical Society. Photograph by E. Muybridge.
Stereographs from the Pacific Coast series. Box 03: PC-RM-Stereos. FN-36238.

boat carried the coal, supplies, and equipment from a buoy tender ship to a small pier on the island. Two keepers were initially installed on the island, living in a 36 by 28 foot, one and a half story building, painted "light buff, with brown roof" (Davidson 1889:152).

While men were employed on the island to maintain the fog signal and light, several seal hunters were camped on the point in the early 1870s. A group of six to eight men were employed (likely by Mr. King, who was leasing the island) to hunt seals, killing from five to twenty per day. The skin, oil, and other body parts were sold, while the rest was thrown back into the ocean (*Santa Cruz Sentinel* 1875 18 June). A few years later, the crew from a schooner named *New York* landed on the island with the intent of hunting seals. Despite warnings by the keeper (Thomas Owens), that this activity was prohibited, they continued hunting for several days (U.S. Treasury Department 1879).

The island then, as it is today, was isolated (Figure 39). Approaching it from the sea was treacherous due to high surf. Approaching from the landward side was also fraught with

Figure 39. Año Nuevo Island Light Station, circa 1900.

Photograph taken from the channel separating the island from the mainland.
Courtesy of Department of Special Collections, Stanford University Libraries.

peril and difficulty due to currents and breakers. Despite the government's right-of-way, there was no road to the point, which was completely covered with sand. In 1875, a small party of visitors journeyed to the island, and described the trip in the *Santa Cruz Sentinel*. A Captain Scott was in charge of the island at that time, with a Mr. Lature as assistant. The party was brought to the island by elephant seal hunters in their small whaling boat. They were greeted by Scott and Lature, and were carried from the landing to the fog signal building in a coal car on the tramway. The tramway made a broad curve on the island on its way to the fog signal building (*Santa Cruz Sentinel* 1875 18 June). The coal shed was located at the landing, for ease in unloading from the boats.

In July 1880, a second fog signal whistle, together with boiler and engine was installed. By the next month, the existing fog signal building was enlarged. In 1881, it appears that a new fog signal building was constructed to house the newer equipment. A cistern and water-shed were constructed to supply the fog signal. The water-shed consisted of a broad cemented area, tapering at the bottom to a cistern which collected the rainfall. Later, this water was pumped into a tank which was gravity-fed to the residence. A new coal house was built, and the dwelling for the keepers was also repaired and painted during that same month. That same year, electrical call bells were installed between the signal and dwelling, the tramway was repaired, and the old boiler and engine of the fog signal was overhauled and repaired. A large quantity of grass seeds was sent to the island and planted to arrest the drifting sands. This met with limited success, however. Another attempt involved the construction of drift fences. Walkways were also installed on the island. Proposals were made for further improvements on the island, including a sea wall, which would address the erosion from wave action occurring immediately adjacent to the fog signal house (U.S. Lighthouse Board 1880). This continued to be a problem for years.

In 1883, pumps were installed for the kitchen in the keeper's dwelling, as well as for the cistern. In 1885, a 450 foot long, ¾ inch pipeline was installed between the dwelling and the fog signal, as well as to the cistern (U.S. Lighthouse Board 1885).

In June 1886, the much needed sea wall was constructed. The wall was designed to protect the fog signal building and the water-shed from the erosion of the sea. Several reports, in fact, remarked on the erosion occurring to the area immediately adjacent to the fog signal building and water-shed. The cement wall was 70 feet long, averaging 23 feet tall, varying in thickness between one foot and one foot, six inches. Apparently, it was extended at some point to 180 feet long. A cave north of the fog signal was also filled with cement (14 feet long by two feet wide by two feet deep). Portland cement was used in all these projects. The upper line of the water-shed was also repaired at that time, as it had eroded away. A stone wall was installed along the exposed edge of the water-shed, with the cemented surface built to join with this wall. Stones were placed over areas of blowing sand (covering approximately 3,700 square feet). Fencing consisting of barrel staves and brush was also placed around this area, to serve as a kind of drift fence to retain the sand (U.S. Lighthouse Board 1886).

Crossing the channel from the mainland to the island was, and continues to be extremely treacherous. Although it is only a short distance from the mainland, the seas separating the island are rough. Large swells break on both sides of the island, meeting on the landward side. The channel is shallow, and many submerged rocks can be found. Currents are unpredictable, and can draw ships out of the channel into heavy surf. In April 1883, the extremely treacherous waters surrounding the island took the lives of the keeper (Henry Colburn), his assistant (Bernard Ashley), and two boys from a farm nearby (Clayton and Frank Pratt). The small group was attempting to return to the mainland from the island via the shortest, though more dangerous route. The boat they were in was quickly swamped by breakers, which caused it to drift out to sea when a large breaker completely submerged them. All four were drowned. The two widows and children were on the island, and had blown the fog whistle to get attention of passing ships (U.S. Treasury Department 1883). The steamer *Los Angeles* did, in fact, anchor offshore after hearing the fog signal in perfectly clear weather. Upon noticing the flag flying upside down, a small boat was sent to the island. The steamer notified U.S. Naval Inspector, Commander George Coffin of the tragedy. He in turn, notified the Lighthouse Board. Mr. John Ryan, who was serving as first assistant keeper at Pigeon Point was also notified. Ryan arrived on the island on April 9 to find the flag at half mast, upside down. He provided assistance to the family members, and several days later assisted them in removing their belongings off of the island. Eventually, Ryan would serve as head keeper on the light station.

Despite the aids to navigation at Año Nuevo Island and Pigeon Point, wrecks continued to occur along this portion of the coast. Some of these included the following:

- *J. W. Seaver* 1887
- *San Vicente* 1887
- *Colombia* 1896
- *City of Para* 1906
- *Point Arena* 1913
- *Iolanda* 1925

- *San Juan* 1929
- *Tamishua* 1930
- *New Crivello* 1936
- *West Mahwa* 1937
- *Southland* 1944

The hazards present near Año Nuevo Island were described in an issue of the Pacific Coast Pilot in 1889:

> This rocky ledge is one of the most dangerous on the coast in its relation to the large amount of coast trade. In thick weather a vessel coming from the westward is close upon it before seeing it, the more especially as the land to the eastward retreats one and a half miles, is quite low, and frequently cannot be made out. The islet sends off a ledge for half a mile to the east-southeast (ESE) that serves to break the swell before reaching the cove, but increasing the danger to vessels approaching from the southeast around to the northwest.
>
> Two breakers are reported off the islet, the first lies about one-quarter of a mile south-southwest (SSW) from it, and the second about one-third of a mile south. With a large swell these breakers are very heavy (Davidson 1889:151).

LIGHT

As a result of these hazards, in 1890, a light was installed on the island in order to bolster the warning system. Some indicate that the light itself came from the station at Point Montara (Wayne Wheeler personal communication 2005). The light consisted of an oil lens lantern and was listed as "Fixed White" in a description of the station a few years later. The lantern consisted of a polygonal lens with six sides, 6 feet in diameter. It was 32" in height, with one plate on each side, each measuring 16 inches by 32 inches by ¼ inch thick. Unlike other lights, this one lacked a balustrade, or many of the other embellishments typically found on lighthouses. It contained a wood door to the lantern, with a ventilator on top. The lamp itself was described as tubular, with one wick to the burner. A spare lamp and two spare lamp burners were kept at the station. The manufacturer of the lantern is not known. The light was originally installed on top of the water tank (tank house), supported by six inches by six inches wood posts on a concrete foundation, which was painted white (U.S. Lighthouse Establishment 1907, Figure 40). In 1911, the light was rated to have an effective range of 8.8 miles.

In 1894, the existing tramway was overhauled and repaired, with 675 feet of it renewed with iron rails being put down (Figure 41). The tracks were two inches wide by ½ inch thick. A turntable was put in place in order to eliminate a long curve at the north end of the island, thereby shortening the track. The trestle walkway from the dwelling to the signal building was also rebuilt. At the same time, a 4,500 gallon water tank was built. Two years later (1896), a larger 35,000 gallon water tank was built on a masonry foundation. In 1897, the keeper constructed a landing for the wharf, built with lumber salvaged from the beach supplemented with a small quantity provided to him (U.S. Lighthouse Board 1897).

Figure 40. Tank House with Light at Top.

Photograph taken prior to the construction of the light tower in 1913.
Courtesy of California State Parks.

Figure 41. Portion of Tramway at North End of Island, 1926.

Courtesy of California State Parks. Photograph by Jack Chambers.

New Fog Signal Building

The primary importance of the island for warning purposes remained the fog signal, however. In 1899, the older fog signal was replaced by a newer one, and a new building was constructed to house it. The original building (1872) appears to have been replaced by that constructed in 1881, and was demolished. This second building was reused as a coal house and tool room. An enclosed gallery or breezeway was built to connect the two buildings (U.S. Lighthouse Board 1902). By 1900, the fog signal apparatus was moved into it and was up and running (Figure 42 and Figure 43). The building measured 42 feet long by 34 feet wide. It was connected to the light by a concrete walk. The fog signal itself was a 12 inch whistle, with 10 second blasts separated by 55 second intervals. It was powered by a 30 horsepower boiler, which consisted of 41 tubes, each twelve feet long and three inches in diameter. The boiler was described as a horizontal flue tube type measuring twelve feet long by three and a half feet in diameter. It was heated by a brick furnace (U.S. Lighthouse Board 1900). Cement walkways were built around the fog signal building to provide ease of travel at this time.

Society, San Francisco, California

During this same period, a small frame structure with plate-glass panes was built around the lens lantern to protect it from the weather. A new building, known as the boathouse (or storehouse) was constructed at the landing at the pier (Figure 44). The boathouse contained two stories, with the lower on the beach level and the upper at the tramway. Inside the building, a hoist with block and tackle transported supplies for the fog signal from the landing to the upper story of the boathouse. From there, it was loaded into a tram car, which was pushed by hand all the way to the fog signal building. A boat dock extended into the water from the boathouse, and a coal house was built at the landing, to house not only coal but also oil in the upper part of the structure (U.S. Lighthouse Board 1900).

A small boat was provided for the keepers, allowing them to go ashore on assigned days in order to pick up mail. Mail was delivered to a box on the coast highway adjacent to a farm house. Supplies for the keepers were kept in store houses attached to each of the dwellings, carried by wheel barrow along the wood walkways (Franke 1988).

Regular inspections were made by the District Superintendent. New supplies or replacement supplies were ordered during these inspections trips (Franke 1988). Inspections appeared to take place every few months, as H.W. Rhodes, Inspector (or his 1st Assistant), arrived for inspection twice per year during the World War I period (U.S. Treasury Department 1919)

By the turn-of-the-century, two employees were operating the station, both of whom had families with them. The additional keeper was required because of the second fog signal. As a result, the existing 36 foot by 28 foot dwelling was insufficient. It was divided into two living quarters, and contained only one small kitchen. A new dwelling was recommended, at an estimated cost of $6,000. This exorbitant sum was due to the fact that: "…the island is in the open sea, outside of all freighting accommodations, and that the material for the dwelling would have to be transported to the site by special arrangements" (U.S. Lighthouse Board 1902). The U.S. Lighthouse Board expressed its reasons for the

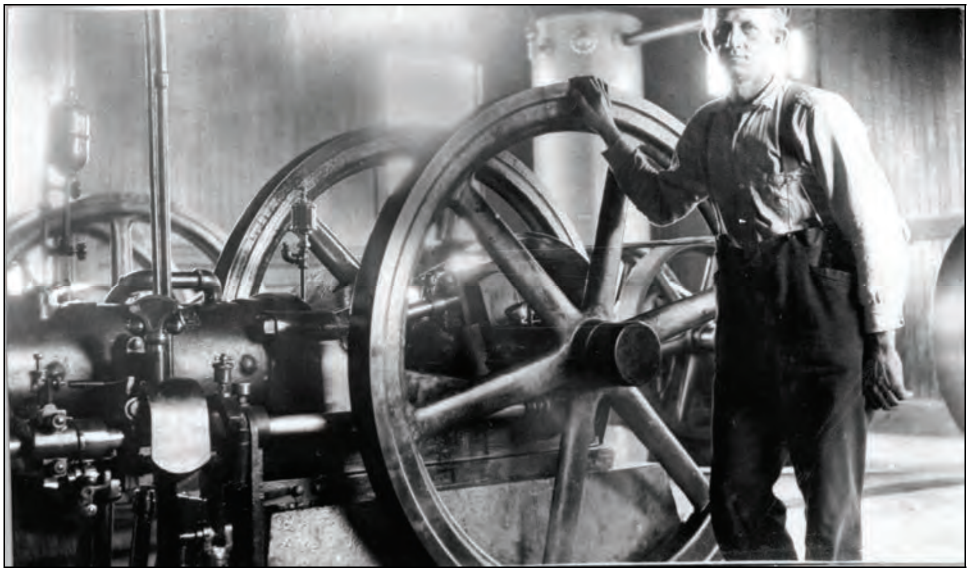


Figure 42. Air Compressor in New Fog Signal Building, circa 1920s.

Courtesy of U.S. Lighthouse.

Figure 43. U.S. Coast Guardsman working on Air Compressor in Fog Signal Building, 1948.

Courtesy of U.S. Lighthouse Society, San Francisco, California. Photograph by Reginald McGovern.

Figure 44. Row Boat at the End of the Pier at Año Nuevo Island, Unknown Date.

Courtesy of Department of Special Collections, Stanford University Libraries.

need for the new dwelling: "The Board is of the opinion that it is necessary to encourage capable men to take service with the Light House Establishment; that to do so it is necessary that they should be provided, at least, with reasonable accommodations" (U.S. Lighthouse Board 1904). The need for the new dwelling was particularly required because of the addition of the second fog signal, which required more manpower.

NEW KEEPER'S RESIDENCE

In 1904, a larger, more substantial house, including 8 rooms for the keeper and 7 rooms for the assistant keeper was planned for the light station (U.S. Lighthouse Board 1904, Figure 45). Work was delayed, however, because of the difficulty in getting supplies to the island. Landing was treacherous. Nevertheless, the addition was constructed on the south side of the existing building in 1906, adding nine more rooms including a bathroom. The house was described as white with red roofs. There were three outhouses, and a cement walkway was placed around the buildings (U.S. Light House Establishment 1907).

The rain-shed was also improved at this time (U.S. Lighthouse Board 1905), and by 1907, a 15,000 gallon redwood water tank was built on a redwood frame on concrete piers (U.S. Lighthouse Board 1907). By that year there were three wood tanks and one concrete cistern (Figure 46). One tank was located on the northwest side of the fog signal building; one on the highest point of the island 300 feet north of the fog signal; one on the north side of the keeper's dwelling; and the cistern was 100 feet north of the fog signal building (U.S. Light House Establishment 1907). The original tank was eventually replaced by a larger one, though the new one was not treated properly, and as a consequence the water was unfit to drink. The water was only used for washing and bathing.

Figure 45. View of Keeper's Dwelling, circa late 1950s.

Photograph taken from top of light tower.
Small chicken house is visible in front of keeper's dwelling.
Courtesy of California State Parks.

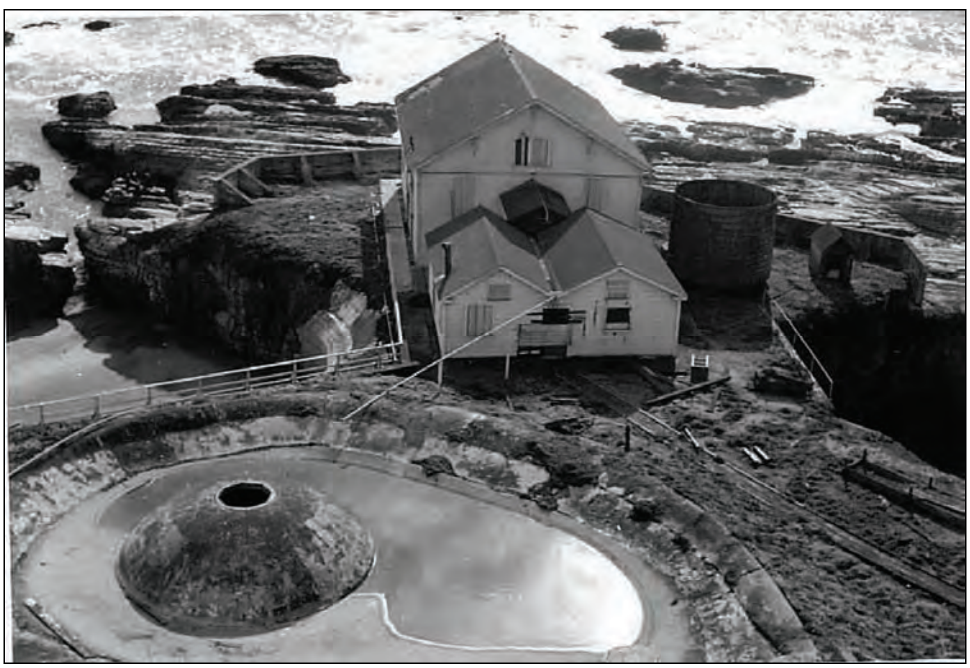


Figure 46. Fog Signal Building, 1957.

Water tank and distillate house to the right.
Water shed and cistern are in foreground. Seawall is visible at rear of fog signal building.
Courtesy of California State Parks.

The keeper's residence was renovated in 1911, and a cistern was constructed to provide fresh water. A tank next to the residence caught runoff from the roofs of the house. This water was carried by buckets into the residences for cooking and drinking. By this time, the keeper's dwelling was painted white with drab trimmings. It contained eight rooms and bath for the keeper, and seven rooms and bath for the two assistants. Each dwelling had a small storeroom. There were cement walkways around the dwellings, along with a wooden walkway to the fog signal building (Figure 47). There was also about one half acre of cultivated garden adjacent to the dwelling.

Maintenance of the buildings was a constant problem as a result of the sea air. Painting and red-leading were constant repair efforts. Fences were built to prevent the sea lions from coming into the gardens and the houses. The fast-growing herds of seals however, often over-ran the house.

In late 1913, the keeper noted that a new tower was under construction (U.S. Treasury Department 1913; Table 23). The following year, the lens was installed on this steel tower, 73 feet above the water (Figure 48). This tower was used for the remainder of the station's existence.

Fuel used on the station consisted of several types. Fuel oil (distillate) was used for the fog signal engines, kerosene for the light tower, and coal for cooking and heating. Lubricating oil was also used for the machinery. Distillate is considered any of a wide range of petroleum products produced by distillation, referring specifically to those products in the mid-boiling range, also called middle distillates and distillate fuels. The distillate was brought to the island in 50 gallon drums, as was the kerosene. The kerosene was kept in

Table 23. Partial List of Head Keepers at Año Nuevo Island Light Station.

