Portents of Plague from California's Protohistoric Period

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Abstract. The thesis that California's native peoples were infected with Old World diseases prior to the founding of the first mission in 1769 is attracting increasing attention but is not widely accepted by students of the state's prehistoric and colonial periods. The perceived lack of irrefutable proof that exotic pestilence was transmitted to California after the Columbian landfall but before foreign settlement is, in part, responsible for this lack of recognition. This article scrutinizes many varied lines of evidence that are interpreted as strong indicators of premission pestilence. As a consequence, researchers of California's prehistoric and colonial past are urged to seriously consider the profound implications for the interpretation of archaeological, biological, and ethnographic data.

The thesis that California's native peoples and environments were plagued by exotic pestilence prior to the founding of the first mission in 1769 is attracting increasing attention but is controversial and not widely accepted. Nevertheless, the legitimacy of the thesis has been strengthened by the growing recognition of the role that Old World diseases have played in adjoining regions of the Americas and by the work illustrating the premission sources and available pathways for the conveyance of foreign pestilence to the state (e.g., Dobyns 1983; Ramenofsky 1987; Smith 1987; Erlandson and Bartoy 1995; Preston 1996). However, general endorsement of the possibility that foreign germs were present prior to the initiation of colonial settlement, a recognition verging on conventional wisdom for large areas of North America, continues to elude California researchers. Reluctance seems founded in part on the survival of ill-advised perceptions of the state's geographic insularity and persistent mindsets that adhere to the long-held view that California remained an island of immunity until 1769

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(Cook 1978: 91, 1976a: 24; Jackson 1985: 475, 1994: 164; Preston 1996: 3–5).

Remaining doubts are based on the lack of evidence documenting the arrival of foreign diseases prior to missionization. Ethnographic and archaeological materials originating from within California are commonly judged as ambiguous and indistinct confirmation at best. For example, one assessment of the issue concluded that "no evidence can be found for demographic collapse prior to direct contact in California" (Baker and Kealhofer 1996: 16). Unfortunately, the lack of irrefutable and substantiated archaeological testimony leads some researchers to dismiss the possibility and to view the thesis as simply an interesting academic curiosity. This perception is aptly illustrated by a researcher who concluded that, in the absence of archaeological confirmation, "discussions of disease as an important agent in processes of change remain little more than unsubstantiated, although perhaps intuitively pleasing, just-so stories" (Milner 1980: 47–48).

Intuitive or not, it is the contention of this article that only verified archaeological and ecological data derived from within the state can conclusively decide whether exotic pathogens were demographic factors during California's protohistoric period (defined here as 1519–1769).[1] On the other hand, specialists can ill afford to wait for definitive proof and simply continue to dismiss the issue as only a hotly contested academic debate because the "argument has large methodological implications regardless of the evidence for a catastrophic population decline" (Dunnell 1991: 562). Furthermore, dismissal is especially unwarranted at a time when the present body of evidence, when examined in its entirety, free of the disciplinary filters inherited from former paradigms, vigorously suggests that Old World germs had profound impacts in California before 1769.

The intent of this essay, therefore, is to strengthen the faith in the thesis with a compilation of historical, ethnographic, archaeological, and biological information that strongly indicates the protohistoric presence of Old World diseases in California. In addition, it will be argued that all students of the state's native peoples and environments should, regardless of the evidence, interpret all data in light of the probabilities of exotic pestilence prior to 1769.

The Protohistoric: Mirror or Mirage to Pre-Columbian California?

Were the Native Californians, their habitats, and their material cultures that were observed by members of the Portolá expedition in 1769 and 1770 an accurate reflection of the cultural landscapes that characterized the late

pre-Columbian era of California? If they were, the reliance on (and faith in) early historic and ethnographic accounts as being trustworthy windows on the state's late pre-Columbian environmental and human legacy is reasonable. Likewise, the cultural and biological remains of protohistoric peoples can and should be interpreted as reasonable analogs of California's late prehistoric past. These assumptions have, in fact, strongly conditioned what and how we think about California prior to European settlement (Cook 1976a: 199, 1978: 91; Castillo 1978: 100; Heizer and Elsasser 1980: 224; Chartkoff and Chartkoff 1984: 256).[2]

Until recently, the legitimacy of the view that California remained free of colonial consequences until the advent of missionization was virtually guaranteed by the relative inattention given to Old World disease as a powerful disruptive wild card in America's post-Columbian but presettlement period.[3] However, archaeologists and other researchers during the 1980s and 1990s have uncovered convincing evidence that exotic pestilence devastated portions of North America beyond the frontiers of California prior to Euro-American occupation (e.g., Ramenofsky 1987; Smith 1987; Campbell 1990; Sundstrom 1997).[4] So convincing are the findings that for much of North America catastrophic disease must now be assumed for presettlement times "unless there is specific countervailing evidence" (Dunnell 1991: 564).[5] For large areas of the continent then, the presence of exotic contamination prior to Euro-American settlement is increasingly assumed unless otherwise proven absent.[6]

The growing acknowledgment of the role presettlement epidemics have played in North America outside of California is the antithesis of the assumptions still governing most interpretations of the state's pre-Columbian and protohistoric periods. The premission environment is still perceived as generally devoid of exotic pestilence unless demonstrated otherwise (Kealhofer 1996: 75). The perceptual regional dichotomy is explained in part by the isolation of the state from early colonial heartlands and the paucity of European visitations prior to 1769 (Preston 1996: 3–5). Consequently, fewer documented observations are available as clues and reinforcements for the thesis that California, or portions of it, was victimized by Old World germs before the initiation of the mission system. More noteworthy is the absence of archaeological investigations specifically designed to test the hypothesis (Erlandson and Bartoy 1995: 168). Indeed, an endeavor to resolve the issue by means of a limited assessment of a selection of existing archaeological, historic, and ethnographic materials has concluded that little direct evidence of disease-induced devastation prior to 1769 can be derived from contemporary information (Kealhofer 1996).

Despite the perceived lack of indisputable proof and studies specifi-

cally devoted to the issue, the interest in the possibilities of premission epidemics in California continues to accrue. Few scholars would deny that protohistoric sources of foreign diseases increased over time and were progressively carried with the colonial frontier to California's very doorstep. Therefore, if the state did retain an absolute immunity prior to 1769, it would represent the only colonial land in northwestern New Spain (Sonora, Baja California, and the southwestern United States) where exotic germs failed to precede Euro-American settlement (Cook 1937: 20–22; Dobyns 1963b: 176; Reff 1990: 279, 1992: 268; Jackson 1994: 55). Moreover, California would also qualify as the only protohistoric realm where native dwellers remained entirely uninfected despite having had regular terrestrial intercourse with people of adjoining territories, who are documented to have suffered repeated episodes of foreign contagion prior to 1769 (Preston 1996: 17–20). These contacts transported Old World peoples, livestock, and domestic plants to the Colorado River region prior to 1769 (Bolton 1949: 165, 169; Burrus 1966, 1967: 55). Furthermore, glass beads were carried to Sierra environments, and these regions may also have been frequented by colonial peoples from New Mexico during the protohistoric period.[7] Regardless, these pathways and encounters are considered to have failed in the conveyance of pathogens, disease spores, or their hosts, such as insects (Upham 1986; Settipane and Russo 1995). It would be a rare environment indeed in which the shipborne encounters with Europeans managed to deposit trinkets and Old World weeds prior to 1769 but not pathogens, spores, or their intermediate vectors (Bolton 1916: 85; Hendry 1931; Heizer 1941; Bicknell and Mackey 1998; Mensing and Byrne 1999).[8] An appreciation of California's geographic position and an understanding of the epidemiological history of adjoining lands renders the prospect that absolute immunity endured for the entire 250 years of the state's protohistoric period remarkable to say the least.

To assert that California remained devoid of foreign contagion prior to 1769 in the face of epidemiological and regional precedent would seem to require an explanation as to why diseases failed to reach California and, moreover, proof that they did not (Walker and Hudson 1993: 20–21). Why, for example, are the terrestrial, maritime, and biological vectors for disease diffusion that are readily acknowledged for California after 1769 thought to have been of little consequence prior to that date? Indeed, Old World epidemics infected large portions of the state during the colonial period (e.g., the 1827–8 measles, 1830–3 malarial, and 1837–9 smallpox epidemics) when native hosts were already severely reduced (Cook 1939: 185, 1955a, 1976b: 3–5; Jackson 1994: 120). The magnitude and destruction caused by a historical epidemic is poignantly remembered by Lucy Thompson (1991: 86–87), whose Yurok ancestors told "of epidemics that came up the river

and laid us low in the devastation of life. The only way we could keep the whole tribe from complete devastation by the ravages of these dreadful diseases was to abandon the dead and leave the river and go back into the high mountains." What processes preceding 1769 would have precluded similar occurrences when native populations were more numerous, interactive, and thought to have been even more susceptible (Fawcett 1984: 265)? Given the documented epidemiological history of California during the colonial period, the suggestion that protohistoric plague, if it had occurred, would have "made little difference in the culture and everyday life of most natives" seems indefensible (Rice et al. 1996: 85).

In light of the increasing weight of regional precedence and the history of colonial epidemics, students of California's premission peoples and environments would be ill advised to rule out, for any portion of the state, the prospects of exotic contamination prior to 1769. That is, if evidence to the contrary is unavailable, it is reasonable to assume that foreign diseases may have destroyed native peoples and may have been responsible for cultural and habitat alterations on a par with other American regions during historic times (Stannard 1989: 49; Trimble 1989). In short, Portolá and his accompanying pioneers may have observed a pristine landscape in California, but rapidly improving are the odds that they had encountered a land that had been, to one degree or another, culturally and environmentally modified by Old World germs. To presuppose the opposite must now be supported and defended on evidence to the contrary.

Historical Retrospectives: Hints or Humbug?

To expect that ethnographic informants and historic observations offer precise insights into the conditions of life and land that existed during California's pre-Columbian era is to stretch credibility (Ames 1991: 943; Stahl 1993). As Robert Dunnell (1991: 571) explains, "The memories of even the oldest individuals are likewise suspect when those memories are generations removed from the pre-Columbian era and pertain to extinct practice." Nevertheless, it is not beyond comprehension that recollections and observations documented during early historic decades may reasonably reflect conditions during the late protohistoric period. As such, some of the accounts, conditions, and customs of Native Californians that later were recorded by colonial peoples and ethnographers may be suggestive of premission epidemics. Likewise, some of the incongruities among Spanish maritime accounts and those recorded by the early missionaries have proven intriguing and may as well be indicative of disease-induced anomalies.

