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COASTAL HUNTER-GATHERER SETTLEMENT SYSTEMS IN THE SOUTHERN NORTH COAST RANGES

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ABSTRACT

Models of coastal hunter-gatherer settlement systems commonly emphasize an inverse relationship between coastal productivity and residential mobility. In this paper, archaeological data from the southern North Coast ranges are examined to evaluate ethnographic observations of low coastal productivity and high residential mobility. Recent research at Albion Head, MacKerricher State Park, and the Fort Ross Study Area indicate considerable variation in the degree of residential mobility and the elaboration of settlement types in late prehistoric settlement systems. A "central-based village" model is described in some detail using survey information from Fort Ross. The implications of finding different kinds of settlement systems in coastal Sonoma and Mendocino Counties are considered briefly.

Studies of coastal hunter-gatherer populations have long stressed the relationship between resource "abundance" or "richness" and the degree of residential mobility. Ethnographic studies of the coastal Pomo (Kashaya or Southwestern Pomo, Southern Pomo, Central Pomo, Northern Pomo) of the southern North Coast Ranges of California are no exception. Since the 1920s ethnographers have characterized this region as one of low coastal productivity. That is, the density and diversity of wild food resources available to hunter-gatherer populations were perceived as limited. Consequently, coastal Pomo settlement systems have been portrayed as small, dispersed communities, with individual family units practicing extensive seasonal rounds during much of the annual cycle. Similar interpretations have been proposed for late prehistoric hunter-gatherers of the region as well.

In this chapter, I argue that ethnographic descriptions of residentially mobile Pomo groups in a resource-poor environment may be appropriate models for some, but not all, late prehistoric coastal hunter-gatherers of the region. Here, the coastal region of the southern North Coast Ranges is defined as the rocky coastal shore and adjacent uplands of Mendocino and Sonoma Counties (Figure 2.1). I begin by synthesizing Perlman's (1980) coastal productivity model that predicts high residential mobility, small group size and minimal sociopolitical complexity among coastal hunter-gatherer societies in high wave-stress, mountainous coastal regions such as the North Coast Ranges. I then summarize several ethnographic descriptions of coastal Pomo peoples that support this argument. Finally, I describe the results of recent archaeological studies of coastal hunter-gatherer populations in Mendocino and Sonoma Counties. These studies indicate that substantial variation characterized the late prehistoric subsistence-settlement systems of the southern North Coast Ranges. The implications of these findings are then discussed.

THE COASTAL PRODUCTIVITY MODEL

The most elegant presentation of the coastal productivity model was by archaeologists in the 1970's and 1980's. Many coastal adaptation studies tend to stress the relationship between resource productivity (density, diversity and seasonal availability of foodstuffs) and the nature of hunter-gatherer subsistence-settlement systems. For example, Perlman (1980) generates expectations of hunter-gatherer populations (degree of residential mobility, size of local group, complexity of sociopolitical organization) based on the level of coastal resource productivity. Perlman (1980:292-294) predicts large, sedentary communities will evolve along highly productive coastlines characterized by broad and shallow continental shelves and low wave-stress estuaries. His predictions concerning the rise of sedentary communities along rich estuaries that contain a diverse range of terrestrial, estuarine and marine resources have been echoed by

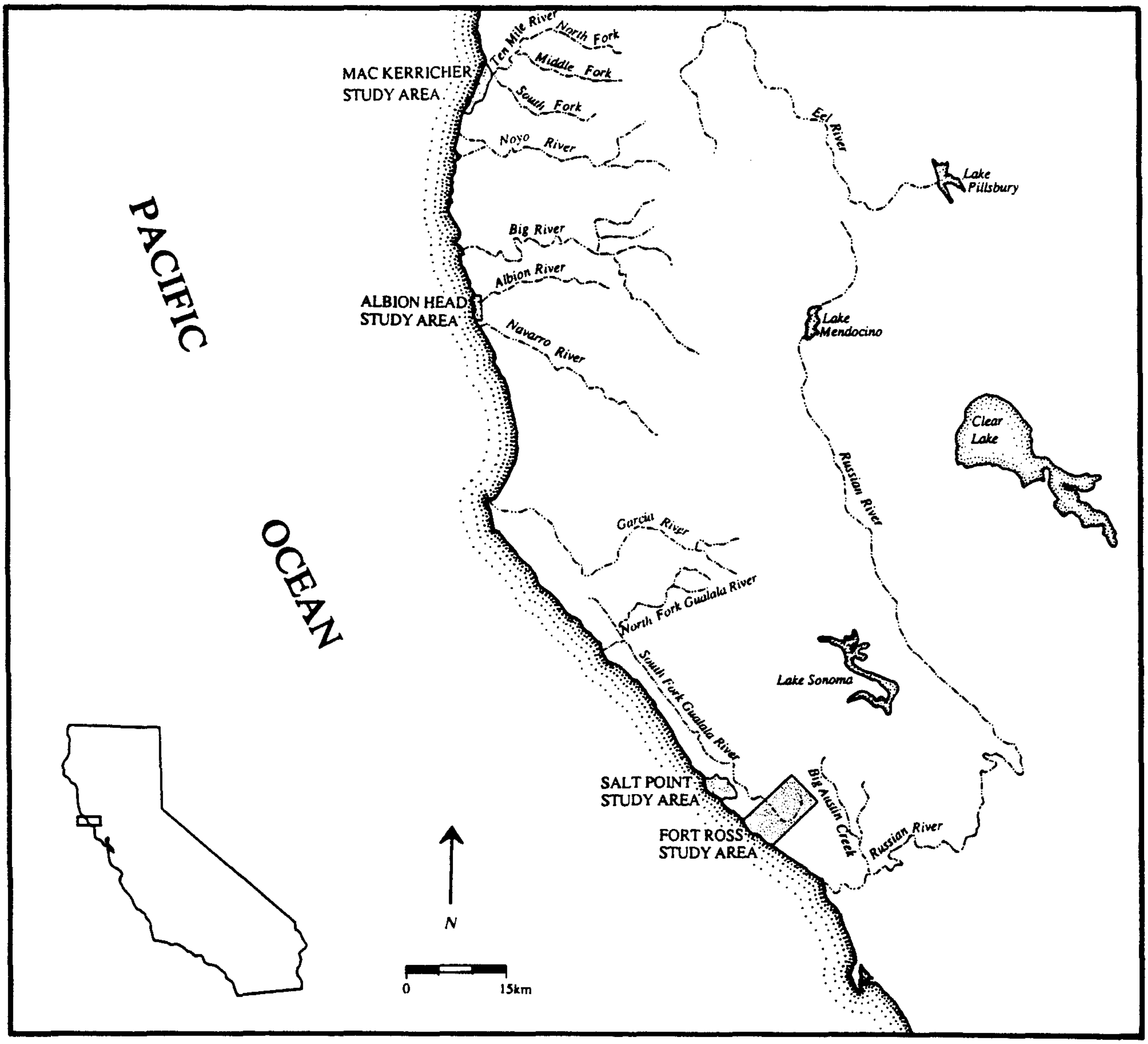

Figure 2.1. The southern North Coast Ranges.

