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Numic Expansion in the Southern Sierra Nevada

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Recent research indicates that late prehistoric Numic expansion onto the western slope of the southern Sierra Nevada was facilitated by a competitive edge held by migrating groups, mainly Great Basin-derived settlement and subsistence behaviors fine-tuned to the uncertainties of living in Little Ice Age mountain environments. But ethnographic, linguistic, and archaeological evidence also suggests widespread borrowing from California cultures and the development of complementary social and economic relationships with California groups. This indicates a negotiated and elastic, rather than an overtly competitive, process of territorial expansion.

> The Mono are an offshoot of the Nevada Indians, and should be properly classified with them, but they have been so long on the western slope of the Sierra, and acquired so many habits and usages, that they may be included here [i.e., in California]. Many years ago—it is impossible to ascertain how long ago—they came over from Owen's River Valley, and conquered for themselves a territory on the upper reaches of the San Joaquin and King's River [Powers 1877:397].

* * *

The Western Mono of California's southern Sierra Nevada are recent migrants to the area and arguably the terminal expression of what has become known as the Numic spread (Morgan 2006). Because of this, the Mono present a good opportunity to look at how migrating groups come to occupy and maintain territory. The case of the Mono is interesting for a number of reasons, chief among which is the notion that migration entails competition (Bettinger and Baumhoff 1982). This is especially intriguing because the Mono, an ostensibly "simple" group from the Great Basin, migrated into and appear to have outcompeted groups in California, a region notorious for its large, semi-sedentary, complex hunter-gatherer populations. That they did so during the Little Ice Age, a period of pronounced environmental uncertainty, is all the more captivating because it begs the question of how migration might also be associated with climate change. This paper addresses these issues, ultimately arguing that although migration is certainly a competitive process and may be linked with environmental perturbations, it can also be reflexive, especially in cases where groups are circumscribed and economies and cultures are well established. These latter conditions appear to require substantial adaptive flexibility, especially with regard to territorial and economic maintenance.

THE NUMIC SPREAD

The geographic position and relatedness of Numic languages led to the development of the Numic spread hypothesis, of which the Mono migration is perhaps the latest expression. Though the close relationships and historical connections between Great Basin languages were recognized by Kroeber (1907, 1925) and noted by others (Merriam 1904; Powell 1891), the hypothesis was developed by Sydney Lamb (1958a). Basing his conclusions on linguistic similarities and differences between the ten identified Numic languages and the geographic areas occupied by speakers of these languages, Lamb argued that Proto-Numic rapidly spread throughout the Great Basin from a southeastern California homeland approximately 1,000 years ago. Perhaps nowhere in the field of hunter-gatherer archaeology has a hypothesis derived from linguistics initiated such a fiercely contested debate as to whether or not it happened, how it happened, and how we might identify it if it did happen (see Madsen and Rhode 1994).

The Mono migration avoids some of the pitfalls associated with the Numic spread hypothesis, due mostly to its strong and nearly unanimous linguistic support (but see Jackson 1989), its extremely shallow time depth, and Mono accounts of their own history (there is at least one instance where a Mono—in this case Nɨm—individual claimed that the first Northfork Mono came from near Bishop in Owens Valley [Gifford 1932:16]). Archaeological evidence and close familial and social ties between eastern and western Mono people likely also reflect the recent split between these two groups as well as their continuing close ties (Morgan 2006).

THE WESTERN MONO

Groups speaking Western Mono (a Numic language) occupy a territory along the southwestern slope of the Sierra Nevada (Campell 1997; Kroeber 1925, 1959; Lamb 1958a; Miller 1986). Groups speaking Mono were widely dispersed, with families and extended kin groups living in small, autonomous hamlets along or near the San Joaquin, Kings, and Kaweah rivers. Camps and hamlets tended to cluster around springs, streams, stream confluences, and flats along canyon margins immediately below winter snowline. Hamlets were the main supra-familial aggregations of Mono people and the basic sociopolitical entities of the greater Mono linguistic grouping (Gayton 1945, 1948; Gifford 1932; Hindes 1962; McCarthy 1993).

