Catalysts to Complexity

Late Holocene Societies of the California Coast

Edited by Jon M. Erlandson and Terry L. Jones

with contributions by

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Perspectives in California Archaeology, Volume 6
Senior Series Editor: Jeanne E. Arnold

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Preface

As many readers are undoubtedly aware, this is the third volume in a series dedicated to the archaeology and paleoecology of the California Coast published by the Institute of Archaeology at University of California, Los Angeles (UCLA). The first volume of 11 chapters (Erlandson and Colten 1991) covered the evidence for terminal Pleistocene and Early Holocene (ca. 10,000 to 6650 RYBP) occupations of the California Coast, with coverage limited by the lack of early archaeological sites located north of the Monterey Bay area. The second volume of 11 chapters (Erlandson and Glassow 1997) summarized the nature of coastal California's Middle Holocene environments and human adaptations, including single chapters on both the San Francisco Bay and North Coast areas. The current volume, which includes 17 chapters from 31 California archaeologists, grew out of a symposium held at the 1998 Society for California Archaeology Annual Meeting in San Diego, California. That symposium, "The Late Holocene along the California Coast: Archaeological and Environmental Records," included 16 papers. The purpose of this session was to provide a forum for archaeologists working along the California Coast to examine the environmental and archaeological records from various coastal regions, focusing on the development of cultural complexity over the past 3500 years, the relationships between environmental shifts and cultural changes, and other stimuli to the emergence of sociopolitical and economic complexity in Native California.

Among the symposium participants who chose not to prepare chapters for the published volume were Richard Carrico, John R. Johnson, and Jerry D. Moore. After the symposium was held, an additional paper was solicited from Brian Byrd and Seetha Reddy (Chapter 4) to supplement treatment of the San Diego Coast and incorporate a wealth of new archaeological and paleoenvironmental data emerging from the Camp Pendleton area on the northern San Diego Coast. The result is a volume of 17 chapters, including our own introductory and concluding comments. For the first time in the three volume series, there is more than one paper from the northern California Coast. Nonetheless, the relative dearth of archaeological research north of the San Francisco Bay area still limits the amount of data available for regional synthesis. Consequently, the 15 regional summaries are heavily weighted toward the southern and central California Coast, reflecting the more intensive nature of archaeological research in these areas, their better documented archaeological sequences, and the comparatively larger number of archaeologists working in them.

The authors who contributed to this volume approach data from individual areas in a variety of ways. To some extent, this variation reflects epistemological differences between researchers or "schools of thought." It is also related, however, to inherent variability among the Late Holocene cultures of the California Coast, where the organizational complexity of coastal peoples varied considerably through both space and time. Finally, the different approaches taken in individual chapters are also heavily influenced by differences in the quantity, quality, and resolution of the archaeological and paleoenvironmental records available in each area.

We should also note that the authors contributing to this volume have been asked to limit their analysis and discussions primarily to the period prior to European contact, which began in California with the voyage of Juan Rodriguez Cabrillo in AD 1542, but intensified with the Spanish colonization of Alta California in AD 1769 and the discovery of gold in northern California in AD 1849. This decision was not intended to minimize the devastating impact of European colonialism on Native Californians or to diminish

the importance of the archaeological study of Contact period processes. In fact, a fourth volume is currently being planned by Erlandson and Kent Lightfoot to deal explicitly with archaeological approaches to the study of the Protohistoric and Historic periods in Alta California and the dramatic sociopolitical, economic, and demographic changes that occurred as California was increasingly integrated into a global economy.

Clearly, the current volume could never have come together without a tremendous amount of work by a diverse array of people. First and foremost, we wish to thank all the authors who participated in the original symposium or contributed chapters to this volume. Their efforts in the field, in the lab, and at the computer—at data collection, processing, synthesis, writing, and revision—are all greatly appreciated. At UCLA, we thank Jeanne Arnold (Series Editor), Marilyn Beaudry-Corbett (former Director of Publications), Brenda Johnson-Grau (Managing Editor), Julia Sanchez (Acting Director of Publications), and the editorial staff at the Cotsen Institute of Archaeology at UCLA for their extensive efforts in nurturing this volume through review, production, and distribution. We are also indebted to anonymous reviewers who dedicated large amounts of their time to evaluating individual chapters and the volume as a whole, and made constructive suggestions on how the volume could be improved. Special thanks are also offered to Angela Barrios of the Social Sciences Department, California Polytechnic State University for her efforts in electronic editing near the final hour of production. Finally, we wish to extend our gratitude to the Cotsen Institute of Archaeology and their editorial board for sharing a commitment to continue the publication of fundamental research in California archaeology—a legacy at UCLA and other University of California campuses with a long and hallowed history.

— Jon M. Erlandson
Terry L. Jones

CHAPTER 1

Late Holocene Cultural Complexity on the California Coast

TERRY L. JONES

In two previous volumes on California coastal prehistory—dealing sequentially with the Early and Middle Holocene (Erlandson and Colten 1991a; Erlandson and Glassow 1997)—researchers described evidence for the initial human colonization of California shorelines, placed that evidence in the context of rapidly and dramatically changing coastal environments caused by post-glacial sea level rise, and described some of the first changes in adaptation brought about by the settling in and growth of initial populations. The Early Holocene coastal archaeological record generally speaks to very basic issues of subsistence, environment, and technology, dated in 1991 to about 8000 BC, but more recently pushed back to at least 9750 BC (Erlandson et al. 1996). While littoral foragers were exploiting shellfish and employing watercraft by this early date, we know very little of their social and political organization, rituals, intergroup relationships, or cultural identities (see Erlandson 1994). Some authors have argued for reliance on storage and semisedentism as early as 6500 BC (for example, Glassow 1991; Koerper, Langenwalter, and Schroth 1991), but these possible signs of cultural complexity are lost among a myriad of unresolved questions about the basic adaptation of California's earliest coastal inhabitants. The archaeological record is more substantial for the Middle Holocene, and many primary adaptive traits are reasonably well defined. Signs of incipient complexity (for example, regularized interregional exchange) are slightly more abundant, but most of the Middle Holocene record has been interpreted largely with reference to technology, subsistence, and habitat.

Relative to these earlier periods, several aspects of the Late Holocene archaeological record for the California Coast are unique. The record of occupation is much more complete, with abundant evidence of human occupation along the entire coast, sea level was more stable, preservation is more favorable, and chronological resolution is higher. More importantly, the Late Holocene archaeological record ends with historically documented Native societies that showed significant, albeit varied, signs of cultural complexity, including sedentism, permanent social inequality, and hierarchical political organization. California's maritime societies probably acquired most of this cultural sophistication some time during the last 3500 years. As a consequence, many of the chapters in this volume deal extensively with issues of cultural complexity—viewed alternately as fully emergent during the Late Holocene or as the culmination of trends that began earlier.

The Northwest Coast of North America has long been linked with culturally complex foragers. Permanent social inequality, sedentism, and elaborate maritime adaptations (Ames 1994:209) were documented more than a hundred years ago among groups like the Kwakiutl, Haida, and Bella Coola of British Columbia. While Northern California has often been included within the Northwest Coast culture area (see Ames 1994; Kroeber 1939; Matson and Coupland 1995:3; Suttles 1990:10–11), the complexity of California coastal societies is much less known ethnographically. Because California attracted early and rapid settlement by Euro-Americans, its ethnographic and ethnohistoric records are incomplete. While California anthropologists have long been aware that many Native societies along the coast and major rivers showed significant elaborations in political organization, technology, and exchange (see Bean and King 1974; Bean and Lawton 1976; C. King 1976; T. King 1978), these have generally not attracted the attention of broader anthropological audiences (Gregg 1991:87). That California was home to sedentary, populous, politically complex

hunter-gatherers has become increasingly apparent in recent years due in part to archaeological investigations that have provided insights into the lifeways of foraging peoples who existed in areas now densely populated by modern industrialized societies.

Broad recognition of cultural complexity in California was also delayed by a prevailing theoretical paradigm that equated hunting and gathering with cultural simplicity and tended to overlook signs of more elaborate adaptations. This view held sway in anthropology through the 1970s, but seminal essays in the early 1980s (for example, Koyama and Thomas 1981; Price and Brown 1985) reversed this trend and created an intellectual environment that encouraged discovery or recognition of culturally complex foragers—historically, ethnographically, and archaeologically. Although California is under represented in the early literature regarding forager complexity, archaeological research of the last decade or so has produced a number of important essays that elucidate cultural practices far more elaborate than those of simple band societies (for example Arnold 1987, 1991a, 1992a, 1992b; 1993b, 1995a; Fagan and Maschner 1991; C. King 1990; Lambert and Walker 1991; Lightfoot 1993) and illustrate clear diachronic progressions toward complexity (for example, Basgall 1987; Bouey 1987).

WHAT IS CULTURAL COMPLEXITY?

An unfortunate by-product of the paradigmatic shift toward recognition of cultural sophistication among foragers is the emergence of the term "complexity" as an often ill-defined cliché. The idea of cultural complexity is derived from comparative evaluation of the social and adaptive practices of the world's societies, and is a relative concept that might best be defined by what it is not. The antithesis of complexity is embodied in the social, economic, and political practices of mobile, nonpopulous hunter-gatherers who occupied many marginal environments (for example, deserts and arctic tundra) at the time of Euro-American contact. The California Coast, with its rich marine resource base, was not such a place, but a good example is provided by the Great Basin Shoshone (a group described by D. Thomas [1981:19] as one of the least affluent of all the world's foragers) who practiced a relatively simple form of hunter-gatherer adaptation. The Shoshone were a typical band society. They congregated in politically autonomous associations of two or more family groups in a defined territory within which they made seasonal movements. The band's territory was fully open to all members and was occasionally defended against trespass by others, but organized warfare was rare. Division of labor was based almost wholly on age and gender, and craft specialization was absent; men hunted and fished, while women gathered plant foods and attended to children. Storage was practiced, but stores were insufficient to accommodate long-term sedentism. Leadership statuses were commonly achieved rather than ascribed, and there was little disparity in wealth. Membership in bands was fluid, and maximum population was usually no more than fifty people per group, although spatially concentrated resources sometimes temporarily attracted more populous, multiband settlements. Each household was a self-sufficient unit (Steward 1938:44). Some groups traded for foodstuffs and/or shell money, but others practiced little or no intergroup exchange (Steward 1938:45). Kin reckoning was bilateral, lineal descent groups were absent, and nuclear households were the norm.

Cultural complexity, in contrast, is marked by sociopolitical practices and institutions traditionally associated with crop-based adaptations, but now also recognized for hunter-gatherers in many parts of the world, particularly coastal and other relatively rich and/or highly variable environments (Keeley 1989; R. Kelly 1995:293; Price and Brown 1985). Traits of complexity are perhaps most clearly delineated in the well-known cultural evolutionary models of Fried (1967), who defined rank and stratified societies as more complex than bands, and Service (1962), who defined bands, tribes, chiefdoms, and states. While these categories are no longer employed in a strictly evolutionary sense, they are still useful as heuristic devices that define clusters of social and economic traits of increasing complexity (Arnold 1996a:4; Creamer and Haas 1985). Tribal societies are marked by heavy reliance on storage, sedentism, large settlements (commonly 250 to 300 people and up to 1000 in some cases), and high population density. Social organization includes large extended households and lineal descent groups. Organized warfare is more common than among mobile foraging groups (Lenski and Lenski 1974:193), which affects some occupational specialization related to defense, warfare, and trading. Concepts of property ownership are more highly developed, resulting in some inequality in the distribution of resources. Exchange is more elaborate than the generalized reciprocity typical of egalitarian band societies. Wealth objects exist (R. Kelly 1995:294), and exchange tends to involve these status goods rather than nonbasic resources (Creamer and Haas 1985:738). Among so-called "Big-Man" tribal systems of ethnographic Polynesia and Melanesia, surpluses are used to establish and maintain positions of temporary authority (Sahlins 1963), often via competitive feasting. Chiefdoms are distinguished from tribes by permanent social inequality and centralized political authority. They have clearly defined social hierarchies that are often marked by stratification and, in some cases, slavery. They are composed of economically interdependent communities, united under the power of a paramount chief. Systems of redistribution allow chiefs to accumulate significant wealth and to distribute resources within the polity. The anticipated archaeological signatures

Table 1.1 Ethnohistoric complexity among Native societies of the California Coast

TRAIT	NORTH COAST*	SAN FRANCISCO BAY**	CENTRAL COAST***	SOUTHERN COAST	
				NO. BIGHT†	SO. BIGHT††
Sedentism (low residential mobility)	+	?	?	+	+
Large settlements (>200 people)	-	+	-	+	?
Population density (>5 persons/mi²)	11.0	-	-	21.6	-
Sophisticated maritime technology (Oceangoing watercraft)	+	-	-	+	-
Advanced storage technology and high dependence on storage	+	+	?	+	+
Warfare or high frequency of intergroup conflict	+	?	+	+	+
Marked inequality in distribution of property	+	-	-	+	-
Unilineal descent groups	+	+	+	+	+
Craft specialization	?	-	-	+	-
Social stratification	+	-	-	D	-
Slavery	+	-	-	-	-
Ascribed leadership statuses	+	?	-	+	+
Hierarchical political organization	-	-	-	+	-
Intensive intergroup or monetized exchange	+	-	-	+	-

* Tolowa, Yurok, Wiyot, Pomo; ** Coast Miwok, Ohlone; *** Esselen, Salinan, northern Chumash; † Chumash, Gabrielino; †† Luiseno, Kumeyaay
+ = definitely present in at least one group; - = absent; ? = uncertain; D = disputed
Sources: Keeley 1989, Strong 1929, Kroeber 1925, Schalk 1981, Heizer 1978, Harrington 1942

of tribes and chiefdoms have been discussed by Creamer and Haas (1985), O'Shea (1984), and Peebles and Kus (1977).

CULTURAL COMPLEXITY AT CONTACT ALONG THE CALIFORNIA COAST

The ethnohistoric record indicates that social elaborations beyond those of simple bands were present among many California coastal societies at the time of contact (table 1.1). Historically, this record is most compelling for the coastal area north of Cape Mendocino (figure 1.1) due to its linkage with the Northwest Coast culture area. The Yurok, in particular, were highly sedentary, had a stratified society complete with slavery, were organized into descent groups, engaged in competitive feasting, and had highly developed concepts of private property and wealth, particularly the ownership of "treasure" or valuable heirlooms passed from one generation to the next (Bean 1978; Pilling 1978). A comparable portrait of complexity has emerged more recently for the Chumash of Southern California who had an elaborate maritime adaptation based on intensive ocean fishing and acorn storage. Early ethnohistories (for example, A. Brown 1967; Kroeber 1925; Landberg 1965) seem to have underestimated Chumash cultural elaborations, but more recent studies (for example, J. Johnson 1988; C. King 1990) emphasized extremely large settlements, high population density (C. King 1976, 1982), craft specialization (Bean 1978), and a hierarchical form of political organization (Grant 1978b:510). In a unique situation for California, these ethnohistoric interpretations have been bolstered in the Chumash area by strong archaeological support for complexity, including evidence for ascribed political statuses, hierarchical political organization (Martz 1984, 1992), craft specialization, and intensive trading (Arnold 1991a, 1992a, 1992b). Elsewhere in California, intricate mosaics of incomplete ethnohistoric documentation and archaeological findings of varied quantity and significance suggest complexity. In the San Francisco Bay area and along the Central Coast, the ethnohistoric record is poor, but archaeological findings are providing some evidence of wealth accumulation and social inequality (see Hylkema, chapter 13), albeit more weakly elaborated than among the Chumash or Yurok. In general, for the time of historic contact, permanent social inequality seems to have been less pronounced on the Central Coast (Coast Miwok, Ohlone, Esselen, Salinan) and the southern bight (Luiseno, Kumeyaay), where societies were less populous and more mobile (table 1.1, figure 1.1).