many other archaeologists working in temperate coastal environments (Spiess et al. 1983; Yesner 1980; Lightfoot et al. 1987). Establishing residential bases in the estuarine ecotone minimizes transportation costs by limiting the distance task groups travel to nearby resource patches (see Gwynne 1982:247-275; Rowley-Conwy 1983:122-125; Clark 1983:99-102).

Perlman (1980:284-294) contrasts the above expectations with those predicted for hunter-gatherer societies adapting to regions of relatively low coastal productivity. He suggests in coastal environs characterized by steep continental shelves, rocky intertidal zones, and high wave-stress shores, the most optimal solution would be that of small, residentially mobile, band-level societies. Perlman (1980:271) depicts the North Coast Ranges region of California as a mountainous coastline with a lower level of coastal productivity than many other coastal regions of North America (e.g. southern New England coastline). Based on Perlman's (1980) model, one would then expect to find hunter-gatherer societies in this region to be characterized by small populations, by minimal sociopolitical complexity, and by extensive seasonal rounds.

COASTAL POMO SETTLEMENT SYSTEMS

It was Alfred Kroeber (1925:225-234) who first examined the relationship between resource productivity and Pomo settlement systems in the southern North

Coast Ranges of California. In comparing the coastal Pomo to interior Pomo groups located along the Russian River and at Clear Lake, he noted that the food supply of the former was inferior for two reasons. First, the rocky reefs and rocky intertidal zones that characterize much of the coastline provide only a "fair" amount of food. Second, a dense redwood belt, extending anywhere from eight to 32 kilometers in width, parallels the narrow coastal terrace across the region. Consequently, the nearby hinterland, which is dominated by dense redwood groves that support scant economic resources for hunter-gatherers, is perceived as being largely barren and unproductive. Kroeber (1925:234) suggested that relatively few Pomo communities could survive on the coast because of the relative paucity of food.

Fred Kniffen (1939), a geographer from U.C. Berkeley, elaborated upon Kroeber's initial ecological interpretation. Kniffen also stressed the very poor productivity of the redwood belt, and noted that even along the coast no single resource is abundantly present (pg 383). In comparing the Soutwestern Pomo with other interior Pomo peoples (Clear Lake, Russian River), he observed:

> *In general abundance and variety the coast area was least well endowed by nature. It possessed special resources in several things: salt, seaweed, and shellfish. These attracted the regular visits of Indians from as far away as Clear Lake. Acorns and the wild oats were important; in no single resource did the area stand out. The necessity for a variety of occupations to gain a livelihood compelled seasonal change of residence. As a result they were lacking private ownership, specialization of handicraft, close political organization, and frequent and regular travel to other areas. Of the areas considered, this was the least densely populated* (Kniffen 1939:391).

Kniffen (1939: 384) argued that the coastal Pomo had to "scour the country to provide their livelihood from a variety of sources." He postulated an annual cycle for the Southwestern Pomo in which the local population was dispersed into small family units for most of the year. These family groups foraged for shellfish, seaweed and fish during the late spring and summer, and for berries, acorns, and quail on interior hills in the late summer and early fall. During the winter the population aggregated into villages set back from the coast in which people subsisted on stored goods, and from which people hunted deer and fished for silver salmon and steelhead trout in nearby streams.

Edward Gifford, who worked among the Pomo in 1915-1917, 1934 and 1950, succinctly characterized the Southwestern Pomo as:

> *among the most primitive of the California aborigines, a fact to be correlated with their mountainous terrain on a rugged, inhospitable coast. Their low culture may be contrasted with the richer culture of the Pomo of the Russian River Valley and Clear Lake, environments which offered opportunities for greater cultural development than did the forested mountains fronting the Pacific* (Gifford 1967:1).

He described an annual cycle based primarily on the writings of P. Kostromitonov, who from 1830 to 1838 served as the manager of the Russian trade outpost of Fort Ross on the central Sonoma coastline. Gifford's description of the annual cycle is almost identical to Kniffen's seasonal round, further supporting the idea that a variety of coastal and interior places were visited by Pomo groups during their seasonal movements.

More recent ethnographic overviews have continued to stress the ecological constraints of the rocky North Coast Ranges coastline. In their synthetic chapter on Western Pomo lifeways, Bean and Theodoratus (1978:289) reported that the:

> *coast-redwood zone was the least favorable of the habitats exploited by the Pomo due to the heavily eroded nature of the coast beachline backed by an unbroken redwood forest. Further, it was restricted in the amount of edible plants and animals available* (Bean and Theodoratus 1978:289).

They described a settlement pattern characterized by relatively permanent villages in the interior (sometimes as far as 32 kilometers from the coast) and seasonal campsites on the coast, river and creek mouths, and in favorable areas in the redwood forest.

Archaeologists working in the southern North Coast Ranges have employed the ethnographic descriptions as analogs to aid in reconstructing the past (e.g., Meighan 1967). Most scholars recognize that ethnographic case studies can provide insights into prehistoric coastal adaptations: how hunter-gatherer groups adapt to similar environmental conditions with similar levels of technological sophistication. Furthermore, the ethnographic descriptions make logical sense to most archaeologists, since they tend to support predictions generated from coastal adaptation studies of the 1970's and 1980's. Ethnographic descriptions of the coastal Pomo as small, residentially mobile groups correspond nicely with Perlman's (1980) expectations for this coastal region.

THE SHORTCOMINGS OF POMO ETHNOGRAPHY

In employing Pomo case studies as ethnographic analogs for reconstructing the past, one must recognize two critical problems. First, ethnographic studies of the early 20th century were documenting Pomo groups who had been in close contact with various Euro-American colonial institutions since at least the early 19th century. This included the Russian mercantile operation at Fort Ross, Spanish padres at missions in San Rafael and Sonoma, Mexican ranchers, and American settlers, miners, and lumberjacks. While the effects that Euro-American economic activities, settlements and diseases had on traditional Pomo lifeways have yet to be fully understood, it is clear that changes in subsistence practices and settlement patterns had occurred by the 1920's and 1930's (see Kennedy 1955; Cook 1973).