KEEPER	ARRIVAL DATE	DEPARTURE	MILITARY SERVICE	COMMENTS
Thomas Owens	04/11/1876	11/23/1880	-	Resigned
Henry Drexler	11/23/1880	03/28/1880	Army	Resigned
Henry Colburn	03/28/1881	04/27/1883	Navy	Drowned
John Ryan	04/27/1883	01/20/1883	Navy	Transferred to Point Arena
Joseph Hodgsen	01/20/1883	05/20/1886	Navy	-
John Wilson	08/16/1888	07/15/1890	Army	-
Henry Hall	07/11/1890	10/09/1890	-	-
John Olaf Stenmark	04/06/1892	06/21/1892	-	-
Thomas Butwell	08/30/1894	02/14/1901	-	-
Herbert Luff	02/14/1901	02/03/1903	-	-
Inby Engels	02/03/1903	09/19/1904	-	-
Lawrence Ward	09/19/1904	01/01/1907	-	-
Edwin Gunter	01/01/1907	06/14/1910	-	-
Martin Rasmussen	06/14/1910	10/01/1910	-	-
J.O. Becker	?	1926	-	-
Jack Chambers	1926-?	ca. early 1930s	-	-
Radford Franke	ca. early 1930s	?	-	-

Figure 47. Wood Walkway (Catwalk) from Keeper's Dwelling to
Fog Signal Building (at left), Light on Tank House, 1926.

Courtesy of California State Parks. Photograph by Jack Chambers.

Figure 48. Steel Light Tower adjacent to Tank House, circa late 1940s.

Courtesy of California State Parks.

tanks, or reservoirs. The coal was brought in 100 pound sacks, with each keeper allotted four tons per year. The lubricating oil was brought in five gallon cans (Franke 1988).

Boats used included several dories, which were kept on four davits in the boat house mounted on swivel mounts. Dories were small (15-25 feet in length), shallow draft boats which were both lightweight and versatile, designed to be used for a variety of purposes, including fishing and whitewater rafting. Those used at on the island were 18 feet long, and were identified as “Dory style” #18084, #18083, and #17076. They each were equipped with nine foot long oars, which were maintained with frequent varnishing.

DAILY LIFE

The keeper and assistant keepers were charged with keeping the station operating and in good condition. They were responsible for all maintenance, such as painting, carpentry, and plumbing. Painting was perhaps the most frequent maintenance task, due to the weather conditions. The light tower, for example, needed constant cleaning and repainting to prevent rust. This was painted white. Red-leading was also frequently accomplished on many of the station’s metal surfaces.

A week in the life of the keeper of the station during the month of June 1914, as shown below in table 4 is typical, as shown in Table 24.

Table 24. Lighthouse Establishment Form 306, 1914.

DAY	RECORD OF IMPORTANT EVENTS AT THE STATION, BAD WEATHER, ETC.
13	Run Fog Signal
14	Sunday
15	Washday
16	Cleaning around Station
17	Nailing the railings and walks
18	Cleaned weeds around Distallate [sic] House
19	Cleaned Brass works in tower

Note: Data from *Journal of Light-Station* June 1914 (U.S. Treasury Department 1914).

Watches ran for six hours at a time, 24 hours a day. The light in the tower had to be lit one half hour before and after sunset. It was illuminated by kerosene vapors, and had to be constantly observed so that it did not go out. An alcohol torch was used to reheat the generator if the temperature got too low. Maintenance for the light included cleaning the lantern windows, and the lens prisms; filling up the kerosene reservoir; and covering the lens with linen during the daylight to protect it from being discolored by the sun. Window curtains were also used to protect the lens. The station would be thoroughly cleaned and policed on Fridays. This included cleaning the fog signal building and light tower, shining all of the brass, and replacing the silk mantle on the lens (Franke 1988).

Keepers were required to maintain a log recording their daily activities. This was recorded on the Treasury Department’s, Lighthouse Establishment Form 306, *Journal of Light-Station*. The journal was maintained daily, and was to record important events at the station, along with daily activities such as maintenance, trips away from the station, visitors, etc.

Life changed little over the years, as attested by the log of the keeper for a week in March 1928, shown in Table 25.

Table 25. Lighthouse Establishment Form 306, 1928.

DAY	RECORD OF IMPORTANT EVENTS AT THE STATION, BAD WEATHER, ETC.
21	Varnishing hallway, bathroom, pantry, and kitchen floors keeper's quarters. Varnished 3rd coat nine foot oars. Cleaning roof fog signal bldg. Painting new shingles fog signal bldg. Painting with red lead dock ladder and two channel markers. 2nd Asst. Keeper crossed for mail.
22	Repair work on stove Second Asst. Keeper's quarters i.e. took stove top off and repaired damper found damper worked out of shape could not close. Painting window sash and window sills fog signal bldg. Cleaning up old shingles and wood from around fog signal bldg. Scraping wire brushing, 40,000 gallon water tank in tank house. Misty rain.
23	Blowing Fog. Painting window sash and sills in Fog signal bldg. Painting with aluminum paint bulkhead lamp fog signal bldg. Scraping and wire brushing 40,000 gallon water tank in tank house. Rainfall. 2"
24	Blowing Fog. Painting window sash and sills in Fog signal bldg. Cleaning up fog signal apparatus and fog signal bldg. Cleaning up keeper's chicken yard. Making miter box and miter cuts on old 3" x 3" posts from tramway. Sawing new 3" x 3" lumber into posts for tramway. 1st and 2nd Asst. Keepers crossed for mail. Rainfall.
25	Sunday Blowing Fog.

DAY	RECORD OF IMPORTANT EVENTS AT THE STATION, BAD WEATHER, ETC.
21	Varnishing hallway, bathroom, pantry, and kitchen floors keeper's quarters. Varnished 3rd coat nine foot oars. Cleaning roof fog signal bldg. Painting new shingles fog signal bldg. Painting with red lead dock ladder and two channel markers. 2nd Asst. Keeper crossed for mail.
22	Repair work on stove Second Asst. Keeper's quarters i.e. took stove top off and repaired damper found damper worked out of shape could not close. Painting window sash and window sills fog signal bldg. Cleaning up old shingles and wood from around fog signal bldg. Scraping wire brushing, 40,000 gallon water tank in tank house. Misty rain.
23	Blowing Fog. Painting window sash and sills in Fog signal bldg. Painting with aluminum paint bulkhead lamp fog signal bldg. Scraping and wire brushing 40,000 gallon water tank in tank house. Rainfall. 2"
24	Blowing Fog. Painting window sash and sills in Fog signal bldg. Cleaning up fog signal apparatus and fog signal bldg. Cleaning up keeper's chicken yard. Making miter box and miter cuts on old 3" x 3" posts from tramway. Sawing new 3" x 3" lumber into posts for tramway. 1st and 2nd Asst. Keepers crossed for mail. Rainfall.
25	Sunday Blowing Fog.

Note: Data from *Journal of Light-Station* March 1928 (U.S. Treasury Department 1928).

Another important job was to maintaining the fog horn. The keepers had to keep watch on the fog. Once it began rolling in, the fog whistle had to be put into operation. The engine was started, air compressor activated, and the air in the receivers would run the horn. Two engines and two air compressors were used, switching from one to the other in order to let one cool. Two large air receivers were kept full at all times. Each light station had its own characteristic blast interval. Ships would therefore be able to determine their approximate location. Charts of the fog horn signal were maintained and sent to headquarters every month. These charts recorded the actual time the fog signal was started and served as protection for the station, as proof that the signal was in operation (Franke 1988).

Sea lions attempted to enter the buildings and gardens, and fences were built to prevent them. In 1918, the lighthouse keeper made an official complaint to the department about the sea lions over-running his house. At one time a killer whale had stirred up the sea lions so much that they forced their way into the house (Le Boeuf 1981). At that time, there were no elephant seals on the island although Stellar sea lions could be found in abundance.

Several families lived on the island during the operation of the light station. Edwin F. Gunter was the keeper in 1907. J.O. (Otto) Becker served as head keeper sometime following 1910, up until 1926 (Figure 49). He was replaced by Jack Chambers, who brought his wife Hazel (Streeter; Figure 50). At that time there were two other families living on the island. Groceries were delivered to the island every three months by barge. Hazel would make a list of the things she needed, give it to the barge tender, and he would bring them during his next trip. These items were brought from San Francisco. Two tenders made frequent trips to the island, including the *Sequoia* and the *Lupine* (in use by 1928). The tenders could not dock at the island, but instead anchored in a cove to the south, and the supplies were brought ashore in a dory or whaling boat. Hazel also went to the Steele Ranch (at Point Año Nuevo) to pick up fresh meat from Pescadero or Santa Cruz once per week. Depending upon the tide, Mrs. Chambers either walked from the island to the ranch, or took a boat. When winds were heavy, however, it became impossible to reach the mainland. The winds brought large waves which wrapped around the island, and caused dangerous surf on the sea between the island and the mainland. In later years, the phone line often would be blown down by these winds, leaving the residents cut-off from the mainland (Franke 1988).

In planting a garden, Mrs. Chambers and Another lady dug out approximately one foot of beach sand, filled the hole with kelp, then covered the kelp with sand, and the garden was placed on top. With this approach, the ladies were able to grow cabbage, onions, carrots, squash, corn, and “anything that could withstand the wind.” Other keepers reported that their vegetables were grown in a small area, and included cabbage, carrots, turnips, beets, radishes, and chard. Each plant was surrounded by a tin can with the bottom cut out in order to keep water on the plants. Most families further supplemented their menus with fish from the ocean as well as abundant abalone (Franke 1988). Mrs. Chambers made abalone or clam chowder every night (Calcagno n.d.). Each of the keepers had a chicken yard with a few chickens which supplemented their meals with eggs and an occasional chicken dinner. As there was no refrigeration on the island, only limited amounts of fresh vegetables, meat, bread, and fruits could be kept. These could, however, occasionally be obtained from local markets in the Pescadero area. Weekly baths were taken on Saturday. The left over water was used on the vegetable garden. Sewage was dumped off the end of the island.

A spring-wound phonograph provided entertainment. A small RCA radio was also operated by the keeper, run by dry cell batteries (Franke 1988). Most of the keepers enjoyed their time on the island:

> We were never lonely and enjoyed our life on Año Nuevo Island, the isolation did not bother us as the life was quite interesting. We would walk down beyond the Fog Signal building and watch the Sea Lions on the end of the Island and on the adjoining rocks and did a lot of exploring around the Island beach, in the evenings while having our dinner we could look from our upstairs kitchen window and watch the Sea Lions romping in the breakers with the setting sun shining through the waves while they were catching their evening meal of fish or just surfing on the waves [Franke 1988:4]

Figure 49. Otto Becker and his Wife (center) together with Raymond and Anna Noyes (at left), circa early 1920s.

Photo taken in the yard adjacent to the keeper's dwelling.
Courtesy of U.S. Lighthouse Society, San Francisco, California.

Figure 50. Jack Chambers, 1926.

Photo taken in the yard adjacent to the keeper's dwelling.
Courtesy of California State Parks. Photograph by Jack Chambers.

1920S AND 1930S

Telephone service was finally provided to the island during the 1920s, with a line installed between the fog signal building and the keeper's dwelling. Existing facilities were improved and upgraded during this period. A new 40,000 gallon water tank was built in 1928, replacing an older tank. A new 1 ½ inch pipe line was installed as a part of this new water tank. A new walk at the signal building, connected to the end of the tramway was also constructed.

A series of earthquakes, particularly one on October 22, 1926 caused significant damage to the island's structures, several of which never fully recovered (particularly the lens). The quake on the 22nd, in fact, consisted of four quakes occurring in quick succession between 4:40 and 7:55 am. During the first quake, the lamp was thrown out of its base, and about 1/3 of the lens prisms were shaken out of the frame. A second at 5:45 am demolished the lens. The tower rocked such that the lens was shaken loose from the table and thrown to the floor, and much of the broken glass fell through to the watch room below.

By the 1930s, there were three men assigned to the island, the keeper and two assistant keepers. Generally, there were two men on the island at one time. Each man received 96 days off per year. By that time, facilities remained largely unchanged, and consisted of a steel light tower, fog signal building, keeper's dwelling, oil and distillate house, landing dock and warehouse, carpenter and blacksmith shop, concrete rain shed, and cistern and water tank (Rhodes 1930; Figure 51 and Figure 52).

In 1939, a diaphone was established on the island, replacing the earlier fog signal. By this time, the island was manned by four Coast Guard personnel, all of whom lived onsite. At least some of these personnel brought their families with them to the island.

ABANDONMENT OF THE ISLAND

Following World War II, as the use of radar and radio beacons became far more widespread, a lighted whistle buoy was placed approximately 1600 yards south of the island. In 1948, the Coast Guard ordered the light station discontinued. The expense of maintaining the station was too great, and a marker buoy with automatic light, sound, and radar reflector had recently replaced the light. Personnel soon abandoned the island (Figure 53, Figure 54, and Figure 55).

An inventory made the following year revealed a great deal of material still remaining:

- Rain Shed, concrete, 115 feet by 160 feet
- Cistern, 75,000 gallon
- Cistern, 4,000 gallon
- Trestle, wood, 290 feet, with marine railway steel rails, 680 feet.
- Trestle dock, wood on steel piles, 199 feet long
- Marine Railway steel rails, 220 feet long
- Walk approach, 99 feet long
- Dock, wood set on timber piles, 20feet by 20 feet.

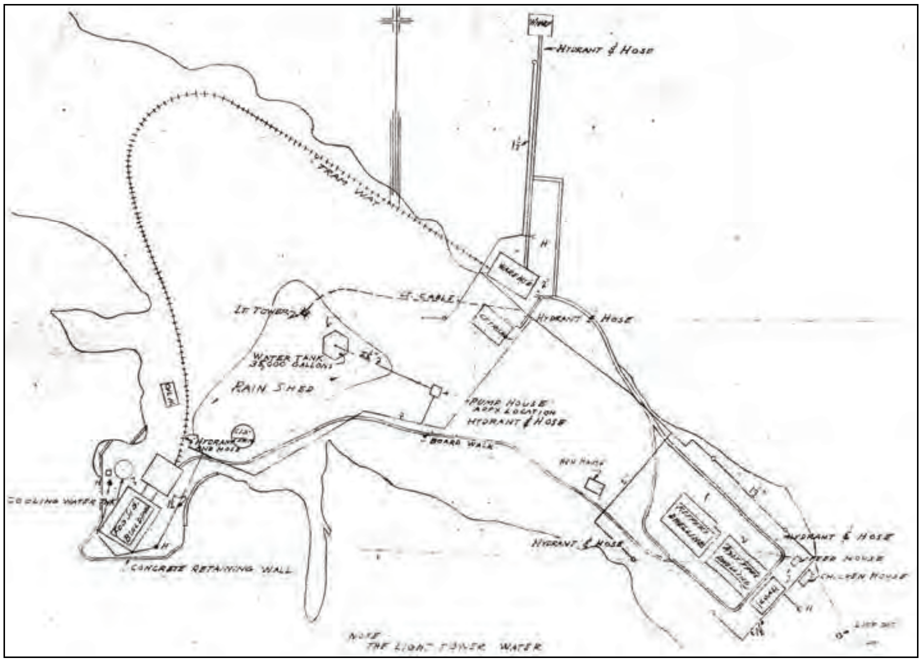


Figure 51. Año Nuevo Island Light Station Fire Protection System, March 18, 1942.

Courtesy of U.S. Coast Guard, San Francisco, California.

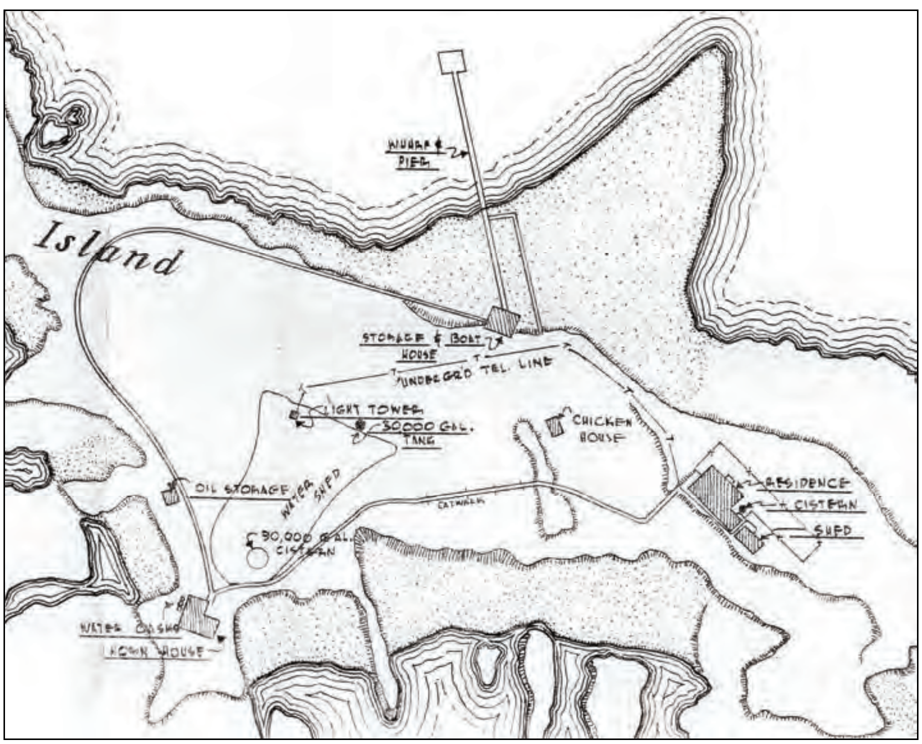


Figure 52. Map of the Island showing the Built-up Portion, circa 1958.

Courtesy of U.S. Coast Guard, Washington, D.C.

Figure 53. Unidentified Coast Guard Family preparing to leave Año Nuevo Island prior to its Abandonment, 1948.

Courtesy of U.S. Lighthouse Society, San Francisco, California. Photograph by Reginald McGovern.

Figure 54. Aerial Photograph of Año Nuevo Island looking Northwest, 1948
shortly before Coast Guard Abandonment.

Courtesy of U.S. Lighthouse Society, San Francisco, California. Photograph by Reginald McGovern.

Figure 55. Aerial Photograph of Año Nuevo Island, looking Southeast, 1948.

Courtesy of U.S. Lighthouse Society, San Francisco, California. Photograph by Reginald McGovern.