THEMES IN THE STUDY OF EMERGENT COMPLEXITY

While the archaeological record has been used to supplement incomplete ethnohistoric records in California, archaeological research has been pursued more broadly in California and elsewhere (see Ames 1991, 1994; Arnold 1996a, 1996b; Byrd 1994; Campana 1994; Hayden 1990; R. Kelly 1991; Lightfoot 1993; Renouf 1991, among others) to explore the processes underlying the emergence and

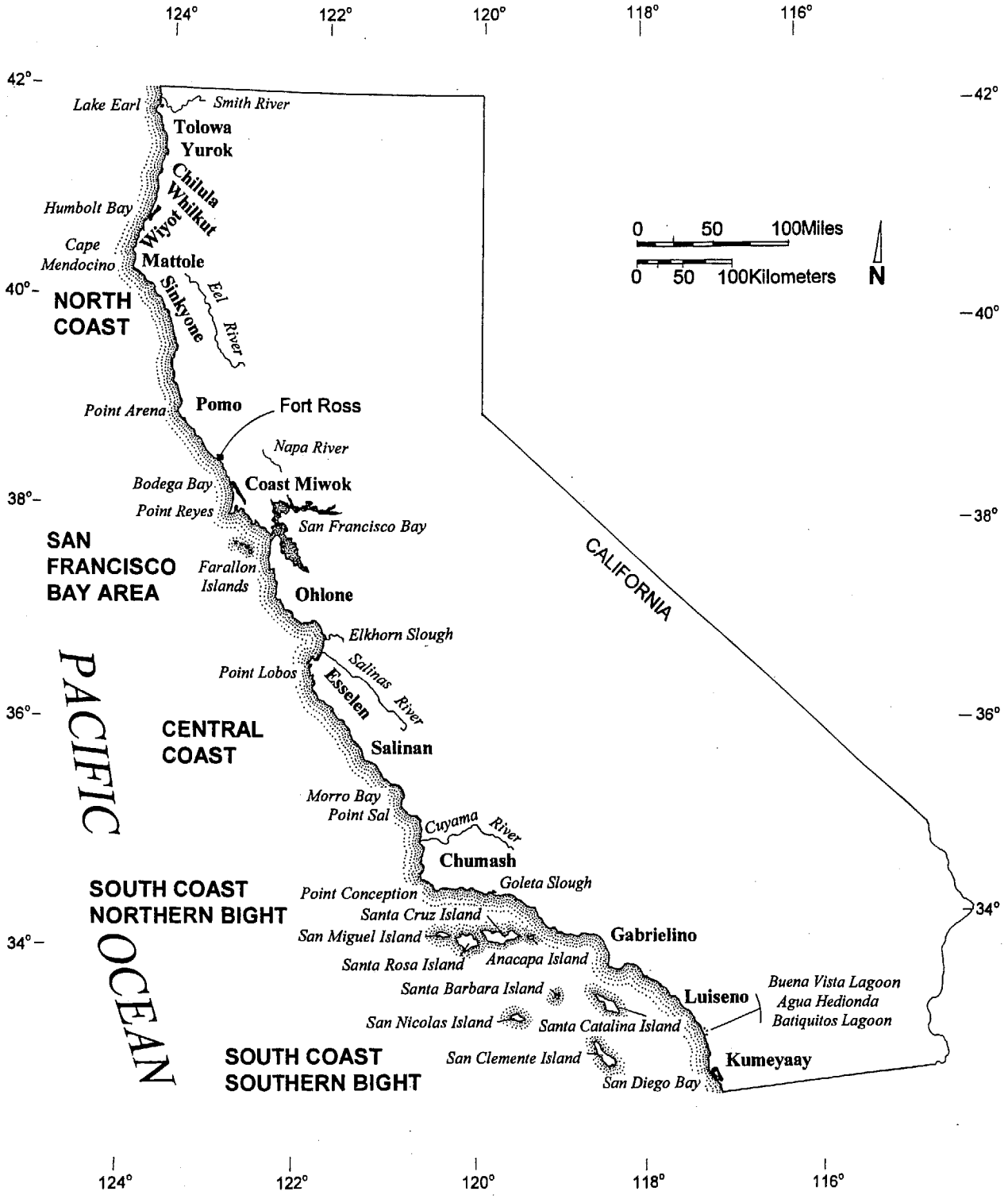


Figure 1.1 The California Coast, with major geographic features and general tribal territories

evolution of complexity. This research agenda was fueled in the 1980s and 1990s by the growing recognition that social inequality, previously linked to the Neolithic revolution, was widespread among prehistoric foraging populations (Arnold 1996a:3) and seems to have greater antiquity than previously thought (Campana 1994:1). In the simplest of terms, researchers worldwide have sought to determine how, when, and why various traits of complexity arose by looking more intensely at hunter-gatherer populations rather than simply at agriculturalists (Arnold 1996a:3). The range of complexity among its coastal societies makes California particularly interesting in that broad explanatory models need to consider not only those societies with significant cultural and social elaborations but also those with more limited complexity. Chapters in this volume address these issues to varying degrees, with the caveat that archaeological and ethnohistoric data are sketchy for some parts of the California Coast. In recognition of this, several chapters (see Glassow in chapter 11, Jones and Ferneau in chapter 12, Hylkema in chapter 13, Lightfoot and Luby in chapter 14, and Dowdall in chapter 15) touch only briefly on complexity and instead emphasize overviews of ethnohistory, Late Holocene cultural chronology, subsistence, and settlement. Virtually all the chapters show strong influence from cultural ecology, highlighting topics of chronology, environment, and population. Limitations of strict cultural ecological or adaptationist perspectives recognized elsewhere in studies of emergent complexity (for example, Bender 1985; Maschner 1991) are acknowledged in this volume, with alternative foci on power, labor, gender, ritual, and ethnicity.

Cultural Chronology

Issues of cultural chronology underlie the debate regarding emergent complexity in nearly all the chapters in this volume. Most apparent are differences of opinion concerning when signs of cultural elaboration appeared. Some authors (for example, Erlandson and Rick, chapter 10) see the roots of complexity as lying farther back in the Holocene and emerging gradually. Munns and Arnold (chapter 8) and Hildebrandt and Levulett (chapter 16) instead, envision a cluster of complex traits emerging together after AD 1000. Kennett and Conlee (chapter 9) envision a similarly abrupt emergence slightly farther back in time, about AD 700. Anchoring these debates are numerous richly detailed regional and local cultural chronologies (figure 1.2) with a wide range of theoretical underpinnings. California archaeology has long been anchored by tripartite cultural schemes owing to seminal chronologies developed by D. Rogers (1929) for the Santa Barbara area (Oak Grove, Hunting, and Canalino cultures); Lillard, Heizer, and Fenenga (1939) for Central California (Early, Middle, and Late horizons); and M. Rogers (1939) for the San Diego area. Early syntheses (for example, Heizer 1949) argued for the applicability of a single three-part sequence for the entire state, but subsequent research (that is, Fredrickson 1974a; Gerow 1968) revealed significant regional variation as early as the Middle Holocene. Fredrickson (1974a) proposed alternative (albeit still tripartite) chronological nomenclature for Central and Northern California (Paleoindian, Archaic, and Emergent periods), abandoning the traditional Early, Middle, and Late divisions. Because California shell bead types show tremendous similarity in temporal distributions over wide areas of California, most California archaeologists have not entirely abandoned the traditional Early, Middle, and Late chronological structure. Indeed, the present day cultural sequence for the Santa Barbara Channel area (C. King 1990; see figure 1.2), based largely on bead and ornament types, is divided into these familiar subdivisions.

For most of the California Coast, the Late Holocene is synonymous with the traditional Middle and Late periods, the dating of which varies slightly from region to region, but the Middle period, distinguished from the preceding Early by the first appearance of *Olivella* saucer beads, is generally thought to have begun between 1500 and 500 BC. All regions of California show significant cultural changes marking the end of the Middle period some time between about AD 600 and 1300. These include the appearance of new bead types (Class M *Olivella* rectangles in the north and Class E lipped *Olivella* beads in the south), arrow points, and pottery (on the extreme South Coast). Some (for example, Arnold 1992a, 1995a) also argue that sophisticated watercraft (oceangoing canoes in the north and plank canoes in the south) appeared at this juncture as well (although see Davenport et al. 1993; Gamble and Russell, chapter 7, this volume). Dating of the Middle–Late Transition varies considerably depending on which cultural or artifactual traits are emphasized and which geographic region is considered. For the classic Central California bead sequence, there are three alternative dates for the beginning of the Late period (Bennyhoff and Hughes 1987): circa AD 300 (scheme A2), AD 900 (scheme B1), and AD 1000 (scheme B2), although most recent research favors the AD 900 date (see Hylkema, chapter 13; Milliken and Bennyhoff 1993). In the Santa Barbara area, the Late period begins circa AD 1300. Some local sequences also include a discrete phase marking the Middle-Late Transition: AD 700 to 1200 in the San Francisco Bay area (Hylkema, chapter 13, this volume), AD 1000 to 1250 on the Central Coast (Jones 1993), and AD 1150 to 1300 in the Santa Barbara area (Arnold 1992a). On the North Coast, Frederickson (1974a) posed a transition from the upper Archaic to the Emergent periods circa AD 1000 based largely on changes in adaptation, not specific artifact types. Subsequent research on the North Coast has sought to define specific cultural assemblages within that temporal framework (figure 1.2).

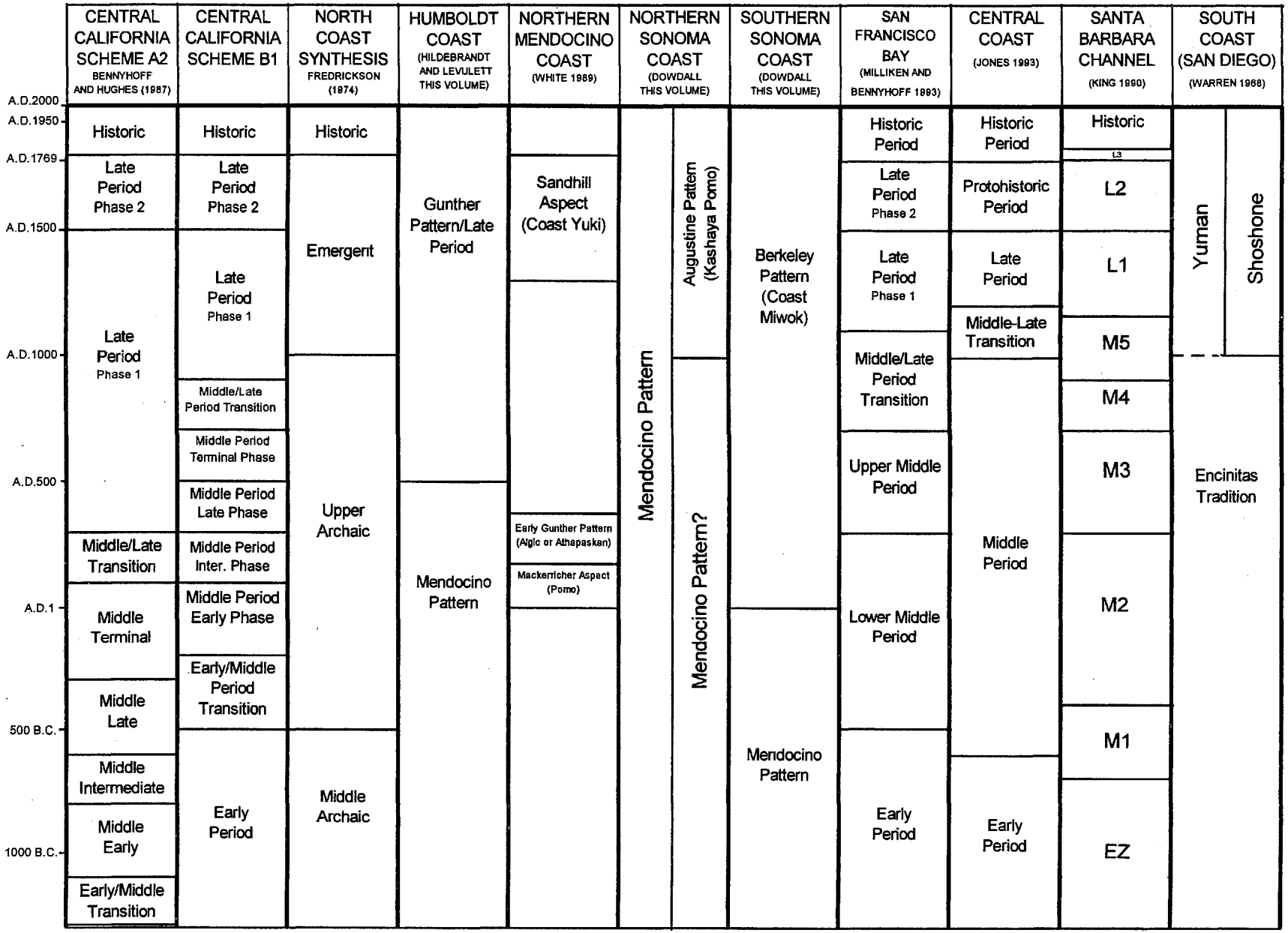


Figure 1.2 Late Holocene (3500–present) chronological sequences for the California Coast

Adding to the intricacies of California culture history is the problem of radiocarbon calibration. All the seminal California cultural sequences were developed on the basis of stratigraphic excavation and seriation before the advent of radiocarbon dating. Radiocarbon dates were first applied to most regional sequences in the 1960s. By the late 1990s thousands of Late Holocene dates had been obtained from the coast (see Breschini et al. 1996). This abundance is problematic, however, in that research of the last two decades (for example, Stuiver and Reimer 1986; Stuiver, Pearson, and Braziunas 1986) shows that the radiocarbon and calendric time scales are not synchronous, due largely to changes through time in the natural levels of atmospheric ^{14}C. Fortunately, radiocarbon dates can be brought into line with the calendric scale through a series of corrections readily made using the Stuiver and Reimer (1993) computer program. These corrections have been made systematically only recently, however, so that the bulk of the California coastal radiocarbon record, including dates used to define seminal chronologies, consists of uncalibrated and uncorrected dates. In the two previous volumes on California coastal prehistory, this problem was dealt with by referring exclusively to the radiocarbon time scale (that is, dates were referred to in Radiocarbon Years Before Present [RYBP]). Because the Late Holocene ends with known historic events, there is an intrinsic obligation in this present volume to focus on calendric time. We therefore encouraged authors to correct dates for isotope fractionation and marine and terrestrial ^{14}C inequities through use of Stuiver and Reimer (1993) and to present calendar ages in years BC or AD. While the volume emphasizes corrected dates and calendric time, longstanding cultural historical frameworks that pre-date recognition of the radiocarbon/calendric discrepancy have in most cases not been revised. Also, in some cases regional radiocarbon databases were not calibrated.

Environment

Environment has long been a major theme in theories of hunter-gatherer complexity, and virtually all chapters in this volume include extensive descriptions of regional environmental settings. In the landmark 1968 volume, *Man the Hunter*, Suttles (1968:56) attributed the high population density and complexity of Northwest Coast foraging societies to the richness and variability of the region's marine and riverine habitats. Bean (1978:681) and Bean and Lawton (1976) in turn attributed the high population density and social complexity of Native California at least partially to the extraordinary energy potential of California environments. This synchronic conceptualization held sway among California anthropologists for nearly two decades until sufficient paleoenvironmental and archaeological data began to accumulate, allowing development of diachronic perspectives on environment and complexity. Diachronic modeling began in earnest in 1987 when Basgall (1987) and Bouey (1987) argued that the key resource fueling the emergence of cultural elaborations in Native California was the acorn and that intensified acorn exploitation went hand in hand with increasing cultural complexity. These influential papers temporarily directed attention away from coastal habitats and environmental variability, but this situation was reversed in 1992 with the publication of Arnold's important papers (1992a, 1992b) on emergent complexity among the Chumash of Southern California. Arnold took a strong and very different position regarding the chronology and causes of emergent complexity. She argued that foragers living on Santa Cruz Island were negatively affected by a severe El Niño-like decline in marine productivity circa AD 1150 to 1250, which increased production of shell beads and created an opportunity for elites to promote and control craft specialization, thus reinforcing their power and creating a permanent hierarchical organization. This was a significant departure from longstanding views of the California environment as rich, stable, and nurturing. As demonstrated by the now widely recognized El Niño/La Niña/Southern Ocillation (ENSO) cycle (see Dayton and Tegner 1990), the California Coast is subject to wild swings in productivity. This is consistent with a newly emerging characterization of California's Mediterranean climate as the antithesis of stability in which dramatic flux may be the norm, not the exception (M. Davis 1995). Arnold's (1992a) chapter, in particular, and her characterization of Late Holocene environmental variability have been the foci through the 1990s of debate regarding complexity in coastal California (Arnold 1997; Arnold, Colten, and Pletka 1997; Colten 1994, 1995; Jones and Hildebrandt 1995; Kennett and Kennett 2000; Raab and Bradford 1997; Raab and Larson 1997). The debate continues in this volume in chapters by Raab et al. (chapter 2), Byrd and Reddy (chapter 4), Munns and Arnold (chapter 8), Kennett and Conlee (chapter 9), and Erlandson and Rick (chapter 10). Some of these authors challenge Arnold's characterization of the Middle to Late Transition (Kennett and Conlee [chapter 9]), while others evoke environmental flux as a significant agent of change but not necessarily one that prompted increased complexity (Gallegos [chapter 3]; Koerper, Mason, and Peterson [chapter 5]; Glassow [chapter 11]; Jones and Ferneau [chapter 12]). Several chapters focus on environmental variability between about AD 800 and 1400, a period known as the Medieval Climatic Anomaly (Stine 1994; T. Jones et al. 1999) (Kennett and Conlee [chapter 9], Munns and Arnold [chapter 8], Glassow [chapter 11], Jones and Ferneau [chapter 12]), and point to likely intervals of demographic problems in Late Holocene prehistory. Others,