The Mono are very late migrants to California, coming west from the Great Basin between 600 and 300 years ago, during a shift from warm and variable Medieval, to cold but also variable Little Ice Age, climatic conditions (Graumlich and Lloyd 1996; Hughes and Diaz 1994a, b; Kroeber 1925, 1959; Lamb 1958a). The shallow time depth of this shift is supported by very minor dialectical differences between Owens Valley Paiute and Western Mono languages, as well as by substantial shifts in obsidian hydration frequencies, bead types, projectile point forms, and the frequency of pottery and steatite artifacts (Goldberg and Moratto 1984; Kroeber 1925; Lamb 1958a, 1958b; Morgan 2006). That the Mono moved into land that was occupied, at least seasonally and/or sporadically, for at least the preceding 7,000 years, likely by Penutian ancestors of today's Miwok and Foothill Yokuts groups, indicates they displaced or replaced existing California populations. This situation begs the question of how they did so and the degree to which this replacement was overtly competitive.

MODELING PALEOCLIMATE, PALEOENVIRONMENT, AND CULTURAL ADAPTATIONS

A significant factor contemporary with and assumed to have affected the Mono migration was late Holocene climate change. Sierran paleoclimatic and paleoenvironmental proxy data and paleoenvironmental modeling indicate that climatic variability and disequilibrium was the norm for at least the last 2,000 years. Variance is evident in two or more periods of extreme and persistent drought between 1,300 and 650 cal B.P. (during the Medieval Climatic Anomaly) and at least one phase of cooler, wetter conditions and glacial advance after 650 cal B.P. (during the Little Ice Age) (Graumlich 1993; Graumlich and Lloyd 1996; Hughes and Brown 1992; see Table 1). Continuous disequilibrium likely selected for rapid forest succession and for significant shifts in biotic composition and the geographic extent of different biotic zones (Allen and Breshears 1998; Miller and Urban 1999; Overpeck et al. 1990; Urban and Miller 1996). Pronounced drought, particularly around 1,000 B.P., likely created gaps in pine-fir forests, allowing for the proliferation of oak as well as grassland communities; it also likely increased the elevational range of key species like black oak (Byrne et al. 1991; Cannell et al. 1996; Curren 1991; Garrison et al. 2002; Wullschleger et al. 2003). Timberline was also higher during this time than at present (Luckman and Kavenaugh 1998; Scuderi 1987). Following the onset of Little Ice Age cooling, oak communities contracted, the density of oak in montane forests decreased (while conifer density increased), and the distinction between elevation-determined biotic zones became more pronounced, this due to the constriction of plant ranges, the development of distinct alpine and subalpine communities, and more pronounced seasonality associated with increased snowfall (Campell and McAndrews 1993; Körner 1998; Peterson 1998; Woolfenden 1996).

This means that during the Little Ice Age (in contrast to conditions prevailing during the preceding Medieval Climatic Anomaly), the distribution of resources essential

Table 1

LATE HOLOCENE SOUTHERN SIERRA PALEOENVIRONMENTAL SYNTHESIS

Date	Terminology	General Climate	Climatic Events	Biotic Zone Composition
2000–1300 B.P.	Late Holocene	Cool/Wet	Cessation of Altithermal drought and high temperatures	Expansion of pine-fir Forest Proliferation of meadows
1300–650 B.P.	Medieval Climatic Anomaly	Warm/Dry	Extreme and persistent drought 1,050–838 and 740–600 B.P.; increased incidence of fire	Expansion of grassland and Blue-Oak-Grey Pine Forest to higher elevation; expansion of black oak range and elevation within Sierran Montane and Yellow Pine Forests Upward migration of treeline elevation
650–50 B.P.	Little Ice Age	Cool/Wet	Glacial advance Increased precipitation	Contraction of grasslands and oak woodlands; contraction of black oak range and density; downslope migration of treeline elevation Increased biotic zonation
50 B.P.–Present	Modern	Warmer/Drier	Glacial retreat; generally milder, less variable climates	Establishment of modern biotic zones

