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REPORTS

A 5,000-Year Record of Coastal Settlement on Anacapa Island, California

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Although Anacapa Island is the closest of the Channel Islands to the mainland, its Native American occupation remains poorly understood. Twenty-seven archaeological sites have been recorded on Anacapa, and a few of these have been excavated. However, radiocarbon dates have never been published for the island, leaving a substantial gap in our understanding of the chronology of human settlement and land use on the Channel Islands. Recent ¹⁴C dates for six Anacapa Island sites demonstrate that the island has been occupied for over 5,000 years. Five of the sites have occupations dating between 5,290 and 2,780 cal BP, corresponding with an increase of dated sites on nearby eastern Santa Cruz Island. These data, along with Late period ¹⁴C dates from two sites, indicate that the island was occupied for most of the Middle and Late Holocene, if not earlier.

Human occupation of California's Channel Islands spans roughly 13,000 calendar years (Erlandson et al. 1996; Johnson et al. 2002). Prompted, in part, by the antiquity of island archaeological sites, archaeologists have greatly expanded ¹⁴C dating efforts across the northern and southern islands. These ¹⁴C dating projects have resulted in a variety of interesting demographic, settlement, ecological, and other analyses (see Erlandson et al. 2005; Kennett 1998, 2005; Vellanoweth 2001; Yatsko 2000). While the use of radiocarbon dating has greatly increased on the Channel Islands, there are still a number of significant gaps in island chronologies. This includes a relatively limited amount of data from the two smallest islands, Anacapa and Santa Barbara.

Recent work on Santa Barbara Island, including ten ¹⁴C dates from seven sites, helps fill this void, suggesting the island was occupied by at least 4,400 cal

BP (Erlandson et al. 1992; Rick 2001). However, ¹⁴C dates from Anacapa Island have never been published, limiting our understanding of the chronology of human settlement on the Channel Islands. This is surprising, since it is the closest island to the mainland and has 27 recorded archaeological sites.

In this paper I present the first radiocarbon dates for Anacapa Island, including dates for six sites. In synthesizing these radiocarbon dates, I also briefly summarize some of the limited artifactual and faunal data from the island. These data help bring the archaeology of Anacapa out of the shadows and into the context of larger southern California coastal prehistory. I begin with a brief discussion of Anacapa Island environments and previous archaeological research to contextualize my analysis.

CONTEXT AND BACKGROUND

Composed of three separate segments (East, Middle, and West), Anacapa Island extends about 8 km. from east to west, but only has an area of about 1.8 km². Anacapa is the closest of the Channel Islands to the mainland at just 19 km. offshore. The island contains steep, precipitous cliffs making access relatively difficult. West Anacapa reaches a height of 285 m. and rises steeply to a sharp ridge. The middle and east segments are considerably lower, reaching heights of 99 and 80 m., respectively, and both have relatively flat terraces on top (Schoenherr et al. 1999). On West Anacapa, a small beach is present at Frenchys Cove; it is the best landing spot on the island. When viewed from the mainland, the island looks considerably larger than it actually is. This may have resulted in the Chumash calling the island Eneepah ('*Anyapax*'; Johnson 1999), a word thought to mean deception or mirage (McKusick 1959).

Like the other Channel Islands, Anacapa contains relatively limited terrestrial resources, with the island deer mouse and possibly the California bat as the only native land mammals. Small scrub plants dominate the island, although a few oaks and other trees are present in some of the high canyons of West Anacapa (Schoenherr