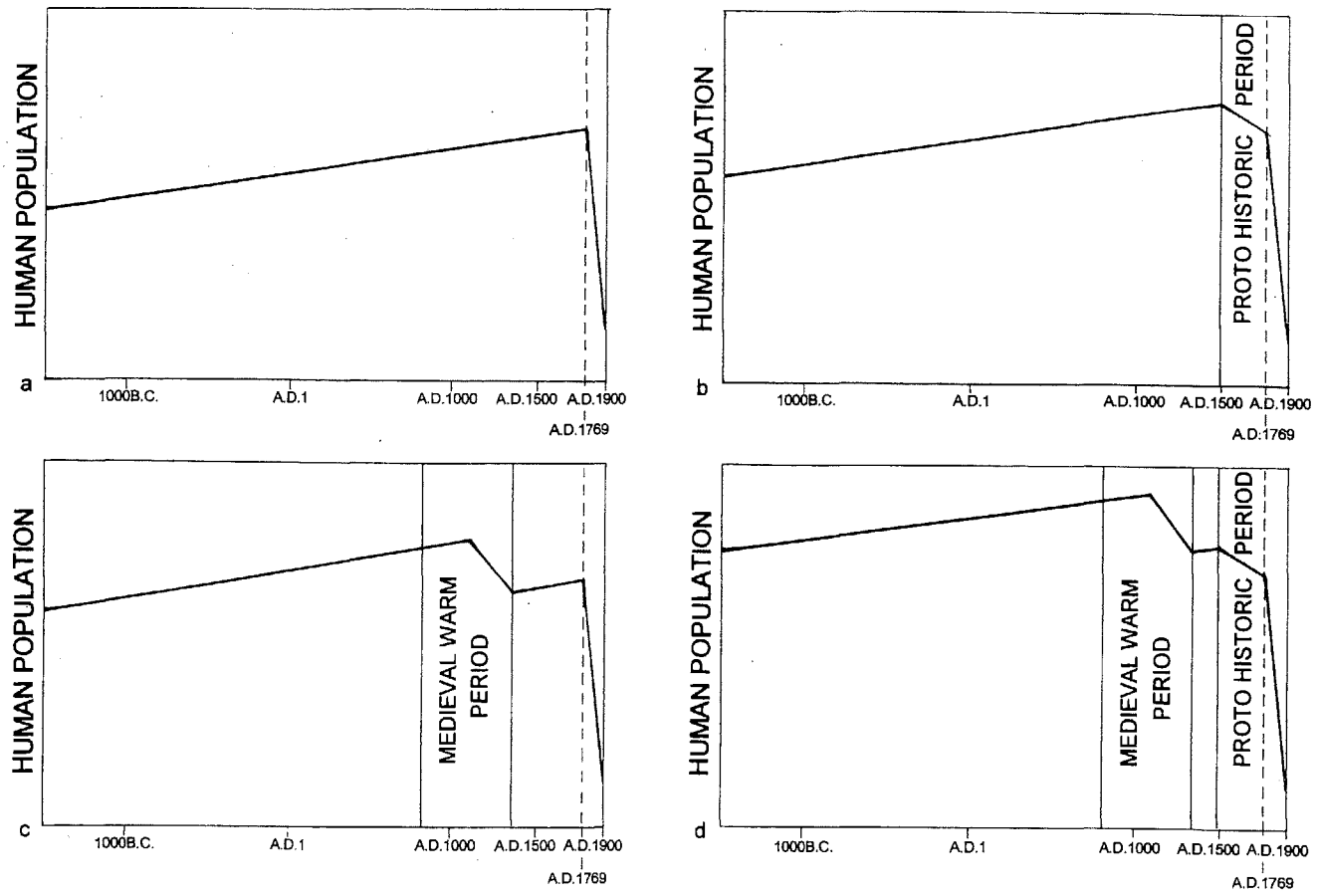


Figure 1.3 Four models of Native American population trends for the Late Holocene, California Coast

mostly those focused on Northern California, do not consider climatically induced cultural change in any detail (see Hylkema [chapter 13], Dowdall [chapter 15], Hildebrandt and Levulett [chapter 16]), at least in part because Late Holocene paleoenvironmental sequences are lacking for their regions.

Population Demographics

Characterizations of California coastal environments as rich, diverse, and/or highly variable are made more profound by consideration of actual relationships among the resource base, human population trends, and processes of cultural development. Two contrasting views of coastal richness and population have been spawned by cultural ecology, both of which are represented in this volume. The first, which dominated thinking up to 1981 or so, emphasized the "affluence" of coastal hunter-gatherers, with the idea that a richness of resources allowed populations to become more dense and develop more complex cultural expressions (Koyama and Thomas 1981; B. Fagan 1995:253). Cohen (1977, 1981) developed a very different perspective, suggesting that coastal foragers in temperate latitudes were not so much affluent as they were overcrowded. Affluence may have existed at the time of initial colonization, but growing populations would have rapidly stressed economic systems, forcing development of more complex social arrangements to meet increasing subsistence demands. Cohen's ideas have been widely embraced in California despite Baumhoff's (1963, 1981) demonstration that California Native societies seem to have operated below carrying capacity, at least at the time of historic contact. Cohen's ideas have also been linked with microeconomic theories of intensification and optimal foraging (for example, Basgall 1987; T. Jones 1991, 1992; Hildebrandt and Jones 1992; Broughton 1994b; Erlandson 1991a; Raab 1992). Nearly half the chapters in this volume allude to the process of economic intensification (broadening of the diet, with greater labor investment, as a larger number of lower ranked foods are exploited) in connection with emergent complexity.

Papers by Basgall (1987) and Arnold (1992a, 1992b) should again be recognized as seminal in their treatment of demographic stress. Arnold's model, while going well beyond a simple prime mover scenario, is consistent with the

overcrowding hypothesis insofar as it links complexity with demographic stress, not affluence. Basgall (1987) instead, envisioned stress and complexity building incrementally in response to population growth. Except for Glassow (chapter 11) and Koerper, Mason, and Peterson (chapter 5), most chapters in this volume treat human population, population growth, and population "pressure" more implicitly than explicitly. Best estimates for the aboriginal population of what is now the state of California when Spanish colonists arrived in AD 1769 are between 310,000 (S. Cook 1976:43) and 350,000 (Baumhoff 1963), for a mean density of 2.2 people/mile^2. Most coastal tribes showed much higher population densities, however, including the Chumash, whose population density has been estimated at 21.6 (table 1.1).

Several alternative trajectories of population may have preceded the demographic situation of AD 1769. One not directly proposed in any chapter, but implied by several, is that the Native population was at its pinnacle in 1769 following incremental growth through the Holocene (figure 1.3a). This incremental growth was reversed precipitously after direct contact with Europeans in AD 1769. Many California scholars (for example, Chartkoff and Chartkoff 1984:235, 256; Erlandson and Bartoy 1995; Forbes 1969:25; Meighan 1981:35; Preston 1996, 2002) suspect, however, that European diseases impacted Native Californians well before the Spanish established a permanent presence along the Southern and Central California Coast. Exposure could have occurred during any of the pre-Mission contacts between Native Californians and early explorers (see Early Contact and the California Protohistoric Period below), or contagion could have spread from centers of earlier New World settlement to California through human-to-human transmission. Preston (1996) suggested that Old World diseases probably had devastating effects on Native California peoples centuries before Europeans established permanent colonies. He provided a detailed account of the specific European diseases that had spread throughout most of the New World by the early 16th century (for example, chicken pox, measles, small pox, yellow fever, and tuberculosis, among others) and argued further that the aboriginal population of California probably reached its peak early in the 16th century and declined thereafter (figure 1.3b). Most coastal archaeologists probably agree with Preston's analysis, and would (at least in theory) recognize the Protohistoric period in California archaeology, from about AD 1519 (the year Cortez landed in Mexico) to AD 1769, as a distinctive demographic interval. Unfortunately, the Protohistoric period is not easily recognized in California archaeological sites because ^{14}C dates near the historical era have rarely been calibrated and lack precision. Nonetheless, Protohistoric decline represents another possible direction in the population history of Native California (figure 1.3b). Several chapters suggest that demographic problems during the Protohistoric period may have come on the heels of an earlier decline during the Medieval Climatic Anomaly (see Glassow [chapter 11], Jones and Ferneau [chapter 12]; see also T. Jones et al. 1999) (figures 1.3c, d).

Sedentism and Mobility

Linkages between sedentism and complexity have been recognized since Boas's first studies of the Northwest Coast, and the relative mobility of California prehistoric foragers also has a lengthy history of debate. Discussions of sedentism began in earnest in California in the mid-1960s when Curtis (1965), Owen (1964, 1967), and Warren (1967) argued alternatively for semi sedentism and full sedentism for Early Holocene peoples on the Southern Coast. Since then, debates concerning mobility have tended to focus more on Binford's (1980) settlement classification system with its mobile foragers and sedentary collectors (see Breschini and Haversat 1980, Hildebrandt 1984). In applying this scheme, diachronic trends toward a collector strategy are generally interpreted as signs of increasing sedentism, usually in the absence of stronger empirical evidence (for example, seasonality data) for year-round occupation of single settlements. In some cases, (for example, the Chumash, Yurok), ethnohistoric accounts strongly suggest year-round site use, but for most of the rest of coastal California, the ethnohistoric record is ambiguous, and definitive archaeological evidence for relative mobility has been difficult to isolate. Nonetheless, the importance of sedentism is not lost on the authors of this volume, nearly all of whom posit diachronic trends toward decreasing mobility, usually as precursors to social elaboration. Because of the difficulties in establishing permanence of settlement empirically, however, very different opinions regarding the timing of emergent sedentism are expressed. This divergence suggests that mobility and settlement remain critical issues in the archaeology of the California Coast.

Power, Political Hierarchy, and Labor

Permanent, centralized political authority, of course, is a key feature of social and adaptive complexity. Indeed, Arnold (1996a, 1996b) defines hereditary hierarchical leadership and the ability to control resources and labor as the singular defining characteristics of cultural complexity. For Arnold, in other words, only chiefdom-level political organization represents significant complexity. Her definition has value for the Chumash—the only group in coastal California to achieve this level of political sophistication unequivocally (table 1.1), and Arnold (1991a, 1992a, 1992b) has consistently attempted to define the chronology and causes underlying the emergence of this structure for this group. In their contribution to this volume, Munns and Arnold (chap-

ter 8) make the clearest and most definitive statement concerning the emergence of permanent social inequality. Relying on the remarkable archaeological record from Santa Cruz Island, Munns and Arnold acknowledge that signs of complexity consistent with tribal levels of political organization—sedentism, ascribed status (marked by elaborate juvenile burials), and violence—were apparently in place as early as the Middle period. They propose, however, that signs of more significant social inequality and hierarchy—intensive craft specialization and exchange, along with a major disparity in the distribution of mortuary goods—appeared only after AD 1100. They argue for a fundamental reorganization of labor, leadership, and allocation of resources that placed permanent power in the hands of elites and allowed specialization in the manufacture of plank canoes and shell beads. Intensive production of the latter, indicated by profuse deposits of beads, bead-manufacturing detritus, and bead-making drills (Arnold 1987), provides some of the most compelling evidence for occupational specialization in Native California. Kennett and Conlee (chapter 9) argue, however, that intensified production of shell beads began earlier in the Chumash area, about AD 650.

Other evaluations of social inequality focus exclusively on mortuary associations, specifically on disparity in the distribution of wealth items within cemeteries as an indication of inequality in the distribution of wealth and power, and the occurrence of wealth objects in juvenile graves, suggesting inherited status. Hildebrandt and Levulett (chapter 16) show significant inequity in the distribution of prestige items (imported obsidian bifaces and shell beads) in a post-AD 1000 cemetery on the Northern California Coast. This cemetery also showed signs of ascribed status, correlating nicely with the social inequality observed on the North Coast ethnographically. In the San Francisco Bay area, Hylkema (chapter 13) describes a more equitable distribution of wealth objects among Late period graves, suggesting a more egalitarian social situation. In contrast with earlier times, the Late period in that region shows a significant increase in the mean number of shell beads interred per individual, but a majority of graves included wealth objects. Some measure of social inequality, however, was suggested by burials with inordinately high numbers of beads (approximately 2000 per interment), and richly adorned juvenile graves. Similarly limited mortuary evidence for inequality and ascribed statuses is reported for the Central Coast (Jones and Ferneau [chapter 12]), and the Southern California Bight (Koerper, Mason, and Peterson [chapter 5]; Byrd and Reddy [chapter 4]; Gallegos [chapter 3]).

Ritual

Close relationships between political and ritual authority in pre-state societies are common (Aldenderfer 1992), as exemplified by ritualized feasting (potlatches) on the Northwest Coast and the temporary power gains in so-called Big Man economies of New Guinea and elsewhere. The possibilities of ritual-related influences on power structures is touched on briefly in several chapters in this volume, but is most strongly developed by Lightfoot and Luby (chapter 14). Alluding to an earlier study by Luby and Gruber (1999), they, suggest that San Francisco Bay shell mounds are not merely accumulations of dietary debris, but instead represent ritualized mortuary feasting and social aggrandizement. Elites are thought to have sponsored periodic gatherings at these locations to enhance their status with feasting in honor of ancestors. Through this process, the mounds were further thought to take on a symbolic significance for the local inhabitants (see also Lightfoot 1997). The abandonment of many of these mounds at the end of the Middle period is argued to represent a significant transformation in regional symbolic and ritual systems.

Gender

Over the last decade, discussions of gender in prehistoric California have emphasized the Milling Stone horizon—a culture apparently so uninvolved with hunting that males must have done a significant amount of gathering (Erlandson 1994:266; T. Jones 1996; McGuire and Hildebrandt 1994)—and bedrock mortar features associated with intensive acorn processing by women (Jackson 1994; McCarthy 1993). The hallmark of complex Late Holocene economies in Native California was a gender division of labor in which women specialized in intensive processing: plant foods in terrestrial settings and fish on the coast. In a situation not unlike that of horticultural societies, basic adaptive success was probably more dependent on female rather than male labor. Whether this situation resulted in higher status for females is uncertain, as is the timing of the appearance of such specialization. T. Jones (1996) argued for a Middle Holocene emergence as a result of population circumscription, while Hollimon (1990) suggested it was a Late Holocene phenomenon in the Santa Barbara Channel area. Raab et al. (chapter 2) point out that change in the importance of female subsistence efforts may have affected birth rates among these societies, increasing the rates of population growth.

Ethnicity

While studies of power, labor, gender, and cultural complexity are relatively recent in California coastal archaeology, considerations of ethnicity date back nearly a hundred years to the culturally particularistic studies of Franz Boas and his student, A. L. Kroeber. This emphasis has maintained its usefulness in California largely because of a mosaic-like distribution of Native language families that almost certainly

Table 1.2 Chronology of Late Holocene ethnolinguistic group movements along the California Coast

TRIBE	LINGUISTIC AFFIL.	ARRIVAL ON COAST (EST.)	PREV. ESTABL. GROUP	REFERENCE
Tolowa	Athapaskan	AD 1300	Karok (Hokan-speakers)	Hildebrandt and Levulett, this volume, ch. 16
Yurok	Algic	AD 1100-1300	Karok (Hokan-speakers)	Hildebrandt and Levulett, this volume, ch. 16
Wiyot	Algic	AD 900	Karok (Hokan-speakers)	Hildebrandt and Levulett, this volume, ch. 16
Mattole	Athapaskan	AD 1300	Karok (Hokan-speakers)	Hildebrandt and Levulett, this volume, ch. 16
Sinkyone	Athapaskan	AD 1300	Karok (Hokan-speakers)	Hildebrandt and Levulett, this volume, ch. 16
Pomo	Hokan	AD 1000	Yukian-speakers?	Dowdall, this volume, ch. 15; Fredrickson 1984
Coast Miwok	Utian	AD 1	Yukian-speakers?	Dowdall, this volume, ch. 15; Fredrickson 1984
Ohlone	Utian	AD 800-1200*	Hokan-speakers	Jones and Ferneau, this volume, ch. 12
		2000 BC**	Hokan-speakers	Moratto 1984
Gabrielino	Uto-Aztecan	600 BC	Hokan-speakers?	Gamble and Russell, this volume, ch. 7; Moratto 1984
		AD 600	Hokan-speakers	Koerper, Mason, and Peterson, this volume, ch. 5
		4000 BC	Hokan-speakers	Drover and Spain 1972

*Arrival into Monterey Bay area
** Arrival into San Francisco Bay area

reflects a complex history of group movements, in-migrations, and replacements (Kroeber 1925, 1955a). At the time of historic contact, six major linguistic stocks and twelve language families were represented along California's shoreline, and many local prehistories incorporate explanations for the coexistence of vastly different languages (often immediately adjacent to one another) that emphasize in-migrations of one group or the other. Developed within particularistic frameworks, chronological models unraveling the history of these migrations are profuse in Central and Northern California, and often posit very different settlement histories. While some (for example, R. Hughes 1992) have warned against the simplistic correlations between ethnicities and material culture expressed in such models, many of the group movements thought to contribute to the complex California linguistic mosaic are still seen as Late Holocene phenomena. Chapters in this volume are evenly divided into those considering ethnic replacements (Levulett and Hildebrandt [chapter 16], Dowdall [chapter 15], Jones and Ferneau [chapter 12], Gamble and Russell [chapter 7]) (table 1.2) and those that do not (Lightfoot and Luby [chapter14]; Hylkema [chapter 13]; Glassow [chapter 11]; Erlandson and Rick [chapter 10]; Kennett and Conlee [chapter 9]; Munns and Arnold [chapter 8]; Vellanoweth et al. [chapter 6]; Koerper, Mason, and Langenwalter [chapter 5]; Byrd and Reddy [chapter 4]; Gallegos [chapter 3]; Raab et al. [chapter 2]). In most of the latter cases (for example, chapters on the Chumash), the archaeological and linguistic records suggest ethnic continuity through the Late Holocene. In several cases, however, major changes in regional Late Holocene archaeological records strain the limits of credibility as simple adaptive adjustments by single-resident ethnic groups.

