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Sedentism and Settlement in Native California: Research Progress and Prospects

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ABSTRACT
The ethnographic literature of California has long attributed some measure of reduced mobility to nearly all of its Native societies, but methods for determining this measure for any given group have greatly varied. Treatment of sedentism in the archaeological literature has been approached from multiple theoretical perspectives, including those derived from cultural evolution, cultural ecology, human behavioral ecology, and neo-Marxism. Here we provide a brief review of the history of treatment regarding the issue of sedentism in California archaeology, beginning with an overview of general theory on hunter-gatherer sedentism in anthropological literature, followed by a review of selected California ethnographic accounts, and regional models. We conclude with recent and encouraging findings from newer analytical studies and offer recommendations to researchers for making progress in future studies on this topic.

RESUMEN
La literatura etnográfica de California ha atribuido durante mucho tiempo alguna medida de movilidad reducida a casi todas sus sociedades nativas, pero los métodos para determinar esta medida para cualquier grupo han variado en gran medida. El tratamiento del sedentismo en la literatura arqueológica se ha abordado desde múltiples perspectivas teóricas, incluidas las derivadas de la evolución cultural, la ecología cultural, la ecología del comportamiento humano y el neomarxismo. Aquí proporciono una breve revisión de la historia del tratamiento del tema del sedentismo en la arqueología de California, comenzando con una visión general de la teoría general sobre el sedentismo de cazadores-recolectores en la literatura antropológica, seguida de una revisión selectiva de los relatos etnográficos de California del sedentismo, y una discusión de modelos regionales. Finalmente, concluyo con hallazgos recientes y alentadores de estudios analíticos más recientes, y ofrezco recomendaciones sobre el camino para que los futuros investigadores avancen en futuros estudios sobre este tema.

KEYWORDS Sedentism; Chumash; sedentary societies; societal complexity; cultural evolution; cultural ecology; human behavioral ecology; neo-Marxism

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"... the fairly sedentary habits of virtually all ... tribes would have made possible the taking over of the art [of agriculture] with relatively little change of mode of life" [Kroeber 1925, 815].

As California archaeologists continue to shift their focus toward topics of political identity and colonialism (e.g., Brown 2018; Hull and Douglass 2018; Lightfoot and Gonzalez 2018; Lightfoot et al. 2013; Panich 2014; Schneider 2015; Schneider et al. 2018), issues of relative and emergent sedentism have fallen somewhat to the wayside. As Kroeber (1925) alluded to above, hunter-gatherer sedentism has long been linked theoretically with emergent agriculture, and much effort in recent decades has been devoted to defining the exact chronological relationship between mobility and domestication over time (e.g., Bar-Yosef and Cohen 1989; Dow and Reed 2015; Marshall 2006). California has never been a major focus in considerations of forager sedentism, however, because it never developed agriculture nor has the exact degree of sedentism manifested in its Native settlement strategies ever been entirely clear. As a consequence, most theoretical discussions of sedentary foraging in the New World have focused on the Northwest Coast (e.g., Murdock 1976; Schalk 1981; Suttles 1968) where permanent villages were documented by the earliest ethnographers.

California’s acorn economies, on the other hand, have long been vaguely associated with sedentism—or even more so with “semi-sedentism” (e.g., Beardsley et al. 1955)—but in most cases the ethnographic details of such systems are incomplete, so the mechanics of acorn-fueled low mobility have been left to archaeologists to resolve. Over the last few decades, significant progress has been made on this front through a combination of theory-driven modeling, application of mid-range concepts related to site function, and more sophisticated analysis of faunal and floral remains (e.g., seasonality studies). The purpose of this article is to review archaeological progress on the issue of sedentism in Native California, beginning with a brief consideration of theory on sedentism in general. This is followed by a summary of ethnographic accounts, discussion of salient regional modeling efforts, and a review of encouraging findings from new analytical approaches.

**Sedentism in Theory**

Here we consider four broad and overlapping areas of theory that have influenced, and continue to influence, the study of hunter-gatherer settlement and sedentism in California and beyond: cultural evolution, cultural ecology, human behavioral ecology, and sociopolitical dynamics and complexity, as well as mid-range theory. Cultural evolution, of course, posits unilineal stages of societal development. Cultural ecology is distinguished by considerations of environment, resources, and demography, while human
behavioral ecology builds upon the former, working within hypothetico-deductive modeling guided by evolutionary tenets. A fourth theoretical camp that we consider under the heading of sociopolitical dynamics and complexity (or neo-Marxism) de-emphasizes subsistence, environment, and ecology in favor of sociopolitical traits such as power, labor, and social stratification. In addition to these four primary domains, we briefly note areas of mid-range theory that have also contributed to discussions of sedentism and settlement in recent archaeological discourse.

**Cultural Evolution**

While the era of cultural evolutionary theory has long passed, its influence on thinking about stages of settlement and sedentism lingers, particularly in long-standing terminology used in regional culture histories. The seminal cultural evolutionary synthesis of Willey and Phillips (1958, 107) defined the “Archaic stage” as “migratory hunting and gathering” that followed extinction of mega fauna and continued “into environmental conditions approximating those of the present.” It was also associated with dependence on smaller, more varied fauna, with an apparent increase in gathering and implements used to prepare wild vegetable foods. The Archaic was distinguished from the stage that followed it, the Formative, which was defined by well-established sedentary village life based on agriculture. While Willey and Phillips (1958) explicitly recognized that regions like California and the Northwest Coast did not pursue agriculture but still achieved sociopolitical complexity (including sedentism) comparable to that of agricultural societies, California was still classified as “Archaic.”

Also emerging from the cultural evolutionary era was a mobility classification scheme that included four types: free wandering (with no territorial boundaries), restricted wandering (groups constrained by territorial limitations), center-based wandering (groups seasonally returning to a central village), and semi-permanent sedentary (groups occupying a village year-round but moving every few years) (Beardsley et al. 1955). This system was subsequently modified by Murdock (1967) based on ethnographic observations: fully nomadic, semi-nomadic (members who wander in bands for at least half the year but occupy a fixed settlement for some season or seasons); semi-sedentary (members shift from fixed settlements at different seasons or occupy more or less permanently a single settlement from which a substantial proportion of the population departs seasonally to occupy shifting camps [e.g., during transhumance]); and fully sedentary (i.e., nucleated villages or towns) (Murdock 1967, 159). The challenges inherent in recognizing these various types of systems archaeologically would become apparent later.

A bridge between unilineal cultural evolution and cultural ecology was Johnson and Earle’s (1987) highly influential proposal for multilinear
evolution, emphasizing the idea that social evolution can follow different paths depending on a community’s cultural history (rather than the singular path suggested by unilineal theory). With respect to sedentism, Johnson and Earle (1987, 63) highlighted the fact that some hunter-gatherer societies did, in fact, become fully sedentary without agriculture as the driver of critical social change. This and similar ideas advanced by Price and Brown (1985) opened the dialogue on emergent sedentism that would follow (e.g., Kelly 1992, 1995).

**Cultural Ecology and Early Settlement Models**

Beginning in the 1960s, the “New Archaeology” movement began to focus on settlement systems as units of analysis (e.g., Chang 1968; Trigger 1968). What ultimately emerged from this new emphasis were two highly influential models: Binford’s (1980) foragers and collectors, and Bettinger and Baumhoff’s (1982) travelers-processors. Both of these whittled down the ethnographically observed variation apparent in the schemes put forward by Beardsley et al. (1955) and Murdock (1967) to focus on archaeologically recognizable signatures of contrasting mobility systems.