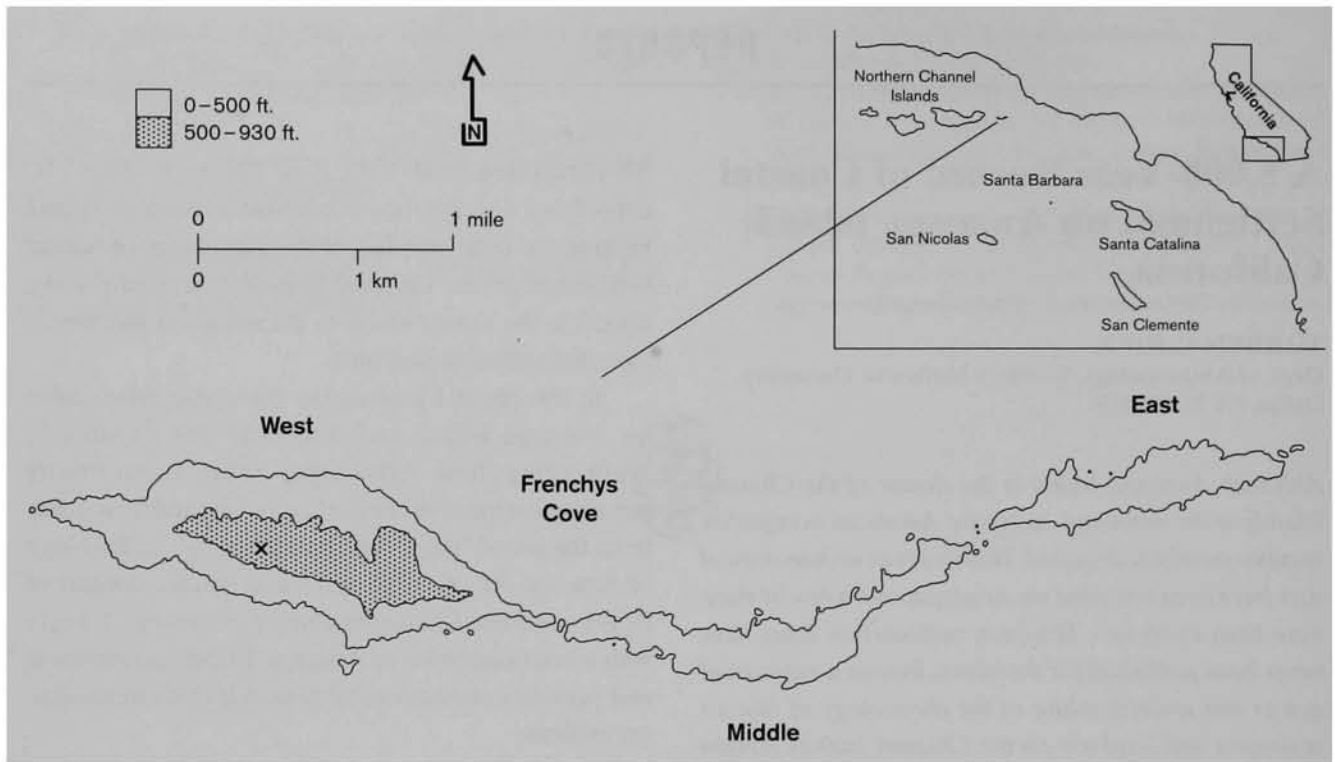


Figure 1. Location of Anacapa Island and the Southern California Coast.

et al. 1999). Marine resources surrounding the island are rich and abundant, however, and a variety of sea and land birds breed on the island. Freshwater is relatively limited, but a few springs are present in the island's sea cliffs.

Despite Anacapa's relatively small size, 27 sites have been recorded on the island (Greenwood 1978). These include a variety of shell middens, lithic scatters, and cave sites. The island appears to have been unoccupied during the Historic period, as there are no indications of villages in ethnohistoric sources (see Johnson 1999; Kennett 2005). Due to its close proximity to Santa Cruz Island (~8 km.), it may have been used primarily by people occupying that island, although a few sites are relatively large and may indicate a more sustained occupation.