The oral history recorded from the Chumash Kitsepawit may provide

testimony of protohistoric contagion. In one of his stories Kitsepawit remembered that when he was a little boy he listened to an older Chumash tell of three epidemics that "cleared out nearly all of the Indians." The virulence of these illnesses is given credence by the statement made to him by the elder that "people went about feeling sick until they fell backwards, dead" (Hudson et al. 1977: 11). Kitsepawit, having been born in 1839,[9] probably was not acquainted with the Chumash who had personally experienced the transition from protohistoric to historic times in California. Even so, this tale of pestilence might have described a disease event or events that occurred prior to 1769. While the exact timing is impossible to prove, the ailments recounted by Kitsepawit that brought such distress and death to his portion of the Chumash land are almost certainly of Old World origin. Researchers are convinced that pre-Columbian California was anything but disease free; however, the endemic ailments were not the virulent destroyers that epidemics of foreign origin proved to be (Walker et al. 1989; Powell 1992; Larson 1994). The affliction that was said by Kitsepawit to have killed people and wiped out entire villages certainly fits the epidemiological profile of many Old World diseases.

Even more intriguing is a story related to Alfred Kroeber by an elderly Mojave. As a child, Kroeber's informant was told by an old Mojave about the demise of a Colorado River tribe called the Alakwisa. This elder, in turn, had heard about this people from members of the Kamia tribe long after the Alakwisa had become extinct. Interestingly, the stories concerning the end of two Alakwisa villages have one thing in common. The villagers were rapidly struck down in a fashion that resembles the documented effects of Old World diseases on indigenous societies in countless New World locations. For example, the stories relate how "women began to fall over dead at the metate or while stirring fish mush, and men at their occupations. . . . each time the Alakwisa died swiftly and without warning. . . . Whole villages perished, no one being left to burn the dead or the houses, until the posts remained standing or lay rotting on the ground, as if recently abandoned" (Kroeber 1925: 797–8). These accounts have sufficient chronological depth to have addressed a time prior to 1769, when adjacent regions immediately south and east of the Colorado River are known to have been afflicted by Old World germs (Dobyns 1963b; Forbes 1965: 131–2). Reminiscences by native peoples from other regions in California intimate similar catastrophic disease episodes, which may have occurred during premission times (see Cook 1956: 85, 88; Bunnell 1880: 64).

Settlement anomalies and severe illnesses also were recorded by foreign intruders along the lower Colorado River during the protohistoric period. The expedition led by Juan de Oñate in 1604–5, for example, found

only five native groups below Yuma, whereas an earlier exploration in 1540 led by Hernando Alarcón encountered some seven or eight groups (Forbes 1969: 25). Intriguingly, the Alarcón party observed that the natives were dying from a disease that resulted in the vomiting of blood (Hammond and Rey 1940: 139). This symptom has the signature of exotic infection that may have been disseminated from nearby regions of northwestern New Spain thought also to have been contaminated by Old World microbes around this period (Dobyns 1972: 18; Roberts and Ahlstrom 1997: 125).

Despite assertions to the contrary (Kealhofer 1996: 63–64), the contrasting accounts of early explorers and the noted changes in sociopolitical complexity among some native groups appear to corroborate some of these chronicles. For example, the names of coastal towns recorded in Cabrillo's log (1542–3) do not match those documented later for the same vicinity by missionaries (King 1975, 1978: 58; Erlandson and Bartoy 1995: 158–9). Ecclesiastical records also indicate considerable population diminishment and village abandonment in the Santa Barbara region after the time of Vizcaíno's voyage in 1602–3 but before 1769 (Brown 1967: 35, 78). Both Cabrillo and Vizcaíno appear to have sighted much larger populations and more numerous villages in the proximity of Santa Barbara and the Channel Islands than were reported by the missionaries and later mentioned in American accounts.[10] Similarly, the condition and behavior of the Coast Miwok observed on the north coast during the Cermeño visitation (1595–6) differed from those recorded earlier in 1579 by Drake.[11]

The early colonial commentaries made by Spanish explorers directly after 1769 also record scenes of sickness and abandoned landscapes. Accounts by members of the Portolá expedition in 1769–70 make note of unoccupied villages, although the cause and duration of their abandonment is uncertain (Palóu 1966: 151; Bolton 1971: 271).[12] Interestingly, at times the early entradas of the 1770s came across very sick natives, but the maladies are mostly of undetermined kind and origin (see Lyman 1991: 14–15). Fray Garcés and company, on the other hand, encountered Colorado peoples in 1770 suffering sickness of epidemic proportions and resembling the consequences of Old World diseases (Coues 1900: 26–27, 230, 287; Bolton 1930: 36–37, 1971: 271). Sherburne Cook (1976b: 23) argued that syphilis was present in southern California and the San Joaquin Valley early in the decade of the 1770s. He asserts that Portolá and his men "were without doubt heavily infected" and that it is "clear that from the time the Spanish first set foot in California there was ample opportunity for the introduction of syphilis to the native population" (also see Cook 1955b: 44). Given Cook's insistence about the prevalence of syphilis among the alien intruders, it would not be unreasonable to assume that the premission expeditions con-

ducted by Cabrillo, Drake, and Cermeño as well as the documented and, possibly, undocumented entradas from the east could also have introduced the disease among California's indigenous peoples (McCarthy 1999: 422, 424). Albeit not directly analogous in all cases, references by Old World explorers to depopulation, village abandonment, and sickness are routine for a number of North American regions and are believed to have been caused by exotic germs that had preceded the explorers (Dobyns 1983: 313–27, 1989; Stannard 1990: 330).

The early Spanish colonists also encountered a fascinating religion or cult known as Chinigchinish, which is widely held to be a nativistic or crisis response to the Europeans and especially to their germs (Robinson 1970; Hudson and Blackburn 1978: 243; Castillo 1990: 67–68; Hale 1995: 38). Significantly, deadly diseases were strongly personified in the belief system of Chinigchinish, and the associated ceremonialism seems also to have possessed both Christian and traditional elements (Hudson 1979: 357). Whether Chinigchinish was developed before or shortly after 1769 is still unresolved. However, that it was well formulated and widely disseminated in California by the early stages (i.e., 1770s) of colonial activity has led several scholars to acknowledge that Chinigchinish may have originated in protohistoric times as a revivalist response to exotic contagion (Dubois 1908: 97; Bean and Vane 1978: 669; Phillips 1981: 15–17; also see Kroeber 1925: 638). In the northwest and other American environments, similar revitalization ceremonies are thought to have developed also in the wake of precolonial epidemics (Boyd 1985: 531; Sundstrom 1997: 324).

Whether the recorded village abandonment, contrasting cultural descriptions, and the Chinigchinish cult were induced by the protohistoric introduction of Old World pathogens is yet, if ever, to be determined. Despite the lack of certainty, data derived from disease-afflicted realms outside of California, and from within the state after 1769, indicate that village abandonment, simplification of cultural systems, and revivalist cults are some of the observed outcomes of epidemic desolation.[13] Furthermore, additional lines of evidence serve to reinforce the probable affiliation of these phenomena with the arrival of premission diseases in California.

Mission Demographics: Antecedents or Anomalies?

Demographic information obtained from the early mission period may help corroborate the stories of severe illness told to Kitsepawit and may shed light on some of the cultural anomalies and practices observed during the protohistoric and early historic periods. Illustrative are the early trends among the mission populations examined by Sherburne Cook. He

was surprised by the unanticipated high death rates. As Cook (1976: 422–3) explains:

> The very high initial rate is remarkable, for it raises the question whether it represents the natural, gentile, pre-mission death rate. From the annual data, and the fact that the very earliest years give a rate not far from 70 per thousand, it might be assumed that this was indeed the wild death rate carried over into the missions. However, it will be remembered that the birthrate curve, even if directly extrapolated, showed a birth rate no higher than 45 or certainly 50 per thousand. If we assume, therefore, that the wild death rate was 70, then we cannot escape the conclusion that the Indian population of California was in a state of very rapid decline when the Spanish arrived.

Cook's explanation favored either a sharp drop in birthrates or alternately an explosive rise in death rates that happened "so suddenly that the change from the wild to converted rate was not reflected in the mission records" (ibid.: 423). In the context of the wisdom of the time, Cook's reluctance to accept premission pestilence as the probable cause is understandable. In later writing, Cook (1976a: 199) never totally discounted the possibility of premission epidemics, but directed his examinations primarily on the reduction of native peoples during the historic era. That aside, the pattern of decline is reminiscent of the demographic declines encountered in Hawaii approximately fifty years after the initial introduction of Old World diseases by Captain James Cook in 1778. Despite the absence of contemporary epidemics, the island missionaries recorded a steady population decline not unlike that tabulated by Sherburne Cook. The comment by the Reverend W. P. Alexander in 1835 is instructive. Referring to the mission demographics of Kauai, he wrote (in Stannard 1990: 331). that "the proportions of deaths to births within my bounds was, as 2 to 1—the number of deaths 122; & of births 61." This condition was replicated throughout the islands and has been attributed to the secondary consequences of the earlier introduction of Old World pathogens, such as infertility and high infant mortality rates (ibid.: 337).[14]

Perhaps if Cook had been privy to more recent evaluations of mission demographics he would have been less hesitant to attribute the observed abnormality to the presence of exotic diseases prior to 1769. Of particular relevance in this respect is the work that Phillip Walker and John Johnson have accomplished regarding the effects of contact on the Chumash. Through the use of mission registers (baptisms, births, marriages, and deaths) they have constructed a population pyramid that reproduces the demographic profile for a Chumash habitat in 1782. This was

the year that both Mission Santa Barbara and Mission San Buenaventura were founded, and the Chumash were still primarily living in their original villages. The profile revealed an unanticipated aberration in that there was a significant underrepresentation of children born during the previous ten years in the 1782 Chumash village population. Walker and Johnson (1994: 112) surmise that "it is possible that diseases introduced by Spanish explorers resulted in high infant mortality rates in the pre-mission Chumash population." Since these missions postdate the protohistoric by a little more than a decade, the authors are not necessarily implying that the suspected disease event preceded 1769. However, the data do suggest that microbial contamination preceded the establishment of these missions. In adjoining regions of California during the previous decade (i.e., 1770s), high child mortality was frequently encountered during the initial stages of missionization (Palóu 1913: 213; Bolton 1926: 4, 161; Cook 1976b: 18; Milliken 1987: 26). If these demographic conditions preceded these earlier missions, the causal agent would have been, by definition, present before 1769. This phenomenon may help explain why "none of the early accounts speak of Indian families with more than two or three children" (Kelsey 1984: 504). Syphilis is known to produce sterility and to increase the infant mortality rate among infected populations, and opportunities for its introduction were offered on numerous occasions prior to 1769. Harry Kelsey (ibid.: 503–4) concurs and believes, "Such intimate contact with Europeans had tragic results for the Indians. Soldiers, sailors, and settlers spread syphilis wherever they went, and other diseases as well. When this started no one knows, but it seems reasonable to assume that the earliest expeditions left these hidden reminders of their passing." Although he is referring here to Baja California, Kelsey (ibid.: 504) goes on to proclaim that "it seems likely that Jesuit missionaries in the eighteenth century were dealing with a native population already on the decline and a native family in which few children survived the newly introduced diseases of childhood."