In Binford’s (1980) model, he differentiated between residential and logistical mobility to assist in classifying groups as either sedentary or mobile, which has since become ingrained in settlement analyses worldwide (e.g., Barker 2009; Liu and Chen 2012; O’Connell 1987; Perreault and Brantingham 2011). In this construct, foragers—who do not rely on storage—make seasonal residential moves between resource patches. Binford (1980) associated foraging with relatively homogeneous environments, such as tropical forests, and argued that the strategy is represented archaeologically by seasonal residential bases and locations (where resources are procured and/or processed). Collectors, on the other hand, rely at least partially on stored foods and occupy major villages for much of the year, with special task groups employing field camps, stations, and caches (in addition to residential bases and locations) to acquire and process foods (sometimes in bulk) for transport to residential bases. The model for the collector strategy was the Nunamiut Eskimo, who occupy an environment with great diversity and seasonal variation in resource availability. Binford’s model offered no diachronic predictions given that it is at least partially environmentally deterministic. However, by definition, collectors distinguish themselves from foragers by their reliance on storage.

In their traveler-processor model, Bettinger and Baumhoff (1982, 487) differentiated between “low-cost and high-cost strategies in terms specifically relevant to hunter-gatherer subsistence-settlement systems.” The low-cost strategy (travelers) involves “resources of high quality … [and] greater costs in travel time and lesser costs in extraction and processing time”
(Bettinger and Baumhoff 1982, 487). The high-cost strategy (processors) "is more reliant on resources of low quality ... and incurs lesser costs in travel time and greater costs in extraction and processing time" (Bettinger and Baumhoff 1982, 487). This model differs from Binford’s in that “the traveler-processor dichotomy ... [has an] explicit emphasis on subsistence patterns and the differential allocation of time to specific activities” (Bettinger and Baumhoff 1982, 488).

This classification was applied to the spread of Numic peoples throughout the Great Basin after ca. 1,000 years ago (Bettinger and Baumhoff 1982). The argument centered on the idea that the Numic spread was facilitated by a different settlement/subsistence strategy (emphasizing high-cost processing of small seeds with higher human populations) than the Pre-Numic people (travelers) who preceded them and pursued a lower cost subsistence focused more on large animals and who had lower population densities (Bettinger and Baumhoff 1982, 491). The processing adaptive mode was perhaps more sedentary than the traveling mode, but no argument was made that the Numic processors necessarily achieved full sedentism nor was sedentism an explicit focus of the model. However, Bettinger and Baumhoff (1982, 499) did draw specific parallels to California, specifically the acorn economy, which represented another (even more extreme) case of a high-cost plant food that provided certain competitive advantages and could have facilitated ethnic spreads.

In his monumental analysis of worldwide hunter-gatherer behavior and patterning, Binford (2001) made a number of observations about relative sedentism that both confirm the complicated situation in California and point to the need for further evaluation and research. First, using a two-part typology, he classified about two thirds of ethnographic California groups as sedentary (e.g., Yurok, Wiyot, Patwin, Gabrielino, Coast Miwok, Chumash, Salinan), and one third as mobile (e.g., Diegueno, Tubatulabal, Foothill Yokuts, Monache, Sierra Miwok). Second, he identified multiple general contrasts between mobile and sedentary groups that have implications for California: (1) mobile groups generally occupy larger territories, but have smaller populations and lower population densities; (2) exceptions to this trend are cases where sedentary groups that occupy large territories also feature success in warfare and alliance building; (3) mobile people dependent on terrestrial animals have the lowest population densities while mobile people exploiting aquatic resources have the highest; (4) among groups exploiting both terrestrial plants and aquatic resources, the highest population densities are associated with plant users—from which he infers that the greatest intensification potential lies in terrestrial plants, but that for mobile people, aquatic resources offer the greatest return from intensification strategies; and (5) hypothetically, there are two paths leading to sedentism in warmer climates (like California), one based on terrestrial plants and one on
aquatic resources. Given that California was a mosaic of groups differentially dependent upon terrestrial versus aquatic resources, the potential to explore and evaluate these ideas ethnographically and archaeologically seems significant.

**Human Behavioral Ecology**

Concepts derived from human behavioral ecology (sometimes referred to as human evolutionary ecology) have been applied to American archaeology for a variety of issues for several decades, including settlement and sedentism. Overviews of this body of theory are available in Bettinger, Garvey, and Tushingham (2015), Broughton and O’Connell (1999), Codding, Bird, and Jones (2012), Kennett (2005), Winterhalder (1993), Winterhalder and Bettinger (2010), and Winterhalder and Kennett (2006). Bettinger and Baumhoff (1982) introduced some aspects of behavioral ecology into considerations of mobility, but Kelly (1995) dealt with the topic in greater depth within an explicit framework of behavioral ecology. He made a critical point about the manner in which archaeologists typically treat the concept of sedentism—for example, often suggesting that a given group became more or less (usually more) sedentary over time—and he detailed what it means for a group of people to be sedentary.

Kelly (1995, 121) outlined five variables that can be used to measure mobility in a quantitative manner, including the use of primary biomass, in relation to “abundance of edible plant food” and fauna. He then discussed a number of quantitative measures (including number of residential moves per year and average distance per residential move for a given group) that might relate to a group’s mobility, and provided real-life ethnographic examples. Much of Kelly (1995) is related to modern-day hunter-gatherer groups and how statistical analysis of their movements can be used to infer information about groups in the past. This method is not always foolproof, of course, as there are many factors that influence the way hunter-gatherers live today that may make them different from how they lived in the past.

In a related publication, Kelly (1992) focused more on the way archaeologists view sedentism. He acknowledged the wide range of definitions applied to the term “sedentism,” but ultimately settled on two: (1) “a process whereby groups reduce their mobility to the point where they remain residentially stationary year-round” (Hitchcock 1987, 374; as cited in Kelly 1992, 49) and (2) “settlement systems in which at least part of the population remains at the same location throughout the entire year” (Byrd 1989, 183; as cited in Kelly 1992, 49). The latter seems especially useful for California. Kelly (1992, 44) observed that many archaeologists utilize some specific typology to classify groups, which can be as simple as “distinguish[ing] between mobile and sedentary societies.” He urged that such classifications, while...
sometimes useful, are far too simplistic and that the subject requires much more analysis, a criticism that applies to many studies in California.

Importantly, Kelly (1992) summarized previous ideas on the causes of emergent sedentism, reiterating others’ views that these can be classified as either “push” or “pull” hypotheses (Price and Brown 1985). The latter envisions sedentism as both desirable and efficient, and has been applied to situations where resources are seen as rich, diverse, and/or abundant (especially marine or aquatic foods). California has been specifically implicated as one such place where the resource base would have encouraged sedentism (Moratto 1984; Pilling 1978, 137); however, “push” theories, which link sedentism to subsistence stress and exploitation of labor-intensive foods, have generally come to dominate explanations for transitions to sedentism in California and beyond (e.g., Basgall 2004).

Also of note is that Kelly (1992) discussed the linkage that many archaeologists make between residential infrastructure (houses) and sedentism, observing that the presence of any kind of dwelling is often taken as an indication of year-round sedentism. He then outlined Binford’s (2001) site classification system, and how the types are useful for thinking “about the organization of camp movement relative to foraging activities and thus to understand the role mobility plays in creating archaeological sites” (Kelly 1992, 45). Kelly (1992, 46) further discussed the attachment various groups may have to a landscape based on their mobility behavior, noting that “prehistoric foragers may have had little attachment to land under some conditions and so could more easily migrate from one area to another.” Overall, Kelly concluded that variation in landscapes around the world make it extremely difficult to create any sort of overarching model related to group sedentism. This is not to diminish the importance of considering mobility. What is needed is “to construct more useful approaches than a simple polarization of mobile vs sedentary societies” (Kelly 1992, 60).