- Derrick
- Retaining wall, concrete 180 feet by 9 feet high
- Bulkhead, timber 78 feet by 3 feet high
- Walk, concrete
- Fence, board, 367 feet long
- Fence, picket, windbreak, 12 feet high
- Sump tank housing, concrete, 6 feet by 5 feet
- Walk, plank and railing, 500 foot walk, 800 foot railing
- Tank, Water, redwood stave, 12,000 gallon
- Tank, Water, redwood stave, 35,000 gallon
- Tank, Water, redwood stave, 20,000 gallon
- Sewer system, four inch terra cotta pipe
- Electrical power line, ¼ mile long
- Fire protection system, 1700 feet of buried line
- Keeper's Quarters, 49 feet by 28 feet
- Keeper's Quarters, 28 feet by 36 feet
- Light Tower, steel beam, 18 feet square at base, 35 feet tall
- Fog Signal Building, 34 feet by 44 feet
- Store and boathouse, 18 feet by 30 feet
- Oil house, concrete, 13 feet by 27 feet
- Warehouse, wood frame, 20 feet by 30 feet
- Coal shed, wood frame, 14 feet by 30 feet
- Tank house, hexagonal, 6 feet per side
- Storage shed, 8 feet by 6 feet
- Chicken House, 10 feet by 14 feet
- Watch House, 5 feet by 5 feet with wood plank platform 17 feet by 11 feet
- Flag pole, 40 feet high
- Lantern, 4th order with door
- Lens, 4th order, 360 degrees, 500 watt lamp
- Light flasher, double mercury type
- 2 Diaphones, F27, Number 84 and 87
- 2 Diaphone timers
- Compressor, 9 inches by 8 inches
- Motor, electric, 20 HP
- Motor, electric, ¼ HP
- 2 Air receivers, steel, 3 feet by 12 feet
- Generator Plant, 120-volt
- Generator, exciter

- Engine, Wisconsin, AC-4
- Switch Board, enclosed units
- Starter, motor, electric, 25-HP, Westinghouse
- Fire pump, centrifugal, Demming 150 GPM
- Pump, water
- Winch, hand crank
- 13 Fire hydrants
- Fuel tank, steel, gasoline, 100 gallon
- Fuel tank, steel, gasoline, 500 gallon
- 2 fuel tanks, steel, gasoline, 1000 gallon
- Hoist, single drum, Atlas Lanova Diesel engine
- Air Compressor, 125 CFM, Worthington
- Gasoline Engine, Model F 226, Continental
- Telephone Lines (U.S. Coast Guard 1949)

Much of this material was in poor condition or was otherwise obsolete. That which was salvageable was sent to the Coast Guard depot at Yerba Buena Island.

In 1955, the federal government sought to divest itself from the island, and agreed to sell it to the State of California. The state was unable to raise the funds to purchase the island ($18,094), and it was declared surplus property and taken over by General Services Agency (GSA). GSA planned to auction the island off to the highest bidder, but the state was able to get an extension in order to raise more funds. Despite a high bid of $100,000 by Max Walden (for Frank Spenger), the island was sold to the state for $52,000 in 1958. In 1958, DPR acquired Año Nuevo State Reserve, which encompassed over 1,100 acres of varied terrain on the adjacent mainland. The island was included in this newly created state reserve.

BIOLOGICAL PRESERVE

Having almost been hunted to extinction by the turn-of-the-century, the northern elephant seal made a remarkable comeback. A seal was first reported on Año Nuevo Island in 1955, and the first birth was recorded in 1961 (Orr and Crompton 1961). The first birth on the mainland was recorded in 1975. In order to protect the elephant seal breeding colonies, the state classified the island as a scientific preserve, eventually restricting public access and use. The island was unique in many ways. It represented the narrow overlapping area of the southern migration boundary of the Stellar sea lion and the northern migration boundary of the California sea lion, elephant seal, and sea otter. It contained the largest rookery of Stellar sea lions outside of Alaska and the Arctic (Poulter and Jennings 1964).

Before the early 1960s, most of the structures from the light station remained in place, and were in fairly good condition. To protect them, the state attempted to perform periodic maintenance. The light tower was re-painted and repairs were made to the pier. One of the structures was deemed unsafe, and was removed. The Army supplied periodic helicopter service to the island during this period (California Division of Beaches and Parks 1962). Deterioration accelerated rapidly soon thereafter, however. Corrosion, water and wind erosion, and vandalism all took their toll. The tramway tracks were completely rusted away in many places. The support beams for the pier rusted rapidly once the paint wore off. Vegetation in place on the island as late as 1952 was virtually gone by the early 1960s. Wind erosion accelerated this. Wind erosion also undermined the east side of the 30,000 gallon water tank (Poulter nd). In 1976, the state cut down the steel light tower, as it was in danger of collapse (Figure 56). Visitors to the island in the late 1950s and early 1960s caused all manner of damage. They constructed campfires out of much of the wood walkways and pier, and set fires inside many of the buildings. By breaking into the buildings they allowed access by the sea lions and elephant seals.

Though original plans called for public access to the island, scientists maintained that elephant seals and sea lions were leaving the bluffs and beaches of the island as a result of human activity. The decision was made to keep the island as a biological research park and scenic reserve. It would be limited to scientific and educational purposes on a permit basis. Some recommendations called for the removal of structures on the island in order to "improve" the habitat. In 1961, a proposal was made by Stanford Research Institute (SRI) to lease the island as a marine biological park. Once the structures were reconditioned, the island was to serve as a biological study area for scientific institutions, universities, as well as the general public. Plans called for a cable-operated barge, or an aerial tramway between the mainland and the island to eliminate the hazards of crossing (Orr and Crompton 1961).

Figure 56. Steel Light Tower shortly before being cut down.

Courtesy of California State Parks.

In 1962, SRI was granted a temporary use permit for the island. Dr. Thomas Poulter, Scientific Director of Physical and Life Sciences at the Institute, oversaw the activities on the island. Dr. Robert T. Orr with the California Academy of Sciences was also active in research on the island. The Institute wanted to study the seals and sea lions on the island, and planed to improve the buildings. Initially, SRI proposed using the existing buildings for their facilities. The fog horn building was to be used as shops, offices and storage space. The keeper's dwelling was to serve as housing, and the assistant keeper's dwelling was to serve as offices. Soon after arriving, they tore down the 20,000 gallon water tank adjacent to the old foghorn building. In 1962, the 30,000 gallon tank and the hexagon building within which it was housed (adjacent to the light tower) and all debris in its vicinity were removed. The redwood lumber was used for building blinds. Poulter was replaced by Dr. Richard Peterson with the University of California, Santa Cruz (UCSC) sometime thereafter. UCSC continued to study the seals on the island, through a 10 year permit. Instead of using the other buildings, the scientists lived in the former gasoline storage building, refurbishing it to make it habitable. The building soon proved to be inadequate, and it was closed up with steel doors (Poulter and Jennings 1964). The scientists constructed blinds from which to observe the seals, a staircase and boardwalk to the foghorn building, and snow fencing for drifting sand. The foghorn building was cleaned-out and storm screens were installed to convert the building into a storage facility. A 36 inch aluminum pipe was built from the main part of the island to the observation blind which the researchers climbed through in order to not disrupt the seals.

Recordation

Año Nuevo Island Light Station is located on a nine acre island a short distance off Point Año Nuevo, approximately 55 miles south of San Francisco, and 20 miles north of Santa Cruz. Though the island is only ¼ mile from the mainland, it is separated by a treacherous channel of strong currents and large waves. The island was one of the most dangerous to passing ships due to the presence of numerous rocks and strong swells. Located off a low, rocky and windswept point jutting out into the Pacific Ocean, the island is irregular in shape with little topography. Bluffs rise 15 to 20 feet above the shoreline. There are numerous sandy coves that shelter thousands of sea lions and elephant seals (Figure 57).

The entire island was surveyed for archaeological resources in 1984, yet none were found, except for one ironstone bottle approximately ten meters west of the keeper's dwelling (Woodward 1984). Today, there are only three structures remaining on the island: the keeper's dwelling, fog signal building, and the fuel storage building. In addition, there are several smaller structures and features as well as the archaeological remains of the other buildings and structures that once stood.

The general chronology for the island is presented in Table 26.

Table 26. Outline of Chronology for Año Nuevo Island.

Island purchased by U.S. Government in 1870
House measuring 36 feet by 28 feet built for the keeper in 1872
Fog signal installed in 1874
Light on water tank installed in 1890
Addition to Keeper's dwelling constructed in 1906
Houses renovated in 1911
Light on the tower installed in 1914 (steel tower built)
Earthquake in 1926 destroyed the lantern lens and severely damaged the lighthouse
New fog signal was installed in 1939 (air-powered diaphone)
Facility closed in 1948 (replaced by lighted whistle buoy)
Northern Elephant Seal appear on island in 1955
State purchases island in 1958
Light tower removed in 1976

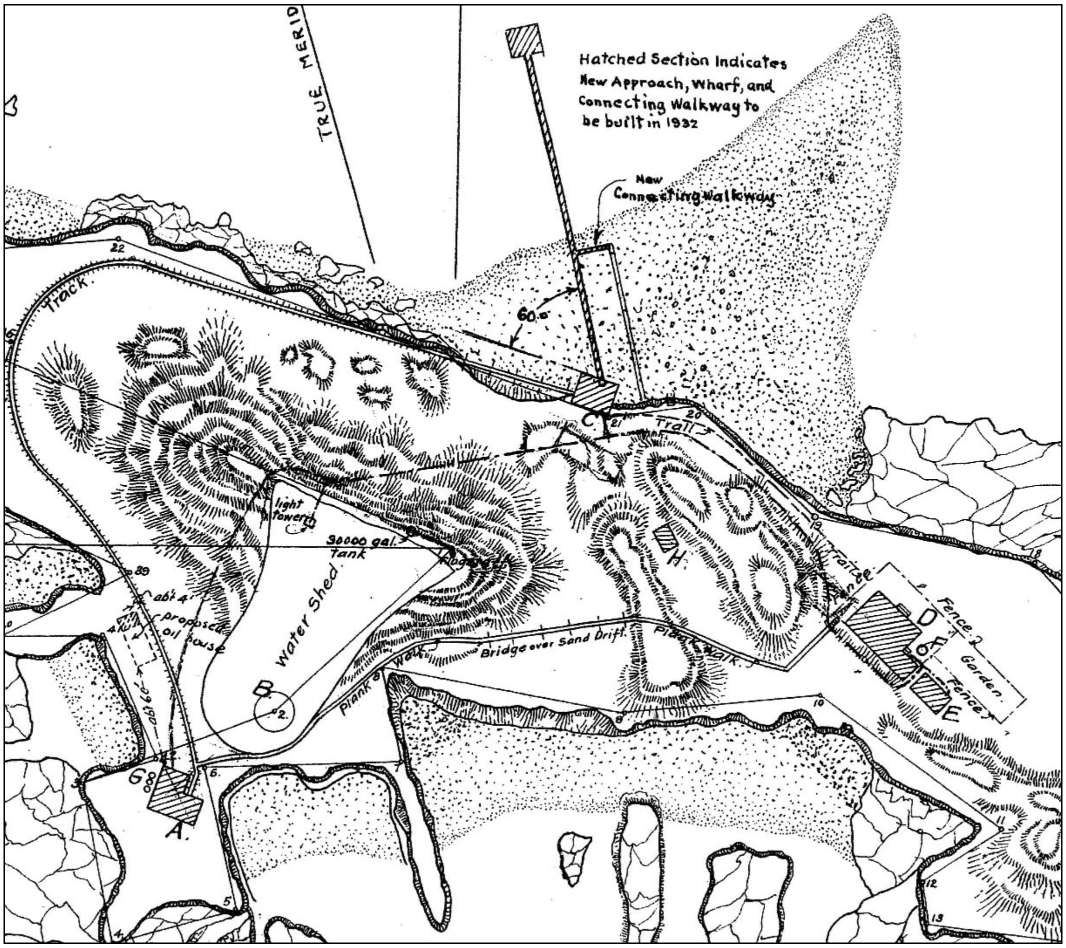


Figure 57. Año Nuevo Island, circa 1928.

Photograph taken from survey made under the direction of Lieut. Col. R.S. Williamson, 1880.

KEEPER'S DWELLING

This building consists of two parts, the older section built in 1872, and the addition constructed in 1906 (Figure 58 through Figure 61). Though the buildings are joined, they are not connected and are very different in style. That section built in 1872 measured 36 feet by 28 feet. The two keepers lived in this one structure with their families, and partitioned it into two sections. The house was described as white with drab trimmings and red roofs (U.S. Light House Establishment 1907). At other times, the window sashes were painted in a brown metallic, Venetian, and Vermillion mixture. The 1906 addition was built to the south of the existing building, adding nine more rooms including a bathroom. The building was renovated in 1911, although specific work completed is not currently known. Plans for another addition to the keeper's dwelling were made in 1916. These were drafted by the Office of the Lighthouse Inspector, Eighteenth District, in San Francisco. It appears that addition was never completed, however. Some sources seem to believe that the older section of the dwelling represents that portion built in 1904, while the original section (1872) is completely gone today. This does not appear as plausible, however, as it is unlikely that a large addition (1906) would be built only two years after that time.

Figure 58. Keeper's Dwelling, Original on left, 1906 Addition on right,
looking South, circa 1950s.

Figure 59. Keeper's Dwelling, Original on left, 1906 Addition on right,
looking South, circa 1950s.

Figure 60. Keeper's Dwelling, looking Northwest, 2005.

Figure 61. Keeper's Dwelling, looking Southeast, 2005.

There are four chimneys, two on each section. The roof is clad in wood shingles. Windows consist of double-hung sashes, with most of the panes missing. Entrances consist of wood doors, most of which are missing. Each quarters contained two bed rooms, a bath, kitchen, and living room, as well as a Eureka #7 1884 stove. The interiors contained lath and plaster sheathing. The interior also contained many wood surfaces which were frequently varnished.

North end (1872 section)

This was the original keeper's dwelling, and was occupied by the keeper once the addition was built (Figure 62 through Figure 66). It contained eight rooms (U.S. Lighthouse Board 1904). It measures 36 feet by 28 feet. It was constructed in a Greek-Revival style, and was far simpler in plan and design than the subsequent addition. The side gable roof is medium pitch, and is clad in wood shingles. The building contains symmetrical façades on front and rear, with an entrance flanked by sash windows. It is a 1 ½ story building, though contained only one floor for living space. The building rests on a brick foundation. Siding consists of eight inch wide clapboards over diagonal board sheathing. It contains four rooms and a single bathroom complete with toilet, enameled iron sink, and bathtub.

The foundation has been seriously undermined by erosion of the adjacent beach. The building is in danger of collapse as a result.

South end (1906 addition)

This was the addition built in 1906, and served thereafter as the assistant keeper's quarters (Figure 67 through Figure 75). It consists of two stories and contained nine rooms originally. The interior appears to have been altered over subsequent years, as there were only seven rooms by Coast Guard abandonment. The building rests on a concrete pier

Figure 62. Keeper's Dwelling, Original on right, 1906 Addition on left, circa early 1920s.

Courtesy of U.S. Lighthouse Society, San Francisco, California.

Figure 63. Assistant Keeper's Dwelling, North End, circa 1958.

Courtesy of California State Parks

Figure 64. Keeper's Dwelling, Original on right, 1906 Addition on left, 2005.

Figure 65. Keeper’s Dwelling, Original Portion, showing Brick Foundation and Deterioration to North Corner, 2005.

Figure 66. Keeper’s Dwelling, Original Portion, West Side, 2005

Figure 67. Rear (west) of Keeper's Dwelling (1906 Addition), showing Separation between Original Building (on left) and Addition on Right, 1926.

Courtesy of California State Parks. Photograph by Jack Chambers.

Figure 68. Rear (west) of Keeper's Dwelling (1906 Addition), 1926.

Courtesy of California State Parks. Photograph by Jack Chambers.

Figure 69. Front (east) of Keeper's Dwelling (Addition) in between
Original at Right and Shed at Left, 1982.

Courtesy of State Parks. Catalog #24738, Archaeology Laboratory, West Sacramento.

Figure 70. Rear of Keeper's Dwelling (1906 Addition),
Stairway to Landing, West Side, 1982.

This stairway was added sometime later judging by previous figure.
Courtesy of State Parks. Catalog #24738, Archaeology Laboratory, West Sacramento.

Figure 71. Exterior of West Wall, Keeper's Dwelling (1906 Addition), showing Broken Iron Pipes, Window Frames, and Molding, 1982.

Courtesy of California State Parks. Catalog #24736, Archaeology Laboratory, West Sacramento.

Figure 72. Front (east) Entrance to Keeper's Dwelling (1906 Addition), 1982.

Note scar from portico and boarded transom.
Courtesy of California State Parks. Catalog #24740, Archaeology Laboratory, West Sacramento.

Figure 73. South End of Keeper's Dwelling with Shed, 1982.

Courtesy of California State Parks. Catalog #24743, Archaeology Laboratory, West Sacramento.

Figure 74. Keeper's Dwelling (1906 Addition), 2005.

Figure 75. Keeper's Dwelling (1906 Addition), 2005.

foundation, with 2 inch by six inch stud framing. Siding consists of shiplap, two inch wide, nailed to diagonal sheathing. The hip roof contains boxed cornices. Five dormer windows covered in hip roofs are in place (three on the east and two on the west elevation). The south end is 55 feet long by 28 feet wide, with two offsets. There are five rooms, with a pantry and bathroom. A 20 inch by three inch sink was in this portion of the dwelling. The interior was clad with plaster, with many details such as picture molding. In later years, when three men were stationed on the island, this section of the dwelling was divided by floors, with the keeper living on the first, and the second assistant keeper in the second (the first assistant keeper lived in the north original building). Upstairs, flooring consists of linoleum. A sign was in place in front of the dwelling beginning in 1930, although it is not known what the sign read.

The main entrance appears to have been on the east elevation. It consisted of a single, two-panel wood door, framed by pilasters as well as by transom and side lights. A small portico was built over the entrance, serving as second story balcony. The portico is now gone. Windows throughout the rest of the building consisted of double hung sash with two lights each. There were two chimneys in the building, in place between the bedroom and sitting room, and the kitchen and dining room on the first floor. The section is similar in style to some keeper's dwellings in New England, and has been described as Colonial

Revival, Cape Cod, or New England style. It contains several Greek Revival elements as well. The building is deteriorating rapidly due to neglect, as well as seal activity.

There were three outhouses and a cement walkway around the buildings. A small, ½-acre garden was also immediately adjacent, used by the keepers for supplemental food. A cistern was built at some point in the 1920s to provide water for the residences. There was also a storehouse measuring eight feet by six feet, adjacent to each dwelling where coal, kerosene, and supplies were kept. Judging by building plans, these storehouses were attached to the building. A storage shed was constructed to the south of the 1906 addition at some point. This was used to store coal, as well as other supplies at other times. A wood walkway, also known as catwalk or boardwalk, led from the keeper's dwellings to the fog signal building. Only a small portion of this walkway remains today.

CHICKEN HOUSE

Lighthouse keepers often kept a small number of animals to provide additional sustenance, and a small chicken house was in place north of the keeper's dwelling (Figure 76). It was a wood frame structure measuring ten feet by fourteen feet. Other small structures were built to house chickens at other times, including to the south of the keeper's dwelling. None of these structures remain today.