Equally fascinating in Walker and Johnson's demographic reconstructions is the disproportionate ratio of women over men in the 1782 Chumash population pyramid. They speculate that warfare prior to missionization may be the cause for the paucity of older men (Walker and Johnson 1994: 111–2). Societal disruption, including warfare, is a recognized outcome of epidemic disease among other Native Americans, and there is nothing to suggest that Native Californians were an exception to this pattern (Engelhardt 1932: 7; Dobyns 1983: 333; McGrath 1991; Upham 1992: 228). Intervillage conflict apparently was common before and after the advent of the mission system (Fages 1937: 31, 66, 70; Palóu 1966: 151). The possibility that at least a portion of the male deaths occurred prior to 1769, perhaps

because of disease-related conflict, is made more likely because the demographic profile for 1782 shows the loss of older males extending over several generations (Walker and Johnson 1992: 130; also see Brown 1967: 75–76; Walker 1996: 2–3).

Additional analysis by Walker and Johnson of two epidemics that plagued the early mission Chumash also suggests that the central coast experienced episodes of protohistoric disease. Originating to the south, diphtheria reached the Chumash missions between 1800 and 1802. In several of the missions the epidemic affected the children almost to the exclusion of the adults. A reasonable explanation according to the authors (Walker and Johnson 1992: 135) is that "the low adult mortality is a sign that the neophyte population had been exposed to the disease before" (also see Cook 1976b: 18). A few years later, in 1806, a virulent measles epidemic swept through the Chumash missions and again the mortality was primarily confined to the young. The elderly Chumash were generally spared, perhaps an indication of an immunity acquired during a previous occurrence of the same disease. Consequently, the authors (Walker and Johnson 1994: 116) conclude once more that "the low percentage of deaths among the elderly suggests exposure to measles in pre-mission times" (also see Owsley 1992: 82). Many of the fortunate among the elderly were from forty-five to seventy years of age, and if they had acquired their immunities while relatively young one can easily place the initial measles epidemic in the years before 1769.[15]

Missionization: Conversion or Convalescence?

The establishment of the San Diego Mission in 1769 initiated a process of foreign religious and economic acculturation of Native Californians that would proceed until secularization in 1834. By its end the process had either destroyed or affected all of the indigenous inhabitants within the mission realm and many of those beyond it. The question of why acculturation was relatively rapid and all-encompassing has interested researchers for years.[16] The antiquated view that Native Californians recognized the inherent superiority of Western civilization and therefore flocked to the missions is not supported by empirical data and is generally dismissed. Instead, the contemporary debate revolves around the issues of the economic, epidemiological, and religious forces that were triggered by contact and may have contributed to the susceptibility of aboriginal populations to acculturation.[17]

The combination of Old World pestilence, intertribal conflict, and climate variability that coincided with initial colonization is argued as the

principal factor that led to a rapid collapse of native subsistence systems (Walker and Johnson 1992: 131). The resulting economic despair, in turn, has been alleged to have made the prospects of missionization more appealing as an acceptable alternative to the catastrophes besetting the Native Californians dwelling along the coast (Kelsey 1984: 506; Larson et al. 1994: 265, 286). In this scenario the mission system is interpreted as providing a new form of economic, political, and social order that absorbed the desperate peoples whose traditional coping strategies had proved insufficient under the new circumstances (Johnson 1989: 367–8; also see Reff 1987: 85). The perceived appeal of the missions is illustrated by Walker and Johnson's (1992: 131) conclusion that "for many Chumash, entering a mission was the lesser of two evils. After the arrival of Europeans, life in Indian villages rapidly deteriorated owing to the effects of epidemics and the disintegration of the Chumash economic system."

The shocking impacts of virulent epidemics on the Native Californians during the initial mission period also have been identified as having assisted in the acculturation process. According to this thesis, when traditional healing practices inevitably failed to prevent or cure the ravages of various introduced pathogens, native peoples would have been expected to show interest in alternative medicines and belief systems (Reff 1987: 90, 1991: 260). Adding to the impetus to gain access to the rituals being introduced by the newcomers were the disease immunities and apparent supernatural powers possessed by the Spanish priests (Dobyns 1991: 553; Walker and Hudson 1993: 28, 114). The willingness of native peoples to seek and accept European substitutes for native health care and economic practices, which were undermined by exotic pestilence, has also been noted for a number of North American areas beyond the frontiers of California (Burrus 1967: 48; Clark 1981: 39; Trigger 1985: 250; Reff 1987: 92).

The consequences of the substantial depopulation that accompanied severe epidemics after 1769 extended far beyond economic and health concerns to shatter the entire fabric of indigenous societies. When the elders, spiritual leaders, and tradition keepers among the native peoples succumbed, the survivors may have been left adrift in a spiritual void, which the missionaries readily filled (Engelhardt 1908: 198; Dobyns 1991: 552). Moreover, it also appears that the missionaries "were not unaware that the death of native spiritual leaders in the epidemics increased the willingness of the Indians to give up their native religious beliefs" (Walker and Hudson 1993: 112; also see Smith 1987: 54; Castillo 1990: 62).

Although most theorists concerned with this issue confine their search for causation to the historic period in California, there is convincing precedent and viable evidence that many of these factors preceded missioniza-

tion and thus facilitated a more rapid conversion of the native peoples. In the adjacent environments of northwestern New Spain (Arizona, Baja California, and Sonora) exotic infection is widely acknowledged as preceding mission founding and believed by some as also having served to prepare the stage for rapid conversion. Indeed, according to Daniel Reff (1992: 272), "The Jesuit materials clarify that Indian acceptance of missionization followed and was coincident with epidemics that destroyed or altered the fabric of Indian society." Robert Jackson (1994: 163) concurs that the "program of social and cultural reorganization undertaken by the missionaries in northwestern New Spain was not static, and followed a century of dramatic change in most Indian societies in the Americas." Again, California remains as the lone and unlikely exception in northwestern New Spain, in that the means that are recognized as facilitating acculturation occur only with, and not before, European settlement (ibid.: 164–5).

What if California was not the exception in northwestern New Spain but conformed to the regional norm with regard to premission diseases and the resulting structural weakening of native societies? According to this possibility, the first missionaries may have encountered cultural environments previously weakened and therefore more vulnerable to acculturation. As noted earlier, in comparison to the observations made prior to 1769 in the vicinity of the Santa Barbara channel, the priests came across a setting that was less populated and, possibly, less culturally complex (Brown 1967: 76; Chartkoff and Chartkoff 1984: 235; Johnson 1988: 113). Interestingly, similar settlement conditions elsewhere in the Americas have been interpreted as diagnostic of the influence of Old World diseases (Reff 1987: 90; Upham 1992: 228). Could the initial colonial conditions described for some coastal settlements in California have been diagnostic of similar causes and, in turn, assisted in the process of acculturation?

The preceding possibility accepts the conventional wisdom concerning most of the events and conditions surrounding the initial colonization of California. However, it differs by accepting the likelihood that coastal peoples were already rendered partially susceptible to acculturation by the introduction of diseases during the protohistoric period. The sources, avenues, and vectors for microbial disruption were readily available, and the initial colonial conditions strongly suggest their presence. Therefore, to continue to assert that conversion was exclusively a historic phenomenon requires an explanation as to why California was unique in this respect in comparison to the rest of northwestern New Spain. Specifically, it would be necessary to demonstrate how the initial processes of missionization in California were different from those of Baja California, Sonora, or Arizona, where native societies were devastated by foreign pestilence prior

to the establishment of missions. In the absence of these explanations the prospects of protohistoric consequences on the acculturation of the Native Californians must be seriously considered.

Mission Epidemics: The California Exception

In several respects colonial (1769–1848) disease experiences in California differed substantially from the rest of northwestern New Spain. Severe epidemics arrived much later after initial settlement in the state than had occurred in Sonora, Arizona, and Baja California. Indeed, Sherburne Cook (1976b: 17–18) made note of the specific contrast between upper and lower California: "Of true epidemics carrying off hundreds or thousands in a few weeks or months there were remarkably few in Upper California. In fact, there was only one of really great extent, and perhaps two of moderate intensity. This situation contrasts forcibly with that in Lower California where at least five serious epidemics occurred within a comparable period of time." In addition, epidemiological patterns and the spatial dispersion of epidemics were significantly different from those of the adjoining regions. These temporal, epidemiological, and spatial distinctions are often interpreted as consequences of geographic isolation and the unique colonial processes that accompanied the relatively late settlement of California.

The first mention of epidemic disease in California occurred when Father Palóu reported one in the vicinity of Santa Clara in 1777: "Indeed, it is remarkable that violent epidemics did not occur much earlier than they did" (in Cook 1976b: 207). From that point on epidemics periodically struck portions of the state but in numbers and frequency nowhere near that documented for the remainder of northwestern New Spain (Jackson 1981, 1987: 258, 1994: 164; Reff 1991, 1992). For some mission localities, the delay before the onset of severe disease episodes was quite long. Illustrative were the Chumash missions that escaped acute infection until 1796. Interestingly, the first outbreak of smallpox did not occur among these Chumash missions until 1844, long after secularization (Walker and Johnson 1994: 110, 118). The inordinately late appearance of smallpox is even more remarkable because opportunities for its introduction were available in previous decades, but they failed to trigger an epidemic among the Chumash (Cook 1939; Larson 1994: 134; Pearcy 1997: 34–35).[18]

The curious delay in the initial outbreak of epidemic disease among the missions of California has prompted attempts to explain this unexpected peculiarity. Most endeavors stress the state's perceived geographic isolation and the periodic inoculation and quarantine practices that accompanied the relatively late colonization of the region. California, in addition,

is said to have benefited from its physical and cultural isolation from the colonial lands to the south and east (Cook 1939: 154–5; Jackson 1994: 116, 164).[19] As Robert Jackson (1985: 475) argues, "The relative geographic isolation of northern Alta California from the rest of New Spain shielded the region from most epidemics." Moreover, the relative infrequency of seaborne visitations during the earlier decades of the colonial period is also thought to have accounted for the delay before some regions (e.g., Chumash) were initially afflicted by acute Old World sickness (Walker and Johnson 1994: 114).[20]

Not only were epidemics fewer in California, but their demographic impacts were also distinct and exceptional in comparison to adjoining regions. Robert Jackson (1994: 118) believes:

> Epidemics in Baja California and in northern Sonora were traumatic events that more than doubled or tripled normal death rates, but with no recovery or rebound through natural reproduction following the epidemic. In contrast, with the exception of the severe outbreaks in 1802 and 1806, epidemics in the Alta California missions did not substantially raise rates above the chronically high mortality documented for the missions.