Intergroup Relations: Trade and Warfare

Far-flung trade networks involving shell beads are a well-known characteristic of prehistoric California. Studies of the last two decades or so have shown that obsidian was also exchanged over equally wide distances as beads with comparable regularity. While there is some evidence for distant movement of beads and obsidian during the Early Holocene (Jackson and Ericson 1994); beads made from marine shells first appear in the Great Basin in significant numbers during the Middle Holocene (Hughes 1994:369). Some (for example, Fredrickson 1974a; Jackson and Ericson 1994) argue for an incremental increase in exchange practices thereafter, consistent with gradually increasing complexity. Others (for example, Munns and Arnold, chapter 9) suggest a punctuated pattern of trading with a significant increase after circa AD 1150. C. King (1976) suggested that the sophistication and intensity of bead exchange placed Native California at a level of complexity akin to agriculturalists. Gamble and Russell (chapter 7) support this view, while Munns and Arnold also envision the intense island-mainland exchange of the Chumash area as consistent with significant complexity. Most other regions of California represented in this volume show evidence of less intensive trading. Jones and Ferneau (chapter 12) argue that long-distance exchange peaked at the end of the Middle period when drought-related environmental problems disrupted intergroup relations.

Less well known outside of California are signs of violence and warfare among prehistoric coastal societies (Keeley 1996:viii). These indications were brought to light most convincingly by Lambert and Walker (1991), who illuminated signs of violence among prehistoric mortuary populations in Southern California and argued that these peaked during the Middle period. Similar evidence is reported in this volume from San Francisco Bay (Hylkema, chapter 13) and the Central Coast. While signs of violence never seem to exceed roughly 10% of any cemetery population, they nonetheless suggest a level of intergroup conflict beyond that usually associated with band societies.

Early Contact and the California Protohistoric Period

One final issue unique to the Late Holocene involves the Protohistoric period (ca. AD 1519–1769), when California Natives had brief but direct contact with European explorers. The chapters in this volume focus on California's precontact era, which officially ended in AD 1769 when Gaspar de Portolá and Junipero Serra marched into Southern California to establish the first Spanish mission at San Diego. This was the first of 21 missions established in Alta California between AD 1769 and 1823 (Castillo 1978:100). Sporadic contacts between Native Californians and Europeans actually took place much earlier, however. In AD 1542, for instance, three Spanish ships commanded by Juan Rodriquez Cabrillo sailed up the California Coast and encountered Natives at several locations, including the Channel Islands (Erlandson and Bartoy 1995). The English adventurer, Sir Francis Drake, landed on the coast north of San Francisco Bay in AD 1579; Sebastian Cermeno wrecked his ship at Drake's Bay in AD 1595. The Spanish merchant, Sebastián Vizcaíno, in AD 1602 to 1603 was the last documented European pre-Mission explorer to view the California Coast (see Wagner 1929).

The history of contact for Northern California coastal tribes beyond the limits of the Spanish Mission system occurs later and is more culturally diverse. Eager to fend off Russian interests in lands at the northern limits of their colonies, the Spanish funded two sea expeditions that landed in Trinidad Bay (near Eureka): the first in AD 1775 (commanded by Don Bruno de Hezeta), and the second in AD 1793 (commanded by Francisco de Eliza) (Heizer and Mills 1952:19). The English Vancouver expedition landed in Trinidad Bay in AD 1793 (Heizer and Mills 1952:19). Later contact was spawned by the burgeoning trade in sea otter pelts that brought American (William Shaler in AD 1804) and Russian ships to the North Coast (Jonathon Winship in AD 1806). The Russians operated a colony at Fort Ross on the North Coast from AD 1812 to 1841, which brought about extensive contact among Pomo, Coast Miwok, Russians, and Aleuts, who were brought in by the Russians as laborers. Coastal California tribes located farther to the north appear to have been spared significant direct contact until the Gold Rush began in AD 1848 (Heizer and Mills 1952:74), but it is again reasonable to suspect that diseases reached there earlier.

Although a number of chapters in this volume discuss the Protohistoric period along the California Coast, including the possibility that Old World diseases impacted California's maritime peoples prior to the Mission period, individual authors have been asked to focus on precontact cultural processes. Erlandson, Jones, and Lightfoot are planning a volume dedicated to the archaeology of California's Native peoples following European contact.

VOLUME ORGANIZATION

In keeping with the format of the two previous works on California coastal prehistory in this series, this volume is organized geographically from south to north. The next two chapters, by Raab et al. (chapter 2) and Gallegos (chapter 3), begin near the California/Mexico border, the most xeric stretch of the California Coast. From there, coverage of tribes and territories moves progressively northward, with nine chapters devoted to the South Coast (generally south of Point Sal), one chapter to the Central Coast (between Point Sal and Monterey Bay), two to the San Francisco Bay area, and two to the North Coast.

CHAPTER 2

Late Holocene San Clemente Island

Notes on Comparative Social Complexity in Coastal Southern California

L. MARK RAAB, ANDREW YATSKO, THOMAS S. GARLINGHOUSE, JUDITH F. PORCASI, AND KATHERINE BRADFORD

Most archaeologists recognize the Late Holocene as a particularly dynamic period of culture change in coastal Southern California. From about 3500 years ago until European contact, distinctive new patterns of technology, economy, settlement patterning, and social organization emerged, forming the cultures of ethnohistoric record. Archaeologists remain far from consensus, however, about the origins of these patterns and the extent to which they affected various coastal groups. Debates about Late Holocene cultural origins captured significant attention during the last decade, with social complexity central to the issues under discussion. This focus is scarcely surprising, because social complexity has become an increasingly important topic in models of Southern California coastal prehistory.

During the first half of the twentieth century, archaeologists devoted most of their efforts to explaining the appearance of new culture traits, particularly in the realms of technology and economy. It was in this light that migrationist models gained favor, attributing culture change to the arrival of new peoples on the California Coast (Harrison and Harrison 1966; D. B. Rogers 1929; Warren 1968). With the appearance of cultural ecology in the 1950s, adaptationist scenarios emphasized in situ adaptations to the environment, rather than population movements, as sources of technoeconomic change (Meighan 1959). As the popularity of ecological models increased, hunter-gatherer studies experienced a widespread revival of interest in American anthropology during the 1960s. This trend encouraged greater archaeological interest in problems of social organization, including neo-evolutionary models that identified the emergence of chiefdoms as the crucial developmental link between "simple" and "complex" societies (R. Kelly 1995). As pointed out elsewhere (Raab 1996), neo-evolutionism and its search for the origins of chiefdoms quickly took hold in California, including the Chumash area of coastal Southern California. These models, bolstered mainly by ethnohistoric data, but also drawing on ideas from cultural ecology and a modest stock of archaeological information, achieved almost instant popularity with academics, Native Americans, and the public (Bettinger 1991; Bean and Lawton 1976; Landberg 1965; C. King 1976, 1990; Chartkoff and Chartkoff 1984).

Such evolutionary models cast social complexity in terms that essentially shape current discussions of this topic, namely the appearance of hereditary chiefs and a variety of ritual and economic specialists over which they held sway. The archaeological correlates of chiefdoms are usually described as a regional settlement hierarchy, including large and permanently settled "capital" villages or towns; the appearance of large cemeteries, reflecting status-differentiated mortuary customs; specialized production of many types of crafts; and extensive elite-controlled regional trade networks (Arnold 1992a, 1995b; Chartkoff and Chartkoff 1984; B. Fagan 2000; C. King 1990; Martz 1984).

With an interest in social complexity firmly established, model building during the 1990s advanced along quite different lines than those popularized by neo-evolutionists. These developments reflected not only changing theoretical perspectives in archaeology generally but also a rapidly increasingly volume of archaeological data available to coastal researchers. Neo-Marxists attributed complexity in the Chumash area to coercive control of crafts production and redistribution of food surpluses by what amounted to a powerful over-class (Arnold 1992b, 1995a), rejecting the neo-evolutionary notion of chiefs as benign managerial elites. These models also assigned an important role to stressful paleoenvironmental forces, an important shift away from neo-evolutionary scenarios that assumed an essentially

stable and consistently productive natural environment. A combination of sea temperature flux and severe droughts was postulated as triggering events in the rise of Chumash chiefdoms on the northern Channel Islands between about AD 1100 to 1300 (Arnold 1992a, 1995b).

Finally, evolutionary ecologists or advocates of other selectionist perspectives weighed into the widening debate about culture change during the last decade, suggesting that resource intensification, climatic deterioration, violent competition, and socioeconomic cooperation all played a role in transforming the Late Holocene cultural landscape. These models offered a basic challenge to both neo-Marxist and neo-evolutionary scenarios. Arguing for declining levels of foraging efficiency and severe climatic deterioration during the Late Holocene, these theorists questioned the idea that social power was derived from the redistribution of food surpluses, since widespread drought and often low levels of foraging efficiency seem unlikely circumstances for the production of large, disposable food supplies. Moreover, evolutionary ecologists pointed to relatively severe health problems and high rates of interpersonal violence in precisely the same regions where redistributive political economies were supposed to have brought about improved living conditions (Broughton and O'Connell 1999; T. Jones et al. 1999; Kennett and Kennett 2000; Raab 1996; Raab and Larson 1997).

These debates have produced generally beneficial results, encouraging productive new lines of thought and research. Just the same, archaeological research in coastal Southern California continues to reflect misleading stereotypes and remains far from exploring the substantial degree of variability that existed in Late Holocene cultural patterns across the region as a whole. As we saw in the preceding summary of theoretical developments, the Chumash area casts a long shadow over discussions of Late Holocene cultural complexity. Some measure of this influence can be seen in the bibliography by Holmes and Johnson (1998), where the Chumash region is revealed as one of the most extensively researched and reported in all of California.

The Protohistoric Chumash, including the occupants of the northern Channel Islands, are routinely described as some of the most complex foragers in North America, if not the world (Arnold 1992a, 1995b; Chartkoff and Chartkoff 1984; B. Fagan 2000; Glassow 1996c; C. King 1990; Moratto 1984). Unfortunately, this characterization may be perceived as a cultural template for describing cultural-evolutionary trends among all Southern California coastal groups. If so, the results are likely to be unfortunate. Even a cursory comparative examination of coastal Southern California archaeology makes it difficult to identify a "typical" pattern of cultural development. Consider, for example, that while the Chumash area is frequently described in terms of a cultural climax featuring high degrees of social complexity, some archaeologists envision a virtual anti-climax at the southern end of the California bight owing to Late Holocene siltation of the large coastal lagoons of the San Diego County Coast. Byrd and Reddy (chapter 4, this volume) reject this coastal abandonment model, arguing that some degree of social ranking may have existed among groups of the San Diego Coast. Nevertheless, the Late Holocene archaeological record of this region reflects little evidence comparable to the mortuary ceremonialism, craft specialization, settlement pattern dynamics, and other patterns thought to signal complexity in the Chumash area.

Between San Diego County and the Chumash region, the Gabrielino Indian area offers another challenge to our understanding of Late Holocene cultural developments. Although reconstructions of Gabrielino prehistory have been modeled for decades on socioeconomic patterns similar to those ascribed to the Chumash (Bean and Smith 1978; McCawley 1996), Gabrielino archaeology reflects a comparatively modest stock of data collected, analyzed, and reported under modern conditions. Whether the Late Holocene Gabrielino area closely replicated the dynamics linked to social complexity in the Chumash case is probably best regarded as an open question and an excellent subject for future research. Part of the ambiguity of Gabrielino archaeology arises from questions about the nature of Late Holocene cultural developments on the southern Channel Islands. As we shall see below, the southern islands were scarcely a clone of the northern Channel Islands and Santa Barbara Coast with regard to the cultural traits linked to social complexity among the Chumash.

Generalizing in any fashion about prehistoric cultural differences across coastal Southern California is hazardous, of course, in that our understanding of the regional archaeological record is undoubtedly biased in a number of ways. For instance, heavy urbanization of the mainland Gabrielino area and the comparatively small amount of archaeological research conducted until recently in the southern Channel Islands make it difficult to know exactly how this region compares to the Chumash case. Still, archaeological investigations prior to extensive urbanization, a growing body of contract research, and substantial advances in the southern Channel Islands archaeology in recent years make it increasingly difficult to dismiss differences of archaeological patterning between the Chumash region and other areas as merely the result of differential data recovery or preservation.

All of these questions show that rigorous comparative research on Late Holocene cultural variability is overdue in coastal Southern California. In this discussion, we try to frame a context for such studies. Our analysis is centered in the southern Channel Islands, focusing in particular on Late Holocene settlement and subsistence patterns on San Clemente Island. This seems a useful approach for several reasons. San Clemente

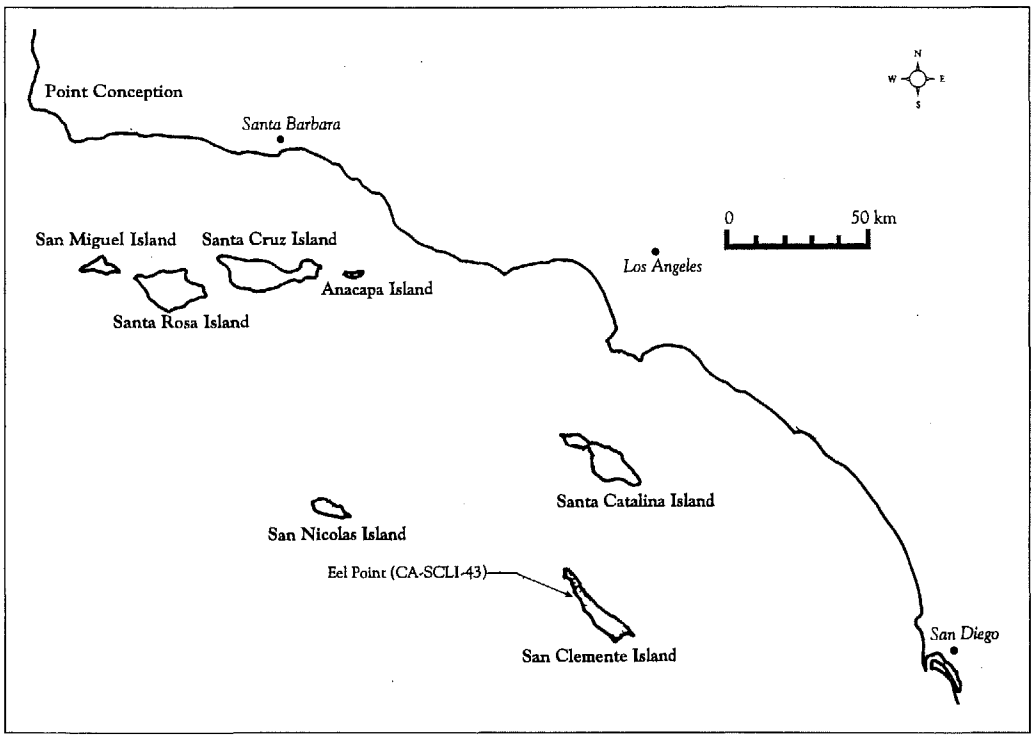


Figure 2.1 San Clemente Island and the Southern California Bight area

Island escaped most of the destructive effects of urbanization that plague the archaeological record of the adjacent mainland coast, preserving an extraordinary record of maritime culture change. Cooperative archaeological research programs with several academic institutions, numerous field schools, and contract research efforts during the last decade have made San Clemente Island one of the most systematically studied of the Channel Islands (Raab, Bradford, and Yatsko 1994; Raab and Yatsko N.D.).

As a result of these advances, increasingly detailed archaeological comparisons can be made between the northern and southern Channel Islands; comparisons that may be useful for gauging maritime cultural variability across Southern California. The northern Channel Islands clearly were integral to Late Holocene cultural trends in the Chumash area. Indeed, northern islands research was pivotal in establishing many of these trends, often making the results of this research a proxy of Late Holocene cultural developments in the Chumash region as a whole (Arnold 1992a; Broughton and O'Connell 1999; Colten and Arnold 1998; Kennett and Kennett 2000; Raab and Larson 1997). It may be instructive for this reason to compare aspects of Late Holocene culture change on San Clemente Island with trends documented in the northern islands. This comparison reveals a more complex pattern of cultural similarities and differences across Late Holocene coastal Southern California than many archaeologists currently recognize.

SAN CLEMENTE ISLAND

San Clemente Island is the southernmost and fourth largest (148 km^2) of the eight Channel Islands of Southern California (figure 2.1). Located 77 km (48 miles) from the Palos Verdes Peninsula on the mainland, San Clemente Island has been a military reservation since 1934. The island is not accessible to the public, and until recently was infrequently visited by archaeologists. Two complementary sources of data are employed in our discussion. One is the Eel Point archaeological site, focus of an intensive series of investigations during the last decade. The other is derived from an island-wide archaeological survey and site testing program based on a 15% probability sample of San Clemente Island's surface ("Legacy Survey"). Comparison of these two data sets affords an instructive basis for examining Late Holocene cultural patterns.

Eel Point

The Eel Point site (SCLI-43), located on the central west shore, encompasses at least 2 ha of dune deposits on an erosion-resistant cape of volcanic rock (Raab, Bradford, and Yatsko 1994). The first recorded archaeological investigation of Eel Point was a brief test excavation conducted by McKusick and Warren (1959). During the 1980s, two UCLA field schools were conducted at Eel Point. This work produced a large collection of fish bone and artifacts, as well as a series of 24 radiocarbon dates (Salls 1988). A doctoral dissertation on the prehistoric marine fisheries of coastal Southern California featured a detailed analysis of the fish remains collected by UCLA archaeologists (Salls 1988).