Second, with few exceptions (Powers 1976; Kennedy 1955), ethnographic descriptions of coastal Pomo groups were not based on participant observation. Rather, most were written by students trained by Alfred Kroeber at U.C. Berkeley who employed the "memory culture" methodology. That is, they interviewed the oldest members of the community (who would speak with them) in order to reconstruct childhood memories of their culture. Studies were often based on a handful of informants interviewed over a few weeks (McLendon and Oswalt 1978:276-277). Kroeber's intent was not to record Pomo lifeways in the early 20th century. Rather, the ethnographers were explicit in their attempts to reconstruct traditional native lifeways prior to their acculturation by Euro-American colonization (see Heizer 1978:8-10; Kroeber 1925:v-vii). By interviewing elders who were born in the mid-nineteenth century, Kroeber and his students attempted to filter out the effects of European and American contact on native lifeways.

The implication of this "memory" methodology is that the Pomo subsistence/settlement systems interpreted by ethnographers are based on data not observed first-hand by field workers. Instead, the ethnographic accounts are based on the childhood memories of a few people who grew up during the heyday of Russian, Spanish and Mexican colonialism in the region. It is unclear whether the ethonographic case studies describe actual subsistence pursuits and settlement patterns that once operated in the region prior to Euro-American contact. They may, in fact, reflect "shreds and patches" of practices dating to the mid-19th, late 19th and early 20th centuries. In any event, these ethnographic studies should be viewed only as models that represent explicit endeavors to reconstruct Indian lifeways prior to Euro-American contact. There is no necessary objective reality inherent in the scenarios; they are hypotheses that can only be evaluated using archaeological data.

ARCHAEOLOGICAL FIELDWORK IN THE SOUTHERN NORTH COAST RANGES

Coastal Mendocino County

Ethnographic descriptions of the seasonal rounds of Northern and Central Pomo groups have been rigorously evaluated at Albion Head (Figure 2.1) in the central Mendocino County coast by Thomas Layton and Dwight Simons (Layton 1990). In a detailed analysis of artifactual and faunal remains from five coastal sites, they demonstrated that the coastal strip was seasonally used in late prehistoric times. They postulated that small groups from interior and southern coastal homelands established short-term coastal camps to hunt sea mammals and terrestrial game and to gather shellfish and plant foods in the intertidal zone and nearby coastal prairie and riparian woodland habitats. Most camps appear to have been occupied during the spring and/or summer months on the basis of various seasonality indices. At the end of the summer season, the visitors are believed to have returned to homelands located to the south or to the east where winter villages were established. Layton (1990:188) suggested that some of these interior winter villages may have been located in Little Lake Valley, more than 20 km overland from the coast. Layton and Simons' findings correspond relatively closely with ethnographic accounts of Northern and Central Pomo seasonal residential movements.

A somewhat different settlement pattern has been described in the northern coast of Mendocino County. Greg White's (1991) investigation of the MacKerricher State Park (Figure 2.1) yielded evidence of year-round occupations of coastal sites during the MacKerricher Phase (A.D. 0-350). White argued that a sedentary settlement system could be supported on the basis of both terrestrial and coastal resources, especially Stellar sea lions. His excavations in the summer of 1989 revealed an oval shaped house structure with numerous subfloor pits (White 1991). In the Sandhill Phase (A.D. 1300-1850), there is evidence for a shift to short-term, early fall occupations in which fisherpeople systematically stripped intertidal rocks for mussels (White 1989:141). After the seasonal mussel harvests, the camps appear to have been abandoned as people probably continued their annual cycle, possibly establishing winter villages in the nearby environs.

Coastal Sonoma County

In the last twenty years considerable archaeological research has been undertaken on the Sonoma coast (see Fredrickson 1984). Much of the coastal strip has been surveyed under the auspices of the California Department of Parks and Recreation (DPR) who have initiated broad-scale cultural resource management inventories of their properties (Alvarez and Fredrickson 1989; Bramlette and Fredrickson 1990; Farris 1986; Pritchard 1970; Stewart 1986). In addition, the ridges and valleys that parallel the coast for 10 to 15 km inland have also been surveyed in some places as part of timber sale inventories undertaken by California Department of Forestry and Fire Protection, and for evaulating the effects of construction projects on cultural resources (Fredrickson 1974; Foster 1983; King 1974).

I will focus my discussion on a 5 by 10 km study area in the heart of the ethnographically described Southwestern Pomo territory near the historic Russian mercantile colony of Fort Ross (Figure 2.1). The rectangular parcel, heretofor defined as the Fort Ross Study Area, includes a 5 km strip of coastline, and a 5 by 10 km area of the adjacent mountainous hinterland (Figure 2.2). The topography of the study area consists of a rocky coastline with few protected beaches, a narrow coastal terrace that follows the coastline, and a series of steep ridges and narrow valleys that tend to parallel the coast in the interior. Between the first and second ridges, about 5 km east of the coast, flows the South Fork of the Gualala River which parallels the coast for almost 45 km.

The topographic features paralleling the coast produce a linear configuration of environmental zones within a short distance of the coast. When coastal and terrestrial resources are considered together, a diverse range of plant and animal resources are found within a 10 km walk of the coast. The nearshore waters contain extensive kelp forests, while the rocky intertidal habitats support a variety of plants, mollusks and fishes. The coastal terrace consists of coastal prairie and close-cone pine forest communities dominated by Bishop pine stands that thrive in frequent fog. Simons et al. (1985:266) note that this habitat supported Roosevelt elk before they were hunted out by Euro-Americans. The coastal-facing side of the first ridge, which rises 450 m above sea level, supports dense groves of redwood in steep ravines, while the more open ridge tops sustain tan oak woodlands. The interior-facing side of the first ridge, which slopes down to the South Fork of the Gualala River, is warmer and drier. This inland zone supports patches of mixed oak woodlands (coast live oak, black oak, bay laurel), douglas fir stands, and redwood groves. Here, black-tailed deer and quail flourish, and silver

