GIVING VOICE TO JUANA MARÍA'S PEOPLE: THE ORGANIZATION OF SHELL AND EXOTIC STONE ARTIFACT PRODUCTION AND TRADE AT A LATE HOLOCENE VILLAGE ON SAN NICOLAS ISLAND, CALIFORNIA

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ABSTRACT

GIVING VOICE TO JUANA MARÍA'S PEOPLE:
THE ORGANIZATION OF SHELL AND EXOTIC
STONE ARTIFACT PRODUCTION AND TRADE
AT A LATE HOLOCENE VILLAGE ON
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Master of Arts in Social Science
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At the time of European contact, the southern California mainland coast and Channel Islands were occupied by a variety of Native groups that were socially complex and steeped in rich cultural traditions. These groups were intricately connected with one another through social, political, and economic ties as well as with other groups through extensive trade networks extending throughout California and the Great Basin. Because of excellent preservation of archaeological sites on the Channel Islands, archaeologists have long turned to this area to investigate myriad topics including human interactions with the environment, maritime adaptations, development of cultural complexity, social organization, and craft production. San Nicolas Island, the most geographically isolated of the Channel Islands, offers a unique opportunity to examine many of these issues.

In this thesis, I examine the Native people of San Nicolas Island within both local and regional environmental and cultural contexts. These contexts form the basis for understanding the archaeological record at CA-SN-25, a village occupied intensely between approximately A.D. 1300 and A.D. 1800. With its excellent preservation and diverse artifact assemblage, CA-SNI-25 offers the opportunity to examine human daily practices and underlying social organization and world-views. I examine a portion of the artifact assemblage – shell and exotic stone artifacts – to understand the nature of artifact production and social organization at the site and how its occupants were connected to the broader region. To do this, I identify different artifact types, styles, and spatial and temporal distribution patterns at the site.

The results indicate a variety of domestic and ceremonial activities occurred at the site. Temporal distributions of artifacts suggest that there was much cultural continuity throughout the most intensive period of site occupation; however, contact with Europeans did influence traditional practices as evidenced by the use of European materials in the production of traditional items. Spatial patterns of artifact distribution suggest that while a variety of activities occurred across the site, some areas were used more intensively than others. Comparisons of artifact assemblages from other sites on the island confirm that CA-SNI-25 was a village. The same people who occupied CA-SNI-25 may have utilized other sites on the island and/or been connected to the occupants of these sites, perhaps through family ties. Comparisons of CA-SNI-25 to sites on the other Channel Islands suggest the people of San Nicolas were more culturally aligned with Gabrielino groups on the southern islands. However, an examination of the material culture from the Channel Islands and adjacent mainland and its relative abundance suggests the people of San Nicolas were intricately connected to groups throughout this region. In all, this thesis illustrates the importance of archaeological investigations as a tool to enhance our

understanding of daily practices, social and spiritual organization, and regional interactions of the Native people of San Nicolas Island.

To Juana María and her People

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CHAPTER 1. INTRODUCTION

Human Occupation of Coastal Environments

People have been drawn to coastal regions for thousands of years. With appropriate social and technological adaptations, these areas offer rich and diverse marine resources that support cultural elaboration, sociopolitical complexity, economic exchange, and the development of extensive trade networks. While the timing of coastal occupation is not entirely clear, there is a growing body of evidence suggesting coastal regions in the Americas were occupied by at least 12,000 years ago if not earlier (Erlandson et al. 1996; Johnson et al. 2000, Rick et al. 2001; Sandweiss et al. 1998). Researchers are currently reevaluating migration theories arguing that in addition to or perhaps instead of an overland migration across the Bering Strait Land Bridge, initial populating of the Americas may have occurred via a coastal route (Dixon 1999; Erlandson 1994; Fedje and Christensen 1999).

In North America, coastal hunter-gatherer groups were densely populated and comparable in social complexity to groups typically practicing agricultural traditions; the latter characterized as highly advanced societies (Ilahiane and Altschul 2002). For example, Native groups in the Pacific Northwest developed sophisticated fishing and sea mammal hunting strategies (Drucker 1965). With the ability to store food, these groups were able to diversify their daily practices including the development of elaborate architecture; the manufacture, display, and distribution of wealth items; and participation in both secular and ceremonial activities to maintain social organization and political structure (Drucker 1965; Kroeber 1939).

Native coastal groups in southern California experienced similar cultural elaboration with the development of rich sociopolitical and technological systems adapted to maritime environments. At the time of European contact, the southern California Channel Islands and adjacent mainland coast (Figure 1.1) were occupied by

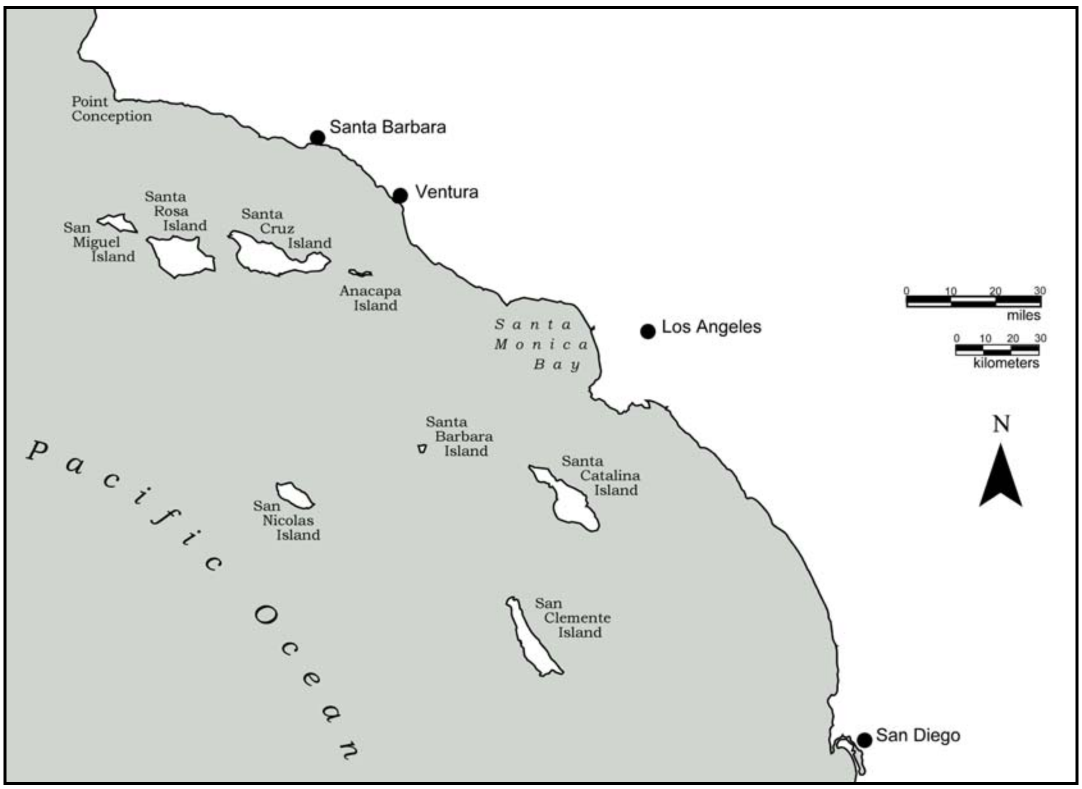

Figure 1.1. The Southern California Coast and Channel Islands (courtesy of Dr. René Vellanoweth).

Chumash and Gabrielino groups. Ethnographic and archaeological records suggest that by the time of contact, social stratification was in place, with power likely in the hands of elites such as chiefs and owners and makers of plank canoes (Arnold 1992, 1993, 1995;

Arnold and Munns 1994; McCawley 1996). The development and later refinement (ca. A.D. 800-1000) of the plank canoe was likely instrumental in connecting Native peoples on the Channel Islands with those on the mainland (Arnold 1995). It appears these groups were linked through trade, family and political alliances, and secular and ceremonial gatherings. This interconnectedness likely led to and helped maintain rapid development of social complexity, particularly during periods of environmental fluctuations that may have restricted access to vital resources, growing population densities, and increasing territorialism beginning about A.D. 1150 (Arnold 1992; Arnold and Munns 1994; Lambert 1993; Lambert and Walker 1991).

San Nicolas Island: A Study of Island Culture

Despite their relative isolation compared to mainland groups, Native peoples of the Channel Islands maintained a rich material culture. In general, island environments are unique places for anthropologists and archaeologists to study the complexities of cultural systems and humans' interactions with environments. With a physically bounded environment and somewhat restricted access to resources, including contact with outside people, islander societies developed unique strategies to manage these limitations (Vayda and Rappaport 1963). Such strategies included ways to manage and utilize available resources and to interact with neighboring groups.

The Native people of San Nicolas Island appear to have developed such management strategies. However, compared to other Native groups on the Channel Islands and adjacent mainland, there is little ethnographic information describing the people of San Nicolas. Instead, we must turn to the archaeological record to discern the social and cultural complexities of these people. In the absence of ethnographic information and oral traditions, archaeology can be used as a tool to reconstruct past human lifeways. Past daily practices leave behind traces of these activities. Through careful analyses of these remains, archaeologists can reconstruct the activities that produced them and ultimately, the social, political, and spiritual structures that guided these practices.

Investigations at CA-SNI-25

In this thesis, I focus on archaeological investigations of a village on San Nicolas Island and identify some of the human daily practices that likely led to the creation of the archaeological record at the site. The village, CA-SNI-25, is located on the island's upper plateau along the north coast (Figure 1.2). While it appears to have been occupied

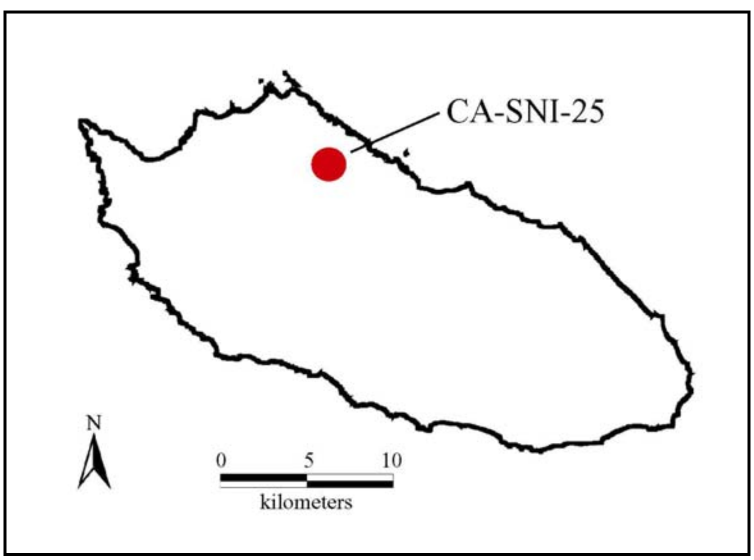

Figure 1.2. General Site Location of CA-SNI-25 Near the Northwest Coast of San Nicolas Island.

as early as 4,000 years ago, the most intensive occupation of the village occurred between about A.D. 1300 and A.D. 1800. Archaeological excavations at CA-SNI-25 were conducted as part of a cooperative agreement between the U.S. Navy and Humboldt State University in concordance with Section 110 of the National Historic Preservation Act (NHPA). As a federal agency and the current owner of San Nicolas Island, the U.S. Navy is required to establish a preservation program for the identification, evaluation, protection, and potential nomination to the National Register of Historic Places (NRHP) of all historic properties within its land holdings. Excavations at CA-SNI-25 were carried out as part of the U.S. Navy's historic preservation responsibilities as outlined in its preservation program.

Humboldt State University, under the direction of Dr. René Vellanoweth, conducted excavations between 2003 and 2005. Prior to this, California State University, Los Angeles carried out excavations, primarily as part of preliminary research investigations. As a result of these investigations, thousands of artifacts have been identified and collected. While the assemblage is comprised of a diverse array of artifacts, this thesis focuses on only a portion of the total assemblage – shell and exotic stone artifacts. The goal of this thesis is to identify and quantify the different types of shell and exotic stone artifacts recovered from CA-SNI-25, to develop site-specific artifact typologies and chronologies, and to compare them to sequences developed for the southern California region. By understanding the breadth and nature of artifacts from CA-SNI-25, we can begin to piece together the types of domestic and ceremonial activities carried out at the site and the underlying social constructs and world-view that directed those activities.

Shell artifacts were selected for analyses because of their relative abundance and diverse use as utilitarian and decorative items. Additionally, shell artifacts are found in different stages of production, offering the opportunity to elucidate artifact manufacturing processes at CA-SNI-25. For many Native peoples occupying coastal regions, including the people of San Nicolas Island, marine shellfish were not only an important food resources but had a much wider utility including use as tools, containers, money, ornaments, and decorative inlays. With intensive labor to modify shells from their natural forms, formal shell artifacts became important symbols of status and wealth tying groups together socially, politically, and economically (Arnold and Graesch 2001; Bradley 2000; Peregrine 1991). For example, by about A.D. 1150, beads produced from *Olivella* shells formed the basis of a standardized economic exchange system in southern California (Bennyhoff and Hughes 1987; King 1990). In addition to economic and social significance, marine shells were often imbued with ceremonial value – often associated with water, fecundity, and death (Claassen 1998; Harris 1943; Safer and Gill 1982; Sheppard 1939). Consequently, analyses of shell artifacts have the potential to elucidate a wide range of activities and underlying cultural beliefs.

In addition to shell artifacts, exotic stone artifacts manufactured from steatite and serpentine are examined in this thesis to understand how the people of CA-SNI-25 were connected to the broader region and how these valuable materials were utilized in a village context. While steatite and serpentine are not locally available on San Nicolas

Island, they were likely obtained through trade with groups from Santa Catalina Island and the mainland. Considering the Native people of San Nicolas Island were somewhat limited by their island environment, trade was likely an important way for them to supplement island resources and establish and maintain social and political ties. To understand the people of San Nicolas Island, we must understand not only their connection to their island environment but to their surrounding region as well.

Thesis Overview

To understand the artifact assemblage recovered from CA-SNI-25, the Native people who created the archaeological record must first be placed within a broader social and environmental context. In the following chapters I explore a variety of issues to establish this context. In Chapter 2, I describe the theoretical framework that guides my research including culture history, practice theory, and world-systems theory. I discuss culture history, an archaeological paradigm, and how it guides the development of site-specific artifact typologies and chronologies that can then be compared to sequences devised for San Nicolas Island and the neighboring region. Following this, I review the basic principles of practice theory which provides the basis for reconstructing the human daily practices and underlying social organization and structure that created the archaeological record at CA-SNI-25. To tie the Native people of CA-SNI-25 and their daily practices to regional interaction spheres, I discuss world-systems theory and how this approach recognizes that cultural groups do not act in isolation but instead are part of a broader economic system in which each group plays a vital role in maintaining and promoting interactions.

Continuing with a regional approach, in Chapter 3 I provide an environmental overview of the southern California region including terrestrial and marine environments of the coastal mainland, Channel Islands, and more specifically, San Nicolas Island. I describe the paleoenvironment of the region and how it has changed over the past 10,000 years as well as the current environment and some of the important resources Native peoples once utilized. I conclude the chapter with a detailed discussion of the physical geography, geology, and terrestrial and marine environments of San Nicolas Island.

In Chapter 4, I review early archaeological investigations conducted in southern California. These archaeological investigations have led to a more detailed understanding of Native history that extends back at least 12,000 years ago. In addition to focusing on the archaeological record, I review ethnographic information for two cultural groups that are key to Channel Islands investigations – the Chumash and Gabrielino. Following this archaeological and cultural context for coastal southern California, I provide in Chapter 5 an ethnographic and archaeological background for San Nicolas Island. With limited ethnographic information available, I focus primarily on previous archaeological investigations and what is known about Native human occupation on San Nicolas Island.

With theoretical, environmental, archaeological, and cultural contexts firmly in place, in Chapter 6 I review research methods utilized in this research including field, laboratory, and cataloging procedures. I provide an overview of artifact types, analysis procedures, and the different typologies and chronologies used to classify and compare artifact assemblages from CA-SNI-25.

In Chapter 7, I provide the results of excavation at CA-SNI-25. In addition to describing site stratigraphy, I present a brief overview of the different features identified during excavation efforts and summarize radiocarbon dating results and site chronology. In the remainder of the chapter, I present the results of artifact analyses, focusing on the different types and quantities of shell and exotic stone artifacts analyzed. While most of the data is presented in tables, I describe in the text notable patterns in material types and artifact styles.

In Chapter 8, I synthesize the data presented in the previous chapter and highlight and compare temporal and spatial patterns of artifact distributions. I then discuss different types of domestic and ceremonial practices that may have produced these patterns. To understand the nature of past human activities at CA-SNI-25 and how the villagers may have been connected to other groups on San Nicolas Island, I compare the site to others that were occupied during the same period. These comparisons highlight island-wide patterns as well as differences between the sites. I then compare CA-SNI-25 to other sites on the Channel Islands to examine the similarities and differences in material culture and practices between the island groups. To better understand how the people of San Nicolas Island fit into regional cultural traditions, I compare the relative importance of their material culture in broader contexts by examining the distribution of island-made artifacts across the southern California region. Finally, in Chapter 9, I summarize the results of this study and propose future research directions that will further our understanding of the complex culture and world-views of the Native people of San Nicolas Island and how they were connected to other groups within the southern California region.

CHAPTER 2. THEORETICAL CONTEXT

Introduction

Theory plays an important role in guiding archaeological inquiry and providing a context for understanding past cultures, human-environment interactions, and socioeconomic spheres. Theory helps to identify relevant information and relationships between data. Although I use many perspectives in this thesis, I weigh most heavily on culture history, practice theory, and world-systems theory to guide my research at CA-SNI-25. Culture history emphasizes broad cultural trends by comparing artifacts and assemblages across space and through time and by identifying spheres of interaction and exchange. Practice theory focuses on the analysis of day-to-day routines to interpret social organization, social identity, and world-views. Spatial and temporal alterations in daily practices may reflect broader cultural and environmental changes. In contrast, world-systems theory focuses on broad patterns, those influenced by social, political, and economic factors. Cultural groups are linked through interactions with one another (e.g., exchange networks) to form a world-system. Practice theory and world-systems theory provide guiding principles to understand the dynamics of artifact production and use at CA-SNI-25 within the context of regional exchange networks.

Culture History Approach to Archaeology

Descriptions of Cultural Change and Continuity

With its development over the past century, the field of archaeology has undergone several shifts in thought. The culture history paradigm dominated archaeology between 1925 and 1955 (Sharer and Ashmore 1993). Prior to this, artifacts were viewed as merely collectables to be displayed in museums and private collections. With the advent of the culture history approach, artifacts were viewed as evidence of past cultural development and change. Consequently, culture historians created descriptive lists of artifact traits and types to trace cultural developments over time (Vellanoweth and Altschul 2002). Variation and continuity in these cultural sequences were linked to cultural change and stability. Site-specific sequences were compared to those from neighboring sites to develop prehistoric regional cultural chronologies.

Culture historians viewed artifact traits and typologies as a proxy for culture change and continuity. However, with its descriptive emphasis, the culture history approach failed to explain the interactions and relationships that produced the archaeological record. Additionally, the approach facilitated descriptions of culture change but did not explain the processes that brought about cultural development (Johnson 2005). In an attempt to address these limitations, archaeological thought shifted to a scientific approach in the 1950s, with the advent of radiocarbon dating and the introduction of computers in archaeology (Sharer and Ashmore 1993). This scientific approach – New Archaeology – prevails today and incorporates an interdisciplinary approach that strives to describe and explain culture change and continuity. Despite this paradigmatic shift, elements of culture history still play an important role in current archaeological research. Researchers continue to describe site-specific temporal and spatial distributions of artifact types and traits and compare these to regional sequences.

Culture History of CA-SNI-25

One of the first steps toward understanding the archaeological record at CA-SNI-25 is to describe the diversity of artifacts recovered and to document their spatial and temporal distributions. Because this thesis represents one of the first analyses of the site's archaeological record, a descriptive approach is particularly important in establishing a context to understand village-wide activities. A culture history will be constructed by analyzing artifact types and traits (e.g., shell fishhooks, shell and stone beads) and tracing them across space and through time to create artifact typologies and chronologies. The artifact typologies developed for CA-SNI-25 will be compared to sequences developed for other sites on San Nicolas Island and to regional chronologies devised for California and Western North America. Practice theory and world-systems theory will be employed to link CA-SNI-25's artifact typologies and chronologies to the human processes that created the artifact distributions found at the site.

Practice Theory

Daily Practices and Social Structure

Examining daily practices can provide an understanding of the dynamic nature of human activities and people's relationships with their physical and social environments.

In Bourdieu's (1977) seminal work, his concept of *habitus* links daily practices to social tradition. *Habitus* embodies the notion that social traditions regulate habits including eating, sleeping, working, and moving in domestic spaces. These daily practices and cultural traditions are part of a community's larger social structure. This concept is key to practice theory which posits that "the ordering of daily lives serves as a microcosm of the broader organizational principles and cultural categories of individuals" (Lightfoot et al. 1998:201).

Because social traditions sanction certain practices, performing these activities ensures the reproduction and continuity of social structure (Giddens 1979). Social structure or organization provides people with a sense of security and familiarity in a complex and changing world. It shapes cultural values and world-views, reinforces positive behaviors and discourages negative ones, coordinates efforts to get tasks done, and helps people cope with unforeseen and changing situations (Bourdieu 1977). While social organization is reproduced through practices and values, it can and does change. Giddens (1979:220) notes that change can occur as an unintended outcome of social reproduction itself. Social change can also occur as a result of external influences that require a change in *habitus*. Some of these external influences include ecological changes, natural disasters, and interactions with different social groups (Giddens 1979:220). Giddens (1979:221) notes that change can involve replacement of certain traditions and practices; however, social beliefs and values are typically not undermined.

Daily Practices and the Archaeological Record

As Lightfoot et al. (1998:201) note, daily practices "dominate people's domestic lives [and] produce much of the material culture we recover in the archaeological record. Furthermore, the performance of daily routines produces patterned accumulation of material culture that are often the most interpretable kinds of deposits in archaeological contexts." Because material culture often reproduces underlying social structure, these physical remains are typically imbued with social meaning and social identity. Types of artifacts and their spatial distributions can provide information regarding the nature of past activities that produced the material remains and how people moved about their landscape. Material culture can also reflect social rules that dictate domestic use of the landscape, social relations, and ceremonial practices.

Hodder and Cessford (2004) used practice theory to interpret the distribution and persistence of cultural materials within domestic space at Çatalhöyük, Turkey. They examined the locations of hearths, ovens, middens and burials; the types of artifacts found in domestic floors; replastering practices; and the types and locations of specialized craft-making activities. Hodder and Cessford (2004) found that social organization and rules were important in directing daily activities. Many of these socially sanctioned practices were mechanisms that enabled people to cope with a variety of problems (e.g., social, economic, sanitation) associated with overcrowded living conditions.

Lightfoot et al. (1998) utilized practice theory to guide their investigations of social identities of interethnic households at Fort Ross, California. They examined the daily practices of four ethnic groups including patterns of refuse disposal, subsistence remains, and artifacts found in domestic spaces. Their findings highlighted important changes as well as continuities in social identities as a result of the interactions between these different ethnic groups.

Practice Theory and Implications for Research at CA-SNI-25

Cultural materials recovered from CA-SNI-25 are relatively well preserved and offer an excellent opportunity to examine the daily practices of the people who occupied the village. The spatial distribution of artifacts reveals the ways in which people organized themselves throughout the village. Concentrations of similar artifact types reflect daily practices centered on domestic, ceremonial, resource procurement, tool-making, and specialized craft-making activities. Changes in artifact types and frequencies at CA-SNI-25 may signify past changes in social organization, stylistic preferences, technological innovations, and environmental conditions. Considering the dearth of ethnographic and historic accounts of the Native people of San Nicolas Island, identifying the daily practices that created these material remains are key to understanding their social structure, cultural values, and world-views.

The World-Systems Perspective

The Modern World-System

In contrast to practice theory's focus on relationships within a cultural group, world-systems theory concentrates on relationships between cultural groups. World-systems theory originated in the 1970s to examine the interactions of nation-states and their relative positions within an interconnected capitalist world-economy. Wallerstein

(1974), a key developer of world-systems theory, argues that to understand the development of a nation-state, one needs to examine this development within a larger system and over a long period of time. In his work *The Modern World-System: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century*, Wallerstein (1974) posits that this larger system or world-system evolved in the 16th century with the capitalist expansion of Western Europe. A world division of labor that guides the production and exchange of basic goods and raw materials has maintained this world-system over the past 500 years (Wallerstein 1974).

The division of labor within the modern world-system reflects a power hierarchy between geographic regions that arose as a result of the exploitation of colonies by European colonial powers to meet capitalistic demands (Frank 1978). These geographic regions of labor include the core, semiperiphery, and periphery. Wallerstein (1974) characterizes the core as having a high living standard, skilled labor force, sophisticated technology, and strong political and military organization. In contrast, the periphery has a low standard of living, unskilled labor, weak political and military organization, and supplies the core with raw materials (Wallerstein 1974). The semiperiphery has a combination of core and peripheral characteristics, trades with both the core and periphery, and often acts as a middleman between the two regions (Wallerstein 1974). Wallerstein (1974) argues that no one nation has been able to dominate the world-system because of this division of labor and economic interdependence of regions.

The strength of world-systems theory lies in its historical approach to understanding the development of nation-states. It recognizes that nation-states do not act in isolation but are part of larger interaction spheres. World-systems theory also recognizes that inequalities have arisen between these nation-states and attempts to explain the historical evolution of changes in power hierarchies over time.

The World-System Prior to the 16th Century

The concept of world-systems theory that developed in the 1970s was not intended to be applied to pre-state societies that existed before the 16th century. Wallerstein (1984) argues that prior to the evolution of the world-system, pre-state societies were self-reliant and not part of an interconnected and interdependent cross-cultural system. Some scholars challenge this idea and argue a world-system has existed for at least 5,000 years (Frank and Gills 1993). Chase-Dunn and Mann (1998) posit that a world-system has evolved over the past 10,000 years. They argue that interdependent cross-cultural interactions did occur in the past and should be considered as interactions within a world-system. Additionally, Chase-Dunn and Jorgenson (2003) suggest a world-systems approach is highly appropriate for studying non-state societies and long-term social processes that include interaction networks and social change.

New definitions of world-systems theory have arisen with its application to societies that existed prior to the 16th century. Frank and Gills (1993:106) redefine the concept to emphasize that “the transfer or exchange of economic surplus is the fundamental criterion of a world-systemic perspective.” Chase-Dunn and Mann (1998:XI) reconceptualize the notion of the “world” to embody “the whole, important interaction network that has consequences of reproducing or changing the conditions of life in a single space.” Interaction networks include relations between people, households, communities, and societies. A world-system evolves when interactions are two-way and occur regularly. Chase-Dunn and Mann (1998) note that networks define the geographic boundaries of the world-system. Depending on the size of a network's sphere of influence, a world-system can be small or large and co-exist with other egalitarian world-systems.

In his description of core, semiperipheral and peripheral regions, Wallerstein (1974, 1979) focuses on the exchange of basic foods and raw materials and excludes the exchange of luxury items. Schneider (1977) challenges this exclusion and argues that past trade of luxury items was a systemic process that created interdependence between prehistoric cultural groups. Following this argument, Chase-Dunn and Hall (1997) identify the trade of luxury items or prestige goods as one of four types of exchange networks that bound the world-system. Other networks include the exchange of information, political/military powers, and bulk goods.

Chase-Dunn and Mann (1998) further modify the world-systems concept with their introduction of core-periphery differentiation. They argue that core-periphery relationships are not always based on power hierarchies and exploitation. Rather, "core-periphery differentiation may exist when two cultural groups are in systemic interaction with one another and one of these has higher population density and/or greater social complexity than the other" (Chase-Dunn and Mann 1998:14). Additionally, Chase-Dunn and Mann (1998) caution that although a cultural group may participate in multiple exchange networks, core-periphery differentiation and/or hierarchies do not necessarily exist for each network. They argue that the nature of the relationship, whether it is core-periphery differentiation or exploitation, must be examined for each type of exchange network.

World-Systems Theory and Archaeology

With the reconceptualization of world-systems theory to explain processes and interactions that have occurred before the 16th century, researchers have used the approach to guide archaeological investigations. Peregrine (1996a:2) argues that world-systems theory is particularly relevant to archaeological research because both investigate economic, social, and political relationships and how these relationships exist within a society and extend outward to include interactions with other societies. World-systems theory has directed archaeological research to go beyond a microscale approach (e.g., household) to examine culture within a regional context. Additionally, world-systems theory provides a context to examine artifact production, accumulation, and exchange within hegemonic systems (Grenda and Altschul 2002).

Peregrine (1996b) used world-systems theory to investigate core-periphery interactions of proto-Iroquois populations in a Mississippian world-system. Chase-Dunn and Mann (1998) utilized a world-systems approach to investigate systemic relations between Wintu groups and Hokan speakers in a late prehistoric northern California world-system. They found that the trade of luxury items was important in maintaining intergroup relations (Chase-Dunn and Mann 1998).

A World-Systems Approach at CA-SNI-25

World-systems theory will be used to tie village-wide activities at CA-SNI-25 to regional trade networks to examine the direction and flow of raw materials and specialized goods. Important indicators of regional activities include the presence of exotic stone materials. Knowledge of exotic stone source locations will help define the geographic boundaries of exchange networks and consequently, the world-system. Another indicator of the existence of a world-system is evidence of specialized craft-making activities which includes the presence of finished craft items, crafts in different stages of production and associated manufacturing debris, and tool kits.

Evidence of exotic stones and specialized craft-making activities at CA-SNI-25 will substantiate the Native San Nicolas islanders' participation in exchange networks of raw resources and luxury items. Determining who the islanders traded luxury items with and what they received in return will elucidate the geographic extent and nature of inter-group relations. Additionally, examining these inter-group relations can provide a better understanding of the ways in which interconnected Native groups in California coped with environmental and social changes. The following chapter will describe the environment of southern California, including San Nicolas Island, to establish a context for understanding cultural developments on San Nicolas Island and in the neighboring region.

CHAPTER 3. ENVIRONMENT OF THE SOUTHERN CALIFORNIA BIGHT

Introduction

Despite the island's relative isolation, the Native people of San Nicolas Island participated in extensive interaction spheres that extended beyond the confines of their island environment. They interacted within a larger region that included the adjacent mainland coast and stretched deep into the interior of Western North America. This chapter examines the environmental context of this regional interaction sphere that encompasses the southern California Bight and its marine and terrestrial environments. The mainland coast and outer islands are discussed in general terms while San Nicolas Island receives a more comprehensive examination. The focus of this chapter is to provide an overview of past and present environmental conditions and marine and terrestrial resources that likely influenced human cultural development, maritime adaptation strategies, craft production, and trade relations.

Geographic Location

The majority of California's coastline follows a north-south trajectory. However, in the southern part of the state, the coastline follows a general northwest-southeast direction. This curve in the coastline is known as the southern California Bight. In total, the bight includes approximately 78,000 km^2 (30,120 mi^2) of coastline, offshore waters, and island landmass (Dailey et al. 1993:2). The southern California Bight encompasses the coastline from Point Conception to the U.S.-Mexico border and eight offshore islands known as the Channel Islands. Based on their distribution, these islands are divided into two general groups: the northern and southern Channel Islands. From east to west, the northern Channel Islands include Anacapa, Santa Cruz, Santa Rosa, and San Miguel. The southern Channel Islands lie in a diamond-shaped pattern and are comprised of three inner islands – Santa Catalina, Santa Barbara, and San Clemente – and San Nicolas, the outermost island.

Like the Channel Islands, the coastal mainland can be divided into three groups or geographic provinces. These three provinces – north coast, central coast, and south coast – are delineated based on differences in topography and hydrology (Vellanoweth and Grenda 2002; Figure 3.1). Despite these differences, the geographic provinces share a

Figure 3.1. Geographic Provinces of the Southern California Bight (adapted from Piedmont Pacific Trade 1992).

mosaic of habitats including intertidal zones, rocky and sandy beaches, sand dunes, estuaries, coastal terraces and bluffs, foothills, and mountain slopes (Schoenherr 1992).

Coastal Geographic Provinces

North Coast

The north coast region encompasses parts of Santa Barbara and Ventura counties and the Transverse Ranges. Unlike most mountain ranges in the United States, the Transverse Ranges are unusual in that they run along an east-west axis. The Transverse Ranges, formed in the last three million years as a result of uplift along the San Andreas fault system, are comprised of igneous (e.g., granite) and metamorphic rocks (e.g., schist, sedimentary rocks) (Schoenherr 1992). Prominent mountains within the Transverse Ranges include the Santa Ynez and Santa Monica mountains. The Santa Ynez Mountains closely parallel the east-west trending coastline, leaving only a narrow coastal plain and thin stretch of sand dunes adjacent to the coast.

Similarly, the Santa Monica Mountains are situated close to the coastline and extend westward into the Pacific Ocean to form the northern Channel Islands. The Santa Ynez River, Santa Clara River, and a series of small drainages convey runoff from the mountains to the ocean. A series of gently sloping floodplains have formed where these rivers drain into the ocean.

Central Coast

The central coast province, also known as the Los Angeles Basin, is comprised of the coastal region of Los Angeles County and the coastal portion of northern Orange

County. The Santa Monica, San Gabriel, and San Bernardino mountains, all part of the Transverse Ranges, form the basin's northern boundary. To the south, the province is bounded by the northern edges of the Santa Ana and San Jacinto mountains. These mountains are part of the Peninsular Ranges that extend approximately 1,450 km (900 mi) into Mexico to form the Baja California peninsula (Schoenherr 1992). Formed approximately 25 to five million years, the Peninsular Ranges are comprised of granites that were intruded into older metamorphic and sedimentary rocks (Schoenherr 1992).

For millions of years, the Los Angeles, San Gabriel, and Santa Ana rivers have collected runoff from the Peninsular and Transverse ranges and deposited alluvium on the Los Angeles Basin floodplain. Sediments in the basin measure up to 4,200 m (13,780 ft) deep and extend approximately 120 km (75 mi) from the base of the San Gabriel and San Bernardino mountains to the coastline (Schoenherr 1992:315). In addition to flooding, the Los Angeles Basin is subject to prolonged periods of fog and haze as the surrounding mountains prevent adequate air ventilation to the north.

Southern Coast

The south coast province encompasses the coastal portion of southern Orange County and the entire coastal region of San Diego County. Peninsular Ranges in this province include the Santa Rosa, Cuyamaca, and Laguna mountains which are drained by numerous creeks and the San Luis Rey and San Digeo rivers. Over time, these creeks and rivers have etched out narrow canyons and flats in the mountains. Coastal lowlands formed where these rivers and larger creeks drain into the ocean. Interspersed within these lowlands, coastal terraces, created as a result of wave-cut erosion, rise above sea level from moderate to steep elevations. In La Jolla, coastal terraces reach an approximate height of 90 m (295 ft) above sea level (Kuhn and Shepard 1984:3). In addition to coastal lowlands and terraces, much of the south coast region has narrow strips of beaches and sand dunes.

Paleoenvironment

Vegetation and Climate

A growing body of palynological, isotopic, and tree-ring data have been used to reconstruct past vegetation communities and climatic conditions in the southern California Bight. These studies provide evidence of dramatic changes in the southern California Bight environment over the past 10,000 years. The period between 10,000 and 8,000 years ago was a time of cool and moist climatic conditions as evidenced by a predominance of pine (*Pinus* spp.) pollen in varved sediment cores from the Santa Barbara Basin (Heusser 1978). However, vegetation communities along the coast were quite different. Analysis of a core sample from a sea cliff near Hollister Ranch suggest that by 9700 B.P.[1] chaparral and coastal sage scrub communities were present – the same plant communities found along the coast today (West 1987). Consequently, this period of cool and moist conditions may not have dramatically affected coastal vegetation communities.

[1] B.P. (Before Present) notation is used throughout the text when discussing geologic (e.g., terminal Pleistocene; early, middle, late Holocene) and environmental history that is not anthropocentrically focused. B.C./A.D. notation is used when discussing human pre-/history; however, B.P. is occasionally noted parenthetically and in tables.

According to palynological studies, oak (*Quercus*) and sunflower (Asteraseae) communities began to thrive beginning about 8,000 years ago suggesting a climatic shift to warmer and dryer conditions (Heusser 1978; Pisias 1978). This warm and dry interval, known as the Altithermal, lasted until about 5,000 years ago (Antevs 1955). Oxygen isotopic (^{18}O) analysis of sea-floor cores corresponds with the palynological evidence indicating that cool ocean temperatures preceded a warming trend between 8300 B.P. and 5400 B.P. (Kahn et al. 1981). Pisias' (1978) examination of sea-floor cores provides additional evidence of fluctuations in sea surface temperatures. Oxygen isotopic (^{18}O) analysis indicates intervals of warm sea surface temperatures and dry climatic conditions between 3800-3600 B.P. and 1800-800 B.P. (Pisias 1978). Climatic conditions between these intervals were generally cooler and wetter than they are today. Glassow et al.'s (1994) oxygen isotopic analysis of California mussel (*Mytilus californianus*) shells from archaeological sites on Santa Cruz Island identified a period of cooler and wetter climatic conditions between 5,500 and 4,500 years ago. This interval corresponds with a highly productive marine environment in the southern California Bight (Glassow et al. 1994).

Environmental fluctuations have been particularly dramatic over the past 3,000 years. Kennett and Kennett's (2000) oxygen isotopic analysis indicate an interval of relatively warm and stable sea surface temperatures between 3000 B.P. and 1550 B.P. A period of cold and unstable sea surface temperatures followed and lasted until 700 B.P. Analysis of tree-ring data from the Transverse Ranges (Kennett and Kennett 2000; Michaelson and Larson 1999) and pollen from the Newport Bay vicinity (Boxt et al. 1999) suggest extreme drought conditions in southern California Bight terrestrial environments between 1050 B.P. and 800 B.P. This period (A.D. 950-1200) of extreme environmental perturbations and drought coincided with an episode of increased human disease, malnutrition, interpersonal violence, and changes in social complexity in southern California.

