California's Channel Islands
The Archaeology of Human-Environment Interactions

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The Ecological, Environmental, and Cultural Contexts for Island Archaeology

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California's Channel Islands, a group of eight islands distributed off the coast from Point Conception to the Mexican border, provide a rich abundance and diversity of environmental resources that allowed human populations to live there for at least the past 13,000 years (Figure 1.1; Erlandson et al. 2011). Archaeologists have focused on the role of these resources in human subsistence on the islands in the past. A long-standing debate during much of the twentieth century centered on whether aquatic resources provided lower nutritional returns than terrestrial resources. This raised the question as to whether coastlines would have been settled first by initial colonizers or only after the carrying capacity of the local terrestrial environment had been exceeded (see Erlandson 1994:273 for a discussion). The Channel Islands were one of the case studies used by Erlandson (1988, 1994, 2001; Erlandson et al. 2008) to argue that marine resources were not second-rate food sources, but provided viable dietary staples. Questions about the desirability of coastal environments are no longer in debate. This is especially true when paired with terrestrial plants available on the islands and mainland. Raab et al. (2009) argue that any model in which coastlines are a last resort for human settlement is outdated and a poor fit for the available data. Many researchers working on the Channel Islands are interested in the decisions that people made regarding the resources available on the islands and in surrounding marine ecosystems. These decisions influenced the landscapes and seascapes that we interact with today.

The long history of human settlement on the Channel Islands, which is among the earliest in the Americas, supports the model that the natural resources there were highly regarded. In this chapter we outline the biogeography of the Channel Islands, discussing the environmental conditions and resources that people encountered while living there. We then present a condensed culture history of the islands' human populations. We highlight the similarities between the northern and southern islands to tell a cohesive story of the Channel Islands as a whole, from the terminal Pleistocene through historic contact, while also acknowledging the environmental and historical circumstances unique to the different islands.

Island Biogeography

As one follows the coastline of California from north to south, one of its most prominent features is its eastward trend, starting south of Point Conception near Santa Barbara. This eastward trend defines the northern edge of the California Bight, which extends southward from Point Conception to Baja California (Figure 1.1). On the Channel Islands and in the surrounding ocean waters of the California Bight are a variety of habitats, resources, and opportunities that have attracted people since the terminal Pleistocene. At the northern end of the bight, Point Conception marks the transition between coastal and near-coastal floral and faunal species of Northern and Southern California, their ranges shifting and at times overlapping, depending on sea surface temperature fluctuations and other environmental
and climatic factors. In this area the confluence of the warm California Countercurrent and the cold California Current fluctuates geographically, causing shifts in the distribution of marine species over different time scales (Johnson 2001).

The Santa Barbara Channel region is defined as the area south of Point Conception, including the mainland coastline of Santa Barbara and Ventura, the northern Channel Islands, and the channel waters in between. Prior to European contact and colonization, the Chumash inhabited the Santa Barbara Channel region, whereas the Gabrielson (Tongva) occupied the Los Angeles Basin and southern Channel Islands (McCawley 1996; Figure 1.1). At the time of contact, both populations lived in permanent villages of hunters, gatherers, fishers, and craft specialists who shared aspects of material culture but differed in other important ways. Although not all of the similarities and differences between these societies can be attributed to environmental variation, landscapes and resource distribution played important roles in coloring the cultural expressions of coastal peoples in Southern California.

Several attributes of the islands have fostered local variation in ecosystems and, consequently, have influenced the nature of human settlement and subsistence through time. On the Channel Islands these include island location relative to the coast and other islands, island size, topography, and geologic substrate (Keegan and Diamond 1987). Island characteristics that are shaped by these variables include climate, freshwater availability, vegetation communities, terrestrial animals, and marine resources. Smaller islands, such as San Miguel, tend to have less terrestrial diversity and abundance (see Keegan and Diamond 1987), whereas larger islands, such as Santa Cruz and Santa Rosa, have the most abundant and diverse species (Kennett 2005). All of the Channel Islands, however, lack the terrestrial diversity of the adjacent mainland and have been further re-
stricted by the effects of wind, erosion, and significant disturbance by humans and introduced animals (Rick, Erlandson et al. 2005).

The northern and southern Channel Islands differ in their latitude, proximity to the mainland and other islands, freshwater availability, and terrestrial resources. From west to east, the northern island chain includes San Miguel, Santa Rosa, Santa Cruz, and Anacapa; all are located within 21 to 43 km of the mainland and share attributes of the mainland coastal ecosystem (Junak et al. 1995; Figure 1.1). Environmental similarities exist among adjacent northern islands because of their proximity to each other, ranging from 5 to 10 km (Emerson 1982), and the fact that they formed one large island (Santarosae) during a period of lower sea levels in the late Pleistocene (Kennett et al. 2008; Watts et al. 2010; Erlandson et al. 2011; Braje, Erlandson, and Rick, Chapter 2; Gusick, Chapter 3; Jazwa, Kennett, and Winterhalder, Chapter 5). Prior to approximately 10,000 years ago, sea levels were lower than at present (~70-75 m at 13,000 years ago). The subsequent rise in sea level caused a 65 percent decrease in land area. This has important implications for understanding early settlement of the islands because it also potentially submerged, and perhaps destroyed, evidence of early occupation and changed the geographic relationship of different land areas to the ocean. For example, areas that are now on the coast may previously have been further inland (Kennett et al. 2008).

The habitats and species of the southern Channel Islands are more isolated and were never connected to the mainland or each other. Santa Catalina, San Clemente, Santa Barbara, and San Nicolas Islands range from 32 and 97 km from the mainland and 34 to 45 km apart from each other (Junak et al. 1995). San Clemente and Santa Catalina, the largest and closest to the mainland of the southern islands, are 30 km apart and are each oriented on a roughly northwest-southeast axis. Important to understanding cultural variation, transportation costs between the southern islands would have been considerably greater than among the northern island chain throughout prehistory because of greater distances and potentially dangerous ocean conditions (Raab et al. 2009).