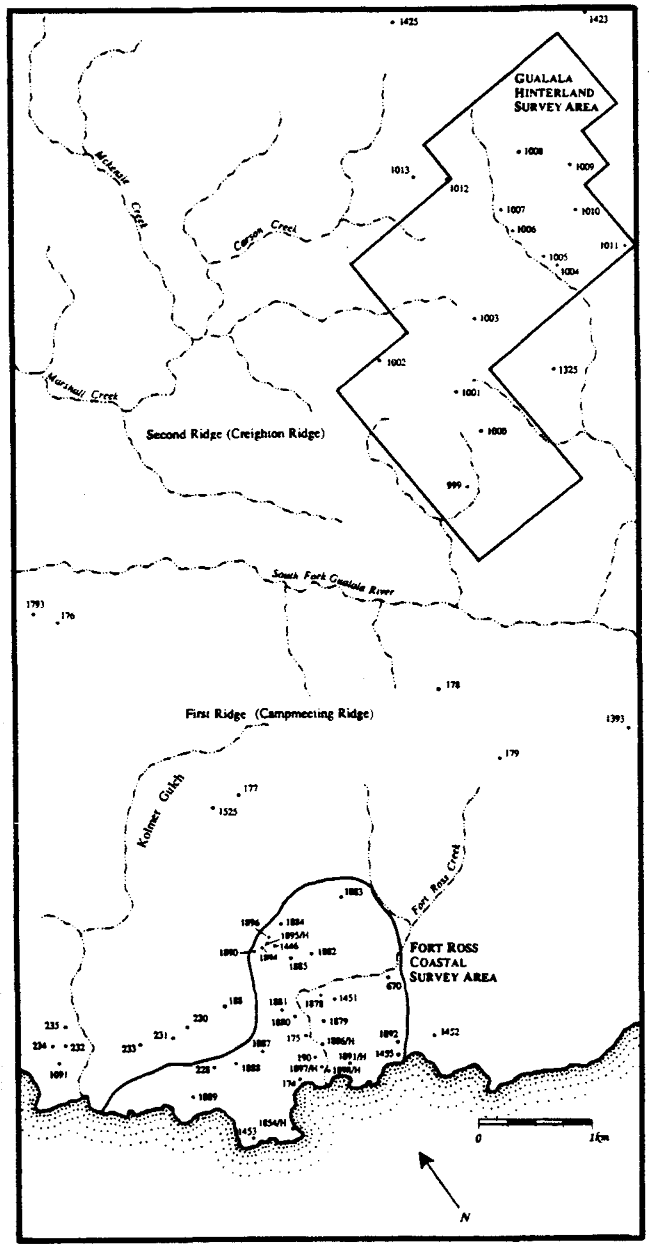

Figure 2.2. The Fort Ross Study Area.

salmon and steelhead trout make seasonal runs up the Gualala River. Beyond the Gualala River, the second and third ridge systems continue to support patches of oak woodlands, although increasingly more chapparal and fewer stands of conifers are found as one moves eastward.

Fifty-four site records have been filed at the Northwest Information Center, Sonoma State University, for the Fort Ross Study Area. The earliest systematic archaeological fieldwork took place in the 1930s and 1940s by Omer C. Stewart and F. H. Bauer whose reconnaissance located several large sites in the study area. In the 1970s and 1980s intensive survey was undertaken in two parcels: a 6.5 km^2 interior parcel near the South Fork of the Gualala River along the second ridge system (Fredrickson 1974; King 1974), and a 2.8 km^2 area within the Fort Ross State Historic Park along the coast (Farris 1984; Lightfoot et al. 1991). Each of these survey areas is described below.

General Reconnaissance

Stewart and Bauer initially recorded thirteen sites in the study area. Of these, Stewart described seven large "villages": four along the top of the first ridge (Campmeeting Ridge) (SON-176, 177, 178, 179), and three along the coastal strip (SON-174, 175, 231) (Figure 2.2). All "village" sites contain one or more "house" features (surface depressions measuring several meters in diameter), diverse artifact inventories, and rich midden deposits. Bauer also identified six shell middens along the coastal strip (SON-188, 230, 232, 233, 234, 235) characterized by dark "midden" soils, high densities of shellfish remains, and various lithic tools and debitage.

Other sites recorded on the top or lower slopes of Campmeeting Ridge or the coastal strip outside the boundaries of the Fort Ross State Historic Park include SON-1091, 1393, 1452, 1525, and 1793 (Figure 2.2). SON-1091 is a shell midden located north of Kolmer Gulch. SON-1393 is a small oval scatter of chert flakes found southeast of the ridge top "villages" of SON-178 and 179. SON-1452 is a cupule rock containing 12 cupules southeast of the Ross garrison on the exposed coastal terrace. SON-1525, a small scatter of Franciscan chert and obsidian artifacts near SON-177, was recorded by Richard Jenkins as part of a timber harvest project. SON-1793 is a small scatter that contains a possible house depression near the original location of SON-176.

Hinterland Survey

A total of 18 sites has been recorded along the South Fork of the Gualala River near the second ridge (Creighton Ridge) from the coast (Figure 2.2). Fourteen sites are found in the 6.5 km^2 survey area described by Fredrickson (1974) and King (1974), yielding a site density of 2.1 sites/km^2. Two sites are recorded as habitation sites. SON-999 contains one house pit, measuring 6 m in diameter, various chipped stone artifacts, some ground stone tools and a midden deposit. SON-1425, an extensive artifact scatter covering 6000 m^2, is also recorded as a possible habitation site. Another site (SON-1001) is described as a large chert quarry distinguished by flakes, cores, hammerstones and preforms. An additional eleven sites (SON-1000, 1002, 1003, 1005, 1007, 1008, 1009, 1011, 1012, 1013, 1325) are defined as lithic scatters, varying in size from 100 m^2 to more than 6000 m^2, containing flakes and occasional chipped stone tools, such as projectile points. A few include ground stone implements such as handstones and pestle fragments. The final class of sites include four petroglyphs (SON-1004, 1006, 1010, 1423) exhibiting one or more cupules ground into bedrock boulders.

Coastal Survey

Since 1970 considerable survey work has taken place in the 2.8 km^2 Fort Ross State Historic Park by archaeologists from the California Department of Parks and Recreation, Sonoma State University, and Santa Rosa Junior College. In 1988 and 1989, field crews from U.C. Berkeley under my direction completed the survey of the few remaining parcels in the park. A total of 27 Native American sites have been recorded for the entire park (including SON-174 and 175 originally recorded by Stewart), yielding a site density of 9.6 sites/km^2.