Even the great measles epidemic that swept through most of the northern missions in 1827 and 1828 failed to raise mortality much above the chronic rates documented for nonepidemic years. Similarly, epidemics among the Chumash missions failed to produce mortalities above the average death rates until 1797 (ibid.: 118; Walker and Johnson 1992: 133). The lower-than-expected mortality resulting from this and other acute disease episodes has been interpreted as a function of the unusually high chronic death rates that characterized the whole mission system in California.

Demographics also reveal an unexpected pattern of life expectancies and child mortality among the missionized peoples. The southern missions generally fared better in both categories (Cook 1976a: 84; Cook and Borah 1979: 211–20). Chronic ailments, including syphilis, and nonbiological factors, such as living and working conditions said to be peculiar to the California mission system, are cited as the principal agencies accounting for these extraordinary and varied demographic circumstances. Whatever the explanation, the result is that Old World parasites appear not to have constituted the most important cause of population collapse among the mission natives as they had been in the remainder of northwestern New Spain (Jackson 1990: 77–78, 1994: 141–2, 164–5; Kealhofer 1996: 74).

When epidemics did strike California during the Spanish and Mexican periods, the spatial spread of infection was anything but uniform. Dis-

eases often struck some missions but left others in close proximity unscathed, a pattern that was unusual in adjacent regions of northwestern New Spain. As an example, Mission San Gabriel experienced the depopulating effects of the 1781 smallpox epidemic while Mission San Juan Capistrano escaped relatively unharmed (Pearcy 1997: 34–35). The continual flow of people among the missions during these periods makes the irregular pattern of infection even more surprising (Cook 1976b: 31; Larson 1994: 134; Walker and Johnson 1994: 118).[21] These exceptional diffusionary patterns have prompted conjecture about their causes. For example, luck and good fortune have been cited as reasonably good explanations for the unsystematic dispersal of germs. More precisely, there may simply have been fewer visits between infected missions and those that were spared. Or, visitations may have occurred during the incubation stages of diseases, and therefore would have been noncommunicable (Valle 1973: 28–29). In referring to the spatial anomalies of the 1827–8 measles epidemic, Rosemary Valle (ibid.: 29), almost as an afterthought, suggests that "the other disease free missions may have experienced local measles outbreaks in the not-very distant past, as a result of which an appreciable number of persons would have acquired immunity to the disease. This herd immunity could have provided a measure of protection to the non-immune."

In an acknowledged disease-experienced environment, the prospects of previous immunity would be considered a reasonable explanation not only for the diffusionary anomalies noted for the California missions but also for the timing and impacts of Old World pathogens (Dobson 1987: 23, 25). Instead, the endeavors to account for these baffling colonial patterns in California are hampered by the disregard of protohistoric contagion. As such, inquiries have largely ignored regional precedents and, instead, relied on conjecture about the region's unique geographic, historical, and socioeconomic conditions and, indeed, even about lucky circumstances. These plausible but unsubstantiated scenarios fly in the face of precedent and are unnecessary when the epidemiological patterns are examined within a perceptual context that acknowledges California as having been susceptible to exotic diseases prior to 1769.

The argument that it is doubtful that mission populations in the state may have acquired premission immunities to certain diseases because mission populations in both Arizona and Baja California failed to do so after decades of infection is attractive but specious (Lightfoot 1996: 636). Mission conditions in Baja California and Arizona are only superficially comparable in epidemiological terms to California during protohistoric times. The similarities and differences between the regions explain why California mission populations may have developed immunities while those in adjoin-

ing environments may not have. For example, the survivors of one epidemic in neighboring lands may have gained immunity to measles but proved susceptible to smallpox. Indeed, the specifics of the sequential epidemics that swept the colonial environs of Baja California and Arizona rarely were repetitive. In essence, immunity to one infectious malady afforded no protection from another (Cook 1937: 24–27; Dobyns 1983: 343; Jackson 1985: 466–8).

Furthermore, owing to the added demographic concentration imposed upon both Baja California and Arizona by constricted geographic space and aridity, native populations were less dispersed and were more concentrated along fewer disease-carrying corridors than were the protohistoric inhabitants of California. Thus, fewer individuals would have escaped repetitive and differing epidemics within these more circumscribed habitats than in the broader and moister lands of California.[22] In addition, to a greater extent than in California, missionized natives in Baja California and Arizona retained their traditional lifeways and often continued to reside in their own villages. Consequently, they were afforded more opportunity to implement traditional medical practices, such as sweatbaths, which often exacerbated the lethality of Old World illnesses. Furthermore, healthy natives who might have been able to care for the sick could more easily take flight, leaving the infirm to fend for themselves (Aschmann 1967 [1959]: 146; Jackson 1994: 55, 142, 161).

The added geographic separation of the natives from the missions in Baja California and Arizona also further removed the infected villagers from the uninfected and otherwise healthy missionaries who, at the very least, could have provided care and nutritional assistance. This relative detachment would have greatly decreased the ability of the sick to survive epidemics and to establish enduring immunities (Frost 1990: 436; Pearcy 1997: 36). Thus, when a familiar epidemic did make a return visit to Baja California and Arizona, relatively few individuals who had previously been exposed to the ailment were present. Those who had survived the earlier disease appearance may, in turn, have perished during the interim because of the arrival of another disease for which no immunity had previously been gained.

In comparison, native populations in California possessed an advantageous habitat that afforded a chronological and spatial means of escape from subsequent epidemics of differing epidemiological character. More precisely, the state remained free of colonial settlement for a much longer period of time than the adjoining regions of northwestern New Spain. As a result, there was ample time during California's 250-year-long protohistoric period to develop disease immunities without necessarily having to

endure the additive life-threatening stresses inherent to foreign settlement and acculturation. In addition, the state's heterogeneous geography provided more numerous and diffuse avenues for foreign microbes in comparison to the constricted missionized corridors of its neighbors. Moreover, California's larger premission populations and their greater spatial dispersion were capable of absorbing epidemics without the catastrophic consequences brought on by Old World diseases in Arizona, Sonora, or Baja California. The premission dissemination of sequential epidemics within the state, therefore, would have produced varied and nonrepetitive patterns of contamination and regional epidemiological shelter. As a consequence, a greater mosaic of immunities that varied in kind, degree, timing, and aerial distribution would have formed in the state's protohistoric setting.

The timing of the most severe epidemics in California casts doubt on the relative importance of geographic isolation and the remedial measures initiated by the colonial authorities. The worst disease episodes (e.g., 1802, 1806, 1827–8, 1838–9, 1844) occurred at times when human numbers were already greatly reduced by colonial consequences and when practices of quarantine and vaccination already had been implemented in some quarters (Cook 1939). Even taking into account that visitations of foreign vessels were more frequent during this period, it is surprising that the diminished populations and precautionary measures still failed to thwart the spread of an episode like the measles outbreak of 1827–8, which infected all but three southern missions. This relative lack of immunity raises the question as to why similar epidemics were not the norm in earlier years when native populations were much larger and precautions fewer. Indeed, acute epidemics were not as common during the period of initial settlement (beginning in 1769), although conventional wisdom would dictate that Native Californians were without prior immunities and were at the peak of their vulnerability to introduced diseases during this time. Furthermore, one of the few disease episodes that did strike a selection of California missions in the early colonial period effectively belies the notion of the state's epidemiological isolation. The outbreak in question is the smallpox epidemic of 1779–82, which reached and infected populations at Mission San Gabriel. It originated in Mexico City and spread overland by way of trade routes through Arizona before crossing into California and making its way to the mission (Pearcy 1997: 26, 34).

All of the credibility-stretching endeavors to explain the epidemiological peculiarities of California during the mission era are unnecessary if exotic pestilence prior to 1769 is accepted as a probability. For instance, if it is assumed that the state was infected in various regions and at different times during the protohistoric period, the timing, spatial patterns, and im-

pacts of epidemics after 1769 would no longer be as mysterious. The documented delay in the first serious disease episode among the missions would be the probable legacy of an earlier arrival of the same pathogen, which produced immunities among the survivors and decimated the human vectors along the terrestrial corridors of infection. In turn, the lower frequency and mortality induced by epidemics would have been an expected outcome in environments that previously had experienced similar diseases (Trimble 1989: 46).[23] Indeed, the number of deaths resulting from epidemics (close to 15 percent for some illnesses among the missionized Chumash, for example) is similar to many of the mortality rates recorded for the disease-experienced European realm in the seventeenth and eighteenth centuries (Wrigley 1969: 63, 696–7; Dobson 1987: 36, 42, 67, 80, 91; 1989: 280; Walker and Johnson 1994: 112).

The possibility of protohistoric exposure to exotic pathogens may explain why some California environments remained immune for a relatively longer period than others did. Current epidemiological knowledge concerning the spread of Old World germs in the Americas seems to indicate that the areas and timing of acute disease episodes varied enormously within relatively small regions. As a people inhabiting the central coast, the Chumash, for instance, experienced nearly every maritime visitation and were an important focus of intertribal trade originating from the east and south during the premission period (Davis 1961: Map 2; Erlandson and Bartoy 1995: 157). That the Chumash missions were spared their first serious epidemic until 1796, and avoided smallpox until 1844, might be explained by these more-frequent protohistoric opportunities for Old World infestation and acquired immunity in comparison to more isolated tribal environments.

It is probable that as native populations declined in the hinterlands of the early missions because of disease and conversion, the frequency and aerial spread of epidemics actually may have diminished for several decades after 1769 in comparison to the late protohistoric period. The chronic effects of diseases like syphilis were compounded by other colonial disruptions and may have reduced the interactions among native peoples. This would have diminished the prospects for the exchange of acute diseases among California's early missions. The condition would have initially contributed to longer intervals between epidemics and a gradual increase in the number of disease-susceptible individuals through isolation in some regions. Eventually, when epidemics were again conveyed to the mission regions of California by the more-frequent colonial visitations after 1820, immunity rates would have been lower and the devastation greater.