Figure 76. Keeper's Dwellings with Chicken House in Foreground, 1957.

Courtesy of California State Parks.

FOG SIGNAL BUILDING

The original fog signal building was built in 1872, was painted white, and included a carpenter and blacksmith shop. The wood frame building was constructed in an L-shape, both sections with gable roofs (see Figure 37). Cornice returns were found on each gable end. Siding consisted of shiplap. The roof was clad in wood shingles. The horn was at the peak of the roof, above a numeral "5." The fog horn gave blasts of ten seconds followed by intervals of 55 seconds (Figure 77). The fog horn itself was frequently painted with aluminum paint.

The building was expanded in 1880 following the placement of a second fog signal, and at some point was demolished to make room for a second building, which was completed in 1881 (Figure 78). It appears possible that one gable portion of the original building was used in the second building, as their shape and form are similar. Immediately adjacent to the building was a large water tank that was used to cool the fog signal boilers. Frequent repairs were made to these boilers. In 1885, for example, one was replaced, followed by another in 1887. They were built by F. J. Moynihan of San Francisco.

In 1899, a new frame building was constructed in front of the older building in order to house a new fog signal (Figure 79 through Figure 84). The fog signal apparatus was moved into it and made operational the next year. New four inch whistle valves replaced the older ones. The building measured forty two by thirty four feet. The older fog signal building was connected to the new one by an enclosed gallery. The older building was converted to use as a coal house and tool shop. The original building (1872) was torn down at that time. A concrete walk was built to connect the building to the light.

Figure 77. New Years Island Fog Whistle, Looking South, circa late 1870s.

"New Years Island, fog whistle, looking south."
Courtesy of California Historical Society. Photograph by E. Muybridge.
Stereographs from the Pacific Coast series. Box 03: PC-RM-Stereos.

Figure 78. Second Fog Signal Building (built 1881)
in front of Water Shed and Cistern, circa late 1880s.

Fog Whistles are smaller vertical members protruding from roof. larger pipes are vents for boilers.
Note similarity to fog signal building at pigeon point in Figure 34.
Courtesy of Department of Special Collections, Stanford Libraries.

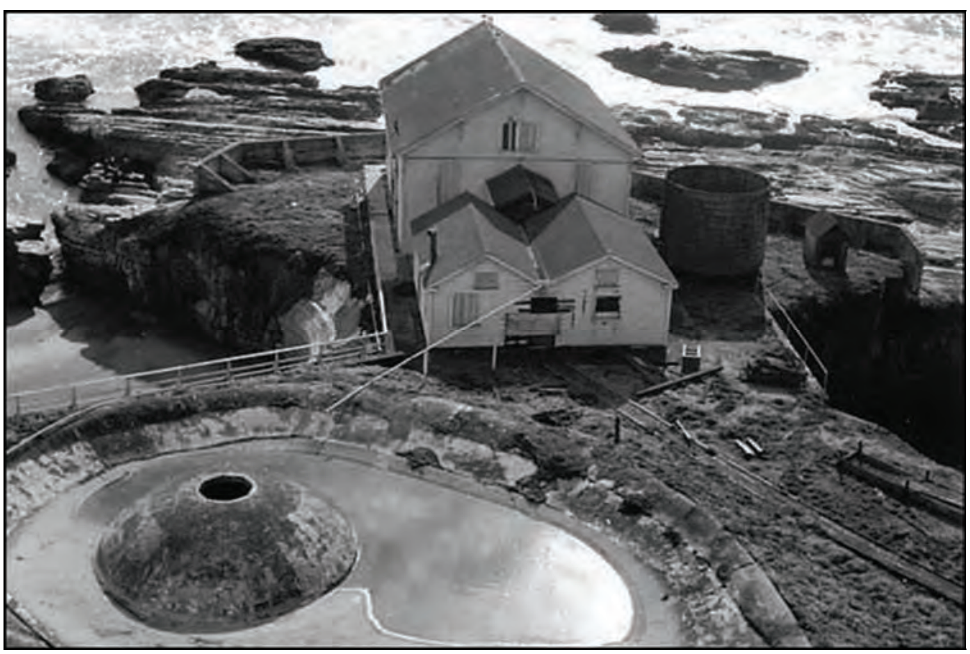


Figure 79. Fog Signal Building with Water Tank and Distillate House to the Right, 1957.

Second (1881) fog signal building is twin gable structure at rear of larger building (1899).
Water shed and cistern are in foreground. Seawall is visible at front.
Courtesy of California State Parks

Figure 80. Fog Signal Building at Right, 1926.

Courtesy of California State Parks. Photograph by Jack Chambers.

Figure 81. Fog Signal Building (at left) adjacent to Light Tower and Tank House, Unknown Date.

Flag pole is barely visible to right of tank house. Note fog signals in gable end.
Courtesy of U.S. Lighthouse Society, San Francisco, California.

Figure 82. Fog Signal Building and Wood Walkway, circa early 1920s.

Note fog signals in gable end at left.
Courtesy of U.S. Lighthouse Society, San Francisco, California.

Figure 83. Fog Signal Building in background with Seawall visible to Left, 1966.

Courtesy of California State Parks.

Figure 84. Fog Signal Building, 1982.

Courtesy of California State Parks. Catalog #24752, Archaeology Laboratory, West Sacramento.

Today, both buildings remain. The building can be divided into three segments: 1) the second 1881 section; 2) the gallery, or breezeway connecting the two buildings; and 3) the newer building constructed in 1899.

1881 Building

This wood frame building was constructed in 1881, to replace an original building constructed in 1872. It currently measures 24 x 31 feet. The building rests on a concrete slab foundation. The roof consists of two gables, clad in wood shingles over closed board sheathing. Eaves contain boxed cornices, with cornice returns on each gable end. Siding consists of shiplap. Windows consist of four and six-light fixed sashes. Those windows on the first floor of the northeast front elevation were added at some subsequent date, as early photographs depict this wall without windows. It appears that all of the windows were replaced at some date, although it is not know specifically when this occurred. Wood, movable sashes are stored in a storage room in the 1899 section of the building. There is only one entrance remaining on the building, on the northeast front. It appears that this entrance was moved from its original location to make way for a sliding door in its place. This sliding door was later covered over, and another single door was put in its place. There was likely an entrance on the other end of the building, the southwest. Following the construction of the newer building in 1899, and the enclosed gallery, this door was likely removed. Window and door trim on this section of the building is five and a half inches wide. Siding members are nine inches to the weather.

The interior contains cement floor (currently painted green). Wall sheathing varies, with shiplap, tongue and groove, and random size boards all found.

It appears that there was no ceiling originally, with the interior was left open. Windows (six-light fixed sashes) on the gable ends provided light for this interior space. These are painted over today. Two large posts support six by six inch beams which carry the ends of the roof trusses on in the middle of the interior. Rafters consist of two by six inch lumber. Only after the building was converted to a coal shed and tool shop was a ceiling installed over parts of the interior. This was to create rooms for tool storage or other shop purposes on the north and east corners of the building. The center of the building was left open. The rooms were built following the construction of the new fog signal building in 1899, as there was no need for a large open space in this building to house the signal equipment and boilers. Various siding was used on these rooms, including tongue and groove and shiplap, of varying dimensions. This siding may have come from other locations on the station. The hole for the fog signal apparatus in the southwest end of the gable roof was patched once this building was converted to serve as coal shed and tool shop. Traces of this opening can be seen in the roof today.

Gallery

The gallery was built in 1899 in order to connect the new fog signal building with the older building. The gallery is eleven feet, eight inches long by eight feet wide. Siding members measure seven inches and nine inches to weather. The structure was built using four by four inch studs, and left unsheathed on the interior. Wood sliding doors are found on each end, providing access to the exterior of the building. The tracks for these doors are replaced frequently due to rust. Trim around the sliding doors is six inches wide.

1899 Building

This wood frame building measures forty four feet by thirty four feet, and was constructed to house newer fog signal equipment. As with the 1881 building, this one is sheathed in shiplap siding (Figure 85 through Figure 97). It contains a gable roof, clad in wood shingles over closed board sheathing. The king post trusses supporting the roof are identical to those in the fog signal building at Point Arena light station (built in 1896). Bottom and top chords consist of three by ten inch lumber, and web members are two by eight inches. Five wood brackets are found beneath the eaves on each gable end. Windows consist of several six-light fixed sashes which replaced original six over six movables sashes; two six over six sashes in the second floor of the northeast elevation; and a single four-light fixed sash on the southeast side which replaced an original six over six sash here originally (scar is visible above window). A modern, sliding aluminum window was installed in the opening for the fog signals on the southwest end. Window trim is five and a half inches wide. Siding members measure seven inches to weather.

The interior contains four rooms. The main room contained the fog signal boilers and apparatus. Only concrete foundations and channels (to drain water away from steam boilers) remain from the equipment, however. A single entrance is found on the southwest end of the building, currently enclosed by a plywood door. Hinge and strike plate scars on the exterior portion of the frame indicate that a door originally opened to the south. Two rooms are found on the northwest and southeast interior sections of the building. The purpose of these rooms is not currently known, although one appears to have been used as a tool room. Each room is sheathed in tongue and groove wood siding. Small windows are found on the interior of these rooms (southwest side) into the main room. There are two doors on each of these rooms providing access from the main room. A small generator room was constructed on the south corner of the room on the southeast side. A loft was recently constructed in the second floor area of the southwest gable end, and is used for biological observation.

The wood shingles on each of the roof sections were replaced within the past 10 years, and the exterior was re-painted shortly after the turn of the millennium. Old shingles were burned on the island.

Figure 85. Fog Signal Building looking North, Unknown Date.

Note sliding door on front of 1881 building. Fog signal whistles are visible on 1899 building. Courtesy of Department of Special Collections, Stanford University Libraries.

Figure 86. Fog Signal Building, 1881 Portion at Front, 1899 Portion at Rear, 2005.

Figure 87. Fog Signal Building looking Northwest, 2005.

Figure 88. Fog Signal Building looking Southwest, 2005.

Figure 89. Fog Signal Building Gallery, 2005.

Photograph shows galley connecting 1881 portion at left and 1899 building at right.

Figure 90. Retaining Wall Adjacent to 1881 Section of Fog Signal Building, looking West, 2005.

Figure 91. Fog Signal Building, looking North, 2005.

Note concrete retaining wall at right, and remains of wood walkway.

Figure 92. Interior of 1881 Section of Fog Signal Building, looking through Gallery (Southwest) to 1899 Building, 2005.

Figure 93. Interior of 1881 Section of Fog Signal Building, East Corner, 2005.

Photograph shows Room 2 and posts supporting beam.

Figure 94. Interior of 1881 Section of Fog Signal Building, West Corner, 2005.

Note tongue and groove siding on wall to left and ceiling sheathing, and shiplap sheathing on wall at right.

Figure 95. Interior of 1899 Fog Signal Building, Southwest Wall, 2005.

Loft visible at top of photograph was original location of fog signal whistles.

Figure 96. Interior of Fog Signal Building, 1899 Portion, 2005.

Photograph shows door into Room 8. Note foundations for boilers and other equipment.

Figure 97. Interior of 1899 Fog Signal Building, Northwest Wall, 2005.

Note tongue and groove sheathing, and lower portions of roof trusses.

LIGHT TOWER

The steel tower was built in 1914, to replace the earlier housing for the light (Figure 98 through Figure 104). Originally (1890), the light was installed on top of a water tank, followed by a wood post set in a concrete foundation, which were painted white. The steel tower was 18 feet square at the base and 35 feet tall, with the lens located on the top of the tower. Immediately below this was an enclosed section known as the watch room, accessible via a hatch. As described above, the earthquakes of October 22, 1926 caused serious damage to the lens and structure. This light was soon replaced. The tower was seriously deteriorated by the early 1960s, and the one inch hand rails were reduced to less than one half inch diameter. The steel light tower was taken down in 1976 for safety reasons.

WATER TANKS

Numerous water tanks were established on the island at various times (Figure 105 through Figure 107). A 4,500 gallon water tank was built in 1894. In 1896, a larger 35,000 gallon water tank was built on a masonry foundation. A new 40,000 gallon tank was constructed in 1928, replacing an earlier tank. A temporary circulating tank was also built, which would “sweeten” the water before it was stored in the larger 40,000 gallon tank. This was designed to remove the redwood stain from the new lumber (U.S. Treasury Department 1928). The large tank was supposed to provide all domestic water needs, but the water was

Figure 98. Overview of Light Station with Light Tower visible at Left, 1953.

Note fog whistles are missing from gable end of fog signal building (replaced by automated system). Courtesy of U.S. Coast Guard Historian's Office, Washington, D.C. Photograph by U.S. Coast Guard.

Figure 99. Steel Light Tower, ca. late 1950s.

Courtesy of California State Parks. Photograph by U.S. Coast Guard.

Figure 100. Steel Light Tower adjacent to Water Tank, 1957.

Courtesy of California State Parks.

Figure 101. Steel Light Tower adjacent to Tank House, 1961.

Courtesy of California State Parks.

Figure 102. Steel Light Tower following Dismantling by State, 1982.

Courtesy of California State Parks.
Catalog #24754 and #24743, Archaeology Laboratory, West Sacramento.

Figure 103. Steel Light Tower, 2005.

Figure 104. Steel Light Tower, 2005.

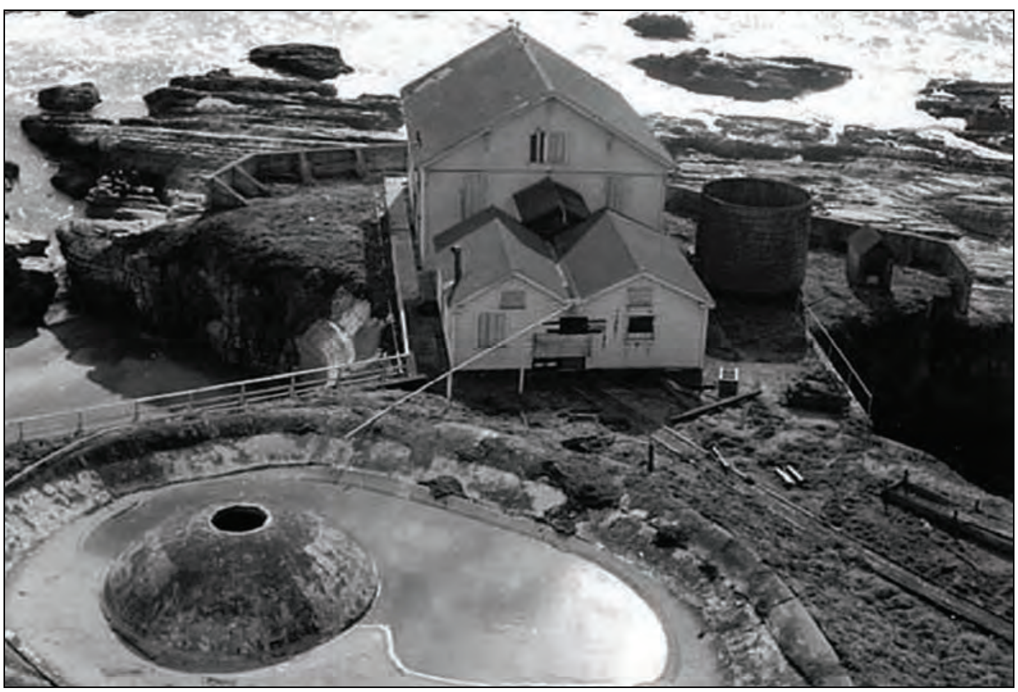


Figure 105. Fog Signal Building with Water Tank at Right, 1957.

Courtesy of California State Parks.

Figure 106. Water Tank adjacent to Fog Signal Building, 1957.

Concrete retaining wall is visible in left foreground, oil storage house and paint locker in rear.
Courtesy of California State Parks.

Figure 107. Foundation for Water Tank adjacent to Fog Signal Building, 2005.

Concrete retaining wall is visible at rear.

not suitable for cooking or drinking. It was only used for bathing and cleaning. In 1949, there were three redwood tanks remaining: 12,000 gallon, 35,000 gallon, and 20,000 gallon. The 12,000 gallon tank appeared to be original.

TANK HOUSE

This hexagon-shaped structure was constructed of wood, and measured sixteen feet, six inches on each side (Figure 108 and Figure 109). It contained a 38,000 gallon water tank. Prior to the construction of the steel tower, the light was placed on top of this building. The building was dismantled by the state in 1962. The area around the tank was "cleaned-up" of all debris at that time.

WATER-SHED AND CISTERN

Built in the 1870s, the water shed (also referred to as rain shed) consisted of a large cemented area measuring approximately 115 feet by 160 feet. At the base of the water shed was a concrete cistern, which caught and stored the collected water (Figure 110 and Figure 111). This water was then pumped into a large water tank above. From here, it was gravity fed to the dwellings. A wood walkway was installed along the inside edge of the lower portion of the water-shed, likely to provide access to the cistern. The cistern was frequently whitewashed. A hatch provided access to the interior. There were actually two cisterns in place on the island by 1949, one with a 4,000 gallon capacity, and the other 75,000 gallons. The smaller one appeared to be that adjacent to the keeper's dwelling.

BOATHOUSE

This structure, also known as the storehouse or warehouse was built in 1900 (Figure 112 through Figure 115). The building was located at the end of the pier. It measured 18 x 30 feet, and contained two stories, with the lower on the beach and the upper at the level of the tramway. It also contained a hoist. Supplies for the fog signal building were hoisted by block and tackle from the landing to the upper story of the boat house, and from there into a tram car. These cars were pushed by hand along the tramway. It was completely destroyed by fire sometime in the late 1950s.

COAL HOUSE

This facility was connected to the boathouse (or was a part of it). It was a wood frame structure measuring fourteen by thirty feet. Fuel, such as coal and distillate was stored in this building. It was apparently built in 1900 (some sources say 1922), and was also referred to as the coal shed, as well as warehouse. The building burned down in 1955.

TOOL HOUSE OR CARPENTER'S SHOP

This building was located immediately adjacent to the boathouse and coal shed. Little else is known about its date of construction, though it appears to correspond to what was referred to as the warehouse, which was a wood frame building, measuring twenty by thirty feet. The building burned down in 1955.

Figure 108. Tank House with Light at Top, Unknown Date.

Photograph taken prior to the construction of the light tower in 1913.
Courtesy of California State Parks.

Figure 109. Tank House in between Light Tower (on left) and Flag Pole (on right), 1926.

Courtesy of California State Parks. Photograph by Jack Chambers.

Figure 110. Cistern at the Base of the Water Shed, 1957.

Fog signal building is visible at right.
Courtesy of California State Parks.

Figure 111. Water Shed looking Northeast, 2005.

Base of light tower is visible at top of photograph.

Figure 112. Aerial Photograph of South Portion of Año Nuevo Island, looking West, 1948.