In a more recent consideration of the origins of sedentism, Dow and Reed (2015, 56) considered the classic notion that “sedentary foraging predated agriculture by several millennia,” the best evidence for which “comes from temperate zones,” with groups in more extreme climates tending to “remain the most mobile.” They then discussed the importance of clarifying their use of the term “sedentism,” as it has many different meanings. In this case, they define a sedentary site as one that was “at least partially occupied almost year-round … [as inferred by] the presence of plants and animals from all four seasons” (Dow and Reed 2015, 56). In addition, they suggested that heavy investment in structures (especially those for food processing) is a sign that a site was occupied by a sedentary group. They then delved into their theories on the necessary environmental factors that would cause a group of foragers to become less mobile, and suggested that a major causative factor was climate, specifically how populations responded to “natural
shocks” of climate (Dow and Reed 2015). They argued that smaller climactic shifts led to new “food acquisition methods,” which were “retained over time … [creating] a ratchet effect such that … a larger population, increased dietary breadth, and new techniques of food collection could persist” (Dow and Reed 2015, 58). Because of this, the rate of sedentism could “remain above its original level” (Dow and Reed 2015, 58).

In an earlier publication that considered sedentism in an evolutionary context, Rosenberg (1998) also discussed ambiguity in the term “sedentism.” He acknowledged that there are many phenomena that seem to be related to sedentism, and that the archaeological community is not in agreement on the cause and effect of these relationships. In order to answer the questions surrounding sedentism, Rosenberg (1998, 654) deemed it necessary to analyze the costs and benefits of both mobile life ways and more sedentary ones, suggesting that “the most effective risk reduction in a hunting-gathering adaptation” is “residential mobility.” Sedentary life ways, on the other hand, come with increased risks of food shortages, along with a number of other stress factors (Rosenberg 1998).

Why, then, did some groups adopt more sedentary lifeways while others remained more mobile? Rosenberg (1998, 654) addressed this quandary by summarizing several mobility models, including: (1) those that “attempt to explain sedentism as resulting from external factors that can be lumped together under the label adaptation models”; (2) those that pull examples from a slim number of regional occurrences, virtually ignoring many other cases that may not fit the model; and (3) those that relate sedentism to population pressure. Rosenberg (1998) explored a number of other models (mostly dealing with the effects of population pressure) in his attempt to explain why some groups stopped moving and became sedentary, or as he put it, “cheated at musical chairs.” Rosenberg (1998, 664) then proposed his own alternative:

(1) sedentism is the ultimate product of … competition for resources … (2) in such situations sedentism … will tend to develop … whenever suitable resources exist … (3) … innovations that make sedentism possible are produced by the same population pressures … and (4) the driving population resource imbalances derive from the simple inherent tendency of population to grow.

In other words, Rosenberg (1998) believed that population pressure, while discounted by many as an explanation for sedentism, can in fact be analyzed in such a way as to resolve the issue of sedentism. He argued that competition resulting from such population pressures leads to innovations that will assist with and encourage sedentism (Rosenberg 1998).

In a response to Rosenberg, Hayden (2000) pointed out issues of concern in Rosenberg’s (1998) argument: (1) Rosenberg never firmly supports his claim that mobility is more advantageous than sedentism; (2) Hayden (2000, 109) wanted to know “why a group would move if it had all the resources it
needed within easy walking distance from home base”; and (3) Rosenberg never gave a sufficient definition for the term “sedentism.” This, Hayden (2000) argued, is a key factor in any article pertaining specifically to sedentism. It is also important to note that viewing all groups as either “sedentary” or “mobile” is problematic in any context. Hayden’s (2000) article is an important example of the fact that many archaeologists are not in agreement on sedentism: what constitutes it, how it can be measured, or why it was ever adopted. Hayden’s (2000) main argument against Rosenberg’s (1998) treatise is the fact that his tests were based on hypotheses that were not grounded in evidence.

Central-Based Foraging and Sexual Division of Labor. Central-based foraging theory is generally considered an extension of and improvement upon optimal diet and patch choice models that are derived from evolutionary theory. Central-based foraging not only incorporates calorie-based resource ranking, but also considers costs associated with travel time to and from a central location, which relates directly to decisions regarding field processing, group movements, storage, mobility, and ultimately, sedentism (e.g., Bettinger, Malhi, and McCarthy 1997; Houston 2011; Metcalfe and Barlow 1992; Tushingham and Bettinger 2013; Whelan et al. 2013; Wohlgemuth 1996).

Some applications (e.g., Zeanah 2004) also incorporate sexual division of labor into the decision matrices. Perhaps the most influential of the latter was a model advanced by Hildebrandt and McGuire (2002), who argued that logistical hunting of large game increased ca. 4,000 years ago in California and the Great Basin coeval with growing populations, heavier reliance on storage, increased sedentism, and more intensive use of plant foods. Prior to 4,000 years ago, there was less gender-based division of labor with a more generalized economy and lower population density. Emergent sedentism after 4,000 years ago, fueled by increased reliance on stored resources, ultimately allowed for (if not encouraged) male specialization in big game hunting to enhance their social prestige.

Ideal Free Distribution. Like much of human behavioral ecology, the concept of ideal free distribution was originally developed to explain the distribution of non-human animals (Fretwell 1969, 1972). It is less about levels of sedentism than about distribution of population relative to habitat, but it does focus on patterns of settlement. The basic model assumes that environments vary in their suitability and that habitats decline in suitability as a function of population density. In relation to this variability, humans should attempt to maximize habitat suitability, and incoming colonizers should attempt to settle the highest-ranking habitats until a point where suitability declines to a level equal to the next highest-ranking habitat. As populations increase either through migration or in situ growth, lower ranking habitats should fill in by rank order, with higher ranking habitats always occupied by more individuals per area (Codding and Jones 2013, 14569). These concepts have the potential to be applied at various scales.
Sociopolitical Dynamics and Complexity (Neo-Marxism)

While cultural and behavioral ecology share an underlying focus on environment, subsistence, and human population, other views of sedentism emphasize nonsubsistence-related traits, including power, labor, and social differentiation. Typically, models highlighting these aspects combine sedentism into a broader package of traits that collectively constitute sociopolitical complexity. This perspective is best exemplified by the work of Jeanne Arnold, such as her important recent synthesis (Arnold et al. 2016) that expands upon earlier models for emergent Chumash complexity. For Arnold, ethnographically documented sedentism emerged at the same time as craft specialization, social stratification, and hereditary political authority (Arnold 1992a, 1996a, 1996b, 2000, 2001, 2004, 2007, 2009; Arnold and Bernard 2005; Arnold and Green 2002; Arnold and Munns 1994; Arnold, Preziosi, and Shattuck 2001).

While Arnold’s models are multifaceted, the key factor thought to drive emergent complexity is reorganization of labor under the authority of increasingly powerful leaders who organize workers to focus on new technologies and modes of production. Archaeological evidence for such models emphasizes emergent technologies, with subsistence envisioned only as a by-product of labor reorganization. Sedentism likewise emerged as a lesser component of the overall sociopolitical transformation.

Mid-Range Theory

Finally, we mention two domains of what can best be described as mid-range theory that are important components of dialogue on sedentism in California and beyond: organization of technology and site structure/infrastructure.