Today island size varies dramatically from the less than 2.6 km² of Santa Barbara Island to the 250 km² of Santa Cruz Island. Among the northern islands, Santa Cruz has the greatest variety of terrestrial resources because of its proximity to the coast, comparatively large size, and topographic variability (Junak et al. 1995; Perry and Delaney-Rivera 2011). The maximum elevation of all of the islands is found on Santa Cruz Island, where the formidable North Ridge reaches nearly 750 m (see Gill, Chapter 7); the only other island with an elevation of more than 600 m is Catalina. In contrast, San Miguel Island is situated farther from the mainland, tops out at about 250 m, and is less than one-sixth the size of Santa Cruz Island. It has limited terrestrial diversity, but a greater abundance of marine resources, including sea mammals (Braje 2010; Kennett 2005); however, on smaller islands, people could reach any location on the island by foot in a day.

**Terrestrial Resources**

The Mediterranean climate that characterizes Southern California is reflected in mild temperatures on the islands, although there are important geographic differences between them. Drastic changes in the weather can be caused by strong winds, fog, and offshore storm systems. As one travels westward along the northern islands, temperatures are generally cooler and precipitation higher on average. Anacapa Island is the driest; Santa Cruz Island is intermediate; and San Miguel Island is the coldest, wettest, and most wind-swept of the Channel Islands (Kennett 2005). The southern islands are generally warmer and more arid than the northern chain, with rainfall on San Clemente Island averaging less than 6 inches per year. Because of these climatic differences, cactus and coastal sage scrub are among the dominant vegetation types on San Clemente and Santa Catalina Islands. In contrast, oak woodlands, pine forests, and ironwood stands are present on Santa Cruz and Santa Rosa Islands (Emerson 1982). Common plant communities found on most of the islands include coastal sage scrub, grasslands, dune vegetation, coastal bluff scrub, coyote brush scrub, riparian habitat, and oak woodland (Junak et al. 1995).

Of the factors influencing plant distribution, local variations in temperature, precipitation, and geological substrate are among the most significant. Modern precipitation levels vary considerably on the Channel Islands as a whole, but
generally speaking, higher elevations receive higher amounts of precipitation (Junak et al. 1995). In addition to rainfall, the marine fog layer provides substantial moisture for higher-elevation plants, the ceiling of which tends to fluctuate between 200 and 400 m. On Santa Cruz Island, marine fog and moisture-laden air are pushed onto north-facing slopes by the prevailing northwest winds, resulting in overcast conditions along the northern coastline about 50 percent of the time (Junak et al. 1995:4). These conditions support mixed conifer forests at China Pines, on the more arid east end of the island; at Christy Pines, near the head of Cañada Christy on the west end; and along the northern slope of the island’s North Ridge.

Although less prolific and diverse than their mainland counterparts, island plant resources were used prehistorically for food, raw materials for making tools and structures (e.g., housing), and sources of firewood (Timbrook 1993). Among the most significant plant communities exploited for these purposes were pine forest, oak woodland, coastal sage scrub, chaparral, and grasslands (Martin and Popper 2001:245). Plants consumed by prehistoric inhabitants include chia (sage seeds) and other seeds; acorns (Quercus agrifolia, among others); pine nuts (Pinus spp.); islay (island cherry [Prunus ilicifolia]); toyon (Heteromeles arbutifolia) and manzanita berries (Arctostaphylos spp.); as well as a variety of roots, bulbs, and tubers (Timbrook 1993; Glassow 1996:17; Erlandson 1994:28). Aside from food and tool resources, pine, oak, Santa Cruz Island ironwood (Lyonothamnus floribundus), and chaparral would also have served as sources of firewood.

California archaeologists have had a tendency to emphasize the role of oak and acorns in subsistence economies (Anderson 2006). It is possible, however, that other habitats, such as coastal sage scrub and grasslands, were more valuable to island occupants because of the variety of seeds, roots, and tubers available (Timbrook 1993, 2007). Of the species dispersed throughout coastal sage scrub and grasslands, blue dicks (Dichelostemma capitatum) and seeds from red maids (Calandrinia ciliata) were harvested in large quantities according to ethnographic accounts (Timbrook 1993:51). Blue dicks, onion (Allium praecox), and other bulbs are significant sources of carbohydrates and are easy to identify, collect, and prepare in large quantities, making them attractive plant resources (see Gill, Chapter 7).

Of the resources available on the islands, terrestrial animals are limited not only in diversity and abundance, but also in size. The largest indigenous land mammal is the island fox (Urocyon littoralis), which is similar in size to the domestic cat. Other native species are the spotted skunk (Spilogale putorius), deer mice (Peromyscus spp.), birds, and a variety of reptiles and amphibians, such as frogs, salamanders, lizards, and snakes (Emerson 1982; Colton 2001). Although terrestrial animals did not comprise a substantial amount of the prehistoric diet, people were able to rely upon a combination of marine animals and terrestrial plants. Marine species provide sufficient amounts of protein and fat but are generally lacking in carbohydrates. Therefore, reliance on plant foods, which were consistently available and obtainable with low costs, would have been important to maintain a balanced diet (Erlandson 1988).

Lithic Sources

In addition to its influence on plant communities, geologic substrate is important with respect to the kinds of lithic materials available on the islands. Obsidian is not present in the Santa Barbara Channel region or the Los Angeles Basin, but it was imported from the Coso Mountains in eastern California, hundreds of kilometers to the northeast (Rick, Skinner et al. 2001). Islanders relied primarily on locally available materials such as Monterey and Franciscan cherts, basalts and other igneous stone, fused shale, sandstone, and quartz (Arnold 1987, 2011; Conlee 2000; Perry and Jazwa 2010; Pletka 2001). On San Clemente, San Miguel, and San Nicolas Islands, people used sandstone and volcanic materials to manufacture bowl mortars at a large enough scale that some were exported to other islands. Other resources are more geographically circumscribed, such as soapstone, or steatite, which is found only on Catalina Island. Soapstone was exported to other islands and the mainland in the form of bowls, comals (heating stones), and effigies (see Perry, Chapter 8; Strudwick, Chapter 10; Teeter, Martinez, and Richardson, Chapter 9; McCawley 1996).
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The lithic material that receives the most attention in the archaeological literature is chert, which was used to manufacture drills (for shell beads) and other tools (Arnold 1987; Perry and Jazwa 2010). Like soapstone, it was used to make a variety of exchange items but is limited in its geographic distribution. Although chert occurs on Santa Rosa and San Miguel Islands, it is most abundant on eastern Santa Cruz Island. Known as Santa Cruz Island blonde chert because of its usual color range from tan to brown, it is well suited for flint-knapping because of its high silica content (Arnold et al. 2001:115). In all, there are at least 30 known chert outcrops on Santa Cruz Island that have evidence of prehistoric quarrying activities, although smaller chert outcrops are present elsewhere, such as Cico and Tuquan chert on San Miguel Island and Wima chert on Santa Rosa Island (Erlandson et al. 1997; Erlandson et al. 2012; Perry and Jazwa 2010). Given the abundance of chert in multiple accessible locations, it seems plausible that these outcrops were quarried throughout the occupation of the islands. Supporting this hypothesis are the recent attempts to generate a chronology for human use of chert quarries. Some of the oldest and most recent radiocarbon dates on Santa Cruz Island are associated with these outcrops (see Gussick, Chapter 3; Arnold 1987; Kennett 2005; Perry and Jazwa 2010). This suggests the strong influence of terrestrial resources such as tool stone on human decisions about site location on the islands through time.