PREVIOUS ARCHAEOLOGICAL RESEARCH

Compared to the other Northern Channel Islands, Anacapa has seen relatively limited archaeological research (see Baldwin 1996; Glassow 1977). Only two papers have ever been published on the island (McKusick 1959; Rozaire 1993), and the last formal archaeological project was conducted in the 1970s by Greenwood

(1978). De Cessac may have excavated at a site in the late nineteenth century, and a few sporadic visits or collections were made by Yates in the late nineteenth century and by Rogers in the 1920s, but relatively little is known about these earlier projects (Glassow 1977). Van Valkenburg and Schrader from the Los Angeles County Museum apparently recorded sites on the west and middle segments in the 1940s (Baldwin 1996; Glassow 1977; McKusick 1959). Orr surveyed East Anacapa, excavated a test pit at ANI-3 and a human burial at ANI-1 in 1956, and visited West Anacapa at a later date, but no report or collections from his work exist (Baldwin 1996; Glassow 1977; McKusick 1959).

In 1958, McKusick (1959) led one of the most comprehensive archaeological projects on the island, including surveys and limited excavations for the UCLA Archaeological Survey. Based on his excavations and limited midden data, McKusick (1959) speculated that the island was occupied relatively recently, perhaps within the last 2,000 years. California mussels, black abalones, and other rocky intertidal shellfish were identified in these assemblages, but the materials were screened through 1/4-inch mesh.

Table 1

A RADIOCARBON CHRONOLOGY FOR ANACAPA ISLAND, CALIFORNIA

Site	Provenience	Lab Number ^a	Materials	¹³ C/ ¹² C Adjusted	Calibrated Age BP (1 Sigma) ^b
ANI 1	Probe: ~18 cm	OS-48488	<i>M. californianus</i>	3820 ± 30	3550–3430
ANI-2	Probe: 38–40 cm	OS-48508	<i>M. californianus</i>	3310 ± 35	2920–2780
ANI-4	Probe: 25–28 cm	OS-48509	<i>M. californianus</i>	3530 ± 30	3230–3080
ANI-5	Midden exposure: ~50 cm	OS-46940	<i>H. cracherodii</i>	5110 ± 35	5290–5120
ANI-6	Test Pit 2	OS-50446	<i>H. cracherodii</i>	1230 ± 30	630–550
ANI-8	Pit 3, 31–46 cm ^c	UCLA-2795	Charcoal	<300	–
ANI-8	Pit 8, 31–46 cm ^c	B-031360	Charcoal	570 ± 40	630–540
ANI-8	Sq. 12, 91–117 cm	OS-50447	<i>H. cracherodii</i>	4950 ± 35	5020–4870
ANI-8	Pit 14, 92 cm ^c	UCLA-2791	Charcoal	>40,000	–

^aOS=National Ocean Sciences AMS Facility, B= Beta Analytic Inc.

^bAll dates were calibrated using Calib 5.0.1 (Stuiver and Reimer 1993, 2005) and applying a Δ of 225 ± 35 years for all shell samples (Kennett et al. 1997). ¹³C/¹²C ratios were determined by the radiocarbon labs.

^cObtained from California Radiocarbon database (Breschini et al. 2005).

Between 1961 and 1963, Rozaire (1978) surveyed the island and recorded 21 sites. Facilitated by McKusick, Rozaire also excavated at ANI-8 in 1958, 1963, and 1965, resulting in the largest excavations on the island. These materials, however, were screened through 1/2 and 1/4-inch mesh and were excavated in arbitrary levels (Rozaire 1978). Rozaire excavated at least three burials and collected 168 artifacts, including shell fishhooks, chert microblades, abalone and *Olivella* shell beads, ground stone, projectile points, bone tools, and other artifacts, as well as a variety of faunal remains (Rozaire 1978, 1993; Sandefur 1978; Walker et al. 1978). He also found historic bullet cases and animal bones, suggesting that there was some historical disturbance at the site. In 1962 and 1965, Rozaire excavated three pits at ANI-6 on West Anacapa, producing more than 800 artifacts, of which 90% were microblades or associated materials (Rozaire 1978, 1993). The presence of microblades and other late artifacts at ANI-6 and -8 suggests an occupation sometime during the last 1,500 years. A variety of vertebrate faunal remains were identified at ANI-6 and -8, including pinnipeds and dolphins (harbor seal, California sea lion, elephant seal, Guadalupe fur seal, Pacific white-sided dolphin, and Pacific harbor porpoise), marine fishes (rockfish, surfperch, California sheephead, sculpin, elasmobranch, and barracuda), and birds (cormorants, albatross, and Cassin's auklet) (Sandefur 1978; Walker et al. 1978).