OMER STEWART'S SETTLEMENT MODEL FOR THE CENTRAL SONOMA COAST

Stewart (1943) proposed a settlement model for the central Sonoma Coast based on his archaeological findings, interviews with Southwestern Pomo informants, and settlement information compiled originally by Barrett (1908:228-235). In this reconstruction, Stewart tended to emphasize the spatial distribution of resources across the coast and interior hinterland, rather than the overall "richness" of the environment *per se*. He noted:

> *the small village communities or tribes are also situated so as to be able to utilize most advantageously the environment. With few exceptions the territory of each tribe includes a section of a valley, a part of a stream, some forested hills* (Stewart 1943:55).

Stewart (1943:50) suggested that relatively permanent villages were established along the first ridge, about 1.5 to 5 km from the coast. He (1943:50) proposed that political relations between villages can be defined in archaeological contexts by the presence or absence of large depressions that may represent former assembly houses. He described a two-tiered hierarchy of settlements along the coastal ridges consisting of large principal villages with assembly houses, and smaller hamlets in the nearby hinterland that lack such structures. He argued that the village communities (principal village and associated hamlets) were optimally located to allow Pomo people to walk short distances in order to exploit coastal, ridge, valley and riverine products. According to his settlement model, sites found in other environmental zones (coastal terrace) away from villages should be short-term camp sites (Stewart 1943:50).

AN ANALYSIS OF SITES IN THE FORT ROSS STATE HISTORIC PARK

A preliminary analysis of survey sites in the Fort Ross State Historic Park is undertaken to evaluate Stewart's "central-based village" settlement model for the central Sonoma County Coast. Archaeological materials were collected from the surface of sites by laying out collection transects that were divided into 1 by 2 m units. Some materials were point provenienced outside collection units. The analysis includes the examination of both the lithic and faunal surface assemblages from selected Ross sites as outlined below.

The classification of lithic artifact types follows the guidelines published by the California Office of Historic Preservation (Jackson et al. 1988). In addition to these, a significant component of the lithic assemblage of some Ross sites consists of broken pieces of rounded cobbles. Most of the pieces appear to have been fired at high temperatures and then quickly cooled (probably in water) to produce fire-cracked rocks. Furthermore, my examination of these artifacts suggests that some may be broken fragments of handstones or millingstones that were recycled as cooking stones. However, others may be simply beach cobbles used as cooking stones. I have defined this rather enigmatic category as fire-cracked/ground stone fragments.

The great majority of the faunal remains recovered from the surface of sites are mollusks. While a handful of animal bones were recovered from survey sites, they are reported in detail elsewhere (Lightfoot et al. 1991). The analysis of the mollusks is based on diagnostic elements (mussel umbos [hinges], chiton plates, abalone whorls, snail apertures, limpet caps) useful in calculating Mininum Number of Individuals (MNIs) (see Waselkov 1987:154-161). We recognize that our estimates of mollusk MNIs are both conservative and tentative. Taphonomic processes, such as trampling, most certainly underestimate the counts of MNIs from survey sites. Many mollusk pieces collected from the surface are so fragmentary and weathered that diagnostic elements can not be identified. Given these taphonomic problems, shellfish classes are broadly defined (e.g., chiton, limpet). The most critical problem is that the fragile, thin-shelled mollusk species (such as mussels) tend to be underrepresented compared to the more durable, thick-shelled species (such as limpets). This problem should be kept in mind when considering the results below.

Lithic densities are calculated by dividing the total number of lithics by the area surface collected on sites. Mollusk densities are determined by dividing the total MNIs by the area surface collected. Archaeological materials point provenienced outside collection units are not included in the density estimates. Table 2.1 presents information on site size, sample fraction (percentage of site area collected), and lithic and mollusk densities. Table 2.2 presents summary information on the obsidian hydration measurements for selected Ross sites.Tables 2.3 and 2.4 present the percentages of lithic categories and raw materials represented on each site, while Table 2.5 presents the percentages of mollusk MNIs.

Table 2.1. Size, Sample Fraction, Lithic Density and Mollusk Density of Selected Ross Survey Sites.

Site Number	Size (m^2)	Surface Collected (m^2)	Sample Fraction (%)	Lithic Density (n/m^2)	Mollusk Density (n/m^2)
228	4536	0	0.00	0.00	0.00
1882	54	18	33.00	0.05	0.30
1883	8247	960	12.00	0.46	0.02
1884	3044	126	4.00	0.67	0.03
1888	85	22	26.00	1.04	2.14
1889	189	8	4.00	0.87	2.37
1890	871	2	0.02	3.00	3.00
1892	120	12	10.00	0.92	6.90
1894	155	0	0.00	0.00	0.00

A chronology has been established for survey sites based on hydration band measurements of obsidian artifacts. Considerable research has been undertaken on obsidian sources in the North Coast Ranges by Fredrickson (1987, 1989), Tremaine (1989), Origer (1987), and Origer and Wickstrom (1982). In this chapter, I employ Tremaine's (1989) comparison constants derived from accelerated obsidian hydration experiments to compare the hydration band measurements of obsidians from Annadel, Borax Lake, Napa Valley, and Mt. Konocti sources. Hydration band measurements are "corrected" to calibrate to the hydration rates of the Annadel flow by multiplying Napa Valley and Mt. Konocti measurements by 0.77, and Borax Lake by 0.62 (see Tremaine 1989:70). Then, using Origer's (1987:55) regression equation for Annadel obsidian based on associated radiocarbon dates, the obsidian readings are ordinally placed into the Upper Emergent Period (A.D. 1500-1812), Lower Emergent Period (A.D. 500-1500), and the Upper Archaic Period (1000 B.C.-A.D. 500). All obsidian hydration results reported in this chapter were analyzed by the Obsidian Hydration Laboratory, Sonoma State University.

Table 2.2. Corrected Hydration Band Measurements for Ross Survey Sites.