The UCLA investigations and three subsequent field seasons by archaeologists from California State University, Northridge and the Natural Resources Office, Naval Air Station North Island, uncovered well-preserved cultural

deposits as much as 3.2 m deep (Raab, Bradford, and Yatsko 1994). Eel Point contains one of the longest and best-preserved sequences of maritime cultural change on the Pacific Coast of North America (Erlandson 1994; Porcasi 1995; Salls 1988; Raab and Yatsko 1992; Raab, Bradford, and Yatsko 1994). The excavations conducted there in 1994, 1996, and 1999 afforded a cultural chronology spanning most of the Holocene, recorded cultural features such as living surfaces and habitation structures, and launched ongoing reconstruction of long-term maritime techno-economic trends (Andrews 2000; Fiore 1998; Garlinghouse 2000; Porcasi 1995; Porcasi, Jones, and Raab 2000; Raab and Yatsko 1992).

Based on 49 ^{14}C dates collected by the authors between 1994 through 1999, the occupation of Eel Point is currently known to range from about 6200 BC to AD 1400. All the ^{14}C dates cited in this discussion have been fully corrected and calibrated using the computer program published by Stuiver and Reimer (1993). Shell dates have been corrected for the marine reservoir using a local offset of 225±35 years. We also note that a significant feature of the Eel Point chronology is an apparent hiatus in site occupation between about 4000 and 6000 BC. The cause of this hiatus is not known (Raab, Bradford, and Yatsko 1994). Despite this hiatus, a comparatively fine-grained record of maritime economic change can be charted across most of the Holocene. In constructing the Eel Point chronology, cultural strata with overlapping ^{14}C dates (one standard deviation) were combined for analytical purposes. The rationale for combining strata in this fashion is two-fold. First, cultural strata with overlapping dates cannot be resolved meaningfully into separate behavioral events. Second, it must be recognized that sampling errors inevitably introduce "noise" into behavioral reconstructions based on midden deposits. Accordingly, our objective here is to identify robust trans-Holocene behavioral trends rather than stake interpretations on every up- or downswing of artifact or faunal frequencies.

Legacy Site Survey

The Legacy Heritage Resources survey, funded by a grant to Andrew Yatsko, Natural Resources Office, Naval Air Station North Island from the US Department of Defense, was based on a statistical probability sample that covered approximately 15% of the island's surface (Raab and Yatsko N.D.). A test-excavated sample of 25 sites recorded during this survey, representing essentially all the site types and topographic settings typical of the island, yielded 60 radiocarbon dates. These dates, part of a study of Late Holocene settlement patterns on San Clemente Island, range from about 3000 BC to AD 1825. Of the Legacy ^{14}C dates, 9 had ranges at one standard deviation that overlapped one or more other dates from the same site or cultural stratum, leaving a sample of 51 dated cultural strata.

Overall, it is possible to gain an impression of Late Holocene cultural trends on San Clemente Island from a comparatively long and detailed cultural sequence at the Eel Point site and an island-wide, statistically controlled sample of 51 discrete cultural components. Although it is certainly desirable to have a larger sample of dates and sites, the available data afford a reasonable basis for reconstructing at least large-scale cultural trends. When these data are combined with a variety of other archaeological information from San Clemente Island, a useful model of Late Holocene settlement trends can be reconstructed.

LATE HOLOCENE DEMOGRAPHIC TRENDS

Several California researchers have suggested that ^{14}C date frequencies afford useful insights into paleodemographic patterns (e.g., Breschini, Haversat, and Erlandson 1996; Erlandson 1994; Glassow 1996c; Glassow, Wilcoxon, and Erlandson 1988). The essential idea is that, all things being equal, one might logically expect a prehistoric human population, as it expanded or contracted in size, to have created a correspondingly larger or smaller number of discrete archeological sites or cultural components. Assuming that regional sampling of ^{14}C dates reflects this variation in a reasonably accurate fashion, the frequency of ^{14}C dates can be viewed as a proxy of the number of cultural components that existed in a given unit of time. The difficulty with this approach is, of course, that all things are seldom equal. The power of a sample of dates to reflect accurately something as complex as a regional archaeological record is subject to many sources of error (see Glassow 1996c for a detailed discussion). Biased selection of sites or samples for dating, the small sample of dates for many time periods, variable deposition of datable materials across time, differences in the number of people who occupied various sites, and settlement dynamics that produced greater or lesser numbers of sites or cultural components regardless of the actual population size are all potential problems.

All of these difficulties acknowledged, the available San Clemente Island ^{14}C data yield useful information. The Legacy Survey's probability sample eliminates a good deal of bias in the selection of sites for dating, thus helping to ensure that sites from all of the island's topographic settings and periods of occupation contribute to our understanding of cultural patterning. As we have pointed out elsewhere, site preservation on San Clemente Island is frequently excellent (Raab, Bradford, and Yatsko 1994), eliminating differential preservation as a major influence upon selection of sites for dating. At the same time, any chronological trends identified in the Legacy data need not be viewed in a vacuum but can be evaluated in light of other lines of archaeological evidence.

To begin this pattern recognition, we plotted the frequency of mean ^{14}C dates (cultural components) in calendar

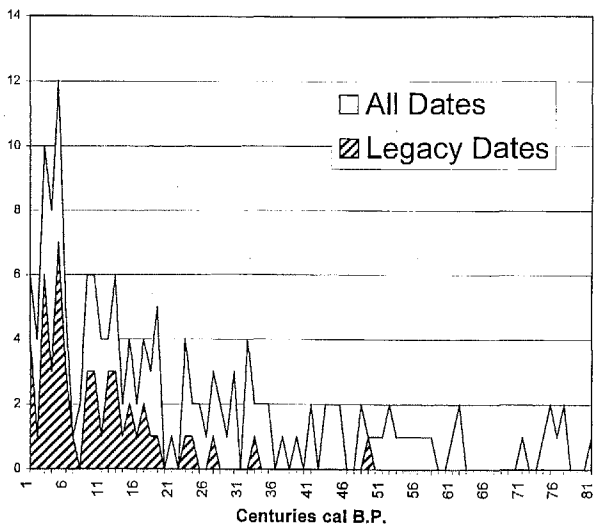


Figure 2.2 Archaeological ^{14}C components per century, San Clemente Island

years before present from the Legacy Survey (figure 2.2). For comparative purposes, figure 2.2 also presents the frequency of total known ^{14}C components from San Clemente Island. At least 225 ^{14}C dates are known from San Clemente Island, based on data from Breschini et al. (1996), Byrd (2000b), Byrd and Victorino (1999), Raab, Bradford, and Yatsko (1994), Gallegos (1994), Salls (1988), and other reports on file at the Department of Anthropology, California State University, Northridge. A total of 106 dates make up the island-wide sample provided in figure 2.2. This reduced sample reflects a number of factors, including exclusion of the Legacy Survey dates, elimination of multiple dates from individual cultural components, and exclusion of dates of uncertain context and laboratory processing.

Demographic Change

Several interesting patterns can be seen in figure 2.2. The Legacy and island-wide samples reflect substantially similar trends for the Late Holocene but different patterns for the Middle to Early Holocene time range. The Legacy sample conspicuously lacks components older than about 3000 BC despite the fact that a cultural component on the order of 6000 BC is well documented at Eel Point (Garlinghouse 2000; Raab, Bradford, and Yatsko 1994). This finding does not necessarily weigh against the adequacy of the Legacy sample. It may be that Middle to Early Holocene cultural components on San Clemente Island were much less numerous than during the Late Holocene, thus requiring a large sample of dates to discover cultural components with an age of 3000 BC or more.

Figure 2.2 conforms generally to trans-Holocene frequency distributions of ^{14}C dates seen from other California coastal localities and from California as a whole (Breschini, Haversat, and Erlandson 1996). As an indicator of relative population size, the Legacy sample could be interpreted to mean the island's prehistoric population was relatively sparse until the Late Holocene, when a fluctuating but generally increasing population reached its maximum size by about AD 1350 to 1450. In other words, increasing population density was the clearest paleodemographic trend on San Clemente Island during the Late Holocene. This pattern is familiar to California archaeologists. Glassow (1996c:101), for example, shows that the trans-Holocene frequency of ^{14}C dates in the Santa Barbara Channel area peaked between about 2000 and 500 years ago.

The causes and consequences of this seemingly robust pattern of Late Holocene demographic expansion have been viewed in various ways by theorists of culture change. Neoevolutionists, for example, often assumed that culture change was fueled by essentially Malthusian dynamics. It was assumed that ancient peoples, like all human populations, tended toward exponential population increase—growth that created a need for additional food supplies. Based on this assumption, it was easy to imagine population pressure as the impetus behind the technological and social-organizational improvements that drove cultural progress. The Southern California Coast was viewed as particularly accommodating to these dynamics, based on the notion that tapping the combined resources of the land and sea produced exceptionally bountiful results. Thus, a rapid increase in the size of Late Holocene coastal populations has been viewed as both the cause and effect of a highly successful Late Holocene culture climax (Chartkoff and Chartkoff 1984; C. King 1990; Landberg 1965). Since dynamics of this sort are both vague and potentially circular, the role of population growth in fostering culture change remains uncertain. However, other San Clemente Island data suggest that the forces behind Late Holocene demographic expansion may have been quite different than traditional models have led us to believe.

MARITIME RESOURCE INTENSIFICATION

Foraging Efficiency and Culture Change

If the Late Holocene was a time of demographic expansion, recent research suggests the paradoxical possibility that this growth was linked to resource scarcity rather than abundance. The evidence for this conclusion can be seen in studies of resource intensification that are grounded in principles of evolutionary ecology. Briefly, evolutionary ecologists stress that Darwinian selection processes are powerfully influenced by the energetic efficiency of the food quest (Broughton and O'Connell 1999; Cohen 1989a, 1989b; R. Kelly 1995; Smith and Winterhalder 1992). Different foraging strategies, operating at varying levels of energetic efficiency, are thought to engender a spectrum of technological, economic, and social organizational adaptations on a synchronic level, while directional changes in cultural

patterning can be expected in the long run, depending on the propensity of some adaptations to produce more descendants than competing cultural arrangements (R. Kelly 1995; Smith and Winterhalder 1992).

For archaeologists, the energetic basis of selection frequently is evaluated through diet-breadth or prey-choice models, as reconstructed from dietary remains. Along these lines, several researchers have recently argued that, on a trans-Holocene time scale, coastal foraging patterns in California often reflect a loss of foraging efficiency (Broughton 1994a, 1994b, 1997; Broughton and O'Connell 1999; Raab 1992; Glassow 1996c). Contrary to the glowing assessments offered by traditional models of Late Holocene coastal adaptation, the long-term trajectory of many California foraging adaptations was marked by overexploitation of high-ranked food items, leading to resource depression and shifts to more costly resources. Dynamics of this kind have been identified for many food resources used by prehistoric coastal populations in California, including acorns (Basgall 1987; Wohlgemuth 1996), shellfish (Botkin 1980; Bradford 1994; Jones and Richman 1995; Raab 1992; Raab and Yatsko 1992), fish (Broughton 1994b, 1997; Raab et al. 1995; Salls 1988), sea mammals (Hildebrandt and Jones 1992; Jones and Hildebrandt 1995; Porcasi, Jones, and Raab 2000), and land mammals (Broughton 1994a, 1994b, 1997).

Foraging efficiency models have relevance beyond dietary matters. The changing energetic efficiency of ancient foraging adaptations has been correlated with profound changes in the social organizational and health status of human populations in many parts of the world (Cohen 1989a, 1989b). Similar patterns have been identified by recent research as aspects of Late Holocene culture change in coastal Southern California (see Broughton and O'Connell 1999). Included are an increasingly gender-based division of labor (T. Jones 1996; McGuire and Hildebrandt 1994; Walker and Erlandson 1986) and elevated rates of disease and violence (Lambert and Walker 1991; Lambert 1993; Raab and Larson 1997).

In previous studies on San Clemente Island, three major marine resource classes point to a progressive trans-Holocene loss of foraging efficiency: sea mammals, shellfish, and fish. Some of the best, though by no means the only, evidence of this trend comes from the Eel Point site. Sea mammal hunting on the Southern California Coast involved a wide range of species, including sea otters (*Enhydra lutris*), small cetaceans (mainly dolphins and porpoises), seals, and sea lions (Pinnipedia). Although representatives of all of these taxa are included in the Eel Point faunal assemblage (Porcasi 1995; Porcasi, Jones, and Raab 2000), our attention in this discussion is focused primarily on seals and sea lions. These species generally are identified as contributing the bulk of meat from sea mammal hunting in Southern California (Colten and Arnold 1998; Glassow 1980; Hildebrandt and Jones 1992) and at the Eel Point site (Porcasi 1995; Porcasi et al. 2000). This finding does not imply that patterns of seal and sea lion hunting are completely understood. As compared to fishing, a comparatively small number of reports treat the relative contributions of pinnipeds to the subsistence base across time, and the factors that may have contributed to such trends (e.g., Colten and Arnold 1998; Erlandson 1994; Glassow 1996c; Porcasi, Jones, and Raab 2000). Hildebrandt and Jones (1992) offer perhaps the most detailed model to date of the ecological dynamics that affected Southern California pinniped hunting.

The Hildebrandt and Jones' (1992) model weighs into a debate about the timing and causes of the distribution of pinniped populations on the Pacific Coast of North America. During the historical era, pinniped populations were largely restricted to remote offshore rocks and islands. All agree that the seasonal vulnerability of seals and sea lions to terrestrial predators played a role in this pattern. Both the Guadalupe fur seal (*Arctocephalus townsendi*) and the California sea lion (*Zalophus californianus*) populations give birth to their pups at rookeries on the Channel Islands during the summer (Riedman 1990). Pinnipeds are highly vulnerable to terrestrial predators during these periods. In their breeding colonies, these animals could have been killed by prehistoric hunters armed with nothing more than clubs. If frequently attacked, however, pinnipeds will abandon their rookeries for more remote locations. The killing of large numbers of females and juveniles also poses a risk of resource depression.

Simply stated, Hildebrandt and Jones argue that:

> the depletion of seal and sea lion populations and their restriction to offshore rookeries and haulouts is an anthropogenic phenomenon not restricted to the historical era. Rather, the process of extirpation . . . is one that began with the initial prehistoric settlement of coastal environments. We derived these conclusions from seal and sea lion population ecology, optimization theory, and dated faunal assemblages from the California and Oregon coasts. In combination, these data suggest a process of human overexploitation which has affected the character of hunter-gatherer intensification within this region (Hildebrandt and Jones 1992:361).

Hildebrandt and Jones (1992:363-367) go on to argue that, in addition to making pinniped meat increasingly scarce, this process encouraged elaboration of sea mammal hunting gear, including harpoons and boats, as the need to hunt pinnipeds under more demanding offshore conditions increased.

Figure 2.3 plots trends in sea mammal hunting and fishing at Eel Point across much of the Holocene. The weight of all fish and the frequency of sea mammal bones per m^3 per cultural stratum were used as general measures of hunting

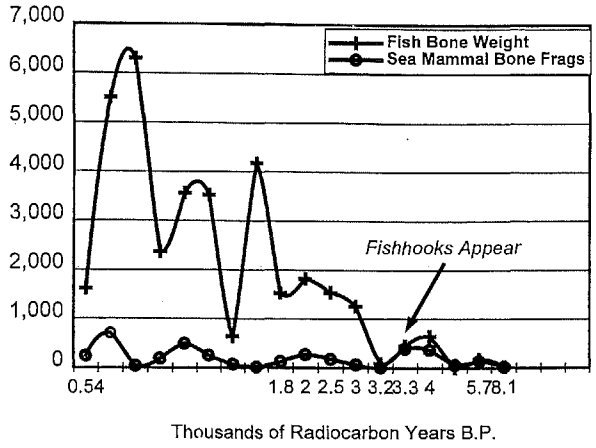


Figure 2.3 Plot of fish bone weight (g/m³) and sea mammal bone (NISP/m³) at Eel Point, San Clemente Island

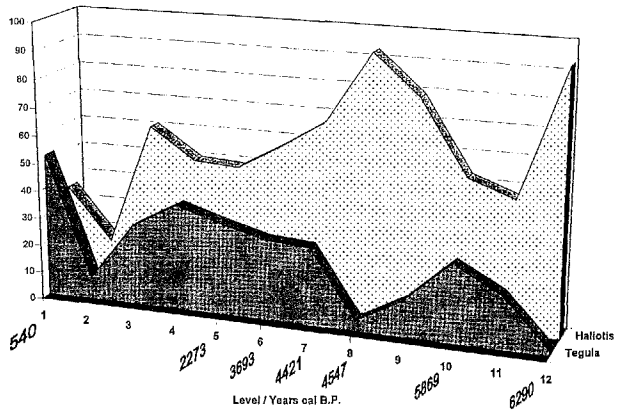


Figure 2.4 Percentage of *Haliotis* and *Tegula* yield by level, unit B, Eel Point

and fishing intensity across time. We should stress that our objective is not reconstruction of dietary yield but merely to gauge the relative intensity of bone deposition across time. The patterns have been corrected for cultural strata with overlapping ^{14}C dates (Raab, Bradford, and Yatsko 1994; Raab et al. 1995), with average densities calculated for contemporaneous cultural strata.