**Freshwater Availability**

Among all of these vital resources, the most important factor influencing and constraining island occupation was freshwater availability (see Jazwa, Kennett, and Winterhalder, Chapter 5; Kennett 2005; Kennett et al. 2009; Raab and Yatsko 1990; Winterhalder et al. 2010). On an inter-island scale, accessibility to freshwater influenced the population size and length of habitation of a particular island. An island may have been occupied permanently, or visitors from other islands may have exploited its resources temporarily, whether seasonally or during stopovers. Freshwater sources on Santa Cruz Island consist of abundant perennial streams and springs. This contrasts with the lack of surface freshwater on Anacapa and Santa Barbara Islands (Emerson 1982; Junak et al. 1995). Between these extremes are natural freshwater catchments and seasonal springs on San Clemente Island (Raab et al. 2009), as well as springs and seeps on San Miguel Island. With their large size, resource abundance, and reliable freshwater sources, Santa Cruz, Santa Rosa, and Catalina were able to support large and/or long-term human occupations. Yatsko (2000) has argued that San Clemente Island, where freshwater is more limited, was partially abandoned during periods of droughts during the Medieval Climatic Anomaly. Furthermore, Anacapa and Santa Barbara could not support permanent settlements because of their small size and limited freshwater; however, it appears that temporary camps were established on these islands to exploit marine resources such as sea mammals and sea birds, and as stopovers along travel routes, among other possibilities (Arnold 1992a; Erlandson et al. 1992; Rick 2001, 2006; Rick and Erlandson 2001; Rick et al. 2009; Rozaire 1978).

Although freshwater was a significant limiting factor with respect to site location, people were able to range farther afield by carrying water in baskets. Archaeological evidence for this on the islands is primarily in the form of asphaltum tarring pebbles, which were used to seal basketry to make it watertight (Hudson and Blackburn 1983). Given such observations, it is important to consider the location of all potential freshwater sources—large and small alike, and at different times in the past—as one of the most significant variables in shaping how people used the landscape, whether directly or indirectly.

**Marine Resources**

Because of the limited availability of terrestrial resources and relative abundance of marine ones, the ocean environment was the primary focus of prehistoric subsistence activities on the Channel Islands. Although plant resources, whether local or imported, were important sources of carbohydrates, most protein requirements were satisfied through exploitation of shellfish, fish, and sea mammals. Resources were obtained from several marine habitats, including rocky intertidal, near-shore sandy bottom, rocky bottom, kelp bed, and pelagic waters (see Jazwa, Kennett, and Winterhalder, Chapter 5; Kennett 2005; Kennett et al. 2009; Rick et al. 2009; Rozaire 1978).
2009; Winterhalder et al. 2010; Strudwick 1986). Differences in island location, sea temperature, and marine habitat affect the variability and availability of specific habitats and species, thereby influencing local food choices. Selection of particular marine animals depends on search costs, pursuit costs, and yield. Predictability, accessibility, abundance, and technological investment are among the factors considered when evaluating the contribution of different marine resources to island inhabitants’ diet (Jochim 1976). These environmental and technological factors changed over time, influencing human decisions about settlement and subsistence. Similarly, overexploitation of marine resources influenced their relative availability and quality (Kennett 2005; Braje et al. 2007; Raab 1992; Raab et al. 2009; Winterhalder et al. 2010; Jazwa, Kennett, and Winterhalder, Chapter 5).

The marine environment of the Santa Barbara Channel region includes a complex interaction of warm- and cold-water currents that form a counter-clockwise gyre of mixed temperatures between the islands and mainland. The resulting nutrient-laden waters support abundant and diverse marine species that have sustained large human populations (Kennett 2005). The warm California Countercurrent traveling northward along the Southern California Bight intersects with the cold California Current moving southward in the channel area. This had several important consequences for the islands’ prehistoric inhabitants. The trajectories of these currents generally result in colder waters to the northwest, around San Miguel Island, whereas warmer waters occur to the southeast, near the southeastern shores of Santa Cruz and Anacapa Islands, as well as around the islands farther south (Johnson 2001). In addition to creating tremendous variations in temperature and habitat, the mixing of these currents promotes the upwelling of nutrient-laden waters from the bottom of the channel, which supports the diversity and proliferation of the region’s marine species (Caviedes 2001).

The distribution of specific marine resource patches and resident species in the California Bight depends on variations in microhabitat characteristics, including geologic composition, slope and orientation of substrate, temperature, salinity, and intensity of wave action (Engle 1994). Important shellfish species harvested from rocky intertidal habitats include California mussel (Mytilus californianus), barnacle (Balanus spp.), black abalone (Haliotis cracherodii), black turban (Tegula funebralis), and a variety of limpets. Lower intertidal and subtidal species include red abalone (Haliotis rufescens), wavy top (or turban) (Littorina undosum), Norris top (Nerita norisit), and brown turban (Tegula brunnea). Shellfish harvested from sandy-bottomed areas include clams (Protothaca staminea, Tivela stultorum) and purple olive snails (Oliva bispinata). With limited terrestrial game, shellfish provided an alternative protein source that was predictable, abundant, and could be harvested with minimal search costs and risks. In addition, shell can be used for containers, fishhooks, and ornamental items. Most shellfish can be accessed by virtually any member of a population with minimal technological investment and experience (Glassow 1993a). Children, adults, and elderly people could procure large amounts of intertidal shellfish with the aid of a digging stick or other tools to pry shell off of rocks (Perry and Hoppa 2012).