Organization of Technology. Organization of technology studies rely on a series of influential publications that defined the concept of tool curation and attempted to identify correlations between mobility and patterns of production, use, and discard of tools (Bamforth 1986, 1991; Binford 1979; Kelly 1988). The foremost observation derived from this perspective is that bifaces and cores seem to be commonly associated with high mobility, while greater frequencies of expedient flake tools are associated with sedentism (Kelly 1992). However, many complications have been identified in attempts to correlate mobility with stone tool production and use residues (Bamforth 1991; Binford and O’Connell 1984). Jones and Coddington (2019) questioned the value of focusing on expedient flake tools to the exclusion of other data sets, such as presence/absence of features and faunal remains, to determine level of mobility.

Site Structure/Infrastructure. This domain refers to the notion that permanent settlements have a tendency to exhibit internal spatial variation with
certain areas reflecting pursuit of specialized activities, whereas residential mobility tends to produce internally homogeneous site deposits (Kent 1991). Related to this is the long-standing idea that the presence of durable infrastructure (e.g., houses) is generally associated with sedentism, although Binford (1990) noted cases where well-constructed houses were not necessarily occupied year-round, but were used repeatedly each year during certain seasons. Nonetheless, the prevailing wisdom associating durable structures with sedentism is summarized aptly by Jorgensen (1980, 114), who observed that “the more sedentary a group, the more probable that its houses would be substantial and relatively permanent.”

Sedentism in Ethnographic California

In his seminal volume, Kroeber (1925) mentioned the word “sedentary” only twice. In one instance, he mentioned the sedentary work of Mojave women; a statement less connected with group mobility than with the Mojave method of basket making. In the second instance, Kroeber made it clear that he thought many of California’s Native groups were sedentary but, given the theoretical agenda of his day, sedentism and settlement were not particular foci of his work.

The first attempt to characterize the mobility of California Native societies explicitly and more carefully was by Beardsley et al. (1955), who ascribed all California groups to the category of “central-based wandering.” This was defined as “a community that spends part of each year wandering and the rest at a settlement or central base to which it may or may not consistently return in subsequent years” (Beardsley et al. 1955, 138). Such a community pattern was considered to be related to a storable wild food such as acorns, a locally abundant food such as shellfish, or incipient agriculture. It was explicitly associated with shell middens and was considered less sedentary than a “semi-permanent sedentary” category defined as a community occupying a single a village over a series of years, but also moving periodically. The semi-permanent sedentary strategy was associated with agriculture, with the single exception of the salmon economies of the Northwest Coast, and was also linked to communities with 500 to 1,000 residents. Nonetheless, Beardsley et al. (1955) considered all of California to be more mobile than the Northwest Coast.

Salvage ethnography completed between the 1920s and 1970s provided more details for many groups, with the caveat that the ethnographic record is still patchy and uneven on the details of settlement and sedentism for many (if not most) areas. Here we summarize ethnographic information on settlement and sedentism for three broad regions: (1) the North Coast, which featured salmon-based economies; (2) central California, where
subsistence was focused on acorns; and (3) the South Coast (Santa Barbara Channel), where the subsistence base featured marine fish and acorns.

**North Coast**

It has long been recognized that groups like the Yurok and Wiyot were sedentary at the time of historic contact. The Yurok are often described as the farthest south of the Northwest Coast hunter-gatherer groups based on the degree to which their livelihood revolved around fishing (Pilling 1978, 141). The Wiyot lived primarily in permanent villages along rivers, with Humboldt Bay thought to be the center of their territory (Elsasser 1978). Both groups constructed durable redwood plank houses, some of which also served to store salmon.

Among the Yurok, Pilling (1978, 137) suggested that “a wealth of shellfish, salmon, sturgeon, eel, candlefish, surf fish, deer, elk, sea lion, and acorns allowed sedentary living.” Yurok ethnogeography shows heavy concentrations of permanent villages along the major rivers, but also a few temporary camps in the adjoining uplands (Pilling 1978, 139), suggesting that some members of Yurok groups occasionally left the riverine villages and pursued resources in other settings (probably deer and elk in the summer). Based on these data, multiple researchers have classified the Yurok and Wiyot as sedentary with some people residing in communities year-round, but also making no more than two movements per year covering 12–24 miles (Table 1).

**Central California**

Generally speaking, central California can be associated with heavy exploitation of acorns, but it can also be divided into three subregions based on ethnography: (1) the San Francisco and Monterey bay areas occupied by Costanoan and Bay Miwok speakers for whom the ethnographic record is simply too incomplete to determine the level of mobility or mechanics of the settlement systems; (2) better known groups such as the Pomo, Patwin, Valley Nisenan, and Valley Yokuts who were heavily involved in acorn exploitation and who seem to have been relatively sedentary and; (3) groups such as the Sierra Miwok and Foothill Yokuts who occupied diverse environments on the western flank of the Sierra Nevada and exploited acorns within systems of seasonal group transhumance.

Pomoan villages tended to be situated in valleys fed by rivers, with individually owned areas for food gathering, fishing, and hunting (Barrett 1908). These villages were not inhabited year-round, however, with people moving around “as occasion demanded” (Barrett 1908, 17). Kroeber (1925, 229) speculated that “as to the relation between the main and subsidiary villages of a group, it is likely that the adjustment between them varied seasonally, winter bringing the maximum of its concentration and summer of
<table>
<thead>
<tr>
<th>Group</th>
<th>Residential Moves/Year</th>
<th>Total Distance of Residential Moves/yr (mi)</th>
<th>Types of Settlements</th>
<th>Previous Characterizations</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yurok</td>
<td>0–2</td>
<td>24</td>
<td>Permanent villages along rivers</td>
<td>Sedentary/move into and out of a central location maintained throughout the year</td>
<td>Binford 2001; Kelly 1995; Pilling 1978</td>
</tr>
<tr>
<td>Wiyot</td>
<td>0–2</td>
<td>12</td>
<td>Permanent villages along rivers and Humboldt Bay</td>
<td>Sedentary/move into and out of a central location maintained throughout the year</td>
<td>Binford 2001; Elsasser 1978; Kelly 1995</td>
</tr>
<tr>
<td>Pomo</td>
<td>0–3</td>
<td>0.1-36</td>
<td>Permanent villages in valleys fed by rivers</td>
<td>Sedentary/move into and out of a central location maintained throughout the year</td>
<td>Barrett 1908; Binford 2001; McLendon and Oswalt 1978</td>
</tr>
<tr>
<td>Patwin</td>
<td>2</td>
<td>14</td>
<td>Permanent villages along rivers</td>
<td>Sedentary/move into and out of a central location maintained throughout the year</td>
<td>Binford 2001; Johnson 1978; McKern 1923</td>
</tr>
<tr>
<td>Valley Nisenan</td>
<td>1</td>
<td>–</td>
<td>Semi-permanent villages along rivers</td>
<td>Sedentary/move into and out of a central location maintained throughout the year</td>
<td>Binford 2001; Kroeber 1929; Wilson and Towne 1978</td>
</tr>
<tr>
<td>Foothill Nisenan</td>
<td>1</td>
<td>–</td>
<td>Semi-permanent villages built on flats near rivers and</td>
<td>Sedentary/move into and out of a central location maintained throughout the year</td>
<td>Binford 2001; Wilson and Towne 1978</td>
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<td>along ridges</td>
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<td>Sierra Miwok</td>
<td>4</td>
<td>32</td>
<td>Permanent villages on mountains and foothills near</td>
<td>Mobile/entire group moves from camp to camp per subsistence needs</td>
<td>Binford 2001; Levy 1978a</td>
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<td></td>
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<td>drainages</td>
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<td>Valley Yokuts</td>
<td>1</td>
<td>4</td>
<td>Permanent villages on mounds near rivers</td>
<td>Categorized as both sedentary and mobile</td>
<td>Binford 2001; Wallace 1978</td>
</tr>
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<td>Foothill Yokuts</td>
<td>6</td>
<td>70</td>
<td>Temporary camps on the western slopes of the Sierra Nevada</td>
<td>Mobile/entire group moves from camp to camp per subsistence needs</td>
<td>Binford 2001; Spier 1978</td>
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<td>Costanoan</td>
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<td>Permanent village sites near the coast</td>
<td>Sedentary/move into and out of a central location maintained throughout the year</td>
<td>Binford 2001; Levy 1978b</td>
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<td>Chumash</td>
<td>0.1</td>
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<td>Permanent village sites near water</td>
<td>Sedentary/move into and out of a central location maintained throughout the year</td>
<td>Binford 2001; Grant 1978</td>
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dispersal.” While Kroeber (1925) did not provide any further details on what prompted these movements or which sectors of the group engaged in them, Barrett (1908) suggested that a group would usually not move very far from their original village and would often return to previously abandoned sites after some time.