Note pier and boat house at end.
Courtesy of U.S. Lighthouse Society, San Francisco, California. Photograph by Reginald McGovern.

Figure 113. Boathouse at end of Tramway, Unknown Date.

Courtesy of U.S. Lighthouse Society, San Francisco, California.

Figure 114. Overview of Island with Boat House, Coal House, and Carpenter's Shop visible at Right, 1953.

Courtesy of U.S. Coast Guard Historian's Office, Washington, D.C. Photograph by U.S. Coast Guard.

Figure 115. Foundation of Boathouse to left of Modern Blind, 2005.

Pier is visible at left.

FUEL STORAGE/PAINT LOCKER BUILDING

This concrete structure measured 13 x 27 feet, and was connected to the boat house by the tramway (Figure 116 through Figure 119). It was apparently built in 1908. Though plans for the building could not be located, it appears to be similar to those constructed at other locations during this same period. At Point Conception, for example, the concrete and steel oil house measured 26 x 14 feet was built upon concrete piers and a five and a half inch thick concrete slab floor. A single steel door consisting of a 3/16 inch plate with two, two and a half inch riveted hinges provided access into the front of the structure. Four windows (two on each side) were also in place. The fuel storage building at Año Nuevo building began to deteriorate soon after the Coast Guard abandoned the station, and concrete began spalling off of the reinforcing rods. Cement patches have been applied to many places on the building. Several types of doors and window coverings have been installed on the building over the years of its operation. The building continues to deteriorate rapidly, particularly on the roof, where spalling is a major problem.

PIER

A pier or wharf was one of the first elements built on the island in 1872 (Figure 121 and Figure 122). Supplies were provided to the island from this pier and trips to and from the island were made from it. Because of difficult conditions, the pier was frequently repaired. The existing pier appears to be relatively recent, though a section of the pier built in 1932 remains.

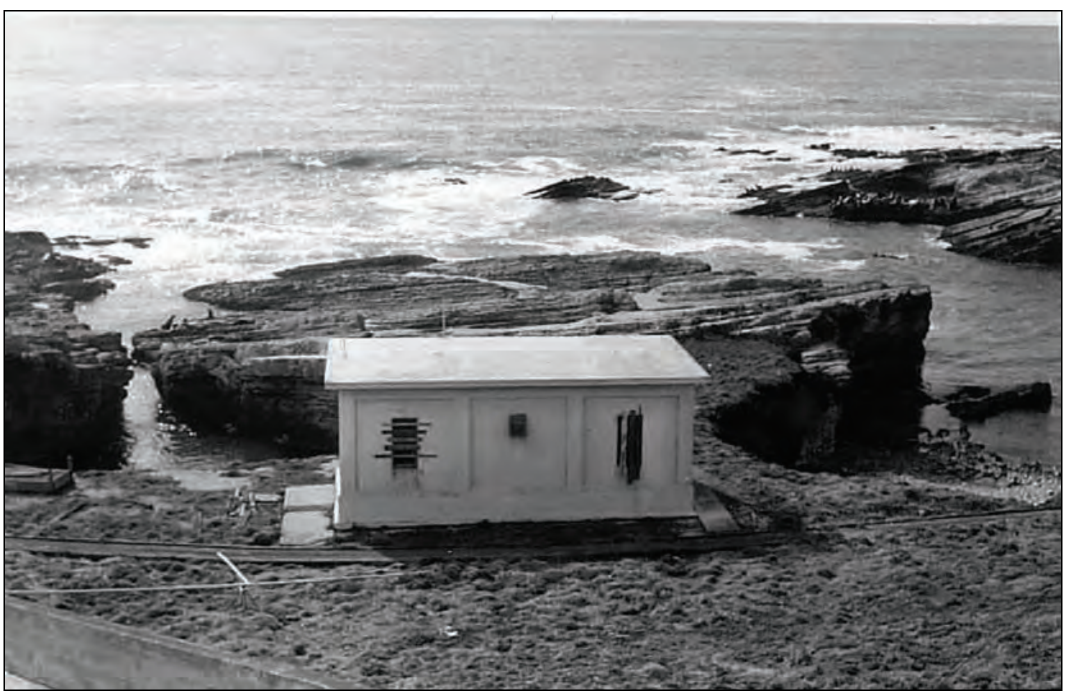


Figure 116. Fuel Storage/Paint Locker Building, 1957.

Courtesy of California State Parks.

Figure 117. Fuel Storage/Paint Locker Building, looking Southwest, 2005.

Figure 118. Fuel Storage/Paint Locker Building, looking Southeast, 2005.

Figure 119. Interior of Fuel Storage/Paint Locker Building, 2005.

Figure 120. Fog Signal Building (1899 Portion) looking Southeast, 2005.

Distillate building is the small gable-roof structure in front, to left of seawall.

Figure 121. Wharf and Pier, circa 1961.

Courtesy of California State Parks.

Figure 122. Pier/Wharf, 2005.

Remains of pier built in 1932 are visible at left.

OTHER LANDSCAPE ELEMENTS

Many other features built on the light station, particularly those of wood, were either burned by trespassers or reused in later structures. As a result, very few remain today.

Wood Walkway

There were several wood walkways connecting buildings (Figure 123 and Figure 124). One portion measured 500 feet long, complete with hand railings. Small trestles were constructed over several gullies on the island for the walkways. The walkways were frequently repaired, being completely rebuilt in 1894. Decking consisted of two inch by twelve inch lumber. Gravel was poured along walking pathways, as well as along the edges of the boardwalk.

In the late 1950s and early 1960s, these were all broken up and torn apart by visitors to the island, who used most of the wood for campfires. This may have been the cause of the fire that destroyed the boat house.

Concrete Walkways

Concrete walkways were built around the fog signal building in 1900 and the dwelling sometime thereafter (Figure 125). Those around the keeper's dwelling have eroded significantly and are largely gone today. Concrete walkways remain around three sides of the fog signal building, however.

Figure 123. Remains of Wood Walkway Keeper's Dwelling
with Fog Signal Building, 2005.

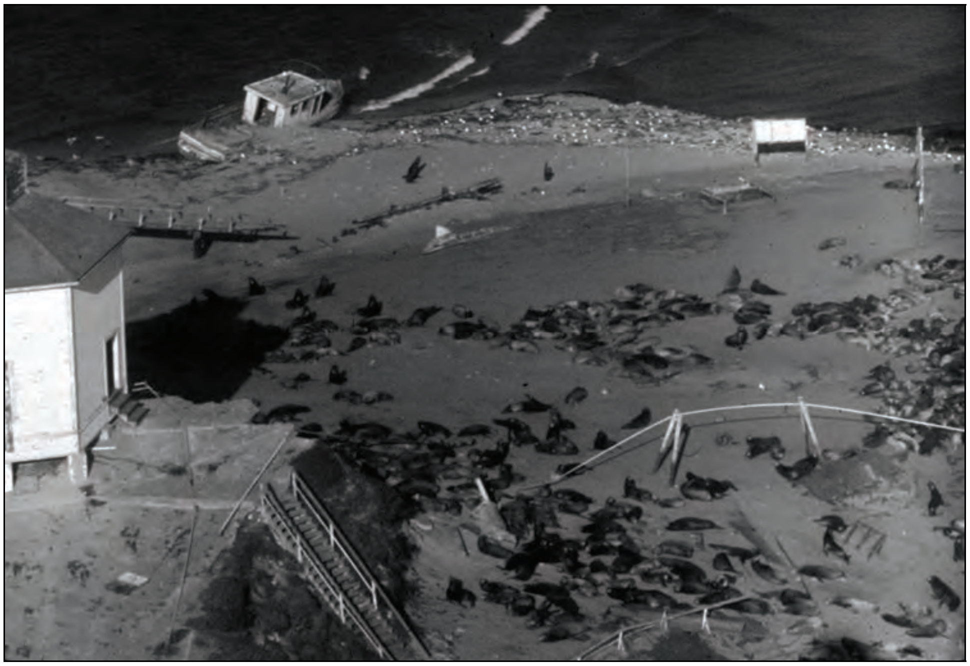


Figure 124. Portion of Water Tank Structure, circa 1961.

Photograph shows wood stairway leading up to the water tank.
Courtesy of California State Parks.

Figure 125. Remains of Concrete Walkway near Keeper's Dwelling, 2005.

Windbreak

The windbreak was located on the south side of the island, constructed upon four inch by six inch by ten foot studs, and painted frequently to protect it from the weather. It was blown down during high winds in February 1926. It was apparently rebuilt with twelve foot tall pickets, extending for approximately 253 feet. No trace of this feature remains today. The wood was likely burned or re-used for other purposes.

Fence

A board fence was constructed at some point, measuring 367 feet long, with various heights. No trace of this feature remains today. The wood was likely burned or re-used for other purposes.

Tramway

Built in 1872, the tramway or trestle measured 290 feet in length, and was four feet, four inches wide (Figure 126). It contained steel rails, two inches wide by one half inch thick. Oregon fir planks, measuring two by twelve inches were coated with a crude oil mixture and nailed directly onto four by four inch redwood stringers. The tramway, as with the walkway, required frequent repairs and cleaning. It was also cleared of weeds and sand on a regular basis. In 1894, it was overhauled and repaired, with 675 feet of it renewed with new iron rails. A turntable was also built in order to eliminate the long curve, thereby shortening the track. No trace of this feature remains today. The wood was likely burned or re-used for other purposes.

Figure 126. Fog Signal Building looking South, Unknown Date.

Note tramway at right and fences adjacent to building.
Courtesy of Department of Special Collections, Stanford University Libraries.

Retaining Wall

This concrete wall measured 180 feet long, of varying height, and was located at the water's edge in front of the fog signal building. It was built in 1886.

Phone Line

A pole supported a single span across the water to the mainland, and was frequently knocked out during high winds. The phone pole is no longer in place, and phone lines were removed sometime following the abandonment of the island by the Coast Guard.

Refuse

A great deal of abandoned equipment remains on the island (Figure 127 through Figure 130). The source of this material is difficult to trace. While some of it dates to the period of the operation of the light station, a great deal more has been brought to the island as a part of biological investigations occurring since the early 1960s. A large brick pile is in place in the northwest portion of the island, immediately adjacent to where the tramway originally ran. Many of these bricks contain the name "Cowen." It appears that these were firebricks produced by the Joseph Cowen & Company. The company was founded in Blaydon-on-Tyne, England, and operated between roughly 1823 and 1904. The company may have been originally named Foster & Cowen. The firm was taken over in 1893, and operated until 1946 (Piwarzyk 1996). These bricks are now being removed and used across the island in order to create nesting habitat for various bird species.

Figure 127. Brick Pile, 2005.

Figure 128. Brick Pile looking East, 2005.

Figure 129. Concrete-encased Phone Pole, 2005.

Figure 130. Various Iron Refuse on Beach on Southwest Portion of Island, 2005.

SITE LAYOUT

The interrelationship of the buildings, structures, fences, paths, tramway, and pier is important in the history of the island (Figure 131). The relationship between these features was planned to create flow, which provided for ease of moving people, goods, and equipment to various activity centers on the island. These activity areas can be broken into the following:

Housing (keeper's dwelling, assistant keeper's dwelling, chicken house, gardens)

Storage (pier, boat warehouse, coal shed, carpenter shop)

Navigational Aids (fog signal building, light tower, rain shed, cistern, water tank)

Open/Unused Areas (rocky and sandy coves, west end of island)

The first three activity areas were linked by the wood walkways, catwalks, as well as the tramway. Unfortunately, the discernment of these activity areas today is difficult. Many of the features themselves are gone. The routes of passage connecting these areas together are also gone.

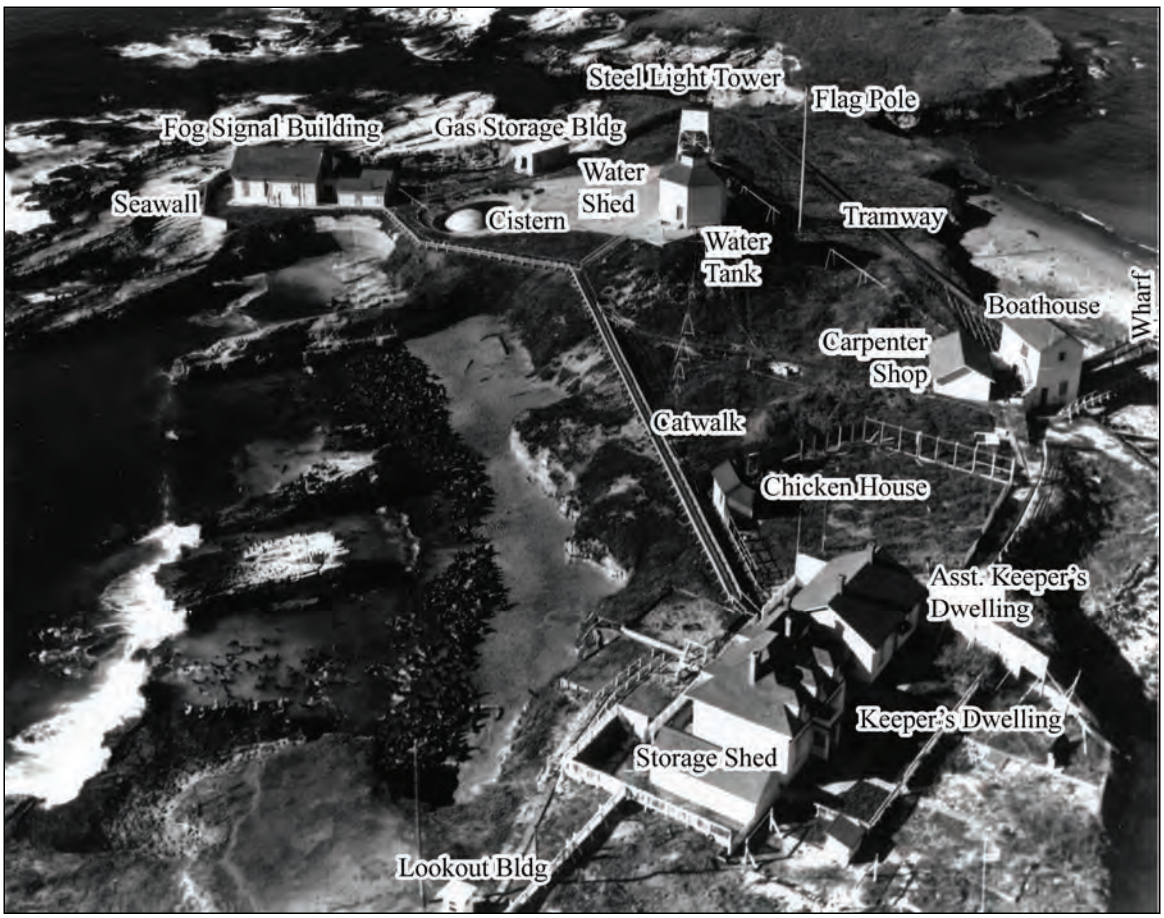


Figure 131. Año Nuevo Island Light Station, 1953.

Courtesy of U.S. Coast Guard Historian's Office, Washington, D.C. Photograph by U.S. Coast Guard.

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APPENDIX A:
GENERAL CATALOGUE

General Catalog—Explanatory Key

LOT NO	Previously assigned by DPR Lot No. - =Salvage Excavations by FWARG/Albion Lot No. 0 =Previous DPR Surface Collection Lot No. 1 =Previous Cabrillo/DPR Surface Collection Lot No. 5-6 =Previous Cabrillo Excavation
SPEC NO.	Specimen number assigned consecutively during cataloguing
ITEM NO	Previously assigned by DRP
UNIT TYPE	Unit type: CU (Control Unit), EU (Excavation Unit), RRU (Rapid Recovery Unit), STU (Surface Transect Unit), SCA (Surface Collected Artifact), TU (Test Unit)
UNIT SIZE	Unit size in meters
NS GRID	Location on NS grid
EW GRID	Location on EW grid
UPPER DEPTH	Upper depth in cm below surface
LOWER DEPTH	Lower depth in cm below surface
MESH	Screen size used, if applicable (“)
GROUP	Artifact/Material group BON Bone/Antler (artifactual) BOT Botanical (non-artifactual) CHR Charcoal/Ash samples FAU Faunal (non-artifactual bone, shell, teeth, horn, antler, claw, etc) FLS Flaked stone GDS Ground, Polished, or Battered Stone HIS Historic OTH Other (Other prehistoric) SHL Shell (artifactual)
CLASS	Artifact Class ASC Assayed Cobble AWL Awl BAT Battered Stone (hammerstone) BED Bead or Tube (prehistoric bone, groundstone, or shell) BIF Biface BLM Bowl mortar

CLASS	Artifact Class *continued*
	COR Core (types include: modified chunk, angular reduction debris, split cobble, battered cobble)
	CSC Charcoal Sample
	CRB Radiocarbon sample
	CRT Core Tool
	DEB Debitage
	DRI Drill
	FFT Formed Flake Tool
	FLC Flaked Cobble Tool
	FSG Fish Gorge
	GNS Grooved/Notched Stone
	HAL Haliotis
	HST Handstone/Mano
	LML Large Mammal bone
	OTH Other
	PEN Pendant
	PES Pestle
	PIG Pigments (ochre, etc.)
	POL Polished Bone
	PPT Projectile Point
	SED Seed
	SFT Simple Flake Tool
	SHL Shell, general (not speciated)
	SPT Spatula (bone)
	UNI Unidentified
TYPE	Artifact Type (prehistoric and historic)
	BRN Burned
	END End
	FRG Fragment
	HAL Haliotis spp. (abalone)
	LFS Leaf shaped
	OLI Olivella
	MAR Margin
	MID Midsection
	WHL Whole

MATL	Material Type BON Bone CCS Cryptocrystilline silicate CER Ceramic CHR Charcoal FCT Franciscan Chert GRA Granite/granodiorite IGN Igneous MCT Monterey Chert MTS Metasedimentary MUD Mudstone OBS Obsidian PLS Plastic QZC Quartz Crystal QZT Quartzite ROC Red Ochre SAN Sandstone SDM Sedimentary SED Seed SHL Shell TTH Tooth UNI Unidentified
COUNT	Material count
WT.	Material weight in grams measured to nearest 1/10th of a gram except for items over 300 grams which are weighed to the nearest gram
DESCRIPTION	Material description

General Catalog CA-SMA-018
(Accession No. P1238)