Sea Levels and Shorelines

Sea levels rose rapidly until approximately 7,000 to 5,000 years ago and dramatically altered terrestrial and marine environments of the southern California Bight (Inman 1983). Approximately 20,000 km^2 (7,720 mi^2) of land along the California coast has been submerged and converted into marine habitat (Bickel 1978:16). Coastal canyons formed as a result of sea level transgression in the terminal Pleistocene and early Holocene and were inundated as sea levels rose. Bays and lagoons formed at the heads of these submerged canyons and supported rich estuarine and marsh communities (Bickel 1978; Hill 1984). Embayments that formed in the early Holocene were filled with alluvium as rising sea levels altered stream gradients and sedimentation processes in the lower reaches of coastal canyons (Vellanoweth and Erlandson 2004).

In addition to coastal canyons, rising sea levels have also dramatically altered the coastline. Approximately three km (1.9 mi) of coastal plains and riparian habitats have been inundated leaving behind a relatively narrow coastal plain (Bickel 1978:16). Coastal terraces that were transformed into submerged marine platforms now support kelp forest communities. Along the narrow coastal strip, rocky areas, wave-swept sandy beaches, and sand flats were established as sea levels stabilized. Today, these rocky areas provide habitat for a variety of shellfish species including abalone (*Haliotis* spp.), mussel (*M. californianus*, *Septifer* spp.), and limpets (e.g., *Lottia* spp., *Acmaea* spp.) (Vellanoweth and Erlandson 2004:145). Wave-swept sandy beaches support Pismo clams (*Tivela stultorum*) while other clams such as *Saxidomus* spp. and *Chione* spp. thrive in sand flats (Vellanoweth and Erlandson 2004:145).

Current Coastal Mainland Environment

Climate

In general, the southern California Bight has a Mediterranean climate. Temperatures along the coast are mild, largely due to coastal fog, and fluctuate little during summer and winter months. There are slight temperature differences between the geographic provinces with mean annual temperatures of 15˚C (59˚F), 18˚C (64˚F), and 17˚C (62˚F) in Santa Barbara, Los Angeles, and San Diego, respectively (Dailey et al. 1993:5). Summers are typically dry while winters are brief and wet. Annual rainfall in Santa Barbara and Los Angeles are similar, measuring about 38.1 cm (15 in), while San Diego is slighter drier with an annual mean rainfall of 25.4 cm (10 in) (Dailey et al. 1993:5). In addition to rainfall, coastal fog contributes to the southern California Bight's overall precipitation levels.

Coastal Plant and Animal Communities

At lower elevations, coastal fog plays an important role in preventing frost. With the absence of freezing temperatures, many different types of plant communities thrive on the coastal mainland. In the intertidal zone, sea grass (*Phyllospadix* spp.), and kelp (*Macrocystis* spp.) grow providing rich habitat for numerous shellfish and fish species.

Closer to shore, sand dunes and sandy beaches support plant species that are adapted to saline environments and ever-present winds (Schoenherr 1992:693; Table 3.1). Estuaries have formed where rivers or creeks carry freshwater out to the ocean. These types of environments are found up and down the southern California Bight coastal region and include Goleta Slough in Santa Barbara County, Ballona Wetland in Los

Table 3.1. Selection of Terrestrial Native Plants and Animals Inhabiting Southern California Coastal Communities (Schoenherr 1992).

Community	Plants	Animals
Sand Dune and Beach	Red Sand Verbana (*Ambrosia maritima*) Beach Ragweed (*Ambrosia chamissonis*) Beach Morning Glory (*Convolvulus soldana*)	Snowy Plover (*Charadrius alexandrinus*) Least Turn (*Sterna albifrons*) El Segundo Blue Butterfly (*Euphilotes battoides allyni*)
Estuarine	Cord Grass (*Spartina foliosa*) Eel Grass (*Zostera marina*) Salt Grass (*Distichlis spicata*)	Light-Footed Clapper Rail (*Rallus longirostris levipes*) American Avocet (*Recurvirostra americana*) American Coot (*Fulica Americana*)
Coastal Sage Scrub	Chia Sage (*Salvia columbariae*) Coyote Brush (*Eriodictyon californicum*) Coastal Cholla (*Opuntia prolifera*)	Desert Night Lizard (*Xantusia vigilis*) White-Footed Deer Mouse (*Peromyscus maniculatus*) Coyote (*Canis latrans*)
Coastal Chaparral	Chamise (*Adenostoma fasiculatum*) California Scrub Oak (*Quercus berberidifolia*) Fire Poppy (*Papaver californicum*)	Western Fence Lizard (*Sceloporus occidentalis*) Woodrats (*Neotoma* spp.) Gray Fox (*Urocyon cinereoargenteus*)
Grassland	Purple Needlegrass (*Stipa pulchra*) Mariposa Lily (*Calochortus* spp.) Red Maids (*Calandrinia ciliata*)	Stephen's Kangaroo Rat (*Dipodomys stephensi*) Monarch Milkweed Butterfly (*Danaus plexippus*) California Gnatcatcher (*Polioptila californica*)

Angeles and Ventura counties, Bolsa Chica Wetland in Orange County, and San Luis Rey Wetland in San Diego County.

Moving to slightly higher elevations, coastal scrub and chaparral dominate exposed coastal terraces and bluffs while coastal lowlands support grass communities.

Many native plants in these communities have been or are currently in danger of being replaced by nonnative species. Invasive plants like European beachgrass (*Ammophila arenaria*), wild oat (*Avena barbata*), perennial ryegrass (*Lolium perenne*), and foxtail (*Alopecurus aequalis*) have already impacted grassland and coastal scrub communities (Schoenherr 1992).

Heading away from the coast and rising in elevation, chaparral oak woodland grows in the foothills while the mountains support pine forest. In the past, Native peoples collected acorns and pine nuts in these inland environments and incorporated them into their diet and traded these food resources with other Native groups.

Ocean Currents of the Southern California Bight

The ocean currents within the southern California Bight largely influence the region's marine environment (Figure 3.2). The California Current carries cold, highly oxygenated, nutrient-rich waters from the northern subarctic region southward. When the current reaches the southern California Bight, a combination of the bend in the coastline, prevailing northwesterly winds, and submarine topography alters the current's trajectory (Browne 1994; Engle 1994). Part of the California Current strikes San Miguel Island, the outermost of the northern Channel Islands, and is diverted eastward into the Santa Barbara Channel. This diverted flow forms a counterclockwise eddy that bathes Santa Rosa Island and the western side of Santa Cruz Island in cold water before it loses momentum and becomes warmer (Browne 1994; Engle 1994; Schoenherr et al. 1999).

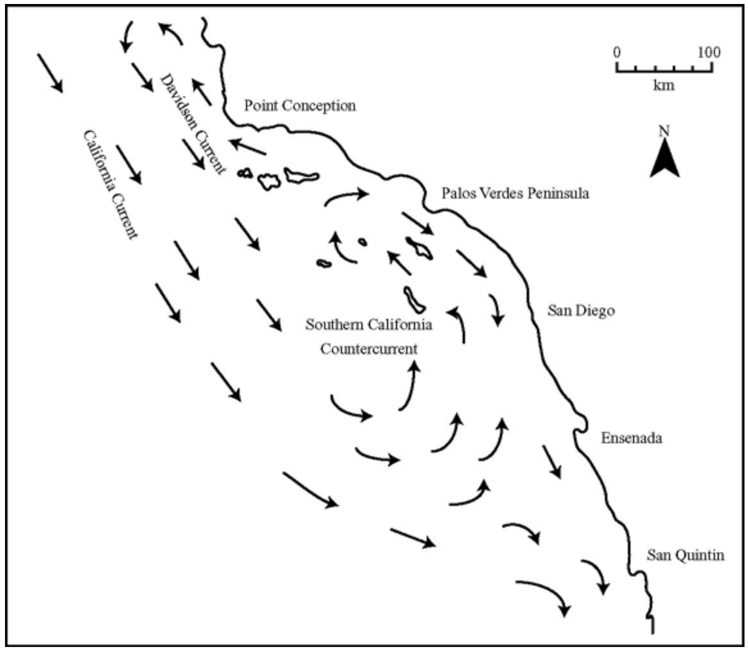

Figure 3.2. Major Ocean Currents along the Coast of Southern California (adapted from Dailey et al. 1993:9).

The main flow of the California Current continues its southerly journey to San Nicolas Island. Just south of the island, part of the current is diverted to the east and then north. This new flow is called the Southern California Countercurrent. This countercurrent mixes water from the California Current with two other types of ocean waters: 1) warm, saline waters from the Central Pacific carried eastward and 2) warm, highly saline, low oxygenated Equatorial Pacific waters carried northward (Browne 1994). The Southern California Countercurrent bathes Santa Catalina, Santa Barbara, San Clemente, and the eastern portion of Santa Cruz islands in this mixture of ocean waters. The result is a dramatically altered marine environment that supports a diverse array of aquatic life adapted to cold, warm, and intermediate temperature ocean waters that differ in saline, oxygen, and nutrient contents.

Additionally, the circulation pattern of currents in this region would have been important to Native peoples in facilitating ocean travel by canoe between the Channel Islands and mainland. In particular, three eddies around San Nicolas Island would have connected the islanders to the northern Channel Islands, San Clemente Island, and Santa Catalina Island. Utilizing a fourth eddy, Native peoples could have easily travel from Santa Catalina Island to Palos Verdes on the peninsula where significant villages and trading centers were located (Scalise 1994).

Northern Channel Islands

Physical Geography

The northern Channel Islands, an extension of the Santa Monica Mountains, form a chain that stretches approximately 100 km (62 mi) (Schoenherr et al. 1999:200). The partially submerged mountain ridge varies in elevation so that its ends – San Miguel and Anacapa islands – are lower in elevation relative to the middle portion of the ridge which comprises Santa Rosa and Santa Cruz islands. Of all the Channel Islands, Anacapa is situated the closest to the mainland at a distance of 19 km (12 mi). Before sea levels rose approximately 9,000 to 5,000 years ago, the four northern islands were connected as a single landmass known as Santarosae Island.

Today, the northern Channel Islands are more closely interspaced and situated closer to the mainland compared to the southern Channel Islands. As a result of this proximity, biotic communities on the northern Channel Islands and northern coastal portion of the southern California Bight share relatively similar biotic coastal communities compared to those found on the southern Channel Islands and southern portion of the coastal mainland (Schoenherr et al 1999:198).

Geology

With the exception of Anacapa Island, the northern islands are composed primarily of sedimentary rocks that were formed as early as the Cretaceous period and overlain by Pleistocene marine sediments (Sorlien 1994). This underlying deposit is predominantly sandstone and shale. Anacapa Island, however, is comprised mainly of volcanic rock formed during the Miocene epoch and overlain by sedimentary deposits (Sorlien 1994).

Santa Cruz Island's geology is perhaps the most complex of the northern Channel Islands. While the island's northern end consists of Miocene volcanics under a bed of Pleistocene deposits, the island's southern end is comprised of a combination of sedimentary and metamorphic rocks (Schoenherr et al. 1999:291). Santa Cruz Island schist, a type of metamorphic rock, is believed to be the oldest rock material on the northern Channel Islands and was formed prior to the Cretaceous period (Schoenherr et al. 1999: 291). Other formations of note include the island's sedimentary and Monterey chert outcrops. In the past, Native peoples quarried the chert and used it for manufacturing stone tools and trade (Rosenthal 1996). San Miguel Island contains another important source of chert – Cico chert. This chert was also quarried and exchanged throughout the southern California Bight (Erlandson et al. 1997).

Terrestrial Environment

Like the southern California Bight coastal mainland, the northern Channel Island region has a Mediterranean climate with similar temperature ranges and average annual rainfall levels. Prevailing northwesterly winds constantly whip San Miguel and cause precipitation to form on the western sides of Santa Rosa and Santa Cruz islands (Schoenherr et al. 1999:201). Freshwater is available on all of the islands in the form of seeps, creeks, and/or springs. However, water is not necessarily available year-round and is severely limited on Anacapa Island. Fog is present year-round and prevents island temperatures from dropping below freezing. Plant communities on the northern islands are similar to those found on the mainland and include coastal sage scrub and chaparral, coastal grassland, beach and dune, woodland, pine forest, and marsh. Many of the plants in these communities are seed- or fruit-bearing and in the past were an important component of Native peoples' diets.

Santa Cruz and Santa Rosa islands, which are the largest of the northern Channel Islands, have the greatest number of native plant species – 480 and 380 species, respectively (Schoenherr et al. 1999). In contrast, the smaller of the islands, San Miguel and Anacapa, each have approximately 170 native plant species (Schoenherr et al. 1999). While the northern Channel Islands have many of the same plant species found on the mainland, they also support plants that are endemic to one or more islands. For example, Greene's Dudleya (*Dudleya blochmaniae*) is found on all of the northern islands while all eight Channel Islands support island morning glory (*Calystegia macrostegia*). Examples of single-island endemic plants found on the Channel Islands are listed in Table 3.2.

Table 3.2. Selection of Single-Island Endemic Plants found on the Channel Islands (Schoenherr et al. 1999:9-12).

Location	Plants
Northern Channel Islands	
Anacapa Island	Junak's Malacothrix (*Malacothrix junakii*)
Santa Cruz Island	Santa Cruz Island Fringepod (*Thysanocarpus conchuliferus*)
Santa Rosa Island	Santa Rosa Island Manzanita (*Arctostaphylos confertiflora*)
San Miguel Island	No endemic plants are found solely on San Miguel Island
Inner Southern Channel Islands	
Santa Barbara	Santa Barbara Live-Forever (*Dudleya traskiae*)
Santa Catalina	Santa Catalina Island Ironwood (*Lyonothamnus floribundus* spp. *floribundus*)
San Clemente	San Clemente Island Hazardia (*Hazardia cana*)

The northern Channel Islands also support endemic species of invertebrates and vertebrates. For example, the house finch (*Carpodacus mexicanus frontalis*) and eleven species and subspecies of land snail (*Micrarionta* spp.) inhabit the northern Channel Islands. Endemic species of white-footed deer mouse (*Peromyscus maniculatus*) are also found on each of the northern islands. A larger terrestrial mammal, the island fox (*Urocyon littoralis*), has populations on all of the Channel Islands except for Anacapa and Santa Barbara. The island fox is related to the mainland gray fox (*U. cinereoargentus*) and was likely introduced to the southern Channel Islands as early as 5,000 years by humans as pets and through trade (Vellanoweth 1998). The initial arrival of island foxes on the northern Channel Islands is not entirely clear; however, they are believed to have occupied these islands before they were introduced on the southern islands (Collins 1991; Vellanoweth 1998).

Unlike the island fox, there are several species of animals that are not endemic to the islands including the black rat (*Rattus rattus*), domestic sheep (*Ovis aries*), rock wren (*Salpinctes obsoletus*), and peregrine falcon (*Falco peregrinus*) (Schoenherr et al. 1999).

Marine Environment

The same winds that the drive the Southern California Countercurrent also influence climate and cause upwelling approximately 90 km to 200 km (56-124 ft) offshore (Schoenherr et al. 1999:72). These nutrient-rich waters sustain a diverse marine community, including pinniped populations. San Miguel Island supports one of the largest pinniped rookeries in the world (Schoenherr et al. 1999). Pinniped species found on the island include California sea lions (*Zalophus californianus*), northern elephant seals (*Mirounga angustirostris*), and northern fur seals (*Callorhinus ursinus*). Anacapa Island also attracts a few of these pinniped species to its shores in addition to colonies of brown pelicans (*Pelecanus occidentalis*) and Western gulls (*Larus occidentalis*).

The northern Channel Islands' intertidal zones are comprised of a variety of marine plants, shellfish, and fish species. Eel grass and sea grass grow in shallow waters, while red algae (Rhodophyta), brown algae (Phaeophyta), and southern sea palm (*Eisenia arborea*) inhabit deeper levels of the intertidal zone (Murray and Bray 1993). Red abalone (*Haliotis rufescens*) thrive in depths up to 150 m (490 ft) and inhabit the cold waters surrounding San Miguel and Santa Rosa islands (Haaker 1994). Black abalone (*H. cracherodii*) occur on all of the northern Channel Island while green abalone (*H. fulgens*) and pink abalone (*H. corrugata*) inhabit the warmer waters off Santa Cruz Island's eastern shores (Haaker 1994).

Other types of shellfish commonly found on the northern Channel Islands include California mussel, giant keyhole limpet (*Megathura crenulata*), sea urchin (*Strongylocentrotus* spp.), acorn barnacle (*Balanus* spp.), and black turban (*Tegula* *funebralis*) (Schoenherr et al. 1999). Numerous species of fish feed in the offshore kelp forests including blue rockfish (*Sebastes mystinus*), pile surfperch (*Damalichthys vacca*), and blackeye goby (*Coryphopterus nicholsii*) (Cross and Allen 1993).

Inner Southern Channel Islands

Physical Geography

Of the southern Channel Islands, Santa Catalina is located the closest to the mainland at a distance of about 32 km (20 mi). Compared to the northern Channel Islands, the southern group is more dispersed and arid. These islands were never connected as a single land mass but instead are formed by a series of offshore submarine ridges. As discussed earlier, the Southern California Countercurrent bathes the innermost southern Channel Islands (Santa Catalina, Santa Barbara, and San Clemente) in waters warmer than those carried by the California Current. Consequently, the marine environment surrounding the inner southern islands supports species that have an affinity toward warm water.

Geology

The inner southern Channel Islands have remarkably similar geologic formations. San Clemente Island is comprised of sedimentary rocks overlying a base of Miocene volcanic rock. In the past, Native peoples quarried outcrops of reddish dacite for the manufacture of stone tools (Howard 1993). Similarly, Santa Barbara Island is composed of Miocene volcanic rock overlain with sedimentary marine terraces.

Santa Catalina Island's geology is slightly more complex. At the island's southern end, Miocene volcanic rocks have intruded into metamorphic rocks. To the northwest, the island is comprised primarily of metamorphic rocks that were formed during the Jurassic period as the result of the uplift of an offshore submarine trench.

One rock type of particular note, steatite, occurs at several places on the island and was quarried and manufactured into a variety of objects by Native peoples (Williams and Rosenthal 1993). These manufactured items and raw stone materials were traded throughout the southern California Bight.

Terrestrial Environment

Like the northern Channel Islands and mainland, the inner southern Channel Islands are influenced by a Mediterranean climate and northwesterly prevailing winds. Rainfall is slightly less than the Bight's northern regions with an average between 30 cm to 38 cm (12-15 in) (Schoenherr 1992). Freshwater is available on Santa Catalina and San Clemente islands in the form of creeks, springs, and seeps. However, water is not permanent on San Clemente Island and at times, is absent on Santa Barbara Island. Fog adds to overall moisture levels and prevents freezing temperatures. Types of plant communities on the inner southern Channel Islands are identical to those mentioned for the northern islands. However, compared to the northern islands, the inner southern islands support a greater number of endemic species, likely due to their more geographically dispersed nature. Plant communities on the southern Channel Islands include between six and 16 percent endemic species, while the northern islands support only five to seven percent (Schoenherr et al. 1999:203).

Santa Catalina Island, the largest of the southern Channel Islands, supports the greatest number of plant communities and has the highest biodiversity among the southern islands. In the past, Native peoples incorporated the edible fruit of the Catalina cherry (*Prunus lyonii*) into their diets. This plant is also found on San Clemente Island. One plant, giant coreopsis (*Coreopsis gigantea*), thrives on all of the Channel Islands except San Clemente (Raven 1967). Additional floral endemics include island bird's-foot trefoil (*Lotus argophyllus* var. *niveus*) and island pinpoint clover (*Trifolium gracilentum* var. *palmeri*) (Schoenherr et al. 1999). Each of the inner southern Channel Islands also supports plants that are single-island endemics (Table 3.2).

Plant communities on both the southern and northern Channel Islands are currently threatened by exotic species. Many of these nonnative plants like narrow-leaf broom (*Genista linifolia*), wild oat, filaree (*Erodium cicutarium*), and brome grasses (*Bromus diandrus*) that were brought to the islands either purposely or inadvertently with the introduction of sheep and cattle grazing in the late nineteenth century (Schoenherr et al. 1999). On Santa Catalina Island, a little more than 30 percent of the plants are nonnative (Schoenherr et al. 1999:154).

Several species of nonnative animals have been introduced to the inner southern Channel Islands including the cattle egret (*Bubulcus ibis*), goat (*Capra hircus*), wild pig (*Sus scorfa*), and house cat (*Felis domesticus*) (Schoenherr et al. 1999). However, several endemic animals do currently inhabit the southern islands. These animals include the island fox, deer mouse, and island night lizard (*Xantusia riversiana*), with the latter found on all of the southern Channel Islands except Santa Catalina (Schoenherr et al.

1999). The house finch (*Carpodacus mexicanus clementis*) occupies all of the southern islands.

Marine Environment

The marine environment of the southern islands is similar to that of the northern islands. Sea birds that frequent the northern islands are also found on the inner southern islands. Kelp beds and other marine vegetation are abundant and occupy the offshore regions of the islands. Compared to all of the Channel Islands, San Clemente Island has the second greatest area (20 percent) of kelp forests (Engle 1994:18).

Shellfish composition differs slightly between the northern and inner southern Channel Islands. Warm water species like green and pink abalone are more abundant on the southern islands, especially San Clemente Island (Haaker 1994). California mussel populations, however, are not as abundant compared to the northern Channel Islands. Fish species include garibaldi (*Hypsypops rubicunda*), California sheephead (*Pimelometopon pulchrum*), and kelp surfperch (*Brachyistius frenatus*) (Cross and Allen 1993). Schools of common dolphin (*Delphinus delplu*) occasionally pass through the deep, submarine canyons off San Clemente and Santa Catalina islands (Fagan 2003). Additionally, pinnipeds are found on the inner southern Channel Islands, though populations are not as large as those found on San Miguel Island.

San Nicolas Island

Physical Geography

San Nicolas Island is located approximately 98 km (61 mi) from the mainland and is the outermost of the southern Channel Islands. San Nicolas Island is situated approximately equidistant between the northern and southern Channel Islands with its closest neighbor, Santa Barbara Island, located approximately 46 km (29 mi) to the northeast (Vellanoweth et al. 2002). Compared to Santa Catalina and San Clemente islands, San Nicolas Island is relatively small measuring approximately 13 km (8 mi) in length and 5.6 km (3.5 mi) in width with a maximum elevation of 277 m (909 ft) at Jackson Hill (Schoenherr et al. 1999:333).

Geology

San Nicolas Island is composed primarily of Eocene sedimentary rock that covers a bed of marine sediments (Meighan and Eberhart 1953; Vedder and Norris 1963). This underlying sedimentary layer is comprised of a combination of metavolcanic and metasedimentary rocks within a matrix of sandstone, siltstone, and shale (Vedder and Norris 1963). Although these metasedimentary and metavolcanic rocks are difficult to work with because of their porphyritic nature and mineral content, Native people utilized these rocks for the manufacture of stone tools (Clevenger 1982).

Along the island’s northwest region, a sandstone shelf embedded with iron concretions extends outward from low-lying coastal cliffs. Wave action has caused the iron concretions to erode from their sandstone substrate and take on a lenticular-shape.

Based on ethnographic information, these iron concretions or *toshaawt* stones were used in ceremonial-ritualistic practices to make rain and cure the sick (Timbrook 2000; Figure 3.3). To date, San Nicolas Island has been the only location identified as the source of these stones (Timbrook 2000).

Figure 3.3. Examples of *Toshaawt* Stones Recovered from Various Archaeological Sites on San Nicolas Island.

Terrestrial Environment

Prevailing northwesterly winds influence San Nicolas Island's climate, and fog adds to this arid island's total precipitation levels. These same winds coupled with wave-action have eroded the island's sedimentary rock to form coastal terraces and cliffs that surround a central, wind-swept plateau (Meighan and Eberhart 1953; Vedder and Norris 1963). Freshwater sources are found primarily within the island's northwest region and consist of twelve perennial springs and seeps (Vellanoweth et al. 2002:83).

The island is sparsely vegetated and limited to primarily grasses and shrubs and a few edible endemics (Junak and Vanderwier 1988). Trees are not native to San Nicolas, but were introduced during the Euro-American occupation of the island (Schoenherr et al. 1999:339). Overall, of the 270 plant species found on San Nicolas Island, approximately half are nonnative to the region (Vellanoweth et al. 2002:83). Many of these exotic species were brought to the island with the introduction of sheep grazing and include Australian salt bush (*Atriplex semibaccata*) and burr clover (*Medicago hispida*) (Dunkle 1950).

Coastal sage scrub dominates the island's coastal bluffs and terraces. Native plants commonly found in this community include giant coreopsis (Figure 3.4), coyote

Figure 3.4. Giant Coreopsis on San Nicolas Island (courtesy of Dr. René Vellanoweth).

brush, California boxthorn (*Lycium californicum*), coastal prickly-pear (*Opuntia littoralis*), coastal cholla, and California saltbrush (*Atriplex californica*) (Schoenherr et al. 1999:340). Silver lupine (*Lupinus albifrons*) also grows in the scrub community and in the past, Native people used it for firewood (Thomas 1995; Figure 3.5). Two plants are restricted solely to San Nicolas Island and include the San Nicolas Island lomatium

Figure 3.5. Silver Lupine on San Nicolas Island (courtesy of Dr. René Vellanoweth).

(*Lomatium insulare*) and San Nicolas Island buckwheat (*Eriogonum grande* var. *timorum*) (Schoenherr et al. 1999).

In addition to native plants, land animals endemic to the island include the land snail, island night lizard, deer mouse (*Peromyscus maniculatus exterus*), and island fox (Vellanoweth 1998; Vellanoweth et al. 2002; Figure 3.6).

Figure 3.6. San Nicolas Island Fox (courtesy of Dr. René Vellanoweth).

Marine Environment

In contrast to the limited terrestrial environment, marine life surrounding San Nicolas Island is abundant and diverse. The rocky shoreline supports numerous shellfish species, while rich kelp beds grow along a broad, submarine shelf that extends approximately four kilometers (2.5 mi) offshore at a depth of 107 m (350 ft) (Vedder and Norris 1963; Figure 3.7). San Nicolas Island's kelp forests are the largest of the

Figure 3.7. Kelp Beds off the North Coast of San Nicolas Island (courtesy of Dr. René Vellanoweth).

Channel Islands and comprise approximately 30 percent of the total area of kelp forest resources for the islands (Engle 1994:18). The island's kelp forests are particularly productive due to cold, nutrient-rich waters of the California Current.

All five species of abalone, including white abalone (*H. sorenseni*) inhabit San Nicolas Island's offshore reaches (Schwartz 1994). However, populations of the latter are limited and the species is currently listed as endangered. Also found in the intertidal zone are California mussel, wavy topshell (*Astraea undosa),* limpets, chitons (*Mopalia* *ciliata*, *Cryptochiton stelleri*), Norris top shell (*Norrisia norrisi*) and turbans (*Tegula* spp.) (Vellanoweth et al. 2002:84). In the past, Native people extensively used purple olive (*Olivella biplicata*), which occupy primarily sandy substrates, to manufacture shell beads (Vellanoweth et al. 2002). The island's inhabitants also produced baskets woven from sea grass that grows in shallow waters (Thomas 1995).

On shore, snowy plovers, black oystercatchers (*Haematopus bachmani*), Brandt's cormorants (*Phalacrocorax penicillatus*), Western gulls, and brown pelicans nest and breed on the island and feed in the offshore waters (Vellanoweth et al. 2002). Additionally, six species of pinnipeds, including California sea lions, northern elephant seals, and Pacific Harbor seals (*Phoca vitulina*), inhabit and breed on San Nicolas Island (Schoenherr et al. 1999:345; Figure 3.8).

Figure 3.8. California Sea Lions on a San Nicolas Island Beach (courtesy of Dr. René Vellanoweth).

San Nicolas Island and the southern California Bight in general, are comprised of a complex web of environments influenced by numerous factors including geology, marine currents, and climate. Native peoples occupying the coastal mainland utilized a variety of terrestrial and marine resources while Channel Islanders relied heavily upon a maritime economy. In all, the environment of the Bight played a significant role in shaping Native social, technological, and political organization. With an environmental context firmly in place, the following chapter will examine the different Native cultures that developed in the southern California Bight beginning approximately 13,000 years ago.

CHAPTER 4. ARCHAEOLOGICAL AND CULTURAL BACKGROUND OF THE SOUTHERN CALIFORNIA BIGHT

Archaeology and Culture History of the Bight

Early Investigations

In the late nineteenth century, museums and private collectors from around the world sponsored archaeological expeditions in the southern California Bight. During these expeditions, rare and highly artistic artifacts were collected from the surface or obtained during informal excavations. Detailed information regarding artifact location and context was rarely documented. Some of these early investigators or antiquarians include Bowers (1878, 1883), de Cessac (1882), Dall (1874), Eisen (1904), Henshaw (1887), Palmer (1906), and Schumacher (1877). Léon de Cessac, a French naturalist, amassed large artifact collections and conducted extensive excavations on the Channel Islands. He is attributed with compiling the largest collection of stone effigies known from the southern California region (Reichlen and Heizer 1964). Artifacts collected during this early period are currently housed around the world, including the Musée de l'Homme in Paris.

Chronology Building

With the turn of the twentieth century, the field of archaeology experienced a paradigmatic shift from antiquarianism to culture history. Artifacts were no longer considered merely collectibles but were viewed as tools to understanding prehistoric and historic cultural development. Artifact traits and types were listed and compared with archaeological sites in the region. These artifact and regional studies led to the development of cultural chronologies, including those by Kroeber (1909, 1936) and Merriam (1906).

Numerous cultural chronologies have been proposed for southern California and neighboring regions (Table 4.1). D. B. Rogers (1929) and Olson (1930) developed cultural chronologies for the Santa Barbara region. While Rogers (1929) defined three prehistoric cultural sequences, Olson (1930) identified eight cultural phases, including three for Santa Cruz Island. With the introduction of radiocarbon dating in the 1950s and the ability to directly date artifacts and their depositional contexts, stratigraphic relationships of artifacts formed the basis of cultural chronology-building. With this new technology, Orr (1962) and Owen (1964) advanced cultural chronologies in the Santa Barbara Channel area, while Wallace (1954) focused on cultural development in Ventura County.

Many of the cultural chronologies developed for the central coast were a result of archaeological work conducted by the Works Progress Administration, State Emergency Relief Administration, and the Natural History Museum of Los Angeles County (Vellanoweth and Altschul 2002:90, 93). Walker (1937, 1951), Heizer and Lemert (1947), and Treganza and Bierman (1958) carried out extensive work in Los Angeles County with the latter focused on chronological development at Topanga Canyon. In the south coast, M. J. Rogers (1929, 1945) led the way for development of cultural chronologies in San Diego County.

Table 4.1. Cultural Sequences for Southern and Central California.[a]

Radio-carbon Years B.P.	Year A.D. B.C.	Geological Time Scale	Santa Barbara Channel Region	Los Angeles Basin & Southern Channel Islands	Southern Coast	South-Central California	Mojave Desert
			Historic Period			Historic	Historic Period
190-	1782-					Phase 2B	
400-	1500-		Late Period			Phase 2A	Late Prehistoric
			Middle/Late Transition	Late Prehistoric		Late Period Phase 1	
1020-	1000-				Late Prehistoric	Middle/Late Transition	Saratoga Springs
1610-	500-	Late Holocene	Middle Period			Middle Period	
2000-	A.D. 0- B.C.			Intermediate			
2425-	500-					Early/Middle Transition	Gypsum
2825-	1000-						
3225-	1500-				Intermediate		
3625-	2000-						
4000-	2500-						
4370-	3000-						
	3500-	Middle Holocene	Early Period	Millingstone		Early Period	Pinto
5000-	4000-						
	4500-				Millingstone or La Jolla		
6000-	5000-						
	5500-						
7100-	6000-	Early Holocene					Lake Mojave
7500-	6500-		Paleocoastal Period	Paleocoastal	San Dieguito		

[a]Adapted from Bennyhoff and Hughes (1987); Gibson (1992:6); and Vellanoweth and Altschul (2002:87).

As a result of extensive archaeological work in the southern California Bight, numerous and complex cultural sequences were developed. Based on his work in the Santa Barbara Channel region, King (1981, 1990) developed a detailed temporal sequence that combined many of the cultural chronologies advanced by Olson (1930), Orr (1968), D. B. Rogers (1929), Wallace (1955), and Warren (1968). King (1990) analyzed bone, shell, and stone artifacts recovered from grave lots to create a detailed chronology that provided a temporal framework for understanding social and economic change in the Santa Barbara Channel region.

The collective work of antiquarians, culture historians, and modern archaeologists has created an extensive understanding of cultural development over time in southern California. The following discussion synthesizes this early work and more recent studies to provide an overview of prehistoric and historic cultural development in southern California.

Terminal Pleistocene (13,300-10,000 B.P.; 11,300-8000 B.C.)

Archaeological data from the Channel Islands provides some of the earliest evidence of human occupation in North America. Human skeletal remains from the Arlington Springs site on Santa Rosa Island have been dated to the terminal Pleistocene, approximately 13,300 years ago (Johnson et al. 2000). Daisy Cave on San Miguel Island provides additional evidence of early human occupation approximately 13,000 years ago (Erlandson et al. 1996). Additionally, Daisy Cave has produced some of the earliest evidence of woven plant fibers and basketry on the Pacific Coast (Connolly et al. 1995).

Archaeological sites dating to the terminal Pleistocene are typically small and reflect ephemeral occupation and short-term maritime activities. Early islanders utilized rocky shore and kelp bed habitats and caught a variety of fish species. Dietary reconstructions suggest fish and shellfish comprised a large portion of the islanders' diet (Rick et al. 2001). In contrast, early mainland groups utilized primarily bay and estuary habitats (Erlandson and Rick 2002; Erlandson et al. 1999; Rick and Erlandson 2000). While dietary reconstructions indicate a diversified diet, these early mainland groups relied more heavily on shellfish than fish resources (Erlandson and Rick 2002; Erlandson et al. 1999; Rick and Erlandson 2000).

Early Holocene (10,000-6650 B.P.; 8000-4650 B.C.)

There is increased evidence for occupation in coastal southern California during the early Holocene. Evidence suggests that during this time the Channel Islands were more intensely utilized; however, settlement does not appear to have been permanent. Coastal strands were used by mobile hunter-gatherers who may have traveled seasonally to the islands from the mainland in search of marine resources that included shellfish, fish, and sea mammals (Rick et al. 2001; Salls 1988; Vellanoweth et al. 2002).

Populations on the adjacent mainland consisted of highly mobile foragers in groups comprised of one to three families (Grenda and Altschul 2002). These nuclear families likely congregated at certain times of the year to share information and to create and maintain social alliances; however, it is unlikely there was formal sociopolitical organization (Grenda and Altschul 2002). Between 8000 B.P. and 5000 B.P. relative temperatures increased world-wide and reached a postglacial optimum (Antevs 1955).

During this time (6000-3000 B.C.), milling stone tools like manos and metates dominate the archaeological record suggesting people processed small hard seeds. In addition to milling stones, the archaeological record is characterized by an increase and diversification of marine resource subsistence remains. Diversifying their diet to include terrestrial and marine resources was likely a way for early human populations to adapt to the arid environment.

Middle Holocene (6650-3350 B.P.; 4650-1350 B.C.)

Temperatures reached a climatic optimum at the end of the early Holocene and began to slowly decrease during the beginning of the middle Holocene, about 6800 B.P. (Feng and Epstein 1994). This decline in temperature coincides with the beginning of an increase in population density on both the mainland and Channel Islands. Between about 3000 B.C. and 1350 B.C. (5000-3350 B.P.), a shift in tool technology occurred, signally an expansion of utilized food resources. Mortars and pestles appear in the archaeology record indicating acorns became an important subsistence resource (Basgall 1987; Baumhoff 1963). A diversification of projectile point styles and other stone tools, basket-hopper mortars, bone tools, and shell ornaments became prominent in the archaeological record dating to this period.

The development of the circular shell fishhook some time after 3,500 years ago enabled groups to exploit a greater range of marine resources including near-shore bottom-feeding fish (Moratto 1984; Rick et al. 2002; Strudwick 1986; Tartaglia 1976). During this period, large sea mammals also became a significant component of the human diet on the Channel Islands (Moratto 1984). Additionally, trade became increasingly important. Many coastal archaeological deposits dated to this period contain trade items such as obsidian obtained from inland regions. In return, people from these interior regions obtained items from the coast as evidenced by items like shell beads found in inland archaeological deposits. Trade was likely an important mechanism to ensure food-security during climatic changes, population growth, and increasingly circumscribed territories that limited hunter-gatherer mobility. Additionally, trade likely reinforced and reaffirmed sociopolitical and economic ties between groups.

Shoshonean Incursion

An interesting linguistic division occurs in southern California. Historically, Chumash groups in the Santa Barbara region as well as Diegueño groups (Tipai and Ipai) spoke Chumashan and Hokan languages, respectively. However, groups located between these two regions – the Gabrielino, Juaneño, Luiseño, and others – spoke Takic of the Uto-Aztecan language family. These Takic groups shared the same language as their Shoshonean neighbors to the east including the Cupeño, Serrano, and Cahuilla.

To explain this linguistic division, Kroeber (1976) hypothesized that Shoshonean groups occupying the eastern desert region split off from their parent bands and migrated west. As these Takic speakers reached and settled the coast and southern islands, they replaced the indigenous Hokan speakers of the region, thus driving a linguistic wedge between the north and south coasts. Kroeber (1976) hypothesized the population replacement along the coast occurred around 1,500 years ago.