to Mono subsistence became increasingly constrained to specific elevations exploitable only during particular times of the year. Further, increased snowfall lowered the average yearly snowline, reducing access to and limiting the productivity of middle and high elevation resources like black oak acorn and sugar pine nut. Periodic droughts and colder than average conditions also led to pronounced variability in resource production (due in part to more variable masting of nut-bearing trees like oak [see Morgan 2009]) in these spatially and temporally discrete resource patches, with no guarantee of adequate production in any given year. Combined, increased patchiness and increased variance in the environment's production of key resources resulted in considerable uncertainty regarding resource availability from year to year, conditions faced by anyone (especially Mono or Yokuts), seeking to exploit or occupy the western slope of the Sierra Nevada. The environment the Mono faced during the late Holocene was thus both highly seasonal and spatially patchy, as well as unpredictable and characterized by homogenous, time-compressed resource distributions, particularly above snowline. This results in a confusing situation regarding expected Mono cultural adaptations. Should they have been residentially mobile in order to exploit widely dispersed resource patches and thus have resembled simple foragers? Or should they have stored and occupied more sedentary villages supported by logistical forays as a way of offsetting temporal and spatial variation in resource productivity and thus have resembled more complex collectors? Finally, what kind of technologies and behaviors did they bring from the Great Basin that were useful in coping with these circumstances?

RECONSTRUCTING MOBILITY AND STORAGE BEHAVIORS

Research that I have reported elsewhere (Morgan 2006, 2008, 2009) attempted to answer the above questions. That research focused on documenting (1) where the Mono settled and how they exploited the Sierran landscape—this typically marked by the presence of bedrock milling stations (but also lithic scatters, etc., representing hunting, trade, and travel throughout the Sierra); and (2) where and how the Mono stored acorn—this marked by rock-ring acorn caches found throughout their home range. The following summary highlights some of the results of this research.

My studies focused on a roughly 30 km.[2] parcel centered on the San Joaquin River watershed (Figure 1). In order to analyze settlement and storage in reference to environmental and paleoclimatic data, the study area was stratified into three gross ecozones (Table 2) generally corresponding to major modern biotic divisions (Küchler 1977). These were taken to approximate biotic distributions between 650 and 150 B.P., when the Mono migration most likely took place. These three ecozones were based on two main elements conditioning settlement