A team led by Keith Johnson of the UCLA Archaeological Survey apparently worked on West Anacapa in 1962, but little is known about this project

(Glassow 1977). Meighan excavated at ANI-2 in 1970, and Glassow (1977) noted that a small collection of artifacts (n=16) and faunal remains (n=26) were curated at UCLA. No report is known for this project.

In 1977 and 1978, Greenwood (1978) conducted a survey of the island, returning to previously recorded sites and documenting several new ones. She also provided updates on the status of island archaeological resources and recommendations for preservation and future research. Although one previously recorded site was not relocated, Greenwood recorded 26 sites, bringing the island total to 27.

Since Greenwood's survey, Anacapa has seen relatively little archaeological research. A few monitoring projects associated with the activities of Channel Islands National Park were conducted by Don Morris in the 1980s and 1990s, but no formal research projects were undertaken on the island. Morris and Lima (1996) conducted research on historic shipwrecks around the island, but investigations of terrestrial resources were limited. Despite past excavation and survey projects on the island, little is known about the chronology of Anacapa. Below, I present a series of ¹⁴C dates to help fill this gap, providing a chronological context for some of the work described above.

¹⁴C DATES FOR ANACAPA ISLAND

Radiocarbon dates were obtained for six of the island's archaeological sites, including three each on East and West Anacapa. I also present three additional ¹⁴C dates that

were acquired by Rozaire for ANI-8, but not previously published in detail. Radiocarbon samples were collected from ANI-1, -2, -4, and -5 during site visits in 2004. Samples for ^{14}C dating from Rozaire's collections from ANI-6 and -8 were obtained from the Natural History Museum of Los Angeles County (NHMLAC) in 2004.

Except for Rozaire's dates from ANI-8, all of the ^{14}C dates presented in this study are Accelerator Mass Spectrometry (AMS) dates on single marine shell fragments and were analyzed by the National Ocean Sciences AMS (NOSAMS) facility at the Woods Hole Oceanographic Institute. Fragments of each shell were carefully removed for ^{14}C dating and care was taken to make sure that each sample crossed over multiple growth lines to ensure the best possible date (see Rick et al. 2002). To remove contaminants, the specimens were etched in dilute hydrochloric acid to remove the outer layers most susceptible to diagenesis, then rinsed in distilled water. The pretreated shell samples were then dried and converted to CO_2 by reaction with phosphoric acid under vacuum. Subsamples were used to measure $^{13}\text{C}/^{12}\text{C}$ ratios and the remaining samples were converted to graphite before being dated. All dates were calibrated with Calib 5.0.1 (Stuiver and Reimer 1993, 2005), applying a ΔR of 225 ± 35 years to compensate for local upwelling (Kennett et al. 1997). The radiocarbon lab determined $^{13}\text{C}/^{12}\text{C}$ ratios as part of the AMS process.

ANI-1

Located on a terrace adjacent to the Landing Cove on East Anacapa, ANI-1 covers an area of roughly 20×28 m. (Greenwood 1978). Rozaire and McKusick estimated that the site deposits were between 12 and 22 inches (30–56 cm.) deep. A ^{14}C probe I excavated in the site suggested the deposits are only about 20 cm. deep. The site is badly eroded, argilliturbated, and disturbed by historical activities. The shell midden deposit contains abalones, owl limpets, barnacles, California mussels, fish bones, and historic animal bones. Greenwood (1978) reported chipped stone debitage and a scraper as the only artifacts from the site. Human burials have been observed at the site, and McKusick (1959) indicated that one of these was excavated by Orr in 1956. No human remains were observed at the site in 2004.