Site	N	M	SD	Min	Max	Range
228	12	2.82	0.69	1.70	3.83	(2.1-3.5)
1882	0					
1883	16	1.52	0.50	0.80	2.62	(1.0-2.0)
1884	3	1.01	0.16	0.87	1.23	(0.8-1.2)
1888	3	1.40	0.14	1.20	1.50	(1.3-1.5)
1889	4	1.90	0.75	1.40	3.20	(1.1-2.6)
1890	2	1.97	0.87	1.10	2.85	(1.1-2.8)
1892	2	1.30	0.10	1.20	1.40	(1.2-1.4)
1894	5	1.58	0.67	0.80	2.70	(0.9-2.2)

N = number of obsidian hydration readings
M = mean corrected hydration measurement in microns
SD = standard deviation in microns
Min = minimum hydration measurement in microns
Max = maximum hydration measurement in microns
Range = +/- standard deviation

One must be cautious about the use of the obsidian hydration chronology for dating Ross survey sites. Both Tremaine (1989:1-7) and Origer (1987:1-5) raise a number of important theoretical and methodological concerns. A potentially serious problem is my application of hydration rates developed for interior Sonoma County to the cooler environment of the coast (see Origer 1987:48).

Fifteen of the 27 Native American sites recorded in the Fort Ross State Historic Park appear to have been occupied primarily during the Upper Emergent Period (Annadel hydration measurements of about 0.9 to 1.6 microns) and the Lower Emergent Period (1.6 to 2.8 microns)(Table 2.2). The other twelve sites date primarily to the Russian occupation of the region (1812-1841) or during the later Mexican/American ranch period.

Four (SON-1451, 1453, 1454, 1455) of the late prehistoric sites are not included in the following description. SON-1451 is a small lithic scatter from which six chert flakes were collected by a DPR crew. SON-1453 and 1454 have been recently excavated by Sonoma State University and Santa Rosa Junior College, and are currently being written up. Both are large lithic scatters (1000 m^2 and 1500 m^2, respectively) located on the coastal terrace. SON-1455, also situated on the coastal terrace, has been excavated and reported upon by Farris (1986) and will not be included in this analysis of survey sites. Farris defines it as small seafood processing station occupied sometime between A.D. 830 and 1500.

The remaining eleven prehistoric sites are grouped into the following five classes for descriptive purposes (cupule rocks, lithic scatters, large lithic/shell sites, small low density scatter, and small shell-bearing deposits with moderate to high lithic densities).

Cupule Rocks

Two sites, SON-1879 and 1887, exhibit cupules ground into sandstone bedrock boulders. Seven cupules were counted at the former, and two at the latter. Both sites are found on the coastal terrace. No artifacts were recovered in the immediate area.

Lithic Scatters

SON-228 and 1894 were mapped and collected by U.C. Berkeley crews in 1989. Since artifacts were point provenienced from one (SON-228), and recovered from a disturbed road cut in the other (SON-1894), artifact densities are not calculated (Table 2.1). The primary lithic categories for SON-228 and 1894 include interior flakes (60%, 24%), edge-modified flakes (10%, 9%), cores (5%, 9%), biface thinning flakes (13%, 9%), and shatter (2%, 28%) (Table 2.3). Most lithic materials are manufactured from obsidian (54%, 45%) and chert (33%, 32%), followed by local sandstone (13%, 9%) (Table 2.4). No shellfish remains are found on these sites. The corrected mean hydration band measurement for 12 obsidian artifacts from SON-228 is 2.82 microns (sd = 0.69), suggesting use in the Upper Archaic and Lower Emergent (Table 2.2). The five obsidian hydration measurements from SON-1894 suggest a long use duration that may have spanned from the Lower Emergent to Upper Emergent Periods (x=1.6, sd=0.67).

Table 2.3. Percentage of Lithic Types for Ross Survey Sites.

Site	BC	BI	BT	CO	EM	FC/GF	HA	HM	IF	HS	NW	PC	PE	PP	SC	SH	SM	UN	T
228	5	3	13	5	10	0	0	0	60	2	0	0	0	0	0	2	0	0	39
1882	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	1
1883	0	3	3	6	5	52	1	0	9	5	0	2	1	1	3	8	1	0	569
1884	0	1	2	5	6	59	1	0	6	0	1	3	0	2	2	12	0	0	99
1888	0	0	22	0	22	8	0	0	35	0	0	0	0	0	13	0	0	0	23
1889	0	5	5	5	29	29	0	0	12	5	0	0	5	0	0	0	0	5	18
1890	0	0	22	0	11	0	0	0	11	0	0	0	0	11	11	34	0	0	9
1892	7	0	7	0	12	41	7	0	7	0	0	0	0	0	7	12	0	0	15
1894	0	4	9	9	9	4	0	4	24	0	0	0	0	0	9	28	0	0	22

BC = % battered cobble
BI = % biface
BT = % biface thinning flake
C0 = % core
EM = % edge-modified flake
FC/GS = % fire-cracked/ground stone fragment
HA = % hammerstone
HM = % hopper mortar
IF = % interior flake
T = Total Count of Lithic Artifacts

HS = % handstone
NW = % net weight
PC = % primary cortical flake
PE = % pestle
PP = % projectile point
SC = % secondary cortical flake.
SH = % shatter
SM = % slab millingstone
UN = % uniface

Large Lithic/Shell Sites

Two sites, SON-1883 and 1884, are located in the northern-most section of the survey area on the coastal-facing slope of the first ridge. Elevation is 207 and 268 m above sea level, respectively. The extensive sites, measuring 8247 m^2 and 3044 m^2 respectively, are characterized by similar intra-site spatial patterns. The southern and downslope side of the sites contain dark, shell- bearing deposits, while clusters of lithic artifacts extend along the northern and upslope side of the sites. While no pit depressions were noted, both sites have been seriously impacted by logging activities. However, fired daub, similar to that found in pithouses in the American Southwest, was recovered from the northern half of SON-1883. This finding suggests that semi-subterranean structures may be associated with this site.

The surface collection of SON-1883 (960 m^2, 12% sample fraction) and SON-1884 (126 m^2, 4% sample fraction) yielded moderate lithic densities (0.46/m^2, 0.67/m^2, respectively) and very low densities of mollusk MNIs (0.02/m^2, 0.03/m^2, respectively) (Table 2.1). A diverse range of chipped stone and ground stone lithic categories (14 and 12 categories, respectively) is represented on the sites. The most common lithic category is fire-cracked/ground stone fragments, making up 52% and 59% of the total lithic assemblages, respectively (Table 2.3). The next most common categories include shatter (8%, 12%), interior flakes (9%, 6%), edge-modified flakes (5%, 6%), cores (6%, 5%), biface thinning flakes (3%, 2%), primary cortical flakes (2%, 3%), and bifaces (3%, 1%). Pestles, millingstones, and projectile points are present (Table 2.3). In contrast to most other survey sites, the most common lithic raw material is sandstone (55%, 60%), reflecting the abundance of fire-cracked/ground stone fragments, followed by chert (28%, 34%). Obsidian makes up only 11% and 2% of the lithic assemblage, respectively. The only quartz and schist artifacts from survey sites are found on these sites (Table 2.4).