Fish exploitation requires the greatest investment in pursuit costs by requiring the construction and maintenance of specialized technologies (Glassow 1993a); however, the development of these technologies makes fishing a highly intensifiable source of protein (Raab 1992). Occupying the range of marine habitats—including open ocean, kelp beds, and sandy and rocky shores—the strategies for catching fish vary widely depending on the context (Kennett 2005). Low-investment methods of obtaining fish in nearshore areas include spear fishing or grabbing fish by hand, with limited search and handling time, and minimal technological investment (Raab and Yatsko 1990). The waters above rocky substrates are common residences for multiple species of rockfish (Sebastes sp.) and California sheephead (Semicossyphus pulcher), whereas sandy habitats support surfperch (Family Embiotocidae), flatfishes (Order Pleuronectiformes), bat rays (Myliobatis californica), and sharks (Triakis seminasciata, Galeorhinus galeus). More costly options include the use of nets, basketry traps, poison, bow and arrow, and hook and line (Strudwick 1986). The introduction of the single-piece fishhook, J-shaped and later circular, to the Channel Islands by no later than 2,500 years ago allowed
inhabitants to more efficiently rely upon abundant and predictable resources (Rick et al. 2002). In addition to the manufacture and maintenance costs of specialized tools, fishing from watercraft on the open ocean has the greatest pursuit costs because of the technology and distances involved; however, especially with the use of boats, kelp forests are rich habitats with resources such as fish and sea mammals that could be exploited with minimal risk and low search costs. As is evident in the archaeological record, kelp forest fish were important resources throughout human occupation of the islands (Kinlan et al. 2005). The most extensive kelp beds are found along the southern coasts of Santa Cruz and Santa Rosa Islands (Kennett 2005).

Aside from shellfish and fish, sea mammals were also important resources because they are predictable and produce large meat packages providing protein, vitamins, and fat. In addition, the bones and skin were used to make structures, clothing, tools, and other items. Sea mammals inhabiting the open ocean and kelp beds surrounding the Channel Islands include California sea lion (Zalophus californianus), Guadalupe and northern fur seals (Arctocephalus townsendi, Callorhinus ursinus), harbor seals (Phoca vitulina), and sea otters (Enhydra lutris), as well as dolphins and cetaceans (Kennett 2005). Resident dolphins that were hunted by islanders include Pacific white-sided (Lagenorhynchus obliquidens), common (Delphinus delphis), bottlenose (Tursiops truncata), and Risso's (Grampus griseus) (Glasgow 2005; Glasgow et al. 2008; Porcasi and Fujita 2000). Migratory sea mammals such as the northern elephant seal (Mirounga angustirostris), dolphins, and porpoises also provided seasonal resources for island populations (Colten 2001; Yesner 1980).

Primary determinants of sea mammal exploitation are accessibility and abundance, which vary depending on location and season (Glassow 1993a). Search and pursuit costs limit reliance on mobile sea mammals, and their large size requires collective efforts to capture and process the meat (Yesner 1980). The more reliable method for sea mammal exploitation involving the lowest risk and largest potential returns would be to club or spear individuals on shore. Rookeries and haulouts on the islands provided predictable locations of aggregated individuals during certain times of the year, especially summer (Kennett 2005). Currently, the largest rookery is at Point Bennett on western San Miguel Island, where harbor seals, northern fur seals, California sea lions, elephant seals, and other species come to breed. The most prolific rookeries have always been adjacent to the colder waters near San Miguel and Santa Rosa Islands, although they also exist farther south on Santa Barbara and Santa Clemente Islands.

Influencing the distribution of marine animals are spatial and temporal variations in sea temperature. Temporal variation occurs on three general scales of duration and intensity. First, sea temperature varies seasonally, resulting in annual fluctuations in the distribution and abundance of marine species (Raab et al. 1995). Second, El Niño-Southern Oscillation (ENSO) events elevate sea surface temperature over a period of one to three years because of the intrusion of warmer waters and suppression of the thermocline. This results in significant declines in upwelling and concomitant decreases in primary productivity and therefore resident marine populations (Caviedes 2001; Kennett 2005). Increases in sea temperature can harm kelp beds, which in turn can lead to starvation and reproductive disruption among species dependent on them. During ENSO events, when upwelling of cool, nutrient-rich water decreases, fish and sea mammal species from southern waters migrate into the Channel Islands. This would have offered different food choices for island inhabitants but would not have compensated for the mass mortality or migration of certain species (Arnold 1992a). Third, cycles in sea temperature occurring over decades and centuries would have influenced decision making over multiple human generations. The temporal and spatial variability that characterizes the Channel Islands required its inhabitants to interact with a dynamic and ever-changing environment over the course of their occupation of the islands.

Island Chronology

Given the similar environmental conditions encountered by occupants of the northern and southern Channel Islands, there were some fundamental commonalities between the island Chuckash and island Gabrieleno (Tongva). Meighan (2000:7–8), for example, has argued that the archaeology of the southern islands is more similar
to that of the northern islands than it is to the adjacent mainland. This is perhaps most apparent in the strong maritime focus of both populations (e.g., Kennett 2005; Erlandson et al. 2008; Erlandson et al. 2011; Raab et al. 2009). This is, in turn, likely related to the rich marine resources and comparatively limited terrestrial resources available on the islands. There are, however, important differences between the two island groups, both at the time of contact and earlier, many of which have been highlighted in recent literature (Salls 1992; Raab et al. 1994; Raab et al. 2009; McCawley 1996; Vellanoweth and Erlandson 1999; Meighan 2000; Altschul and Grenda 2002; Cassidy et al. 2004; Rick, Erlandson et al. 2005). For example, Vellanoweth and Erlandson (1999) found that fishing intensified on San Nicolas Island as early as 5,000 years ago, similar to what was found on the other southern islands (e.g., Raab 1997), but perhaps earlier than was the case on the northern islands, where it is usually associated with the late Holocene (Braje et al. 2007:741; Colten 2001; Glassow 1993a; Kennett and Kennett 2000; Kennett 2005; Raab et al. 1995; Rick 2007; Rick et al. 2008:81). Raab et al. (2009:181–189) have also argued that the existing archaeological record does not support a model in which the island Gabrielino were organized as redistributive chiefdoms to the same degree as the island Chumash.