Porcasi, Jones, and Raab (2000) and Garlinghouse (2000) identify a number of interesting trans-Holocene trends in the Eel Point archaeofaunal assemblage. Patterns of sea mammal hunting at Eel Point lend support to models of optimal foraging. The highest levels of sea mammal hunting are found in the Early and Middle Holocene, with the relative magnitude of pinniped hunting declining in the Late Holocene. The vast majority (85.5%) of pinnipeds at Eel Point are California sea lions and Guadalupe fur seals, both migratory breeders whose rookeries would have been high-priority targets of human hunters. Over 90% of identifiable pinniped bone elements are derived from females and juveniles (Porcasi 1995; Porcasi, Jones, and Raab 2000). These data clearly indicate a pattern of predation centered on breeding colonies. These data support the models advanced by Hildebrandt and Jones (1992) and Broughton (1994a), showing that pinniped hunting declined after the Middle Holocene, while sea otter hunting sharply increased.

The diachronic pattern of fishing at Eel Point contrasts sharply with sea mammal hunting. Although our treatment of fish bone here is intended merely to examine overall changes in bone density within the midden deposits, intensification of fishing at Eel Point is one of the most dramatic trends observable in the site's faunal assemblage. The upper line in figure 2.3 plots the weight of fish bone (gm/m³) in cultural strata ranging in age from approximately 6000 BC to AD 1400. While this plot reflects the "noise" that one might expect from sampling midden deposits, the trend toward intensification of fishing during the Late Holocene is unmistakable. This pattern parallels the finding of other regional researchers that fishing became increasingly important during the Late Holocene (Andrews 2000; Glassow 1980; Orr 1968; Reinman 1964; Salls 1988; Tartaglia 1976; Vance 2000).

A study by Garlinghouse (2000) of shellfish collecting at Eel Point reinforces the findings of other researchers regarding the vulnerability of shellfish stocks to harvesting pressure by humans. Analysis of shellfish remains from one of the deepest excavation units at Eel Point, Unit B, is instructive. Garlinghouse (2000) found that California mussels (*Mytilus californianus*) produced the bulk of shellfish meat during the Early Holocene at Eel Point but declined sharply in importance after the Early Holocene. It is not clear whether this decline reflects the resource-depression dynamics described by Jones and Richman (1995) for other California coastal locations, changing marine environmental conditions, or a combination of factors. Perhaps more instructive are trans-Holocene patterns involving the largest and smallest species of shellfish collected at Eel Point. The largest shellfish by far were abalones (*Haliotis* sp.), while the smallest were black turban snails (*Tegula* sp.) at about 1/100 to 1/1000 the meat yield of abalones per individual. There is a general decline in abalone meat yield across time, while *Tegula* assumed generally a greater dietary role after about the mid-Holocene (figure 2.4).

Other evidence of resource depression comes from San Clemente and Santa Catalina Islands, where abalone yields declined under the impact of harvesting pressure, and smaller shellfish, such as the black turban and the wavy turban (*Astraea undosa*) made up shortfalls in subsistence needs (Raab 1992; Bradford 1994). Similarly, studies of black abalones (*H. cracherodii*), the most frequently exploited abalone

species on San Clemente and Santa Catalina Islands, show that the mean size of these organisms declined under human predation (Raab 1992; Raab and Yatsko 1992).

The declining pattern of shellfish productivity reported by Garlinghouse and others echoes the findings of many other researchers in coastal California. Botkin (1980) was one of the first to argue that, based on a study in the Malibu area, overexploitation of shellfish followed a trajectory predicted by optimization principles. Glassow (1996c) reported that yields of the California mussel were under enough harvest pressure by the Late Holocene to force shellfish collectors in the Vandenberg area to increase the proportion of small turban snails in their diet. There can be little doubt that shellfish populations were sensitive to harvest pressure in many coastal locations.

The Eel Point shellfish data reinforce the findings of an earlier study by Raab (1992) of small "*Tegula* midden" sites on San Clemente Island. As pointed out by Raab and Yatsko (1992), the island's wide-ranging marine terraces contain a density of small shell-bearing sites that frequently range between 200 to 300 per km^2. The cultural deposits of these sites often are no more than 10 to 15 m in diameter and 30 cm deep. A detailed study of three of these sites found that crushed *Tegula* shells constituted upwards of 70% of midden contents by weight. Raab (1992) and Raab and Yatsko (1992) showed that these *Tegula* middens were created by short-term occupations dedicated essentially to the collection and consumption of black abalones and *Tegula*. Moreover, each site reflected collecting cycles in which consumption of *Tegula* increased to offset declining consumption of the larger and more productive black abalones. While sites of this kind may have been occupied throughout the span of human occupation of San Clemente Island, there can be little doubt that most of these sites date to the Late Holocene. Of the 51 components dated by the Legacy Survey, 49 fall into this category, and all date to the Late Holocene.

DEMOGRAPHIC EFFECTS OF INTENSIFICATION

Patterns of Maritime Intensification

Based on the foregoing review, trans-Holocene foraging patterns at Eel Point were marked by two robust dietary trends: (1) the contribution of pinnipeds and shellfish declined over time, particularly during the Late Holocene, while (2) the importance of fish and sea otters increased markedly during the Late Holocene (Porcasi 1995; Porcasi, Jones, and Raab 2000; Raab et al. 1995). Once again, this pattern generally conforms to the predictions of optimization models that focus on prey choice in California coastal environments during the Late Holocene (Broughton 1994a, 1994b, 1997; Broughton and O'Connell 1999; Jones and Hildebrandt 1995; Hildebrandt and T. Jones 1992; Raab and Yatsko 1992). It appears that biological constraints played a major role in these trends. Pinnipeds and shellfish were vulnerable to overexploitation, the former because of the vulnerability of breeding colonies to attack by human hunters, and the latter because of slow shellfish growth rates and limited intertidal habitats. Fishing, in contrast to pinniped hunting and shellfish collecting, was the only major subsistence activity that could be made increasingly productive by investing more labor in exploiting a wider range of marine habitats using a broader range of fishing techniques (Andrews 2000; Raab et al. 1995; Salls 1988; Vance 2000).

The impact of these dynamics for Late Holocene San Clemente Island was dramatic. As we report elsewhere (Raab, Bradford, and Yatsko 1994), the oldest known circular shell fishhooks at Eel Point are dated to 1280 BC, but a perforated abalone disk dated to 1550 BC is almost certainly a hook blank (Vance 2000). This conclusion rests on the observations that this specimen is similar in size and shape to hooks and hook blanks identified from more recent strata, and the fact that there is no known tradition on prehistoric San Clemente Island of shell disk or ring ornaments comparable to the northern Channel Islands (C. King 1990). While circular shell hooks may have appeared at Eel Point about 3500 years ago, they were certainly present in substantial numbers by about 3000 years ago (Vance 2000). This date is between one and two millennia earlier than many previous estimates of the first appearance of circular single-piece shell hooks in the Channel Islands region (Glassow 1980; C. King 1990; Koerper et al. 1995; Strudwick 1986; Vance 2000).

The quantity of fish bone increased steadily in Eel Point middens after the appearance of shell hooks (figure 2.3). It seems doubtful that hooks alone account for this trend, because they undoubtedly were employed with watercraft, nets, traps, gorges, spears, and other gear. Just the same, it appears that the use of shell hooks increased exploitation of certain marine habitats and fish species. Although a wide range of species was cataloged by Salls (1988:723-725) at Eel Point, California sheephead (*Semicossyphus pulcher*), rockfish (*Sebastes* sp.), and bass (*Paralabrax* sp.) account for over 90% of the fish assemblage in all time periods. Another study of trans-Holocene fishing trends at Eel Point by Andrews (2000) found that small to medium-size fish made up most of the catch (ca. 0.25 to 2 kg), typically from kelp beds or nearshore rocky reefs. The advent of circular shell hooks seems to have been particularly important in increasing this production (Salls 1989:183-188; Strudwick 1986:133-135). This utility may help explain why circular shell hooks were adopted when bone fish gorges ("bipoints") and other fishing gear had proved successful for millennia.

About 1000 years ago, otter hunting at Eel Point increased rapidly to the highest levels recorded for the Holocene (Porcasi 1995; Porcasi, Jones, and Raab 2000). This pattern

is similar to one described by Broughton (1994a) for Late Holocene sites around San Francisco Bay. The increase in otter hunting could be explained in a number of ways, but it seems likely that increased fishing, particularly in the kelp beds, brought human fishers into more frequent contact with otters. At the same time, otters were also exploited for their pelts, and Late Holocene trade networks may have placed a premium on otter hunting. Judging from the Eel Point evidence, sea mammals and shellfish were the highest ranked marine food resources, but they declined in productivity through the Holocene. During the Late Holocene, a major realignment of the foraging effort took place around activities related to fishing.

Tegula Middens and Eel Point

The contrast between Eel Point and the *Tegula* middens is stark. Eel Point contains a variety of cultural features (hearths, occupation surfaces, house floors, and burials), midden deposits rich in many kinds of faunal, and a wide range of bone, shell, and stone artifacts. The Late Holocene cultural deposits at Eel Point amount to tens of thousands of cubic meters (Raab, Bradford, and Yatsko 1994; Raab et al. 1995). Based on the density and diversity of cultural materials, Eel Point is reasonably viewed as a large and comparatively permanent residential base (Andrews 2000; Fiore 1998; Porcasi, Jones, and Raab 2000; Salls 1988; Vance 2000). Rarely more than 600 m² in extent, shallow *Tegula* middens typically contain few discrete cultural features and a limited range of artifacts and faunal remains (Byrd 2000b; Byrd and Victorino 1999; Raab 1992).

Data presented in reports and previously published discussions allow us to gauge the relative intensity of fishing and shellfish collecting in the *Tegula* middens and at Eel Point. As noted, it is possible to estimate changes in maritime economic behavior at Eel Point across about 8000 calendar years. To date, only three *Tegula* middens on San Clemente Island (SCLI-1318, -1319, and -1325), located about 4 km north of Eel Point, have been studied in comparable detail (Raab 1992). These *Tegula*-bearing sites contain Late Holocene and Protohistoric cultural components. Site SCLI-1318 produced calibrated dates of AD 865 and 1655; site SCLI-1319 yielded dates of 350 BC and AD 1660. From one to four 1 m² excavation units were placed in these sites (Raab 1992). Although ^{14}C dates were not obtained for site SCLI-1325, the character of its shell-bearing deposits and the presence of circular shell fishhooks leave little doubt that it dates to the Late Holocene. At Eel Point, a sample of faunal data from three cultural strata of a 1 x 2 m excavation unit (2N/35E; Garlinghouse 1995, 2000; Raab et al. 1995) can be compared with strata in the *Tegula* middens. The temporal overlap of the cultural strata that may be compared between the *Tegula* middens and Eel Point is not precise, but all strata postdate the appearance of circular shell fish hooks, and all strata fall within the Late Holocene, during which fishing was rapidly intensifying on San Clemente Island.

Table 2.1 *Tegula* shell and fish bone (gm/m³) in *Tegula* middens and contemporaneous Eel Point cultural strata

Unit/Strata	*Tegula*/CYBP	*Tegula*	Fish Bone	Ratio
SCLI-1318*				
0–10 cm	295 ± 50	3,524.2	10.0	352:1
10–20 cm	1,085 ± 50	6,642.0	14.7	452:1
20–30 cm		3,947.6	7.8	506:1
SCLI-1319				
0–10 cm		7,148.6	15.7	455:1
10–20 cm	290 ± 50	43,332.7	48.2	899:1
20–30 cm	2,296 ± 50	67,092.8	239.6	280:1
30–40 cm		32,206.6	173.4	186:1
SCLI-1325				
0–10 cm		18,641.7	229.3	81:1
10–20 cm		65,330.0	620.0	105:1
20–30 cm		66,750.0	379.6	176:1
30–40 cm		50,850.0	170.7	298:1
40–50 cm		28,850.0	78.3	368:1
50–60 cm		2895.8	8.5	341:1
SCLI-43 (Eel Point)**				
Unit 2N/35E:				
Stratum 5/6***	1,967 ± 90	1,460.0	1,415.9	1:1
Stratum 7	2,566 ± 60	2,850.0	707.7	4:1
Stratum 8	3,230 ± 90	1,786.0	1,258.0	1.4:1

* Data from Raab 1992

** Data from Raab et al. 1995b

*** Combined strata owing to overlapping radiocarbon dates, Raab et al. 1995b.

Table 2.1 shows that fish bone density in the three *Tegula* middens varies from 0.009 to 0.6 kg/m³, with an average of 0.15 kg/m³ for all strata. The density of *Tegula* shell in the same strata ranges from a low of 2.9 to 67 kg/m³, with an average of 22.4 kg/m³. As these data suggest, some strata consist almost entirely of crushed *Tegula* shell. In the three comparable strata from Eel Point, we find a nearly opposite pattern with regard to the exploitation of *Tegula* and fish. Table 2.1 shows that *Tegula* range from 1.5 to 2.8 kg/m³, with an average of 1.6 kg/m³ for all three strata. In the same strata at Eel Point, fish account for 0.7 to 1.4 kg/m³, with an average of 1.1 kg/m³.

Is it possible that the differences between Eel Point and the *Tegula* middens merely reflect depositional scale? In other words, could it be that more of everything was deposited at Eel Point simply because that site sustained a larger population than any of the *Tegula* middens, leaving open the possibility that the relative importance of fishing and shellfish collecting was proportionally comparable at all sites? The ratios of *Tegula* to fish bone in Table 2.1 argue against this possibility. In the *Tegula* middens, these ratios range from

a low of 81:1 to a high of 899:1. At Eel Point, the ratio of *Tegula* to fish bone ranges from 1:1 to 1.4:1 (Garlinghouse 1995, 2000; Raab et al. 1995). Fish appear to have made a considerably larger contribution to the meals consumed at Eel Point compared to remains found in the *Tegula* middens. Although we have not presented the data here, much the same pattern exists for sea mammal consumption (Porcasi 1995; Porcasi, Jones, and Raab 2000; Raab 1992).

Another trend with regard to *Tegula* consumption is worth noting. Summarizing trans-Holocene patterns of shellfish collecting at Eel Point, Garlinghouse (1995:8) concluded that:

> The overall density of shellfish, based on total adjusted shell weight per cubic meter from each level, demonstrates a gradual decrease from the earliest-dated levels. The overall trend in diversity of the shellfish assemblage, as measured by weight, yield and MNI, follows a downward slope indicating a gradual narrowing of the diet breadth. As indicated by the shellfish assemblage, at least, islanders apparently did not expand the diet breadth by exploiting an increasing variety of different molluscan resources; rather, the islanders intensified production of *Tegula*, a previously underemphasized resource, while deemphasizing the exploitation of other species.

The pattern described by Garlinghouse at Eel Point presents an interesting contrast with the *Tegula* middens. During the Late Holocene, even though shellfish collecting at Eel Point increasingly focused on *Tegula*, the amount of *Tegula* consumed accounted for a decreasing proportion of total midden constituents. Once again, these data create a strong contrast in dietary patterns between the *Tegula* middens and Eel Point.

Though limited, the data examined above hint at intersite differences in subsistence behavior too pronounced and too consistent with larger technoeconomic trends to be dismissed as sampling error. It seems reasonable to hypothesize that the foraging patterns reflected in the small *Tegula*-rich middens primarily involved shellfish collecting and consumption, while Eel Point was the scene of a much greater emphasis on fishing and sea mammal hunting. Assuming that these two subsistence modes were contemporaneous, the *Tegula* middens and Eel Point appear to be components of a bifurcated Late Holocene settlement-subsistence system that included large, relatively permanent sites such as Eel Point where fish and sea mammals were major staples, and many small, temporarily occupied satellite loci where shellfish provided the bulk of the provisions consumed on site.

Resource Intensification and Division of Labor

Several lines of evidence suggest that changes in the division of labor during the Late Holocene might be an important component of the patterns observed in the current study. Researchers increasingly believe that gender-based divisions of labor probably changed over the Holocene, with the patterns observed among historical California Indian groups having arisen during the Late Holocene. Bettinger (1991), Walker and Erlandson (1986), T. Jones (1996), and McGuire and Hildebrandt (1994) argued that labor demands imposed by new foraging practices should be viewed as a logical cause of the widely documented division of labor that existed in aboriginal California. In general, males fished and hunted larger game animals; females hunted smaller game and collected a wide range of plant foods. Increasing expenditures of labor to gather and process small, dispersed food items; rising labor demands in the face of resource overexploitation; and increased efforts to produce and maintain a widening array of specialized tools and weapons all argue for an increasingly complex division of labor. In coastal California the increased importance of fish and the adoption of more labor intensive shellfish exploitation strategies are consistent with the emergence of a processing specialization among women concurrent with increasing intensity in fishing and hunting by males. This appropriation of tasks approximates the division of labor observed at contact in native California (T. Jones 1996:245).

As in other parts of California, fishing was an increasingly important aspect of subsistence on San Clemente Island during the Late Holocene. Undoubtedly, males and females and persons of various ages were engaged in fishing, but it seems likely that intensive fishing, particularly employing watercraft, increasingly involved males. It is worth noting that an elaborate fishing kit, including complete and partially formed circular shell fish hooks, hook production tools, and shell hook preforms, was part of a male burial on San Clemente dated to about AD 800 (Salls 1988:100–101). Although this single case does not warrant the conclusion that men alone engaged in fishing, it is consistent with the possession of fishing gear by at least some males during the Late Holocene.