This scenario may provide a better understanding of the 1827–8

measles and the 1838–9 smallpox epidemics, which primarily swept the northern portion of the state but did relatively less damage among the southern missions (Cook 1939: 183–4). The northern frontier of California's mission realm prior to 1820 was farther removed from the southern sources of infection and experienced relatively fewer seaborne visitors. In addition, the terrestrial pathways that linked the colonial settlements in the north with the southern missions were long and progressively depleted of human vectors after 1769. By the 1820s and 1830s, as a consequence of this enhanced geographic isolation, the northern missions would have harbored more susceptible hosts than the more disease-experienced and immunized missions in southern California. The higher-than-normal adult mortality recorded for the 1827–8 measles outbreak in the north may, therefore, be diagnostic of an extended interim of disease-free conditions in earlier decades due to geographic and demographic isolation (Valle 1973: 29). Relative isolation and less immunization may also be part of the explanation for the lower life expectancy and higher child mortality experienced by some of the northern missions in comparison with those in the south.

The factors that governed the epidemic patterns among the California missions are varied and still puzzling. The defensible assumption of protohistoric infection does not solve all of the conundrums but brings the state into better conformity with other North American and Old World experiences. More important, it opens channels that may lead to a more thorough understanding of the state's unique history of colonial epidemiology.

Exhumed Bodies of Epidemiological Evidence from the Protohistoric

The present interpretation of the archaeological inventory does not provide the smoking gun for the protohistoric presence of Old World diseases in California. As Erlandson and Bartoy (1995: 168) point out,

> this may be due to problems related to identifying evidence for epidemic disease in human skeletons, the poor documentation associated with many cemeteries excavated by early antiquarians or archaeologists, chronological problems caused by the lack of adequate dating for many existing collections, and the failure of archaeologists to calibrate uncorrected radiocarbon dates to the calendrical scale required to connect archaeological data with protohistoric events.

Unfortunately, human bones that escaped cremation practices rarely exhibit the consequences of acute infection of the kind that proved most responsible for the annihilation of many New World peoples after the ar-

rival of Columbus (Walker et al. 1989: 349; Ortner 1992: 5–6, 190). And, as with most protohistoric matters in California, archaeological materials have often been interpreted with mindsets that have either ignored or underrated the indirect evidence of premission diseases (Kealhofer 1996: 62). Nevertheless, even with the problems inherent in the identification, dating, and interpretation of protohistoric remains, some archaeological findings are symptomatic of Old World pestilence when evaluated holistically and without presuppositions. The following discoveries in California denoting settlement, burial, and osteoarchaeological information are representative.

Geographic change and abandonment of indigenous settlements are noted consequences of Old World diseases that devastated a variety of American environments during both the protohistoric and historic periods (Ewers 1973; Dobyns 1983: 302–27; Ramenofsky 1987: 16–19, 122; Smith 1987: 68–75, 143–44; Perttula 1991, 1992). Several localities in California display similar patterns of premission settlement changes, and those involving the native dwellers of the central and south coasts are particularly noteworthy. A comprehensive analysis of settlement continuity among the Channel Chumash has revealed a surprising disruption and truncation of village occupation around the time of Cabrillo's visitation (1542–3) (Erlandson 1998). The magnitude of these cultural perturbations was equaled only by the changes induced by climatic anomalies during the medieval period (ninth to thirteenth centuries). Earlier investigations addressing specific sites for both the Mainland and Island Chumash serve to illustrate the overall pattern of disruption. For example, Erlandson and Bartoy (1995: 11) have suggested that protohistoric epidemics may have been responsible for the abandonment or the severe decline of activity recorded for villages on Santa Cruz and Santa Rosa islands and at a mainland site in Tecolote Canyon (Orr 1968: 200; Arnold 1992: 140–1). The Tecolote settlement was located west of Goleta and, by virtue of possessing a 1,500-year history of continuous occupation, was evidently deemed rather favorable by the Chumash. This continuum was sharply and curiously curtailed by total abandonment about the time of Cabrillo's landfall.

During the sixteenth century, settlement disruptions at sites in Long Beach and near San Diego occurred that were similar to those described for the Channel Chumash (Underwood 1999). At Long Beach a dramatic decrease in the occupation of sites now on the university campus is recorded for about the 1560s or 1570s. Intriguingly, the sharp reduction in settlement occurred not long after Cabrillo's landfall in California and was accompanied by an in situ Spanish bead (Boxt 1997: 27).[24]

Likewise, several premission, but post-Columbian, settlement changes

are documented for the central Sierra Nevada that are especially pertinent because of their relative isolation from potential sources of exotic infection from both the coast and the lands of northwestern New Spain to the south. Of particular interest is a summer village site at Dry Meadow that was inhabited until the eighteenth century, when apparently it was abandoned (Chartkoff 1993). Similarly, settlements in the New Melones area, Kings and Sequoia national parks, the lowlands near the White Mountains, Buena Vista Lake, and Morro Bay have been documented as having experienced precipitous declines in usage during California's protohistoric period (Clemmer 1962: 52; Moratto et al. 1988: 335; Mundy 1988: 159–68; Grayson 1991: 504; Hartzell 1992: 32). Also of interest are the indicators that a breakdown of indigenous exchange systems occurred between the eastern Sierra Nevada and the western Great Basin sometime near the beginning of California's protohistoric period (Arkush 1990: 32). Strangely, despite the numerous citations of settlement and economic changes in the state during the protohistoric period, it is still maintained that "there is no archaeological evidence to indicate settlement pattern disruption or economic disaster" (Kealhofer 1996: 61). Nonetheless, the evidence suggests otherwise.

Unusual patterns in burials have also been associated with the arrival of Old World germs in portions of the Americas (Milner 1980: 48–49; Dobyns 1983: 324; Smith 1987: 60–68). These include the occurrence of mass burials and unusual age distributions among the interred. A variety of California burials dating from the protohistoric period are instructive in this respect. Large protohistoric Chumash burials that roughly correspond with the timing of the settlement abandonment previously mentioned have been uncovered on both Santa Rosa and San Miguel islands. Some of these mass graves hold an inordinately large number of young children, who may have succumbed to exotic diseases because of a lack of immunity (Erlandson and Bartoy 1995: 166–7; also see Orr 1968: 200–1).[25] Other clues intimating premission epidemics are reports of mass burials in the Sacramento region, which may date to as early as the sixteenth century, and burial anomalies in the Santa Clara Valley (Borah 1992: 15; Hildebrandt et al. 1995: 97–98).[26]

Despite the difficulty in assessing the direct effects of acute Old World diseases on human skeletal material, indirect osteoarchaeological findings may be diagnostic of their presence. Since the Chumash were the subject of several direct maritime visitations by Spanish explorers during premission times, their paleopathological story is especially germane.[27] For example, the level of interpersonal and intergroup conflict among the Chumash is believed to have increased after 500 A.D. and continued at relatively high

levels until the Late period (1150–1782 A.D.) (Walker et al. 1989: 359–60). This rise in the frequency of violent conflict "may have been the result of increasing competition for limited terrestrial resources on an increasingly circumscribed landscape" and a function of environmental degradation (Lambert 1993: 518; also see Moratto 1984: 213–4). The upward trend in hostilities appears to have reversed, however, during the Late period when a relatively abrupt decline is reported (Lambert and Walker 1991: 970; Walker 1996: 103). It is not certain whether the reduction of violence was common to either Phase 1 (A.D. 1150–1500) or Phase 2 (A.D. 1500–1782) of the Late period, on the Coast, or both. The turnaround is nevertheless hypothesized to have been produced by a lessening of the causes of violence coinciding with a period of environmental, economic, and political stability. Interestingly though, according to ethnographic accounts, the level of violence once again returned to high levels toward the end of the protohistoric period (Brown 1967: 7, 75–76; Walker 1996: 103). The postulated conditions of economic and political stability thought to have contributed to the Late period reductions in violence are plausible but lacking in affirmation (Larson et al. 1994: 281). The suggestion that relatively stable economic and political conditions were partially an outcome of pestilence during Phase 2 of the Late period lacks complete verification as well but is equally plausible.

Beginning in the 1500s elements of the Chumash and other California peoples may have experienced a substantial reduction of population because of the arrival of Old World diseases. Social and economic disruptions would have initially characterized this demographic shrinkage, but with time more stable economic and political relationships would have emerged. The recovering population would have been assisted by a resource bounty unconstrained by intense human predation and severe economic competition. Thus, in time, a period of relative economic and political stability could have developed in the epidemic's aftermath. Subsequent epidemics may have periodically sustained these conditions of relative, albeit fluctuating, resource and political benefits throughout most of California's protohistoric period.[28] The upturn in violence just prior to missionization may have followed on the heels of the most recent epidemic and a period of environmental instability. As a consequence, when Portolá entered California in 1769 his party may have encountered Native inhabitants who were still in a state of social disruption and had not yet reestablished more stable societal patterns (ibid.: 281; Walker et al. 1989: 359).[29]

Trends in other health-related aspects among the Channel Chumash display a similar pattern to that of violence. Cranial (cribra orbitalia), dental (linear enamel hypoplasia), and bone (tibial periosteal) defects provide

evidence that infectious diseases and nutritional stress increased significantly through time and culminated with the highest frequencies late in prehistory (Lambert 1993: 515). Environmental disruptions and population growth during the same period may reasonably have caused a reduction in nutritional resources that in turn led to these maladies (Walker 1996: 101–3). In addition, a "decline in health was no doubt a result of the health problems people encountered when they began to aggregate in large villages. As the number and intensity of interactions among people grew, so did the opportunities for the maintenance and spread of infectious disease" (Walker et al. 1989: 360). The declining health of the Channel Chumash reverses in some categories during the Late period, as intimated by the decreased frequency of periosteal lesions and cibra orbitalia.[30] Plausible explanations for the upturn in health trends have been suggested, including improvements in climatic conditions, unexplained reductions in population density, and acquired immunities to endemic pathogens (Lambert and Walker 1991: 969; Lambert 1993: 518).

Interestingly, one indicator of health among the Channel Chumash, hypoplastic lines, seems not to have improved during the Late period and, in fact, became worse (Walker et al. 1989: 356). The stresses produced by malnutrition and disease have been linked to increasing frequencies of hypoplasia, and both have been suggested as possibly being responsible for the continuance and exacerbation of this Late period phenomenon (Lambert and Walker 1991: 968). Definitive and corroborative evidence for malnutrition and disease during this time is unavailable, but increased human density and sedentism are postulated as conducive to increases in both (Dickel et al. 1984: 446–7; Basgall 1987: 38). A rise in human density, however, is contradictory to the scenario cited above, which endeavors to explain the reduction of periosteal and cibra orbitalia frequencies among the Chumash as the result of a diminishment of population pressure and an improved environment[31] (Lambert 1993: 518).