On a finer scale, there were cultural differences between people living on different islands, in part related to many of the factors already described. Nevertheless, a brief discussion of the culture history of the islands as a whole is a valuable contribution given the similarities that existed throughout the islands. The body of literature on the northern Channel Islands is expansive compared to that of the southern islands (see Raab et al. 1994:243; see bibliography in Glassow 2016), although there have been recent compilations focused on the island Gabrielino (Altschul and Grenda 2002; Raab et al. 2009). Nonetheless, the northern and southern Channel Islands have certainly been intertwined throughout their occupation and therefore share much of their prehistoric past. The Channel Islands have become a fixture in high-profile journals and have been explicitly tied to some of the most pressing questions in American archaeology, such as the debate over the routes that people took when first entering the Americas (e.g., Erlandson 1994, 2002; Erlandson et al. 2007; Erlandson et al. 2011; Braje, Erlandson, and Rick, Chapter 2) and complexity among hunter-gatherer societies (e.g., Arnold 1991, 1992a, 1993, 1995, 2001a).

The Terminal Pleistocene and Earliest Inhabitants

The evidence for occupation of the Channel Islands during the terminal Pleistocene (before 10,000 cal BP) is confined to the northern islands, whereas the earliest evidence for settlement of the southern islands dates to the early Holocene (Raab 1992; Goldberg et al. 2000; Salls 2000; Altschul and Grenda 2002; Cassidy et al. 2004; Raab et al. 2009). There is strong evidence that people have visited and seasonally exploited the resources of the northern islands since at least 13,000 cal BP (Erlandson et al. 2007; Erlandson et al. 2008; Erlandson et al. 2011; Johnson et al. 2002; Kennett 2005; Kennett et al. 2008). None of the Channel Islands were ever connected to the mainland, even during the periods of lowest sea level during the Quaternary. This has been interpreted as evidence for the early use of boats in the Americas (Cassidy et al. 2004; Erlandson 2002; Erlandson et al. 2007; Erlandson et al. 2011; Raab et al. 2009).

When the Pleistocene island Santarosae existed, its occupants had a significantly shorter distance (9 km at the closest point) to travel across water to reach the mainland, which was not the case for the southern islands (Vedder and Howell 1980; Porcasi et al. 1999; Kennett et al. 2008; Raab et al. 2009). As a result of eustatic sea level rise, the islands of Santarosae were separated by the time of the earliest evidence for permanent settlement at approximately 8,000 years ago (Winterhalder et al. 2010). This rise in sea level caused a 65 percent decrease in land area, which may have submerged evidence of early permanent settlement (Kennett et al. 2008). Because of this significant change, it is unclear whether the early, ephemeral sites that have been found were part of a broader settlement system that included more-permanent sites on the mainland or other islands (Kennett 2005).

The earliest human presence on the northern Channel Islands is associated with the terminal Pleistocene. Arlington Man, a partial skeleton found beneath 11 m of sediment near the mouth of a canyon on the northern coast of Santa Rosa
Island, has been dated to between 13,000 and 12,900 cal bp (Johnson et al. 2002; Agenbroad et al. 2005). Because this is an isolated find, it is difficult to interpret settlement or subsistence, with the exception of the inference of maritime abilities (Erlandson et al. 2008).

The cultural record on the Channel Islands starts on San Miguel Island, with the sites at Daisy Cave and Cardwell Bluffs (Rick, Erlandson, and Vellanoweth 2001; Erlandson et al. 2008; Erlandson et al. 2011), and on Santa Rosa Island, at CA-SRI-512W, located near Arlington Springs (Erlandson et al. 2011). Both San Miguel sites have clear evidence for the use of maritime resources in shell lenses that date to the late Pleistocene (Erlandson et al. 2008; Erlandson et al. 2011). The assemblage from CA-SRI-512W, however, appears to be dominated by bird bone (Erlandson et al. 2011). Substantial recent work has also been done to identify late Pleistocene lithic technologies on the Channel Islands (e.g., Erlandson et al. 2011; Braje, Erlandson, and Rick, Chapter 2). These include chipped stone crescents, Channel Island Barbed (CIB; a.k.a. Arena) points, and Amol points, which reliably date to the terminal Pleistocene and early Holocene on the northern Channel Islands (Erlandson et al. 2011; Erlandson and Braje 2008a, 2008b; Glassow et al. 2008).

**Early Holocene**

The number of sites on the northern Channel Islands dating to the early Holocene (10,000–7500 cal bp) dwarfs what has been found on the southern islands. More than 50 shell midden sites on the northern islands date to the terminal Pleistocene and early Holocene (Erlandson et al. 2011). On the southern islands, evidence of early Holocene occupation is primarily limited to Eel Point (CA-SCLI-43), on the western side of San Clemente Island (Raab and Yatsko 1990; Cassidy et al. 2004; Byrd and Raab 2007; Raab et al. 2009), which was first occupied at least 9,000 years ago. Additionally, there is some evidence that San Nicolas Island may have been first settled around 8,000 years ago. Crescents, which date to the terminal Pleistocene and early Holocene, have been recovered from both Santa Catalina and San Nicolas Islands (Jertberg 1986; Erlandson et al. 2008).

On the northern Channel Islands, there is evidence for a diverse faunal assemblage, including fish, shellfish, and sea mammals. On San Miguel Island, Daisy Cave, which was first occupied during the terminal Pleistocene, was also inhabited throughout the early Holocene. It is located within 2 km of an important “Cico” chert source and one of the island’s few reliable freshwater sources, both of which are likely among the reasons for its continued occupation throughout much of human habitation of the islands (Erlandson et al. 1997:127). Because of its surrounding steep topography, Daisy Cave remained within a few hundred meters of the coast throughout the late Pleistocene and early Holocene (Kennett 2005:117). Shell middens on the Channel Islands have also yielded evidence of fishing-related technologies that date to this period. At least 30 whole or fragmentary bone gorges have been recovered from early Holocene levels in Daisy Cave, making this some of the earliest evidence for hook-and-line fishing on the Pacific Coast of the Americas (Rick, Erlandson, and Vellanoweth 2001:605; Erlandson et al. 2005:679; Erlandson et al. 2008; Kennett 2005:122). These gorges were manufactured from bird, sea mammal, and land mammal bones and retain evidence of scoring or asphaltum from where they were tied to a fishing line. Almost 2,000 pieces of woven sea grass cordage were recovered from these strata and have been interpreted as fishing line or even nets (Connolly et al. 1995:313; Rick, Erlandson, and Vellanoweth 2001:605). Additional sea grass appears to have been woven into twined basketry.