On the other hand, the Patwin were said to live in villages year-round, occupying permanent earth-covered structures (Johnson 1978). However, according to Binford (2001), the Patwin were also said to move up to two times a year, suggesting that certain camps were inhabited year-round with some people moving in and out at various times during the year. The Patwin also utilized several different kinds of housing, including temporary structures (McKern 1923). According to Kroeber (1932, 254–255), “a prime requisite for a [Patwin] town was a knoll sufficient to preserve the inhabitants from winter inundation … [with] inhabited sites … determined by springs.” Overall, these more sedentary acorn-using groups seemed to move into and out of a central location that was maintained throughout the year. They made no more than three residential moves per year, covering up to 36 miles.

The migratory Sierran groups seem to have occupied semi-permanent villages in the fall and winter, but migrated into the mountains in the spring and summer. They made between one and six residential moves per year, covering up to 70 miles.

All of the central California groups are thought to have been organized into what Kroeber (1955) referred to as tribelets so that movements would have been constrained by the territorial boundaries controlled by a group. The fission-fusion settlement system attributed by Kroeber to the Pomo may at least hypothetically represent a common pattern associated with tribelet organization. It should also be noted that the house structure used throughout central California was the dome-shaped tule hut, which did not necessarily represent substantial expenditures of time or labor to construct. Furthermore, even in areas for which the ethnographic record is relatively robust, understanding of the actual number and timing of group movements is, in fact, poor. Regarding the Valley Yokuts, for example, Wallace (1978) stated that the rich food resources of their land “… permitted the southern tribes to occupy permanent residences for most of the year.” However, Binford (2001) classified them as “mobile.”

South Coast

As discussed more below, the Santa Barbara Channel, occupied by Chumash speakers at the time of contact, has figured prominently in discussions of emergent sedentism in recent decades. Because the Chumash were one of the earliest California groups to be contacted by the Spanish, Kroeber
(1925, 550) noted that “there exist more impressions than information.” He did note, however, that:

Marine life along the Chumash shores is exceptionally rich, the climate far famed, and every condition favored the unusual concentration of population among a people living directly upon nature.…. [there was] small inducement for the coast people to go to the interior, except for occasional visits [Kroeber 1925, 551].

Accounts specifically attesting to full sedentism among the Chumash are still not as robust as one might assume. Many attest to the size of Chumash settlements (e.g., Jorgensen 1980; King 1990) and their individual tule houses (e.g., Grant 1978; Kroeber 1925, 557), but explicit accounts of long-term occupation are not numerous. However, at least one oft-quoted historic description explicitly suggests fairly long-term occupation of settlements:

These Indians live in communities and have a fixed domicile. They arrange their houses in groups. The houses are well constructed, round like an oven, spacious and fairly comfortable; light enters from a hole in the roof … [Longinos Martinez 1961, 52].

King (1990, 76) criticized earlier ethnohistorians and archaeologists for “not sufficiently stressing the permanence of occupation of Chumash villages.” In response, researchers such as Hammett (1991, 5) began to refer to the Chumash as “sedentary harvesters [who] supported themselves by means of managing a wealth of non-agricultural resources,” frequently referring to their “large sedentary populations.” In more recent years, this led to the general consensus that the Chumash were sedentary at the time of contact. Gamble (2008, 276), for example, stated that “the Chumash exhibited numerous traits of sociopolitical complexity … these traits include sedentism, possession of large quantities of stored and processed foods, [and] environmental manipulation to increase productivity.” Binford (2001) classified the Chumash as highly sedentary, undertaking 0.1 moves per year covering 0.1 miles, making them the most sedentary group in Native California. While the consensus on Chumash sedentism seems reasonable, there remains little clarity about how subsistence was accomplished vis-à-vis seasonal variation in resources, particularly in the interior areas where fish and other marine resources were not available.

In many cases, the California ethnographic record is suggestive of low mobility, if not full sedentism, at the time of historic contact, especially for groups like the Yurok and Chumash who combined acorns with marine and/or anadromous fish. The Yurok and other North Coast groups, however, seem to have spent at least some time in upland hunting camps away from the primary riverine villages. Whether villages were wholly abandoned during these times is unknown. Similar uncertainties plague nearly all of the ethnographic accounts. Also noteworthy is the preference of ethnographers,
whose perspectives were largely synchronic, for “pull” theories of emergent sedentism, as in Pilling’s (1978) explanation for sedentism among the Yurok.

Regional Archaeological Models

Attempts to develop diachronic models that culminate with ethnographically observed levels of sedentism began in earnest in the 1970s in California. Initial efforts, guided by cultural evolutionary theory, were superseded by perspectives of cultural ecology, human behavioral ecology, and social complexity theory. Two additional archaeological research domains, orderly anarchy and seasonality studies, are included in this discussion.

Cultural Evolution

King (1974) argued that at least some sedentary villages existed in rich, resource-diverse settings in the San Francisco Bay Area as early as the Middle Period (ca. 1,000 B.C.). This view was supported in a highly influential synthesis by Fredrickson (1974, 48), who suggested that sedentary life became fully established at the beginning of the Upper Archaic (1,000 B.C.) as part of a larger package of complexity related to exchange and wealth-based status distinctions—all of which increased following the end of the preceding Middle Archaic (3,000-1,000 B.C.). It was during the latter period that the mortar and pestle appeared. These shifts were part of Fredrickson’s (1974) overall model of incrementally increasing social complexity during the Holocene.

With respect to the Upper Archaic, Fredrickson (1974, 48) noted that it “seems to have been marked by ever-increasing sociopolitical complexity. … Sedentary life appears to have become fully established in many regions, and the developing economic efficiency may have contributed to population growth.” As was standard for the time, no actual evidence was presented to support the idea of sedentism or other aspects of ever-increasing social complexity. However, Fredrickson’s discussion alluded frequently enough to acorns and the mortar and pestle that he seemed to link the technology at least partially with sedentism and increasing complexity, although he also clearly emphasized social factors in the unilineal changes posited in his overall model. Both he and King (1974) continued the trend established by ethnographers, favoring a “pull” explanation for emergent sedentism, linking it with rich resources and increased efficiency.