Others have suggested an earlier timing of the Takic expansion and population replacement that dates to about 4000 B.C. (6000 B.P.). Evidence for early population replacement includes the temporal and spatial distribution of a certain shell bead type – *Olivella* Grooved Rectangle beads (Howard and Raab 1993; Vellanoweth 1995, 2001; Figure 4.1). The presence of Shoshonean traditions (e.g., basketry twining

Figure 4.1. *Olivella* Grooved Rectangle Beads from San Nicolas Island (courtesy of Dr. René Vellanoweth).

techniques, cremation practices) along the coast provides evidence for an intermediate arrival dating between 2000 B.C. and 500 B.C. (2500-4000 B.P) (Kowta 1969; Lauter 1982:87; Rozaire 1959). Linguistic evidence and a comparison of osteological traits of humans on the southern islands suggest a late population replacement around A.D. 500 (1500 B.P.) (Reinman and Townsend 1960; Titus 1987; Walker 1986). Although there is no consensus among scholars regarding the timing of the Shoshonean incursion, the possibility of an early movement of Uto-Aztecan speakers into southern California warrants its discussion in the middle Holocene.

<u>Late Holocene (3350 B.P.-Present; 1350 B.C.-Present)</u>

The late Holocene witnessed continued human coastal occupation and increasing population densities. Population growth intensified around A.D. 1000 (1000 B.P.) and resulted in increased territorialism that limited hunter-gatherer mobility. Archaeological evidence, including changes in technology, suggests coastal groups relied more heavily on marine resources in addition to other staples like acorns, seeds, land mammals, and birds (Gamble and Russell 2002).

At this time, the Channel Islands were occupied permanently with the exception of the smaller islands – Anacapa and Santa Barbara. Settlement of Anacapa and Santa Barbara was limited by overall size and availability of reliable freshwater sources (McCawley 2002:44). Island populations relied heavily on marine resources. With limited terrestrial resources and fluctuating availability of marine resources, trade enabled islanders to supplement their locally available resources, buffer against environmental variability, and maintain social and economic ties with neighboring islanders and mainlanders.

The need to produce items for trade led to the development of technical specialization. Evidence of extensive steatite quarrying on Santa Catalina Island (Howard 2000; Williams and Rosenthal 1993), shell bead production on Santa Cruz Island (Arnold and Graesch 2001; Arnold and Munns 1994), and groundstone production on San Nicolas Island (Bryan 1970; Martz 2002) suggest the islanders exported these resources to the mainland. In addition to these resources, the islanders likely traded fox pelts, fish, sea mammal, and pigments like ochre and kaolin, in exchange for mainland resources like deer (*Odocoileus hemionus*), acorns, seeds, obsidian, and serpentine.

While overall population density increased during the late Holocene, Grenda and colleagues (Grenda and Altschul 1994a, 1994b; Grenda et al. 1994) note that settlement patterns in the central coast differed from those in the rest of the southern California Bight. Unlike the large, permanent settlements in the north and south coast regions, settlement in the central coast consisted of small villages established around estuaries. These settlements may have functioned as a single social unit during environmentally stable periods. However, in times of flooding and drought, villages established on flood-prone areas adjacent to the wetlands may have disbanded to live in other areas (Grenda and Altschul 1994a, 1994b; Grenda et al. 1994). Villages located on elevated landforms may have been occupied by higher-ranked individuals who were allowed to remain during these environmentally unstable periods (Grenda and Altschul 1994a, 1994b; Grenda et al. 1994).

Although there is no consensus, it is believed increased development of cultural and political complexity including social stratification, craft specialization, and labor manipulation, began between A.D. 500 and A.D. 1150 (Arnold 1992; Erlandson and Rick 2002). Evidence of these social changes are found in the archaeological record and include status differences in burials, an increase in shell bead money production and exchange, and an increase and diversification of luxury items like ornaments. During this time of rapid cultural development, environmental conditions were in flux. This period may have been a time of extreme drought and warm sea surface temperatures (Arnold 1992; Raab and Larson 1997) or a time of cold ocean temperatures that produced a highly productive marine environment (Kennett and Conlee 2002; Kennett and Kennett 2000).

Although the exact nature of this variability is not agreed upon, environmental perturbations have been linked to the rapid development of cultural complexity in southern California. Arnold (1991, 1992, 1993, 1995; Arnold and Munns 1994) posits that with environmental perturbations and resulting food resource instability, islanders became more dependent on mainlanders for basic items. Consequently, islanders engaged in extensive craft specialization and production. With this increased reliance on ocean travel, canoe owners were able to control distribution of trade items as well as knowledge of canoe-making technology. Canoe owners gained an elite status resulting in the development of social hierarchy and the rise of chiefdoms in the north and central coast regions.

Raab (1994) proposes an alternate model to explain culture development in the southern California Bight. He posits that with extreme drought and limited availability of freshwater resources between A.D.1150 and A.D. 1300, dense settlements formed around freshwater sources. As populations grew, infectious diseases spread and coincided with increases in poor health and rates of interpersonal violence (Raab 1994). Leadership and social ranking may have arisen to address these social and environmental stresses. Individuals may have acquired higher-ranking status by facilitating cooperative relations between competitive groups and distributing resources where needed. Raab (1994) suggests that because of increased food and interpersonal securities, community members accepted hierarchical social divisions.

Grenda and Altschul (2002) also focus on differential access to resources to describe the rise of cultural complexity in the region. Following a world-systems perspective, Grenda and Altschul (2002) divide the southern California region into core, semiperiphery, and periphery regions. The late Holocene core extended from Newport

Bay to Point Conception and encompassed Santa Cruz, Santa Rosa, and Santa Catalina islands. In the core regions, rich resources were located in close proximity to one another. In contrast, resources in semiperiphery regions – the coastal mainland south of the Newport Bay, coastal plains, mountain regions, San Miguel, San Clemente, and San Nicolas islands – were distributed more peripherally and contained smaller and more widely spaced resource patches (Grenda and Altschul 2002). With access to an abundance of rich resources, economic, social, and political power grew in the core regions. Chiefs and elites in these core areas controlled semiperiphery and periphery regions with the latter comprised of Santa Barbara and Anacapa islands and the interior desert (Grenda and Altschul 2002).

Historic Period

Spanish voyager, Juan Rodríguez Cabrillo was the first reported explorer to visit the southern California region in 1542. Cabrillo visited Santa Catalina Island on his way to Monterey Bay and later returned to the Channel Islands where he died from an infection (Kelsey 1986:157-159; Wagner 1941:20, 55).

Following Cabrillo, Sebastián Vizcaíno arrived in southern California in 1602. His expedition provided detailed accounts of Native groups along the southern California coast, including descriptions of religious practices on Santa Catalina Island (Wagner 1929:237). The Spanish explorers brought with them glass beads, iron needles, and other metal tools that were presented to Native peoples as gifts and exchanged for supplies. The archaeological record dating to the historic period provides evidence that Native peoples incorporated European materials in their traditional technologies. For example, perforation diameters of *Olivella* shell beads decreased with the use of metal needles to drill holes much smaller than those created with stone drills. Additionally, European glass was worked in a similar manner as stone as evidenced by a projectile point made of clear glass found on San Nicolas Island (Figure 4.2).

Figure 4.2. Projectile Point Made of European Glass Recovered from an Archaeological Site (CA-SNI-25) on San Nicolas Island.

Following Gaspar de Portolá's expedition of 1769, the first Spanish mission in the central coast region, Mission San Gabriel, was established in 1771. A year later, Mission San Luis Obispo was founded. Establishment of the missions and growing Euro-American settlement dramatically changed the lives of Native peoples of California. European diseases and violent conflicts decimated Native populations while cultural assimilation led to the disruption and loss of traditional lifeways. While some Native coastal groups fled to interior mountains and valleys, many were forced into the mission system where they were required to perform manual labor and accept introduced religious doctrine.

Secularization of the California missions occurred in 1834. The mission centers were transformed into pueblos and accompanied by continued land-use changes and Euro-American settlement. Within a span of 300 years, there was considerable loss of life, cultural identity, and traditional knowledge in California. Fearing a complete loss of knowledge regarding traditional lifeways, anthropologists traveled throughout California in the early to mid-twentieth century to conduct ethnographies. Supplemented by archaeological research, today, these ethnographies along with oral traditions provide much of our understanding of Native peoples who inhabited southern California.

Chumash Ethnographic Background

Geographic Territory and Language

The Chumash occupied the north coast region from San Luis Obispo to Malibu Canyon and the adjacent interior encompassing the Santa Ynez and San Rafael mountains, Cuyama and Santa Clara rivers, and western edge of the San Joaquin Valley (Grant 1978). Historically, the Chumash territory also included the northern Channel Islands – Anacapa, Santa Cruz, Santa Rosa, and San Miguel. Six groups speaking Chumashan languages occupied the territory and include the Chumash Ventureño, Barbareño, Ynezeño, Purisimeño, Obispeño (coinciding with their respective missions), and Island groups. The Chumash territory was bordered by the Hokan-speaking Salinans to the north, Penutian-speaking Yokuts to the north east, and Takic-speaking Gabrielino to the south (Figure 4.3).

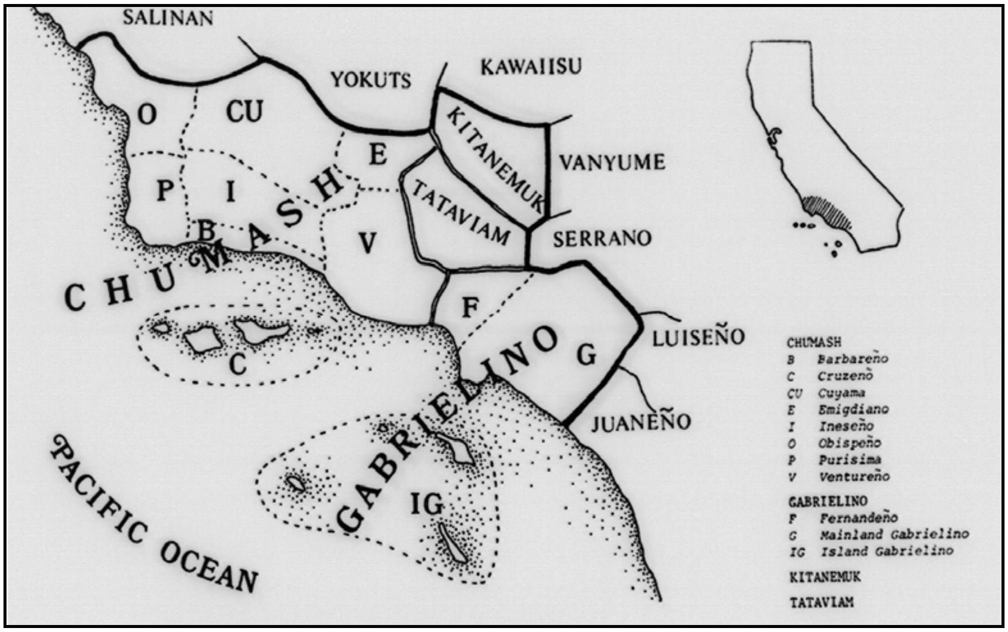

Figure 4.3. Ethnographic Territories of the Chumash, Gabrielino and Neighboring Groups (from Hudson and Blackburn 1982:35, courtesy of Malki Museum Press).

<u>Sociopolitical Organization</u>

Ethnographic information and mission records have been used to estimate the Chumash population size prior to and at the time of European contact. These estimates vary widely. Kroeber (1976:551) suggests an original population between 8,000 and 10,000 while Cook and Heizer (1965:21) estimate a population range of 18,000 to 22,000 in A.D. 1770.

At the time of European contact, Chumash groups were organized into chiefdoms with each village headed by a chief or *wot* (McCawley 2002). Several villages were collectively under the leadership of a big chief or *paqwot* (McCawley 2002). Chiefs managed economic affairs, acted as war leaders, settled disputes, collected and distributed surplus food, and arranged ritual interactions and exchanges between groups (Grant 1978). Political alliances, intermarriage, and economic exchange connected groups within the Chumash territory and neighboring regions (McCawley 2002).

In addition to chiefs, members of trade guilds had substantial economic and social power. With the development and improvement of the plank canoe (*tomol*) between A.D. 500 and A.D. 1000, trade between the northern islands and mainland dramatically increased. Canoe owners who reaped the benefits of wealth and prestige, formed a guild called the Brotherhood of the *Tomol*. Guild members had access to technical canoe-making knowledge and controlled the exchange of staples and luxury items between the northern islands and mainland (Hudson et al. 1978:143-167; Johnson 2001:54-55).

Spirituality and Religion

Shamans were important spiritual leaders who presided over puberty, marriage, and death ceremonies; solstice and harvest celebrations; and other important rituals and festivals (Grant 1978). When herbal medicines were ineffective, shamans were called upon to heal the gravely sick. Like trade guilds, shamans formed a powerful association called the *'antap* (Bean 1972:113-114; Hudson and Underhay 1978:29). The *'antap* recruited, tested, and trained shamanic practitioners and monitored shamans to prevent abuse of power (McCawley 1996:95). The *'antap* was divided into two membership groups – the *'antap* and *shan*. *'Antap* membership was comprised of leaders who presided at community rituals and festivals and advised provincial leaders. Members of the *shan* assisted the *'antap* and conveyed information to leaders during the *'antap's* travels (Hudson and Underhay 1978:29-30).

Northern Channel Islands

As would be expected, the occupants of the northern islands relied heavily on marine resources for subsistence. With the development of the *tomol*, islanders expanded their resource base by utilizing distant, offshore resources that included schooling fish like tuna. Shell and sea mammal bone were used to manufacture tools, fishhooks, and ornaments. Locally available materials were used to produce shell beads, drills, and a variety of groundstone tools including mortars, pestles, and digging-stick weights. These items were used locally and traded along with fish and sea mammal skins in exchange for acorn, deer meat and antlers, a variety of animal hides, bone tools, baskets, obsidian, and herbs from the mainland (Arnold 1992; King 1990). Travel time between the northern islands and coastal mainland took approximately three to four hours, one-way (Hudson et al. 1978:137). Through trade, marriage, and social and ceremonial gatherings, the islanders maintained extensive ties to their mainland neighbors.

Gabrielino Ethnographic Background

Geographic Territory and Language

The Gabrielino occupied the central coast and interior regions immediately south of the Chumash (Figure 4.3). Historically, the Gabrielino territory extended south to Newport Bay and eastward encompassing the San Gabriel and Santa Ana mountains; the Los Angeles, San Gabriel, Río Hondo, and Santa Ana rivers; the San Fernando, San

Gabriel, and San Bernardino valleys; and the Los Angeles-Santa Ana Plain (McCawley 1996). Gabrielino territory also included the southern Channel Islands – Santa Catalina, Santa Barbara, San Clemente, and San Nicolas. The total territory encompassed 3,890 km^2 (1,500 mi^2) of exposed and sheltered coastal strips, prairies, foothills and, mountains (Bean and Smith 1978; McCawley 1996:24). Harrington (1962) identified four linguistic divisions in the Gabrielino territory which included Gabrielino proper, Fernandeño, Santa Catalina Island dialect, and San Nicolas Island dialect. Historically, the Gabrielino territory was bordered by the Takic-speaking Tataviam, Serrano, and Cahuilla to the east and the Luiseño to the south (Figure 4.3).

Sociopolitical Organization

The Gabrielino population was estimated at approximately 5,000 in A.D. 1770 (Bean and Smith 1978:540). Spanish accounts indicate village populations ranged from 50 to 200 individuals (Bean and Smith 1978:540) with larger populations living along the coast. At the time of European contact, the Gabrielino were organized in chiefdoms. Each village was comprised of one or more lineages belonging to two moieties: wildcat or coyote (McCawley 1996:113). Each lineage was led by a chief or *tomyaar* who carried out similar duties as the Chumash's *wot*. The *tomyaar* played a key role in arranging social, economic, and ritual congregations that helped create and reaffirm alliances between the lineages.

Bean and Smith (1978:543) identified three social classes: elite, middle class, and commoners comprised of the poor and slaves. Members of the elite counseled the *tomyaar* and participated in certain religious ceremonies while the middle class was comprised of bureaucrats, craftsmen, and skilled laborers (Bean and Smith 1978:543). Like the Chumash, Gabrielino canoe (*te'aat*) owners formed a guild restricting access to technical information and controlling trade interactions.

Spirituality and Religion

Like the Chumash, the Gabrielino had a rich spiritual and religious culture. Shamans were important spiritual leaders who bridged the secular and supernatural worlds, presided over ceremonies and celebrations, and preserved historical knowledge and oral literature. The shamans had their equivalent of the Chumash *'antap* association called the *yovaarekam* derived from the word *yovaar* or sacred enclosure (Bean and Smith 1978:542; Hudson and Blackburn 1986:56-60). These sacred enclosures were a place where the *Chengiichngech* religion was worshiped. Access to the enclosure was limited to shamans and certain elite. *Chengiichngech*, the creator-god, was part of a diverse pantheon of supernatural beings and was represented by a coyote or mountain lion (*Puma concolor*) skin stuffed with feathers, deer antlers, mountain lion claws, and bird beaks and talons (McCawley 1996:28). Although *Chengiichngech* appears to have some Christian elements, historical accounts from Vizcaíno's expedition in 1602 indicate the religion was practiced prior to missionization of southern California (McCawley 1996:168).

In addition to puberty, marriage, and funerary ceremonies, the Gabrielino conducted the Eagle Rite Ceremony – a ceremony practiced by many Uto-Aztecan groups. The ceremony was usually held during the annual mourning and harvest celebrations and entailed the ritual slaying of a golden eagle (*Aquila chrysaetos*), bald eagle (*Haliaeetus leucocephalus*), or California condor (*Gymnogypus californianus*). On the southern islands, ravens (*Corvus corax*) were often substituted if eagles or condors could not be found (Hudson and Underhay 1978:85-88). The death of the bird symbolized the continued life of a lineage and the magical flight connecting a shaman to the supernatural world (Bean 1972:138-139). The bird's feathers were used to make a skirt worn by the *tomyaar* or shaman during the ceremony while the remainder of the bird was buried and mourned with gifts of food and seeds given in thanks (Boscana 1933:58).

Other important ceremonies occurred during summer and winter solstices. A sun staff was used during the winter solstice ceremony to signify the sun's return by symbolically pulling the sun back in a northward direction (Miller 1991:105). The sun staff consisted of a stone disc, often incised with radiating lines that represented the sun or cardinal directions, attached at an angle to a wooden stick (Miller 1991:105)

In addition to the sun staffs, shamans used many other objects imbued with great power. Quartz crystals were important talismans believed to create pathways in wood and stone and were also associated with rain, thunder, and lightning (Hudson and Blackburn 1986:154-156). *Toshaawt* stones, often found in shaman kits, were believed to have powerful healing, sorcery, and rain-making properties. These dense, lenticular-shaped stones were used in the Gabrielino Girl's Puberty Ceremony and other rituals conducted by the Chumash, Kitanemuk, and Luiseño (Merriam 1955:86; Timbrook 2000). A search for the source of *toshaawt* stones has identified only one known location, San Nicolas Island (Timbrook 2000).

Southern Channel Islands

Ethnographic information indicates groups on the southern islands were intricately linked to one another and Gabrielino groups on the mainland. Interactions between islanders on Santa Catalina and San Clemente were particularly extensive (Johnson 1988:15). Marriage, political alliances, and ritual congregations likely formed the basis of these ties, facilitating trade and enabling the islanders to obtain locally unavailable resources including certain foods and worked and raw materials.

With its close proximity to the mainland and both the northern and southern islands, Santa Catalina Island was an important trade depot and stopping-off point during ocean voyages (Finnerty et al. 1970; McCawley 1996). Steatite quarried from Santa Catalina Island, as early as 4,000 years ago, was widely traded and has been found in archaeological deposits on the other Channel Islands and mainland. Kroeber (1976:629) identified two steatite trade routes that led to the Gabrielino and Chumash mainland via the Palos Verdes Peninsula and the northern islands, respectively. Steatite was worked to form a variety of objects including cooking vessels, bowls, pipes, effigies, beads, and ornaments.

Groups from San Clemente Island also participated in trade. Islanders traded kaolin (white clay), ochre, and marine resources in exchange for plant resources, raw materials, and manufactured items from the other islands and mainland (Finnerty et al. 1970:22-23). San Clemente Island was also an important place for religious and ceremonial activities. Numerous cache pits, hearths, and post holes uncovered at the Lemon Tank site (CA-SCLI-1524) reveal ritual ceremonies. The cache pits consist of dog (*Canis familiarus*), fox, and raptor burials associated with grave offerings that include ochre (red pigment), basketry impressions, and burned plant remains (Eisentraut 1990; Hale 1995). Caches of red maid seeds and mortars containing pigment were also found at the site (Eisentraut 1990; Hale 1995). The Lemon Tank site may have been associated with annual mourning ceremonies and *Chengiichngech* traditions (Eisentraut 1990; Hale 1995).

While Santa Barbara Island was not permanently occupied due to an absence of permanent fresh water, the island was used as a stopping-off point during ocean voyages. Islanders from San Nicolas and perhaps the northern islands likely stopped at Santa Barbara during their trips to the neighboring Channel Islands and/or mainland (Glassow 1980:36; Hudson 1981:193-194; Swartz 1960). Additionally, archaeological evidence suggests black basalt was quarried on the island and traded in both raw form and as manufactured stone tools (Harrington 1933).

The trade of raw and manufactured items throughout the Channel Islands and adjacent mainland reflects an extensive interaction sphere that developed over thousands of years of human occupation of the southern California Bight. This chapter has focused on describing the nature and rise of cultural complexity in the region to establish a context for understanding cultural development on San Nicolas Island. In a similar manner, the following chapter will examine the archaeological and cultural background of San Nicolas Island to establish a context for evaluating CA-SNI-25.

CHAPTER 5. ETHNOGRAPHIC AND ARCHAEOLOGICAL BACKGROUND OF SAN NICOLAS ISLAND

Ethnographic Background

Introduction

Spanish explorers who encountered the Native people of San Nicolas Island referred to them as the Nicoleño. Fernando Librado, J.P. Harrington's Chumash consultant, claimed the Nicoleño were Gabrielino and originally came from Santa Catalina Island (Hudson 1981:194). Another one of Harrington's informants, José de Los Santa Juncos, claimed the Nicoleño were "…powerful witches. They used to pass to and from the islands on basalas of Tules [bundled reed canoes]" (Harrington 1986:R104F40).

Prior to European contact and settlement, population on the island likely ranged between 600 and 1,200 individuals (Vellanoweth et al. 2002:83). The Nicoleño were dramatically impacted by the arrival of Russian fur traders and Aleut hunters from Alaska who spent extended periods of time on San Nicolas Island hunting sea otters (*Enhydra lutris*). Skirmishes between the Native islanders and Russian and Aleut hunters were reported to have decimated the Nicoleño population, leaving all but women, children, and a few men (Kroeber 1976:633-634). Following the removal of the last Nicoleño from the island in 1853, fur hunters and Chinese abalone hunters continued to visit San Nicolas. Between 1857 and 1943 sheep grazing was introduced to the island. After destroying much of the island's native vegetation, the sheep were removed after the United States Army took control of San Nicolas in 1943 (Swanson 1993).

<u>The Lone Woman of San Nicolas Island</u>

Little ethnographic information exists describing the Native people of San Nicolas. Much of our understanding comes from accounts of Juana María, the "Lone Woman" of San Nicolas Island (Figure 5.1). In 1835, padres from Mission Santa Barbara

Figure 5.1. Presumed Portrait of Juana María, the "Lone Woman" of San Nicolas Island (courtesy of the Autry National Center, Braun Research Library, Institute for the Study of the American West, Los Angeles; Photo P.1574).

sent a schooner, the *Peor de Nada*, to San Nicolas Island to relocate the surviving Nicoleño to the mainland. A young Nicoleño woman was left behind. Due to a sudden storm, the ship's crew left without her and returned to the mainland where the Nicoleño were sent to San Pedro, Los Angeles, and San Gabriel (McCawley 1996:210). Except for accounts of one man who died on a beach (McCawley 1996:210), little is known regarding what happened to the Nicoleño following their removal to the mainland.

According to historic accounts, the woman left behind on San Nicolas remained isolated on the island for 18 years (Hardacre 1880; Nidever 1937). During that period, three unsuccessful attempts were made to locate and return her to the mainland. Finally, in 1853, George Nidever and his crew located the lone woman. When they found her she wore a sleeveless dress made of cormorant feathers and occupied a roofless house located near a spring (Hardacre 1880; Nidever 1937). The lone woman returned to Santa Barbara where she lived with Nidever and his family. During her stay, Native peoples from Ventura, Santa Barbara, and Santa Ynez attempted to converse with her but could not understand her language (Hardacre 1880; Kroeber 1976:634). These individuals were likely speakers of different Chumash languages that included Inseño, Barbareño, and Centureño (Munro 2000:660). Four words of her language were recorded: *to-co* (hide), *nache* (man), *te-gua* (sky), and *pínche* (body) (Hardacre 1880).

A few weeks after arriving in Santa Barbara, the lone woman of San Nicolas Island died. She was christened "Juana María" on her deathbed and buried in the Nidever family plot at Mission Santa Barbara. Many of the objects she brought from the island have disappeared and those sent to the California Academy of Sciences in San Francisco were destroyed in the fires that followed the 1906 earthquake (Heizer 1960; Hudson 1981:195-197; Woodward 1957:268-269). Although her possessions have since disappeared, Juana María's life has been immortalized in the children's novel, *The Island of the Blue Dolphins* (O'Dell 1960).

Language

Recently, Munro (2000) analyzed the four recorded words spoken by Juana María and confirmed the language belonged to the Takic branch of the Uto-Aztecan speaking family. When compared to other Uto-Aztecan languages, Munro determined the words were most similar to the Cupan subgroup of Takic. Since there are similarities to both the Cupeño-Cahuilla and Luiseño-Juaneño language subgroups, Munro (2000) suggested Juana María's language may have belonged to a relatively unknown subgroup within the Cupan language.

Archaeological Background

Previous Archaeological Investigations

Archaeological investigations on San Nicolas Island between 1870 and 1950 focused on collecting museum-quality artifacts (Martz 2005). This focus continued through the early 1950s as thousands of artifacts were removed from the island and placed in museums and private collections located around the world (Martz 2005). Many of these early investigators included Stephen Bowers, Bruce Bryan, Léon de Cessac, Philip Orr, Malcolm Rogers, Paul Schumacher, and Arthur Woodward who also conducted work on the mainland and other Channel Islands (Schwartz and Martz 1992:46).

Many of the artifacts collected during this early phase of archaeological investigation on San Nicolas Island are pictured and described in Hudson and Blackburn's (1982, 1983, 1985, 1986, 1987) *The Material Culture of the Chumash*

Interaction Sphere volumes. Hudson and Blackburn examined artifacts from museum collections and reviewed ethnographic accounts and notes. They synthesized this information into five volumes which primarily focus on the Chumash and their interactions with neighboring groups in southern California. Food procurement and transportation; food preparation and shelter; clothing, ornamentation, and grooming; ceremonial paraphernalia, games, and amusements; and manufacturing processes, metrology, and trade are described in the five volumes (Hudson and Blackburn 1982, 1983, 1985, 1986, 1987). The diversity, excellent craftsmanship, and quantity of artifacts from San Nicolas Island described in the volumes attest to the Nicoleño's rich material culture and highlight the magnitude of artifact collection that has occurred since the 1870s.

Beginning in the 1950s, with the advent of radiocarbon dating and a paradigmatic shift in archaeological thought toward a more scientific approach, archeological investigations on San Nicolas Island have been driven by problem-orientated research (Schwartz and Martz 1992). From the 1950s through the 1980s, research included archaeological investigations of exposed burials and middens in addition to analyses of weaving techniques and midden constituents (Lauter 1982; Reinman 1964, 1982; Reinman and Townsend 1960; Rozaire 1959). Additionally, artifact types and traits were examined to construct site-specific and island-wide artifact typologies and chronologies (Schwartz and Martz 1992).

Beginning in the 1980s, endeavors were undertaken to systematically survey the entire island. As a result of these surveys, 358 archaeological sites were recorded and mapped (Reinman and Lauter 1984). To date, a total of 535 prehistoric archaeological sites have been mapped and recorded. Test, data recovery, and index unit excavations have occurred at many of these sites (Martz 1994; Rosenthal and Jertberg 1997, 1998a, 1998b; Vellanoweth 1996). Problem-orientated research at these sites include dietary reconstructions (Vellanoweth and Erlandson 1999); lithic (Clevenger 1982), faunal (Bleitz-Sanburg 1987; Salls 1988), and botanical analyses (Thomas 1995); cultural chronology-building (Lauter 1982); and osteological studies (Kerr and Hawley 2000).

In Martz's (2005) comprehensive examination of prehistoric sites on San Nicolas Island, she categorized the nature and distribution of the sites. Most of the sites appear to have been stone artifact manufacturing and shell processing locations (31%), in addition to flaked stone reduction locations (19%), shellfish processing locations (17%), residential sites (15%), camp sites (15%), deflated hearth features (3%), and sites too damaged to categorize (1%) (Martz 2005). The majority (38%) of these sites are located on the island's central plateau, 22 percent within the west end, 18 percent on the southern coastal terrace, 15 percent on the northern coastal terrace, and eight percent on cliffs (Martz 2005:69). Martz (2005) notes that the activities carried out at these sites and settlement patterns on the island changed over time. The following discussion will examine changes in settlement patterns over time and factors that may have led to these changes.

<u>Early Holocene Occupation (8505-6650 B.P.; 6505-4650 B.C.)</u>

San Nicolas Island appears to have been occupied as early as 6500 B.C. (8505 B.P.) as evidenced by a radiocarbon date from CA-SNI-339 (Schwartz and Martz 1992).

This habitation site is situated on the southeast end of the island. Evidence from other sites indicates occupation in the early Holocene was seasonal and primarily occurred on the island's plateau, southern coastal terrace, and west ends (Martz 2005). Additional seasonal camps may have been present along the coast but were submerged when sea levels rose between 9,000 and 7,000 years ago (Martz 2005:77).

Evidence from early Holocene sites suggests islanders hunted sea mammals (e.g., California sea lions, harbor seals, fur seals, sea otters) and captured small, near-shore fish like perch (Embiotocidae) (Bleitz-Sanburg 1987). The islanders also collected a variety of shellfish species including mussel, red abalone, and wavy topshell (McLean 1978).

Middle Holocene Occupation (6650-3350 B.P.; 4650-1350 B.C.)

Occupation of San Nicolas Island intensified in the middle Holocene. Most of the sites occupied during this period are located within easy access of fresh water and the ocean, primarily along the northwest coast (Vellanoweth et al. 2002). The majority (68%) of these sites are residential camps that were occupied in spring, fall, and occasionally summer (Martz 1994; Salls 1988; Vellanoweth 1996; Vellanoweth et al. 2002:85-86). It appears people visited San Nicolas Island seasonally to hunt, fish, and collect shellfish. However, considering seasonality data at the sites are inconclusive and many of the other Channel Islands were occupied year-round, it is possible San Nicolas Island was also occupied throughout the year (Vellanoweth et al. 2002:86).

Population increased on San Nicolas Island in the middle Holocene and coincided with a change in subsistence patterns. Faunal data indicate intensified fishing activities that included the capture of rockfish, cabezon (*Scorpaenichthy marmoratus*), and

California sheephead (Rosenthal and Jertberg 1998a, 1998b; Vellanoweth and Erlandson 1999). The diverse catch of fish was likely a result of the development of the circular shell fishhook approximately 3,500 years ago. This technological innovation may have been a response to growing population density on San Nicolas Island.

While fishing activities intensified, exploitation of large sea mammals for food decreased (Bleitz 1993; Bleitz-Sanburg 1987). Fur-bearing sea otters became more important as well as a variety of shellfish species including black abalone, turban, limpets, and sea urchin (Rosenthal and Jertberg 1998a, 1998b). At the same time, collection of mussel, red abalone, and wavy topshell decreased, perhaps due to changes in dietary choice or resource availability as a result of environmental or habitat changes due to over-exploitation.

The middle Holocene also marks the earliest evidence of island foxes on San Nicolas Island. Fox remains have been found in an archaeological deposit dating to 3200 B.C. (5200 B.P.) (Vellanoweth 1998). Other fox remains dating to this period and the late Holocene have been found in ritualistic burials. This context suggests foxes played an important role in ceremonial activities. Foxes also appear to have been important trade commodities. Protein electrophoresis and mitochondrial DNA studies of foxes currently inhabiting San Nicolas Island indicate they are most closely related to foxes on San Miguel and San Clemente islands (Vellanoweth 1998). This affinity suggests foxes on San Nicolas and San Clemente islands may have originated on San Miguel Island and were introduced through human trade as pets or semidomesticates (Vellanoweth 1998).

Late Holocene Occupation (3350-147 B.P.; 1350 B.C.-A.D. 1853)

In the late Holocene, settlement patterns shifted from coastal regions to the island's central plateau. The majority of the sites situated on the plateau are villages that were occupied year-round. The shift in settlement patterns from the coast to inland regions was likely in response to increased population density and sedentism. Historic accounts written by early archaeological explorers on San Nicolas Island indicate that many of these late Holocene villages were comprised of semi-subterranean pit houses made of whale bone, fire hearths, and large cemeteries with grave offerings (Heizer 1951:11; Rogers 1930a, 1930b; Schumacher 1877; Woodward 1940). Analysis of site constituents indicates islanders brought fish and shellfish back to inland villages where they were processed. Additionally, birds appear to have been an important resource with feathers and bones used for a variety of purposes (Vellanoweth et al. 2002). However, there is little evidence that large sea mammals were intensely exploited (Bleitz 1993; Bleitz-Sanburg 1987).

While occupation on San Nicolas Island intensified in the late Holocene, population density fluctuated over time. Radiocarbon dates of archaeological deposits indicate several occupation peaks: 1050-800 B.C., 300-50 B.C., A.D. 450-700, and A.D.1200-1540 (Vellanoweth et al. 2002:89). Declines in island population also occurred: 1300-1050 B.C., 550-300 B.C., A.D. 200-450 (Vellanoweth et al. 2002:89). These population peaks and declines coincided with fluctuating climatic and sea surface temperatures (Arnold 1992; Kennett and Kennett 2000; Raab 1994), population density, and rates of interpersonal violence on the southern California mainland (Walker and Lambert 1989).

Analysis of archaeological deposits indicates that as population density increased, both settlement and subsistence patterns changed. Dietary reconstructions suggest fish became an increasingly important food resource (Vellanoweth et al. 2002). In addition to near-shore environments, the islanders exploited pelagic habitats and caught a variety of fish taxa including Pacific mackerel (*Scomber japonicus*), yellowtail (*Seriola lalandi*), jack mackerel (*Trachurus symmetricus*), barracuda (*Sphyaena argentea*) and ocean sunfish (*Mola mola*) (Martz 2005).

This diversification of fish species coincided with intensified shell fishhook production as evidenced by an increase in quantities of completed fishhooks, fishhooks in different stages of manufacture, and tools used to manufacture hooks. Shell fishhooks were manufactured from red abalone, black abalone, and Norris top shell. The latter two species became increasingly important in hook production at the end of the late Holocene. This shift away from the use of red abalone to the production of black abalone and Norris top shell hooks may have been a result of changes in stylistic preferences, technological innovation, and/or an absence of preferred red abalone. Regarding the latter, a similar pattern occurred on the northern Channel Islands. Just before contact, use of California mussel intensified over red abalone suggesting that people over-harvested red abalone beds (Glassow et al. 1988; Rosenthal and Jertberg 1998a, 1998b; Salls 1992).

Trade

Evidence for trade on San Nicolas Island occurs in the middle Holocene and grows substantially into the period of European contact. This evidence includes the presence of stone materials like Monterey, Franciscan, and Cico cherts that do not occur naturally on the island. Monterey chert is found along the coast of California from Oceanside to just north of San Francisco and on Santa Cruz Island. Franciscan chert is abundant along the coast from just north of Santa Barbara to Oregon while Cico chert is found on San Miguel Island. Additionally, obsidian recovered from archaeological deposits on San Nicolas Island, including CA-SNI-25, have been sourced to the Coso Volcanic Field located in eastern California approximately 360 km (220 mi) from the island (Rick et al. 2001). While islanders utilized locally available metavolcanic and metasedimentary stones, chert and obsidian were important supplementary tool stone materials. The islanders' flaked stone technology included projectile points, knives, and other formed tools (Rosenthal 1996).

Steatite is another exotic stone found in archaeological deposits on San Nicolas Island. The Nicoleño obtained two varieties of steatite, coarse-grained and fine-grained, from Santa Catalina Island and possibly from the mainland where sources are located in the Santa Ynez Mountains, Temescal Canyon, and in Tataviam territory (Hudson and Blackburn 1987:35). Coarse-grained steatite, a soft variety, was generally made into bowls, cooking vessels, and arrow shaft straighteners (Scalise 1994:65). The hard and dense fine-grained variety was typically used to manufacture pendants, beads, and effigies (Scalise 1994:65).

Serpentine is also found in archaeological deposits on San Nicolas Island in a variety of forms including beads, effigies, and ceremonial objects. The stone could have been obtained in raw or worked forms from several locations on the mainland. Hudson and Blackburn's (1986:34-35) review of ethnographic accounts notes that King (1976:315) described a source in the San Rafael Mountains, while Rosen (1979:28) identified sources near Vasquez Rocks and on the Channel Islands. Howard (2000) noted serpentine formations on Santa Catalina Island during her survey of steatite quarry locations.

Asphaltum may have been another important trade resource. This tar substance was used as an adhesive and to coat baskets to make them waterproof. While asphaltum does wash ashore and could have been collected on San Nicolas Island, several high-quality sources are located along the coastal mainland. These sources are situated just east of Goleta Beach at More’s Landing and near Rincon at the present location of the University of California, Santa Barbara campus (Harrington 1928:105; Rogers 1929:46-48).

Analysis of macrobotanical remains from archaeological deposits on San Nicolas indicates the presence of several plants species not endemic to the island. These exotic plant remains include wild cucumber (*Marah* spp.), red maids, legume family (Fabaceae), manzanita, and tentatively blueberry or huckleberry (*Vaccinium* spp.) (Thomas 1995).

The plants were likely acquired from the mainland through trade with groups such as the Chumash and Luiseño (Klug and Popper 1993).