Dietary reconstructions conducted on the material excavated from Daisy Cave suggest that fish composed between 34 and 65 percent of the edible meat at this site during the beginning of the early Holocene (Rick, Erlandson, and Vellanoweth 2001:609). There were also *Olivella* shell beads and a large shellfish assemblage dominated by California mussels, black abalones, and turban snails (Erlandson et al. 2008). Despite this, it appears that Daisy Cave is an outlier among sites dating to the early Holocene; in nearly every other island site of this period, shellfish represent by far the most abundant dietary constituent. During the early Holocene, fish were usually a distant second, and other meat sources such as sea mammals and birds rank an even more distant third (Glassow 1993a; Rick, Erlandson et al. 2005:185; Erlandson 1994:259–260). Many other early sites on the northern Channel Islands are
located near freshwater springs and may have been seasonal campsites. *Olivella* beads and bone gorges similar to the ones found at Daisy Cave have been found at some of these early middens (Erlandson et al. 2008).

Although Eel Point is one of the few sites on the southern Channel Islands with an early Holocene occupation, it has extensive cultural components with evidence for residential permanence (i.e., well-defined house features) (Cassidy et al. 2004; Raab et al. 2009). During this period, the occupants of the site depended heavily on relatively large sea mammals (including seals, sea lions, and dolphins) and California mussels, with small contributions from fish (Goldberg et al. 2000; Cassidy et al. 2004). What is perhaps most notable about the cultural assemblage from Eel Point is the suite of lithic tools found there. Cassidy et al. (2004) and Raab et al. (2009) have argued that the early Holocene tool kit from this site is strikingly similar to assemblages dating to the late Holocene that have been associated with the construction of plank canoes. This may provide the best proxy that still exists for the form of early boats, since the wooden boats themselves would only survive in extremely favorable conditions that have yet to be discovered archaeologically. Cassidy et al. (2004; also Raab et al. 2009) argue that there is no reason to think that the boats that people took to arrive at the Channel Islands prior to the plank canoes of the late Holocene were not technologically sophisticated. Rather, the challenge of traveling to and between the southern islands, in particular, would have required sturdy ocean-going boats. They argue that the assemblage at Eel Point suggests the use of plank technology with sophisticated features that maximized the utility of the craft.

**Middle Holocene**

The first known evidence for persistent residential bases on both the northern and southern islands dates to the middle Holocene (7500–2600 cal BP); if earlier coastal settlements existed, they may now be underwater (Winterhalder et al. 2010). The first evidence for a residential base on the islands is on the north coast of Santa Rosa Island near the mouth of Tecolote Canyon, where the cemetery at CA-SRI-3, a large site that also contains a later midden component, has been radiocarbon dated to between 8,000 and 7,000 years ago (Orr 1968; Erlandson 1994; Winterhalder et al. 2010). There is a significant increase in the number of archaeological sites dating to the middle Holocene, suggesting demographic expansion. On the northern Channel Islands, settlement expansion is evident on the north and east coasts of Santa Rosa Island (e.g., CA-SRI-41, -116, and -187), and the south and west coasts of Santa Cruz Island (CA-SCRI-333, -109) (Glassow et al. 2008; King 1990; Wilcoxon 1993; Winterhalder et al. 2010; Glassow, Chapter 4). This period is also associated with large interior middens, potentially associated with the seasonal collection of plant resources (Perry 2003; Kennett and Clifford 2004; Kennett 2005; Perry and Delaney-Rivera 2011). On the southern Channel Islands, there is clear evidence for occupation of Catalina (e.g., Little Harbor site; Meighan 1959; Salls et al. 1993; Raab et al. 1994; Raab et al. 1995) and San Nicolas (e.g., Bird Blind site; Vellanoweth and Erlandson 1999; Altschul and Grenda 2002; Cassidy et al. 2004), and expansion of settlement on San Clemente (e.g., Nursery site) (Raab et al. 1994; Raab et al. 2009; Goldberg et al. 2000).

Coinciding with settlement expansion is the earliest evidence of residential sedentism on the islands, as represented by whale bone house structures. On the southern islands, Salls et al. (1993; also Raab et al. 1994; Raab et al. 2009) describe middle Holocene house features at Eel Point and the Nursery site (CA-SCLI-1215) on San Clemente Island. They argue that the adoption of substantial residential structures was a trend that influenced a large area at the same time. Features that have been identified as house pits are evident at roughly the same time at CA-SCRI-333 on the western end of Santa Cruz Island (Salls et al. 1993; Wilcoxon 1993; Jazwa et al. 2013). Additionally, the middle Holocene was characterized by a large interaction sphere in which *Olivella* grooved rectangle beads were traded long distances. The distribution of these beads suggests that this interaction sphere linked the southern Channel Islands with the mainland, extending as far as the Great Basin and Oregon (Howard and Raab 1993; Jenkins and Erlandson 1996; Raab et al. 2009).

Along with these changes in settlement during the middle Holocene are several interesting
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Dietary trends associated with diversification. A unique case occurred on the eastern end of Santa Rosa Island, where a substantial estuary was present during the early and middle Holocene. This is the location of SRI-187, a residential base with evidence for the consumption of estuarine shellfish (Cole and Liu 1994; Rick, Kennett, and Erlandson 2005; Rick et al. 2006; Wolff et al. 2007; Rick 2009; Winterhalder et al. 2010:484; Jazwa, Kennett, and Winterhalder, Chapter 3). There were numerous such environments on the mainland California coast, many of which were the focus of human settlement because of their high productivity, but no others of this scale existed on the northern Channel Islands (Bickel 1978; Imman 1983; Erlandson 1994).

More generally, an emphasis on hunting dolphins has been noted on both the northern (Glassow 2005; Glassow et al. 2007; Glassow and et al. 2008) and southern (Meighan 1959; Raab et al. 1995; Raab et al. 2009; Cassidy et al. 2004; Porcasi and Fujita 2000; Porcasi et al. 2004) islands during this period. Glassow et al. (2007, 2008) attribute the hunting of dolphins at the Punta Arena (SCRI-109) site on the south coast of Santa Cruz Island to the proximity of a deep, steep-sided submarine canyon that does not exist elsewhere on the northern islands, but does occur on the southern islands near Eel Point on San Clemente Island and the Little Harbor site on Catalina Island (Porcasi and Fujita 2000). Raab et al. (2009:100) suggest that dolphin hunting seems to have peaked during the middle Holocene for reasons yet to be explained, although it did occur both before and after to lesser extents. Potential techniques for capturing dolphins without harpoons include striking stones together underwater to disrupt their echolocators and drowning them in nets (Raab et al. 1995; Raab et al. 2009; Porcasi and Fujita 2000).