The increasing importance of fishing and some aspects of sea mammal hunting (sea otters, for instance) may help account for the comparatively intense deposition of fish and sea mammal remains at Eel Point, particularly if these activities involved frequent use of watercraft. The range of species found in the Eel Point fish assemblage suggests that a good deal of fishing was conducted in kelp beds, likely with the aid of boats (Raab et al. 1995; Salls 1988). Palsson (1991), in a global ethnographic survey, showed that intensive fishing strongly correlates with coastal sedentism because a centralized base of operations makes for efficient deployment of watercraft. Manufacture, maintenance, and storage of an increasingly diverse array of fishing and hunting gear are also managed effectively at a major base of operations. Processing of fish catches is also a logical activity at this

kind of site. Salls (1988:375) found large numbers of fish skull and tail bones and correspondingly small numbers of mid-body vertebrae in certain parts of the Eel Point site. Also noting copious quantities of ash and a general absence of bone charring, Salls (1988:375) argued that parts of the site were used to smoke or dry fish.

Eel Point's presence as a base for fishing and hunting does not explain the existence of the *Tegula* middens. Some of the intensification trends reflected at Eel Point may offer insights into this problem, however. A logical implication of declining foraging efficiency is a need for more frequent and wide-ranging foraging trips. Men and women are capable of equally high levels of stamina in pursuit of such a subsistence strategy, but young children are not (R. Kelly 1995:261–270). In many societies, foraging patterns allow children and their caregivers, often including the children's mothers and adults of both sexes, to search for food (R. Kelly 1995).

As foraging trips take these collectors more than a few kilometers from a residential base, the group needs sites to rest and prepare meals. Such sites have many of the qualities that Meehan (1982) documents for the "dinner time camps" of northern Australia: they offer an expedient facility for adults and their dependent children to prepare meals while foraging for shellfish. Intensive foraging for both terrestrial and marine resources seems a logical source of the thousands of *Tegula* middens that dot San Clemente Island's landscape (Raab 1992). The collecting of abalones and *Tegula* primarily, and only a comparatively small amount of fishing, appears to have provided the provisions required in these camps. It also seems logical to suppose that the *Tegula* found at Eel Point may have been produced during such trips.

Intensification and Population Growth

California archaeologists routinely describe the Late Holocene landscape as relatively densely populated, particularly in coastal regions. This tradition has deep historical roots. Kroeber (1925:884–885) estimated that California, accounting for about 5% of the area of the contiguous United States, contained somewhere between 16 to 19% of its prehistoric population. Based on the traditional models examined earlier, demographic expansion during the Late Holocene was the cause of this remarkable population density. But how do archaeologists know that this was true of the Late Holocene? Fundamentally, the large number of Late Holocene archaeological sites or cultural components within many regions of the state are said to warrant this conclusion. Figure 2.2, with its steep rise in Late Holocene sites and cultural components, shows a microcosm of this pattern. Yet, if we look to San Clemente Island for an understanding of the underlying causes of this pattern, there may be reasons to question traditional thinking.

We are not arguing against the conclusion that population increased in California during the Late Holocene. A variety of data appear to point to Late Holocene population growth. From our point of view, studies of resource intensification in California offer some of the best evidence of demographic expansion. These studies do not deny that foraging efficiency was probably influenced by a number of nondemographic factors, such as environmental change and technological innovation. Still, "whenever technological improvements increased the resource base, the population could be expected to increase until the balance between costs of morbidity/mortality and population-control maintenance was restored" (Hayden 1981:523). The progressive resource depression seen in many areas of Late Holocene California appear to make little sense apart from stresses caused by imbalances between population size and vital resources.

If we hypothesize that such imbalances were widespread in Late Holocene California, including the Southern California Coast, some interesting questions arise. One of these is whether traditional models seriously misconstrue the archaeological evidence of population growth. As we saw earlier, traditional models argue that high levels of natural resource abundance, made even more productive by Late Holocene "improvements" in the division of labor and technology, fueled a rapid population increase. Against this interpretation, a growing body of data concerning resource intensification, including the San Clemente Island data we presented, implicates increasing resource scarcity as a more likely cause of a diversified division of labor and, ironically, new plateaus of population growth as social and technological innovations tapped new sources of subsistence. These two scenarios clearly have quite different cultural-evolutionary implications.

Consider, for example, the substantial body of bioarchaeological data that has emerged from the Santa Barbara Channel area during the last decade. A large body of data from this area points to depressed health conditions in the wake of Late Holocene population expansion and culture change (Lambert 1993; Lambert and Walker 1991; Raab and Larson 1997). These data are at odds with traditional interpretations that paint a picture of the Late Holocene as a culture climax of unqualified adaptive success (Raab 1996).

An even more basic problem, perhaps, is understanding the true nature of Late Holocene population growth. The San Clemente Island data drive home a basic problem that is likely to be involved in estimating the true size of Late Holocene population growth. The fundamental difficulty is this: how do we differentiate those attributes of a settlement-subsistence system that point to population size and not merely to the population's division of labor or seasonal logistics? Erlandson (1997b) addressed this problem in the context of the Middle Holocene Santa Barbara Coast, illustrating how a detailed understanding of the functional

variability of sites within a regional settlement system is essential to realistic reconstruction of demographic trends (see also Erlandson et al. 1992). Based on a similar perspective, we hypothesized that the *Tegula* middens and large, structurally complex sites such as Eel Point were complementary aspects of a Late Holocene settlement pattern forged by intensification dynamics that included depressed shellfish stocks and a greatly expanded emphasis on fishing.

If our model is correct, a large number of *Tegula* middens could have been created in a comparatively short span of time by the same population that occupied Eel Point. The result could be a highly inflated estimate of population growth during the Late Holocene, if one treated each Late Holocene cultural component as an independent indicator of population size. Archaeological research clearly benefits from achieving the highest possible degree of temporal resolution, but this problem cannot be solved merely by radiocarbon dating more sites. Given what appears to be the emergence of an expanding division of labor during the Late Holocene in many regions of California, the problem outlined here may be more widespread than many archaeologists recognize.

DISCUSSION AND CONCLUSIONS

New areas of consensus may be emerging about some of the larger cultural and environmental dynamics that shaped the Late Holocene Southern California Coast. Among these is increasing recognition of the importance of resource intensification trends, despite the continuing debate about this topic. Colten and Arnold (1998:682), for instance, rejected optimal foraging models and intensification dynamics as influences on culture change: "The data we introduce here suggest that this kind of model does not accurately describe marine mammal exploitation, technological change, or sociopolitical complexity in the southern coastal region of California." Colten and Arnold (1998:685–686) also concluded, based on one of the most extensive discussions of northern Channel Islands faunal assemblages in print, that: "These data show that Early assemblages are dominated by shellfish and marine mammals, Middle period assemblages are roughly equally divided between fish, shellfish and marine mammals, and Late period assemblages are predominantly fish." And, "While a decrease in marine mammals over time is consistent with diet breadth optimal foraging models, and models suggesting over-exploitation, it is unlikely that change in this relatively small part of the faunal assemblage would stimulate major technological or social change" (Colten and Arnold 1998:695).

We agree with Colten and Arnold that culture change cannot be explained on the basis of a single activity or resource, such as sea mammal hunting. Even so, debate about the relative importance of sea mammal hunting should not draw attention away from larger patterns of maritime intensification and the correlation of these patterns with broader cultural and bio-archaeological trends. On that account, one point seems clear: the general pattern of trans-Holocene intensification described by Colten and Arnold (1998) for the northern Channel Islands virtually mirrors that of Eel Point and a number of other California coastal localities cited earlier.

Colten and Arnold's assertions to the contrary, it makes little sense to dismiss resource intensification as a significant factor in Late Holocene culture change. To do so we must ignore apparent correlations among resource intensification, technological innovation, settlement pattern shifts, and changing rates of disease and interpersonal violence (Broughton and O'Connell 1999; T. Jones et al. 1999; Kennett and Kennett 2000; Raab 1996). To the extent that correlations of this kind enter into theorizing about Late Holocene culture change, we may be witnessing an important shift in archaeological thinking. Traditional models of California prehistory, as we saw earlier, often viewed the Late Holocene as a cultural climax, that is, scenarios that envisioned only highly successful modes of cultural adaptation. It seems increasingly evident that models of this kind offer no particularly realistic basis for explaining culture change.

Although we have not focused on Late Holocene paleoenvironmental research in this discussion, this topic deserves at least brief mention. A growing number of researchers believe declining foraging efficiency was not the sole source of stress widely felt by Late Holocene coastal populations. Recent discussions have noted evidence of episodes of extreme and persistent Late Holocene coastal droughts, notably during the so-called Medieval Warm Period, or between about AD 800 to 1300 (Arnold 1992a; T. Jones et al. 1999; Kennett and Kennett 2000; Raab and Larson 1997). Impacting populations already under stress from comparatively low levels of foraging efficiency, severe Medieval era droughts may have put some coastal populations at high risk for malnutrition, disease, and violence (T. Jones et al. 1999). For the northern Channel Islands, Kennett and Kennett (2000:390–391) offer the following assessment of these forces:

> Based on the available data, our current working hypothesis is that climatic instability and resource stress associated with persistent drought stimulated greater conflict and competition for access to perennial water sources on the islands beginning about AD 500. This situation promoted greater sedentism near perennial water sources and enhanced territorial behavior. Violent interaction and competition was exacerbated by the introduction of the bow and arrow sometime between AD 500 and 800. The favorable environmental conditions between AD 650 to 800

> undoubtedly promoted population increases at certain locations and the establishment of sedentary villages in more marginal locations in terms of water availability. More intensive fishing, production of non-food trade items and increased trade emerged after about AD 900 in the context of environmental and social instability as new behavioral strategies for dealing with subsistence problems associated with decreased mobility. Decreased settlement mobility and territorial behavior certainly would have exacerbated resource stress for some groups of people. In this context, more cooperative economic strategies (trade) became dominant after AD 1300 as violent interaction subsided regionally in the context of small and stable territories.

On San Clemente Island, Yatsko (2000) documented a major change in settlement patterning during the period from about AD 800 to 1300, using the Legacy Survey information and other data. Yatsko's study shows that upland portions of the island, geologically unsuited to holding water, contained few sites during this interval, while the number of sites increased near major water-holding canyons. Overall, it appears that San Clemente Island was sparsely populated or perhaps periodically depopulated during the Medieval Climatic Anomaly (Yatsko 2000). This trend may be discernable in figure 2.2, where the number of radiocarbon-dated cultural components plunges in the island-wide and Legacy samples between about AD 1100 to 1300, a break with what otherwise appears to be generally increasing Late Holocene settlement density on San Clemente Island. The statistical error associated with ^{14}C dates does not allow us to tell whether this trend reflects island abandonment, but lowered settlement density seems evident during the Medieval Climatic Anomaly. San Clemente Island lends support to the conclusion that periodic climatic stresses were pervasive during the Late Holocene in coastal Southern California.

If a consensus is emerging that Late Holocene populations experienced certain cultural and environmental stresses, it is important to avoid enshrining new stereotypes about culture change. It may be as mistaken to assume that all coastal groups responded alike to resource intensification and climatic pressures as it was for neo-evolutionists to conclude that all groups were relentlessly evolving toward greater adaptive success and cultural complexity.

On San Clemente Island there is little evidence for certain of the cultural reactions described above by Kennett and Kennett. Settlement patterning is a case in point. The Nursery site (SCLI-1215), with its house structures, extensive midden deposits and Late Holocene cemetery, attests to residential sedentism on San Clemente Island (Potter 1998; Raab, Bradford, and Yatsko 1994; Salls 1988). Semi-subterranean houses with whalebone roof structures appeared, however, around 5000 years ago at the Nursery site (Raab, Bradford, and Yatsko 1994; Salls et al. 1993). At Eel Point, superimposed house floors virtually span the Holocene (Fiore 1998). One has the impression that favored settlement locations were occupied over long periods of time on San Clemente Island, rather than a trend of establishing major new residential bases during the Late Holocene. If anything, the proliferation of the small *Tegula* middens described earlier reflect more expansive settlement dynamics during the Late Holocene than during previous time periods.

The Late Holocene southern Channel Islands also reflect interesting patterns regarding to evidence of interpersonal violence. Admittedly, this phenomenon is difficult to assess, because bioarchaeological data are far more limited from the southern Channel Islands than from the Santa Barbara Channel area. Some of the best data come from the Nursery site (SCLI-1215) on San Clemente Island, where a Late Holocene cemetery has been partially excavated and analyzed. Salls (1988:388–390) reported a date of 1490 ± 30 years (UCLA-2592) for a bone sample from one of the Nursery site burials (the source of the fishing kit mentioned earlier). Assuming mixed atmospheric and marine carbon sources (50% of each for the sake of simplicity), this sample produced a mean calibrated date (one standard deviation) of AD 830. Potter (1998) described 22 burials from this cemetery population, all apparently contemporaneous, based on mortuary patterns and degree of preservation. Potter (1998:14) found that "longer life expectancy and better general health for Late Holocene populations contrasts with that of the northern Channel Islands. In the southern Channel Islands, it appears that health was poor for the Middle Holocene samples and remarkably good for the Late Holocene sample. Also contrasting with the northern Channel Islands data is the temporal decrease of violence, as indicated by the lack of injuries present from interpersonal violence, in the Late Holocene sample."

To date, investigations on the southern Channel Islands (Kerr and Hawley 2000; Potter 1998; Titus 1987) have failed to find skeletal evidence of interpersonal violence comparable to the Late Holocene populations of the Santa Barbara Channel area (Kennett and Kennett 2000; Lambert 1993). Wounds attributable to the bow and arrow, a new and more lethal form of combat that appeared during the Late Holocene, are conspicuously absent in the southern Channel Islands skeletal populations studied to date. On San Clemente Island experience shows that small triangular stone arrow points are rare, while they are relatively common in Late Holocene archaeological deposits of the Santa Barbara Channel region (Glassow 1996c). Much the same distinction can be made with regard to patterns of disease and malnutrition, where Late Holocene populations of the Santa Barbara Channel area appear to have been at greater

risk of disease and malnutrition than were the inhabitants of the southern islands.

The Nursery site cemetery population reflects no evidence of status differentiation with regard to the effort expended on grave preparation and treatment of the body or associated grave goods. This pattern contrasts with at least some Chumash coastal cemeteries of comparable age, where marked differences between burials can be seen for each of these variables (Martz 1984).

The brief examples given here do not adequately probe the cultural trends that distinguished the northern and southern Channel Islands during the Late Holocene. Even so, some differences seem worthy of comment. Where the clearest archaeological evidence of complexity can be seen in coastal Southern California (e.g., status hierarchy in mortuary populations, settlement aggregation, and extensive trade in non-food items), these traits were part of a distinctive Late Holocene cultural pattern that appears to have emerged in the Santa Barbara Channel area. Probably not coincidentally, increased territoriality and violent competition were fundamental components of this pattern (T. Jones et al. 1999; Kennett and Kennett 2000; Lambert and Walker 1991). As LeBlanc (1999) and Keeley (1996) document, ancient warfare was a potent source of culture change, including many of the types of shifts seen in Late Holocene settlement patterning, technology, social organization, and human welfare of the Santa Barabara Channel area. Many of the dynamics linked to emergent social complexity, including violent conflict and intercommunity cooperation, can be seen as logical responses to a need for community defense, leadership in warfare, and diplomacy between warring communities. Beyond the archaeological evidence, J. Johnson (2000) provided ethnohistoric evidence for a substantial influence of warfare on Protohistoric Chumash social organization. Here we encounter a bit of irony: progress with a large price tag. Where neo-evolutionists equated increasing social complexity with cultural "improvements," it now appears that this trend imposed a substantial cost in human welfare, at least during the turbulent centuries between about AD 800 and 1300.

On the southern Channel Islands, where a strong pattern of warfare, territoriality, and health problems appears to be lacking, archaeological indicators of social complexity also appear to be more ambiguous. One example is regional trade in non-food items. Santa Catalina Island is a well-known source of steatite (soapstone) artifacts that were widely exchanged during the Late Holocene in coastal Southern California. Williams and Rosenthal (1993) examined modes of steatite artifact manufacture on Santa Catalina Island in light of arguments for specialized marine shell bead production on the northern Channel Islands. As compared to northern islands bead manufacture, Williams and Rosenthal (1993) concluded that there is little evidence involving specialized production or centralized control in the steatite trade. Overall, research on the southern Channel Islands to date appears to reflect a "weak complexity" pattern, at least in terms of the accepted archaeological correlates of social complexity in the northern Channel Islands.

Much of the mainland coast may reflect a pattern similar to the southern Channel Islands. If so, one of the crucial tasks for researchers interested in emergent social complexity is explaining why the distinctive constellation of enhanced territoriality, high rates of interpersonal violence, and depressed health conditions seen among the Chumash failed to become universal despite the fact that Late Holocene paleoclimatic and resource intensification stresses seem to have been pervasive. As Kennett and Kennett (2000) argued, this problem requires recognition that groups may employ a range of strategies for responding to stressful environmental and cultural conditions. These strategies may range from attempts to gain exclusive control over productive resources, sometimes employing violence, to cooperative modes of behavior involving sharing and reciprocity. Future research could profitably examine the cultural and environmental factors that promote differing responses across time and space. Instead of a monolithic march of chiefdoms toward social complexity, Late Holocene coastal Southern California probably contained a variable mix of both adaptive modes.