To obtain ^{14}C samples from this site, I excavated a shallow probe in intact midden deposits in the central

site area. This probe was excavated to a depth of about 25 cm., with the midden appearing to terminate at a depth of roughly 20 cm. A fragment of a single California mussel (*Mytilus californianus*) shell from about 18 cm. below the surface was dated to roughly $3,820 \pm 30$ RYBP, with a 1 sigma age range of 3,550 to 3,430 cal BP, suggesting that portions of this site date to the early part of the Late Holocene.

ANI-2

ANI-2 sits on a knoll on the south side of East Anacapa. The site covers an area of roughly 24×30 m. (Greenwood 1978), but because it is bisected by the main island hiking trail, a scatter of fragmented shell extends for a considerable distance to the west and east. The shell midden deposits are relatively dense at the site, and include California mussels, abalones, barnacles, limpets, fish bones, and pinniped and sea otter remains. According to Glassow (1977), Meighan excavated here in 1970, but no report is available for this project. A catalog of Meighan's excavations, however, lists faunal remains, choppers, a pestle fragment, a biface, and other artifacts (see Baldwin 1996; Glassow 1977).

A shallow probe was excavated in intact deposits in the central site area about 3 m. south of the island trail. This probe went through dense shell midden deposits to a depth of about 50 cm. The midden persists deeper, but the probe could not be excavated further. A single California mussel shell obtained *in situ* from 38–40 cm. below the surface yielded an AMS date of $3,310 \pm 35$ RYBP, with a 1 sigma age range of 2,920 to 2,780 cal BP. This Late Holocene date is about 500 to 700 years younger than the date for ANI-1. Although multiple components may be present at this site, some of the densest deposits appear to date to about 2,900 cal BP.

ANI-4

ANI-4 is located on the northeast side of a knoll near the midpoint of East Anacapa, and contains a shell midden and lithic component. The site covers an area of about 14×17 m., and Rozaire estimated the site was roughly 18 inches (46 cm.) deep (Greenwood 1978). The midden appears to be dominated by California mussel, with some black abalone and owl limpet shells, and a few pieces of fish and bird bone. Greenwood (1978) noted chert, chalcedony, and quartzite flakes, a quartzite knife, and a sandstone pebble tool.

A small probe was excavated just southwest of the island trail adjacent to the site. The midden in this area appears to be relatively shallow (25–30 cm. deep). A California mussel shell was collected from 25–28 cm. below the surface and sent to NOSAMS for radiocarbon dating. This sample produced a date of $3,530 \pm 30$ RYBP, and a 1 sigma calibrated age range of 3,230 to 3,080 cal BP. This date falls in between the dates from ANI-1 and -2, suggesting that East Anacapa was relatively intensively occupied during the early portion of the Late Holocene.

ANI-5

This site is located on a small knoll just east of the landing at Frenchys Cove, and covers an area 12 x 12 m. wide. The site has been heavily disturbed by historical activities, including grading and building construction. Greenwood (1978) referred to it as a small, temporary habitation campsite, perhaps occupied intermittently over a period of time. Intact portions of midden appear to exist, however, and this site contains some of the densest deposits I noted on the island. The deposits vary in depth, but appear to reach 50 cm. or more in places. California mussel, black abalone, wavy top, owl limpet, barnacles, chiton, and *Olivella* shells, as well as abundant fish bone and some pinniped and bird bone, were noted at the site. Greenwood identified an *Olivella* cup bead, a metate fragment, a blade fragment, tarring pebbles, an *Olivella* bead blank, and other artifacts, and I observed microblade cores, a microblade, and a small fused shale biface. Greenwood (1978) also noted a human tibia and a possible vertebra and rib.