The prevalence of red abalone (Haliotis rufescens) in many midden sites throughout the islands indicates another dietary trend during parts of the middle Holocene. Historically, red abalones prefer to live in subtidal environments in Southern California but will live in intertidal regions during periods of cooler water (Raab 1992). Glassow (1993b, Chapter 4; Glassow et al. 1988; Glassow et al. 1994; Glassow et al. 2008; also Raab 1992; Salls 1992) has argued that red abalone middens dating to between 6300 and 5300 yr BP were in part related to cooler water temperatures during this period when compared to both immediately earlier and later time intervals (Kennett 2005:66; Kennett et al. 2007:354). He also suggests that the comparatively lower human population densities during this period would have limited the depletion of stocks of abalone and other large gastropods from overpredation, while the later expansion of human populations may have had deleterious effects on these high-ranked resources (Glassow, Chapter 4).

There appears to be a similar pattern on the southern Channel Islands with respect to the emphasis on large gastropods during the middle Holocene. For example, of comparable importance to red abalone in warmer waters are wavy top (Lithopoma undosum), a large snail that lives in lower intertidal and subtidal waters (Perry and Hoppa 2012). Salls (1992) notes that it is common for shell middens on the southern Channel Islands to exhibit shifts from energy-efficient dietary staples to less efficient ones over time, which may be related to population growth and/or changes in mobility. For example, Meighan (1959) observed a change on Santa Catalina Island from abalone to mussel, and Raab (1992; Raab et al. 2009) documented a shift on San Clemente from large abalone to small turban snails (Tegula spp.).

The transition from the middle to late Holocene is characterized by a further diversification of subsistence activities and technologies throughout the Channel Islands. Changes in hunting and fishing strategies are manifested in faunal and artifact records of middle and late Holocene sites, including the introduction of stone net weights, contracting stern points, and circular shell fishhooks (Erlandson 1997; Glassow 1997; Glassow et al. 2007; Rick et al. 2002). Also evident, in the form of tarrning pebbles and asphaltum impressions, is the use of asphaltum for a variety of purposes, including making watertight baskets. When this evidence is considered along with mortars and pestles and other technologies, it is evident that by the end of the middle Holocene, islanders had diversified their subsistence and economic activities, particularly with respect to fishing, and were participating in spheres of interaction that extended to the mainland interior.
Late Holocene

During the late Holocene (after 2600 cal BP), important interrelated environmental, technological, economic, and sociopolitical changes occurred on the Channel Islands (Rick, Erlandson et al. 2005; Glassow 2010). One of the most significant trends in the Santa Barbara Channel region was the intensification of marine fishing. This was pronounced in island contexts, where fish and sea mammals became particularly important (Braje et al. 2007; 741; Colten 2001; Glassow 1993a; Kennett 2005; Kennett and Kennett 2000; Kennett and Conlee 2002; Raab et al. 1995; Rick 2007; Rick et al. 2008:81; Jazwa et al. 2012). On the southern islands, there is similar evidence of fishing intensification (Raab 1997; Vellanoweth and Erlandson 1999; Cassidy et al. 2004; Raab et al. 2009), although it may have occurred somewhat earlier, around 5000 cal BP. This trend may have been related in part to the development of plank canoe technology, the earliest clear evidence for which dates to the early part of this period. This allowed more extensive targeting of pelagic fish.

Most of the current evidence suggests that the Chumash tomol provided residents of the Santa Barbara Channel region with more reliable oceanic transportation than what was available earlier, although Cassidy et al. (2004; also Raab et al. 2009) argue that sturdy boats must have been used previously. Nonetheless, this development may have allowed islanders to travel more quickly, farther from shore into pelagic waters, and with larger amounts of cargo, while also providing a more stable platform for fishing and sea mammal hunting (Arnold 1992a, 1995, 2001a; Gamble 2002; Fagan 2004). The Gabrielino t'ilat, a similarly constructed plank canoe, was developed for travel among the southern Channel Islands and adjacent mainland (Raab et al. 2009). Given the labor and material costs of making such watercraft, their ownership was limited to chiefs and other wealthy individuals, a circumstance that has inspired lively discussion regarding the role of these boats in promoting complexity (Arnold 1992a, 1995; Arnold and Bernard 2005; Arnold et al. 1997; Gamble 2002).

Beginning around AD 650, there was accelerated population increase and growth in the number of permanent settlements on the northern Channel Islands (Arnold 2001a; Kennett 2005; Kennett and Conlee 2002; Winterhalder et al. 2010). Institutionalized differences in social status appeared at this time as well (Kennett et al. 2009). One period in particular, the Middle to Late period transition (MLT; 800–650 BP), has been associated with important changes that facilitated sociopolitical complexity (Arnold 1991, 1992a, 1997, 2001b; Arnold and Tissot 1993; Arnold et al. 1997; Jazwa et al. 2012, Kennett 2005; Kennett and Conlee 2002; Raab and Larson 1997). Arnold and her collaborators originally associated these changes with a period of elevated sea surface temperature (SST) inferred from changing radiolaria assemblages in sediments from the adjacent Santa Barbara Basin (Pisias 1978). They further argued that increased SSTs reduced marine productivity and the overall extent of kelp forests. Kelp is particularly sensitive to elevated SSTs, and the reduction in the distribution of offshore kelp forests and associated biota would have had serious consequences for islanders. Increased SSTs would also have changed the distribution of various dietary species, including fish, shellfish, and sea mammals (Arnold 1992a, 2001a; Colten 2001; Pletka 2001). This, in turn, led to the resource stress that stimulated sociopolitical change on the islands during the MLT.