Limpets (48%) and mussels (24%) dominate the identifiable shellfish remains at SON-1883, followed by turban snails (12%) and chitons (8%). SON-1883 yielded the only abalone MNIs identified for prehistoric survey sites. A more balanced distribution of mollusk remains are found at SON-1884. Here, limpets, mussels, chitons, and barnacles make up 25% of the mollusk assemblage, respectively.

SON-1883 appears to date sometime in the Upper Emergent and/or Lower Emergent Periods. The average corrected hydration band measurement is 1.52 microns (sd=0.5, n=16). SON-1884 may overlap or

Table 2.4. Percentage of Lithic Raw Material Types for Ross Survey Sites.

Site	BA	CH	GW	OB	U	SA	SC	T
228	0	33	0	54	0	13	0	39
1882	0	0	0	0	0	100	0	1
1883	3	28	1	11	1	55	1	569
1884	0	34	0	2	2	60	2	99
1888	0	65	0	26	0	9	0	23
1889	0	33	0	28	0	39	0	18
1890	0	67	0	33	0	0	0	9
1892	0	33	7	13	0	47	0	15
1894	0	32	0	45	0	9	14	22

BA = % basalt QU = % quartz
CH = % chert SA = % sandstone
GW = % graywacke SC = % schist
OB = % obsidian T = Total Count of Lithic Artifacts

slightly postdate the occupation at SON-1883. While the sample size is very small (n=3), the corrected mean hydration measurment is 1.01 microns (sd= 0.16), suggesting occupation during the Upper Emergent and early Historic Periods.

Small Low Density Scatter

SON-1882, situated in the upper coastal terrace, measures only 54 m^2 in size. While 33% of the surface area was collected, lithic and mollusk densities are very low: 0.05/m^2 and 0.3/m^2, respectively (Table 2.1). Only one lithic artifact, a sandstone fire-cracked/groundstone fragment, was recovered (Table 2.3). Diagnostic elements of turban snails, mussels, chitons and barnacles are present on the site (Table 2.5). No obsidian hydration measurements are available.

Small Shell-Bearing Deposits with Moderate to High Lithic Densities

Four sites (SON-1888, 1889, 1890, 1892) are relatively small in size (85 to 871 m^2) with high mollusk densities (2.1/m^2 to 6.9/m^2) and moderate to high lithic densities (0.37/m^2 to 3.0/m^2) (Table 2.1). All four sites are located on the coastal terrace and lower slopes of the first ridge. Only a small percentage of SON-1890 (0.02%) was collected given dense vegetation and the buried nature of the site.

An examination of the lithic and mollusk constituents of the sites suggest that they can be further subdivided into two groups. The first group, composed of SON-1888 and 1890, exhibits a lower diversity of lithic types (five and six categories represented), and a relatively even distribution of mollusk classes. The lithic assemblages are dominated by biface thinning flakes (22%, 22%), interior flakes (35%, 11%), and secondary cortical flakes (13%, 11%). The most common lithic raw material is chert (65%, 67%), followed by obsidian (26%, 33%) (Table 2.4). Limpets (38%), turban snails (26%), mussels (17%), chitons (15%), barnacles (2%) and periwinkles (2%) are found at SON-1888. SON-1890 exhibits a similar distribution of mollusk classes except mussels (49%) dominate, and no limpets or periwinkles were recovered (Table 2.5). Measurements of obsidian hydration bands indicate use sometime during the Upper and/or Lower Emergent Periods (Table 2.2). The corrected mean hydration band measurements for SON-1888 and 1890 are 1.4 microns (sd=0.14, n=3) and 1.97 microns (sd=0.87, n=2), respectively.

The other group, SON-1889 and 1892, is characterized by a more diverse range of lithic categories (nine and eight represented), and mollusk assemblages dominated by limpets. In many respects they look like smaller versions of SON-1883 and 1884. For example, at SON-1889 and 1892 fire-cracked/ground stone fragments (29%, 41%) are common, and edge-modified flakes (29%, 12%), interior flakes (12%, 7%) and biface thinning flakes (5%, 7%) are well represented. However, SON-1889 contains other artifact categories possibly associated with additional food procurement and processing activities, such as bifaces (5%), cores (5%), handstones (5%), and pestles (5%). In contrast, SON-1892 comprises other artifact categories probably involving lithic production, such as battered cobbles (7%), hammerstones (7%), secondary cortical flakes (7%) and shatter (12%). Similar to SON-1883 and 1884, sandstone is the most common raw material (39%, 47%), followed by chert (33%, 33%). However, obsidian is a little more common on SON-1889 and 1892 (28%,13%) than the two large survey sites.

SON-1889 and 1892 contain the highest percentages of limpets (66%, 54%) of any survey sites, followed by turban snails (19%, 15%), mussels (9%, 27%), chitons (3%, 3%) and barnacles (3%, 1%). Obsidian hydration measurements (n=4) for SON-1889 suggest a long use duration that may span from the Upper Archaic to the Upper Emergent Periods (x=1.9, sd=0.75). SON-1892 appears to date to the Upper Emergent Period (x=1.30, sd=0.1) (Table 2.2).

Table 2.5. Percentage of Mollusk MNIs from Ross Survey Sites.

Site	AB	BA	CH	LI	TU	MU	PE	T
228	0	0	0	0	0	0	0	0
1882	0	17	17	0	33	33	0	6
1883	4	4	8	48	12	24	0	25
1884	0	25	25	25	0	25	0	4
1888	0	2	15	38	26	17	2	47
1889	0	3	3	66	19	9	0	32
1890	0	17	17	0	17	49	0	6
1892	0	1	3	54	15	27	0	83
1894	0	0	0	0	0	0	0	0

AB = % abalone TU = % black turban snail
BA = % barnacle MU = % mussel
CH = % chiton PE = % periwinkle
LI = % limpet T = Total Count of MNIs

LATE PREHISTORIC SETTLEMENT SYSTEMS: THE FORT ROSS STUDY AREA

The hinterland and coastal surveys in the Fort Ross Study Area tend to support some aspects of Stewart's (1943) model of central-based villages. Two large survey sites, SON-1883 and 1884, correspond in most respects to the other "village" sites recorded by Stewart on the coastal-facing slope and top of the first ridge. In 1989 we relocated two of Stewart's sites (SON-177 and 179), while an attempt by Sonoma State University crews to relocate SON-176 proved unsuccessful. It is possible that this site was not accurately located by Stewart, or that SON- 1793, a small lithic scatter containing one possible house depression, may actually be the original site (Allison 1989).