Lot No	Specimen No	Item No	Unit Type	Unit Size	N/S Grid	E/W Grid	Upper Depth	Lower Depth	Mesh	Group	Class	Type	Material	Count	Weight	Description	Comment
-	1	-	CU	2x1	N0	E0	0	20	1/8D	FLS	COR		MCT	1	72.1	CORE	
-	2	-	CU	2x1	N0	E0	0	20	1/8D	FLS	COR		MCT	1	63.9	CORE	
-	3	-	CU	2x1	N0	E0	0	20	1/8D	FLS	COR		MCT	1	154.9	CORE	
-	4	-	CU	2x1	N0	E0	0	20	1/8D	FLS	DEB		MCT	121	916.0	DEBITAGE	
-	5	-	CU	2x1	N0	E0	0	20	1/8D	FLS	DEB		QZT	1	54.9	DEBITAGE	
-	6	-	CU	2x1	N0	E0	0	20	1/8D	GDS	BAT		MUD	1	201.7	BATTERED STONE	
-	7	-	CU	2x1	N0	E0	0	20	1/8D	SHL	BED	OLI	SHL	1	1.8	BEAD	
-	8	-	CU	2x1	N0	E0	0	20	1/8D	FAU	SHL		SHL	0	174.6	SHELL	
-	9	-	CU	2x1	N0	E0	0	20	1/8D	FAU	UNI		BON	41	78.9	BONE	
-	10	-	CU	2x1	N0	E0	20	40	1/8D	FLS	COR		MCT	1	41.4	CORE	
-	11	-	CU	2x1	N0	E0	20	40	1/8D	FLS	COR		MCT	1	51.7	CORE	
-	12	-	CU	2x1	N0	E0	20	40	1/8D	FLS	SFT		MCT	1	12.5	SIMPLE FLAKE TOOL	
-	13	-	CU	2x1	N0	E0	20	40	1/8D	FLS	SFT		MCT	1	6.5	SIMPLE FLAKE TOOL	
-	14	-	CU	2x1	N0	E0	20	40	1/8D	FLS	DEB		MCT	39	331.9	DEBITAGE	
-	15	-	CU	2x1	N0	E0	20	40	1/8D	SHL	BED	OLI	SHL	1	0.9	BEAD	
-	16	-	CU	2x1	N0	E0	20	40	1/8D	FAU	SHL		SHL	0	11.1	SHELL	
-	17	-	CU	2x1	N0	E0	20	40	1/8D	FAU	UNI		BON	45	34.4	BONE	
-	18	-	EU	2x1	N2	E0	0	20	1/4D	FLS	COR		MCT	1	49.9	CORE	

Lot No	Specimen No	Item No	Unit Type	Unit Size	N/S Grid	E/W Grid	Upper Depth	Lower Depth	Mesh	Group	Class	Type	Material	Count	Weight	Description	Comment
-	20	-	EU	2x1	N2	E0	0	20	1/4D	FLS	COR		MCT	1	44.6	CORE	
-	21	-	EU	2x1	N2	E0	0	20	1/4D	FLS	COR		MCT	1	117.6	CORE	
-	22	-	EU	2x1	N2	E0	0	20	1/4D	FLS	DEB		MCT	71	691.6	DEBITAGE	
-	23	-	EU	2x1	N2	E0	0	20	1/4D	GDS	GNS		IGN	1	134.4	NOTCHED STONE	PITTED
-	25	-	EU	2x1	N2	E0	0	20	1/4D	HIS	OTH		PLS	1	0.7	PLASTIC FRAG	
-	26	-	EU	2x1	N2	E0	0	20	1/4D	SHL	BED	OLI	SHL	1	1.5	BEAD	
-	28	-	EU	2x1	N2	E0	0	20	1/4D	SHL	BED	OLI	SHL	1	0.8	BEAD	
-	29	-	EU	2x1	N2	E0	0	20	1/4D	FAU	SHL		SHL	0	24.7	SHELL	
-	30	-	EU	2x1	N2	E0	0	20	1/4D	FAU	UNI		BON	52	59.5	BONE	
-	31	-	EU	2x1	N2	E0	20	40	1/4D	FLS	COR		MCT	1	142.0	CORE	
-	33	-	EU	2x1	N2	E0	20	40	1/4D	FLS	DEB		MCT	50	612.4	DEBITAGE	
-	35	-	EU	2x1	N2	E0	20	40	1/4D	GDS	PIT		SDM	1	560.3	PITTED STONE	
-	37	-	EU	2x1	N2	E0	20	40	1/4D	SHL	BED	OLI	SHL	1	1.9	BEAD	
-	38	-	EU	2x1	N2	E0	20	40	1/4D	SHL	BED	OLI	SHL	1	1.8	BEAD	
-	39	-	EU	2x1	N2	E0	20	40	1/4D	FAU	SHL		SHL	0	20.3	SHELL	
-	40	-	EU	2x1	N2	E0	20	40	1/4D	FAU	UNI		BON	106	51.3	BONE	
-	41	-	CU	2x1	N4	E0	0	20	1/8D	FLS	COR		MCT	1	75.8	CORE	
-	42	-	CU	2x1	N4	E0	0	20	1/8D	FLS	COR		MCT	1	182.8	CORE	
-	43	-	CU	2x1	N4	E0	0	20	1/8D	FLS	SFT		MCT	1	47.1	SIMPLE FLAKE TOOL	
-	44	-	CU	2x1	N4	E0	0	20	1/8D	FLS	SFT		MCT	1	1.7	SIMPLE FLAKE TOOL	

Lot No	*Specimen No*	*Item No*	*Unit Type*	*Unit Size*	*N/S Grid*	*E/W Grid*	*Upper Depth*	*Lower Depth*	*Mesh*	*Group*	*Class*	*Type*	*Material*	*Count*	*Weight*	*Description*	*Comment*
-	45	-	CU	2x1	N4	E0	0	20	1/8D	FLS	DEB		MCT	155	1545.6	DEBITAGE	
-	46	-	CU	2x1	N4	E0	0	20	1/8D	GDS	PIT		MUD	1	303.4	PITTED STONE	
-	47	-	CU	2x1	N4	E0	0	20	1/8D	GDS	HST		MUD	1	85.0	HANDSTONE FRAG	
-	49	-	CU	2x1	N4	E0	0	20	1/8D	SHL	BED	OLI	SHL	1	1.7	BEAD	
-	50	-	CU	2x1	N4	E0	0	20	1/8D	SHL	BED	OLI	SHL	1	2.8	BEAD	
-	51	-	CU	2x1	N4	E0	0	20	1/8D	SHL	BED	OLI	SHL	1	1.0	BEAD	
-	52	-	CU	2x1	N4	E0	0	20	1/8D	BON	AWL		BON	1	4.8	AWL	
-	53	-	CU	2x1	N4	E0	0	20	1/8D	CHR	CSC		CHR	0	0.7	CHARCOAL	
-	54	-	CU	2x1	N4	E0	0	20	1/8D	FAU	SHL		SHL	0	101.0	SHELL	
-	55	-	CU	2x1	N4	E0	0	20	1/8D	FAU	UNI		BON	166	161.5	BONE	
-	56	-	CU	2x1	N4	E0	20	40	1/8D	FLS	FFT		MCT	1	26.4	FORMED FLAKE TOOL	
-	57	-	CU	2x1	N4	E0	20	40	1/8D	FLS	COR		MCT	1	67.0	CORE	ARTIFACT #2
-	58	-	CU	2x1	N4	E0	20	40	1/8D	FLS	SFT		MCT	1	13.8	SIMPLE FLAKE TOOL	
-	59	-	CU	2x1	N4	E0	20	40	1/8D	FLS	DEB		MCT	90	545.8	DEBITAGE	
-	60	-	CU	2x1	N4	E0	20	40	1/8D	SHL	BED	OLI	SHL	1	1.6	BEAD	
-	61	-	CU	2x1	N4	E0	20	40	1/8D	SHL	BED	OLI	SHL	1	0.5	BEAD	
-	62	-	CU	2x1	N4	E0	20	40	1/8D	SHL	BED	OLI	SHL	1	1.0	BEAD	
-	63	-	CU	2x1	N4	E0	20	40	1/8D	SHL	BED	OLI	SHL	1	0.6	BEAD	
-	64	-	CU	2x1	N4	E0	20	40	1/8D	FAU	SHL		SHL	0	100.8	SHELL	
-	65	-	CU	2x1	N4	E0	20	40	1/8D	FAU	UNI		BON	111	34.8	BONE	

Lot No	Specimen No	Item No	Unit Type	Unit Size	N/S Grid	E/W Grid	Upper Depth	Lower Depth	Mesh	Group	Class	Type	Material	Count	Weight	Description	Comment
-	66	-	EU	2x1	N6	E0	0	20	1/4D	FLS	COR		MCT	1	77.9	CORE	
-	67	-	EU	2x1	N6	E0	0	20	1/4D	FLS	COR	FRG	MCT	1	61.8	CORE FRAGMENT	
-	68	-	EU	2x1	N6	E0	0	20	1/4D	FLS	SFT		MCT	1	59.7	SIMPLE FLAKE TOOL	
-	69	-	EU	2x1	N6	E0	0	20	1/4D	FLS	DEB		MCT	73	1233.5	DEBITAGE	
-	71	-	EU	2x1	N6	E0	0	20	1/4D	GDS	GNS		MUD	1	162.3	NOTCHED STONE	
-	72	-	EU	2x1	N6	E0	0	20	1/4D	SHL	BED	OLI	SHL	1	1.1	BEAD	
-	74	-	EU	2x1	N6	E0	0	20	1/4D	FAU	SHL		SHL	0	170.4	SHELL	
-	75	-	EU	2x1	N6	E0	0	20	1/4D	FAU	UNI		BON	127	181.6	BONE	
-	76	-	EU	2x1	N6	E0	20	40	1/4D	FLS	DEB		MCT	26	176.6	DEBITAGE	
-	77	-	EU	2x1	N6	E0	20	40	1/4D	FAU	SHL		SHL	0	37.9	SHELL	
-	78	-	EU	2x1	N6	E0	20	40	1/4D	FAU	UNI		BON	54	24.2	BONE	
-	79	-	CU	2x1	N8	E0	0	20	1/8D	FLS	COR		MCT	1	89.7	CORE	
-	81	-	CU	2x1	N8	E0	0	20	1/8D	FLS	COR		MCT	1	70.1	CORE	
-	82	-	CU	2x1	N8	E0	0	20	1/8D	FLS	DRI		MCT	1	11.0	DRILL	
-	85	-	CU	2x1	N8	E0	0	20	1/8D	FLS	ASC		QZT	1	107.7	ASSAYED COBBLE	
-	86	-	CU	2x1	N8	E0	0	20	1/8D	FLS	DEB		IGN	1	29.6	DEBITAGE	
-	87	-	CU	2x1	N8	E0	0	20	1/8D	FLS	DEB		MCT	132	1357.6	DEBITAGE	
-	88	-	CU	2x1	N8	E0	0	20	1/8D	SHL	BED	OLI	SHL	1	1.2	BEAD	
-	89	-	CU	2x1	N8	E0	0	20	1/8D	SHL	BED	OLI	SHL	1	0.7	BEAD	
-	90	-	CU	2x1	N8	E0	0	20	1/8D	SHL	BED	OLI	SHL	1	1.3	BEAD	

Lot No	*Specimen No*	*Item No*	*Unit Type*	*Unit Size*	*N/S Grid*	*E/W Grid*	*Upper Depth*	*Lower Depth*	*Mesh*	*Group*	*Class*	*Type*	*Material*	*Count*	*Weight*	*Description*	*Comment*
-	92	-	CU	2x1	N8	E0	0	20	1/8D	CHR	CSC		CHR	3	2.3	CHARCOAL	
-	93	-	CU	2x1	N8	E0	0	20	1/8D	FAU	SHL		SHL		19.1	SHELL	
-	94	-	CU	2x1	N8	E0	0	20	1/8D	FAU	UNI		BON	101	64.2	BONE	
-	95	-	CU	2x1	N8	E0	20	40	1/8D	FLS	DRI		MCT	1	4.9	DRILL	
-	100	-	CU	2x1	N8	E0	20	40	1/8D	FLS	ASC		MCT	1	204.9	ASSAYED COBBLE	
-	101	-	CU	2x1	N8	E0	20	40	1/8D	FLS	DEB		MCT	100	656.2	DEBITAGE	
-	102	-	CU	2x1	N8	E0	20	40	1/8D	GDS	BAT		SDM	1	172.3	BATTERED STONE	
-	103	-	CU	2x1	N8	E0	20	40	1/8D	SHL	BED	OLI	SHL	1	0.4	BEAD	
-	104	-	CU	2x1	N8	E0	20	40	1/8D	SHL	BED	OLI	SHL	1	1.7	BEAD	
-	105	-	CU	2x1	N8	E0	20	40	1/8D	SHL	BED	OLI	SHL	1	0.6	DETRITUS	
-	107	-	CU	2x1	N8	E0	20	40	1/8D	FAU	SHL		SHL	0	106.2	SHELL	
-	108	-	CU	2x1	N8	E0	20	40	1/8D	FAU	UNI		BON	223	59.9	BONE	
-	110	-	EU	1X2	N5	W2	0	20	1/4D	FLS	DEB		MCT	74	569.3	DEBITAGE	
-	111	-	EU	1X2	N5	W2	0	20	1/4D	GDS	GNS		SDM	1	159.2	NOTCHED STONE	
-	113	-	EU	1X2	N5	W2	0	20	1/4D	SHL	BED	OLI	SHL	1	0.1	BEAD	
-	115	-	EU	1X2	N5	W2	0	20	1/4D	BON	AWL		BON	1	4.9	AWL	
-	116	-	EU	1X2	N5	W2	0	20	1/4D	FAU	UNI		TTH	1	2.3	TOOTH	
-	117	-	EU	1X2	N5	W2	0	20	1/4D	OTH	PIG		ROC	1	7.3	OCHRE	
-	118	-	EU	1X2	N5	W2	0	20	1/4D	FAU	SHL		SHL	0	120.8	SHELL	
-	119	-	EU	1X2	N5	W2	0	20	1/4D	FAU	UNI		BON	82	62.6	BONE	

Lot No	Specimen No	Item No	Unit Type	Unit Size	N/S Grid	E/W Grid	Upper Depth	Lower Depth	Mesh	Group	Class	Type	Material	Count	Weight	Description	Comment
-	120	-	EU	1X2	N5	W2	20	40	1/4D	FLS	COR		MCT	1	33.0	CORE	
-	121	-	EU	1X2	N5	W2	20	40	1/4D	FLS	DEB		MCT	31	176.0	DEBITAGE	
-	122	-	EU	1X2	N5	W2	20	40	1/4D	FLS	DEB		IGN	4	39.4	DEBITAGE	
-	123	-	EU	1X2	N5	W2	20	40	1/4D	BON	AWL		BON	1	68.0	AWL	
-	124	-	EU	1X2	N5	W2	20	40	1/4D	FAU	SHL		SHL	0	63.7	SHELL	
-	125	-	EU	1X2	N5	W2	20	40	1/4D	FAU	UNI		BON	36	19.0	BONE	
-	127	-	EU	1X2	N5	W4	0	20	1/4D	FLS	COR		MCT	1	99.9	CORE	
-	128	-	EU	1X2	N5	W4	0	20	1/4D	FLS	COR		MCT	1	94.1	CORE	
-	129	-	EU	1X2	N5	W4	0	20	1/4D	FLS	ASC		MCT	1	195.8	ASSAYED COBBLE	
-	130	-	EU	1X2	N5	W4	0	20	1/4D	FLS	DEB		MCT	98	1241.7	DEBITAGE	
-	131	-	EU	1X2	N5	W4	0	20	1/4D	FLS	DEB		CCS	3	94.8	DEBITAGE	
-	132	-	EU	1X2	N5	W4	0	20	1/4D	HIS	OTH		PLS	1	0.8	PLASTIC FRAG	
-	133	-	EU	1X2	N5	W4	0	20	1/4D	FAU	SHL		SHL	4	5.5	SHELL	
-	134	-	EU	1X2	N5	W4	0	20	1/4D	FAU	UNI		BON	14	23.2	BONE	
-	135	-	EU	1X2	N5	W4	20	40	1/4D	FLS	COR		MCT	1	163.9	CORE	
-	138	-	EU	1X2	N5	W4	20	40	1/4D	FLS	DEB		IGN	1	7.4	DEBITAGE	
-	139	-	EU	1X2	N5	W4	20	40	1/4D	FLS	DEB		MCT	38	299.5	DEBITAGE	
-	140	-	EU	1X2	N5	W4	20	40	1/4D	SHL	BED	OLI	SHL	1	0.7	BEAD	
-	142	-	EU	1X2	N5	W4	20	40	1/4D	BON	POL	FRG	BON	1	2.1	POLISHED BONE FRAG	
-	143	-	EU	1X2	N5	W4	20	40	1/4D	FAU	SHL		SHL	0	64.7	SHELL	

Lot No	Specimen No	Item No	Unit Type	Unit Size	N/S Grid	E/W Grid	Upper Depth	Lower Depth	Mesh	Group	Class	Type	Material	Count	Weight	Description	Comment
-	144	-	EU	1X2	N5	W4	20	40	1/4D	FAU	UNI		BON	31	30.1	BONE	
-	145	-	EU	1X2	N5	W6	0	20	1/4D	FLS	SFT		MCT	1	7.8	SIMPLE FLAKE TOOL	
-	146	-	EU	1X2	N5	W6	0	20	1/4D	FLS	COR		MCT	1	70.9	CORE	
-	147	-	EU	1X2	N5	W6	0	20	1/4D	FLS	DEB		MCT	108	1008.1	DEBITAGE	
-	148	-	EU	1X2	N5	W6	0	20	1/4D	FLS	DEB		IGN	3	74.3	DEBITAGE	
-	150	-	EU	1X2	N5	W6	0	20	1/4D	SHL	BED	OLI	SHL	1	0.6	BEAD	
-	151	-	EU	1X2	N5	W6	0	20	1/4D	SHL	BED	OLI	SHL	1	0.7	BEAD	
-	154	-	EU	1X2	N5	W6	0	20	1/4D	BON	PEN	FRG	BON	1	5.1	PENDANT	
-	155	-	EU	1X2	N5	W6	0	20	1/4D	CHR	CSC		CHR	0	10.1	CHARCOAL	
-	156	-	EU	1X2	N5	W6	0	20	1/4D	FAU	SHL		SHL	0	137.1	SHELL	
-	157	-	EU	1X2	N5	W6	0	20	1/4D	FAU	UNI		BON	97	133.2	BONE	
-	159	-	EU	1X2	N5	W6	20	40	1/4D	FLS	SFT		MCT	1	0.7	SIMPLE FLAKE TOOL	
-	160	-	EU	1X2	N5	W6	20	40	1/4D	FLS	DEB		MCT	29	119.7	DEBITAGE	
-	161	-	EU	1X2	N5	W6	20	40	1/4D	FAU	SHL		SHL	0	54.3	SHELL	
-	162	-	EU	1X2	N5	W6	20	40	1/4D	FAU	UNI		BON	31	15.7	BONE	
-	163	-	EU	1X2	N5	W8	0	20	1/4D	FLS	COR		MCT	1	185.7	CORE	
-	164	-	EU	1X2	N5	W8	0	20	1/4D	FLS	COR		MCT	1	74.9	CORE	
-	165	-	EU	1X2	N5	W8	0	20	1/4D	FLS	COR		MCT	1	82.8	CORE	
-	166	-	EU	1X2	N5	W8	0	20	1/4D	GDS	BAT		QZT	1	725.8	BATTERED STONE	
-	167	-	EU	1X2	N5	W8	0	20	1/4D	FLS	ASC		MCT	1	414.1	ASSAYED COBBLE	