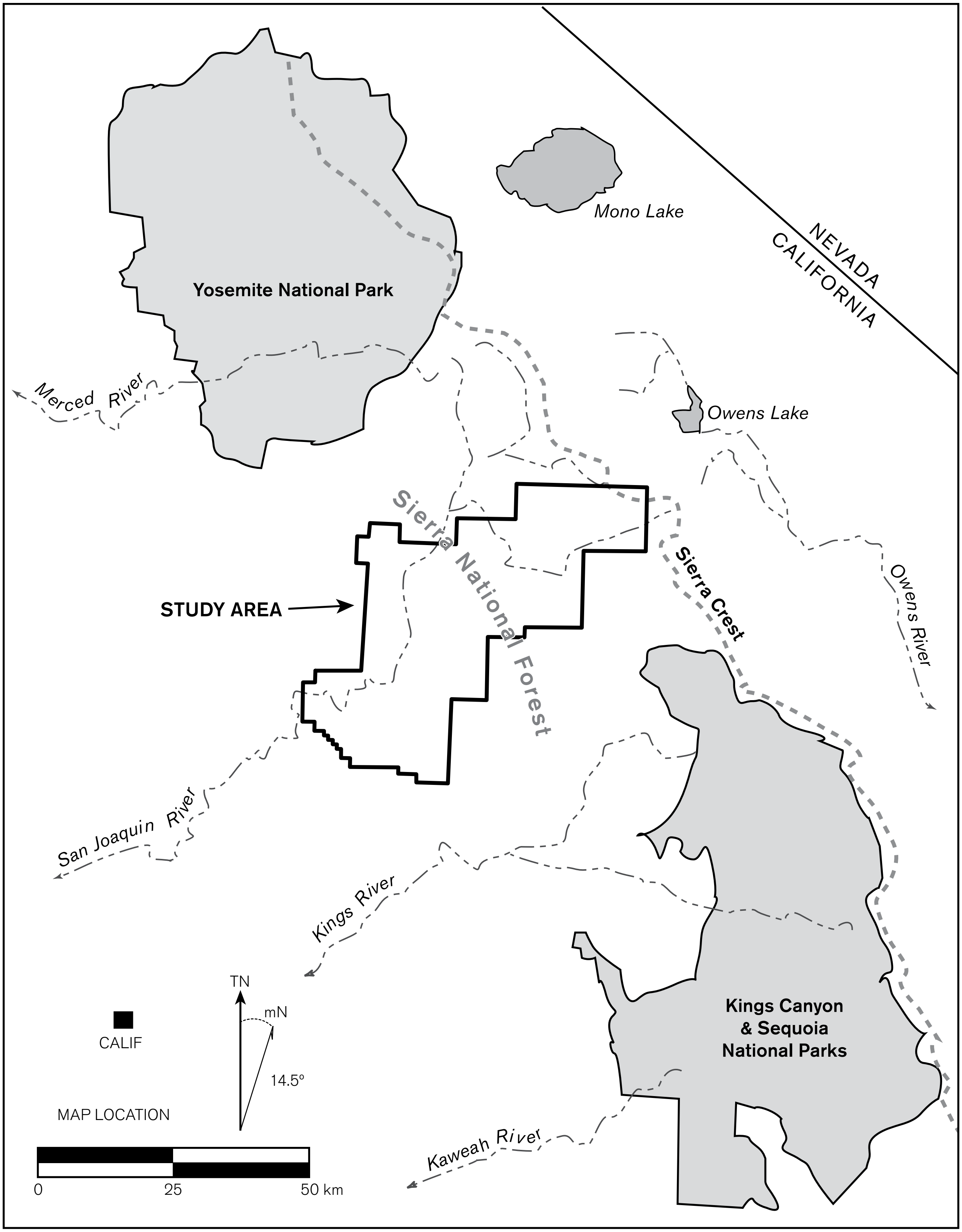

Figure 1. Study area location.

Table 2

ECOZONES IN THE SAMPLE

Ecozone	Küchler's Biotic Zones	Elevation	Dominant Vegetation
Lower Montane	Blue-Oak Grey Pine Forest	Below 1,000 m.	*Quercus douglassii, Pinus sabiniana*
	Chaparral	1,000 – 1,350 m.	*Adenostoma fasciculatum, Arctostaphylos* sp., *Ceanothus* sp., occasional stands of *Quercus kelloggii*
	Sierra Yellow Pine Forest	1,000 –1,425 m.	*Pinus ponderosa*, stands of *Quercus kelloggii*
Montane Forest	Sierra Montane Forest	1,425 – 2,050 m.	*Abies concolor*, *Pinus lambertiana*, *Pinus ponderosa*, stands of *Quercus kelloggii*
Subalpine	Upper Montane-Subalpine Forest	2,050 – 3,300 m.	*Abies magnifica*, *Pinus contorta*
	Northern Jeffrey Pine Forest	2,000 – 2,400 m.	*Pinus jeffreyi*
	Alpine	Above 3,300 m.	*Draba oligosperma, Erigonum ovalifolium, Festuca brachyphylla, Phlox covillei, Poa rupicola, Sitanion hystrix*

and mobility: snowline and resource distribution. In the first case, snow hampers travel, limits settlement, and curtails biological productivity in the winter, phenomena exacerbated by Little Ice Age conditions. In the second case, resource distribution often conditions settlement choices and mobility.