The Native people of San Nicolas Island produced a variety of goods made from locally available resources. These items were used locally and likely exchanged for many of the exotic resources mentioned above. High-quality sandstone occurs naturally on the island and was quarried and manufactured into a variety of groundstone implements including bowls, mortars, and pestles. The magnitude of production and excellent craftsmanship suggest these implements were not only used locally but traded with other islanders and mainland groups (Bryan 1970; Heizer 1951; Schumacher 1877).

As mentioned previously, San Nicolas Island is the source of *toshaawt* stones, which were important trade items as evidenced by their use by a variety of groups throughout the southern California Bight. *Olivella* shell beads were also an important trade item. Finished *Olivella* beads, bead detritus or the waste product of shell bead manufacture, and tools used to produce these beads are found in archaeological deposits dating from as early as the middle Holocene (Martz 1994; Martz et al. 1999). The Nicoleño may have utilized *Olivella* beads for ornamentation and grave offerings, for trade, and/or as the basis of a widely recognized and standardized system of shell bead money exchange.

In addition to finished items, the native people of San Nicolas likely exchanged raw resources. These resources may have included shellfish, fish, sea mammal furs and meat, and pigment (e.g., red ochre, kaolin). Trade interactions coupled with social, marriage, and religious ties formed the basis of an interaction sphere that encompassed

San Nicolas Island, the southern California Bight, and beyond. The people of San Nicolas Island, with their access to an abundance of stone, marine, and mineral resources, were an integral part of this interaction sphere.

CA-SNI-25: A Late Holocene Village on San Nicolas Island

Location

CA-SNI-25 is located in the northwest portion of the island on the central plateau. The site's presence on this elevated landform makes it visible from many vantage points along the island's northern extent. A freshwater spring and Tule Creek are situated approximately 243 m (800 ft) west of the site while the coast is located approximately 800 m (2,630 ft) to the northeast. Corral Harbor, a natural indentation in the coastline and one of the few safe ports of harbor on San Nicolas Island, is situated approximately 963 m (3,160 ft) to the northeast and is clearly visible from CA-SNI-25 (Figure 5.2).

Site Description

CA-SNI-25 is located on a relatively flat swale bordered by slopes to the north, east, and west. Site boundaries extend approximately 620 m (2,034 ft) northwest/southeast by 300 m (984 ft) northeast/southwest. The west portion of the site has been developed by the U.S. Navy and includes a building, concrete pad, and dirt access road.

Figure 5.2. Close-up View of Corral Harbor from CA-SNI-25 (courtesy of Dr. René Vellanoweth).

The site consists of the remnants of a large village that was intensely occupied between approximately A.D. 1300 and A.D. 1800 and perhaps as early as 4000 B.C. The ground surface is marked by several large mounds, midden, and artifacts. Malcolm Rogers (n.d.) described the site during his survey of the island. He noted community houses approximately 11 m (35 ft) in diameter with one containing large quantities of whale ribs. Rogers noted an additional structure that was badly dilapidated with only a floor of sandstone slabs intact. He claimed these were the remnants of a sweathouse. At the southeast end of the site, Rogers identified a cremation cemetery. This area had been previously disturbed by early relic hunters. Rogers identified a variety of artifacts on the ground surface distributed across the site that included steatite effigies, tablets, doughnut stones, bowls, and beads; chert and obsidian blades and knives; sandstone mortars and pestles; bone tools; and shell beads.

Several loci at CA-SNI-25 have been formally excavated, including two areas – East Locus and Mound B – that are the focus of this research (Figure 5.3). These loci contain largely intact archaeological deposits including numerous features and midden

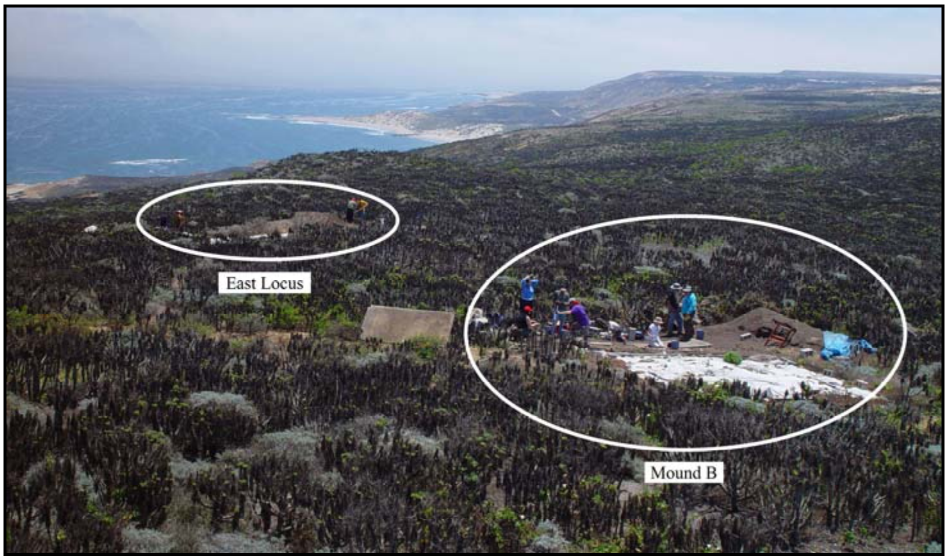

Figure 5.3. Overview of CA-SNI-25 East Locus and Mound B (courtesy of Dr. René Vellanoweth).

deposits that retain their integrity largely due to minimal disturbance associated with modern human activities and a dearth of burrowing animals. These features include hearths, caches, pits, and fox burials. The artifact assemblage recovered from the site is extensive and well preserved. Groundstone artifacts include mortars, pestles, bowls, charmstones, and beads, while points, knives, and utilized flakes make up the chipped stone assemblage. Many of these ground and chipped stone artifacts are made of steatite, serpentine, chert, and obsidian – materials obtained from the neighboring Channel Islands and mainland.

The bone artifact assemblage is comprised of awls, needles, pressure flakers, and net spacers. Shell artifacts are dominated by fishhooks, beads, and other ornaments as well as an assortment of cut, chipped, and ground manufacturing debris. Preliminary analysis of fish remains indicates the occupants of CA-SNI-25 exploited a variety of marine habitats including rocky reefs, kelp beds, and sandy nearshore habitats (Martz 2005). Rockfish and surfpurches (Embiotocidae) comprised a large portion of the villagers' diet in addition to California sheephead and Pacific mackerel (Mariani 2004).

The diverse array of artifacts and excellent preservation at CA-SNI-25 offer a unique opportunity to examine spatial organization and the different types of activities carried out in a village setting over time. The chapter that follows will describe research issues highlighted and methods utilized in my research.

CHAPTER 6. RESEARCH PROCEDURES

Introduction

Due to a dearth of ethnographic information, we must turn to the archaeological record to understand the Nicoleño's domestic and ceremonial activities, sociopolitical organization, and inter-group trade relations. With few current large-scale excavations using modern archaeological techniques on San Nicolas Island, CA-SNI-25 offers a unique opportunity to examine a variety of research issues. The goal of my research is to examine the spatial and temporal distribution of artifacts at CA-SNI-25 in the context of village-wide activities. Additionally, I endeavor to refine local and regional artifact chronologies, examine technological innovation and change over time, and clarify the Nicoleño's role in regional interaction spheres.

While excavations at CA-SNI-25 are ongoing, to date, numerous features have been identified and thousands of artifacts have been recovered. I limit my study to include features and artifacts uncovered prior to and during the 2005 field season. I examine cultural constituents from two loci – East Locus and Mound B. These two areas have undergone the most extensive excavation at CA-SNI-25. I limit my analysis to include only a portion of the total artifact assemblage: 1) formal shell artifacts, 2) modified shell, 3) shell manufacturing debris, 4) fossil shell, and 5) exotic groundstone.

I examine formal shell artifacts (i.e., artifacts with diagnostic traits) modified shell, and shell manufacturing debris to better understand production activities and processes, stylistic preferences, craft specialization, and ceremonial and ritualistic activities at CA-SNI-25. The presence of exotic stone artifacts is a clear indicator of regional trade. I examine steatite, and serpentine groundstone artifacts and how these valuable stones were used (i.e., utilitarian, ornamental, ceremonial). I trace the distribution of these exotic stone sources to better define geographic boundaries of regional interaction spheres and tie production activities at CA-SNI-25 to local and regional trade networks.

As with all research, collection and interpretation of data are prone to biases. Approaches to the recovery and study of archaeological assemblages can influence data collection, analysis, and interpretation. For example, methods used to excavate archaeological deposits, define artifact categories and typologies, and sort artifacts into categories are just some of the potential sources of bias. By describing methods used in excavation, field sorting, and laboratory processing and analysis, I hope to overcome or at least minimize these biases so that data and interpretations presented in this thesis are relevant to future investigations.

Field Procedures

Excavation Methods

All units at East Locus and Mound B were stratigraphically excavated using arbitrary 10-centimeter levels within stratigraphic units. Each stratum and level was given Roman and Arabic numeral designations, respectively. When a transitional layer between strata was encountered, the stratum was given a Roman numeral and letter (e.g., IIA) designation. When features (i.e., nonportable evidence of human activity that once removed, context is lost and the feature is destroyed) were encountered, they were excavated separately from the rest of the unit. Feature sediments were either bagged and saved or a bulk sample was collected before the remaining cultural deposit was screened. A bulk sample was collected to enable detailed analyses of floral remains and other small-sized constituents.

Units were excavated using a trowel, brush, and dustpan. Excavated soils were placed in a bucket with graduated liter markings. Volume was recorded before excavated materials were screened through 1/8-inch wire mesh (Figure 6.1). Soil and radiocarbon

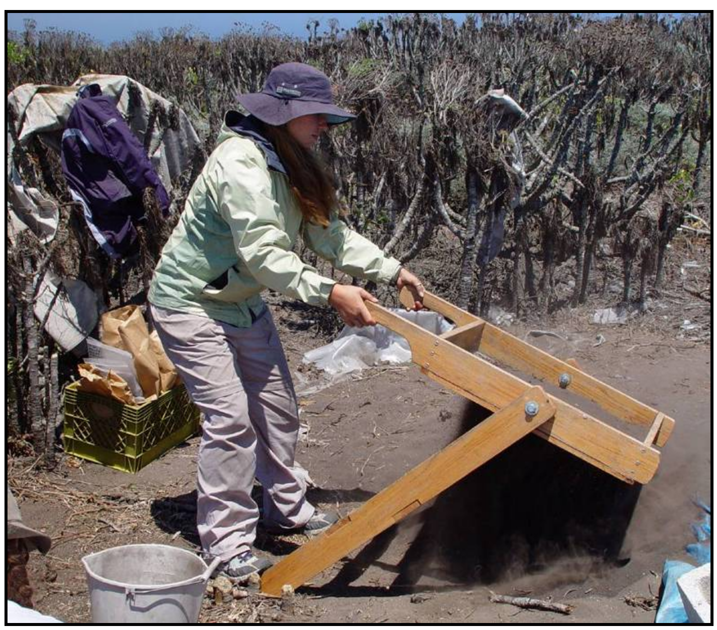

Figure 6.1. Humboldt State University Student (Veronica Chapas) Screening Excavated Soils at CA-SNI-25 (courtesy of Dr. René Vellanoweth).

samples were collected, noting depth and provenience. Soil color was determined with a Munsell Soil color chart and texture was described for each soil sample. Artifacts found *in situ* were mapped, noting depth and provenience within the unit. All depth measurements were taken using a line-level attached to a datum of known elevation. Field teams completed level and feature forms for each unit and feature, respectively.

Field Sorting Methods

Materials screened through 1/8-inch mesh were field sorted into general categories and bagged and labeled separately. These categories included shell fragments typically measuring ¼-inch or greater, bone, flaked stone, asphaltum, whole *Olivella* shells, *Olivella* bead detritus, modified shell, modified bone, groundstone, fire affected rock, ochre, tarring pebbles, rhizoconcretions (i.e., fossilized root casts), charcoal, obsidian, radiocarbon samples, land snails, and floral remains. Formal or diagnostic artifacts were wrapped in tissue, placed in protective containers, and bagged separately. All remaining materials were saved and bagged. Each bag of sorted material was labeled with its provenience (i.e., CA-SNI-25, locus, unit number, stratum, level), material category or artifact description, and date.

Laboratory Procedures

Preparation Procedures

The CA-SNI-25 artifact assemblage is currently stored at the Humboldt State University Archaeological Laboratory. Formal shell artifacts, modified shell, shell associated with the production of formal shell artifacts, fossil shell, and groundstone artifacts made of steatite and serpentine were pulled from the artifact assemblage for detailed analysis. Shells that were sorted and bagged in the field were re-examined in the lab. Shells exhibiting modification were separated and added to the assemblage to be analyzed.

A sample of screen residuals was examined to determine the likelihood that artifacts pertinent to this research were not initially sorted in the field and bagged separately. Based on this sample, it is believed there was approximately a 90 percent success rate of finding artifacts in the field either *in situ* or while sorting through the screen residuals. Consequently, success rate of field sorting precluded further examination of archaeological sediments for this research.

With the exception of artifacts that were determined to be extremely fragile or exhibited residues (e.g., pigment, asphaltum), artifacts were cleaned using a soft brush and water to remove staining from soil that accumulated on the materials. An ultrasonic cleaner was used to clean stone and shell beads and *Olivella* shells and bead detritus. Cleaned artifacts were allowed to air-dry before being placed in zip-top bags.

Shell and Fossil Shell Analysis

Shells and fossil shells were identified to the most specific taxonomic category possible. Formal shell artifacts and fossil shells were then individually weighed to the nearest hundredth of a gram using a digital balance and measured to the nearest hundredth of a millimeter using digital calipers. Artifact measurements included length, width, thickness and/or curvature, and if present, perforation diameter. A 30X microscope and 10X hand loupe were used to examine fine details including residues adhered to artifact surfaces and grinding, cutting, chipping, and drilling patterns.

Artifact traits were also noted including shape, type of modification, and when determinable – function. Several types of artifacts were further classified using pre-existing typologies. Shell fishhooks were grouped into categories defined by Strudwick (1985) for San Nicolas Island and the southern California Bight. When specimens retained identifiable traits, fishhook style (e.g., J-shaped, circular), hook orientation (i.e., tip of hook curved to the right or left), and shank style (e.g., knobbed, grooved) were noted (Figures 6.2). Shell fishhook blanks were classified into different production

Figure 6.2. Examples of Shell Fishhooks. (A) J-shaped fishhook with left-orientated hook and knobbed shank; manufactured from red abalone. (B) Circular fishhook with right-orientated hook and knobbed shank; manufactured from black abalone.

stages (e.g., Stage 1, 2, 3) based on Strudwick's (1985) typology (Figure 6.3).

Olivella shell beads were classified using Bennyhoff and Hughes' (1987) classification system and typology. The typology is based on several bead characteristics

Figure 6.3. Examples of Shell Fishhook Blank Manufacturing Stages (based on Strudwick 1985). (A) Stage 1 blanks. (B) Stage 2 blanks. (C) Stage 3 blanks.

including portion of shell used to manufacture the bead, angle and extent of end-grinding, length, width, and curvature measurements, and perforation diameter. Beads made out of shells other than *Olivella* were categorized using Gibson's (1992) classification system. Based on length, width, and thickness, shell beads were classified into five categories: cylinder, disk, rectangle, square, and miscellaneous. The latter category includes tube and whole shell beads. The presence of epidermis and/or nacre was also noted. Shell beads found in different stages of manufacture were categorized based on the extent of modification: bead blank and bead-in-production. The latter two categories were used to classify both *Olivella* and non-*Olivella* shell beads. Bead blanks represent early stages of bead production in which bead pre-forms have been chipped but not ground along the perimeter of the blank (Figure 6.4A). Beads-in-production include specimens that 1) have chipped perimeters and likely broke during the drilling phase, or 2) are fully drilled with chipped perimeters that have not been ground smooth (Figure 6.4B).

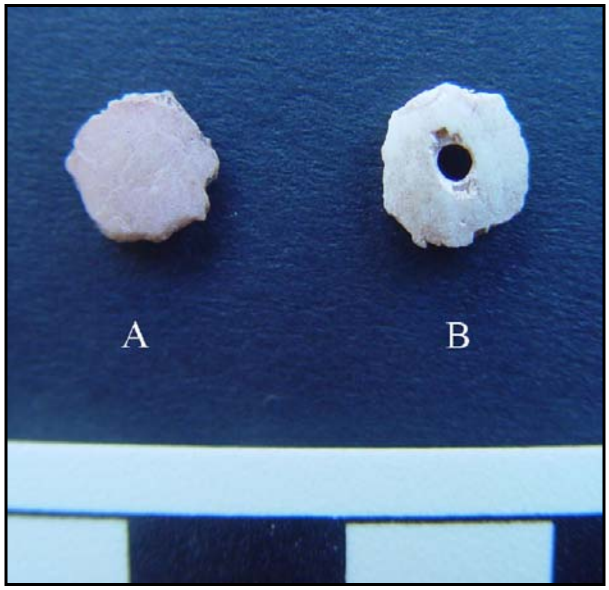

Figure 6.4. Examples of *Olivella* Bead Manufacturing Stages. (A) Bead blank. (B) Bead-in-production.

Some shells with extensive modification were classified as shell tools. Types of modification included cut, ground, and/or chipped. In addition to these modifications, some shell tools retain asphaltum residue. The remaining items that were not considered to be formal shell artifacts were analyzed in a slightly different manner. *Olivella* bead detritus was classified into three general categories based on what part of the shell the detritus represented: callus, wall, or other (e.g., spire, canal, or outer lip) (Figure 6.5). For each provenience, detritus was grouped into these categories then counted and weighed collectively. Whole *Olivella* shells that were likely intended for bead production were classified based on a typology developed by Macko (1984). Whole *Olivella* shells from the same provenience were grouped into a size category

Figure 6.5. *Olivella* Shell Features and Bead Detritus. (A) Features of an *Olivella* shell. (B) Examples of *Olivella* callus detritus. (C) Examples of *Olivella* wall detritus. (D) Examples of *Olivella* detritus classified as “other”.

(0.01-10.00 mm, 10.01-20.00 mm, >20.00 mm), then counted and weighed collectively.

Shell that showed evidence of expedient modification was classified as modified shell. Modified shell represents production sequences in the manufacture of formal shell artifacts (e.g., fishhooks, beads, ornaments). Shells with modification were separated into groups based on marine shell species, fossil shell, and type of modification. Types of modification included cut, ground, chipped, drilled, a combination of one or more of these elements, or the presence of modification and asphaltum. Shells of the same species, type of modification, and provenience were then sorted into size categories using a graduated set of wire mesh screens. The size categories included >1”, 1-1/2”, 1/2-1/4”, and 1/4–1/8”. Modified shells within the same size classification were then counted and weighed. Whole and fragments of shell with asphaltum residue but no additional modification were analyzed in a similar manner. Shells of the same species and provenience were also sorted by size using graduated wire mesh screens and then counted and weighed.

Exotic Stone Analysis

The first step of groundstone analysis was to determine exotic stone material type, which included two varieties of steatite (coarse-grained and fine-grained) and serpentine. The stone artifacts were then individually weighed to the nearest hundredth of a gram using a digital balance and measured to the nearest hundredth of a millimeter using digital calipers. Artifact measurements included length, width, thickness, and perforation diameter if applicable. A 30X microscope and 10X hand loupe were used to examine fine details including residues adhered to artifact surfaces and grinding, drilling, and use-wear patterns.

Stone artifacts were classified into general categories: bead, bowl, doughnut stone, ornament, and undifferentiated groundstone. The latter category includes artifacts of unknown function. Based on length, width, and thickness measurements, stone beads were classified into two shape categories – disk and cylinder – according to typologies developed by Gibson (1992) and King (1990). Detailed descriptions were noted for each artifact including shape, modification (e.g., incising), and asphaltum residue.

Cataloging Procedures

Data collected during analysis as well as artifact provenience were written on tags and stored with each artifact or group of artifacts. Information on these tags was then entered into a Microsoft Access database. A catalog number was automatically generated for each database entry. This number was then handwritten on the corresponding artifact tag so that a unique number identified each artifact or group of artifacts. Queries were then run to generate groups of data that are presented in the tables included in the following chapter. The following chapter primarily focuses on the results of artifact analyses including the types of artifacts identified and comparisons of counts and percentages between East Locus and Mound B.

CHAPTER 7. RESULTS

Excavation Results

Excavated Area and Volume

As of the end of the 2005 field season, a total of 102 units were excavated at East Locus and Mound B, yielding a total excavation volume of 31.79 m^3 (31,794 L). At East Locus, 32 units measuring 1 m x 1 m, 12 units measuring 1 x 0.5 m, and one unit measuring 1 x 0.7 m were excavated. Additionally, one unit (8B1) was initially excavated as a 0.5 m x 0.5 m unit and later expanded (8B2) to encompass a total area of 1 m x 1 m. The 47 units excavated at East Locus (Figures 7.1, 7.2) yielded a total excavation volume of 17.2 m^3 (17,204 L). A slightly greater volume was excavated at East Locus compared to Mound B. At Mound B, a total volume of 14.59 m^3 (14,950 L) was excavated from 53 units measuring 1 m x 1 m, one 1 m x 0.7 m unit, and one 1 m x 0.5 m unit (Figures 7.3, 7.4).

Stratigraphy

In general, three strata (I, II, III) were encountered at each locus (Figure 7.5). At East Locus and Mound B, the uppermost level of Stratum I is comprised of wind-blown sand and modern vegetation that developed following abandonment of the site. The lower levels of Stratum I, which reflect the final phase of site occupation, consist of anthropogenic soils partially intermixed with aeolian sand. Stratum I soils are very dark

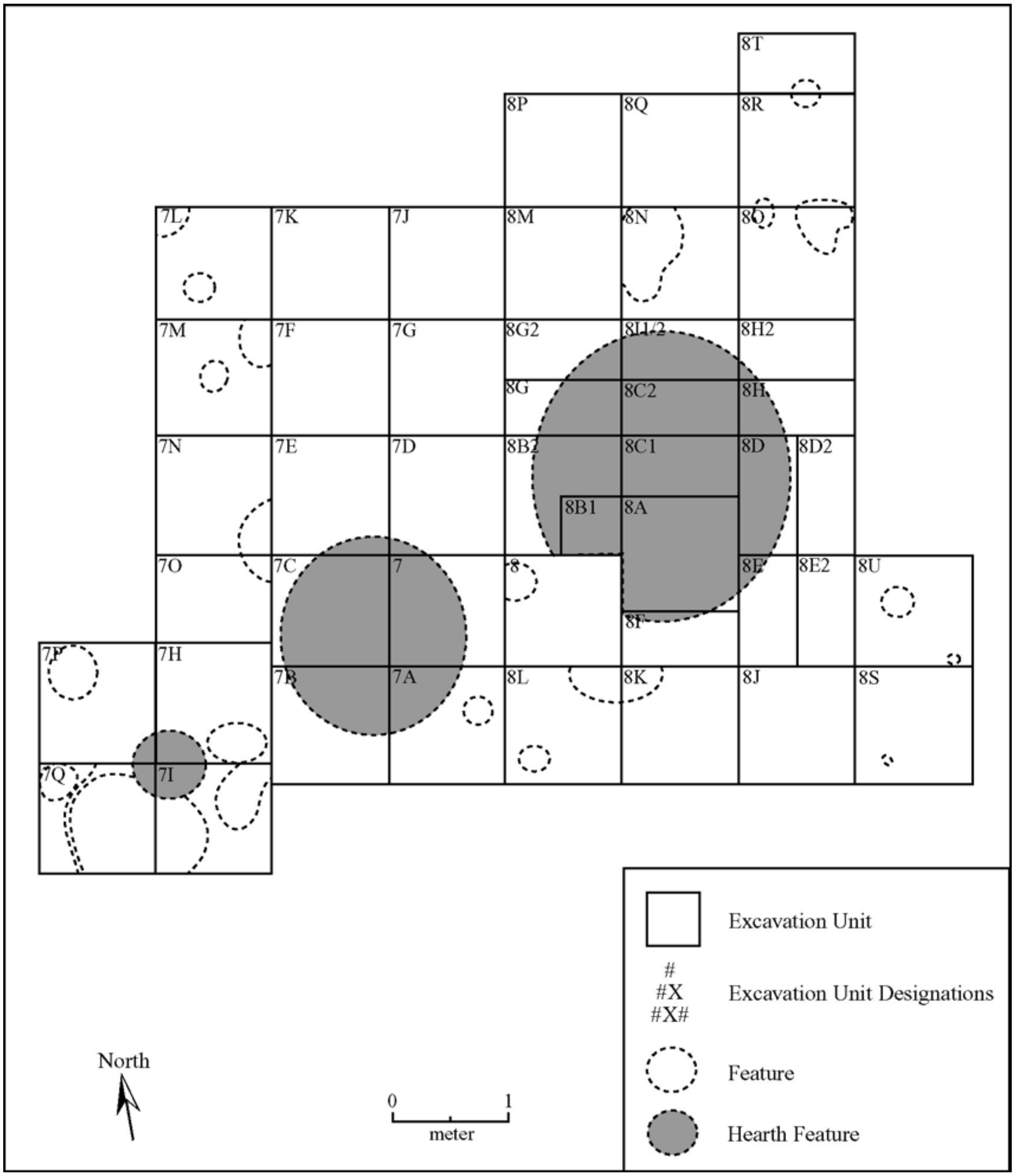

Figure 7.1. East Locus Excavation Units and Features (as of the end of the 2005 field season). Note excavation Units 20 and 21 are not pictured. They are situated approximately 10 meters east of Unit 8T).

Figure 7.2. Overview of East Locus (looking northwest; photo taken at the end of the 2005 field season; courtesy of Dr. René Vellanoweth).

grayish brown (10YR 3/2) granular sand containing roots and cultural materials including mostly fragmented shell, bone, and stone.

Stratum II underlies Stratum I and is comprised of very dark gray (10YR 3/1) anthropogenic soils composed of silty sand. While the upper levels of Stratum II likely represent terminal site occupation, the lower levels reflect the main occupation of the site as evidenced by an increase in cultural materials with depth. Additionally, the majority of the site's features are encountered in Stratum II.

A transitional stratum comprised of anthropogenic soils, Stratum IIB, occurs between Strata II and III. Stratum IIB soils consist of very dark grayish brown (10YR 3/2) silty sand with fewer cultural materials compared to Stratum II. The transitional stratum reflects the beginning of occupation at CA-SNI-25 as determined by the excavated sample. Below Stratum IIB lies Stratum III, which is composed of brown

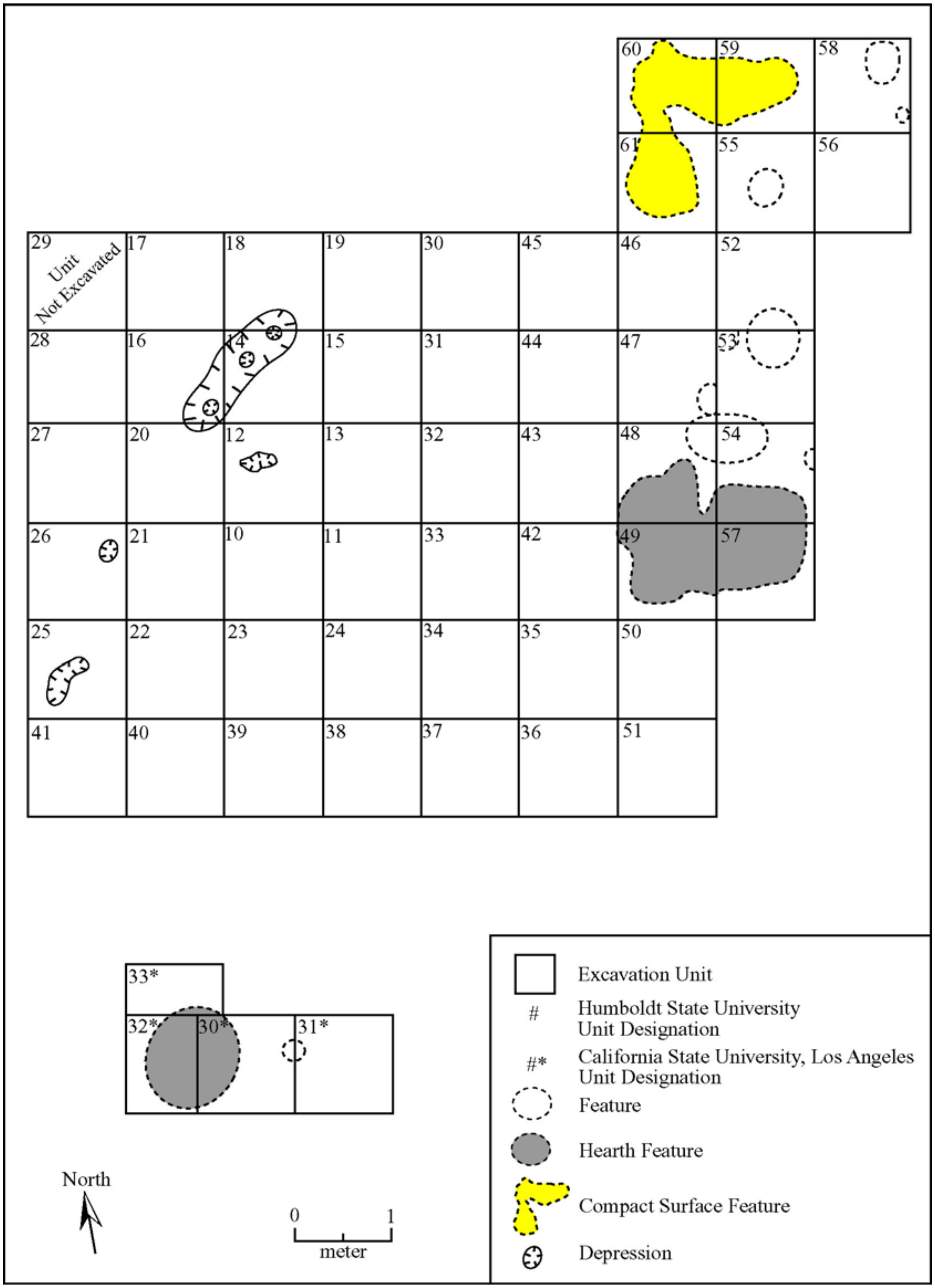

Figure 7.3. Mound B Excavation Units (as of the end of the 2005 field season).

Figure 7.4. Overview of Mound B (looking west; photo taken at the end of the 2005 field season; courtesy of Dr. René Vellanoweth).

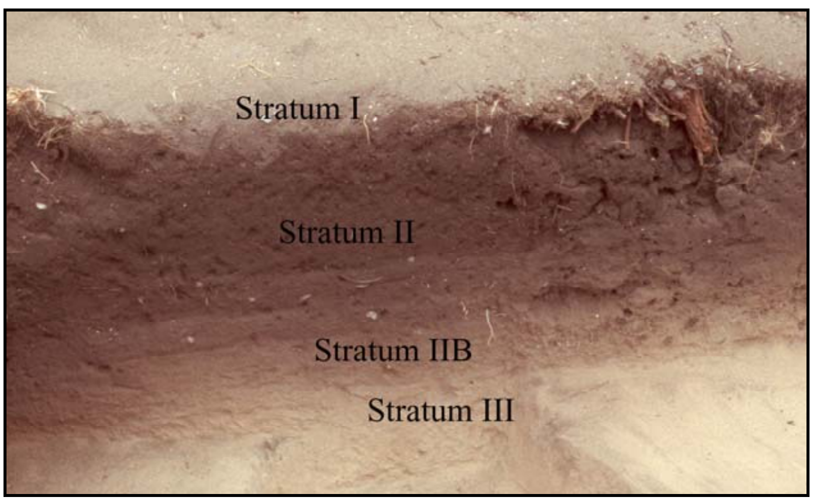

Figure 7.5. Soil Stratigraphy and Designations of a Typical Excavation Unit at CA-SNI-25 (courtesy of Dr. René Vellanoweth).

(10YR 5/3) fine sand containing few or no cultural materials. While Stratum III typically represents a period prior to initial occupation of CA-SNI-25, several features from the occupation of Stratum II cut into Stratum III. In these instances additional designations were given.

Strata I, II, and III were encountered at both loci. Excavations at CA-SNI-25 focus on uncovering intact features in these different strata. To do this, the horizontal dimensions of the site are excavated peeling off one layer (stratum) at a time. In the case of the two loci presented here, East Locus is farther along in its vertical excavation than Mound B. Consequently, more of Stratum II has been excavated at East Locus. Stratum II has been excavated in 40 (85%) units at East Locus and 21 (38%) units at Mound B. With the exception of four (19%) units in the southern portion of the locus, the units with Stratum II exposed are located in the eastern edge of Mound B. Nevertheless, differences in the extent of Stratum II excavation do not appear to influence comparisons of artifact counts and densities between the two loci. Comparisons of cultural constituents from Stratum I at Mound B and Strata I and II at East Locus are key considering that radiocarbon dates (discussed below) indicate these strata reflect contemporaneous occupation. In fact, Stratum II at Mound B appears to reflect a period of occupation that occurred prior to intensive use of East Locus.

Features

As of the end of the 2005 field season, a total of 36 features were identified at the two loci: 24 features were encountered at East Locus and 12 at Mound B (Tables 7.1, 7.2). Features were primarily encountered in Stratum II at both loci. Thus far the majority (67%) of features have been found at East Locus compared to Mound B. This distribution may be due to differences in vertical extent of excavation and/or a difference in the nature of activities at the two loci. Features identified at East Locus and Mound B

Table 7.1. East Locus Features.

Field Designation or Description	Unit(s)	Stratum/Level Feature First Noted	Description
Fishing Tackle Kit	7H	II/1	Cache of shell fishhooks, blanks, and manufacturing tools. Found associated with asphaltum embedded with basketry/textile impression.
Fox Burial	7I	II/1	Remains of two foxes (*U. littoralis*). Foxes buried in a pit surrounded by culturally-sterile sand.
Feature	7Q	II/1	Oval-shaped area comprised of brown soil surrounded by very dark gray and black soils. Associated with a fox burial feature, fish and sea mammal bones, a shell fishhook fragment and blank, and shellfish fragments. Feature appears to be a pit dug within another pit.
Cairn Feature	8R, 8T	II/1	Rock cairn associated with redwood, obsidian, ground and flaked stone, modified shell, fish and sea mammal bone, and an *Olivella* bead.
Pit Feature	7N, 7O	II/2	Pit comprised of dark, silty soil situated in eastern portion of units. Pit contains charcoal, charred shellfish fragments and fish bone, flaked and ground stone, tarring pebbles with asphaltum, a rhizoconcretion, and modified marine shell.
Feature 6	8, 8A, 8B1, 8B2, 8C1, 8C2, 8D1, 8E1, 8G1, 8G2, 8H1, 8H2, 8I1/2	II/2	Large circular hearth. Dark, ashy soil. Composed almost entirely of charcoal. Level above feature contained a concentration of *H. cracherodii*, sea mammal bone with cut marks, fire-affected rock, flaked stone, and shell fishhooks.
Land Snail Feature	8N	II/2	Concentration of land snails (*Micrarionta* spp.) embedded in compact soil. Located along west wall of unit.
Feature A	8O, 8R	II/2	Circular area measuring 20 cm in diameter located in northwest corner of unit. Darkened soil covered with a concentration of cut *H. cracherodii* epidermis fragments. Associated with charcoal and burnt sea mammal bone and shellfish fragments.
Feature B	8O, 8R	II/2	Circular pit measuring 50 cm in diameter located in northeast corner of unit. Comprised of darkened soil containing charcoal and burnt bone and shellfish fragments.
Feature 9	7, 7A, 7B, 7C	II/3	Medium-sized circular hearth containing dark, ashy soil. Composed almost entirely of charcoal and soil.
Pit Feature	7A	II/3	Small circular depression containing a concentration of shellfish fragments and asphaltum. Located immediately southeast of Feature 9. Feature may represent a basket dump.
Feature	7P	II/3	Circular burned area in northwest corner of unit. Contains charcoal, fish bone, and shellfish fragments.
Feature	8L, 8K	II/3	Small circular area containing dark, ashy soil.
Feature	8	II/4	Small circular area containing dark, ashy soil in northwest corner of unit.
Feature A	8U	II/4	Small circular pit located in northeastern portion of unit containing darkened and compact soil, ochre, iron concretions, one calcite crystal, tarring pebbles, and charred shellfish and bone fragments.
Hearth Feature (Ash Lens Feature)	7H, 7I, 7P, 7Q	IIA/1	Small circular hearth containing a charred seed and burnt sea mammal and fish bones.
Pit Feature	7H	IIB/1	Oval-shaped pit approximately 60 cm in diameter. Contains concentration of fish bone. Fish bone consists of many large fragments found in excellent condition. Feature located immediately east of Ash Lens Feature.

Table 7.1. East Locus Features (continued).

Field Designation or Description	Unit(s)	Stratum/Level Feature First Noted	Description
Feature A	7L	IIB/1	Concentration of bird bone located within a pit. Bird bone fragments include four sternums, an ulna, and rib bones. Sea mammal vertebrae also present.
Feature B	7L	IIB/1	Concentration of fish bone associated with shellfish fragments.
Pit Feature	7M	IIB/1	Depression approximately 30 cm in diameter. Comprised of darkened soil located in center of unit. Contains charcoal and fragments of shellfish and bone.
Marine Shell Cluster	7M	IIB/1	Concentration of *M. californianus*, *H. cracherodii*, and land snail (*Micrarionta* spp.) embedded in darkened soil. Located in northeast corner of unit on a raised area immediately adjacent to a pit feature in the same unit.
Feature 1	8S	IIB/1	Small circular pit with a soil stain and concentration of morning glory (*C. macrostegia*) seeds.
Feature B	8U	IIB/1	Small circular area of darkened and compact soil. Located in southeast corner of unit. Contains charcoal and charred shellfish and bone fragments.
Feature	8L	III/1	Small circular soil stain near southwest corner of unit.

include hearths, pits, fox burials, soil stains, concentrations of shellfish and bird bone, and caches of artifacts (Figure 7.6).