The spatial pattern of the "village" sites (SON-176, 177, 178, 179, 231, 999, 1883, 1884) suggests that they are centered along the coastal-facing slope and top of the first ridge (Campmeeting Ridge), although at least one (SON-231) is found on the coastal terrace and another (SON-999) at the bottom of the second ridge (Creighton Ridge) from the coast. The sites are distributed relatively evenly along the first ridge system, about 0.5 to 2.5 km apart (Figure 2.2). All but one (SON-231) are located in higher elevations above the cool fog and wind belt that marks the microclimate of the coastal terrace throughout much of the year. Most sites are located near freshwater springs. At the present time the seasonal use, occupation duration, and contemporaneity of the "village" sites remains largely unkown.

The "village" sites are ideally located to take advantage of both coastal and interior hinterland resources. The "village" sites on the first ridge are located no more than 5 km from the coastal terrace, the South Fork of the Gualala River or the second ridge system. From these residential bases, foraging parties or specialized task groups could, within a few hours, walk to resource patches containing shellfish, rocky reef fish, sea mammals, elk (coastal terrace); tan oak acorns (coastal-facing slope of first ridge); salmon, steelhead trout, rainbow trout (Gualala River); and deer, quail, and other acorns and seeds (the second and third ridge systems).

The survey results suggest that various kinds of archaeological remains are found on the coastal terrace and in the hinterland of the South Fork of the Gualala River. Some shell-bearing sites (SON-1888, 1890, 1455) may be seafood processing stations where various mollusks and other foods were collected and processed. The relatively low diversity of lithic categories (edge-modified flakes, interior flakes) may be associated with these activites. Other shell-bearing deposits on the coastal terrace are more complicated. SON-1889 and 1892 are similar, in some respects, to the habitation sites on the coastal face of the first ridge. In addition to the procurement and processing of seafoods, the lithic assemblage at SON-1889 appears to emphasize other plant processing activities, while lithic production and/or maintenance activities were common at SON-1892. Several alternative scenarios may explain these sites. They may be short-term camps repeatedly used by task groups or small residential units. They may even represent more residentially stable settlements (family residences?) integrated within the settlement hierarchy of the first ridge.

The sites in the near hinterland of the Gualala River, if they date to the Upper and Lower Emergent Periods, may represent locations used by people from the ridge top "villages" to exploit diverse kinds of interior resources. At least one site (SON-1001) is a chert quarry. Other sites may be places used for hunting game, fishing activities or processing plant foods, such as acorns (see King 1974). Future research will be necessary to evaluate these scenarios.

There is some evidence that the lithic scatters found on the coastal terrace may predate the central-based village settlement system. The obsidian hydration measurements from one lithic scatter (SON-228) suggest an earlier period of use then other sites on the coastal terrace. Similar results are reported from Salt Point State Park, located about 12 km north of Fort Ross (Figure 2.1). Here an intensive survey of a 4.05 km^2 parcel yielded lithic scatters and shell-bearing deposits along the coastal terrace, as well as large "village" sites on the coastal-facing slope of the first ridge (for an overall site density of $31/km^2$) (see Bramlette and Dowdall 1989; Bramlette and Fredrickson 1990; Pritchard 1970:30). Pritchard (1970:32) argues that the coastal lithic scatters may predate most of the other coastal sites based on available chronological information. Recent studies of the Salt Point settlement pattern have generally supported Pritchard's interpretation (Bramlette and Dowdall 1989).

CONCLUSIONS

The conclusions of this chapter are threefold.

First, ethnographic descriptions of coastal Pomo peoples are applicable to some, but not all late prehistoric societies of the southern North Coast Ranges. Given the inherent problems with Pomo ethnographies, archaeologists must not employ them uncritically to reconstruct the past. Rather, the ethnographic information should serve only as hypotheses that must be evaluated with archaeological data.

Second, considerable variation characterizes the late prehistoric subsistence-settlement systems of the southern North Coast Ranges. The relationship postulated between low coastal productivity and high residential mobility may have merit for some but not all areas of coastal Mendocino County. At Albion Head, the testing of ethnographic models with archaeological data suggests seasonal movements to the coast by small groups during the warm months of the year. The relationship between resource productivity and residential mobility is more problematic for the Sonoma County coast. Here a more complicated late prehistoric settlement pattern existed, characterized by "central-based villages" along the first ridge, seafood processing stations and short-term camps or family residences along the coastal terrace, and various special purpose sites in the interior hinterland. While the seasonal use of the sites has yet to be determined, the settlement structure is analogous to residentially stable, logistically organized, collector systems described by Binford (1980) and others. Furthermore, as Stewart (1943) first suggested, this settlement system may be characterized by relatively high population densities and sociopolitical differentation. Local communities may have consisted of large, principal villages with assembly houses that were surrounded by outlying hamlets lacking such nondomestic architectural structures, as well as small family residences dispersed in the hinterland.

Third, the diversity of late prehistoric settlement patterns found along the southern North Coast Ranges has important implications for coastal productivity models, such as Perlman's (1980). The settlement pattern of the Fort Ross Study Area does not appear to fit Perlman's (1980) expectation for a coastal environment characterized by a steep continental shelf, rocky reefs and intertidal zones, and high wave-stress shores. This finding suggests that logistically organized, collector settlement systems in coastal environments are not associated exclusively with low wave-stress, gentle continental shelves containing extensive estuaries. This implies that a more diverse range of hunter-gatherer settlement patterns may be found along rocky, mountainous stretches of coastline in central and northern California then previously expected.

Of course, the question remains why a central-based village system may have developed in some areas of the southern North Coast Ranges and not others. Future work will evaluate this question by considering the following factors. One factor is local variation in the spatial structure of environmental zones. What are the consequences of the South Fork of the Gualala River paralleling the Sonoma coastline or the different composition of the redwood belt in northern and southern latitudes (see Baumhoff 1963:197)? Another factor is the effect of regional population densities on coastal settlement systems. Is there a relationship between high population densities in interior valleys and the development of logistically organized, collector systems on the coast? Finally, social factors will be considered that may be associated with the rise of sociopolitical hierarchies in the region (see Lightfoot 1984).

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