A postulation that exotic illnesses may be responsible for the Late period health patterns among the Channel Chumash is justified and would serve to mitigate the seemingly contradictory explanations for the decreasing periostitis and cibra orbitalia that accompanied the increasing hypoplasia. The arrival of premission epidemics, which may explain the Late period reduction of violence, would have lessened the congregated conditions of the afflicted Chumash. It seems reasonable to surmise that a reduction in human population not only would have ultimately served to diminish resource stresses but also would have reduced the endemic ailments, such as gastrointestinal maladies, that are associated with dense concentrations of people (Walker et al. 1989: 355–6). The alleviation of both dietary and en-

demic health problems coupled with an improving environment may have contributed to the reported reduction of periosteal lesions and the anemia that leads to cibra orbitalia. Coincidentally, the continued increase of dental hypoplasia could reflect the osteoarchaeological residuals among the Chumash who had survived acute epidemics of measles, for example, and could also be a sign of the persistence of exotic strains of chronic ailments, such as syphilis, during the protohistoric period (McHenry and Schulz 1978: 36–37; Lambert 1993: 517).

The foregoing hypothesis eliminates the necessity for contradictory explanations and is applicable to all of the conditions involving trauma and chronic health reported for the Channel Chumash during the Late period. At the very least, the fluctuations in settlement and health patterns demonstrated for portions of premission California appear to erode the viability of the suggestions that "no evidence for dramatic changes during the protohistoric period is seen in burial practices" or that "no evidence is presented that supports a sharp increase in infectious disease during the protohistoric period" (Kealhofer 1996: 60, 62).

Protohistoric Pastures: Where the Deer and Antelope Finally Roam

In 1602 Juan Sebastian Vizcaíno (in Bolton 1916: 91) observed "much wild game, such as harts, like young bulls, deer, buffalo, very large bears, rabbits, hares, and many other animals" in the vicinity of Monterey. His report is typical of the observations recorded by nearly all of the early European visitors to California during its protohistoric period. It would probably surprise those first Old World eyewitnesses to know that their comments in passing about wildlife would provide evidence that their germs had preceded them. That is, the large terrestrial and marine animals they encountered in great abundance were aberrations and artifacts of human depopulation that occurred before 1769.

Prior to Vizcaíno's voyage in 1602–3, earlier explorers had recorded similar sightings of large game. Near San Diego a member of Juan Rodriguez Cabrillo's expedition in 1542 reported seeing "some herds of animals like domestic animals which were in the number of a hundred or more" (Páez 1968: 5). Likewise, in his descriptions of the north coast, Sir Francis Drake (in Heizer 1974: 92) wrote that in 1579 "infinite was the company of very large fat deere, which there we sawe by the thousands as we supposed in a heard" (also see Wagner 1929: 84).

The Concentrations of wildlife that welcomed the first Europeans prior to 1769 also were noted during the initial years of colonial settlement.

Various members of the Portolá expedition (1769–70) reported herds of large game (especially antelope, deer, and bears) during their exploratory journey. Indicative is the diary of Miguel Costansó (1911: 77), who saw "many herds of antelopes crossing the plain" and stated that "many antelopes were seen during the march." Deer were also well represented along their route, as noted by Francisco Palóu (1966: 219), who said that "many deer have been seen in herds, and the explorers declare they saw a band of fifty of them in this place." In addition to deer and antelope, bears were at times numerous and were encountered on various occasions, as documented by Pedro Fages (1937: 39), in the vicinity of the central coast: "In this canyon were seen whole troops of bears, they have the ground all plowed up." These early colonial onlookers were equally impressed by the abundance of marine life, both aquatic and winged, occupying the shores and bays of California. Again, Pedro Fages (1937: 77) recalled "that there is an abundance of all species in this sea" (also see 51, 76).

The presence of significant congregations of game animals is also attested in the diaries and narratives of the initial Spanish forays into California's interior. In a reconnaissance of the San Francisco Bay region in 1770, Fages (1911: 9) saw "on the way many herds of antelopes, some of them exceeding fifty" (also see Teggart 1913: 89). Later in 1772, his party encountered in the San Joaquin Valley "plentiful game, such as deer, antelope, mule deer, bear, geese, cranes, ducks, and many other species of animals" (in Bolton 1935: 4). Large numbers of bear, deer, and antelope were also evident in some interior locations of southern California during the initial settlement period. Members of the Anza expedition in 1774 testified to this by documenting sightings of herd animals and noting that "throughout all these lands there are bears" (in Bolton 1930: 346, 432; also see Fages 1937: 12).[32]

The numbers and the variety of wildlife depicted in these early accounts have rarely been contested or proven controversial. The diversity and abundance of game thought to have inhabited California prior to missionization are customarily interpreted as reasonable products of the state's environmental fertility and of native management practices that are believed to have enhanced or, at the very least, conserved faunal resources (Baumhoff 1963: 167, 169, 1978: 16–17; Heizer and Elsasser 1980: 85–91, 101–3; Anderson et al. 1997: 38). That native peoples in the West, including California, existed in relative equilibrium and harmony with their game resources is a commonplace assumption (see Margolin 1978: 9; Thelander 1994: 19). The first substantial depletions of wildlife in California are widely acknowledged to have begun with the arrival of colonial settlers in 1769 (Dasmann 1965: 33; Thelander 1994: 46).

Despite the appeal of a setting where humans lived in relative equilibrium with wildlife, it is unlikely to have been the case. Elk bones, for instance, are rarely encountered in late pre-Columbian archaeological sites in the Rocky Mountains (Kay 1994: 361). The same holds true for large game remains in the Great Basin, the Columbian Plateau, the Southwest, the Northwest, British Columbia, the Canadian arctic, Alaska, and the American Plains. In essence, large animals were scarcely represented in Native American diets and seldom are seen outside of sanctuary environments by early Euro-American intruders.[33] It appears that the indigenous peoples inhabiting these regions were responsible for the depressed state of large game and as a result "were the ultimate keystone predator" that once structured ecosystems throughout western North America (Kay 1997: 153).

Interestingly, and of particular relevance to this thesis, is that the first substantial elk remains to appear in archaeological deposits in the Rocky Mountains occur around five hundred years ago (i.e., after Columbus but before Euro-American settlement) (Kay 1997: 153, 1994: 382; also see Frison 1991: 273–5).[34] Similar findings indicating a protohistorical upsurge in large game have been noted for numerous regions, including the northern Plains, the Great Basin, the American Southwest, the Canadian Northwest, and Alaska (Nelson 1983: 165; Yesner 1989: 103; Geist 1996: 61–63; Truett 1996: 200). This upswing in wildlife availability and use has been postulated as a consequence of diminished human predation caused by exotic contagion that reached these regions prior to the actual arrival of Euro-Americans. This explanation is strongly favored by Valerius Geist (1996: 14), who asserts that "the Post-Columbian abundance of bison in North America . . . was almost certainly due to the decimation of a large portion of the Native North Americans' population by Eurasian diseases that decreased human hunting of bison and allowed herds to flourish." His assertion appears to be corroborated by an assessment of native "winter counts" on the northern Plains by Linea Sundstrom, who tabulated the irruption of buffalo after protohistorical plagues. She (Sundstrom 1997: 320) concluded that "the single pattern that emerges from those data is a tendency for periods of abundance to follow epidemics immediately" (also see Lehmer 1977: 110).

Research within California reveals that early in prehistoric time (Early to Middle Holocene) the indigenous peoples relied heavily on the fauna that provided the greatest nutritional return for the energy expended in acquiring them. Overpredation eventually depleted these so-called low-cost or preferred species to a point where they became more difficult to procure and were no longer sufficient for survival. Gradually, during the Middle to Late Holocene, people adapted to a growing scarcity of favored prey by

changing their emphasis to alternative prey, which required an intensification of effort in order to acquire and, sometimes, to process. These high-cost species included shellfish, fish, rodents, birds, and a wider variety of vegetable resources (Chartkoff and Chartkoff 1984: 147–9). Furthermore, they often proved more resilient to human predation.[35]

This shift in resource exploitation corresponds to a rise in resource intensification and broad-spectrum subsistence. The decline or near-elimination of preferred fauna was accompanied by the broadening of aboriginal diets for a number of California environments, including the San Francisco Bay area, the central and south coastlines, the northern highlands, the Central Valley, and the White Mountains.[36] Human predation appears responsible for both the severe depletion of low-cost animal resources and the shift in foraging emphasis. Jack Broughton (1994a: 372) postulates that "as human densities grew steadily during the late Holocene the abundances of such low-cost resources as large-bodied terrestrial herbivores decreased. As a result, such smaller, higher-cost resources as mollusks, smaller fishes, and acorns, became the focus of intensive human exploitation." These findings tend to refute the idea that Native Californians had only a minimal impact upon the state's animals through predation. The evidence strongly suggests that they, like other native peoples in the West and elsewhere, had severely depressed the numbers and spatial distribution of preferred wildlife within their resource territories. As a consequence, by late pre-Columbian times they were forced to rely primarily on alternative sources of nutrition.

The relative scarcity of low-cost or preferred animals among the remains of the late pre-Columbian inhabitants of California has been noted and contrasted with the enormous faunal resources observed during the historic period. According to Jack Broughton (ibid.: 371), "Against this background, the paucity of deer, pronghorn, and tule elk in central California late prehistoric archaeological vertebrate faunas is striking." He also speculates that "the historic period superabundances reflect . . . a rebound after the collapse of Native American populations." This deduction is plausible and conforms to the documented patterns discovered in adjacent portions of North America. It is also applicable to the protohistoric period.

The regional abundance of large game noted for some areas by the protohistoric explorers and the earliest colonial (after 1769) visitors to California compares favorably with the more widespread observations made later in the historic period. Recent archaeological findings in the state have disclosed marked upsurges in the availability and use of low-cost faunal resources in a variety of terrestrial and marine locations during the protohistoric period.[37] This pattern is exemplified by recent ex-

cavations near the Pit River in northern California. The dramatic irruption in the presence and use of preferred fauna during the protohistoric period has been attributed to exotic diseases by investigators James Chatters, James Cleland, and Frank Bayham (1997: 29): "With regard to the initial consequences of European colonization of the Americas, we have found new evidence of the impact of an early wave of introduced diseases and subsequent cultural adaptation. This early wave appears to have occurred 100 years or more prior to the historically documented epidemics of the 1830s."