Radiocarbon Dates

Radiocarbon Dating

Radiocarbon dating was primarily used to determine the site chronology of CA-SNI-25. A total of 24 radiocarbon (^{14}C) dates on marine shells and charcoal using accelerator mass spectrometry (AMS) and conventional ^{14}C techniques were obtained from East Locus, Mound B, and a third portion of the site referred to as Mound A (Table 7.3). Radiocarbon samples consisted of primarily marine shell including *Haliotis cracherodii*, *Haliotis rufescens*, *Mytilus californianus*, and *Lottia gigantea*. Charcoal and bone collagen were dated as well. All samples were calibrated using CALIB 5.01 to provide calendar age estimates (Stuiver and Reimer 1993).

Table 7.2. Mound B Features.

Field Designation or Description	Unit(s)	Stratum/Level Feature First Noted	Description
Shell & Lithic Feature	52, 53	I/2	Concentration of *M. californianus*, *H. cracherodii*, and flaked stone. Found associated with smaller quantities of groundstone, bone, *Olivella* bead detritus, ochre, a fishhook fragment, and charcoal.
Feature 1	30, 32, 33	II/1	Large circular hearth containing charcoal, charred seeds, a rock covered with asphaltum, ochre, three large fire-affected rocks, and fish bone.
Feature 1B	30, 31	II/1	Fire-affected rock surrounded by a concentration of marine shell. Fish bone, shellfish fragments, charcoal, and Monterey chert found beneath a rock in a pit.
Fox Burial Feature	47	II/1	Located near southeast corner of unit. Associated with small amounts of shellfish fragments, flaked stone, and charcoal. Concentration of sea urchin (*Strongylocentrotus* spp.) fragments and compact soil found above burial.
Feature	54	II/1	Circular area approximately 10 cm in diameter located in northeast portion of unit. Comprised of extremely compact soil.
Compact Surface Feature	59, 60, 61	II/1	Compact soil surface, likely created by human use.
Hearth Feature	48, 49, 54, 57	II/2	Large deflated hearth. Irregularly shaped. Contains charcoal and charred bone and shellfish fragments.
Pit Feature	55	II/3	Circular pit located in center of unit. Cluster of *H. cracherodii* and concentration of bone and shellfish fragments found above pit. Large sandstone metate/slab with tiny drilled holes located immediately adjacent to the pit. Pit contains charcoal, a whole *H. rufescens* shell with a hole drilled in the umbo, bone, and shellfish fragments.
Bird Bone Feature	58	II/3	Concentration located near southeast corner of unit. Contains *H. cracherodii* whole shell with ochre pieces, incised cormorant (*Phalacrocorax* spp.) femur, cormorant beak, bat ray (*Mylobatis californica*) teeth, and several pelican (*Pelecanus* spp.) vertebrae. Associated with a quartz crystal, Cico and Monterey chert flakes, and a *H. rufescens* nacre pendant.
Feature	53	IIB/1	Soil stain located in northwest corner of unit.
Feature	53, 54, 47, 48	IIB/1	Pit containing charcoal, fish and sea mammal bone, shellfish fragments, and a wood fragment.
Pit Feature	58	IIB/1	Located in northeast corner of unit. Contains shellfish fragments, charcoal, two *Olivella* beads, and a bone harpoon shank.

There are potential problems with radiocarbon dating marine shells that require the use of correction factors. Due to low ^{14}C concentrations in marine carbon reservoirs, radiocarbon dates reported for marine shells are older than the actual shells, typically by 400 years. Carbon concentrations in the marine reservoir are further distorted as a result

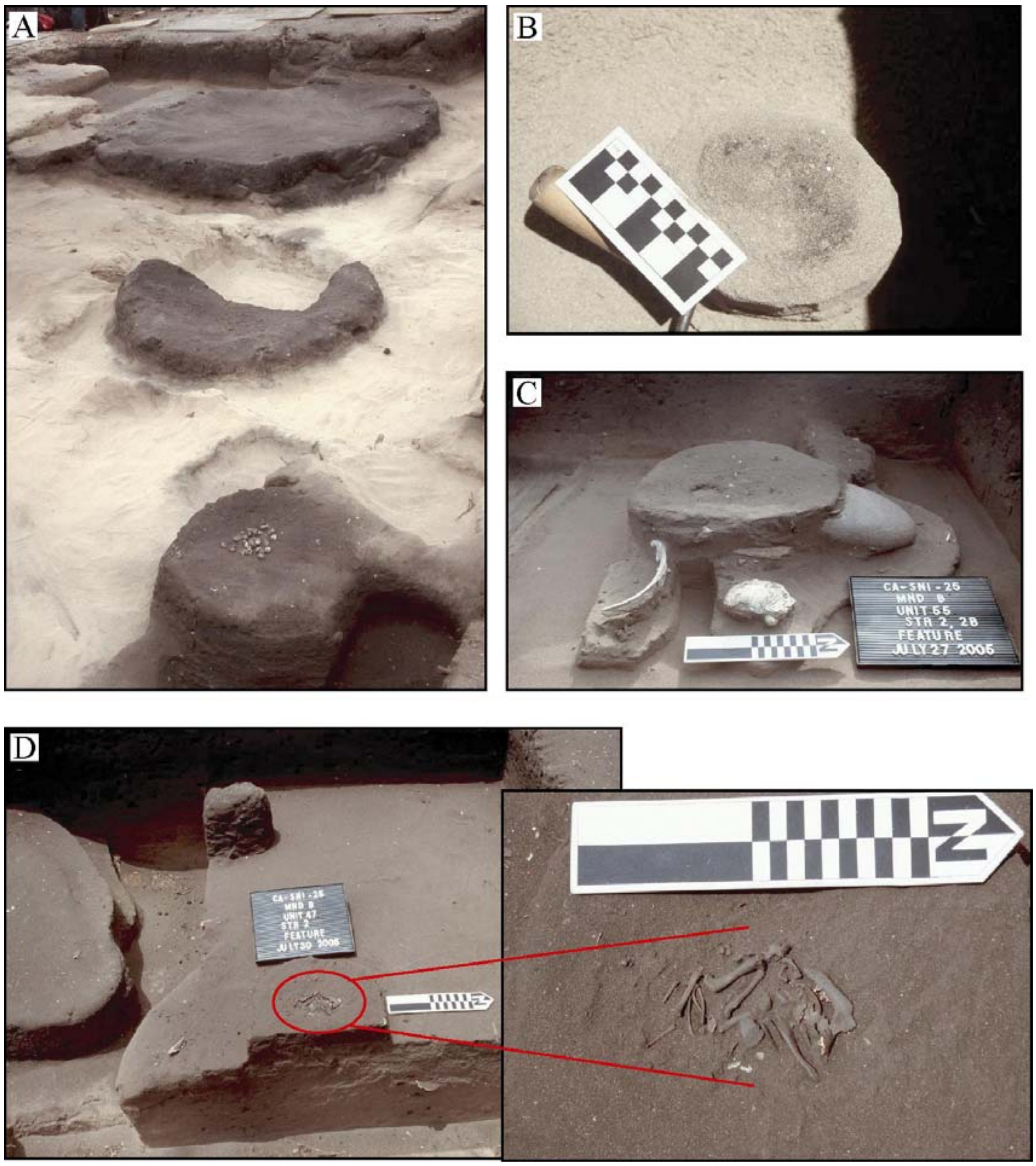

Figure 7.6. Examples of Features Identified at CA-SNI-25 (courtesy of Dr. René Vellanoweth). (A) Hearth features at East Locus. (B) Pit feature containing morning glory seeds at East Locus. (C) Pit feature containing a sandstone metate/slab, an abalone shell with a drilled hole, and marine shell fragments. (D) Overview and close-up of fox burial feature at Mound B.

Table 7.3. Radiocarbon Dates for CA-SNI-25.

Sample #	Unit and Context	Stratum/ Level	Depth (cm)	Material	Uncorrected ^{14}C Age (B.P.)	Calibrated Age Range (cal B.P.), 1 Sigma[a]	Calibrated Age Range (B.C./A.D.), 1 Sigma[a]
	East Locus[b]						
OS-54411	Unit 8, Feature 6 (hearth)	II/2	70	Charcoal	175 ± 30	280 (220-170) 1	A.D. 1670 (1730-1780) 1950
OS-54398	Unit 8S, association with stone tools	II/2	37	*H. cracherodii*	940 ± 30	410-310	A.D. 1540-1650
OS-54400	Unit 8T, Rock Cairn Feature	II/2	108	*H. cracherodii*	1000 ± 30	470-370	A.D. 1480-1580
OS-54562	Unit 7, Feature 9 (hearth)	II/1	60-70	Charcoal	395 ± 70	510 (510-430) 320	A.D. 1440 (1440-1520) 1630
OS-54355	Unit 7H, Fishing Tackle Kit Feature	II/1	18	*H. cracherodii*	1090 ± 35	520-450	A.D. 1430-1500
OS-54401	Unit 7I, southwest corner of unit	II/3	63	*H. cracherodii*	1160 ± 30	590 (570-500) 500	A.D. 1360 (1380-1460) 1460
OS-54399	Unit 8S, association with groundstone tool	II/4	58	*H. cracherodii*	3140 ± 30	2750-2650	800-700 B.C.
OS-54397	Unit 7L, Feature A (pit)	IIB/1	63	*M. californianus*	5700 ± 35	5910-4780	3960-3830 B.C.
	Mound B[b]						
OS-54354	Unit 11, top of mound	II/3	46	*H. cracherodii*	880 ± 30	360-260	A.D. 1590-1700
OS-54361	Unit 61, Compact Surface Feature, lower level	II/1	50	*L. gigantea*	1070 ± 45	520-430	A.D. 1430-1520
OS-54413	Unit 52, Shell and Lithic Feature	I/3	63	*H. cracherodii*	225 ± 35	520-460	A.D. 1430-1490
OS-54362	Unit 60, Compact Surface Feature, upper level	II/1	49	*H. cracherodii*	1670 ± 25	1040-940	A.D. 910-1010
OS-55025	Unit 47, Fox Burial Feature	II/2	77	*U. littoralis*	1540 ± 35	1380 (1460-1510) 1510	A.D. 440 (440-490) 570
OS-54356	Unit 47, Fox Burial Feature	II/2	79	*H. cracherodii*	2330 ± 30	1750-1610	A.D. 200-340
OS-54359	Unit 58, Bird Bone Feature	II/3	74	*H. cracherodii*	2450 ± 30	1890-1770	A.D. 60-190
OS-54360	Unit 58, Pit Feature	IIB/1	93	*H. cracherodii*	4750 ± 35	4810 (4810-4670) 4650	2860 (2860-2730) 2710 B.C.
OS-54358	Unit 57, Hearth Feature	I/3	94	*H. cracherodii*	4800 ± 30	4840 (4840-4770) 4720	2900 (2900-2820) 2770 B.C.
OS-54357	Unit 55, Pit Feature	II/3-IIB/1	85	*H. rufescens*	4890 ± 35	4940-4830	3000-2880 B.C.
	Mound A[c]						
Beta-156565	Unit 2	-	77	Charcoal	30 ± 30	240 (60-40) 10	A.D. 1710 (1890-1910) 1960
Beta-116352	Index Unit	-	90-100	Charcoal	130 ± 50	270 (120-60) 10	A.D. 1680 (1830-1890) 1950
Beta-116920	Index Unit	-	20-30	Charcoal	550 ± 50	630 (560-520) 520	A.D. 1320 (1390-1430) 1430
Beta-116351	Index Unit	-	50-60	Charcoal	650 ± 90	650-560	A.D. 1300-1390
Beta-156566	Unit 2	-	77	Marine Shell	1270 ± 40	670 (610-550) 550	A.D. 1340-1400
Beta-175270	Index Unit	-	80-90	Bone collagen	760 ± 40	720 (710-670) 670	A.D. 1240-1280

[a]All dates were calibrated using CALIB 5.01 (Stuiver and Reimer 1993) and applying a ΔR of 225 ± 35 for all marine shell samples (see Kennett et al. 1997); intercept ranges of highest probability listed in parentheses.
[b]Dates provided by Dr. René Vellanoweth, Department of Anthropology, Humboldt State University.
[c]Dates provided by Dr. Patricia Martz, Department of Anthropology, California State University, Los Angeles.

of upwelling of deep ocean waters in the southern California Bight which contain even lower carbon concentrations (Prior et al. 1999). To correct for skewed radiocarbon dates resulting from these low ^{14}C concentrations, a marine reservoir correction of 225 ± 35 years was applied to all marine shell samples (Kennett et al. 1997).

Radiocarbon dating wood (e.g., charcoal) can also result in erroneous dates. These dates report the time when the plant expired, not necessarily when the wood was utilized (Schiffer 1987:309, 315). Radiocarbon dates from wood may be of greater antiquity than the dates of actual cultural use. For example, driftwood that reaches San Nicolas Island may be anywhere from a few years to hundreds of years old. Consequently, driftwood charcoal dates may appear older than when the wood was actually burned. While driftwood was utilized, however, the Nicoleño relied more heavily on shrubs for fuel as well as sea mammal bone (Philbrick and Haller 1988). Because shrubs like sagebrush (*Artemisia* spp.), buckwheat, and silver lupine are locally available on the island, it is likely the wood was burned soon after it was collected. Currently, plant species for the six charcoal samples from CA-SNI-25 have not been confirmed, although preliminary analysis suggests buckwheat and sage were used. These relatively short-lived species would not be affected by the old wood problem.

There are also potential complications for dating old shell. There have been reported instances of shell mined from old shell middens and brought back to sites that were occupied much later in time (Rick et al. 2005). In these cases, radiocarbon dates from old shells erroneously imply a much earlier site occupation than what actually occurred. Dating old shell and wood are two complications that may potentially influence the radiocarbon dates for CA-SNI-25.

Chronology of CA-SNI-25

The radiocarbon dates for CA-SNI-25 are relatively tight and internally consistent with standard deviations typically less than 40 years. According to the radiocarbon dates the site appears to have been occupied between approximately 3000 B.C. and A.D. 1840. The radiocarbon dates for East Locus, Mound B, and Mound A, overlap suggesting these three areas were utilized contemporaneously during the most intensive period of site occupation. The majority of site occupation appears to have occurred between about A.D. 1300 and A.D. 1800 (one sigma), with a series of 12 dates falling in this interval. The clustering of these dates is in accordance with the artifact assemblage comprised of late period *Olivella* beads, shell fishhooks, and other artifacts defined for the time period.

The oldest dates (~4000-3000 B.C.) for the site may reflect an earlier occupation, although stratigraphically this has been difficult to discern in the field. Alternatively, the shells yielding old dates may have been mined from sites elsewhere on the island for the production of shell artifacts at CA-SNI-25. For the most part, large abalone shells were selected for radiocarbon dating. If these shells were deposited thousands of years earlier and brought to the site, their dates would reflect the age of death of the organism rather than its use as an artifact, thereby contributing to the old shell effect.

Overview of the CA-SNI-25 Artifact Assemblage

For this thesis, a portion of the total artifact assemblage was analyzed including artifacts of marine shell, fossilized marine shell, and exotic stone. A total of 3,258 artifacts with a combined weight of 10,040.08 g was analyzed (Table 7.4). Shell artifacts

Table 7.4. Artifact Assemblage by Material, Count, and Weight (g).

	East Locus				Mound B				Total		Total	
Material	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
Shell	1,396	98	4,892.66	97	1,812	99	4,959.08	99	3,208	98	9,851.74	98
Fossil Shell	6	<1	29.54	1	3	<1	14.46	<1	9	<1	44.00	<1
Exotic Stone	23	2	117.68	2	18	1	26.66	1	41	1	144.34	1
Total	1,425	100	5,039.88	100	1,833	100	5,000.20	100	3,258	100	10,040.08	100

make up the majority (98%) of the assemblage analyzed in this thesis, while stone and fossil shell artifacts each comprise approximately one percent. The majority (56%) of artifacts were recovered from Mound B, contributing half of the assemblage's total weight. Shell artifact density is greater at Mound B; however, East Locus contains slightly greater concentrations of exotic stone artifacts and fossil shell (Table 7.5).

Table 7.5. Artifact Assemblage Count and Weight (g) Densities by Material.

	East Locus		Mound B			
Material	Cnt/m^3	Wt/m^3	Cnt/m^3	Wt/m^3	Total Cnt/m^3	Total Wt/m^3
Shell	81.16	284.46	124.19	339.90	205.36	748.55
Fossil Shell	0.35	1.72	0.21	0.99	0.55	2.91
Exotic Stone	1.34	6.84	1.23	1.83	2.57	9.90
Total	82.85	293.02	125.63	342.71	208.48	761.36

The exotic stone assemblage is comprised of two types of stone: serpentine and steatite. Shell and fossilized shell artifacts include 16 different marine shell species as well as undifferentiated clam, *Haliotis* spp., *Dentalium* spp., and one unidentifiable shell fragment (Tables 7.6, 7.7). *O. biplicata* is the most common (63%) marine shell species;

Table 7.6. Scientific and Common Shell Names.

Scientific Name	Abbreviated Scientific Name	Common Name
Acmaea mitra	*A. mitra*	White Cap Limpet
Astraea undosa	*A. undosa*	Wavy Topshell
Crassadoma gigantea	*C. gigantea*	Purple Hinge Rock Scallop
Cypraea spadicea	*C. spadicea*	Chestnut Cowrie
Dentalium spp.	*Dentalium* spp.	Tusk Shell
Fissurella volcano	*F. volcano*	Volcano Limpet
Haliotis spp.	*Haliotis* spp.	Abalone
Haliotis cracherodii	*H. cracherodii*	Black Abalone
Haliotis rufescens	*H. rufescens*	Red Abalone
Lottia spp.	*Lottia* spp.	Limpet
Lottia gigantea	*L. gigantea*	Owl Limpet
Lottia limatula	*L. limatula*	File Limpet
Megathura crenulata	*M. crenulata*	Giant Keyhole Limpet
Mytilus californianus	*M. californianus*	California Mussel
Norrisia norrisi	*N. norrisi*	Norris Top Shell
Olivella biplicata	*O. biplicata*	Purple Olive Shell or *Olivella*[a]
Septifer biplicata	*S. biplicata*	Platform Mussel
Trachycardium quadragenarium	*T. quadragenarium*	Spiny Pricklycockle
Trivia californiana	*T. californiana*	California Trivia

[a]The genus name is regularly used as the shell's common name.

Table 7.7. Shell and Fossil Shell Assemblage by Species, Count, and Weight (g).

	East Locus				Mound B				Total		Total	
Species[a]	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
A. mitra	1	<1	15.90	<1	1	<1	2.63	<1	2	<1	18.53	<1
A. undosa	10	1	127.50	3	5	<1	37.98	1	15	<1	165.48	2
Clam	6	<1	24.71	1	7	<1	15.43	<1	13	<1	40.14	<1
C. gigantea	1	<1	12.11	<1	-	-	-	-	1	<1	12.11	<1
C. spadicea	1	<1	15.21	<1	6	<1	76.71	2	7	<1	91.92	1
Dentalium spp.	-	-	-	-	1	<1	0.13	<1	1	<1	0.13	<1
F. volcano	-	-	-	-	5	<1	0.32	<1	5	<1	0.32	<1
H. cracherodii	197	14	1,947.03	40	269	15	2,049.78	41	466	14	3,996.81	40
H. rufescens	307	22	2,147.56	44	238	13	2,038.54	41	545	17	4,186.10	42
Haliotis spp.	26	2	55.12	1	15	1	12.85	<1	41	1	67.97	1
Lottia gigantea	4	<1	9.42	<1	3	<1	13.36	<1	7	<1	22.78	<1
Lottia limatula	1	<1	0.82	<1	-	-	-	-	1	<1	0.82	<1
M. crenulata	3	<1	27.96	1	7	<1	32.58	1	10	<1	60.54	1
M. californianus	33	2	97.14	2	34	2	93.56	2	67	2	190.70	2
N. norrisi	12	1	32.62	1	3	<1	11.21	<1	15	<1	43.83	<1
O. biplicata	796	57	396.64	8	1,216	67	586.47	12	2,012	63	983.11	10
S. biplicata	-	-	-	-	1	<1	0.62	<1	1	<1	0.62	<1
T. quadragenarium	2	<1	12.16	<1	-	-	-	-	2	<1	12.16	<1
T. californiana	1	<1	0.30	<1	4	<1	1.37	<1	5	<1	1.67	<1
Unknown	1	<1	0.01	<1	-	-	-	-	1	<1	0.01	<1
Total	1,402	100	4,922.21	100	1,815	100	4973.54	100	3,217	100	9,895.75	100

[a]Includes fossil shell species.

however, it contributes only 10 percent of the total weight of the shell and fossil shell artifacts. *H. rufescens* is the second (17%) most common marine shell species and comprises the bulk (42%) of the total weight of shell. Following *H. rufescens*, *H. cracherodii* (14%) makes up 40 percent of the shell assemblage's total weight.

Fossil Shell Assemblage

The fossil shell assemblage consists of nine specimens representing five different marine shell species and one clam of unknown genus (Table 7.8; Figure 7.7). *M. californianus* makes up the majority (n=3, 33%) of fossil shell and is the only species found at both loci. Fossil shells are grouped into three categories: whole, fragments, and modified. While the majority (n=6, 67%) of fossil shells is unmodified, three specimens

Table 7.8. Fossil Shell Assemblage by Category, Count, and Weight (g).

Location and	Modified				Fragments				Whole				Total		Total	
Species	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
East Locus																
Clam	1	50	10.74	78	-	-	-	-	-	-	-	-	1	11	10.74	24
M. californianus	1	50	3.01	22	1	50	8.14	69	-	-	-	-	2	22	11.15	25
O. biplicata	-	-	-	-	-	-	-	-	2	100	3.92	100	2	22	3.92	9
T. quadragenarium	-	-	-	-	1	50	3.73	31					1	11	3.73	8
Subtotal	2	100	13.75	100	2	100	11.87	100	2	100	3.92	100	6	67	29.54	67
Mound B																
C. spadicea	-	-	-	-	1	50	2.81	45	-	-	-	-	1	11	2.81	6
H. cracherodii	1	100	8.21	100	-	-	-	-	-	-	-	-	1	11	8.21	19
M. californianus	-	-	-	-	1	50	3.44	55	-	-	-	-	1	11	3.44	8
Subtotal	1	100	8.21	100	2	100	6.25	100	-	-	-	-	3	33	14.46	33
Total	3	N/A	21.96	N/A	4	N/A	18.12	N/A	2	N/A	3.92	N/A	9	100	44.00	100

exhibit evidence of modification and are chipped, cut, and/or ground. The single modified shell from Mound B is chipped and ground. At East Locus, one modified shell is cut while the second fossil shell is ground.

Figure 7.7. Examples of Fossil Shell. (A) Unmodified *C. spadicea*. (B) Unmodified M*. californianus*. (C) Unmodified *T. quadragenarium*. (D) Modified clam of undifferentiated species.

Overview of the Shell Artifact Assemblage

The shell artifact assemblage is comprised of 3,208 artifacts with a combined weight of 9,851.74 g. Modified fossil shells and whole fossil *Olivella* shells are included in the shell artifact assemblage, bringing the total shell artifact count and weight to 3,213 and 9877.62 g, respectively. These artifacts are grouped into 16 categories (Table 7.9). Based on count, the majority (28%) consists of whole shells with bead detritus (23%) and modified shells (22%) rounding out the assemblage. Although modified shells are the third most common category, they contribute the bulk (63%) of the shell artifact assemblage by weight.

Shell Bead Assemblage

Shell beads found throughout California and the Great Basin have been extensively studied and used to construct local and regional bead chronologies

Table 7.9. Shell Artifact Assemblage by Category, Count, and Weight (g).

	East Locus				Mound B				Total		Total	
Category	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
Asphaltum Container	2	<1	133.77	3	1	<1	225.00	5	3	<1	358.77	4
Bead	197	14	33.68	1	201	11	63.78	1	398	12	97.47	1
Bead Blank	5	<1	5.54	<1	2	<1	1.41	<1	7	<1	6.95	<1
Bead Detritus	222	16	75.40	2	519	29	196.35	4	741	23	271.75	3
Bead-in-production	6	<1	1.47	<1	20	1	9.04	<1	26	1	10.51	0
Fishhook	56	4	35.83	1	28	2	23.02	<1	84	3	58.85	1
Fishhook Blank	56	4	238.57	5	39	2	189.81	4	95	3	428.38	4
Fishhook/Ornament Blank	30	2	98.60	2	22	1	113.84	2	52	2	212.44	2
Fishhook/Ornament Detritus	36	3	68.77	1	20	1	35.20	1	56	2	103.97	1
Modified Shell[a]	301	22	3,057.51	62	394	22	3,209.67	65	695	22	6,267.18	63
Ornament	9	1	37.74	1	22	1	55.35	1	31	1	93.09	1
Ornament Blank	12	1	39.73	1	9	<1	27.18	1	21	1	66.91	1
Pearl	2	<1	0.30	<1	2	<1	0.48	<1	4	<1	0.78	<1
Shell Tool	10	1	362.04	7	12	1	246.87	5	22	1	608.91	6
Shell with Asphaltum	59	4	407.84	8	28	2	214.4	4	87	3	622.24	6
Whole Shell[b]	397	28	313.54	6	494	27	355.89	7	891	28	669.43	7
Total	1,400	100	4,910.33	100	1,813	100	4,967.29	100	3,213	100	9,877.62	100

[a]Includes counts and weights of fossil shell.
[b]Includes counts and weights of fossil *Olivella* shell.

(Bennyhoff and Hughes 1987; Gibson 1992; King 1990). Additionally, analysis of spatial distributions has enabled researchers to trace the geographic boundaries of prehistoric trade routes (Bennyhoff and Hughes 1987; Vellanoweth 2001). Many different bead styles were recovered from East Locus and Mound B. Consequently, important chronological and regional information derived from these studies is included in the discussion of the CA-SNI-25 shell bead assemblage.

The assemblage is comprised of completed beads, beads in different stages of manufacture (i.e., bead blanks, beads-in-production), detritus, and whole shells (collected for production but not utilized). Table 7.10 summarizes three different categories or stages of bead production: finished beads, bead blanks, and beads-in-production. Bead blanks represent an early stage of bead production in which bead pre-forms have been chipped along the perimeter of the blank but not drilled. In contrast, beads-in-production

Table 7.10. Shell Bead Production Assemblage by Bead Category, Count, and Weight (g).

Location and	Bead				Bead Blank				Bead-in-production				Total		Total	
Species	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
East Locus																
Clam	2	1	0.26	1	1	20	1.87	34	-	-	-	-	3	1	2.13	2
H. cracherodii	-	-	-	-	1	20	0.32	6	-	-	-	-	1	<1	0.32	<1
H. rufescens	9	5	1.53	5	2	40	3.29	59	-	-	-	-	11	3	4.82	4
Haliotis spp.	1	1	0.01	<1	-	-	-	-	-	-	-	-	1	<1	0.01	<1
M. californianus	12	6	0.48	1	-	-	-	-	-	-	-	-	12	3	0.48	<1
O. biplicata	171	87	31.10	92	1	20	0.06	1	6	100	1.48	100	178	41	32.64	28
T. californiana	1	1	0.30	1	-	-	-	-	-	-	-	-	1	<1	0.30	<1
Unknown	1	1	0.01	<1	-	-	-	-	-	-	-	-	1	<1	0.01	<1
Subtotal	197	100	33.69	100	5	100	5.54	100	6	100	1.48	100	208	48	40.71	35
Mound B																
Clam	3	1	0.86	1	-	-	-	-	-	-	-	-	3	1	0.86	1
Dentalium spp.	1	<1	0.13	<1	-	-	-	-	-	-	-	-	1	<1	0.13	<1
H. cracherodii	-	-	-	-	1	50	1.39	99	-	-	-	-	1	<1	1.39	1
H. rufescens	2	1	0.39	1	-	-	-	-	-	-	-	-	2	<1	0.39	<1
Haliotis spp.	2	1	0.05	<1	1	50	0.02	1	1	5	0.01	0.1	4	1	0.08	<1
M. californianus	4	2	0.12	<1	-	-	-	-	-	-	-	-	4	1	0.12	<1
O. biplicata	187	93	61.47	96	-	-	-	-	19	95	9.02	99.9	206	48	70.49	61
T. californiana	2	1	0.77	1	-	-	-	-	-	-	-	-	2	<1	0.77	1
Subtotal	201	100	63.79	100	2	100	1.41	100	20	100	9.03	100	223	52	74.23	65
Total	398	N/A	97.48	N/A	7	N/A	6.95	N/A	26	N/A	10.51	N/A	431	100	114.93	100

exhibit more extensive modification and include 1) beads with chipped perimeters that likely broke during the drilling phase, and 2) beads that are fully drilled with chipped perimeters that have not been ground smooth. Beads-in-production are differentiated from rough and chipped *Olivella* disk beads (Class H2 and H3) by perforation diameter and the shape of the perforation (i.e., biconical or conical tapered drilling).

Artifacts in these three bead production categories comprise 13 percent and one percent of the total shell artifact assemblage count and weight, respectively. Five marine shell species were identified in addition to undifferentiated clam, *Dentalium* spp., *Haliotis* spp., and unidentified shell.

Olivella shells comprise the majority of the bead production assemblage at both East Locus (86%) and Mound B (92%). A variety of different types of finished shell beads were identified, although blanks and beads-in-production are poorly represented. The latter category is comprised of only two types of shell – *Olivella* and *Haliotis* spp. In all, 26 (6%) beads-in-production were identified with 20 (77%) recovered from Mound B.

Small quantities of bead blanks were also recovered. A total of seven (2%) blanks were identified with the majority (n=5, 71%) found at East Locus. Although fewer bead blanks were recovered, shell diversity is slightly greater compared to beads-in-production. Five (71%) bead blanks representing three shell species and unidentified clam were recovered from East Locus.

Olivella Assemblage

Table 7.11 summarizes the *Olivella* assemblage, which includes finished beads, bead blanks, bead detritus, beads-in-production, and unmodified whole shells. While

Table 7.11. *Olivella* Assemblage by Category, Count, and Weight (g).

	East Locus				Mound B				Total		Total	
Category	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
Bead	171	21	31.10	8	187	15	61.47	10	358	18	92.56	9
Bead Blank	1	<1	0.06	<1	-	-	-	-	1	<1	0.06	<1
Bead Detritus	222	28	75.40	19	519	43	196.35	33	741	37	271.75	28
Bead-in-production	6	1	1.48	<1	19	2	9.02	2	25	1	10.50	1
Whole Shell[a]	396	50	288.61	73	491	40	319.63	55	887	44	608.24	62
Total	796	100	396.64	100	1,216	100	586.47	100	2,012	100	983.11	100

[a]Includes fossil *Olivella* shell.

items in these categories make up the bulk (63%) of the shell artifact assemblage in terms of count, they contribute a small (10%) portion of the total weight. Sixty percent of the total *Olivella* assemblage was recovered from Mound B. The majority (n=887, 44%) of the *Olivella* assemblage is made up of whole shells followed by bead detritus (n=741, 37%). Twenty-five (1%) *Olivella* beads-in-production were identified with approximately three times as many specimens recovered from Mound B (n=19) than East Locus (n=6). Additionally, one *Olivella* bead blank was identified at East Locus.

Olivella Beads

Finished beads comprise 18 percent (n=358) of the *Olivella* assemblage. Relatively equal numbers of beads occur at both loci; however, bead density is slightly greater at Mound B (12.82 beads/m^3) than East Locus (9.94 beads/m^3). Finished beads are grouped into three categories based on the portion of the *Olivella* shell used to manufacture them (Table 7.12). The majority (n=135, 43%) of beads are whole or nearly

Table 7.12. *Olivella* Bead Types by Count and Weight (g).

	East Locus				Mound B				Total		Total	
Bead Type	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
Callus	47	27	6.39	21	16	9	4.01	7	63	18	10.40	11
Wall	63	37	2.58	8	77	41	12.35	20	140	39	14.93	16
Nearly-/Whole Shell	60	35	22.08	71	93	50	45.05	73	153	43	67.13	73
Fragment[a]	1	1	0.04	<1	1	1	0.06	<1	2	1	0.10	<1
Total	171	100	31.10	100	187	100	61.47	100	358	100	92.56	100

[a]Too fragmented to classify.

whole shells retaining large portions of the shell callus and wall. Beads manufactured from the wall portion of the shell are the second (n=140, 39%) most common bead type followed by callus beads (n=63, 18%). Unlike the other two categories, counts for callus beads are greater at East locus (n=47) compared to Mound B (n=16) with almost three times as many beads found at East Locus.

In addition to general categories, *Olivella* beads are classified based on Bennyhoff and Hughes' (1987) bead typology. Table 7.13 summarizes descriptions of the different bead classifications identified at both loci. *Olivella* beads are grouped into 12 general

Table 7.13. Selected *Olivella* Bead Classifications and Definitions (Bennyhoff and Hughes 1987).

Bead Type	Name	Portion of Shell	Description
A1	Simple Spire-Lopped	Nearly Whole	Spire removed perpendicularly.
A2	Oblique Spire-Lopped	Nearly Whole	Spire ground off diagonally.
A4	Punched Spire-Lopped	Nearly Whole	Spire-lopped bead with perforation punched in shell wall.
B1	Side-Ground	Nearly Whole	Spire-lopped and slight end-grinding; end ground diagonally.
B2	End-Ground	Nearly Whole	Spire-lopped and slight end-grinding; maximum bead diameter near the spire.
B3	Barrel	Nearly Whole	Spire-ground and moderate end-grinding; maximum bead diameter at the middle.
B4	Cap	Nearly Whole	Spire-ground and extensive end-grinding; only upper one-third of shell remains.
B6	Double-Oblique	Nearly Whole	Spire and end ground diagonally.
C3	Split Oval	Wall	Quarter-shell wall with central perforation.
E1	Thin Lipped	Callus	Average bead curvature: 3.0 mm – 4.0 mm.
E2	Thick Lipped	Callus	Average bead curvature: 4.0 mm – 5.0 mm.
F1	Oval Saddle	Wall	Bead width ≥ bead length.
F2a	Full Saddle	Wall	Oval-shaped; bead width > bead length.
F2d	Elliptical Saddle	Wall	Short, elongate oval bead.
F3b	Small Saddle	Wall	Square to rectangular shape; bead length < 6.5 mm long.
G1	Tiny Saucer	Wall	Very small circular bead; bead diameter: 2.0 mm – 5.0 mm.
G2	Normal Saucer	Wall	Circular bead; bead diameter: 5.0 mm – 10.00 mm.
G4	Ground Saucer	Wall	Circular bead with surface around perforation ground flat.
G5	Oval Saucer	Wall	Circular to slightly oval-shaped bead.
G6	Irregular Saucer	Wall	Asymmetrical bead slightly circular or oval-shaped.
H1a	Ground Disk	Wall	Small circular bead with ground edges; perforation diameter = 1.0 mm.
H1b	Semi-Ground Disk	Wall	Small circular bead with partially ground edges; perforation diameter = 1.0 mm.
H2	Rough Disk	Wall	Small irregular bead with chipped edges; perforation diameter: 0.6 mm – 1.2 mm.
J	Wall Disk	Wall	Medium-sized circular or oval-shaped disk bead with ground edges.
K1	Cupped	Callus	Small, thick, circular bead; bead diameter: 3.0 mm – 7.0 mm; bead thickness: 2.0 mm – 3.0 mm.
K2	Bushing	Callus	Small, thin, circular bead; bead diameter: 3.0 mm – 4.0 mm; bead thickness: 1.0 mm – 2.0 mm.
K3	Cylinder	Callus	Small, thick, circular bead; bead diameter: 2.0 mm – 3.0 mm; bead thickness: 1.0 mm – 3.0 mm.
L2	Small Thick Rectangle	Wall	Rectangular to square bead; perforation diameter: 1.5 mm – 2.5 mm.
M1a	Normal Sequin	Wall	Rectangular to square bead; perforation diameter = 1.0 mm.
O1	Drilled Whole Shell	Whole Shell	Perforation drilled in shell wall.
O2	Punched Whole Shell	Whole Shell	Perforation punched in shell wall.

classes (Table 7.14; Figure 7.8) and 31 types (Table 7.15). Beads from Mound B are classified into 12 general bead classes and 28 types, while beads representing 10 general classes and 27 types occur at East Locus. Additionally, three *Olivella* beads are too

Table 7.14. *Olivella* General Bead Classes (Bennyhoff and Hughes 1987) by Count and Weight (g)

		East Locus				Mound B				Total		Total	
Class	Bead Name	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
A	Spire-lopped	32	19	12.57	40	54	29	20.67	34	86	24	33.24	36
B	End-Ground	19	11	4.30	14	32	17	18.75	31	51	14	23.05	25
C	Split	-	-	-	-	3	2	0.18	<1	3	1	0.18	<1
E	Lipped	15	9	1.77	6	5	3	0.75	1	20	6	2.52	3
F	Saddle	5	3	0.30	1	3	2	0.14	<1	8	2	0.44	<1
G	Saucer	43	25	1.49	5	47	25	6.76	11	90	25	8.25	9
H	Disk	5	3	0.13	<1	10	5	4.56	7	15	4	4.69	5
J	Wall Disk	9	5	0.60	2	9	5	0.56	1	18	5	1.16	1
K	Callus	32	19	4.62	15	11	6	3.26	5	43	12	7.88	9
L	Thick Rectangle	1	1	0.06	<1	3	2	0.07	<1	4	1	0.13	<1
M	Thin Rectangle	-	-	-	-	1	1	0.02	<1	1	<1	0.02	<1
O	Whole Shell	9	5	5.21	17	7	4	5.63	9	16	4	10.84	12
Fragment[a]	-	1	1	0.04	<1	2	1	0.12	<1	3	1	0.16	<1
Total		171	100	31.10	100	187	100	61.47	100	358	100	92.56	100

[a]Not based on Bennyhoff and Hughes' (1987) classification system.