The first ecozone included the *lower montane forest*. It is both below winter snowline (which varies considerably on yearly and locational bases, but averages about 1,425 m. in elevation [Miller 1955; Morgan 2006:195]) and has the greatest diversity and abundance of key resources, especially acorn. Resources here, though abundant, are characterized by significant depressions in productivity during the winter and distinct differences in the timing and production of separate resource patches, resulting in temporally and spatially patchy resource distributions. The second ecozone consisted of the *montane forest* (between 1,425 and 2,020 m.). It contains key nut-producing trees like black oak (*Quercus kelloggii*) and sugar pine (*Pinus lambertiana*), but is above the average winter snowline. Resources in this zone, though occurring in small patches (e.g., black oak groves), are more uniformly distributed than those in the lower montane forest. They are also constrained in their productivity to a relatively brief period in summer and fall, resulting in an essentially homogenous, dispersed, and time-limited resource macro-patch. Importantly, the maximum elevation of this zone demarcates the maximum elevation of nut trees exploited by humans in the study area, at 2,100 m. The last ecozone, termed the *subalpine*, produces little in the way of key resources save occasional sheep, marmot, deer, Pandora moth larvae, and sparse grasses and roots.

Archival research and field survey inventoried over 555 km.^{2} of the 1,626 km.^{2} study area. It identified 631 archaeological sites containing stationary processing and/or caching features and 420 sites with bedrock milling stations, these containing 6,134 milling surfaces. There were 340 rock rings, presumably representing acorn cache foundations, recorded in the study area. Overall, this coverage provided a sample of the study area of approximately 34%, roughly equally distributed across all three ecozones. This large sampling and the consistent coverage between ecozones is believed to have resulted in collected data that accurately depicts Mono land use in the study area.

Mobility

In order to look at how the Mono moved about the landscape in the process of coping with the temporal and spatial patchiness of the Little Ice Age Sierra Nevada resource base, one focus of the study was to reconstruct mobility by looking at the distribution of Mono residential sites and camps in different ecozones, as marked by the presence of bedrock milling stations. The idea was to track the intensity of use of different portions of the forest at different times of the year, with seasonal patterning based on the density and distribution of different site types. Occupations below snowline (i.e., in the lower montane forest) could be occupied at any time of the year, but would certainly be favored in the winter. Occupations above snowline (i.e., the montane

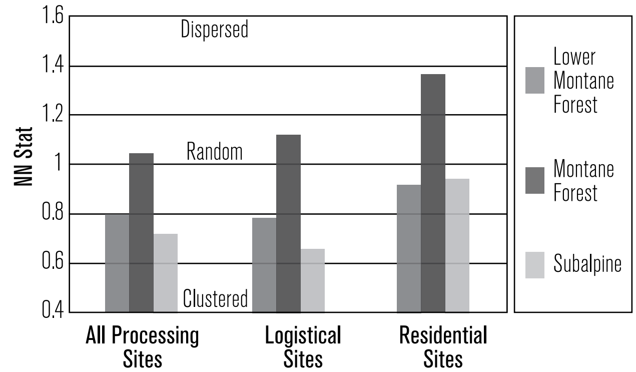

Figure 2a. Nearest Neighbor Statistics, by ecozone.

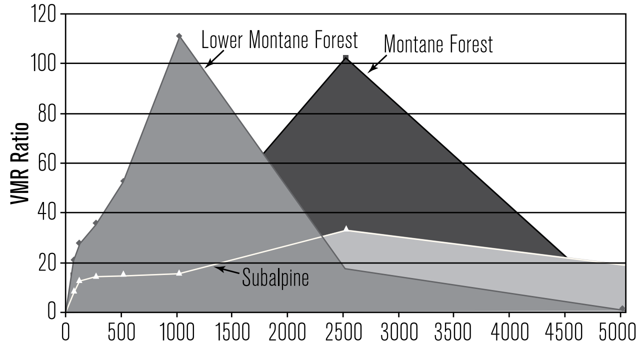

Figure 2b. Variance to Mean Ratios, by ecozone.

and subalpine forests) could only be intensively occupied in the late spring, summer, and fall.