Raab and Larson (1997), on the other hand, argued that the archaeological record in the Santa Barbara Channel region during the MLT is not consistent with marine resource depression because of warm SST and reduced marine productivity; instead, they associated this period with drought conditions that occurred during the Medieval Climatic Anomaly (Kennett 2005; Jones et al. 1999; Jones and Schiwatalla 2008; Raab and Larson 1997; Stine 1994; Yatsko 2000). These widespread droughts gave rise to the nutritional and social stress indicators evident in the bioarchaeological record at this time (Lambert and Walker 1991; Lambert 1993). These include disease, malnutrition, and violence, which they argue was related to shrinking supplies of fresh water and terrestrial foods on the islands and mainland. They also extend the time over which these trends developed beyond the MLT (Raab and Larson 1997:331–334). A well-dated oxygen isotope SST record from the Santa Barbara Basin indicates that the MLT also occurred at the tail end of a longer climatic interval (AD 450–1300).
characterized by cooler and more variable SSTs (Kennett and Kennett 2003; Kennett 2005). In any case, there are relatively few well-documented and precisely dated sites on the islands that have been associated with the MLT (Arnold 1991:956, 1992a:276, 1992b:142; Raab and Larson 1997; Yatsko 2000; Munns and Arnold 2002:133; Perry 2003; Kennett 2005; Rick, Erlanson et al. 2005; Rick 2007; Glassow 2010:2:27; Jazwa et al. 2012).

The *Olivella biplicata* shell bead industry, the product of which served as a medium of exchange throughout Southern California, also grew significantly on the northern Channel Islands during the MLT (Arnold 1987, 1990, 1992a, 1992b, 2001a; Arnold and Munns 1994; Munns and Arnold 2002:132–133; Kennett 2005; King 1990; Rick 2007). Early on, the dominant bead production technique was to make multiple beads from the walls of each individual *Olivella* shell. By the end of this period, another form was introduced and became the predominant type. This was a more labor intensive and resource-wasteful technique that produced one bead from the thicker callus portion of each shell (Arnold and Graesch 2001; Arnold and Munns 1994). Associated changes in chert microblades and microdrills used in the manufacture of these beads occur at this time as well (Arnold 1987, 1990, 1992a; Arnold et al. 2001; Kennett 2005; Perry and Jazwa 2010; Preziosi 2001). The dramatic increase in microblade, microdrill, and *Olivella* bead manufacture—particularly with respect to the increased standardization associated with triangular prepared microliths and callus beads—is often cited as evidence of craft specialization and increased complexity in the Santa Barbara Channel region (Arnold 1987, 1992a, 1993, 2001a, 2001b; Arnold and Graesch 2001; Dietler 2003; Preziosi 2001).

The southern Channel Islands show analogous settlement and economic patterns; there is an increase in permanent coastal villages during the late Holocene, with an apparent lack of sites during the period associated with the MLT (Raab et al. 1994; Yatsko 2000). There is, however, some debate as to whether the island Gabrieleno were organized as chiefdoms in a manner similar to the Chumash (Raab et al. 2009). Raab and colleagues (Raab et al. 2002; Raab et al. 2009) have argued that many of the factors that characterize the complex chiefdoms of the northern Channel Islands, including warfare, territoriality, and health problems, appear to be missing from the archaeological record on the southern islands, leaving the case for social complexity more ambiguous. Williams and Rosenthal (1993) showed that steatite artifact manufacture on Santa Catalina Island was not specialized to the degree of *Olivella* shell bead production on the northern islands. Raab et al. (2009:194) argue that this lack of specialized production or centralized control suggests that the southern Channel Islands reflect a pattern of “weak complexity” in comparison with that of the northern islands, which was referred to historically as the “Island Province” (Hudson et al. 1977; Hudson and Underhay 1978); however, this difference may be related to the fact that less archaeological work has been done on the southern islands, and indicators of complexity have yet to be found. Additionally, on San Clemente and San Nicolas Islands, military operations, specifically the use of safe harbors for boat travel and training, have damaged or destroyed cultural resources, including coastal village sites and traditional boats.

Other elements of late Holocene complexity relate to island ceremonials, which is documented in the historic and ethnographic literature, including accounts written by Spanish priests at missions where islanders were continuing to practice their own rituals (such as mourning ceremonies). Among the specialists who resided in island communities were healers, singers, dancers, undertakers, and members of the Chumash *antap* and the Tongva Chingichngish (Johnson 2001; Perry, Chapter 8). Both the *antap* and Chingichngish were pan-regional ritual organizations that incorporated members from different villages and societies (McCawley 1996). They have been interpreted as “crisis religions” that spread in response to dramatically changing circumstances after European contact (Perry, Chapter 8; Strudwick, Chapter 10; Hudson and Underhay 1978; Raab et al. 2009).

Overall, what the ethnohistoric and archaeological data depict are the dynamic ways in which people on the islands were connected to each other and mainlanders through subsistence, trade, marriage, and ceremonial life. Their collective study helps to enrich our understanding of island lifeways, mainland connections, and
cultural transformations through time, from the end of the Pleistocene through European contact and after.

Conclusion

California's Channel Islands and the surrounding ocean waters have a wide variety of subsistence and other resources that have supported human populations in some capacity over the course of at least 13,000 years. At the time of European contact in 1542, the islands were densely populated compared to other areas in California, to hunter-gatherers in general, and to earlier periods on the islands (Moratto 1984; Kelly 1995; Winterhalder et al. 2010). To varying degrees, the islands' residents lived in large coastal villages under the control of chiefs. They were also part of an extensive trade network that included nonfood items such as shell beads and steatite artifacts (King 1976, 1990; Johnson 1982, 1993; Arnold 1992a, 2001a; Williams and Rosenthal 1993; Raab et al. 2002; Raab et al. 2009; Kennett 2005).

As discussed above, however, the cultural systems that existed on the Channel Islands at European contact were the end product of at least 13,000 years of changing patterns of human subsistence and settlement. The changes that occurred were related to environmental adaptations, historical contingencies, and other factors beyond the grasp of archaeological research. Soon after the permanent settlement of California by the Spanish, and through several different mechanisms, the islands were quickly depopulated (Raab et al. 2009; Strudwick, Chapter 10). Because of the long history of occupation and unique adaptive systems of the human inhabitants of California's Channel Islands, they provide an excellent opportunity to address many of the most pressing and interesting questions in present-day American archaeology, including those about initial colonization and cultural complexity. Furthermore, these long-term perspectives offer insights that are relevant to the current issues of cultural preservation and ecological restoration (e.g., Braje 2010; Rick and Erlandson 2008a, 2008b).

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