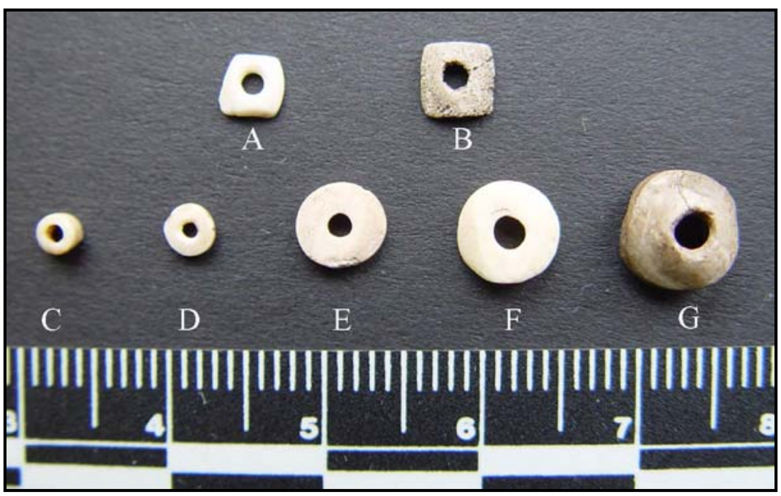

Figure 7.8. Examples of Different *Olivella* Bead Classes (Bennyhoff and Hughes 1987). (A) Class L (thick rectangle). (B) Class M (thin rectangle). (C) Class K (callus). (D) Class G (saucer – tiny). (E) Class G (saucer - normal). (F) Class J (wall disk). (G) Class E (lipped).

Table 7.15. *Olivella* Bead Type Classifications (Bennyhoff and Hughes 1987) by Count and Weight (g).

	East Locus				Mound B				Total		Total	
Bead Type	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
A1	27	16	10.96	35	44	24	18.82	31	71	20	29.78	32
A2	3	2	0.29	1	9	5	1.55	3	12	3	1.84	2
A4	2	1	1.32	4	1	1	0.30	<1	3	1	1.62	2
B1	-	-	-	-	1	1	0.25	<1	1	<1	0.25	<1
B2	9	5	2.48	8	11	6	14.21	23	20	6	16.69	18
B3	5	3	1.29	4	13	7	3.59	6	18	5	4.88	5
B4	5	3	0.53	2	5	3	0.59	1	10	3	1.12	1
B6	-	-	-	-	2	1	0.11	<1	2	1	0.11	<1
C3	-	-	-	-	3	2	0.18	<1	3	1	0.18	<1
E1	14	8	1.61	5	5	3	0.75	1	19	5	2.36	3
E2	1	1	0.16	1	-	-	-	-	1	<1	0.16	<1
F1	-	-	-	-	1	1	0.07	<1	1	<1	0.07	<1
F2a	2	1	0.14	<1	-	-	-	-	2	1	0.14	<1
F2d	1	1	0.07	<1	-	-	-	-	1	<1	0.07	<1
F3b	2	1	0.09	<1	2	1	0.07	<1	4	1	0.16	<1
G1	17	10	0.34	1	20	11	0.37	1	37	10	0.72	1
G2	12	7	0.41	1	8	4	5.56	9	20	6	5.97	6
G4	2	1	0.09	<1	1	1	0.07	<1	3	1	0.16	<1
G5	1	1	0.13	<1	1	1	0.12	<1	2	1	0.25	<1
G6	11	6	0.52	2	17	9	0.64	1	28	8	1.16	1
H1a	2	1	0.04	<1	4	2	4.20	7	6	2	4.24	5
H1b	1	1	0.02	<1	3	2	0.03	<1	4	1	0.05	<1
H2	2	1	0.07	<1	3	2	0.33	1	5	1	0.40	<1
J	9	5	0.60	2	9	5	0.56	1	18	5	1.16	1
K1	17	10	1.45	5	6	3	0.48	1	23	6	1.93	2
K2	8	5	0.16	1	3	2	0.07	<1	11	3	0.23	<1
K3	7	4	3.02	10	2	1	2.71	4	9	3	5.73	6
L2	1	1	0.06	<1	3	2	0.07	<1	4	1	0.13	<1
M1a	-	-	-	-	1	1	0.02	<1	1	<1	0.02	<1
O1	5	3	2.90	9	4	2	4.16	7	9	3	7.06	8
O2	4	2	2.31	7	3	2	1.47	2	7	2	3.78	4
Fragment[a]	1	1	0.04	<1	2	1	0.12	<1	3	1	0.16	<1
Total	171	100	31.10	100	187	100	61.47	100	358	100	92.56	100

[a]Not based on Bennyhoff and Hughes' (1987) classification system.

fragmented to classify. Overall, the majority (n=90, 25%) of beads is classified as saucer (Class G). Saucer beads were commonly produced in southern and central California between 600 B.C. and A.D. 1780 (Bennyhoff and Hughes 1987; King 1990). While saucer beads are the most common (n=43, 25%) class at East Locus, this bead type is second (n=47) in count to spire-lopped beads (n=54) at Mound B. Spire-lopped (Class A) beads were commonly produced between 5500 B.C. and A.D. 1780 throughout

California and the Great Basin, making them some of the earliest and most wide-spread beads in Western North America (Bennyhoff and Hughes 1987; King 1990).

Callus beads (Class K), on the other hand, were manufactured in southern and central California relatively late between A.D. 1150 and A.D. 1780 (Bennyhoff and Hughes 1987; King 1990). Forty-three (12%) callus beads were recovered from the two loci with the majority (n=32, 19%) found at East Locus.

Lipped (Class E) beads were also produced later in time, occurring in southern and central California between about A.D. 1500 and A.D. 1780 (Bennyhoff and Hughes 1987; King 1990). Of the 20 lipped beads identified, 15 (9%) were found at East Locus. Few lipped beads have been identified on San Nicolas Island, although four have been recently reported for CA-SNI-39 (Maxwell et al. 2002).

Just as lipped bead production declined, disk (Class H) bead production intensified. Disk beads, produced in southern California during the Mission Period (A.D. 1770-1834), were commonly used as a standard form of shell bead currency (Bennyhoff and Hughes 1987; Gibson 1992; King 1990). As the demand for currency increased over time, disk beads were mass-produced with less time spent finishing each bead. Consequently, disk beads became progressively larger as bead edges were left chipped rather than ground (Bennyhoff and Hughes 1987:135). Additionally, metal needles were used to drill tiny perforations in disk beads (Bennyhoff and Hughes 1987:135). Fifteen (4%) beads from East Locus and Mound B are classified as disks with twice (n=10) as many beads recovered from Mound B.

Olivella Bead Detritus

Bead detritus comprises 37 percent (n=741) of the *Olivella* shell assemblage and contributes a significant (23%) portion to the total count of the shell artifacts. Density of bead detritus is approximately three times greater (13.46 g/m^3) at Mound B than East Locus (4.38 g/m^3).

Detritus is grouped into three general types: callus, wall, and other (Table 7.16). Bead detritus from the shell's callus likely represents the waste product of wall bead manufacture, while wall detritus likely reflects callus bead production. Detritus classified

Table 7.16. *Olivella* Bead Detritus by Type, Count, and Weight (g).

	East Locus				Mound B							
Type	Cnt	%	Wt	%		%	Wt	%	Total Cnt	%	Total Wt	%
Callus	177	80	66.61	88	374	72	168.20	86	551	74	234.81	86
Wall	10	5	2.87	4	48	9	11.65	6	58	8	14.52	5
Other[a]	35	16	5.92	8	97	19	16.50	8	132	18	22.42	8
Total	222	100	75.40	100	519	100	196.35	100	741	100	271.75	100

[a]Spire, canal, or outer lip fragments.

as *other* includes small fragments of shell spire, canal, and outer lip. These fragments may have originated as waste debris during the production of whole or nearly whole shell beads as well as callus and wall beads.

Callus fragments dominate (n=551, 74%) the bead detritus assemblage followed by detritus classified in the other category (n=132, 18%). The overall abundance of callus detritus suggests intensive wall bead production at both loci. This bead production emphasis is further supported by the relatively large quantities of wall beads found at both loci (n=140, 39%). However, there is approximately four times more callus detritus (n=551) than wall detritus (n=140). This difference is particularly significant when compared to the similarity in counts between wall detritus (n=58) and callus beads (n=63). It would seem that the number of wall beads recovered from the two loci is much less than would be expected based on intensity of wall bead production. It is possible that wall beads were removed from the site and used for other purposes (e.g., decoration, grave offerings, trade).

Whole *Olivella* Shells

Whole shells (n=887, 44%) also comprise a large portion of the *Olivella* assemblage and contribute 28 percent of the total number of shell artifacts. The majority of whole shells were recovered from Mound B (n=491, 55%) followed by East Locus (n=396, 45%). Although the shells are unmodified, they were likely collected and brought back to the two loci for bead production, but for whatever reason were not used.

Whole shells are classified into three size categories based on shell length: small (0.01-10.00 mm), medium (10.01-20.00 mm), and large (>20 mm) (Table 7.17). The

Table 7.17. *Olivella* Whole Shell Size Classifications by Length (mm), Count, and Weight (g).[a]

Size Classification	East Locus				Mound B				Total		Total	
Range	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
0.01-10.00	36	9	7.5	3	61	12	11.7	4	97	11	19.2	3
10.01-20.00	345	87	249.76	87	422	86	292	91	767	86	541.76	89
>20.00	15	4	31.35	11	8	2	15.93	5	23	3	47.28	8
Total	396	100	288.61	100	491	100	319.63	100	887	100	608.24	100

[a]Includes fossil *Olivella* shell.

majority (n=767, 86%) of whole shells is grouped in the medium size category and includes one fossil shell. Twenty-three (3%) shells, including one fossil shell, fall within the large size range. Shells in the medium size range clearly dominate the whole shell assemblage. It is possible that medium size shells were the most common type available for collection or that they were considered ideal for bead manufacture.

Other Shell Beads

Beads manufactured from shells other than *Olivella* comprise a small portion (n=40, 10%) of the total shell bead assemblage. Twenty-six (65%) beads were recovered from East Locus and 14 (35%) from Mound B. The beads were manufactured from four different marine shell species in addition to clam and one unidentifiable specimen (Table 7.18; Figure 7.9). The majority (n=16, 40%) of beads were produced from *M. californianus*, followed by *H. rufescens* (n=11, 39%).

Based on overall shape, shell beads are grouped into five categories: cylinder, disk, rectangle, square, and miscellaneous (Table 7.18). The latter category includes a *Dentalium* spp. tube bead and three whole shell *Trivia californiana* beads. Disks are the most common (n=26, 65%) type with the majority (n=19, 73%) from East Locus. Disks as well as cylinder and rectangle beads were manufactured from *H. rufescens* and *M. californianus*. *Mytilus* spp. disks are reported to have been produced in the Santa Barbara Channel region between A.D. 900 and A.D. 1500, while *Mytilus* spp. cylinder beads were commonly made between A.D. 1400 and A.D. 1780 (Gibson 1992; King 1990). *M. californianus* disk beads were found at both loci, but only one cylinder bead was recovered from East Locus. Disk beads produced from *H. rufescens* are thought to have been contemporaneous with *Mytilus* spp. disk beads (Gibson 1992; King 1990). However, *H. rufescens* rectangle beads were manufactured much earlier between about

Table 7.18. Shell Bead Assemblage by Shape, Count, and Weight (g).[a]

Location and	Cylinder				Disk				Rectangle				Square				Misc.				Total		Total	
Species	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
East Locus																								
Clam	-	-	-	-	2	11	0.26	17	-	-	-	-	-	-	-	-	-	-	-	-	2	5	0.26	5
H. rufescens	1	50	0.04	40	6	32	0.85	56	2	67	0.64	96	-	-	-	-	-	-	-	-	9	23	1.53	31
Haliotis spp.	-	-	-	-	-	-	-	-	-	-	-	-	1	100	0.01	100	-	-	-	-	1	3	0.01	<1
M. californianus	1	50	0.06	60	10	53	0.39	26	1	33	0.03	4	-	-	-	-	-	-	-	-	12	30	0.48	10
T. californiana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	100	0.3	100	1	3	0.30	6
Unknown	-	-	-	-	1	5	0.01	1	-	-	-	-	-	-	-	-	-	-	-	-	1	3	0.01	<1
Subtotal	2	100	0.10	100	19	100	1.51	100	3	100	0.67	100	1	100	0.01	100	1	100	0.3	100	26	65	2.59	53
Mound B																								
Clam	2	100	0.70	100	1	14	0.16	24	-	-	-	-	-	-	-	-	-	-	-	-	3	8	0.86	18
Dentalium spp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	33	0.13	14	1	3	0.13	3
H. rufescens	-	-	-	-	1	14	0.34	52	-	-	-	-	1	50	0.05	85	-	-	-	-	2	5	0.39	8
Haliotis spp.	-	-	-	-	2	29	0.05	7	-	-	-	-	-	-	-	-	-	-	-	-	2	5	0.05	1
M. californianus	-	-	-	-	3	43	0.11	17	-	-	-	-	1	50	0.01	15	-	-	-	-	4	10	0.12	2
T. californiana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	67	0.77	86	2	5	0.77	16
Subtotal	2	100	0.70	100	7	100	0.66	100	-	-	-	-	2	100	0.06	100	3	100	0.9	100	14	35	2.32	47
Total	4	N/A	0.80	N/A	26	N/A	2.17	N/A	3	N/A	0.67	N/A	3	N/A	0.07	N/A	4	N/A	1.2	N/A	40	100	4.91	100

[a]Excluding *Olivella* beads.

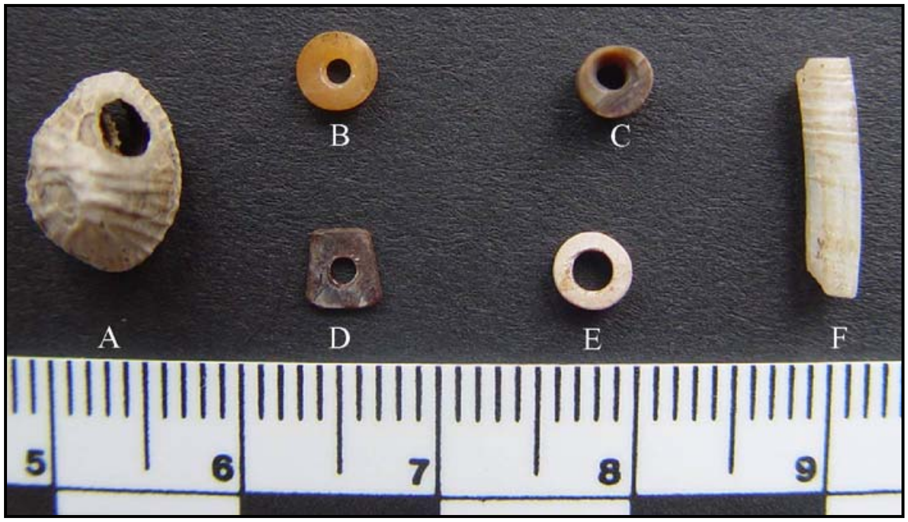

Figure 7.9. Examples of Non-*Olivella* Beads. (A) *T. californiana* whole shell bead. (B) *H. rufescens* epidermis disk bead. (C) *M. californianus* epidermis disk bead. (D) *M. californianus* rectangle bead. (E) Clam disk bead. (F) *Dentalium* spp. tube bead.

4000 B.C. and 200 B.C. (Gibson 1992; King 1990). While seven (18%) *H. rufescens* disk beads were recovered from the two loci, two (5%) *H. rufescens* rectangle beads were found at East Locus. Finally, three clam disk beads were recovered from the loci. Clam disks were commonly manufactured between A.D. 900 and A.D. 1500; however, some clam species (e.g., *Chione* spp.) have been found in contexts dating to as early as 5500 B.C. (King 1990).

In addition to shape, shell beads are grouped into three categories based on the portion of shell used to manufacture them: epidermis, nacre, and other (Table 7.19). The former is the tough, dorsal surface of the shell, while nacre consists of the thin, shiny surface found on the ventral portion of the shell. The *other* category is comprised of beads exhibiting both epidermis and nacre or beads manufactured from marine shells that do not have nacreous surfaces (e.g., clam, *T. californiana, Dentalium* spp.).

Table 7.19. Shell Bead Assemblage by Manufacturing Portion of Shell, Count, and Weight (g).[a]

Location and	Epidermis				Nacre				Other				Total		Total	
Species	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
East Locus																
Clam	-	-	-	-	-	-	-	-	2	20	0.26	24	2	5	0.26	5
H. rufescens	7	47	1.16	78	-	-	-	-	2	20	0.37	34	9	23	1.53	31
Haliotis spp.	-	-	-	-	1	100	0.01	100	-	-	-	-	1	3	0.01	<1
M. californianus	8	53	0.32	22	-	-	-	-	4	40	0.16	15	12	30	0.48	10
T. californiana	-	-	-	-	-	-	-	-	1	10	0.30	27	1	3	0.30	6
Unknown	-	-	-	-	-	-	-	-	1	10	0.01	1	1	3	0.01	<1
Subtotal	15	100	1.48	100	1	100	0.01	100	10	100	1.10	100	26	65	2.59	53
Mound B																
Clam	-	-	-	-	-	-	-	-	3	33	0.86	40	3	8	0.86	18
Dentalium spp.	-	-	-	-	-	-	-	-	1	11	0.13	6	1	3	0.13	3
H. rufescens	1	33	0.05	42	-	-	-	-	1	11	0.34	16	2	5	0.39	8
Haliotis spp.	-	-	-	-	2	100	0.05	100	-	-	-	-	2	5	0.05	1
M. californianus	2	67	0.07	58	-	-	-	-	2	22	0.05	2	4	10	0.12	2
T. californiana	-	-	-	-	-	-	-	-	2	22	0.77	36	2	5	0.77	16
Subtotal	3	100	0.12	100	2	100	0.05	100	9	100	2.15	100	14	35	2.32	47
Total	18	N/A	1.60	N/A	3	N/A	0.06	N/A	19	N/A	3.25	N/A	40	100	4.91	100

[a]Excluding *Olivella* beads.

H. rufescens and *M. californianus* are the only two species that make up the epidermis category. In the case of *H. rufescens*, this may be due to the relative ease layers of epidermis and nacre separate. The majority (n=15, 83%) of *H. rufescens* epidermis beads, commonly produced between A.D. 1400 and A.D. 1780, is from East Locus (Gibson 1992; King 1990).

Additionally, three undifferentiated *Haliotis* spp. nacre beads were identified at both loci. Considering they are thin and extremely delicate, the limited number of nacre beads at the two loci may be a result of poor post-depositional preservation. Alternatively, this small quantity of nacre beads may reflect bead-makers' preferences for other bead styles.

Shell Ornament Assemblage

The shell ornament assemblage is comprised of whole and fragments of ornaments and ornament blanks (Table 7.20). The latter category represents early stages of ornament production. A total of 52 artifacts were identified with the majority (n=31, 60%) found at Mound B. In all, these artifacts comprise two percent of the total number of shell artifacts. Marine shell diversity is slightly greater at Mound B compared to East Locus and includes eight different species in addition to undifferentiated *Haliotis* spp. and clam. The majority (n=16, 31%) of ornaments and blanks were manufactured from *H. rufescens*, followed by *M. crenulata* (n=7, 13%). The latter was used to produce ring ornaments in the Santa Barbara Channel region beginning about 600 B.C. (King 1990).

Shapes of whole and fragments of ornaments and ornament blanks are fairly standardized and include circular, oval, and ring. Two circular ornaments of particular note include two large *H. cracherodii* disks with central perforations recovered from the same unit at East Locus (Figure 7.10). Both ornaments have asphaltum on their dorsal surfaces, suggesting they may have been attached to something. Mound B contains a circular ornament with scalloped edges made from *H. rufescens*. (Figure 7.11). The ornament has three perforations drilled at one end and may have been used as a pendant. Additionally, a rectangular-shaped nacre ornament made from *H. rufescens* was found at East Locus. This specimen has two holes drilled near the center and may have functioned as a sequin or button (Figure 7.12). In total, 15 specimens have perforations including

Table 7.20. Shell Ornament Assemblage by Artifact Category, Count, and Weight (g).

	Whole				Fragment				Blank				Blank Fragment				Total		Total	
Location and Species	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
East Locus																				
A. mitra	1	11	15.9	42	-	-	-	-	-	-	-	-	-	-	-	-	1	2	15.9	10
H. cracherodii	2	22	15.51	41	-	-	-	-	2	18	12.53	32	-	-	-	-	4	8	28.04	18
H. rufescens	-	-	-	-	-	-	-	-	8	73	22.79	58	-	-	-	-	8	15	22.79	14
Haliotis spp.	1	11	0.35	1	-	-	-	-	1	9	4.2	11	1	100	0.21	100	3	6	4.76	3
L. gigantea	3	33	4.65	12	-	-	-	-	-	-	-	-	-	-	-	-	3	6	4.65	3
L. limatula	1	11	0.82	2	-	-	-	-	-	-	-	-	-	-	-	-	1	2	0.82	1
M. crenulata	1	11	0.51	1	-	-	-	-	-	-	-	-	-	-	-	-	1	2	0.51	<1
Subtotal	9	100	37.74	100	-	-	-	-	11	100	39.52	100	1	100	0.21	100	21	40	77.47	48
Mound B																				
A. mitra	1	6	2.63	9	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2.63	2
Clam	1	6	1.72	6	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1.72	1
C. spadicea	1	6	4.16	14	1	17	4.86	19	-	-	-	-	-	-	-	-	2	4	9.02	6
F. volcano	5	31	0.32	1	-	-	-	-	-	-	-	-	-	-	-	-	5	10	0.32	<1
H. rufescens	2	13	15.11	50	1	17	6.49	26	4	50	13.92	66	1	100	6.13	100	8	15	41.65	26
Haliotis spp.	-	-	-	-	1	17	0.11	0	-	-	-	-	-	-	-	-	1	2	0.11	<1
L. gigantea	2	13	0.3	1	-	-	-	-	-	-	-	-	-	-	-	-	2	4	0.3	<1
M. crenulata	2	13	4.92	16	2	33	1.2	5	2	25	5.74	27	-	-	-	-	6	12	11.86	7
M. californianus	1	6	0.54	2	1	17	12.37	49	2	25	1.39	7	-	-	-	-	4	8	14.3	9
S. biplicata	1	6	0.62	2	-	-	-	-	-	-	-	-	-	-	-	-	1	2	0.62	<1
Subtotal	16	100	30.32	100	6	100	25.03	100	8	100	21.05	100	1	100	6.13	100	31	60	82.53	52
Total	25	N/A	68.06	N/A	6	N/A	25.03	N/A	19	N/A	60.57	N/A	2	N/A	6.34	N/A	52	100	160.00	100

Figure 7.10. *H. cracherodii* Disk Ornament with Chipped Central Perforation.

Figure 7.11. *H. rufescens* Ornament with Scalloped Edges.

Figure 7.12. *H. rufescens* Nacre Sequin or Button.

nine ornaments, two ornament fragments, three ornament blanks, and one ornament blank fragment.

Non-*Olivella* Whole Shells

In addition to 887 whole *Olivella* shells, four whole shells representing shell types other than *Olivella* were examined as part of the shell artifact assemblage (Table 7.9). One whole *M. crenulata* shell was recovered from East Locus. Considering that *M. crenulata* ornaments have been identified at CA-SNI-25, it is possible the shell was collected and brought back to East Locus for ornament manufacture.

Two *T. californiana* shells found at Mound B may have also been intended for ornament production. These two shells show no evidence of modification. A whole *C. spadicea* shell was recovered from Mound B. The shell may have been intended for ornament production or use in ceremonial activities. Regarding the latter, in many Native cultures, cowrie shells are representative of fecundity and often associated with birth ceremonies, weddings, and burials (Harris 1943:143; Safer and Gill 1982; Sheppard

1939:200). Although it is not certain whether the Native people of San Nicolas Island shared this belief, their mainland neighbors across the channel did so and it is likely that the islanders at least knew of this association.

Shell Fishhook and Other Manufacturing Items

Overview

The assemblage is comprised of whole fishhooks, fragments, blanks, and three additional categories containing items that may be associated with fishhook or ornament production (Table 7.21; Figure 7.13). These latter three categories include whole blanks, blank fragments, and detritus. These specimens are conservatively classified because they either exhibit traits that are characteristic of both fishhooks and ornaments or they are too fragmented to classify with certainty. Considering the quantity of fishhooks versus ornaments at CA-SNI-25, however, it is likely that those fragments are part of a hook-making assemblage.

Table 7.21. Shell Fishhook and other Manufacturing Items by Artifact Category, Count, and Weight (g).

	East Locus				Mound B				Total		Total	
Category	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
Fishhook	8	4	6.83	2	-	-	-	-	8	3	6.83	1
Fishhook Frag.	48	27	29.00	7	28	26	23.02	6	76	26	52.02	6
Fishhook Blank	27	15	152.64	35	20	18	115.72	32	47	16	268.36	33
Fishhook Blank Frag.	29	16	85.93	19	19	17	74.09	20	48	17	160.02	20
Fishhook/Ornament Blank	16	9	68.98	16	14	13	80.36	22	30	10	149.34	19
Fishhook/Ornament Blank Frag.	14	8	29.62	7	8	7	33.48	9	22	8	63.10	8
Fishhook/Ornament Detritus	36	20	68.77	16	20	18	35.20	10	56	20	103.97	13
Total	178	100	441.77	100	109	100	361.87	100	287	100	803.64	100

Collectively, these artifacts comprise nine percent (n=287) of the total number of shell artifacts. Sixty-two (n=178) percent of the shell fishhooks and other manufacturing

Figure 7.13. Examples of Shell Fishhook Blanks (top and middle rows) and Finished Hooks (bottom row).

items were recovered from East Locus. The majority (n=245, 85%) of these items from both loci is made up of *H. rufescens* followed by *H. cracherodii* (n=26, 9%; Table 7.22).

Shell Fishhook Overview

Table 7.23 summarizes the different fishhook styles and hook orientations identified at the two loci by marine shell species. Two fishhooks styles were identified: circular and J-shaped. Fishhooks that were too fragmented to attribute to a specific style were classified in a third category – indeterminate. Collectively, whole fishhooks and fragments (n=84) comprise 29 percent of the total assemblage containing shell fishhooks and other manufacturing items.

In addition to style, fishhooks are classified based on orientation of the hook (i.e., direction of hook curvature): hooks orientated to the left (n=38, 45%), right (n=4, 5%),

Table 7.22. Shell Fishhook and other Manufacturing Items by Artifact Category, Species, Count, and Weight (g).

	H. cracherodii				*H. rufescens*				*Haliotis* spp.				*M. californianus*				*N. norrisi*				Total		Total	
Category[a]	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
East Locus																								
F	2	14	1.29	3	6	4	5.54	1	-	-	-	-	-	-	-	-	-	-	-	-	8	3	6.83	1
Ff	-	-	-	-	41	27	25.97	7	3	43	1.56	26	-	-	-	-	4	100	1.47	100	48	17	29.00	4
FB	3	21	30.58	67	23	15	121.25	31	1	14	0.81	14	-	-	-	-	-	-	-	-	27	9	152.64	19
FBf	4	29	6.49	14	25	16	79.44	21	-	-	-	-	-	-	-	-	-	-	-	-	29	10	85.93	11
FOB	1	7	2.00	4	14	9	65.85	17	-	-	-	-	1	100	1.13	100	-	-	-	-	16	6	68.98	9
FOBf	1	7	1.01	2	11	7	25.25	7	2	29	3.36	57	-	-	-	-	-	-	-	-	14	5	29.62	4
FOd	3	21	4.47	10	32	21	64.11	17	1	14	0.19	3	-	-	-	-	-	-	-	-	36	13	68.77	9
Subtotal	14	100	45.84	100	152	100	387.41	100	7	100	5.92	100	1	100	1.13	100	4	100	1.47	100	178	62	441.77	55
Mound B																								
Ff	-	-	-	-	25	27	20.97	8	2	100	0.58	100	-	-	-	-	1	100	1.47	100	28	10	23.02	3
FB	4	33	34.04	36	16	17	81.68	31	-	-	-	-	-	-	-	-	-	-	-	-	20	7	115.72	14
FBf	2	17	36.92	39	17	18	37.17	14	-	-	-	-	-	-	-	-	-	-	-	-	19	7	74.09	9
FOB	1	8	17.38	18	13	14	62.98	24	-	-	-	-	-	-	-	-	-	-	-	-	14	5	80.36	10
FOBf	1	8	4.24	4	7	8	29.24	11	-	-	-	-	-	-	-	-	-	-	-	-	8	3	33.48	4
FOd	4	33	3.24	3	15	16	31.29	12	-	-	-	-	1	100	0.67	100	-	-	-	-	20	7	35.2	4
Subtotal	12	100	95.82	100	93	100	263.33	100	2	100	0.58	100	1	100	0.67	100	1	100	1.47	100	109	38	361.87	45
Total	26	N/A	141.66	N/A	245	N/A	650.74	N/A	9	N/A	6.50	N/A	2	N/A	1.80	N/A	5	N/A	2.94	N/A	287	100	803.64	100

[a]F = Fishhook; Ff = Fishhook fragment; FB = Fishhook Blank; FBf = Fishhook Blank fragment; FOB = Fishhook/Ornament Blank; FOBf = Fishhook/Ornament Blank fragment; FOd = Fishhook/Ornament detritus.

Table 7.23. Total Shell Fishhook Assemblage by Fishhook Style, Curvature, Count, and Weight (g).

Fishhook Style	Left				Right				Undetermined				Total		Total	
and Species	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
Circular																
H. cracherodii	1	8	0.76	8	1	33	0.53	29	-	-	-	-	2	2	1.29	2
H. rufescens	10	83	7.91	86	2	67	1.28	71	10	100	2.06	100	22	26	11.25	19
Haliotis spp.	1	8	0.57	6	-	-	-	-	-	-	-	-	1	1	0.57	1
Subtotal	12	100	9.24	100	3	100	1.81	100	10	100	2.06	100	25	30	13.11	22
J-Shaped																
H. rufescens	18	86	18.08	85	1	100	4.06	100	12	86	9.11	96	31	37	31.25	53
Haliotis spp.	1	5	1.26	6	-	-	-	-	1	7	0.19	2	2	2	1.45	2
N. Norrisi	2	10	2.01	9	-	-	-	-	1	7	0.21	2	3	4	2.22	4
Subtotal	21	100	21.35	100	1	100	4.06	100	14	100	9.51	100	36	43	34.92	59
Indeterminate																
H. rufescens	4	80	2.17	78	-	-	-	-	15	83	7.81	97	19	23	9.98	17
Haliotis spp.	-	-	-	-	-	-	-	-	2	11	0.12	1	2	2	0.12	<1
N. Norrisi	1	20	0.6	22	-	-	-	-	1	6	0.12	1	2	2	0.72	1
Subtotal	5	100	2.77	100	-	-	-	-	18	100	8.05	100	23	27	10.82	18
Total	38	N/A	33.36	N/A	4	N/A	5.87	N/A	42	N/A	19.62	N/A	84	100	58.85	100

and hooks too fragmented to accurately determine orientation (n=42, 50%). Fishhooks with intact shanks were also classified based on shank style: knobbed and grooved.

Circular Shell Fishhooks

Twenty-five (30%) circular fishhooks were identified: 19 (76%) from East Locus and six (24%) from Mound B (Table 7.24). The majority (n=22, 88%) was manufactured from *H. rufescens*; however, two *H. cracherodii* hooks were found at East Locus. One of the *H. cracherodii* hooks is orientated to the right. In total, three fishhooks (12%) have

Table 7.24. Circular Shell Fishhook Assemblage by Location, Curvature, Count and Weight (g).

Location and	Left				Right				Undetermined				Total		Total	
Species	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
East Locus																
H. cracherodii	1	11	0.76	10	1	33	0.53	29	-	-	-	-	2	8	1.29	10
H. rufescens	8	89	6.5	90	2	67	1.28	71	7	100	1.78	100	17	68	9.56	73
Subtotal	9	100	7.26	100	3	100	1.81	100	7	100	1.78	100	19	76	10.85	83
Mound B																
H. rufescens	2	67	1.41	71	-	-	-	-	3	100	0.28	100	5	20	1.69	13
Haliotis spp.	1	33	0.57	29	-	-	-	-	-	-	-	-	1	4	0.57	4
Subtotal	3	100	1.98	100	-	-	-	-	3	100	0.28	100	6	24	2.26	17
Total	12	N/A	9.24	N/A	3	N/A	1.81	N/A	10	N/A	2.06	N/A	25	100	13.11	100

right-hook orientation and all are from East Locus. This style of hook is uncommon compared to those with left (n=12, 48%) and undetermined (n=10, 40%) orientations.

J-Shaped Shell Fishhooks

Thirty-six (43%) J-shaped fishhooks were identified with the majority (n=24, 67%) recovered from East Locus followed by Mound B (n=12, 33%) (Table 7.25). In addition to *H. rufescens* (n=31, 86%) and undifferentiated *Haliotis* spp. (n=2, 6%), three (8%) *N. norrisi* hooks were identified. As with circular hooks, the majority (n=21, 58%)

Table 7.25. J-Shaped Shell Fishhook Assemblage by Location, Curvature, Count, and Weight (g).

Location and	Left				Right				Undetermined				Total		Total	
Species	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
East Locus																
H. rufescens	12	86	10.36	85	-	-	-	-	8	80	6.28	94	20	56	16.64	48
Haliotis spp.	1	7	1.26	10	-	-	-	-	1	10	0.19	3	2	6	1.45	4
N. norrisi	1	7	0.54	4	-	-	-	-	1	10	0.21	3	2	6	0.75	2
Subtotal	14	100	12.16	100	-	-	-	-	10	100	6.68	100	24	67	18.84	54
Mound B																
H. rufescens	6	86	7.72	84	1	100	4.06	100	4	100	2.83	100	11	31	14.61	42
N. norrisi	1	14	1.47	16	-	-	-	-	-	-	-	-	1	3	1.47	4
Subtotal	7	100	9.19	100	1	100	4.06	100	4	100	2.83	100	12	33	16.08	46
Total	21	N/A	21.35	N/A	1	N/A	4.06	N/A	14	N/A	9.51	N/A	36	100	34.92	100

of J-shaped fishhooks are orientated to the left. Of the 36 J-shaped hooks found at both loci, 11 (31%) have knobbed shanks. Nine (82%) of these hooks are orientated to the left and two (18%) are undetermined. Additionally, one *H. rufescens* J-shaped hook fragment from East Locus has a grooved shank (Figure 7.14). The remaining 24 hooks have broken shanks and consequently, shank style cannot be determined.

Figure 7.14. *H. rufescens* J-Shaped Fishhook Fragment with Grooved Shank.

Indeterminate Shell Fishhooks

Due to broken hooks and/or shanks, fishhook style could not be determined for 23 (27%) of the fishhooks recovered from East Locus and Mound B (Table 7.26). Additionally, orientation for the majority (n=18, 78%) of fishhooks could not be

Table 7.26. Indeterminate Shell Fishhook Assemblage by Location, Curvature, Count, and Weight (g).

	Left				Undetermined							
Location and Species	Cnt	%	Wt	%	Cnt	%	Wt	%	Total Cnt	%	Total Wt	%
East Locus												
H. rufescens	1	50	0.30	33	9	82	5.01	96	10	43	5.31	49
Haliotis spp.	-	-	-	-	1	9	0.11	2	1	4	0.11	1
N. Norrisi	1	50	0.60	67	1	9	0.12	2	2	9	0.72	7
Subtotal	2	100	0.90	100	11	100	5.24	100	13	57	6.14	57
Mound B												
H. rufescens	3	100	1.87	100	6	86	2.80	100	9	39	4.67	43
Haliotis spp.	-	-	-	-	1	14	0.01	0	1	4	0.01	0
Subtotal	3	100	1.87	100	7	100	2.81	100	10	43	4.68	43
Total	5	N/A	2.77	N/A	18	N/A	8.05	N/A	23	100	10.82	100

determined. However, five (22%) left-orientated hooks were identified, one from East Locus was made of *N. norrisi*.

Of the 23 indeterminate fishhooks, two (9%) have knobbed shanks. Both of these hooks are orientated to the left and manufactured from *H. rufescens*. One was recovered from each locus. For the remaining (n=21 91%) fishhook fragments, shank style cannot be determined.

<u>Fishhook and Fishhook/Ornament Blanks</u>

Teardrop-shaped whole blanks and fragments are classified as fishhook blanks. In contrast, specimens with chipped and ground edges that lack definite teardrop shapes are conservatively categorized as fishhook/ornament blanks as they may be associated with either fishhook or ornament production. Fifty-two (35%) specimens are classified in this indeterminate category, while 95 (65%) are identified as whole fishhook blanks and fragments (Table 7.22). Of these 147 artifacts, the majority (n=86, 59%) was recovered from East Locus.

While three different marine shell species were identified in addition to undifferentiated *Haliotis* spp., the majority (n=126, 86%) of whole blanks and fragments were manufactured from *H. rufescens* followed by *H. cracherodii* (n=17, 12%). One unusual find, a *M. californianus* fishhook/ornament blank, was recovered from Mound B. In addition to marine shell species, the whole blanks and fragments were classified into different stages based on Strudwick's (1985) typology. One hundred eighteen (80%) of the blanks are categorized as Stage 1, 28 (19%) as Stage 2, and one (1%) as Stage 3.

Fishhook/Ornament Detritus

Fifty-six pieces of detritus associated with fishhook and ornament production were found at the two loci, the majority (n=36, 64%) from East Locus (Table 7.22). The detritus is made up of three different marine shell species including *H. rufescens* (n=47, 84%), *H. cracherodii* (n=7, 12%), *M.* californianus (n=1, 2%), and undifferentiated *Haliotis* spp. (n=1, 2%).

In addition to species, the fishhook/ornament detritus is classified into four general size classes (Table 7.27). Twenty-six (46%) pieces are grouped in the 2.70 to 25.39 mm (0.50-0.99 in) size class and 19 (34%) pieces fall within the 6.35 to 12.69 mm (0.25-0.49 in) size range.