Lot No	*Specimen No*	*Item No*	*Unit Type*	*Unit Size*	*N/S Grid*	*E/W Grid*	*Upper Depth*	*Lower Depth*	*Mesh*	*Group*	*Class*	*Type*	*Material*	*Count*	*Weight*	*Description*	*Comment*
-	168	-	EU	1X2	N5	W8	0	20	1/4D	FLS	FFT		MCT	1	33.6	FORMED FLAKE TOOL	
-	169	-	EU	1X2	N5	W8	0	20	1/4D	FLS	COR		MCT	1	51.9	CORE	
-	170	-	EU	1X2	N5	W8	0	20	1/4D	FLS	SFT		MCT	1	18.0	SIMPLE FLAKE TOOL	
-	171	-	EU	1X2	N5	W8	0	20	1/4D	FLS	DEB		MCT	233	1778.7	DEBITAGE	
-	172	-	EU	1X2	N5	W8	0	20	1/4D	FLS	DEB		OBS	1	0.5	DEBITAGE	
-	173	-	EU	1X2	N5	W8	0	20	1/4D	FLS	DEB		IGN	3	128.4	DEBITAGE	
-	174	-	EU	1X2	N5	W8	0	20	1/4D	GDS	GNS		SDM	1	333.0	NOTCHED STONE	
-	175	-	EU	1X2	N5	W8	0	20	1/4D	SHL	BED	OLI	SHL	1	0.7	BEAD	
-	177	-	EU	1X2	N5	W8	0	20	1/4D	OTH	PIG		ROC	0	0.5	OCHRE	
-	178	-	EU	1X2	N5	W8	0	20	1/4D	CHR	CSC		CHR	0	2.3	CHARCOAL	
-	179	-	EU	1X2	N5	W8	0	20	1/4D	FAU	SHL		SHL	0	13.8	SHELL	
-	180	-	EU	1X2	N5	W8	0	20	1/4D	FAU	UNI		BON	64	116.1	BONE	
-	181	-	EU	1X2	N5	W8	20	40	1/4D	FLS	COR		MCT	1	162.7	CORE	
-	183	-	EU	1X2	N5	W8	20	40	1/4D	FLS	DEB		MCT	63	351.9	DEBITAGE	
-	184	-	EU	1X2	N5	W8	20	40	1/4D	FAU	SHL		SHL	0	12.5	SHELL	
-	185	-	EU	1X2	N5	W8	20	40	1/4D	FAU	UNI		BON	46	23.4	BONE	
-	186	-	EU	1X2	N5	W10	0	20	1/4D	FLS	BIF	FRG	MCT	1	4.3	BIFACE FRAGMENT	
-	187	-	EU	1X2	N5	W10	0	20	1/4D	FLS	COR	FRG	MCT	1	56.3	CORE FRAGMENT	
-	188	-	EU	1X2	N5	W10	0	20	1/4D	FLS	SFT		MCT	1	6.5	SIMPLE FLAKE TOOL	
-	189	-	EU	1X2	N5	W10	0	20	1/4D	FLS	SFT		MCT	1	23.8	SIMPLE FLAKE TOOL	

Lot No	*Specimen No*	*Item No*	*Unit Type*	*Unit Size*	*N/S Grid*	*E/W Grid*	*Upper Depth*	*Lower Depth*	*Mesh*	*Group*	*Class*	*Type*	*Material*	*Count*	*Weight*	*Description*	*Comment*
-	190	-	EU	1X2	N5	W10	0	20	1/4D	FLS	SFT		MCT	1	61.3	SIMPLE FLAKE TOOL	
-	191	-	EU	1X2	N5	W10	0	20	1/4D	FLS	DEB		MCT	214	1672.4	DEBITAGE	
-	192	-	EU	1X2	N5	W10	0	20	1/4D	FLS	DEB		IGN	6	314.1	DEBITAGE	
-	193	-	EU	1X2	N5	W10	0	20	1/4D	GDS	BAT		QZT	1	180.7	BATTERED STONE	
-	194	-	EU	1X2	N5	W10	0	20	1/4D	CHR	CSC		CHR	0	1.7	CHARCOAL	
-	195	-	EU	1X2	N5	W10	0	20	1/4D	FAU	SHL		SHL	0	10.1	SHELL	
-	196	-	EU	1X2	N5	W10	0	20	1/4D	FAU	UNI		BON	53	35.6	BONE	
-	197	-	EU	1X2	N5	W10	20	40	1/4D	FLS	DEB		MCT	65	600.6	DEBITAGE	
-	198	-	EU	1X2	N5	W10	20	40	1/4D	FAU	SHL		SHL	0	34.3	SHELL	
-	199	-	EU	1X2	N5	W10	20	40	1/4D	FAU	UNI		BON	41	22.8	BONE	
-	200	-	EU	2x1	N9	W10	0	20	1/4D	FLS	COR		MCT	1	91.6	CORE	
-	201	-	EU	2x1	N9	W10	0	20	1/4D	FLS	COR		MCT	1	56.0	CORE	
-	203	-	EU	2x1	N9	W10	0	20	1/4D	FLS	SFT		MCT	1	37.3	SIMPLE FLAKE TOOL	
-	204	-	EU	2x1	N9	W10	0	20	1/4D	FLS	SFT		MCT	1	15.6	SIMPLE FLAKE TOOL	
-	205	-	EU	2x1	N9	W10	0	20	1/4D	FLS	ASC		MCT	1	226.3	ASSAYED COBBLE	
-	206	-	EU	2x1	N9	W10	0	20	1/4D	FLS	DEB		IGN	1	74.7	DEBITAGE	
-	207	-	EU	2x1	N9	W10	0	20	1/4D	FLS	DEB		OBS	1	1.2	DEBITAGE	
-	208	-	EU	2x1	N9	W10	0	20	1/4D	FLS	DEB		MCT	251	1877.9	DEBITAGE	
-	211	-	EU	2x1	N9	W10	0	20	1/4D	GDS	BAT		GRA	1	281.6	BATTERED STONE	
-	212	-	EU	2x1	N9	W10	0	20	1/4D	SHL	BED	OLI	SHL	1	0.6	DETRITUS	

Lot No	Specimen No	Item No	Unit Type	Unit Size	N/S Grid	E/W Grid	Upper Depth	Lower Depth	Mesh	Group	Class	Type	Material	Count	Weight	Description	Comment
-	213	-	EU	2x1	N9	W10	0	20	1/4D	CHR	CSC		CHR	0	16.7	CHARCOAL	
-	214	-	EU	2x1	N9	W10	0	20	1/4D	FAU	SHL		SHL	0	128.5	SHELL	
-	215	-	EU	2x1	N9	W10	0	20	1/4D	FAU	UNI		BON	87	110.2	BONE	
-	216	-	EU	2x1	N9	W10	20	40	1/4D	FLS	BIF	FRG	MCT	1	14.9	BIFACE FRAG	
-	217	-	EU	2x1	N9	W10	20	40	1/4D	FLS	COR	FRG	MCT	1	90.4	CORE FRAG	
-	219	-	EU	2x1	N9	W10	20	40	1/4D	FLS	DEB		MCT	50	279.6	DEBITAGE	
-	221	-	EU	2x1	N9	W10	20	40	1/4D	OTH	PIG		ROC	0	2.4	OCHRE	
-	222	-	EU	2x1	N9	W10	20	40	1/4D	FAU	SHL		SHL	0	25.9	SHELL	
-	223	-	EU	2x1	N9	W10	20	40	1/4D	FAU	UNI		BON	55	16.5	BONE	
-	224	-	CU	2x1	N1	W11	0	20	1/8D	FLS	BIF	FRG	MCT	1	7.8	BIFACE FRAG	
-	225	-	CU	2x1	N1	W11	0	20	1/8D	FLS	ASC		MCT	1	522.4	ASSAYED COBBLE	
-	226	-	CU	2x1	N1	W11	0	20	1/8D	FLS	COR		MCT	1	95.3	CORE	
-	227	-	CU	2x1	N1	W11	0	20	1/8D	FLS	COR		MCT	1	102.0	CORE	
-	228	-	CU	2x1	N1	W11	0	20	1/8D	FLS	SFT		MCT	1	8.4	SIMPLE FLAKE TOOL	
-	229	-	CU	2x1	N1	W11	0	20	1/8D	FLS	SFT		MCT	1	9.2	SIMPLE FLAKE TOOL	
-	230	-	CU	2x1	N1	W11	0	20	1/8D	FLS	DEB		MCT	163	567.0	DEBITAGE	
-	231	-	CU	2x1	N1	W11	0	20	1/8D	FLS	DEB		IGN	1	12.6	DEBITAGE	
-	233	-	CU	2x1	N1	W11	0	20	1/8D	SHL	BED	OLI	SHL	1	0.5	BEAD	
-	234	-	CU	2x1	N1	W11	0	20	1/8D	BON	AWL		BON	1	3.5	AWL	
-	235	-	CU	2x1	N1	W11	0	20	1/8D	FAU	SHL		SHL	0	7.0	SHELL	

Lot No	*Specimen No*	*Item No*	*Unit Type*	*Unit Size*	*N/S Grid*	*E/W Grid*	*Upper Depth*	*Lower Depth*	*Mesh*	*Group*	*Class*	*Type*	*Material*	*Count*	*Weight*	*Description*	*Comment*
-	236	-	CU	2x1	N1	W11	0	20	1/8D	FAU	UNI		BON	211	81.3	BONE	
-	237	-	CU	2x1	N1	W11	20	40	1/8D	FLS	DEB		MCT	37	169.5	DEBITAGE	
-	238	-	CU	2x1	N1	W11	20	40	1/8D	FLS	DEB		IGN	1	18.6	DEBITAGE	
-	240	-	CU	2x1	N1	W11	20	40	1/8D	FAU	SHL		SHL	0	20.3	SHELL	
-	241	-	CU	2x1	N1	W11	20	40	1/8D	FAU	UNI		BON	87	17.4	BONE	
-	242	-	EU	2x1	N7	W11	0	20	1/4D	FLS	DRI		MCT	1	4.6	DRILL	
-	245	-	EU	2x1	N7	W11	0	20	1/4D	FLS	COR		MCT	1	135.8	CORE	
-	246	-	EU	2x1	N7	W11	0	20	1/4D	FLS	BIF		MCT	1	28.2	BIFACE	
-	248	-	EU	2x1	N7	W11	0	20	1/4D	FLS	SFT		MCT	1	13.8	SIMPLE FLAKE TOOL	
-	250	-	EU	2x1	N7	W11	0	20	1/4D	FLS	DEB		MCT	377	1675.6	DEBITAGE	
-	251	-	EU	2x1	N7	W11	0	20	1/4D	FLS	DEB		IGN	1	5.9	DEBITAGE	
-	252	-	EU	2x1	N7	W11	0	20	1/4D	GDS	GNS		SDM	1	99.7	NOTCHED STONE	
-	253	-	EU	2x1	N7	W11	0	20	1/4D	SHL	BED	OLI	SHL	1	0.8	BEAD	
-	254	-	EU	2x1	N7	W11	0	20	1/4D	SHL	BED	OLI	SHL	1	1.9	BEAD	
-	259	-	EU	2x1	N7	W11	0	20	1/4D	SHL	BED	OLI	SHL	1	0.8	BEAD	
-	260	-	EU	2x1	N7	W11	0	20	1/4D	FAU	SHL		SHL	0	38.2	SHELL	
-	261	-	EU	2x1	N7	W11	0	20	1/4D	FAU	UNI		BON	72	26.5	BONE	
-	263	-	EU	2x1	N7	W11	20	40	1/4D	FLS	SFT		MCT	1	14.2	SIMPLE FLAKE TOOL	
-	264	-	EU	2x1	N7	W11	20	40	1/4D	FLS	BIF		MCT	1	26.3	BIFACE	
-	265	-	EU	2x1	N7	W11	20	40	1/4D	FLS	DEB		MCT	129	578.9	DEBITAGE	

Lot No	*Specimen No*	*Item No*	*Unit Type*	*Unit Size*	*N/S Grid*	*E/W Grid*	*Upper Depth*	*Lower Depth*	*Mesh*	*Group*	*Class*	*Type*	*Material*	*Count*	*Weight*	*Description*	*Comment*
-	266	-	EU	2x1	N7	W11	20	40	1/4D	FLS	DEB		IGN	2	15.3	DEBITAGE	
-	268	-	EU	2x1	N7	W11	20	40	1/4D	FAU	SHL		SHL	0	179.6	SHELL	
-	269	-	EU	2x1	N7	W11	20	40	1/4D	FAU	UNI		BON	47	10.7	BONE	
-	270	-	CU	2x1	N9	W11	0	20	1/8D	FLS	DRI		MCT	1	12.2	DRILL	
-	271	-	CU	2x1	N9	W11	0	20	1/8D	FLS	COR		MCT	1	279.6	CORE	
-	272	-	CU	2x1	N9	W11	0	20	1/8D	FLS	COR		MCT	1	76.2	CORE	
-	274	-	CU	2x1	N9	W11	0	20	1/8D	FLS	COR	FRG	MCT	1	56.3	CORE FRAGMENT	
-	275	-	CU	2x1	N9	W11	0	20	1/8D	FLS	COR		MCT	1	160.9	CORE	
-	280	-	CU	2x1	N9	W11	0	20	1/8D	FLS	SFT		MCT	1	15.4	SIMPLE FLAKE TOOL	
-	282	-	CU	2x1	N9	W11	0	20	1/8D	GDS	GNS		SAN	1	135.9	NOTCHED STONE	
-	283	-	CU	2x1	N9	W11	0	20	1/8D	GDS	GNS		MUD	1	86.0	NOTCHED STONE	
-	284	-	CU	2x1	N9	W11	0	20	1/8D	GDS	OTH		SAN	1	0.8	DRILLED STONE	
-	285	-	CU	2x1	N9	W11	0	20	1/8D	FLS	DEB		MCT	209	1600.8	DEBITAGE	
-	286	-	CU	2x1	N9	W11	0	20	1/8D	SHL	BED	OLI	SHL	1	1.3	BEAD	
-	287	-	CU	2x1	N9	W11	0	20	1/8D	BON	AWL		BON	1	7.7	AWL	
-	288	-	CU	2x1	N9	W11	0	20	1/8D	BON	AWL		BON	1	6.6	AWL	
-	289	-	CU	2x1	N9	W11	0	20	1/8D	HIS	OTH		PLS	1	0.9	PLASTIC FRAG	
-	290	-	CU	2x1	N9	W11	0	20	1/8D	FAU	SHL		SHL	0	19.6	SHELL	
-	291	-	CU	2x1	N9	W11	0	20	1/8D	FAU	UNI		BON	144	146.3	BONE	
-	294	-	CU	2x1	N9	W11	20	40	1/8D	FLS	DEB		MCT	120	529.2	DEBITAGE	

Lot No	*Specimen No*	*Item No*	*Unit Type*	*Unit Size*	*N/S Grid*	*E/W Grid*	*Upper Depth*	*Lower Depth*	*Mesh*	*Group*	*Class*	*Type*	*Material*	*Count*	*Weight*	*Description*	*Comment*
-	295	-	CU	2x1	N9	W11	20	40	1/8D	FLS	DEB		CCS	1	7.3	DEBITAGE	
-	296	-	CU	2x1	N9	W11	20	40	1/8D	SHL	BED	OLI	SHL	1	0.4	BEAD	
-	297	-	CU	2x1	N9	W11	20	40	1/8D	FAU	SHL		SHL	0	16.6	SHELL	
-	298	-	CU	2x1	N9	W11	20	40	1/8D	FAU	UNI		BON	85	24.6	BONE	
-	299	-	CU	2x1	N5	W11	0	20	1/8D	FLS	BIF		MCT	1	32.5	BIFACE	
-	302	-	CU	2x1	N5	W11	0	20	1/8D	FLS	COR		MCT	1	146.1	CORE	
-	303	-	CU	2x1	N5	W11	0	20	1/8D	FLS	COR		MCT	1	180.1	CORE	
-	305	-	CU	2x1	N5	W11	0	20	1/8D	FLS	DRI		MCT	1	3.5	DRILL	
-	306	-	CU	2x1	N5	W11	0	20	1/8D	GDS	BAT		MCT	1	162.9	BATTERED STONE	
-	307	-	CU	2x1	N5	W11	0	20	1/8D	FLS	DEB		MCT	201	1071.4	DEBITAGE	
-	308	-	CU	2x1	N5	W11	0	20	1/8D	FLS	DEB		IGN	1	59.3	DEBITAGE	
-	311	-	CU	2x1	N5	W11	0	20	1/8D	SHL	BED	OLI	SHL	1	0.5	BEAD	
-	312	-	CU	2x1	N5	W11	0	20	1/8D	FAU	SHL		SHL	0	13.5	SHELL	
-	313	-	CU	2x1	N5	W11	0	20	1/8D	FAU	UNI		BON	102	88.8	BONE	
-	314	-	CU	2x1	N5	W11	0	20	1/8D	FAU	LML		BON	1	357.9	BONE	23CM E/W, 20CM N/S FRM UNIT DAT.
-	316	-	CU	2x1	N5	W11	20	40	1/8D	FLS	DEB		MCT	87	450.4	DEBITAGE	
-	317	-	CU	2x1	N5	W11	20	40	1/8D	FLS	DEB		IGN	2	122.6	DEBITAGE	
-	318	-	CU	2x1	N5	W11	20	40	1/8D	SHL	BED	OLI	SHL	1	2.5	BEAD	
-	319	-	CU	2x1	N5	W11	20	40	1/8D	SHL	BED	OLI	SHL	1	0.7	BEAD	
-	320	-	CU	2x1	N5	W11	20	40	1/8D	SHL	BED	OLI	SHL	1	1.6	BEAD	