Two statistical methods were used to assess the patterning of sites within these biotic divisions: nearest neighbor and variance to mean ratios. The first provides an objective measure of clustering and dispersal by measuring distances between nearest neighbor pairs and comparing the mean of these measurements to a hypothetical mean based on a random distribution of points. Values near zero indicate clustering, values near one indicate random distributions, and values greater than one indicate dispersal (Clark and Evans 1954; Durand et al. 1992). The results are telling—lower montane sites are clustered and montane sites are slightly dispersed, but approach a random distribution (the clustering in subalpine zones appears to be predicated on a clustering of sites along passes and major trans-Sierran trails; see Figure 2a). Variance-to-mean ratios provide a measure of the degree of this clustering and dispersal, by measuring bedrock mortar density at multiple scales of analysis and assessing where variance is high relative to mean. Where it is high is an indication of the scale at which points are clustered (Ebert 1992; Whallon 1973). Here, milling surfaces are clustered in spaces nearly 2.5 times smaller in the lower montane forest (Figure 2b). Combined, these data indicate substantial population aggregation below snowline in winter, and dispersal in the spring, summer, and fall to map onto dispersed montane resources like acorn and game.

This type of bimodal mobility pattern conforms to expectations regarding the most effective way to average out pronounced montane spatial and temporal resource variability, with both phenomena being exacerbated by late Holocene climatic cooling. Limited residential moves, logistical mobility, and storage are all ways to better average out predictable temporal variance of resource production in temperate, seasonal, mid-latitude climates (Binford 1980). Winter Mono settlement patterns conform to this expectation—clustered and dense site distributions below snowline indicate relatively sedentary, seasonal population aggregations relying on logistical forays and cached and stored foodstuffs (see below) to compensate for resource shortfalls in the winter. Conversely, with low population densities facing extreme environmental conditions and highly unpredictable but homogenous resource bases, mobility and mapping on to resources are arguably the most effective way to average resource shortfalls (Goland 1991; Low 1990). This is the behavior seen in the dispersed settlement pattern in the montane forest, where travel and biological productivity are limited by snow for a substantial portion of each year. Ultimately, this patterning recalls seasonal patterns of population fission and fusion among Great Basin Paiute and Shoshone groups (e.g., Steward 1938a).

Storage

The distribution of acorn caches relative to winter settlements and principal camps was used to assess the efficacy of Mono storage behaviors. Acorn caches consist of a rock ring substructure recalling Paiute and Shoshone piñon caches. These were filled with acorn and covered by a grass thatch (*Fresno Bee* 1936), and they are found throughout the Mono range on granite outcrops with a southern exposure conducive to drying acorn prior to caching. They are also one of the best indicators of Mono ethnicity; they are not found outside the Mono range in the Sierra, but morphologically recall Mono historical connections with Great Basin Numic technologies (Bettinger 1989; Morgan 2006).

As described elsewhere (Morgan 2006, 2008), caches are abundant, and they collectively had three times the capacity required to sustain Mono populations through winter. They are constrained to a 9.4 km. foraging limit (based on typical hunter-gatherer travel distances per day) around winter settlements. The distribution of caches relative to winter hamlets, however, is bimodal, with peaks at 2.4 and 6.5 km. (Figure 3a). When looked at in light of costs associated with caching from a central place (harvesting, drying, storing, and travelling to re-access stored acorn), the number of caches drops precipitously past the eight-hour mark, suggesting the first mode in the cache distribution corresponds to an efficient logistical caching limit around winter settlements.