Table 7.27. Fishhook/Ornament Detritus Size Classification by Location, Count, and Weight (g).

Size Classification	East Locus				Mound B							
(mm)	Cnt	%	Wt	%	Cnt	%	Wt	%	Total Cnt	%	Total Wt	%
3.175-6.34	2	6	0.25	0	1	5	0.22	1	3	5	0.47	0
6.35-12.69	14	39	6.74	10	5	25	3.32	9	19	34	10.06	10
12.70-25.39	15	42	30.68	45	11	55	25.57	73	26	46	56.25	54
≥25.40	5	14	31.1	45	3	15	6.09	17	8	14	37.19	36
Total	36	100	68.77	100	20	100	35.2	100	56	100	103.97	100

Shell Tool Assemblage

A variety of shell tools were recovered from the two loci, including specimens that may have functioned as caulking tools, adzes, reamers, and scrapers. These tools consist of shell margin fragments and whole or nearly whole shells with extensive modification including grinding, cutting, chipping, and drilling. In addition to these modifications, some shell tools contain asphaltum residue. The types of activities that could have likely produced wear marks on the shell tools include cutting and abrading.

Some of the abalone margin tools may have functioned as sweat scrapers or body scratchers. A total of 22 shell tools were identified at the two loci. Although Mound B contains slightly more (n=12, 55%) tools, the 10 (45%) tools from East Locus contribute the majority (59%) of the total shell tools by weight.

Shell tools were manufactured from three different marine shell species (Table 7.28). The majority (n=13, 59%) of shell tools were manufactured from *H cracherodii* followed by *H. rufescens* (n=6, 27%). Seven of these abalone tools have polished/ground areas on the dorsal surfaces, which may reflect where the tool was held in the hand and worn with repeated use (Figure 7.15A).

Table 7.28. Shell Tool Assemblage by Species, Count, and Weight (g).

	East Locus				Mound B							
Species	Cnt	%	Wt	%	Cnt	%	Wt	%	Total Cnt	%	Total Wt	%
H. cracherodii	7	70	250.38	69	6	50	110.14	45	13	59	360.52	59
H. rufescens	2	20	83.04	23	4	33	128.86	52	6	27	211.90	35
M. californianus	1	10	28.62	8	2	17	7.87	3	3	14	36.49	6
Total	10	100	362.04	100	12	100	246.87	100	22	100	608.91	100

One *H. cracherodii* shell tool from Mound B has asphaltum on one end and has been chipped and ground (Figure 7.15B). This specimen may have been used as a caulking tool to apply asphaltum. A *M. californianus* shell tool, also from Mound B, is ground flat with extensively chipped and ground edges to form a leaf shape (Figure 7.15C). Asphaltum is present on the base, suggesting the tool may have been hafted at one time. With the exception of these two tools from Mound B, the shell tools from both loci appear to have similar modifications, suggesting similar types of processing activities were carried out at the two loci.

Figure 7.15. Examples of Shell Tools. (A) *H. cracherodii* tool with chipped margin and ground dorsal surface. (B) *H. cracherodii* tool with chipped and ground margin containing asphaltum (possible caulking tool). (C) *M. californianus* ground leaf-shaped tool.

Modified Shell

The artifact assemblage analyzed in this thesis includes modified shell produced during different processing and manufacturing stages. Types of modification include cutting, chipping, grinding, a combination of these types, and/or modification with the presence of asphaltum residue. Modified shell makes up 22 percent of the total shell assemblage count and 63 percent of its total weight. Density of modified shell is greater (27/m^3; 220g/m^3) at Mound B than East Locus (17.5/m^3; 177.76g/m^3).

The assemblage is comprised of ten different marine shell species in addition to unidentified clam and undifferentiated *Haliotis* spp. (Table 7.29). Three fossil shells are included in the modified shell assemblage. One fossil *H. cracherodii* shell is from Mound B, while one fossil clam shell and one fossil *M. californianus* shell are from East Locus. While *H. cracherodii* makes up the majority (n=370, 53%) of the total count, *H.*

Table 7.29. Modified Shell Assemblage by Species, Count, and Weight (g).[a]

	East Locus				Mound B							
Species	Cnt	%	Wt	%	Cnt	%	Wt	%	Total Cnt	%	Total Wt	%
A. undosa	10	3	127.5	4	5	1	37.98	1	15	2	165.48	3
Clam	3	1	22.58	1	3	1	12.85	<1	6	1	35.43	1
C. gigantea	1	<1	12.11	<1	-	-	-	-	1	<1	12.11	<1
C. spadicea	1	<1	15.21	<1	2	1	29.22	1	3	<1	44.43	1
H. cracherodii	140	47	1,215.39	40	230	58	1,411.72	44	370	53	2,627.11	42
H. rufescens	121	40	1,555.88	51	127	32	1,600.68	50	248	36	3,156.56	50
Haliotis spp.	2	1	9.56	<1	2	1	7.39	<1	4	1	16.95	<1
Lottia gigantea	1	<1	4.77	<1	1	<1	13.06	<1	2	<1	17.83	<1
M. crenulata	1	<1	2.52	<1	1	<1	20.72	1	2	<1	23.24	<1
M. californianus	12	4	52.41	2	21	5	66.31	2	33	5	118.72	2
N. norrisi	8	3	31.15	1	2	1	9.74	<1	10	1	40.89	1
T. quadragenarium	1	<1	8.43	<1	-	-	-	-	1	<1	8.43	<1
Total	301	100	3,057.51	100	394	100	3,209.67	100	695	100	6,267.18	100

[a]Includes modified fossil shell.

rufescens contributes the greatest (50%) weight. Relatively equal numbers of *H. cracherodii* (n=140) and *H. rufescens* (n=121) were recovered from East Locus while Mound B contained almost twice as much *H. cracherodii* (n=230) as *H. rufescens* (n=127).

Of the different types of modifications, cutting is the most common (56-57%) followed by grinding (25%) (Table 7.30). In addition to modification types, modified

Table 7.30. Shell Modification Types for East Locus and Mound B by Percentage.[a]

	Modification Type					
Location	Cut	Chipped	Ground	Drilled	Asphaltum Residue	Total
East Locus	56	10	25	0	9	100
Mound B	57	10	25	1	7	100

[a]Includes modified fossil shell.

shells are classified in three general size categories (Table 7.31). The majority (n=481, 69%) are grouped into the largest size category followed by the medium size range (n=197, 28%). When comparing the two loci, the relative proportions of quantities of shells in the different size classes are similar. Additionally, a total of 460 marine shell

Table 7.31. Modified Shell Size Classification by Location, Count, and Weight (g).

Size Classification	East Locus				Mound B				Total		Total	
(mm)	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
6.35-12.69	9	3	6.81	<1	8	2	6.64	<1	17	2	13.45	<1
12.70-25.39	75	25	183.23	6	122	31	297.44	9	197	28	480.67	8
≥25.40	217	72	2,867.47	94	264	67	2,905.59	91	481	69	5,773.06	92
Total	301	100	3,057.51	100	394	100	3,209.67	100	695	100	6,267.18	100

fragments were examined that could potentially represent shatter or waste debris. Unlike specimens in the modified shell assemblage, these shells exhibit expedient modification likely produced as a waste product during different processing and manufacturing stages of formal artifact production. These shells collectively weigh 3,054.25 g and include *H. cracherodii*, *H. rufescens*, and undifferentiated *Haliotis* spp. Currently, these shells are not formally included in the artifact assemblage analysis; however, with further study they may provide important information regarding manufacturing processes and production sequences.

Whole and Fragments of Shell with Asphaltum

In contrast to modified shells, the assemblage of whole and fragments of shell with asphaltum contains shells with asphaltum but no other evidence of modification (e.g., cutting, chipping, grinding, drilling). For these 87 specimens, it is uncertain whether asphaltum was intentionally applied to the shells or it inadvertently adhered to their surfaces (Table 7.32). Six (7%) whole shells containing asphaltum were identified. The remaining (n=81, 93%) shells are fragments with the majority (n=55, 68%) recovered from East Locus. Shell density is approximately one and a half times greater at East Locus (23.71 g/m^3) compared to Mound B (14.69 g/m^3).

Table 7.32. Whole and Fragments of Shell with Asphaltum by Location, Count, and Weight (g).

	Whole				Fragment				Total		Total	
Location and Species	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
East Locus												
H. cracherodii	4	100	108.07	100	25	45	165.22	55	29	33	273.29	44
H. rufescens	-	-	-	-	13	24	93.62	31	13	15	93.62	15
Haliotis spp.	-	-	-	-	11	20	34.57	12	11	13	34.57	6
M. californianus	-	-	-	-	6	11	6.36	2	6	7	6.36	1
Subtotal	4	100	108.07	100	55	100	299.77	100	59	68	407.84	66
Mound B												
H. cracherodii	2	100	122.68	100	17	65	83.03	91	19	22	205.71	33
H. rufescens	-	-	-	-	4	15	3.63	4	4	5	3.63	1
Haliotis spp.	-	-	-	-	4	15	4.21	5	4	5	4.21	1
M. californianus	-	-	-	-	1	4	0.85	1	1	1	0.85	<1
Subtotal	2	100	122.68	100	26	100	91.72	100	28	32	214.4	34
Total	6	N/A	230.75	N/A	81	N/A	391.49	N/A	87	100	622.24	100

At both loci, *H. cracherodii* dominates (n=48, 55%) the counts followed by *H. rufescens* (n=17, 20%). *M. californianus* is the only other species identified at the two loci and contributes little (n=7, 8%) to the overall count. As with modified shell, whole and fragments of shell with asphaltum are classified into four general size categories (Table 7.33). The majority (n=44, 51%) of shell is grouped into the largest size category followed by the 12.70 mm to 25.39 mm size range (n=29, 33%). Few (n=14, 16%) shells measure less than 6.35 mm.

Table 7.33. Whole and Fragments of Shell with Asphaltum Size Classification by Location, Count, and Weight (g).

Size Classification	East Locus				Mound B							
(mm)	Cnt	%	Wt	%	Cnt	%	Wt	%	Total Cnt	%	Total Wt	%
3.175-6.34	1	2	0.2	<1	-	-	-	-	1	1	0.2	<1
6.35-12.69	9	15	1.89	<1	4	14	1.17	1	13	15	3.06	<1
12.70-25.39	20	34	46.32	11	9	32	20.04	9	29	33	66.36	11
≥25.40	29	49	359.43	88	15	54	193.19	90	44	51	552.62	89
Total	59	100	407.84	100	28	100	214.40	100	87	100	622.24	100

Miscellaneous Shell Artifacts

Asphaltum Container

In contrast to specimens classified as whole shells with asphaltum, three whole *H. cracherodii* shells containing large amounts of asphaltum on their ventral surfaces were classified as asphaltum containers (Table 7.9). These three artifacts, with their concentrations of asphaltum, contribute three percent of the total weight of shell artifacts. The two containers recovered from East Locus are almost identical, while the one from Mound B contains both asphaltum and pieces of ochre (Figure 7.16).

Figure 7.16. *H. cracherodii* Asphaltum Container. Note pieces of ochre within the interior of the shell.

Pearl

Four undifferentiated *Haliotis* spp. pearls were recovered, two from each locus (Table 7.9). One pearl from Mound B has asphaltum on its surface, suggesting the pearl may have been attached to something. At East Locus, one pearl has a decorative line incised at one end (Figure 7.17). This pearl may have been attached to something as well. The remaining two pearls exhibit no evidence of modification.

Figure 7.17. Incised Pearl.

Overview of the Exotic Stone Artifact Assemblage

The exotic stone artifact assemblage analyzed in this thesis is comprised of 41 artifacts that contribute one percent of the total artifact assemblage's count and weight. The need to import these stone materials from Santa Catalina Island and the mainland may be a factor in why exotic stone artifacts are much less abundant than shell artifacts.

The exotic stone artifact assemblage is comprised of two types of stone – steatite and serpentine (Table 7.34). Steatite is differentiated into two types based on hardness or grain size: coarse-grained (soft) and fine-grained (hard). The majority (n=27, 66%) of stone artifacts were manufactured from steatite. However, when distinguishing between the two varieties of steatite, coarse-grained steatite is less (n=8, 20%) abundant compared

Table 7.34. Stone Artifact Assemblage by Material, Count, and Weight (g).

Material	East Locus Cnt	%	Wt	%	Mound B Cnt	%	Wt	%	Total Cnt	%	Total Wt	%
Serpentine	7	30	0.17	1	7	39	0.22	1	14	34	0.39	<1
Coarse-Grained Steatite	3	13	11.17	9	5	28	17.66	66	8	20	28.83	20
Fine-Grained Steatite	13	57	106.34	90	6	33	8.78	33	19	46	115.12	80
Total	23	100	117.68	100	18	100	26.66	100	41	100	144.34	100

to serpentine (n=14, 34%). Although serpentine is found in greater numbers than coarse-grained steatite, it contributes less than one percent of the total weight of exotic stone artifacts. The two forms of steatite and serpentine were used to produce a variety of objects that appear to be utilitarian, ornamental, and perhaps ceremonial in function (Table 7.35).

Table 7.35. Stone Artifact Assemblage by Location, Material, Count, and Weight (g).

Location and Category	Serpentine Cnt	%	Wt	%	Coarse-Grained Steatite Cnt	%	Wt	%	Fine-Grained Steatite Cnt	%	Wt	%	Total Cnt	%	Total Wt	%
East Locus																
Bead	7	100	0.17	100	1	33	0.02	<1	6	46	0.63	1	14	34	0.82	1
Bowl Fragment	-	-	-	-	-	-	-	-	1	8	36.34	34	1	2	36.34	25
Doughnut Stone	-	-	-	-	-	-	-	-	1	8	51.17	48	1	2	51.17	35
Ornament	-	-	-	-	2	67	11.15	100	3	23	10.55	10	5	12	21.70	15
Undiff. Groundstone	-	-	-	-	-	-	-	-	2	15	7.65	7	2	5	7.65	5
Subtotal	7	100	0.17	100	3	100	11.17	100	13	100	106.34	100	23	56	117.68	82
Mound B																
Bead	7	100	0.22	100	2	40	0.27	2	5	83	0.24	3	14	34	0.73	1
Bowl Fragment	-	-	-	-	1	20	13.06	74	-	-	-	-	1	2	13.06	9
Ornament	-	-	-	-	1	20	0.61	3	-	-	-	-	1	2	0.61	<1
Pipe Fragment	-	-	-	-	1	20	3.72	21	-	-	-	-	1	2	3.72	3
Undiff. Groundstone	-	-	-	-	-	-	-	-	1	17	8.54	97	1	2	8.54	6
Subtotal	7	100	0.22	100	5	100	17.66	100	6	100	8.78	100	18	44	26.66	18
Total	14	N/A	0.39	N/A	8	N/A	28.83	N/A	19	N/A	115.12	N/A	41	100	144.34	100

Stone Beads

Beads are the most common (68%) type of exotic stone artifact at East Locus and Mound B (Table 7.35; Figure 7.18). A total of 28 beads were recovered with 14 found at each locus. Each locus has equal numbers of steatite (n=7) and serpentine (n=7) beads.

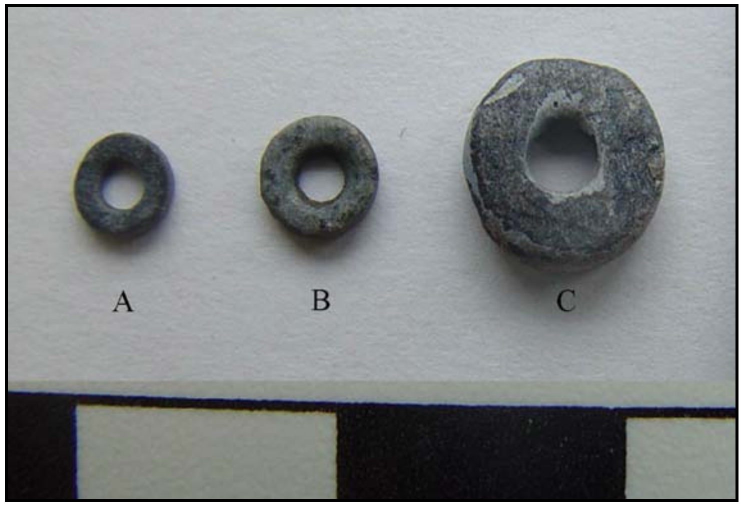

Figure 7.18. Exotic Stone Disk Beads. (A) Serpentine bead. (B) Steatite (fine-grained variety) bead. (C) Steatite (coarse-grained variety) bead.

However, when differentiating between the two varieties of steatite, the coarse-grained variety comprises a small (n=3, 11%) portion of the total bead count. That serpentine was manufactured into beads could be a product of its rarity in island contexts and its relatively high value as a trade item from the mainland. Steatite on the other hand, is widely available on nearby Santa Catalina Island, is an excellent conductor of heat, is relatively soft and easy to modify, and was used in the production of a variety of items, especially utilitarian goods.

In addition to material type, stone beads are classified in two categories based on shape: disk and cylinder (Table 7.36). Twenty-six (93%) of the beads are disks and two (7%) are cylinders. Both cylinder beads are made of serpentine, while disks are made of serpentine and both varieties of steatite. Serpentine (n=12, 46%) and fine-grained steatite (n=11, 42%) dominate the disk bead assemblage.

Table 7.36. Stone Bead Assemblage by Location, Bead Type, Count, and Weight (g).

	Disk				Cylinder				Total		Total	
Location and Material	Cnt	%	Wt	%	Cnt	%	Wt	%	Cnt	%	Wt	%
East Locus												
Serpentine	5	42	0.13	17	2	100	0.04	100	7	25	0.17	11
Coarse-Grained Steatite	1	8	0.02	3	-	-	-	-	1	4	0.02	1
Fine-Grained Steatite	6	50	0.63	81	-	-	-	-	6	21	0.63	41
Subtotal	12	100	0.78	100	2	100	0.04	100	14	50	0.82	53
Mound B												
Serpentine	7	50	0.22	30	-	-	-	-	7	25	0.22	14
Coarse-Grained Steatite	2	14	0.27	37	-	-	-	-	2	7	0.27	17
Fine-Grained Steatite	5	36	0.24	33	-	-	-	-	5	18	0.24	15
Subtotal	14	100	0.73	100	-	-	-	-	14	50	0.73	47
Total	26	N/A	1.51	N/A	2	N/A	0.04	N/A	28	100	1.55	100

Stone Ornaments

Ornaments are the second (15%) most common type of artifact in the exotic stone artifact assemblage (Table 7.35). A total of six ornaments were identified with five recovered from East Locus and one from Mound B. The one exotic stone ornament from Mound B is made of coarse-grained steatite and has both sides ground flat to form a triangular shape (Figure 7.19A)

Three ornaments from East Locus appear to be pendants. One pendant, made of coarse-grained steatite, is an oblong trapezoidal shape and has a perforation at one end (Figure 7.19B). The other two pendants are made of fine-grained steatite. One is a flattened triangular shape and is notched and drilled at one end giving it a fish-like appearance (Figure 7.19C). The third pendant is narrow oblong-shaped with one end terminating in a spherical knob (Figure 7.19D).

The fourth ornament at East Locus is made of coarse-grained steatite and is rectangular-shaped (Figure 7.19E). One side is concave with crisscrossing lines incised on both sides of the ornament. The fifth ornament from East Locus is made of fine-grained steatite, is bi-pointed, and has a groove etched in the center (Figure 7.19F). This object may have functioned as a fastener or button.

Figure 7.19. Steatite Ornaments. (A) Triangular-shaped ornament fragment. (B) Trapezoidal pendant fragment. (C) Fish-like ornament. (D) Knobbed pendant fragment. (E) Ornament fragment with incised cross-hatching. (F) Bi-pointed fastener or button.

<u>Stone Bowls</u>

Two exotic stone bowl fragments were recovered, one from each locus. Both fragments are made of coarse-grained steatite and contribute 34 percent of the total weight of the exotic stone assemblage. The specimen from East Locus consists of a fragment of the interior wall portion of a bowl, while the one from Mound B is a rim fragment.

<u>Doughnut Stone</u>

Doughnut stones are circular stones or disks with large central perforations. One fine-grained steatite doughnut stone was recovered from East Locus (Table 7.35; Figure

7.20). It has seven lines incised on one side of the stone that radiate outward from the central perforation. Asphaltum residue is evident on the inside of the perforation, while a small amount of ochre residue is present on the outer surface of the stone. Two ends of

Figure 7.20. Steatite Doughnut Stone with Incised Lines.

the doughnut stone are slightly battered and worn. The exact function of the stone is unknown. Possible functions include a digging stick weight, net weight, head of a sun staff, compass stone (i.e., used to calculate time/direction and/or as a talisman; Hudson and Blackburn 1982:363-365), or other utilitarian or ritualistic uses. However, digging stick and net weights found on San Nicolas Island were typically manufactured from locally available sandstone. The use of a valuable exotic material to manufacture the doughnut stone potentially strengthens the argument for a ceremonial function rather than a utilitarian one.

Stone Pipe Fragment

A stone pipe fragment was found at Mound B. The fragment is made of coarse-grained steatite and consists of the end of a pipe.

Undifferentiated Groundstone

Three artifacts are classified as undifferentiated groundstone and were manufactured from fine-grained steatite (Table 7.35). One groundstone fragment, recovered from Mound B, is ground on one side to form a linear concave indentation. This artifact's function is unknown; however, it may reflect a failed production attempt of an item such as a pipe or bowl.

One of the undifferentiated groundstone artifacts from East Locus consists of a convex-shaped stone with a half-ring appearance. A line is incised along the middle of the stone's apex (Figure 7.21A). Both ends of the stone are ground flat and when resting on its ends, the artifact balances perfectly (Figure 7.21B). The function of this object is unknown.

Figure 7.21. Steatite Half-Ring Groundstone Artifact. (A) View from top (note incised line). (B) View from side.

The third undifferentiated groundstone artifact, also from East Locus, is rectangular-shaped. One end of the stone is indented, and the adjacent surface has been partially drilled. The stone artifact was found associated with an articulated fish vertebrae column (Figure 7.22). Although its exact function is unknown, the artifact's association with fish remains suggests it may have been utilized in fishing activities.

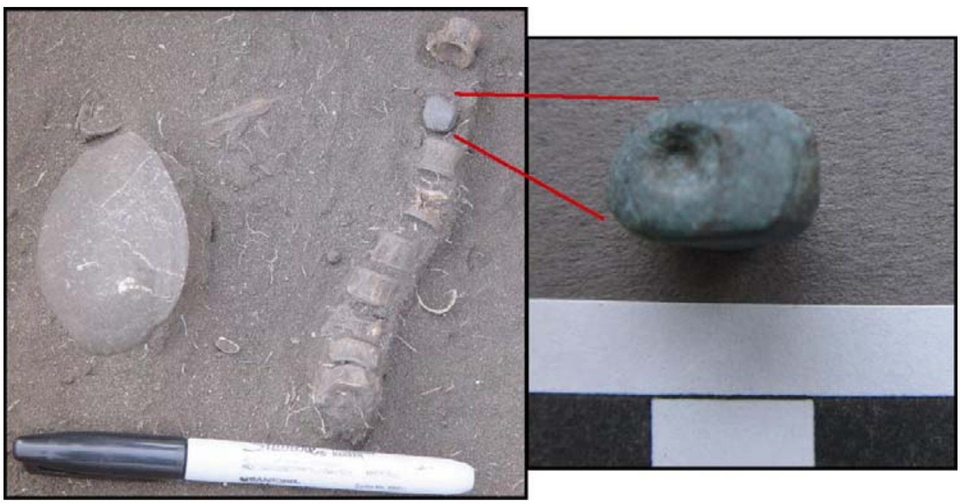

Figure 7.22. Steatite Groundstone Artifact Found in Direct Association with an Articulated Fish Vertebrae Column.

Overall, this chapter has provided a review of the results of excavation and artifact analyses. Results of analyses focused primarily on artifact quantities, material types, and stylistic variations. In the following chapter, I examine these results within a broader context by examining spatial and temporal artifact distribution patterns at East Locus and Mound B and tie these patterns to daily activities within a village setting.

CHAPTER 8. DISCUSSION

Introduction

In this chapter I discuss and compare the spatial and temporal distributions of artifacts at East Locus and Mound B and examine them within a context of daily activities, domestic and ceremonial space, and interactions with neighboring groups. To understand CA-SNI-25 within an island-wide context, I compare the village to other sites located on San Nicolas Island. I focus primarily on artifact assemblages and their spatial distributions to better understand the nature of activities as CA-SNI-25 and how the villagers may have been connected to other groups on the island. To better understand interactions and cultural ties between the people of San Nicolas Island and other groups on the Channel Islands, I compare CA-SNI-25 to two sites – one located on San Clemente Island and the other on Santa Cruz Island. Finally, I compare the relative importance of the material culture from San Nicolas Island with that produced on the other Channel Islands and mainland to examine the roles Native people of San Nicolas Island played within regional social and economic interaction spheres.

Artifact Distributions at CA-SNI-25

Artifact Density

Artifact density within a site reflects the relative intensity of cultural activities, which is a function of population size, length of occupation, and the amount of waste generated by activities carried out at the site. Greater artifact density typically indicates more intensive occupation at the site. At CA-SNI-25, occupation occurred over a period of at least 4,000 years with the most intensive occupation occurring over a 500-year period. Artifact density is slightly greater at Mound B compared to East Locus. It is possible Mound B was occupied for a greater period of time as suggested by the wider range of radiocarbon dates compared to those for East Locus. For example, the majority of radiocarbon dates from East Locus cluster between about A.D. 1400 and A.D. 1670. Greater artifact density at Mound B, however, may be a function of the types of activities carried out in the past. Continued excavations at Mound B will shed more light on the nature and intensity of human activity that took place in the past.

Nevertheless, artifact densities were greatest at both loci in Stratum II. In general, artifact counts gradually increase beginning in the lower levels of Stratum II and reach a maximum in the upper levels of the stratum. Counts then decrease for Stratum I, reflecting the last phase of occupation and final abandonment of the site. Fluctuations in artifact densities in Stratum II across the site may reflect short periods of site abandonment or discontinued use of certain areas followed by re-use.

Marine Shell Species

Marine shell species composition does not appear to change over time at CA-SNI-25. *Olivella* shells dominate the shell artifact assemblage, reflecting an extensive shell bead industry and the importance of *Olivella* beads in regional socioeconomic spheres. The abundance of *H. rufescens* at both loci attests to a shell artifact manufacturing industry that focused on the production of utilitarian and decorative items like fishhooks, ornaments, and beads. While *H. rufescens* dominates the formal shell artifact assemblage, the majority of modified shell found at both loci is comprised of *H. cracherodii*.

The difference in relative abundance of these two species may reflect a more efficient and economical use of *H. rufescens* compared to *H. cracherodii*. For instance, *H. rufescens* appears to have been the species of choice for fishhook and ornament production. This specific use of the shell for formal artifact production may have resulted in little manufacturing debris compared to the more general use of *H. cracherodii*. Considering that *H. rufescens* is commonly found in deep waters ranging between 20 and 40 meters and *H. cracherodii* occurs at depths between two and three meters, the greater difficult in obtaining *H. rufescens* may have encouraged efficient use of the shell. Availability of *H. rufescens* may have also been limited as a result of changes in sea surface temperatures and over-harvesting. Although this was the case for the northern Channel Islands, it is uncertain whether such factors limited the availability of *H. rufescens* on San Nicolas Island. If availability was limited, old abalone shells may have been mined from other sites to ensure a continued supply. Nevertheless, it appears *H. rufescens* was continuously, intensively, and efficiently utilized throughout the occupation of CA-SNI-25.

Olivella Shells and Bead Detritus

The variety of *Olivella* bead styles, bead detritus, and whole shells attest to a shell bead manufacturing industry that occurred throughout the occupation of CA-SNI-25. Based on bead styles and their vertical distribution and association with other bead styles and radiocarbon dates, *Olivella* beads from CA-SNI-25 appear to conform to bead chronologies and typologies defined for California and the Great Basin (Bennyhoff and Hughes 1987; Gibson 1992; King 1990).

One bead type of note that deviates slightly from regional typologies includes saddle beads (Class F) recovered from both East Locus and Mound B. This bead type is reported to have been produced in central California (Bennyhoff and Hughes 1987:129-130). Its presence on San Nicolas Island may reflect an interaction sphere with trade networks extending into central California. Alternatively, the presence of saddle beads at CA-SNI-25 may reflect stylistic variation by an individual bead-maker or perhaps a broader region of production encompassing both southern and central California.

In addition to saddle beads, other types of wall beads were recovered from Mound B and East Locus. Based on the ratio of finished wall beads to detritus, it appears that many of the wall beads produced at Mound B (1:5) and East Locus (1:3) were not retained, particularly in the case of Mound B. A similar pattern occurs for callus beads at Mound B (1:3) with production greater than retention. At East Locus, however, production and retention (1:1) of callus beads is approximately equal. Currently, it is uncertain whether some of the beads produced at East Locus and Mound B are located elsewhere at CA-SNI-25 or if they were removed from the site or perhaps the island. This emphasis on wall bead production at CA-SNI-25 is noteworthy considering the village was occupied during a time when callus beads formed the basis of a monetary exchange system in southern California beginning approximately A.D. 1150 (King 1990). If some of the beads at CA-SNI-25 were produced for trade, it is surprising that callus beads were not intensively produced. One possibility is that with intensive callus bead production occurring on Santa Cruz Island (Arnold 1992, 2001), competition may have led the people of San Nicolas Island to instead specialize in wall bead production. Alternatively, wall beads manufactured at CA-SNI-25 may have been used for decorative purposes. Perhaps these decorative items were the focus of trade and not the beads themselves.

Other Shell Beads

In addition to *Olivella*, beads produced from other types of marine shell occur at East Locus and Mound B. Although *H. rufescens* was used to manufacture a variety of shell artifacts, it does not appear to have been the favored material type for bead production. Instead, the majority of beads other than *Olivella* were manufactured from *M. californianus*. Its relative abundance, blue-purple color, and shiny nacreous surface may have made *M. californianus* ideal for bead production as an alternative to *H. rufescens*. The latter species appears to have been specifically targeted for the production of fishhooks and larger ornaments, likely due to the durability of the shell, its nacreous surface, and visually appealing red color. Overall, non-*Olivella* shell beads are present throughout the different strata of East Locus and Mound B with no apparent bead style preference over time.

Shell Ornaments

Ornaments were produced from a variety of marine shell species and shaped into several different styles. The presence of ornament blanks and detritus suggest ornaments were manufactured at both loci. Although several different marine shell species and ornament styles were identified, circular-shaped *H. rufescens* ornaments and blanks appear to be the most common style. Rectangular, square, and ring ornaments were also found, suggesting these stylistic variations were ubiquitous through time. With the exception of a few ornaments (e.g., one with scalloped edges and a button/sequin) styles appear standardized.

King (1990) and Scalise (1994) note ornaments were used as status symbols and important in distinguishing between and identifying different family lineages. Following approximately A.D. 1150 when power may have shifted to the hands of a few individuals rather than lineages, King (1990) and Scalise (1994) argue ornaments became standardized as the need to display lineage affiliation decreased. It is possible that the overall standardization of ornaments at CA-SNI-25 reflects an absence of or minimal lineage competition. Alternatively, the assemblage may reflect stylistic preferences for a few varieties of ornaments.

Shell Fishhooks and Fishhook Production

Left-orientated hooks manufactured from *H. rufescens* dominate the fishhook assemblage at East Locus and Mound B. This pattern follows Strudwick's (1985) typology for San Nicolas Island and conforms to patterns typically found on the southern Channel Islands. Fishhooks were likely produced at both loci as indicated by the presence of numerous fishhook blanks and detritus. Circular and J-shaped hooks with knobbed and grooved shanks were recovered from the various cultural strata at the two loci, suggesting there was no clear style preference over time. However, *N. norrisi* fishhooks appear to have been utilized later in time as they were recovered primarily from contexts associated with the final phases of occupation at the site.

Right-oriented fishhooks are comparatively rare at the site with only four represented. All are circular except for one J-shaped found at Mound B. The predominant pattern of left-oriented hooks is significant and will be discussed later. It is not clear whether hook orientation is functional or purely stylistic. Experiments using different hook orientations and fishing strategies could help clarify this problem.

Shell Manufacturing Processes

The presence of shell tools and modified shell at East Locus and Mound B suggest that a manufacturing industry focusing on the production of utilitarian and ornamental artifacts was well established at the site. As part of the production sequence of shell artifacts, modified shell was also likely used in the manufacturing of non-shell artifacts and/or as processing tools. Typically, shell tools were found in association with modified shell and shell with asphaltum. Although asphaltum can inadvertently come into contact with shell in archaeological deposits, the preponderance of asphaltum found on shells across the site suggests they were part of the manufacturing process and were functionally related. Additionally, shell tools, modified shell, and shell with asphaltum were commonly found associated with *Olivella* bead and fishhook production, suggesting these items were part of a manufacturing complex.

Exotic Stone Artifacts

Two types of exotic stones found at the site, steatite and serpentine, were made into utilitarian, ornamental, and possibly ritualistic items. Because these materials are not locally available on San Nicolas Island, they had to be traded in either as raw materials or finished products, likely from Santa Catalina Island and the mainland. The majority of exotic stone found at CA-SNI-25 is steatite. The relative abundance of steatite may be a factor of San Nicolas Island's close proximity to steatite sources on Santa Catalina Island and the fact that steatite is a relatively soft stone that can be manufactured into a variety of groundstone items. The presence of steatite and serpentine in Strata I and II at both loci suggests exotic stones were utilized over a long period of occupation at the site, reflecting the islanders' long-term involvement in regional exchange networks.

In addition to material type, densities of exotic stone artifacts at East Locus and Mound B are roughly equal, stylistically similar, and primarily comprised of beads. Collectively, stone beads and ornaments make up the majority of the assemblage, indicating exotic stone materials may have been prized for decorative purposes. However, bowl fragments as well as a highly formed and polished groundstone artifact found in association with articulated fish vertebrae suggest potential utilitarian uses of exotic stone. Although it is not certain, the doughnut stone recovered from East Locus, the pipe fragment from Mound B, and other groundstone artifacts at the site may have been used in ceremonial and ritual activities.

Spatial Distribution of Artifacts at East Locus

Overall, fishhooks, *Olivella* beads, other shell beads and ornaments, production materials (i.e., stone drills, sandstone and rhizoconcretion abraders, asphaltum, and bone applicators, etc.), modified shell, and exotic stone artifacts are distributed both broadly and discretely across East Locus. In some cases, the same space was used for a variety of activities as evidenced by the distribution of fishhook and *Olivella* bead production in similar contexts.

For example, the southeast portion of East Locus, located downwind of a substantial hearth (Figure 7.1), contains large concentrations of *Olivella* bead detritus, whole *Olivella* shells, and completed fishhooks and blanks. Associated with these items is an abundance of modified shell. These patterns suggest that fishhook production and bead-making occurred together at the site, perhaps by the same individuals or family members. This area may have been a discrete production locale or perhaps a dumping area for manufacturing debris processed elsewhere at the site. These deposits are much thicker compared to other units in East Locus, perhaps lending credence to the idea this area was used as a dumping site. Additional activities may have occurred at this locale as evidenced by two pits, which contained burned shell and bone fragments in one and seeds in the other. Also, a groundstone steatite artifact in direct association with articulated fish vertebrae was found in this portion of the site suggesting fish processing activities.

It appears that in the southwest portion of East Locus fishing activities also took place. Numerous shell fishhooks, blanks, and hook-making detritus were uncovered in this part of the site. A variety of materials associated with fishing include well-defined trash pits containing burned fish bone and other marine organisms, chert stone drills, abraders, expedient flakes for fish processing, and what appears to be the remains of a complete fishing tackle kit replete with all the necessary stone, shell, and bone tools to make fishing implements. The tackle kit was found associated with a large piece of asphaltum containing basketry impressions, likely the remains of the woven material (perhaps a bag) that once held the fishing tackle. Similar to the southeast, this locale contains concentrations of *Olivella* bead manufacturing materials in addition to modified shell. This area may have also served ceremonial purposes considering the abundance and diversity of finely crafted fishhooks and the presence of two discrete fox burials that appear to have been ritualistically interred. The fishhooks may have served as offerings to support the world-views of the islanders.

In addition to these two areas of high artifact densities, excavation units located to the north of the hearth features contained moderate amounts of shell and exotic stone artifacts. Similar production activities appeared to have occurred, although fewer artifacts may indicate that this portion of the site was used for other activities and not solely for the purpose of fishhook and bead production. These other activities may have included stone tool manufacture, food processing, other domestic tasks, and/or ceremonial practices.

Spatial Distribution of Artifacts at Mound B

At this point, it is more difficult to analyze the spatial distribution of artifacts at Mound B than East Locus. Only 38 percent of the units have been excavated through Stratum II – the component containing the majority of features at the site. Consequently, only the shell and exotic stone artifacts recovered from the uppermost cultural layers have been included in this thesis. Ongoing excavations will likely reveal additional patterns of artifact distribution at Mound B and therefore the daily practices of the people who once lived there. However, enough artifacts have been uncovered to allow preliminary assessment of their spatial distribution and comparisons with East Locus.

Following a similar pattern at East Locus, the artifact diversity at Mound B suggests a variety of daily activities occurred in relatively confined areas. Evidence of *Olivella* bead and fishhook production are found in association with concentrations of modified shell and shell with asphaltum, the latter two categories likely products of artifact manufacture. In particular, *Olivella* bead production appears to be widely dispersed throughout the locus. Considering that slightly more was excavated at East Locus, *Olivella* bead detritus densities at Mound B suggest bead production was an important activity. In fact, more than twice as much bead detritus was found at Mound B. Conversely, shell fishhook manufacture does not appear to have been as significant an activity compared to East Locus; however, further excavation at Mound B may reveal additional evidence of fishhook production.