King (1990) posed a similar unilineal evolutionary model for the Santa Barbara Channel, albeit with less concrete statements about sedentism. As noted above, King was among the first to argue that the regional ethnographic record indicated sedentism among the Santa Barbara Channel Chumash, but he posited no specific date for its emergence. Rather,
sedentism was one of many traits that developed gradually over 6,000 years and were associated with incrementally growing human populations. He posited that pre-600 B.C. sites tended to be situated in defensive positions at higher elevations away from the shoreline, and that by his Phase M3 (A.D. 300-700), settlements shifted to the shoreline to facilitate boat landings. He further surmised that after 1,000 B.C., villages grew two to five times in size, implying that this was a key divergence point in the overall trajectory toward ethnographically observed sedentism and sociopolitical complexity (King 1990).

At the same time, Banks and Orlins (1981) suggested that at the time of contact inhabitants of the San Francisco Bay employed a variant of Beardsley’s “central-based wandering” model that involved spending part of each year wandering and the rest tied to a central residential base. They specifically tied this settlement system to the ethnogeographically observed tribelet organization in which movements were made within restricted territories, and they suggested that it could have been in place as early as the Middle Period (Banks and Orlins 1981).

All of these models are somewhat impressionistic, lack solid connections to the empirical record, and provide unclear bases for hypothesis testing—which was typical of the era of cultural evolutionary theory. They do offer some general suggestions about sedentism, and Banks and Orlins (1981) specifically attributed an archaeological settlement pattern to the tribelet system of sociopolitical organization. Dissatisfaction with some of the factors in these models was summarized by Glassow (1979, 158):

> The criteria of size and density of midden debris are normally used to differentiate between sites occupied by a relatively large population for most or all of the year and sites occupied by usually smaller groups on a seasonal basis. These criteria should not only be refined and quantified, but they should also be linked with more precise indicators of length and season of occupation.

Here, Glassow highlighted the need for archaeologists in the 1970s to come up with clearer criteria for classifying a group as sedentary or a village as permanent. It is evident, however, that like Fredrickson (1974), Glassow (1979) believed that population size and/or increase provided a means for determining whether a group was sedentary (if a group’s population became larger, they were more likely to have moved from a mobile lifestyle to a sedentary one). The main issue with this idea is the difficulty in determining whether a group’s population size really did expand. A second issue is determining whether a larger population constitutes enough evidence to make the claim that a group was sedentary. It is arguable that this is not enough evidence and that there should be a longer list of criteria.
Cultural Ecology

Attempts to improve upon cultural evolutionary theories were models that relied heavily on Binford’s (1980) forager-collector model. Nearly as soon as it was published, this model was applied to the Monterey Bay Area by Breschini and Haversat (1980) and Dietz and Jackson (1981), and their work was later synthesized by Moratto (1984). In this regional application, an earlier “forager” lifeway was associated with the so-called “Sur Pattern,” dating ca. 5,500-2,500 cal B.P., marked by site components exhibiting a wide range of artifact types and features indicative of residential bases. The Sur Pattern gave way to the so-called “Monterey Pattern” after 2,500 cal B.P. Representing a “collector” adaptation, the Monterey Pattern was marked primarily by dense concentrations of abalone shells that were interpreted as processing stations where abalones were collected in bulk for processing and transport to villages. The latter villages, which were assumed to be essentially sedentary, were not actually identified archaeologically by Breschini and Haversat (1980) or Dietz and Jackson (1981) (whose research was limited to shoreline sites), but were thought to be located inland and inhabited by people whose primary subsistence focus was acorns.

About a decade later, Breschini and Haversat (1992) identified sites ca. 20 miles inland that seemed to represent the previously missing interior sedentary villages. Importantly, in this application of the model, the transition from forager to collector was ultimately attributed to history: the Monterey Pattern was associated with Penutian-speaking Rumsen (or Costanoan), who were thought to have migrated into the area after 2,500 years ago, replacing foragers who spoke a Hokan language. This historical-linguistic group migration explanation for the transition deviates from the theoretical basis of Binford’s model in that he associated the two contrasting mobility strategies with specific types of resource environments (forager = homogeneous environments, collector = heterogeneous environments), with no clear diachronic implications (Jones 1992). Ultimately, the application of the model in the Monterey Bay area fell apart due to this theoretical issue as well as chronological problems. It has been largely abandoned in subsequent syntheses (Jones et al. 2007; Whitaker and Byrd 2012).

Other early applications of the forager-collector construct were subsequently developed for the San Francisco Bay Area, which has been the focus of a bewildering array of alternative settlement models (Milliken et al. 2007). Hylkema (2002) suggested that a forager settlement system prevailed in the southern Bay Area until the beginning of the Middle Period when it gave way to a semi-sedentary collector pattern. However, Hylkema (2002) further argued for spatial variation in this transition, with the forager pattern persisting on the San Francisco Peninsula until ca. 700 cal B.P. (indicated by the dominance of mortars and pestles in tool assemblages).
More recently, the model has been applied and debated further south along the central coast of California, where Bertrando (2006) claimed that a collector-like settlement system emerged 3,500 years ago, marked by primary villages, secondary villages, temporary campsites, and lithic sites—replacing an earlier forager system. In this case, no explicit link with acorn economies was correlated with the shift in mobility, nor did Bertrando (2006) argue for full sedentism, although the timing of the shift (Early Period) is consistent with evidence for initial use of acorns and mortars in the region. Challenging Bertrando’s views, Farquhar (2003) employed an “organization of technology” approach to argue that a logistically organized settlement system associated with the Milling Stone Horizon was in place as early as 8,000-9,000 years B.P.

By the late 1990s, some authors began to emphasize limitations of the widely applied forager-collector model, and research began to move away from simply classifying a group as sedentary in favor of more closely analyzing the archaeological record associated with a particular settlement system. Laylander (1997, 179) argued that this “commonly applied classification … only imperfectly captures the diversity of hunter-gatherer settlement systems.” Laylander (1997) proposed a series of archaeological site level observations that he felt might illuminate levels of mobility in San Diego County, including site area, quantity of cultural residue, tool diversity (and inferred activity diversity), seasonal range of occupation, intrasite feature redundancy, and evidence of local depletion of resources.

Overall, researchers from the 1990s on have begun to offer more concrete evidence in support of claims for sedentism. For example, in discussing the Berkeley Pattern of central California, Hildebrandt (2007, 97) described it as different from the Mendocino Pattern. He argued that this pattern had “higher degrees of sedentism evidenced by well-defined house floors, rich midden deposits, and seasonal indicators spanning most of the year.” This highlights the fact that archaeologists recently have been basing their claims of sedentism on more tangible evidence, rather than simply making educated guesses. Milliken et al. (2007, 115) further argued that “a burial complex with ornamental grave associations … [and] elliptical house floors with postholes suggest sedentism or semisedentism” during the Early Period in the San Francisco Bay Area. These passages represented a trend in which authors were putting more thought into the evidence supporting a claim of sedentism.

**Human Behavioral Ecology and Economic Intensification**

Beginning in the late 1980s, California archaeologists began to incorporate concepts from human behavioral ecology (HBE) and economic intensification into settlement models. Two of the most influential of these were Hildebrandt
and Hayes's (1993) model for the North Coast and Basgall's (2004) acorn intensification model for central California. Both were explicitly diachronic, theory driven, and incorporated clear empirical evidence. For a review of other applications of economic intensification, see Morgan (2012, 2015).