A single black abalone shell was removed from the base of an eroding midden exposure roughly 50 cm. deep located under about 2 m. of overburden just south of the island trail. The midden deposits were very dense in this area. This abalone shell produced a date of $5,110 \pm 35$ RYBP, with a 1 sigma range of 5,290–5,120 cal BP. This is the oldest date for Anacapa Island and confirms an occupation since at least the Middle Holocene. The presence of microblades and a cup bead also suggests an occupation during King's (1990) late Middle and/or Late periods. Due to the historical disturbances at the site, it is difficult to determine the relationship of the Middle and Late Holocene deposits. Future testing could help to better establish the structure, function, and age of this prominent site.

ANI-6

This site is located on a north-facing slope, east of ANI-5 and southwest of Frenchys Cove. Greenwood described the site as a shell midden with numerous lithic tools, encompassing an area of about 10 x 10 m. Shellfish remains at the site are dominated by California mussels, but red and black abalones, owl limpets, and barnacles have been identified, as well as fish, mammal, and bird bones (Greenwood 1978; Sandefur 1978; Walker et al. 1978). Rozaire's (1978, 1993) work at the site uncovered hundreds of microblades and microdrills, shell fishhooks, *Olivella* and steatite beads, and other artifacts. A large oval glass trade bead was also found on the site surface, but has since been lost (Rozaire 1978:35). Two graded areas, paths, and sheetwash have impacted the site, and in 2004 vegetation cover also obscured the site surface.

Rozaire (1978, 1993) excavated three test pits at the site, noting the deposits were roughly 12 inches (30 cm.) deep. However, he never obtained ^{14}C dates for any of the samples. To determine the age of Rozaire's collections, a black abalone shell from Test Pit 2 was selected for radiocarbon dating. The unit was not excavated in separate levels, but since this deposit is shallow, it is likely a single-component occupation. Radiocarbon dating of the black abalone shell provided a date of $1,230 \pm 30$ RYBP, with a 1 sigma age range of 630–550 cal BP, indicating that this sample is Late period in age. This Late period date correlates well with the microblades and other Late period artifacts from the site.

ANI-8

ANI-8 is located on a south-facing ridge crest to the southeast of Frenchys Cove. The site is a small rockshelter with a shell midden that measures about 5 x 5 m. in area (Greenwood 1978). Black abalone, California mussel, and trace amounts of owl limpet and cowry shells were observed on the site surface (Greenwood 1978), and several bird, fish, and mammal taxa were identified by Sandefur (1978). Greenwood noted that back dirt from previous excavations was widely distributed around the site. Rozaire (1978) excavated three human burials, as well as microblades, shell beads, shell fishhooks, bone tools, and a variety of vertebrate and invertebrate faunal remains. Roughly 60 cubic yards (46 m.³) of midden were excavated and sifted through 1/2 or 1/4-inch mesh screens. Rozaire (1978) noted that there were four to five distinct

strata, although he excavated the site in arbitrary 6-inch (15 cm.) levels. Scattered bits of shell occur to a depth of about 1 m., but the artifacts and shells tend to be densest between the 12–24 inch (30–60 cm.) depth. The presence of rabbit and artiodactyl bones to a depth of at least 36–42 inches (91–107 cm.) suggests these deposits are disturbed.

Rozaire never published radiocarbon dates for the site, although the California Radiocarbon database (Breschini et al. 2005) lists three dates on charcoal from ANI-8, referencing a personal communication from Rozaire. Of these three dates, one from Pit 3 (31–46 cm.) is listed as <300 RYBP with no standard deviation, and another from Pit 14 (92 cm.) is listed as greater than 40,000 years old or beyond the limits of radiocarbon dating. The third sample was from Pit 8 (31–46 cm.) and produced a date of 570 ± 40 RYBP, with a 1 sigma calibrated range of 630 to 540 cal BP. This Late period date is consistent with the microblades found in the unit and is roughly the same age as the sample from ANI-6.