In essence, both the observed and archaeological testimony of the protohistoric animal inventory conflicts with the paucity of preferred game that is documented for the late pre-Columbian period. Furthermore, the bountiful game noted for some regions during the protohistoric and early colonial periods in California was far greater than would be expected if severe predation by native peoples had continued uninterrupted by Old World influences throughout premission times (i.e., until 1769). The presence of this game is best explained as the direct outcome of protohistoric consequences, in particular, exotic diseases that depleted human populations and thereby reduced predation pressure. This explanation conforms with the precedent established for the protohistoric period for substantial portions of North America and the predation patterns recorded during and after the colonial period in California.[38]

Reflections on Protohistoric Infections

For wide regions of the Americas today, protohistoric Old World diseases are integral to the currency of debate and, indeed, often serve to stimulate further research endeavors. In contrast, although attention to the issue is increasing with regard to California, proposals that exotic pestilence was an agency of change in the state prior to 1769 are generally ignored. For example, when trying to account for the differing behavioral responses of the Coast Miwok to the arrival of the Drake (1579) and Cermeño (1595) expeditions, Robert Heizer (1974: 26) stated, "Such contact, plus transmittal of what the English might have considered among themselves minor illnesses, could have led to sickness of epidemic proportions after the English departed. I do not suppose that this suggestion can be seriously entertained, but there is nothing really improbable about it." In retrospect, there really is nothing improbable about his speculations. As discussed earlier, the perspective that California was an island of immunity to protohistoric epidemics endures for a number of reasons. Foremost among them is a concern that concrete evidence derived from within the state is still not com-

pelling (Kealhofer 1996: 64). This article has endeavored to demonstrate that a multidisciplinary perspective reveals otherwise.

Many exceptional cultural, epidemiological, and biological conditions have been associated with the protohistoric and early colonial settings in California. They have hitherto been interpreted as reinforcement for the state's perceived uniqueness and relative isolation from the processes that influenced the remainder of northwestern New Spain. Conventional endeavors to account for the archaeological, ethnographic, and historic expressions of these patterns have relied on reasonable and informed conjecture. However, these explanations have produced numerous contradicting scenarios that are not always supported by precedent in other regions or that fail to conform to the colonial record in California.

On the other hand, it is eminently plausible that many of the precolonial and colonial anomalies in California are products, and therefore evidence, of protohistoric disease events. More precisely, these distinctive phenomena may be testimony in themselves that Old World pathogens were, indeed, factors for at least some periods and places within California prior to 1769. Accordingly, efforts to understand them must seriously entertain a cultural and physical landscape that had experienced exotic germs during the protohistoric period. Moreover, the consideration of Old World diseases as agents of premission change provides a unifying perspective: It reconciles many of the contradictions inherent in conventional reasoning; it brings California's protohistoric period into conformity with adjoining regions of northwestern New Spain; and it yields a more accurate understanding of colonial history and environments.

The evidence indicates that mission-era conditions and ethnographic accounts are incomplete analogs of California's pre-Columbian past.[39] They do, however, emulate certain specific protohistoric circumstances, which are neither entirely pre-Columbian nor entirely colonial in nature. That is, colonial conditions in much of the state are a reflection of cultures and environments that were destabilized and changed by foreign parasites but not yet by foreign settlement. In essence, missionization commenced in a landscape that had been markedly changed during a unique period, which lasted for 250 years in the state. Within this time span, pre-Columbian lifeways endured but in reduced and altered forms. Ultimately this modified existence in California was virtually destroyed by the addition of foreign settlement and the processes that accompanied it.

Notes

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1 The chronological parameters for California's protohistoric period used here differ from the more common designation of 1542 to 1769. The latter begins with the first documented Old World contact (the Cabrillo landfall, 1542–3) but fails to include the preceding period, which began with the landing of Cortés in Mexico in 1519. During this interim, Old World diseases (e.g., smallpox) first ravaged Mexico and spread to the Inca Empire in South America (Dobyns 1963a: 494; Cook 1981). The same epidemic/pandemic and, perhaps, others are thought to have spread northward across the Rio Grande prior to Cabrillo's voyage (Dobyns 1981: 50; Preston 1996: 9–10). Therefore, the possibility that California may have received exotic pathogens prior to Cabrillo has compelled the use in this article of an expanded protohistoric period.

2 The survival of these interpretations is both understandable and unwarranted at the same time. The dual beliefs that ethnographic material collected during and after the colonial period and that archaeological remains that postdate Cortés's landing in Veracruz are suitable mirrors on pre-Columbian America endure for a number of reasons. Despite the diminishing appeal of the so-called frontier thesis, which views America as "a land that was once sparsely populated by technologically, socially, and mentally backward people" (Reff 1991: 11), the intellectual momentum and mindsets it has generated continue to linger in some quarters. Likewise, the preeminence of historical/ethnographical analogy over archaeological inquiry in the interpretation of native peoples and environments still remains to condition presuppositions about California (see ibid.: 11–13; McNeill 1976: 3–4; Dunnell 1991: 567; Raab 1996: 71).

3 Although a number of historians (e.g., Stearn and Stearn 1945; Zinsser 1960 [1934]; Crosby 1972; McNeill 1976) have long been convinced of the historical importance of exotic diseases, the ensuing debate over its value was generally conducted by ethnographers, ethnohistorians, and geographers who were interested in determining the validity of documentary evidence relating to pestilence during both the protohistoric and historic periods. Notable research in this vein was conducted by Carl Sauer (1935), Woodrow Borah and Sherburne Cook (1963), Henry Dobyns (1963b), William Denevan (1976: 8–11), Robert Dunnell (1991: 563), and Daniel Reff (1991). Their evaluations of documentary evidence, in addition to shedding light on the historic importance of disease, has disclosed strong suggestions that introduced pathogens did spread beyond the European settlement frontiers into protohistoric environments. However, because of their media of research, they were unable to substantiate the phenomenon. By definition, only archaeological and ecological evidence is capable of accurately determining the occurrence and impact of foreign germs during the protohistoric period (i.e., before historical documentation) of various New World realms (Ramenofsky 1990: 44; Stahl 1993: 253). However, "no single discipline holds the key to understanding this subject" in its entirety (Stannard 1991: 520–1).

4 By no means, however, do the revelations entirely support Henry Dobyns's

uniformitarian contention that epidemic diseases surged forward and "swept through all of the most densely populated portion of the Americas" (Dobyns 1983: 13). Instead, individual epidemics seem to have followed "corridors of least resistance, occasionally dying out in cul-de-sacs" (Blakely and Detweiler-Blakely 1989: 62). Indeed, even in the presence of exotic diseases, the disruption of native cultures was often matched or surpassed by associated cultural calamities and their biological consequences (Jackson 1994: 118).

5 In the American regions known to have been afflicted by introduced pestilence prior to Euro-American settlement, the demographic and cultural evidence indicates a disruption often on a par with that observed later during the time of actual foreign occupation and documentation (see Cook 1973; Hudson 1980; Dobyns 1983; Spiess and Spiess 1987). Accordingly, because of the extreme demographic impacts determined for the protohistoric period in these regions, it has been concluded that the surviving and recovering populations would not necessarily accurately reflect either the genetic or the cultural characteristics of their pre-Columbian ancestors (see Ramenofsky 1982: 351; Dobyns 1991: 554; Dunnell 1991: 570, 573).

6 Furthermore, dramatic environmental consequences were triggered by disruptions in native land-use practices that accompanied and followed the radical demographic and cultural shocks caused by virulent epidemics (see Rostlund 1957, 1960; Sauer 1980; Neumann 1985).

7 Materials that address the protohistoric presence in Sierran environments of beads and, possibly, colonial New Mexicans are Cook 1960: 251; Nevers 1976: 38–39; Malouf and Findlay 1986: 504–6; Moratto et al. 1988: 335; and Arkush 1990: 632.

8 Nearly every protohistoric landfall in the Western Hemisphere (including along the Pacific coast) is recognized to have been accompanied by an importation of germs (see Preston 1996: 20–22). Even the initial landing of Captain James Cook among the isolated islands of Hawaii deposited lethal disease organisms that dramatically affected indigenous populations (Stannard 1990: 338).

9 Earlier suggestions that Kitsepawit's date of birth was 1804 have been challenged, and it seems instead that he was born in 1839 (see Johnson 1982: 135).

10 Information concerning settlement and demographic changes in the proximity of the Santa Barbara channel can be found in Bolton 1916: 26; Shaler 1935: 57–59, 61; Brown 1967: 35, 78; and Johnson 1988: 84, 108–16. The relative size of village populations near the Santa Barbara channel are known to have changed on a seasonal basis, and inordinate numbers of Chumash may have been drawn to the coastal settlements to see the Europeans. It remains uncertain how these and other conditions may have influenced the varying observations during the protohistoric and initial colonial periods (Johnson 1988: 108–16).

11 These discrepancies led Robert Heizer (1941: 325, 1974: 26) to speculate that the Drake expedition may have unleashed an epidemic of infectious diseases, such as syphilis, which altered the perceptions and behavior of the Coast Miwok toward foreigners. There also seems to be a lack of congruence between the sociopolitical conditions disclosed for groups of late pre-Columbian and protohistoric peoples and those observed later during the early missionary period (Reff 1987: 90). The priests after 1769 routinely characterized native settlements only in primitive economic and political terms (Bean and Lawton

1976: 46; also see Sheridan 1992: 157). Archaeological reappraisals of the social complexity exhibited by some Native Californian peoples appear to reinforce the probabilities of a reduction of cultural sophistication during the protohistoric period (see Chartkoff and Chartkoff 1984: 23; Beaton 1991: 949; Lightfoot 1993: 184–5).

12 Although the Moraga expedition of 1806 occurred decades after the first colonial settlements, its members noted signs of village abandonment on the western side of the San Joaquin Valley (Muñoz, in Cook 1960: 248–9). Similar observations were recorded, as well, in other areas of the valley and on the north coast around this time (see Gayton 1936: 81, 83; Heizer 1972: 9). It is uncertain when these indigenous settlements were abandoned or whether exotic diseases were the cause.

13 For information regarding the documented archaeological indicators and cultural responses to virulent epidemics in other regions of North America, see Dubois 1939; Hudson 1980; Walker 1991: 202–4; Borah 1992; Dobyns 1992: 218, 1983: 313–25; Stodder and Martin 1992: 68; Upham 1992: 228–30; and Hickerson 1997: 32.

14 David Stannard argues effectively that the post-European population declines experienced in Hawaii and throughout the Americas are primarily the result of "infertility and subfecundity arising from the disease, stress, and malnutrition that followed in the trail of the European invasion" (Stannard 1990: 325). Some of the demographic and health conditions of the native peoples encountered during the initial years of mission founding in California seem to reflect similar epidemiological legacies.

15 Insights gained from mission demographic analyses and other indicators of protohistoric diseases raise questions concerning the legitimacy of the population estimates for the state as a whole. Contemporary appraisals are grounded in the assumption that Native Californian populations were uncontaminated by foreign processes prior to 1769 (Cook 1976a: 43, 1978: 91). These suppositions are interwoven with conventional wisdom but are arguably incompatible with regional demographic comparisons, environmental fertility, and the actual conditions of the early colonial period (see Preston 1989: 90, 1990; Stannard 1992: 24). As such, the variances in themselves may be interpreted as portents of premission infection and are contradictory to the enshrined presumptions that have led to, and reinforced, orthodox thinking.