Hildebrandt and Hayes (1993) and Hildebrandt (2007) expanded on the forager-collector model using findings from a series of upland site excavations (Pilot Ridge) in Humboldt County. In this application, the earliest inhabitants (10,000-3,000 cal B.P.), representing the Borax Lake Pattern, pursued a forager settlement strategy with sites yielding diverse assemblages indicative of seasonal residential bases (multipurpose camps) (Hildebrandt 2007; Hildebrandt and Hayes 1993). Beginning ca. 3,000 cal B.P., site assemblages in the uplands became less diverse, indicating more logistical use. Hildebrandt and Hayes (1993) attributed this shift to climatic change, which made upland forests cooler, less diverse, and less productive, forcing people to establish themselves along the rivers as part of a collector-type settlement strategy that featured exploitation of salmon from sedentary, riverine villages. Hildebrandt and Hayes (1993, 101) explicitly linked the newly emerging economy with intensive storage, social inequality, and sedentism.

Incorporating paleoenvironmental data and tabular summaries of temporally controlled tool assemblages, this model was profoundly more sophisticated than anything that had been advanced previously for the North Coast, providing a “push” diachronic explanation for the emergence of sedentism in northwestern California that deviated from ethnographic accounts suggesting that rich resources encouraged sedentism. This application of the forager-collector model was subsequently challenged by Tushingham (2009), who acquired data from riverine settings (missing from the Hildebrandt and Hayes [1993] model). She argued that the shift to an intensive salmon economy began later (ca. 1,500 cal B.P.) and was more a product of the immigration of Athabaskan and Algonkian speakers from the north rather than adaptive response to climate change and population pressure.

Equally influential was Basgall’s (2004) model for acorn intensification, for which he explicitly argued that acorn economies represented significant processing labor, and that population in central California would not have embarked on a path of economic intensification if not forced to do so by growing populations. Since acorns are available only seasonally, reliance on them required storage, which led to decreased mobility. Although Basgall (2004) focused less on overall signatures of mobility in his model than on issues of health, he did chart a progression toward increased numbers of mortars and pestles in upland tool assemblages in ethnographic Pomo territory, essentially linking the diachronic increase in technology to ethnographically observed Pomoan sedentism.

Ideal Free Distribution in the Northern Channel Islands. A subset of the HBE approach has been applied to the northern Channel Islands by Jazwa,
Kennett, and Winterhalder (2013, 2016) and Winterhalder et al. (2010). Consistent with the general tenets of the Ideal Free Distribution (IFD) concept, this application of the model begins with the assumption that “people who are knowledgeable about their environment will first settle in the most suitable location. As the population grows ... effects of local competition will cause the suitability of ... [the initial] location to decline” (Jazwa, Kennett, and Winterhalder 2013, 75). This will subsequently lead to a portion of the group moving into a lower ranked location; this pattern will continue as populations expand into more and more locations (Jazwa, Kennett, and Winterhalder 2013).

Jazwa, Kennett, and Winterhalder (2013) used this model to analyze settlements and the faunal record of two sites on Santa Rosa Island. They concluded that diachronic settlement patterning on the island was consistent with the predictions of IFD (Jazwa, Kennett, and Winterhalder 2013, 91), but the level of sedentism was not addressed, largely because it is not necessarily predicted with this theoretical approach. Still, this application seems preferable to many uses of the forager-collector construct because it was driven by clear diachronic predictions.

Social Complexity

Another highly influential model focused on settlement and sedentism around the Santa Barbara Channel, proposed initially by Arnold (1992a, 1992b), envisions abrupt (punctuated) emergence of a constellation of traits of complexity, including sedentism ca. 1,500-1,300 cal B.P. Unlike the HBE-derived models, Arnold envisioned reorganization of labor as the key factor influencing economic transition. Like many other models of emergent complexity, Arnold (1992b) relied on empirical support for sedentism—in this case, huge increases in beads, bead-making drills, and bead manufacturing debris in components dating between 1,500 and 1,300 cal B.P., which were argued to be evidence for emergent craft specialization directed by increasingly powerful rulers. The influence of this model on research in the Santa Barbara Channel cannot be overstated. It has been debated continually over the ensuing decades (e.g., Arnold 1997, 2012; Erlandson 1991, 2001; Erlandson and Rick 2002; Fauvelle 2011, 2012; Glassow 1993; Kennett and Kennett 2000; Lambert 1994; Raab and Larson 1997); however, little (if any) of the dialogue has been focused on the sedentism component of the overall model.

Orderly Anarchy

One final model considered here is Bettinger’s (2015) orderly anarchy proposal for central California. This model goes well beyond simple considerations
of settlement, focusing more on explaining emergence of the tribelet form of political organization. Bettinger linked tribelets directly to intensive use of acorns that he argued began after the introduction of the bow and arrow (first in eastern California and diffusing westward), which had resounding effects on hunting strategies and sociopolitical configurations. Bettinger (2015) dated the appearance of tribelets in central California to the Late Period (or slightly earlier) and associated it with acorns, privatization of food, and seemingly, sedentism. At a minimum, his model suggests that a decided shift in settlement should be seen throughout the central California acorn belt at the onset of the Late Period (ca. 1,000-700 cal B.P.). While Bettinger’s estimate for the emergence of the tribelet form of sociopolitical organization agrees with that of Fredrickson (1974), both seem at odds with Basgall’s (2004) chronological estimate for acorn intensification beginning in the Middle Period. However, Bettinger’s model, like Basgall’s, addresses settlement and sedentism only peripherally, focusing more on acorn use.

**Seasonality Studies**

One additional research domain related to sedentism where Californianists are making serious progress is the area of seasonality studies. As noted by Dow and Reed (2015), such studies have the potential to illuminate sedentism more clearly than models that indicate only relative trends in mobility (Monks 1981; Rocek and Bar-Yosef 1998). From the 1980s onward, seasonality research in California has focused on three data sources: isotopic analyses of shells, paleobotanical remains, and remains of migrating animal species. In the best cases, multiple sources have been evaluated simultaneously.

At Bodega Bay in northern California, Kennedy, Russell, and Guilderson (2005) used a combination of all three sources (relying most heavily on shellfish isotopes) to posit a shift from fall/winter harvest of shellfish from single season processing camps as part of a traveler settlement strategy (e.g., Bettinger and Baumhoff 1982) between 9,000 and 2,500 cal B.P. to year-round harvest as part of a processor system that included major residential and processing camps. Relying only on isotopic findings, Jones et al. (2008) reported a very similar pattern for the late Holocene (3,600-200 cal B.P.) from the Big Sur coast where shellfish harvesting seems to have been undertaken year-round from major coastal residential bases.

Subsequently Culleton, Kennett, and Jones (2009) reported non-year-round, bimodal (winter and summer) harvesting of clams along the San Francisco Bay from a component dating 4,000-1,600 cal B.P. Employing a more robust sample, Eerkens et al. (2013) found the same bimodal pattern at two Late Period (700-400 cal B.P.) sites along the San Francisco Bay, from which they inferred a settlement system that was not fully sedentary but involved seasonal (late winter–early summer) dispersal to small seasonal
camps and aggregation at major residential bases throughout the rest of the year (late summer through early winter).

Jazwa and Kennett (2016) used isotope profiles from archaeological mussel shells to determine season of occupation at two sites on San Miguel Island. Between ca. 5,800 and 1,300 cal B.P., mussel harvesting took place primarily during the spring, coincident with sea mammal breeding on the island and exploitation of the animals. During the Late Period (ca. 500–200 cal B.P.), the seasons of mussel harvesting shifted to summer-fall, no longer coinciding with the appearance of breeding seals and sea lions. From this, Jazwa and Kennett (2016) inferred that the Late Period occupation represented a year-round, sedentary occupation, which was further supported by the presence of a house ring, cemetery, and high diversity of artifacts.