In any case, the data we have presented suggest that a diverse mosaic of responses to cultural and natural environments probably emerged during the Late Holocene in coastal California, including a wide spectrum of gradations in cultural complexity. Resource intensification and climatic deterioration may have imposed widespread stresses on the Late Holocene coast, but these hardly seem to have produced the same adaptive outcomes in the cases we examined here. Documenting this kind of variability and seeking to explain it in a regional comparative framework might be a productive research direction in the new millennium.

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CHAPTER 3

Southern California in Transition

Late Holocene Occupation of Southern San Diego County

DENNIS R. GALLEGOS

The Late Holocene in San Diego County was marked by environmental change and the introduction of new cultural traits. From the Middle to Late Holocene, a warming climate and the loss of estuarine resources caused by sedimentation of coastal lagoons effected changes in settlement and resource exploitation patterns. Settlements generally shifted away from coastal lagoons to canyon settings with more dependable plant, animal, and water sources. In this paper, I focus on the southern portion of San Diego County—the area from Batiquitos Lagoon south to the border with Mexico (figure 3.1)—inhabited by the Kumeyaay at the time of historic contact. While earlier models (e.g., M. Rogers 1945; Shumway, Hubbs and Moriarty 1961; Warren and Pavesic 1963; Warren 1964) suggested whole or partial abandonment of San Diego County during parts of the Holocene, current evidence suggests this area was never abandoned. Continuous and overlapping radiocarbon dates suggest ongoing occupation for the past 9000 years. The most recent portion of this occupation span, the Late Holocene, is divided into two periods: the first from 3350 to 1300 years ago, and the second from 1300 years ago to Spanish contact, referred to here as the "Late period." The Late period is marked by introduction of the bow and arrow, pottery, obsidian from the Obsidian Butte source, and the practice of cremation. Settlement patterns show a marked increase in the frequency of milling stations in inland locations and an overall increase in the number of habitation sites. In conjunction with technological innovations that included improved hunting techniques and better processing and storage of foods, Late period trends reflect adaptation to changing environmental conditions, as well as economic intensification, with ongoing use of a more limited marine resource base and increased focus on terrestrial plant resources and inland habitats.

ENVIRONMENTAL SETTING

San Diego County, situated in the southwest corner of the United States, has a temperate climate that supports a wide range of coastal and inland plant and animal resources. From the onset of the Holocene, environmental change was probably gradual over the millennia, but abrupt major changes such as floods and droughts also occurred within relatively short periods of time. From about 10,000 to 3500 years ago, sea level rose approximately 20 m (Curray 1965), flooding coastal valleys and creating lagoons rich in shellfish and fish. About 3500 years ago, the sea reached its current level and coastal lagoons began to silt in, greatly reducing the availability of lagoonal resources (Gallegos 1985; Masters 1998; Miller 1966; Warren and Pavesic 1963). San Diego Bay was also created as a result of this rise in sea level, but siltation and habitat degradation of the bay did not occur owing to its unique setting, extensive freshwater runoff, and tidal flushing (Masters 1998).

Pine and oak pollen from Early Holocene coastal sites and lagoons suggests a cool, moist climate that became warmer and drier by the Late Holocene, as marked by coastal sage scrub vegetation on the hillsides and ribbons of riparian vegetation lining the river valleys (Axelrod 1967:103; Davis 1992; Gallegos and Kyle 1998; Gallegos et al. 1998; Heusser 1978; Kaldenberg 1982; Kyle, Schroth, and Gallegos 1990). By the Late Holocene, many former lagoons were transformed into saltwater marshes surrounded by coastal sage scrub. For each lagoon, this saltwater influx apparently moved the head of the freshwater flow up the canyon. Given drying conditions and loss of lagoonal resources, local populations abandoned mesas and ridge tops and relocated Late period villages to reliable freshwater sources.

As the lagoons silted in, estuarine mollusk populations declined and shellfish collection was directed instead toward

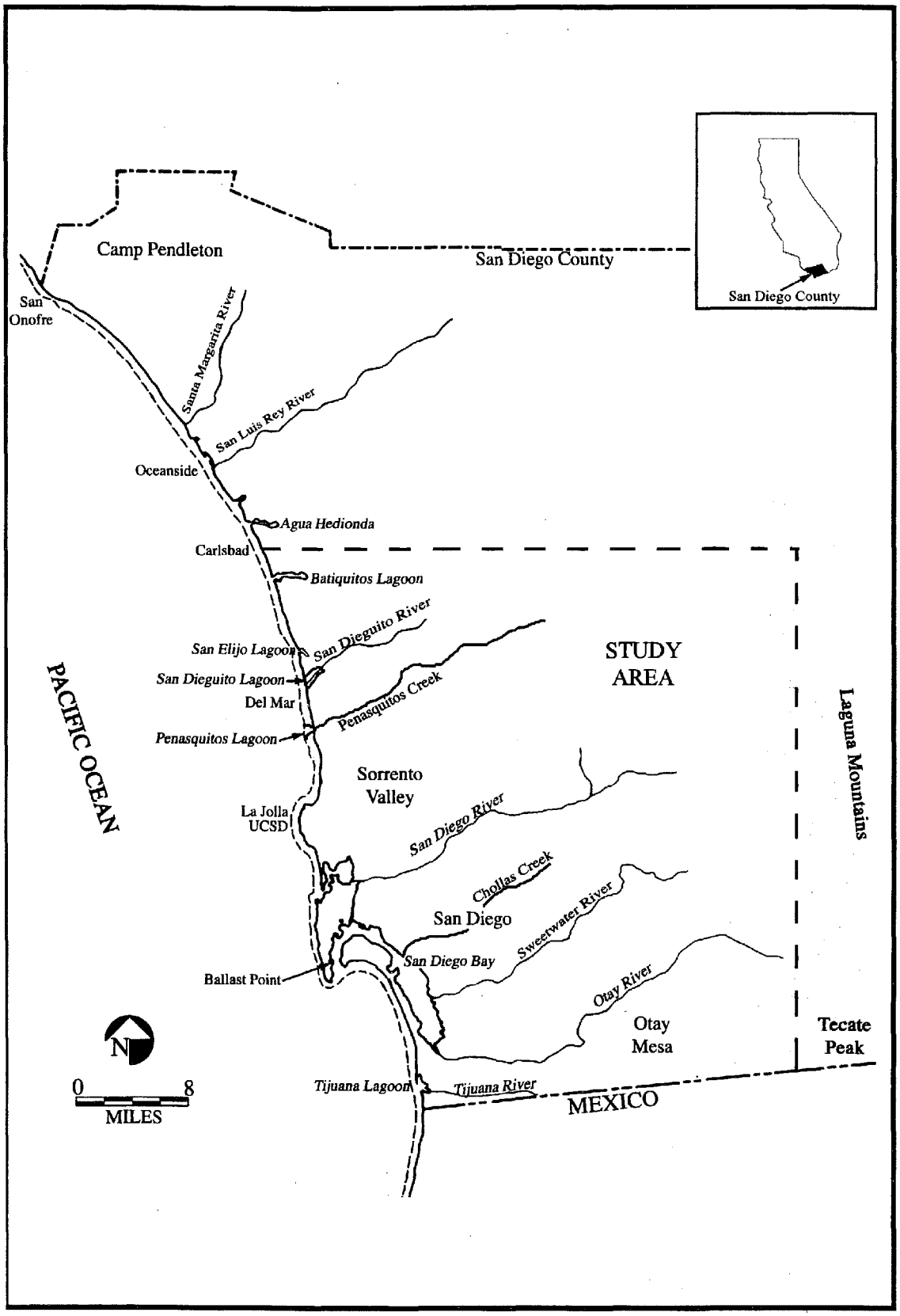


Figure 3.1 Map of San Diego County

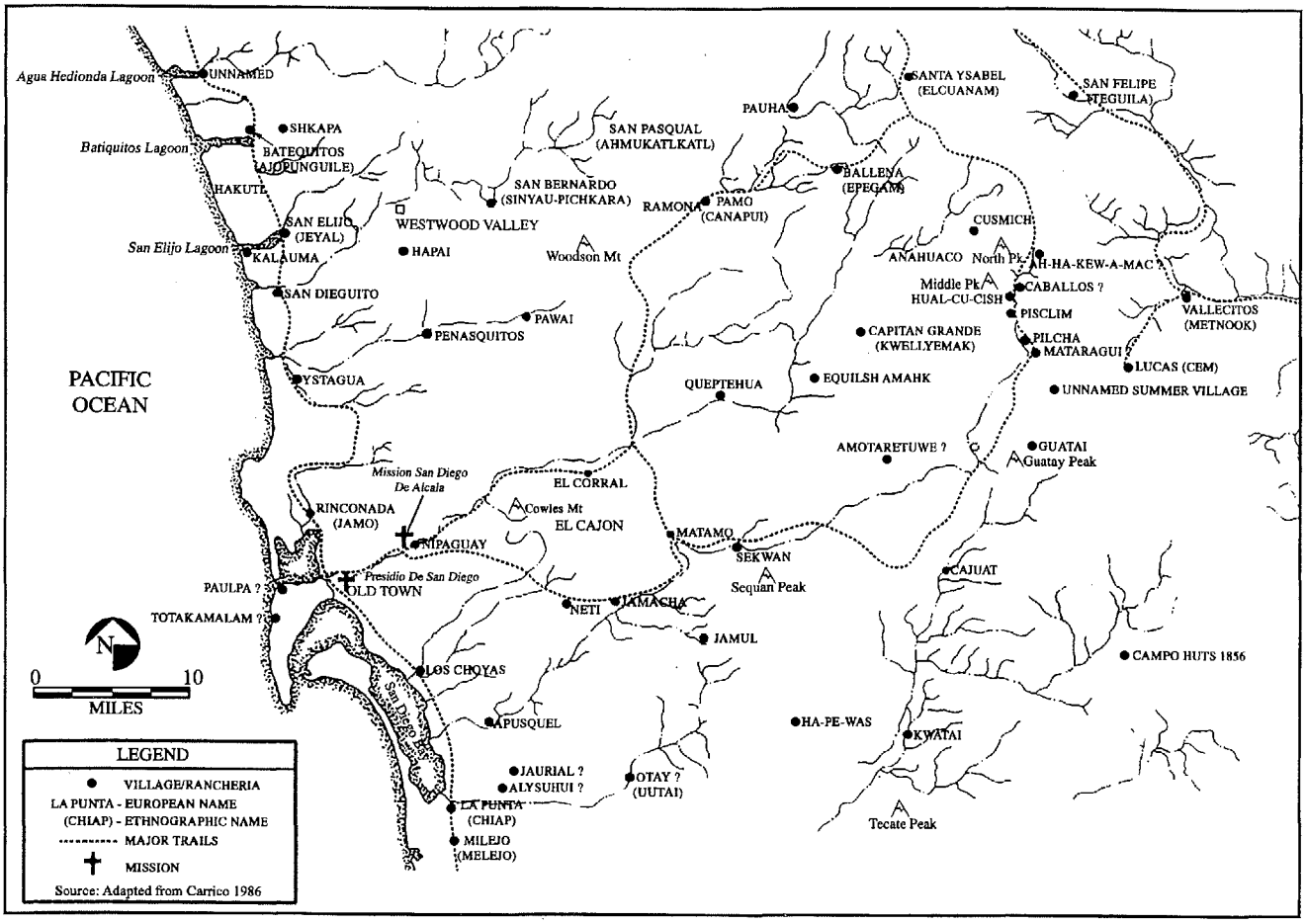


Figure 3.2 Ethnographic and historic villages of San Diego County

sandy beach and open coastal areas. Byrd and Reddy (chapter 4, this volume) document a shift after 4000 years ago along the northern San Diego Coast from estuarine shellfish to small *Donax* clams found in sandy beach habitats. This clam, the size of a fingernail, was probably used in soups. Ezell (1975) cited its use during the Great Depression of the 1930s, and refers to *Donax gouldii* as "Depression Clam." At the Ballast Point site (figure 3.1), *Donax gouldii* was a minor dietary contributor 5000 years ago (Gallegos and Kyle 1998), but it appears to have been a primary food source at the village of Ystagua about 3000 years ago (Carrico and Gallegos 1989; Ezell 1975; Gallegos, Kyle, and Carrico 1989).

For the village of Ystagua (SDI-4513 and SDI-4609) at Peñasquitos Lagoon (figures 3.1 and 3.2), the record of shellfish exploitation begins around 5000 years ago with *Chione* and *Argopecten* dominating the assemblages (Gallegos, Kyle, and Carrico 1989). About 3000 years ago, *Donax* was the most prevalent taxon, with *Mytilus* and *Chama* becoming dominant about 1000 years ago (Carrico and Gallegos 1989). These shifts from the collection of estuarine to sandy beach to rocky intertidal species over the past 5000 years provide additional evidence of Middle to Late Holocene environmental change.

At Ystagua (SDI-4609), prior to 1500 years ago, a major flood produced over a meter of sediment (Carrico and Gallegos 1989). This flood may have caused the reopening of small lagoon basins, such as Batiquitos Lagoon, as suggested by the increase in radiocarbon-dated sites containing primarily *Chione*, *Argopecten*, and *Ostrea* shell from about 1500 years ago to Spanish contact. This flood may also be what Aikens (1983) reported as a pollen and hydrologic peak 1250 to 1350 years ago. Additional evidence supporting a wet period for San Diego County during this general time is the radiocarbon date of 1580 years ago that identified a full stand of water at Lake Cahuilla in the Imperial Valley (Hubbs, Bien, and Seuss 1960:214). Hubbs reported "this is the oldest date so far ..." for Lake Cahuilla, roughly 100 miles long and 30 miles wide, just east of San Diego County.

ARCHAEOLOGICAL AND ETHNOGRAPHIC BACKGROUND

Initial occupation of San Diego County occurred over 9000 years ago (Moriarty 1967; Kyle, Schroth, and Gallegos 1998; Linick 1977; Warren 1968) at lagoon and river valley

GEOLOGIC TIME	PERIOD	YEARS BP	OTHER NAMES	DIAGNOSTIC CULTURAL MATERIAL
LATE HOLOCENE	Late Period	Present	Historic Late Prehistoric Yuman Cuyamaca Complex	Bow-and-arrow, small triangular and side-notched points, cremations, fish hooks, ceramics Obsidian Butte obsidian.
		1,300	San Luis Rey I, II	
		2,000		Stone bowls, triangular points fishing gorges, burials.
		3,000		
MIDDLE HOLOCENE	Early Period (archaic)	4,000		Dart and atlatl, cogged stones, plummet stones, leaf-shaped points/knives, corner-notched and stemmed points, Coso Obsidian, burials.
		5,000		
		6,000		
EARLY HOLOCENE		7,000	Pauma Complex Encinitas Tradition La Jolla Complex	Spear, crescents, lanceolate and leaf-shaped points, leaf-shaped knives, Casa Diablo and Coso Obsidian, burials.
		8,000		
		9,000		
		10,000	San Dieguito Tradition/Complex	

Figure 3.3 Terminology for Culture History in the San Diego Area

localities, followed by numerous coastal lagoon and bay sites. These Early Holocene sites generally contain bifaces, crescents, milling tools, cobble and flake tools, bones from small to large game, and lagoon and ocean resources, including shellfish and fish (Gallegos 1991). Inland deposits are characterized by milling implements and cobble and flake tools indicative of plant food processing and hunting activities. Terminology used for Early and Middle Holocene sites include San Dieguito complex, Encinitas tradition, La Jolla complex, and Pauma complex (M. Rogers 1966; True 1958, 1980; Warren 1968). More recently, the term Early period, or Archaic, has been used in place of these terms (figure 3.3).

For the Late Holocene, the Spanish called the Native Americans associated with Mission San Luis Rey de Francia "Luiseño" and those associated with the San Diego Mission "Diegueño." The Diegueño term has been replaced with Kumeyaay: Ipai is used for northern Kumeyaay, and Tipai for southern Kumeyaay (Luomala 1978). Kumeyaay territory extended north of Batiquitos Lagoon to south of Ensenada, Mexico, and east into the desert. Kumeyaay is in the Yuman language family and is part of the Hokan stock. To the north, the Luiseño, spoke a Shoshonean language. The distribution of Shoshonean or Uto-Aztecan languages shows a contiguous territory extending from the Great Basin to the California Coast, where they are represented by Luiseño and Gabrielino. This pattern, sometimes referred to as the "Shoshonean Wedge," is thought to represent an influx of Shoshonean speakers to the coast at some point in the past. The Luiseño may have entered northern San Diego County sometime between 3500 to 1300 years ago.

Based on early Spanish accounts and ethnographies, the Kumeyaay population was estimated to be between 10,000 and 20,000, with perhaps 85 villages (figure 3.2) (Carrico 1986; Kroeber 1925; Merriam 1968; Shipek 1986). Regarding political organization, Luomala (1978:597) stated that:

> Each band, an autonomous tribelet, had a clan chief and at least one assistant chief. Positions, where inherited, went to eldest sons, or if none, to brothers or, rarely, to widows. Additionally, Pamo had a village chief selected by consensus (Gifford 1918:168). Imperial Valley Tipais, having no clan chiefs, had a tribal chief like Quechans, among whom have been chiefs of Tipai descent (Forbes 1965:343; Gifford 1931:50-51).

A chief, because of knowledge of custom and people, directed clan and interclan ceremonies, lectured on their significance, admonished people on behavior, advised about marriages and their dissolution, resolved family differences, and appointed a leader for an agave expedition or a fight. His assistant delivered his messages and implemented his orders.