Because Rozaire suspected that the site may also have older occupations, I obtained a black abalone shell from his excavation of Sq. 12 (36–46 in. [91–117 cm.]) near the base of this unit. Radiocarbon dating of this shell produced a date of $4,950 \pm 35$ RYBP, with a 1 sigma age range of 5,020 to 4,870 cal BP. This sample suggests a Middle Holocene occupation of the site, comparable to the age of the sample obtained from ANI-5. Because Rozaire excavated the deposits in arbitrary levels, it is difficult to sort out the precise occupational history of the site. It appears that there were at least two occupations, one during the Middle Holocene and another during the Late period.

DISCUSSION AND CONCLUSIONS

The nine ^{14}C dates reported here demonstrate that Anacapa Island was occupied for over 5,000 years, and that occupation extended through the Late period. Of the nine dates, two fall between about 5,290 and 4,870 cal BP, three to between 3,550 and 2,780 cal BP, and two to about 630 to 540 cal BP. Given the proximity of Anacapa Island to the adjacent mainland, especially around 10,000 cal B.P. when it was only about 10 km. away (Porcasi et al. 1999), Anacapa was probably occupied earlier than these dates suggest. Although defining site chronologies on a limited

number of ^{14}C dates is problematic, these dates provide the first absolute age estimates for Anacapa Island's occupation and help put its archaeological record into a wider context.

Most sites on Anacapa appear to be relatively small and shallow shell middens or lithic scatters (see Greenwood 1978). As Glassow (1977) and Greenwood (1978) have noted, however, some of the sites (e.g., ANI-2 and -5) have relatively large and dense midden deposits, suggesting that more sustained occupation may have also occurred. Since ANI-5 and -8 contain multiple occupations, it is also probable that these and other sites were reoccupied over long periods of time. The presence of human burials at six sites (ANI-1, -3, -4, -5, -8, and -15) also illustrates the varied ways that Anacapa was used in the past (Greenwood 1978).

Numerous questions remain about the occupation of Anacapa Island, particularly its relationship to nearby Santa Cruz Island. On eastern Santa Cruz Island, Perry (2005) has noted that 14 of 90 sites with known temporal occupations date to between about 5,000 and 2,700 cal B.P. She has argued that these Early period peoples had fairly mobile settlement strategies, moving seasonally from the coast to the interior (see also Kennett 2005). Interestingly, five of the nine ^{14}C dates for Anacapa also fall within this time period. Given the proximity of Santa Cruz Island to Anacapa (~8 km.), it is possible that Anacapa may have been part of these mobile subsistence and settlement strategies, and was occupied periodically for fishing, hunting, or shellfish collecting.

The abundant chert deposits on eastern Santa Cruz Island have also been an important source of raw material since the Early period (Perry 2004, 2005). During the Late Holocene, these chert quarries were intensively exploited for microblade production (see Arnold 1987, 1992; Perry 2004). A low-grade chert/chalcedony deposit is also present at Frenchys Cove on West Anacapa (Greenwood 1978). Some of this stone is of good quality, and it is possible that these deposits attracted people to occupy and use Anacapa Island. Later in time, Anacapa may have also been used by people from the two historic villages on eastern Santa Cruz Island (see Kennett et al. 2000), or as an overflow when conditions became too crowded. Future research can help explain the relationship between Anacapa Island, the other Channel Islands, and the adjacent mainland.

The Anacapa Island ^{14}C dating project reported here joins a number of other recent ^{14}C dating projects on the Channel Islands. Although the Channel Islands contain a remarkably well preserved archaeological record, every year portions of this record are lost to marine erosion and other processes. Radiocarbon dating is one way to gather basic archaeological information from these eroding sites before they are permanently lost (Erlandson and Moss 1999). I hope the research presented here stimulates more work on Anacapa Island and on ^{14}C dating deposits across the Channel Islands.

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