In another part of California, Greenway (2004) used a variety of floral and faunal seasonal indicators, including macrobotanical remains, to challenge the prevailing wisdom that settlement in the northern Sacramento Valley between 1,500 and 150 cal B.P. was seasonally organized around fishing. In south-central California, Joslin, Leach-Palm, and Wohlgemuth (2006) reported that nutshell and berry pits reflecting summer and fall occupation are associated with an Early Period component in the Cuyama Valley, with small seeds and acorns identified for the Late Period locus that indicated spring, summer, and fall site use. The findings were seen as providing some support for models of intensified acorn use over time.

**Summary and Discussion**

Review of general theory, California ethnography, and regional settlement studies related to the issue of sedentism reveals trends reflecting long-standing interest in the subject, definitive intellectual progress, and prospects for ongoing dialogue and continued advances. Recent and current archaeological discussions of hunter-gatherer sedentism continue to emphasize “push” over “pull” theories that incorporate combinations of human behavioral ecology and cultural ecology as well as perspectives that emphasize sociopolitical variables more than environment that can be considered variants of neo-Marxism.

California ethnography suggests relatively low mobility for most groups, as Kroeber (1925) noted long ago, but the details of many of these systems are far from clear. The salmon-based economies of the North Coast represented by groups like the Yurok and Wiyot seem to represent a fairly well-understood system that featured permanent villages along rivers that were occupied during fall and spring, and task-specific summer hunting stations in the uplands that have been identified archaeologically (Hildebrandt and Hayes 1993). Some fraction of the population may have remained within and maintained riverine villages during the summer, but this is not entirely certain.
Ethnography from central California is more impressionistic, ambiguous, and incomplete. Pomo ethnogeography suggests something akin to a fusion-fission system in which primary villages were located in river valleys, with individually owned areas for food gathering, fishing, and hunting. While these were not inhabited year-round, people congregated in them during winter and fall, spreading out to smaller, secondary villages during other times of the year. Elsewhere in central California, there are contradictions in the ethnography regarding sedentism. The Valley Yokuts, for example, have been characterized as both sedentary and mobile. On the South Coast, the ethnographic record is again less detailed than often assumed, but an overall impression of full-scale year-round sedentism is generally accepted for at least the coastal groups. The full mechanics of the coastal settlement systems vis-à-vis sedentism are nonetheless unclear for the South Coast.

Overall, ethnographers have tended to favor “pull” theories to explain low mobility in California, linking sedentism to exceptionally rich resource bases. They have also tended to conflate sedentism with large village populations and large settlements. For archaeologists, especially those favoring intensification theories, habitat richness is not an especially compelling explanation for sedentism, nor is settlement site size of much value in trying to determine signatures of low mobility over time.

Regional archaeological models show that major progress has been made toward clarification of the ethnographic record and development of diachronic perspectives that explain its evolution. The widely applied forager-collector model helped focus and define possible signatures of alternative mobility strategies in the 1980s and 1990s, but the limitations of this model have also become apparent (Laylander 1997; Zeannah 2004). Three regions have seen modeling efforts that have moved beyond foragers-collectors, advancing sedentism studies considerably: (1) the Northwest Coast, which features debate between Tushingham (2009) and Hildebrandt and Hayes (1993); (2) central California, highlighted by Basgall’s (2004) intensification and Bettinger’s (2015) orderly anarchy models; and (3) the Santa Barbara Channel, where debate began with Arnold’s (1992a) neo-Marxist model.

Hildebrandt and Hayes’s (1993) model for the North Coast was a major breakthrough in settlement/sedentism studies in that it applied intensification theory to develop an in situ “push” model for late mid-Holocene emergence of riverine-focused sedentism that was tested and supported with actual tool assemblage data. That the model is still being debated (see Tushingham 2009, 2020) speaks to its value. Lacking from the model, however, is direct evidence of year-round occupation of riverine sites, understanding of their structure, and the age/prevalence of durable structures.

Alternative perspectives on acorn intensification, represented by Basgall’s (2004) study of the health consequences of balanophagy and Bettinger’s
orderly anarchy model, provide a rich ground for hypothesis building and evaluation that could potentially clarify the many conflicting proposals for sedentism and settlement in places like the San Francisco Bay Area. Bettinger’s model suggests fairly significant economic and sociopolitical changes related to tribelets and acorn use, and predicts when those changes should be apparent in the archaeological record (ca. 1,000-700 cal B.P. or the Middle-Late Transition). Basgall’s model suggests earlier major acorn-related settlement and subsistence changes. Both of these models focus on the technology associated with acorn use, and may ultimately benefit from more direct evidence for long-term use of individual sites.

Arnold’s work (1992a, 1992b) has had a profound influence on research in the Santa Barbara area. It relies on a different set of proxy evidence—bead production residues as indicators of craft specialization to infer sedentism as a relation trait of complexity. Clearly, there could be some value in the Santa Barbara area in disentangling sedentism from craft specialization and evaluating it in its own right by advancing seasonality studies, among other possibilities. Still, the Santa Barbara area shows how much progress can be made when sophisticated, theory-driven models are developed that serve to sharpen hypotheses, focus collection of data, and encourage debate. Development of such models is the first step.

Concluding Remarks and Suggestions

Hunter-gatherer sedentism is now recognized as more common than once thought, and in California has long been linked with acorn exploitation and pursuit of certain aquatic resources. Ethnographic details of acorn-fueled low mobility are absent or sparse for many regions of California, however, which has left the task of documenting and explaining emergent sedentism to archaeologists. Over the last half century or so, California archaeologists have approached emergent sedentism through theoretical lenses of cultural evolution, cultural ecology, human behavioral ecology, and sociopolitical dynamics/complexity, each of which has offered certain useful insights, although only the latter two remain intellectually viable. Relying on such theories for developing explanatory models with testable hypotheses has been productive in certain regions of California and continues to be the important first step for researching this issue.

Beyond the primacy of theory, we suggest that further progress may be made in six ways: (1) accepting and working with the definition of sedentism developed by Rice (1975) for the Mogollon and advocated by Byrd (1989) for the Natufian and Kelly (1992) for the Great Basin, i.e., “settlement systems in which at least part of the population remains at the same location throughout the entire year” (Rice 1975; as cited in Byrd 1989, 183); (2) bearing down specifically on the question of sedentism, disentangling it from other traits
of complexity and proxies such as acorn-processing technology and/or evidence for bead manufacture; (3) identifying data sets that speak directly to the duration and nature of site use, including seasonality inferences from faunal and paleobotanical remains, tool assemblage diversity, presence/absence of house floors or other features, indicating durable infrastructure; (4) dating and defining temporally discrete components (as most clearly exemplified in the ground-breaking work of Hildebrandt and Hayes [1993]) and obtaining substantial samples from them to evaluate assemblages for diversity and range of inferred activities; (5) applying middle-range settlement concepts and site functional definitions rigorously (quantitatively); and (6) combining multiple types of evidence to render conclusions about component function and mobility change through time.

Our overview of previous work makes it clear that a number of archaeological indicators of sedentism need to be developed so that credible interpretations can be formulated. In the past, it was common to examine only one or two such indicators when studying the settlement patterns of any one group. We propose that, in order to gain a better grasp of such patterns, multifaceted studies will be necessary. Researchers need to examine results from these various indicators and cross-analyze them in order to gain a deeper understanding of settlement and sedentism in Native California. Nonetheless, it is clear that much progress has been made on the issue of sedentism by California archaeologists in recent decades, but more remains to be achieved.

Disclosure statement
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