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Seasonal stability in Late Holocene shellfish harvesting on the central California coast

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ABSTRACT

Oxygen isotope determinations from 92 California mussel (*Mytilus californianus*) shells from ten archaeological sites in central coastal California show relatively stable seasonal harvesting patterns between 3600 CAL BP and historic contact (AD 1769). Coastal occupants harvested mussels nearly year-round and seem to have occupied individual residential bases throughout the seasonal cycle. Interior groups returned with mussels from the coast mostly in the spring and early summer, but almost never in the late summer/early fall when nut crops were harvested. These findings suggest two inter-dependent groups with distinct seasonal settlement strategies: inland people, reliant on acorns and other nut crops harvested in the fall, and coastal inhabitants who were less involved with acorns. This pattern is supported by accounts recorded by the first Spanish explorers in AD 1769. While some interior groups may have been seasonally migrating "collectors," coastal populations were less mobile, inhabiting individual residential sites throughout the year, albeit not necessarily on a permanent basis. These findings highlight the strong influence of coastal environments and resources on hunter-gatherer mobility.

1. Introduction

The influence of coastlines and coastal resources on hunter-gatherer settlement and mobility has been of interest to archaeologists for decades (e.g., Pálsson, 1988; Wobst, 1974; Yesner, 1980). Along the California coast, certain Native societies (e.g., the Chumash, Gabrielino, Pomo) were fully sedentary, moving an average of only 0.1 times per year, and traveling only 0.2 km per year, while others (e.g., Coast Yuki, Diegueno, Luiseno, Miwok, Tolowa, and Yurok) made 2–8 seasonal moves per year, covering 29–161 km (Binford, 2001:272). Some of these coastal societies featured permanent social inequality, craft specialization, and/or intensive maritime economies while others were less socially and politically complex (Erlandson and Jones, 2002). In light of this situation, mobility and complexity have been foci of considerable research in California over the last several decades, contributing to broader dialogs on the interrelationships between these two variables (e.g., Arnold, 1996; Kelly, 1995, 1998; Kennett and Kennett, 2000; Lieberman, 1998:75–76; Rocek and Bar-Yosef, 1998). One approach used in evaluating this issue has been to assess site seasonality, either through analysis of ethnohistoric accounts (e.g., in the Santa Barbara Channel where large, permanent towns were noted by early explorers; see Erlandson and Rick, 2002; Gamble and Russell, 2002; Grenda and Altschul, 2002; King, 1990; Spanne, 1975; among others) or the remains of seasonally migrating birds and/or pinnipeds in zooarchaeological collections (e.g., Broughton, 1999; Hildebrandt, 1993; Hildebrandt and Mikkelsen, 1993; Howard, 1929; Simons, 1981). Detailed examinations of annual growth layers in fish otoliths (e.g., Andrews et al., 2003; Huddleston, 1994) and deer teeth (Moffitt, 2003; O'Brien, 2001) have also been completed. Most recently, oxygen isotope analysis of marine shells has also afforded significant insights in southern and northern California (Kennedy, 2005; Kennett, 2005). All of these approaches have been valuable, but there remain many areas where seasonal settlement strategies have not been fully defined.

In this contribution we report findings from isotopic analysis of 92 mussel (*Mytilus californianus*) shells from coastal ($N = 5$) and adjacent interior ($N = 5$) archaeological sites[1] in central California

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[1] Preliminary findings from six of these sites were discussed by Kennett (2003) and Jones (2003), however, the current study incorporate a substantially lager data set (92 mussel shells, 481 isotopic readings) than the previous one (42 mussel shells, and 239 isotopic readings) and develops stronger conclusions.

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dating from 3600 CAL BP to post-European contact (AD 1771–1850). To further strengthen this sample, we combined it with detailed analysis of ethnohistoric information on the distribution of Native populations in 1769–1770 as recorded by Spanish explorers. Together, these two mutually concordant data sources suggest relatively stable seasonal patterns in mussel harvesting between 3600 CAL BP and the time of historic contact. Coastal occupants harvested mussels nearly year-round (albeit with some reduction in the winter) and seem to have occupied individual residential bases throughout the seasonal cycle, while interior groups returned with mussels from the coast mostly in the spring and early summer, but almost never in the late summer/early fall, when nut crops were harvested. These findings suggest two inter-dependent groups with distinct settlement strategies: inland people who traveled to the coast once or twice a year to harvest mussels but were reliant on acorns and other nut crops harvested in the fall (e.g., pine and buckeye nuts), and year-round coastal inhabitants who were less involved with nut crops and more sedentary.