Lot No	Specimen No	Item No	Unit Type	Unit Size	N/S Grid	E/W Grid	Upper Depth	Lower Depth	Mesh	Group	Class	Type	Material	Count	Weight	Description	Comment
-	321	-	CU	2x1	N5	W11	20	40	1/8D	SHL	BED	OLI	SHL	1	0.7	BEAD	
-	322	-	CU	2x1	N5	W11	20	40	1/8D	BON	PEN		BON	1	0.3	PENDANT	
-	323	-	CU	2x1	N5	W11	20	40	1/8D	FAU	SHL		SHL	0	17.9	SHELL	
-	324	-	CU	2x1	N5	W11	20	40	1/8D	FAU	UNI		BON	102	4.2	BONE	
-	325	-	EU	2x1	N3	W11	0	20	1/4D	FLS	COR		MCT	1	63.2	CORE	
-	326	-	EU	2x1	N3	W11	0	20	1/4D	FLS	COR		MCT	1	53.8	CORE	
-	327	-	EU	2x1	N3	W11	0	20	1/4D	FLS	SFT		MCT	1	15.9	SIMPLE FLAKE TOOL	
-	329	-	EU	2x1	N3	W11	0	20	1/4D	FLS	DEB		MCT	120	709.5	DEBITAGE	
-	330	-	EU	2x1	N3	W11	0	20	1/4D	BOT	SED		SED	1	0.1	BURNED SEED	
-	331	-	EU	2x1	N3	W11	0	20	1/4D	GDS	BAT		GRA	1	378.6	BATTERED STONE	
-	332	-	EU	2x1	N3	W11	0	20	1/4D	CHR	CSC		CHR	0	0.2	CHARCOAL	
-	333	-	EU	2x1	N3	W11	0	20	1/4D	FAU	SHL		SHL	0	39.3	SHELL	
-	334	-	EU	2x1	N3	W11	0	20	1/4D	FAU	UNI		BON	70	33.3	BONE	
-	335	-	EU	2x1	N3	W11	20	40	1/4D	FLS	COR		MCT	1	97.7	CORE	
-	336	-	EU	2x1	N3	W11	20	40	1/4D	FLS	COR		MCT	1	114.4	CORE	
-	337	-	EU	2x1	N3	W11	20	40	1/4D	FLS	SFT		MCT	1	3.5	SIMPLE FLAKE TOOL	
-	340	-	EU	2x1	N3	W11	20	40	1/4D	FLS	SFT		MCT	1	10.7	SIMPLE FLAKE TOOL	
-	341	-	EU	2x1	N3	W11	20	40	1/4D	FLS	DEB		MCT	56	278.0	DEBITAGE	
-	342	-	EU	2x1	N3	W11	20	40	1/4D	FLS	DEB		IGN	1	10.4	DEBITAGE	
-	343	-	EU	2x1	N3	W11	20	40	1/4D	FAU	SHL		SHL	0	12.3	SHELL	

Lot No	Specimen No	Item No	Unit Type	Unit Size	N/S Grid	E/W Grid	Upper Depth	Lower Depth	Mesh	Group	Class	Type	Material	Count	Weight	Description	Comment
-	344	-	EU	2x1	N3	W11	20	40	1/4D	FAU	UNI		BON	37	18.6	BONE	
-	346	-	RRU	2x1.25	N2	E1	0	20	1/4D	FLS	DEB		MCT	5	69.0	DEBITAGE	
-	347	-	RRU	2x1.25	N2	E1	0	20	1/4D	GDS	HST	FRG	SDM	1	194.7	HANDSTONE FRAG	
-	348	-	RRU	2x1.25	N2	E1	0	20	1/4D	BON	UNI		BON	1	35.1	BONE TOOL	
-	349	-	RRU	2x1.25	N2	E1	0	20	1/4D	FAU	SHL		SHL	0	2.0	SHELL	
-	350	-	RRU	2x1.25	N2	E1	0	20	1/4D	FAU	UNI		BON	5	69.7	BONE	
-	351	-	RRU	2x1.25	N4	E1	0	20	1/4D	FLS	COR		MCT	1	117.0	CORE	
-	352	-	RRU	2X1.25	N4	E1	0	20	1/4D	FLS	DEB		MCT	1	143.4	DEBITAGE	
-	353	-	RRU	2x1.25	N4	E1	0	20	1/4D	GDS	BAT		IGN	1	235.7	BATTERED STONE	
-	354	-	RRU	2x1.25	N4	E1	0	20	1/4D	FAU	UNI		BON	13	23.5	BONE	
-	355	-	BAC							FAU	SHL		SHL	0	105.5	SHELL	SHELL SAMPLE FRM BACKDIRT
-	356	-	BAC							FAU	UNI		BON	1	0.7	BONE	BONE SAMPLE FRM BACKDIRT
-	357	-	SCA		N6.2	W9.5	0	0		GDS	GNS		SAN	1	137.1	NOTCHED STONE	
-	358	-	EU	2X1	N7	W11	22	22		FAU	LML		BON	1	15.9	BONE	FOUND W/ SPEC. 359
-	359	-	EU	2X1	N7	W11	22	22		FAU	SHL	HAL	SHL	0	115.1	SHELL	FOUND W/ SPEC. 358
-	360	-	SCA		N8	W11	0	0		FAU	LML		BON	1	4.1	BONE	
-	361	-	SCA		N8	W11	0	0		FAU	LML		BON	1	6.2	BONE	
-	362	-	SCA		N11.1	W8.2	0	0		FAU	LML		BON	1	26.6	BONE	
-	363	-	SCA		S1	E2	0	0		FAU	LML		BON	1	26.3	BONE	
-	367	-	CU	2X1	N7	W11	20	40	1/8D	FLS	BIF	FRG	MCT	1	35.2	BIFACE	

Lot No	Specimen No	Item No	Unit Type	Unit Size	N/S Grid	E/W Grid	Upper Depth	Lower Depth	Mesh	Group	Class	Type	Material	Count	Weight	Description	Comment
-	368	-	CU	2X1	N8	E0	20	40	1/8D	FLS	DEB		IGN	1	2.0	DEBITAGE	
-	369	-	CU	2X1	N1	W11	0	20	1/8D	FLS	SFT		MCT	1	2.3	SIMPLE FLAKE TOOL	
-	370	-	CU	2X1	N9	W11	0	20	1/8D	CHR	CSC		CHR	4	0.1	CHARCOAL	
-	371	-	CU	2X1	N0	E0	0	20	1/8D	FLS	DEB		IGN	1	3.5	DEBITAGE	
-	372	-	CU	2X1	N0	E0	20	40	1/8D	FLS	SFT		MCT	1	9.7	SIMPLE FLAKE TOOL	
-	373	-	CU	2X1	N4	E0	0	20	1/8D	FLS	ASC		MCT	1	181.8	ASSAYED COBBLE	
-	374	-	CU	2X1	N4	E0	0	20	1/8D	FLS	COR		MCT	1	51.5	CORE	
-	379	-	CU	2X1	N4	E0	0	20	1/8D	FLS	COR		MCT	1	20.2	CORE	
-	382	-	CU	2X1	N4	E0	20	40	1/8D	FLS	BIF		MCT	1	69.9	BIFACE	
-	383	-	CU	2X1	N4	E0	20	40	1/8D	FLS	SFT		MCT	1	31.4	SIMPLE FLAKE TOOL	
-	384	-	CU	2X1	N8	E0	0	20	1/8D	FLS	SFT		MCT	1	8.9	SIMPLE FLAKE TOOL	
-	386	-	CU	2X1	N8	E0	20	40	1/8D	FLS	COR		MCT	1	50.2	CORE	
-	388	-	EU	2X1	N9	W10	0	20	1/4D	FLS	SFT		MCT	1	72.8	SIMPLE FLAKE TOOL	
-	389	-	EU	2X1	N9	W10	0	20	1/4D	FLS	COR		MCT	1	51.7	CORE	
-	390	-	EU	2X1	N9	W10	0	20	1/4D	FLS	COR		MCT	1	33.5	CORE	
-	391	-	EU	2X1	N9	W10	0	20	1/4D	FLS	COR		MCT	1	29.0	CORE	
-	393	-	EU	2X1	N3	W11	0	20	1/4D	FLS	PPT	FRG	MCT	1	3.6	PROJECTILE POINT FR	
-	394	-	CU	2X1	N9	W11	0	20	1/8D	FLS	COR	FRG	MCT	1	70.7	CORE FRAGMENT	
-	395	-	EU	2X1	N7	W11	0	20	1/4D	FLS	BIF	FRG	MCT	1	78.1	BIFACE FRAGMENT	
-	396	-	EU	2X1	N7	W11	20	40	1/4D	FLS	COR		MCT	1	31.9	CORE	

Lot No	*Specimen No*	*Item No*	*Unit Type*	*Unit Size*	*N/S Grid*	*E/W Grid*	*Upper Depth*	*Lower Depth*	*Mesh*	*Group*	*Class*	*Type*	*Material*	*Count*	*Weight*	*Description*	*Comment*
-	397	-	EU	2X1	N7	W11	20	40	1/4D	FLS	COR	FRG	MCT	1	101.0	CORE FRAGMENT	
-	398	-	EU	2X1	N7	W11	20	40	1/4D	FLS	COR		MCT	1	71.3	CORE	
-	399	-	CU	2X1	N5	W11`	0	20	1/8D	FLS	COR		MCT	1	35.2	CORE	
-	400	-	CU	2X1	N5	W11	0	20	1/8D	FLS	COR	FRG	MCT	1	49.5	CORE FRAGMENT	
-	401	-	CU	2X1	N5	W11	20	40	1/8D	FLS	COR		MCT	1	62.9	CORE	
-	402	-	CU	2X1	N1	W11	0	20	1/8D	FLS	SFT		MCT	1	20.1	SIMPLE FLAKE TOOL	
-	403	-	CU	2X1	N1	W11	0	20	1/8D	FLS	COR		MCT	1	140.2	CORE	
0	1	11	SCA	-	-	-	0	0	-	FLS	PPT	LFS	OBS	1	27.3	PROJECTILE POINT	
0	2	16	SCA	-	-	-	0	0	-	FLS	BIF	MID	OBS	1	14.4	BIFACE FRAG	
0	3	4	SCA	-	-	-	0	0	-	FLS	BIF	END	MCT	1	11.8	BIFACE FRAG	
0	4	-	SCA	-	-	-	0	0	-	FLS	SFT		MCT	1	113.6	SIMPLE FLAKE TOOL	LARGE CORTICAL CHUNK
0	5	-	SCA	-	-	-	0	0	-	FLS	COR		MCT	1	63.5	CORE	COLLECTED 5/3/02
0	6	-	SCA	-	-	-	0	0	-	FLS	COR		MCT	1	97.9	CORE	
0	7	19	SCA	-	-	-	0	0	-	FLS	COR		MCT	1	119.8	CORE	
0	8	4	SCA	-	-	-	0	0	-	FLS	DEB		OBS	1	0.1	DEBITAGE	
0	9	2	SCA	-	-	-	0	0	-	FLS	DEB		OBS	1	0.4	DEBITAGE	
0	10	10	SCA	-	-	-	0	0	-	GDS	BLM	FRG	SAN	1	3542.0	BOWL MORTAR FRAG	
0	11	-	SCA	-	-	-	0	0	-	GDS	PES	WHL	SAN	1	466.0	PESTLE	COLLECTED 7-17-01
0	12	-	SCA	-	-	-	0	0	-	GDS	PES	FRG	SAN	1	263.4	PESTLE FRAG	
0	13	-	SCA	-	-	-	0	0	-	GDS	HST	FRG	GRA	1	260.4	HANDSTONE FRAG	

Lot No	Specimen No	Item No	Unit Type	Unit Size	N/S Grid	E/W Grid	Upper Depth	Lower Depth	Mesh	Group	Class	Type	Material	Count	Weight	Description	Comment
0	14	-	SCA	-	-	-	0	0	-	GDS	HST	FRG	GRA	1	748.4	HANDSTONE FRAG	
0	16	14	SCA	-	-	-	0	0	-	GDS	PIT		SDM	1	254.2	PITTED STONE	COLLECTED 5/3/02
0	17	-	SCA	-	-	-	0	0	-	GDS	PIT		SAN	1	209.6	PITTED STONE	COLLECTED NOV. 2000
0	18	12	SCA	-	-	-	0	0	-	GDS	PIT		SDM	1	218.6	PITTED STONE	COLLECTED NOV. 2000
0	19	25	SCA	-	-	-	0	0	-	GDS	PIT	FRG	GRA	1	215.4	PITTED STONE FRAG	COLLECTED NOV. 00 BROKEN ON PIT
0	20	13	SCA	-	-	-	0	0	-	GDS	PIT		SDM	1	153.9	PITTED STONE	COLLECTED NOV. 00
0	21	-	SCA	-	-	-	0	0	-	GDS	PIT	FRG	SAN	1	109.4	PITTED STONE	COLLECTED 11/27/00
0	22	-	SCA	-	-	-	0	0	-	GDS	PIT	FRG	SDM	1	259.0	PITTED STONE	
0	23	-	SCA	-	-	-	0	0	-	GDS	PIT		SDM	1	237.6	PITTED STONE	COLECTED 11/05
0	24	-	SCA	-	-	-	0	0	-	GDS	GNS	FRG	SAN	1	106.1	NOTCHED STONE	BI-PITTED
0	25	-	SCA	-	-	-	0	0	-	GDS	PIT		SAN	1	386.4	PITTED STONE	COLLECTED 5/3/02
0	26	-	SCA	-	-	-	0	0	-	GDS	PIT	FRG	SAN	1	234.2	PITTED STONE	COLLECTED 5/3/02
0	27	-	SCA	-	-	-	0	0	-	GDS	PIT		SHA	1	145.7	PITTED STONE	COLLECTED 5/3/02
0	28	-	SCA	-	-	-	0	0	-	GDS	PIT		SDM	1	222.7	PITTED STONE	
0	30	8	SCA	-	-	-	0	0	-	GDS	GNS		IGN	1	117.2	NOTCHED STONE	
0	31	5	SCA	-	-	-	0	0	-	GDS	GNS		GRA	1	166.5	NOTCHED STONE	
0	32	-	SCA	-	-	-	0	0	-	GDS	GNS		IGN	0	147.4	NOTCHED STONE	
0	33	-	SCA	-	-	-	0	0	-	GDS	GNS		SDM	1	70.8	NOTCHED STONE	
0	34	-	SCA	-	-	-	0	0	-	GDS	GNS		SDM	1	166.9	NOTCHED STONE	
0	35	9	SCA	-	-	-	0	0	-	GDS	GNS		SDM	1	156.4	NOTCHED STONE	

Lot No	*Specimen No*	*Item No*	*Unit Type*	*Unit Size*	*N/S Grid*	*E/W Grid*	*Upper Depth*	*Lower Depth*	*Mesh*	*Group*	*Class*	*Type*	*Material*	*Count*	*Weight*	*Description*	*Comment*
0	36	10	SCA	-	-	-	0	0	-	GDS	GNS		SDM	1	148.4	NOTCHED STONE	
0	37	7	SCA	-	-	-	0	0	-	GDS	GNS		SDM	1	146.0	NOTCHED STONE	
0	38	6	SCA	-	-	-	0	0	-	GDS	GNS		SDM	1	122.7	NOTCHED STONE	
0	39	-	SCA	-	-	-	0	0	-	GDS	BAT		IGN	1	404.2	BATTERED STONE	
0	40	20	SCA	-	-	-	0	0	-	GDS	BAT		QZT	1	483.5	BATTERED STONE	COLLECTED NOV.00
0	41	-	SCA	-	-	-	0	0	-	GDS	BAT		IGN	1	284.0	BATTERED STONE	
0	42	-	SCA	-	-	-	0	0	-	GDS	BAT		MTS	1	63.7	BATTERED STONE	
0	43	-	SCA	-	-	-	0	0	-	GDS	BAT		QZT	1	67.6	BATTERED STONE	
0	44	-	SCA	-	-	-	0	0	-	GDS	BAT		IGN	1	120.1	BATTERED STONE	
0	45	-	SCA	-	-	-	0	0	-	GDS	BAT		IGN	1	51.0	BATTERED STONE	
0	46	-	SCA	-	-	-	0	0	-	BON	NDL		BON	1	2.6	NEEDLE	
0	47	-	SCA	-	-	-	0	0	-	BON	NDL		BON	1	1.3	NEEDLE	
0	48	-	SCA	-	-	-	0	0	-	BON	SPT	FRG	BON	1	3.9	SPATULA	
0	49	-	SCA	-	-	-	0	0	-	BON	SPT	FRG	BON	1	1.4	SPATULA	
0	50	-	SCA	-	-	-	0	0	-	BON	POL	FRG	BON	1	2.3	POLISHED BONE	
0	51	1	SCA	-	-	-	0	0	-	BON	AWL	FRG	BON	1	1.9	AWL	COLLECTED 7/16/01NEXT TO TU2
0	52	2	SCA	-	-	-	0	0	-	BON	SPT	FRG	BON	1	3.4	SPATULA	BURNED; COLLECTED 7/17/01
0	53	3	SCA	-	-	-	0	0	-	BON	FSG		BON	1	2.8	FISH GORGE	
0	54	17	SCA	-	-	-	0	0	-	BON	AWL		BON	1	2.0	AWL	
0	55	-	SCA	-	-	-	0	0	-	BON	POL	FRG	BON	1	5.2	POLISHED BONE	COLLECTED 9/6/05

Lot No	Specimen No	Item No	Unit Type	Unit Size	N/S Grid	E/W Grid	Upper Depth	Lower Depth	Mesh	Group	Class	Type	Material	Count	Weight	Description	Comment
0	56	-	SCA	-	-	-	0	0	-	FAU	HAL		SHL	1	112.7	SHELL	WHOLE ABALONE
0	57	15	SCA	-	-	-	0	0	-	FLS	FLC		MTS	1	210.4	FLAKED COBBLE TOOL	
0	58	-	SCA	-	-	-	0	0	-	FLS	FLC		SDM	1	256.2	FLAKED COBBLE TOOL	
1	1	42	RRU	-	-	-	0	0	-	FLS	DRI		MCT	1	13.4	DRILL	
1	2	45	RRU	-	-	-	0	0	-	FLS	BIF	MAR	OBS	1	5.5	BIFACE FRAG	COLLECTED 7/10/01
1	3	46	RRU	-	-	-	0	0	-	FLS	DEB		OBS	1	0.9	DEBITAGE	
1	4	10	RRU	-	-	-	0	0	-	BON	SPT	FRG	BON	1	1.8	SPATULA	
1	5	44	RRU	-	-	-	0	0	-	GDS	BAT		QZT	1	413.1	BATTERED STONE	
1	6	49	RRU	-	-	-	0	0	-	GDS	PIT		SAN	1	160.9	PITTED STONE	
5	1	26	TU	-	-	-				FLS	DEB		OBS	1	0.2	DEBITAGE	FROM LEVEL 2
5	2	93	TU	-	-	-				FLS	DEB		MCT	1	0.8	DEBITAGE	FROM LEVEL 2
6	1	15	TU	-	-	-				FLS	DEB		OBS	1	0.1	DEBITAGE	FROM LEVEL 2CM-STERILE

Arnold Schwarzenegger
Governor of California

Mike Chrisman
Secretary for Resources

Ruth Coleman
Director: Department of Parks and Recreation

Blain Lamb
Chief: Archaeology, History, and Museums Division

John Foster
Manager: Archaeology and History Section