As with East Locus, dense artifact concentrations occur around fire hearths at Mound B, indicating this may have been a focal point of domestic activities (Figure 7.3). Interestingly, hard compact surfaces were encountered at Mound B, likely a product of prolonged use and intensive occupation (Figure 7.3). Concentrations of artifacts surrounding these surfaces include fishhook and *Olivella* bead production materials, modified shell, exotic stone artifacts, and stone tools. Some of these concentrations are associated with pit features that contain evidence for both domestic and ceremonial practices.

<u>Comparisons of East Locus and Mound B</u>

Radiocarbon dates and shell ornament chronologies indicate CA-SNI-25 was occupied intensely for at least 500 years prior to and following European contact. CA-

SNI-25 offers a window into the past to examine cultural continuity and change during a critical period of prehistory and history. Preliminary research presented in this thesis suggests similar daily activities were carried out at East Locus and Mound B over a long period of time. Evidence suggests that these two locales were part of a village and not specialized workshop areas where limited activities took place. Rather, people engaged in an assortment of activities typical of village life that highlighted a maritime economy utilizing a variety of resources abundant in their environment.

Olivella bead production appears to have been a significant activity at CA-SNI-25, particularly at Mound B. In addition to personal adornment, the beads were likely used to decorate objects and perhaps presented as grave offerings. Considering *Olivella* beads were widely traded throughout Western North American, beads produced at CA-SNI-25 may have been traded in exchange for goods not available locally on the island, including steatite, serpentine, obsidian, and other goods. Considering the magnitude of production at CA-SNI-25, some of the fishhooks may have also been produced for trade. With limited availability of *H. rufescens* on the mainland, abalone fishhooks produced at CA-SNI-25 may have been an important exchange commodity. Although it is uncertain whether fishhook and *Olivella* beads were produced for exchange, the presence of exotic materials at CA-SNI-25 suggests that the villagers were connected to regional interaction spheres.

While overall production activities appear widely dispersed, certain locations at East Locus and Mound B (i.e., centered around hearth features and compact surfaces) suggest some areas were more intensively utilized over time than others. Why these particular areas were selected for intensive use is not clear. The direction of the prevailing wind, natural topography, proximity to hearths for warmth and/or cooking, vantage points to view the arrival and departure of people, and cultural traditions regulating the use of domestic and ceremonial areas may have been a few factors influencing the organization of space at CA-SNI-25.

Pit features, ritualistically interred animal remains including dogs, foxes, birds, and certain shell and exotic stone artifacts exhibiting highly artistic craftsmanship suggest ceremonial activities occurred within the same space as domestic ones. Research presented in this thesis combined with further excavation and artifact analyses may reveal that ceremonial activities were intricately linked with domestic activities and were a part of daily practices with little separation between spiritual and secular realms.

Following the arrival of Europeans, ceremony may have been particularly important in sustaining cultural traditions and combating the threat of the disruption of cultural lifeways. While it is uncertain at this stage how ceremonial activities may have changed following European contact, artifact analysis presented in this thesis suggests many traditional practices continued at CA-SNI-25 following European contact. However, European materials like metal needles and glass appear to have been incorporated into traditional shell and tool manufacturing processes.

In sum, the evidence presented in this thesis indicates CA-SNI-25 was one of the last Native villages to be occupied on San Nicolas Island before the arrival of Europeans. CA-SNI-25 is also one of the largest, most intensively excavated sites on the island and is well suited for understanding Native cultural traditions. Shell artifacts appear to have been both utilitarian and ornamental, made from locally abundant resources, and show fine craftsmanship and stylistic diversity. Exotic stone artifacts connect the villagers to island and mainland interaction spheres that may have been bound by economic need, social and political alliances, and family ties. Overall, the artifact assemblages are well preserved, abundant, diverse and ideal for inter-site comparisons.

Comparison of CA-SNI-25 to other Sites on San Nicolas Island

CA-SNI-39

Comparing CA-SNI-25 to other sites on San Nicolas Island provides a context to understand the nature of activities at this village within an island-wide setting and how the villagers may have been connected to other groups on the island. One such site located on the northwest coast, CA-SNI-39, was occupied between approximately A.D. 550 and A.D. 1670 (Maxwell et al. 2002). The site is comprised of three occupation surfaces containing abalone shell fishhooks and blanks, *Olivella* beads and bead-making detritus, other shell ornaments, abalone margin tools, steatite beads and effigies, stone and bone tools, and faunal remains (Maxwell et al. 2002). Features associated with these artifacts have been interpreted as the remains of a sweat lodge, fish-drying area, fishing camp, and pit likely linked to the Gabrielino mourning ceremony (Maxwell et al. 2002).

One hundred sixty-eight complete fishhooks and fragments in addition to 53 fishhook blanks attest to an intensive fishhook production industry (Maxwell et al. 2002). Fishhooks and production debris recovered from the sweat lodge feature were found associated with *Olivella* bead manufacturing debris (Maxwell et al. 2002). This pattern, similar to CA-SNI-25, suggests fishhook and *Olivella* bead production occurred in the same place, perhaps produced by the same individuals. Also similar to CA-SNI-25, concentrations of artifacts recovered from the fishing camp complex suggest activities were centered around hearth features.

However, with the exception of the sweat lodge complex, one striking difference between the two sites is the spatial distribution of *Olivella* bead detritus at CA-SNI-39. Bead detritus was found in discrete concentrations suggesting bead manufacturing occurred in specialized activity areas. At CA-SNI-25, bead production appears more widely dispersed throughout the site. Nevertheless, intensive bead production occurred at both sites with more detritus recovered than finished *Olivella* beads. Some of the beads manufactured at CA-SNI-39 may have been produced for trade, perhaps linking these people to the same trade networks as the villagers at CA-SNI-25. Considering that the assemblages of these two sites are so similar, the same people may have occupied them with CA-SNI-39 used mainly for fishing activities and CA-SNI-25 as the primary residential base.

CA-SNI-11

CA-SNI-11 is located on the northwest coast near Thousand Springs Cove which may have been an important port of harbor for canoe voyages. The site is characterized as a residential base that was occupied between approximately 2885 B.C. and A.D. 1025 with two episodes of abandonment occurring over a period of 4,000 years (Martz et al. 1999; Reinman 1964). The artifact assemblage is similar to that found at CA-SNI-25 and includes shell fishhooks and ornaments, *Olivella* beads, steatite artifacts, stone and bone tools, and an abundance of food refuse, especially fish bones (Martz et al. 1999).

Like CA-SNI-25, intensive shell artifact production appears to have occurred at CA-SNI-11. Fifty-eight whole fishhooks and fragments were recovered along with numerous *Haliotis* spp. and *N. norrisi* fishhook blanks (Martz et al. 1999). Modified shells exhibiting cutting, chipping, and grinding were also identified (Martz et al. 1999). Many of the modified shells and shell tools as well as whole abalone shells contain asphaltum, which attest to a suite of technological industries focusing on artifact production and other processing activities (Martz et al. 1999).

A variety of *Haliotis* spp., *M. californianus*, and *Olivella* beads were recovered from CA-SNI-11. Beads made from *Olivella* dominate the assemblage, with the majority represented by spire-lopped, end ground, and wall varieties (Martz et al. 1999). Callus beads were not present, perhaps suggesting they were not popular on San Nicolas Island until sometime after approximately A.D. 1025. This pattern coincides with regional chronologies that suggest callus beads were not widely utilized until sometime after about A.D. 1150 (Bennyhoff and Hughes 1987).

Compared to CA-SNI-25, *Olivella* bead styles at CA-SNI-11 are not as diverse. It is possible *Olivella* bead diversification did not occur on San Nicolas Island until later, that is sometime after CA-SNI-11 was abandoned and by the time CA-SNI-25 was intensively occupied. Alternatively, activities occurring at CA-SNI-11 may not have required the use of a variety of *Olivella* bead styles. The site may have functioned more as a fish processing camp with limited bead production, or the sample assemblage was biased.

In all, the remarkably similar artifact assemblages recovered from CA-SNI-11 and CA-SNI-25 suggest comparable activities were carried out at the two sites. It appears much of the same technology and manufacturing processes utilized at CA-SNI-11 were also employed at CA-SNI-25. The overlap in radiocarbon dates indicates the two sites were occupied contemporaneously for a short period of time. This overlap and similarities in artifact assemblages may reflect use of the two sites by the same people or perhaps the same families. Following site abandonment, it is possible the occupants of CA-SNI-11 took up residence at CA-SNI-25. These and other contemporaneous sites on the island likely reflect a broad settlement pattern where people took advantage of different habitats and the availability of critical resources. It should be expected that many of these sites were used by the same people. The location of CA-SNI-11 and CA-SNI-39 on the coast and adjacent to productive fishing habitats likely dictated these areas as primary fishing camps and secondary villages while CA-SNI-25 may have served as a primary residential village. The location of CA-SNI-25, situated on the central plateau overlooking Corral Harbor, offers a commanding viewshed of the north coast and mid-channel waters. This may have been an important vantage point to view the arrival and departure of ocean voyagers and travelers from primary and secondary villages located elsewhere on the island.

Comparison of CA-SNI-25 to other Sites on the Channel Islands

Southern Channel Islands Comparison: CA-SCLI-1524

CA-SCLI-1524, known as the Lemon Tank Site, is situated on the central plateau near the east coast of San Clemente Island. The site was occupied between approximately A.D. 925 and A.D. 1540 and contains numerous features attributed to both domestic and ceremonial activities (Hale 1995; Scalise 1994). The artifact assemblage from CA-SCLI-1524 suggests a variety of food processing and manufacturing processes occurred. Fishing technology appears similar to that found at CA-SNI-25 and includes fishhooks manufactured primarily from abalone (Scalise 1994). Hooks orientated to the left dominate the assemblage following a pattern similar to that found at CA-SNI-25 and other sites on San Nicolas Island (Scalise 1994). The predominance of hooks on San Clemente and San Nicolas islands manufactured from abalone and orientated to the left may reflect a technological advantage. Alternatively, the similarity in fishhook style may be a function of cultural interactions between southern Channel Island groups, reflecting a learned and shared style of fishhook production passed down from generation to generation.

Shell bead and ornament types found at CA-SCLI-1524 are also similar to those at CA-SNI-25. While beads were manufactured from a variety of types of shell, the majority are *Olivella* and consists of primarily wall beads with some callus beads present as well (Scalise 1994) – a pattern similar to CA-SNI-25. Many of the *Olivella* beads from CA-SCLI-1524 are incised with diagonal, parallel, chevron, and cross-hatched decorative lines (Scalise 1994). While these patterns are found incised on some beads from San Nicolas Island, they are not part of the CA-SNI-25 assemblage or those from CA-SNI-39 and CA-SNI-11. Overall, it appears incised *Olivella* beads was not a popular stylistic variation on San Nicolas Island. It is uncertain whether the incised beads found on San Nicolas were in fact produced on the island. Rather than produced on the island, it is possible these beads were introduced through exchange, perhaps from groups on San Clemente Island or elsewhere. If the incised beads found at CA-SCLI-1524 were manufactured at the site, they may reflect specialized production representative of certain artisans or family groups occupying the site. Alternatively, incised *Olivella* beads may have been widely produced on the island and reflect a unique stylistic variation representative of San Clemente artisans or the product of trade with other island or mainland groups.

In addition to *Olivella* beads, a small quantity of steatite beads and ornaments was recovered from CA-SCLI-1524 indicating trade likely with Santa Catalina Island (Scalise 1994). The presence of steatite bowl fragments suggests utilitarian use of this exotic stone as well as decorative. Additionally, one steatite figurine was identified (Scalise 1994). It is uncertain whether this figurine had a ceremonial or decorative function. Overall, the steatite assemblage is similar to that at CA-SNI-25. However, there appears to be a greater quantity and diversification of steatite artifacts found at CA-SNI-25. This may be a function of a greater duration of occupation at CA-SNI-25, a difference in excavation techniques at the two sites, or perhaps greater intensity of trade between the villagers of CA-SNI-25 and other islanders and groups on the mainland.

In addition to artifact production and other domestic undertakings, there is evidence that ceremonial activities were carried out at CA-SCLI-1524 including dog, fox, and raptor burials and pits containing caches of red maid and morning glory seeds, ochre, and ritualistic food remains (Hale 1995). While not discussed in detail in this thesis, similar burials and caches were identified at CA-SNI-25, suggesting religious beliefs and practices may have been shared by the people of the southern Channel Islands and perhaps adjacent mainland. Shared religious beliefs, family ties, and trade were likely important in maintaining and reinforcing relations between the islanders. These ties would have been important in supplying resources not available on the islands and providing social, economic, and political stability during periods of climatic fluctuations, ecological collapse, culture change, and overall disruption of traditional lifeways before, during, and after European contact.

Northern Channel Islands Comparison: CA-SCRI-240

CA-SCRI-240 is located on the north coast of Santa Cruz Island near Prisoners Harbor Bay. The village, known as *Xaxas* at the time of European contact, was occupied between approximately 2480 B.C. and A.D. 1819 and was likely a major port for ocean voyages and trade center (Arnold 2001). Ethnographic information coupled with archaeological evidence including the remains of structures made of highly valued redwood (*Sequoia sempervirens*) and large concentrations of ornamental and utilitarian steatite artifacts as well as shell ornaments suggest the village was occupied by elites such as Chumash chiefs and canoe owners and makers (Arnold 2001).

As with CA-SNI-25, ceremonial activities appear to have occurred at CA-SCRI-240. Concentrations of black abalone shells and swordfish (*Xiphius* spp.) remains have been interpreted as evidence for ceremonial feasting events (Arnold 2001). Domestic activities also appear to have been carried out at the site, particularly *Olivella* bead production. As with CA-SNI-25, relatively large quantities of bead detritus compared to finished beads suggest more beads were produced at CA-SCRI-240 than retained (Arnold 2001). However, unlike CA-SNI-25, production at CA-SCRI-240 focused on callus bead manufacture with limited wall bead production. Considering that the two sites were occupied contemporaneously, this difference in focus of bead production between the two sites is interesting. If in fact *Olivella* beads produced on San Nicolas Island were traded, the emphasis on wall bead production may have filled a market that was otherwise inundated with callus beads likely supplied by Santa Cruz islanders. Alternatively, the focus on wall beads may reflect a stylistic preference by San Nicolas islanders or perhaps in general, by people of the southern Channel Islands. Yet another possible explanation for this difference in bead production at the two sites may be attributed to the chert microlith industry found at CA-SCRI-240 and elsewhere on Santa Cruz Island (Arnold 2001). It is possible these microliths may have been better suited for working with the thick callus portion of *Olivella* shells while the stone tool industry at CA-SNI-25 may have been better adapted for wall bead production. Experimental archaeology using different stone tool materials to produce *Olivella* callus and wall beads could potentially shed light on this interesting divergence in bead production between San Nicolas and Santa Cruz islands.

As with CA-SNI-25, a variety of beads produced from shell other than Olivella were found at CA-SCRI-240. The majority of these shell beads were made of *H. rufescens* with a few *M. californianus* beads also identified (Arnold 2001). This pattern is in contrast to CA-SNI-25 where the majority of non-*Olivella* shell beads are manufactured from *M. californianus*. Instead, *M. californianus* may have been reserved for fishhook production at CA-SCRI-240 as evidenced by the greater quantity of fishhooks manufactured from mussel compared to *H. rufescens*. *H. rufescens* may have been reserved for bead and ornament production, particularly if availability was limited as a result of climatic fluctuations causing changes in habitat conditions or over-harvesting of red abalone beds. As with the pattern on southern Channel Islands, the majority of fishhooks from CA-SCRI-240 are orientated to the left (Scalise 1994). In general, it appears there was a preference for left-orientated hooks on the Channel Islands. However, on the coastal mainland there is a greater mixture of left and right orientated hooks and an apparent preference for right-orientated hooks along the southern mainland coast in Los Angeles County (Scalise 1994). It is possible left-orientated hooks are a stylistic hallmark of the Channel Islands, perhaps reflecting island culture and affiliation. Alternatively, hooks orientated to the left may have offered a technological advantage suited for island, mid-channel, or kelp bed fishing.

Overall, the similarities in artifact assemblages at CA-SCRI-240, SCLI-1524, CA-SNI-25, CA-SNI-11, and CA-SNI-39 suggest the people of the Channel Islands shared similar cultural traditions despite circumscribed Chumash and Gabrielino cultural affiliations. Their relative isolation and island environment required the people of the

Channel Islands to develop a sophisticated maritime economy utilizing available island resources and supplementing them with items obtained through trade with neighboring groups. Shell fishhook production, *Olivella* bead manufacture, and the use of shell ornaments and variety of utilitarian and ornamental exotic stone artifacts appear to be common throughout the Channel Islands. However, variations in artifact styles and distributions as well as ceremonial activities suggest cultural differences did occur between the people of the northern and southern Channel Islands. To understand how the people of San Nicolas Island fit into regional cultural traditions, it is worthwhile to compare the relative importance of their material culture in broader contexts by examining the distribution of island-made artifacts across the southern California Bight.

A Comparison of the Material Culture of the Southern California Interaction Sphere

Overview

As discussed in the theoretical context of this thesis, a world-systems approach focuses on relationships between cultural groups and recognizes that groups do not act in isolation but instead are part of larger interaction spheres. Hudson and Blackburn (1982, 1983, 1985, 1986, 1987) recognized this relationship and sought to understand the Chumash and their interaction with neighboring groups in the southern California. To understand their role within this geographically and culturally defined world-system, Hudson and Blackburn (1982, 1983, 1985, 1986, 1987) examined the material culture of the Chumash and neighboring groups including the Gabrielino, Kitanemuk, and

Tataviam. They referred to the interactions between the Chumash and neighboring groups as the Chumash Interaction Sphere.

Hudson and Blackburn (1982, 1983, 1985, 1986, 1987) collected data on material culture from museums and private collections, historical and ethnographic notes, and archaeological sources. Recognizing that material culture reflects a variety of characteristics including technological and stylistic variations; social, cultural, and ideological beliefs; and connections through trade and political alliances, Hudson and Blackburn (1982, 1983, 1985, 1986, 1987) compiled the data into five volumes based on different themes (Table 8.1).

Table 8.1. *The Material Culture of the Chumash Interaction Sphere* Volumes.

Volume Number	Volume Title
I	Food Procurement and Transportation (Hudson and Blackburn 1982)
II	Food Preparation and Shelter (Hudson and Blackburn 1983)
III	Clothing, Ornamentation, and Grooming (Hudson and Blackburn 1985)
IV	Ceremonial Paraphernalia, Games, and Amusements (Hudson and Blackburn 1986)
V	Manufacturing Processes, Metrology, and Trade (Hudson and Blackburn 1987)

While examining the five volumes, it was noticed that many artifacts pictured and used to describe the Chumash interaction sphere originated from San Nicolas Island. To better understand the extent of the San Nicolas islanders' role in this southern California interaction sphere, artifacts pictured in the five volumes were counted and grouped by location of origin. The majority of artifacts were counted as single units. However, in certain instances where multiple components comprised a single item (e.g., toolkit, string of beads, basketry fragments), the item was quantified as a single unit rather than each of its components counted individually. Additionally, modern artifacts and replicas of artifacts were not counted.

Results of Artifact Tallies

When comparing the artifact counts for the southern California mainland and northern and southern Channel Islands, the majority of artifacts pictured in the volumes are from the mainland, with most representing a single site known as *Muwu* (CA-VEN-11) (Figure 8.1). However, considering the larger geographic region and diversity of

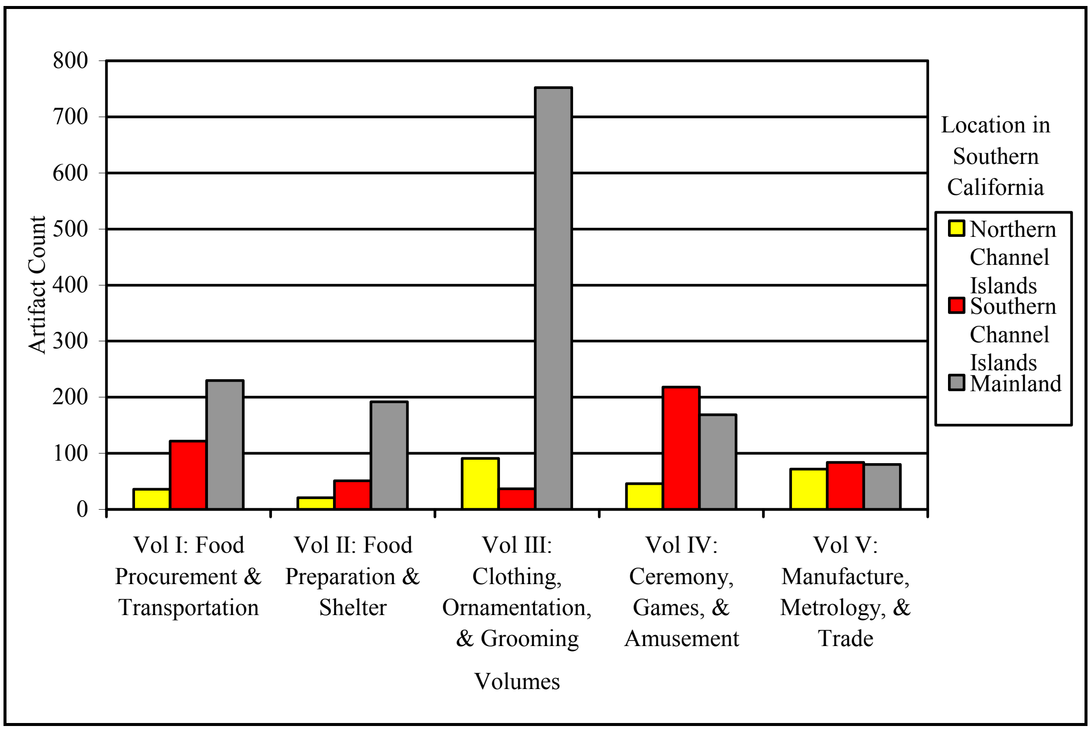

Figure 8.1. *The Material Culture of the Chumash Interaction Sphere* Channel Islands and Mainland Artifact Counts by Volume.

groups on the mainland, it is noteworthy that artifact counts for the southern Channel Islands dominate in Volumes IV and V. The majority of artifacts from the southern Channel Islands were recovered from San Nicolas Island (Figure 8.2).

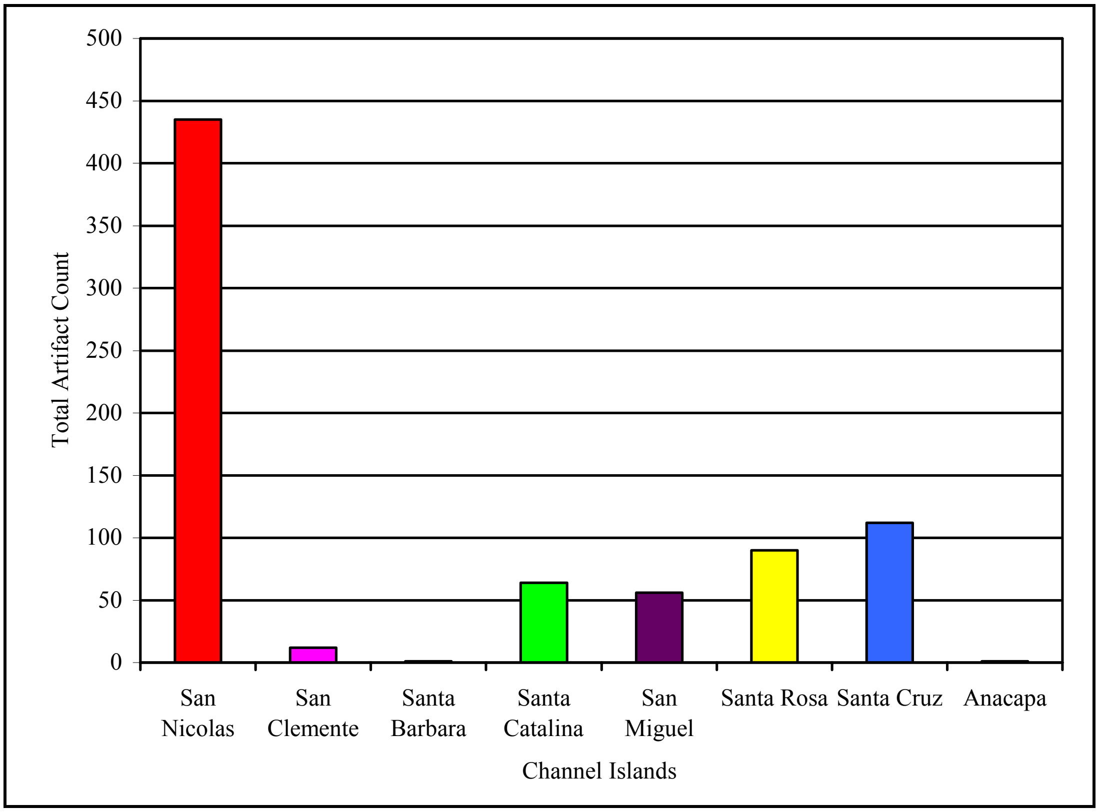

Figure 8.2. *The Material Culture of the Chumash Interaction Sphere* Channel Islands Combined Artifact Counts for the Five Volumes.

When comparing artifact counts for just the Channel Islands, a different pattern emerges. The majority (56%) of artifacts pictured in the five volumes were recovered from San Nicolas Island (Figure 8.3). Artifact counts for San Nicolas Island dominate in each of the five volumes and include an array of artifact types: Volume I – projectile points, shell fishhooks and blanks, bone fish gorges, and stone net sinkers; Volume II – sandstone pestles and mortars and steatite bowls and cooking stones; Volume III – birdbone hair pins and bone and shell ornaments; Volume IV – stone pipes, whale, fish, and bird effigies, bone whistles and flutes, and abalone rim sweat scrapers/scratchers; and

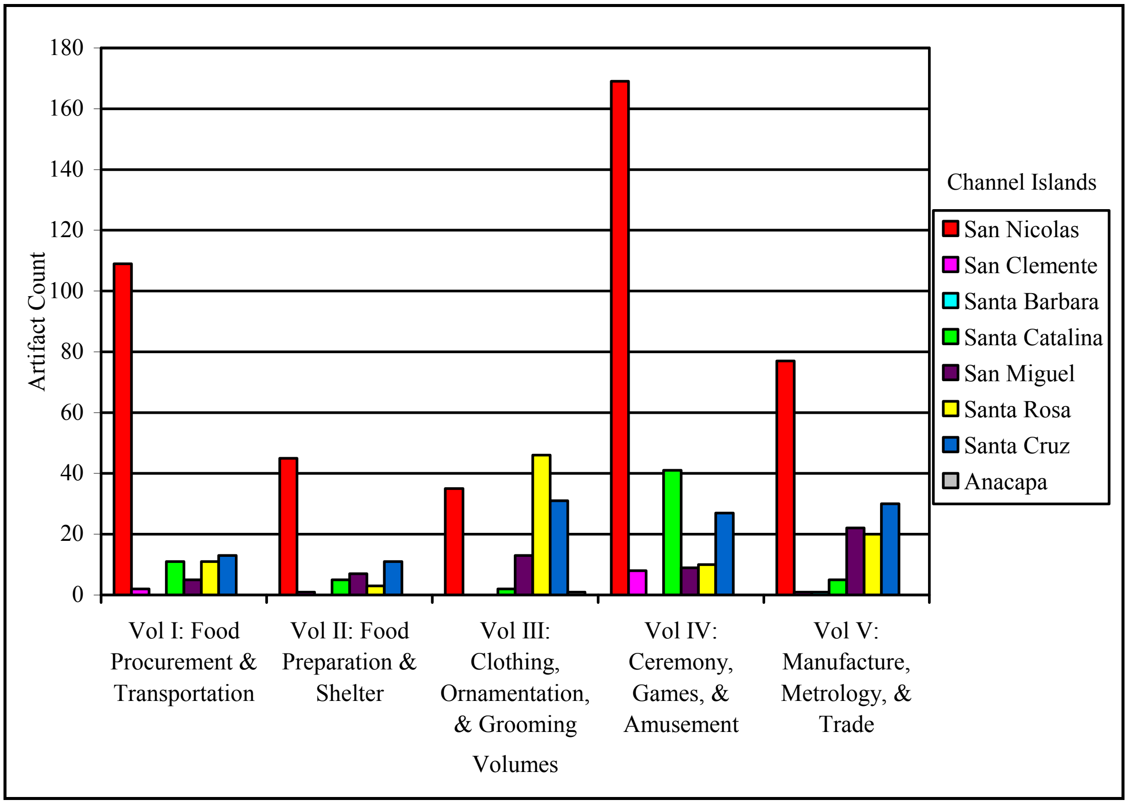

Figure 8.3. *The Material Culture of the Chumash Interaction Sphere* Channel Islands Artifact Counts by Volume.

Volume V – stone knives and projectile points, whalebone wedges and pries, and steatite shaft straighteners.

Artifact counts for San Nicolas Island are particularly high (64%) in Volume IV. Most of the artifacts pictured from the island are stone effigies and pipes attributed to ceremonial use. The large quantity and excellent craftsmanship of these effigies and pipes suggest the people of San Nicolas Island were steeped in rich ceremonial tradition. In fact, ceremonial traditions from San Nicolas Island are used as a hallmark to characterize ceremony of the different groups within the Chumash interaction sphere.

In addition to ceremonial objects, a vast array of artifacts from San Nicolas Island is used to describe and characterize the Chumash interaction sphere. If artifact counts are a proxy for degree of interaction, it appears the people of San Nicolas Island were an integral part of regional relations. Additionally, the abundance of artifacts and their quality of craftsmanship and artistic expression indicate the Native people of San Nicolas Island intensively engaged in activities other than merely food procurement. These items likely played an important role in connecting the islanders to their neighbors through trade, gift exchange, ceremony, and social gatherings.

Overall, the exact role of the people of San Nicolas Island in this regional interaction sphere or world-system is still uncertain. The islanders likely had at least a semiperipheral role through the exchange of raw materials and manufactured goods with core and peripheral groups. Considering that they had skilled labor, sophisticated technology that addressed their island needs, and a relatively high living standard considering the array of utilized utilitarian and non-utilitarian artifacts, perhaps the people of San Nicolas Island can be characterized as a core group.

In addition to their exact role in regional interaction spheres, the San Nicolas islanders' cultural affiliation is somewhat ambiguous. In Scalise's (1994) examination of pattern clustering of artifact traits for the Channel Islands and mainland, she found that artifacts from San Nicolas Island shared more traits with the northern rather than the southern Channel Islands. Were the Native people of San Nicolas Island more culturally aligned with the Chumash of the northern islands than the Gabrielino of the southern islands? Ceremonial evidence from San Nicolas Island suggests the people were more culturally connected with groups on the southern Channel Islands. Rather than an indication of cultural affiliation, the similarities in artifact traits may reflect intensive trade interaction between the people of San Nicolas Island and the northern Channel Islands.

In all, the fact that the material culture from San Nicolas Island is extensively used to characterize other Native groups on the Channel Islands suggests the people of San Nicolas were an integral part of regional economies and trade networks. The diversity and nature of shell and exotic stone artifacts from CA-SNI-25 attest to this rich material culture and bring us closer to understanding the cultural, social, and technological complexities of the Native people of San Nicolas Island.

CHAPTER 9. CONCLUSIONS

As mentioned previously, in this thesis I examined only a portion of the total artifact assemblage from CA-SNI-25, focusing on shell and exotic stone artifacts. In this research, I was guided by several theoretical frameworks: culture history to develop site-specific artifact typologies and chronologies for comparison with those developed for San Nicolas Island and the neighboring region; practice theory to elucidate the different types of activities that occurred in the village and how social traditions may have guided and sanctioned the use of domestic and ceremonial space; and world-systems theory to place the islanders within a broader context to examine their role within regional interaction spheres.

Radiocarbon dates for CA-SNI-25 suggest the site was most intensively occupied between approximately A.D. 1300 and A.D. 1800. This span of occupation is significant in Native history as it reflects a period prior to and following initial European contact when traditional lifeways were dramatically and forever altered. Analyses of the shell and exotic stone artifacts from this period reveal that there was substantial continuity in the types of artifacts produced and utilized. Considering the abundance of marine resources, it is not surprising Native people used a variety of marine shells, including fossil shells, to produce both utilitarian and decorative items. Shell fishhooks were an important production item at CA-SNI-25, particularly at East Locus. Fishhooks recovered from CA-SNI-25 are similar in style to those found elsewhere on the island and conform to typologies developed for the southern California Bight (Strudwick 1985).

Completed fishhooks, blanks, and fishhook-making debris found associated with *Olivella* beads and detritus suggest a variety of shell artifact production activities occurred in the same areas, perhaps by the same individuals. *Olivella* beads from CA-SNI-25, which conform to regional typologies and chronologies (Bennyhoff and Hughes 1987, Gibson 1992; King 1990), may have been produced for trade as well as use at the site for decorative purposes and perhaps grave offerings. Some of these beads and other locally produced items may have been traded in exchange for exotic stone materials in both raw and finished forms. The presence of steatite and serpentine utilitarian, decorative, and perhaps ceremonial artifacts at CA-SNI-25 tie the site's occupants to groups located on Santa Catalina Island and the mainland.

The presence of exotic stone artifacts, an assortment of finely-crafted shell artifacts and associated production materials and tools, and a diverse array of features reaffirms the idea that CA-SNI-25 was a village where a variety of activities occurred. Overall, activities appear to have been widely dispersed across the village rather than localized as specialized workshop areas. However, artifact distributions indicate that some areas were used more intensively than others. For example, relatively dense artifact concentrations around hearths suggest these areas may have been gathering locales where people kept warm while working, could continuously tend the fire, cook, and socialize. In addition to domestic undertakings, ceremonial activities appear to have occurred in the same locales suggesting secular and spiritual realms were intricately linked.

It is highly likely the occupants of CA-SNI-25 interacted with other groups on the island. Comparisons of artifact assemblages from CA-SNI-25 and other sites on the island show remarkable parallels. Similarities in the artifact assemblages may be a result of the occupants of CA-SNI-25 utilizing other sites perhaps as fishing camps or secondary villages, family affiliations linking the villagers of CA-SNI-25 to groups occupying other sites, and/or an island-wide material culture that was technologically and stylistically ubiquitous.

Comparisons of CA-SNI-25 to other sites located on the southern and northern Channel Islands indicate many similarities in material culture between the island groups. Types of shell artifacts produced as well as the presence of utilitarian and ornamental artifacts made of steatite appear to be a hallmark of the Channel Islands. These similarities are not surprising considering groups on the Channel Islands shared a maritime adaptation that focused on fishing in kelp beds and nearshore rocky environments, hunting sea mammals, collecting shellfish, and producing items for trade in exchange for resources not locally available on the islands.

Nevertheless, differences in the artifact assemblages do exist and are likely a function of cultural distinctions between Chumash and Gabrielino groups. An emphasis on *Olivella* wall bead production and similarities in shell fishhook style and features attributed to ceremonial activities is just some evidence suggesting the people of San Nicolas Island were more culturally aligned with groups on the southern rather than northern Channel Islands. Although they may have been more culturally aligned to Gabrielino or Uto-Aztecan traditions, artifact clustering patterns (Scalise 1994) suggest the people of San Nicolas Island interacted with their island neighbors to the north. Trade and perhaps other economic, political, and family alliances united these groups.

Interconnectedness of Native groups in the southern California Bight may have been particularly important in the late Holocene during periods of environmental perturbations, perhaps resulting in differential access to vital resources, increasing population growth, a rise in interpersonal violence, rapid development in social complexity, and changes in traditional lifeways with the arrival and settlement of Europeans.

Although the exact nature of the connection, beyond their participation in exchange networks, between the people of San Nicolas Island and other groups on the Channel Islands and mainland is not entirely clear, substantive ties did exist. A quantitative review of artifacts from San Nicolas Island pictured in *The Material Culture of the Chumash Interaction Sphere* volumes (Hudson and Blackburn 1982, 1983, 1986, 1987) indicates the people of San Nicolas Island were an integral part of regional interaction spheres. Material culture produced on San Nicolas Island is extensively used to describe both northern and southern Channel Islands cultures and traditions. In particular, stone effigies and pipes from San Nicolas Island are used to characterize ceremonial traditions of groups participating in regional interaction spheres. With this consideration, it appears that there was not only a Channel Islands tradition but a general southern California pattern as well. Similarities in material culture and perhaps ceremonial traditions suggest that by the time of European contact, the Native peoples occupying the southern California Bight were connected by a variety of alliances and interactions.

Future Research Directions

We are beginning to better understand the role people of San Nicolas Island played in regional interaction spheres as well as their social and technological organization on the island. With its excellent preservation and diverse artifact assemblage, CA-SNI-25 offers a unique and important opportunity to fill the ethnographic gap created as a result of the removal of the islanders before their stories could be told and documented. Due to a dearth of ethnographic information, we must turn to the archaeological record to give voice to the past.

This thesis has provided important information regarding the use and production of shell and exotic stone artifacts and how these items were rooted in the daily activities and ceremonial practices of the people of San Nicolas Island and their regional interaction spheres. Nevertheless, a number of data gaps still exist that prevent a complete understanding of the wide range of human activities that occurred at CA-SNI-25. Future research directions that can address this problem and ultimately provide a better understanding of the people who occupied the site include continued excavations and detailed analyses of lithic, groundstone, and bone artifacts as well as animal and plant remains. Once a more complete picture of CA-SNI-25 is established, important site comparisons of contemporaneous villages will elucidate island-wide and regional cultural patterns. However, additional information is needed to carry out these comparisons and will require conducting field surveys to identify and evaluate site boundaries and island-wide site distribution patterns, stratigraphic excavations that emphasize horizontal coverage to define living surfaces, and intensive radiocarbon dating to refine chronologies including periods of site occupation and abandonment.

Despite the ethnographic gap for San Nicolas Island, Mission records research may reveal additional information regarding the fate of Juana María's people once they were removed from the island and perhaps identify living descendants. Although the Nicoleño have been absent from San Nicolas Island for more than 150 years, their story is not lost. Instead, their story will continue to be told, reflected in a rich material culture created by social and cultural traditions that connected them to their island environment, Native peoples on the Channel Islands and adjacent mainland, and beyond.

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