2. Study area

2.1. Environment, resources, and sites

The central coastal region of California includes the area south of San Francisco Bay and north of the southern California Bight, encompassing the South or Central Coast Ranges west of the Great Valley (Fig. 1). The most abundant coastal habitats in this region are unprotected surf-swept rocky shores and headlands which provide habitat for California sea mussels (*Mytilus californianus*), abalone (*Haliotis* spp.), turban snails (*Tegula* spp.), and limpets (*Collisella* spp.). Shell middens attest to the exploitation of these taxa as early as 10,000 CAL BP (Greenwood, 1972; Jones et al., 2002) and are abundant along the entire coastline, although protected-habitat clams and cockles dominate at the region's two main estuaries, Elkhorn Slough and Morro Bay. Middens marked by Pismo clams (*Tivela stultorum*) are also known from a few stretches of exposed sandy coast, but all of the sites in the current study are situated adjacent to rocky shores, and their molluscan remains are dominated by rocky coast species. Shells from California sea mussels are especially abundant in these deposits and usually account for at least 50% of all invertebrate remains. With respect to seasonality, mussels and other rocky coast shellfish could have been collected at any time of year except during occasional outbreaks of red-tide which can occur during any month.

The central coast's terrestrial environment is marked by a series of relatively low (600–1500 m) NW–SE trending mountain ranges including the precipitous Santa Lucias which separate the coastal plains from the inland valleys. The coastal flank of the Santa Lucia Range is marked by a complex mosaic of mixed hardwood, relict closed-cone pine, redwood, and southern oak forests, and coastal sagebrush shrub (Kuchler, 1977), while the inland hills and valleys are marked by blue oak-gray pine forest, valley oak savanna, and chaparral. Oak forests are more expansive in the interior and harbor greater numbers of oak species ($N = 6$) than on the coast ($N = 3$) (Pavlik et al., 1991:46–47). The oak, grassland, chaparral, and shrub communities provided key subsistence resources: deer, rabbits, grass seeds, acorns and other nut crops (e.g., buckeyes, and pine nuts). Deer and rabbits could be hunted year-round, while nut crops were available only in the fall and were stored at least through the winter in most of Native California during ethnographic times.

Archaeological sites are uncommon in the rugged uplands of the Santa Lucia Range, and tend to cluster along the coastline and in the interior valleys. Sites from both of these settings, investigated between 1986 and 2005, were used for the current study: five situated within 0–1.6 km of the shoreline dating between 2900 and 300 CAL BP, and five from interior valleys, 19–25 km inland, dating 3600 CAL BP to post-contact[2] (Table 1). Nine sites were middens that produced a wide range of artifacts (Table 2), vertebrate and invertebrate faunal remains. Features and other evidence of structured living space were relatively uncommon at these sites and were limited to single house floors at CA-MNT-1227 and CA-MNT-1748/H, and a dense rock concentration representing a possible rock oven at CA-SLO-267. An outcrop with 58 bedrock mortars was associated with CA-MNT-569B. The diversity of materials recovered from these deposits indicates that they all represent residential bases. Two burials (an adult female and neonate) were also identified at CA-MNT-1223, but in general, these sites were marked by fairly homogeneous midden deposits with diverse faunal and artifact assemblages.

All of the sites yielded California mussel shells, but the role of these mollusks in the diet consumed at the sites varied according to location. On the coast, mussels would have been collected as part of daily foraging activities, and the density of shell in these deposits and high ratios of shell-to-bone suggest that they were indeed harvested frequently. The inland settlements, on the other hand, are separated from the ocean by 19–25 km over the Santa Lucia Range. Given the time and effort required to reach the mussel beds from these inland locations, it can be assumed that mussel shells do not represent daily foraging activities but rather movements between the coast and the interior. More specifically, mussel shells at sites more than a day's journey from the shore probably represent food that was carried over the mountains on return trips to the interior from the coast. The seasonality of mussels recovered in the interior therefore defines the time of year when such return trips were made, although the duration of the coastal stays that preceded these inland migrations cannot be determined.

2.2. Ethnohistory: the Portolá Expedition of 1769–1770

Ethnographically, the central coast region was marked by numerous small, autonomous polities defined by Kroeber (1955) as tribelets. Members of these tribelets spoke languages from one of four mutually unintelligible families: Chumashan, Salinan, Esselen and Costanoan. While brief contacts with European seafarers were made by members of these societies as early as 1542, sustained contact was not initiated until 1769 when the Portolá overland expedition passed through the area on their way northward from San Diego. The expedition members planned to familiarize themselves with the area in order to facilitate later settlement. The first Spanish mission was subsequently established at Monterey in 1770 and six more would be constructed between 1771 and 1797. Partial translations of journals kept by various participants in the Portolá expedition have been available for decades (e.g., Boneau Companys, 1983; Smith and Teggart, 1910; Teggart and Carpio, 1911), and the route of passage has been fairly well reconstructed. Brown (2001) has recently completed a meticulous translation of the Juan Crespi journals that includes information that was previously unavailable and/or improperly translated. The current analysis of observations made by the expedition comes from this more accurate and thorough source.

Portolá and his entourage departed San Diego on July 14, 1769, and reached the central coast region in the vicinity of Oso Flaco Lake (Fig. 1) on September 1, 1769. Initially the group followed a coastal route northward, but when they reached San Carpoforo Creek on September 17, they crossed the Santa Lucia Range and went inland. Continuing northward in the interior, they reached the northern limit of the study area (near Warner [Werner] Lake) on

[2] Three shells were provided from excavations of Neophyte quarters at Mission San Antonio by Robert Hoover who dates them to AD 1771–1850.