16 Certainly missionization was not instantaneous, but recruitment was still rapid enough to have included the bulk of the coastal populations by 1804 (see Costello and Hornbeck 1989: 313; Jackson 1994: 38).

17 Owing in large measure to dense populations and a variable environment, the economic underpinnings of the Native Californians during late pre-Columbian times evolved into intricate and complex subsistence systems. In order to ensure against periodic resource stress caused by population pressure, competition, or environmental fluctuation, an elaborate infrastructure of social buffers and exchange systems evolved, or was formulated, to help minimize risk throughout the coastal environments (Larson et al. 1994). Few would disagree that these sophisticated adaptive strategies were irretrievably disrupted by the consequences of European settlement.

18 The extended interim between the first European settlement and the occurrence of widespread epidemics seems to have also been the case with respect to Cali-

fornia's interior. It was not until the 1830s that chroniclers accompanying the numerous expeditions that penetrated the heart of the state began to report the presence of serious and widespread epidemics. The differences in living conditions and climate between the coastal mission realm and the interior environments of the state have been cited as possible explanations for this suggested epidemiological respite (Cook 1976b: 209–10, 1960, 1962).

19 The notion that California's perceived early isolation played a determining role in diminishing the frequency and severity of epidemic disease is somewhat contradictory to the precedents documented for adjacent areas of northwestern New Spain. The state was no less isolated from European contact during the early colonial period than were Arizona or Baja California following their initial missionization (1687 and 1697, respectively). Severe epidemics not only accompanied the early settlers to these regions but also are thought to have plagued them during their premission or protohistoric interludes (see Aschmann 1967 [1959]: 189; Holmes 1963: 422; Jackson 1981: 317, 1985: 468). Population density and the degree of human interaction among colonial missions and settlements must be considered in the determination of relative isolation and the prospects for disease dissemination. It has not been suggested that Arizona or Baja California contained either an aboriginal or a mission-era population equivalent to that of the lusher environs of coastal California. Beginning with colonial settlement, these regions were rather quickly depopulated, but, nevertheless, disease events continued with a frequency and a mortality greater than would be endured farther north in California (Cook 1937: 19–26; Dobyns 1963b: 181; Jackson 1981: 308, 310).

20 The relatively low number of epidemics in California has also been interpreted as a partial outcome of the actions of a watchful colonial administration that was alert to the dire threats of epidemic disease. It is reasonable to assume that by 1769 priests and other colonial officials were probably more knowledgeable about the tragic toll that epidemics had taken in adjacent areas of northwestern New Spain and were also more privy to new practices of quarantine and inoculation. Endeavors to screen immigrants, to immunize (principally after 1820), and to quarantine infected vessels have been cited as examples of vigilant officials using preventive measures that may have successfully thwarted the spread of epidemics (see Cook 1939: 154, 163–4, 1976b: 18).

21 California's haphazard geography of epidemic contagion has been cited as a refutation of Henry Dobyns's controversial hypothesis that pandemics swept uniformly throughout the Americas (Larson 1994: 134; Walker and Johnson 1994: 118).

22 Compared to Baja California, for example, the aboriginal populations of California were greater and more widely dispersed in a more varied land. As a result, interactions among peoples were geographically more complex, more numerous, and less restricted to relatively fewer corridors (see Davis 1961).

23 For example, Cary Meister (1975: 343) maintains that repeated exposure to foreign diseases resulted in immunities that permitted populations to increase among native peoples along the Middle Gila River in Arizona (also see Ezell 1961: 19).

24 Archaeological findings from numerous locations across the state have revealed additional settlement abandonment and curtailments of village use during the protohistoric period. For example, a village site on San Miguel Island that was continuously occupied for several hundred years was abandoned during the

seventeenth century (Walker et al. 2000). Farther to the north, Chester King (1978: 66) noted similar changes in settlement use and location in the San Francisco Bay area that appear to have occurred during the protohistoric period (also see Glassow 1996: 15).

25 Additional cemeteries with unusual demographic patterns such as those on Santa Rosa Island are suspected to be remnants of the protohistoric period, but the dating is unrefined (Orr 1968: 200–1). Erlandson and Bartoy (1995: 11) point out that "today, high precision radiocarbon dating has the potential to roughly date cemeteries or village sites to the protohistoric era, but this requires calibration of radiocarbon dates to calendar years, a procedure still rarely done by California archaeologists."

26 The Santa Clara burials were also accompanied by osteoarchaeological indications of either malnourishment or disease. The site is thought to postdate 1769 but predate the missions in this portion of California. Speculations that Old World disease might have been responsible have been entertained (Hildebrandt et al. 1995: 97–98). While not precisely conforming to the intent of this article, these disclosures reveal that colonial processes are recognized as having been dispersed in the vanguard of settlement, often through trade within the state after 1769 (see Moore and Imwalle 1988: 41). It seems reasonable, therefore, to ask why similar processes would not have carried exotic diseases into California from the colonial settlements of northwestern New Spain when the state's porous borders were conduits for the interaction of native peoples and for sporadic colonial entradas (see Dobyns 1992; Preston 1996: 17–20).

27 Studies conducted by osteoarchaeologists have considerably enhanced our knowledge about the relative health of the native Californians. The bones seem to report that acute food shortages were generally reduced over time (Early to Late Holocene) but were accompanied by a chronic diminishment in the quality of health (Doran 1980: 119; Dickel et al. 1984: 450, 454; Walker et al. 1989: 360). Patricia Lambert (1993: 517), referring to the Channel Chumash, postulates that "increases in population density, sedentism, and interactions with outsiders are the most likely explanations for the decline in health seen in these populations." Some interesting reversals in these health trends may provide useful and instructive material in the debate over what is, or is not, evidence for exotic pathogens in protohistoric California.

28 Patricia Lambert believes that the documented improvement in several aspects of health among the Channel Chumash occurred before the 1540s (see Lambert 1997: 96–97, 102–3). She suggests that increased trade may have reduced local resource shortages and thereby diminished the catalyst for conflict (also see Kennett 1998: 386). Trade aside, a transition to more peaceful times prior to the 1540s may still have begun during the protohistoric period (1519–1769). Lambert also theorizes that the return to conditions of greater hostility on the eve of the mission period may have been due to social stresses that lingered in the aftermath of droughts; however, she mentions also the possibility of proto-European influence.

29 An increase in the presence of elaborate grave goods during the protohistoric period may also be reflective of disease-induced population reductions among the Chumash peoples that facilitated a rise in material wealth for the survivors (Kealhofer 1996: 60–61).

30 It is recognized that periosteal lesions can be produced by infectious disease, nutritional deficiencies, or as a by product of trauma (Lambert 1993: 517).

31 Increasing hypoplasia in the Central Valley has been found to have been higher also during Phase 2 (1500–1840) of the Late period in the valley, when famine and nutritional imbalance appear not to have been prevalent (Heizer and Elsasser 1980: 71). These conditions have led some researchers to suggest disease as a possible cause and to reason that introduced pathogens may have been responsible for the indicated stress (McHenry and Schulz 1978: 41, 45; Doran 1980: 16; Basgall 1987: 38). Whether the introduced germs arrived prior to or after 1769 is not known for certain.

32 The same Spanish diaries and reports that document an abundance of large game on the coast and in the interior are also laced with descriptions of smaller game (e.g., birds, hares, fish, squirrels) observed in numbers and concentrations that impressed and often astonished the onlookers (see Fages 1911: 13, 15, 1937: 12, 22, 76–77; Bolton 1930: 185, 202, 433; and Palóu 1966, 2:226).

33 Evidence of overpredation in various North American environments during the pre-Columbian era is found in Daubenmire 1985; Yesner 1989; Grayson 1993; Truett 1996; Lent 1999; Butler 2000; and Kay et al. 2000. During the initial Euro-American explorations in the West, concentrations of wildlife were encountered most frequently within buffer zones between tribes, where predation pressure was less. Furthermore, game found sanctuary in habitats that were less accessible to their human predators, and some species were also able to outdistance hunters in open plains and valleys (see Geist 1996: 39 and Martin and Szuter 1999: 38).

34 The chronological parameters for this upsurge in game are made more intriguing because, as Henry Dobyns (1983: 25) believes, "aboriginal lifeways for the native peoples of North America clearly terminated with the large-scale depopulation caused by the initial smallpox pandemic in 1520–1524."

35 This pattern of human predatory behavior conforms with optimal foraging models, which are applicable to both animal and human sustenance behaviors (see Hames 1987; Hawkes 1987).

36 Documentation for the dwindling availability and reliance on low-cost fauna during the mid- to Late Holocene is found in Walker 1982; Hildebrandt et al. 1984; Basgall 1987; Bettinger 1991; Grayson 1991; Glassow 1992; Hildebrandt and Jones 1992; Simons 1992; Broughton 1994a, 1994b, 1997, 1999; Whitley 1994; Colten 1995; McGuire 1995; Bayham and Valente 1997; Butler 2000; and Porcasi et al. 2000.

37 Archaeological findings that illustrate an upsurge in the availability and utilization of low-cost or preferred animal prey during the late precolonial centuries are found in Glassow 1992, 1996; Simons 1992; Colten 1995; Jones and Hildebrandt 1995; McGuire 1995; Jones 1996; Porcasi 1995; Taite 1997; and Butler 2000. Endeavors to account for the increasing availability and reliance on preferred game during this period are also varied and mostly conjectural. Improvements in the hunting capabilities and processing practices utilized by the Native Californians and the possibilities of environmental and demographic fluctuations have been forwarded as conceivably explaining these predation anomalies (see Simons 1992: 80; McGuire 1995: 118; Taite 1997: 16).

38 During the colonial period (1769–1848) foreign visitors and immigrants made note of indigenous predation patterns that also seem to have characterized the pre-Columbian and protohistoric periods. For instance, when Zenas Leonard and his party approached the Tulare Lake Basin from the north in 1834, he remarked (in Ewers 1959: 120) that "here game is very scarce, owing to the numer-

ous swarms of Indians scattered along in every direction." When, on the other hand, Native Californian populations rapidly declined, the colonial record testifies to just the opposite—a rapid expansion of game numbers. Illustrative are the observations made by George Yount in 1833, when he marveled at the abundance and tameness of the game near Benicia in the aftermath of a malaria epidemic: "The rivers were literally crowded with salmon, which, since the pestilence had swept away the Indians, no one disturbed—it was literally a land of plenty" (in Camp 1923: 52).

39 Brian Fagan and Herbert Maschner (1991: 924) came to a similar conclusion and explained that there "has been a tendency to think of the ethnographic record of the 17th–19th centuries A.D. as a true record of the state of native American society along the west coast before European contact. . . . nothing could be further from the truth."

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