Analysis of the distal mode (from 5 to 9 km. from winter settlements) relative to snowline and principal camps indicates this distribution is predicated, at least in part, on provisioning seasonal residential moves. Nearly all caches more than 5 km. from winter settlements are above snowline. Eighty-five percent of these, however, are within 2.7 km. of a montane forest principal camp (Figures 3b and 3c). Higher elevation caches are thus associated with principal camps accessible only after spring thaw, indicating higher elevation caches were used to provision early spring residential moves as higher-elevation resources were just becoming available. This likely helped the Mono not only exploit the montane forest earlier in the spring than their Yokuts and Miwok neighbors, but also helped them maintain territory by establishing their presence in the high country earlier in the year than those groups who might also seek to exploit and live in this area (Morgan 2008).

The preceding indicates that Mono caching was an integral part of exploiting a resource base that was particularly patchy with regard to time, space, and elevation. It also resulted in the creation of logistical foraging radii of stored food around winter settlements. This distribution has been shown to be highly patterned and geared towards maximizing returns on labor and travel relative to winter settlements. Caching, however, also provisioned above-snowline spring and summer camps in a manner facilitating spring residential moves. In doing so, this unique form of storage—a behavior traditionally associated with sedentism (Testart 1982)—facilitated a form of residential mobility essential to exploiting higher elevations and maintaining territory in montane southern Sierra forests.

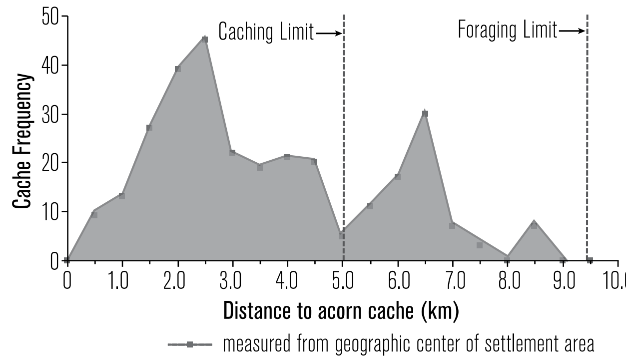

Figure 3a. Distance from hamlets to caches and caching and foraging limits.

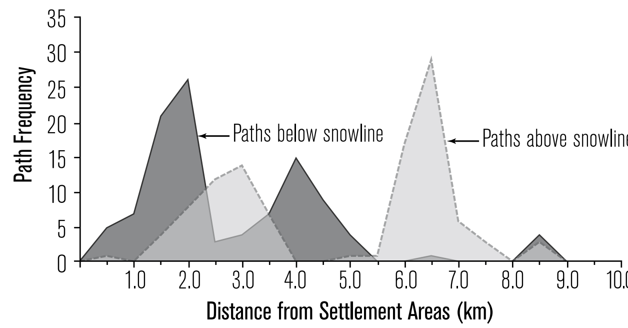

Figure 3b. Comparison of cache distributions above and below snowline.

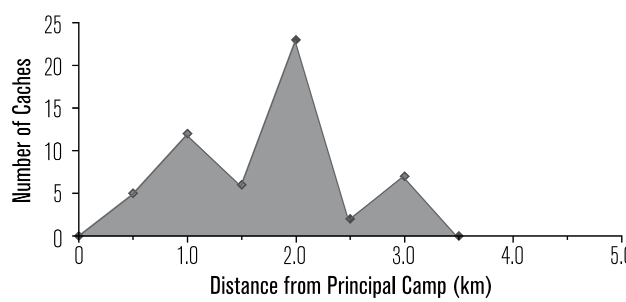

Figure 3c. Cache distribution relative to summer principal camps.

Summary

Mono subsistence and settlement behaviors were well adapted to coping with the uncertainties resulting from Little Ice Age climatic variability. A Numic pattern of winter population aggregation and spring dispersal helped cope with variations in resource availability, bringing consumers to resource patches as they became seasonally productive. Likewise, a distinctively Numic pattern of high-yield nut caching not only helped sustain populations through the winter, but also helped facilitate moves into the high country in the spring. Caches provided a reliable store of food en route to and within a short distance of montane seasonal camps. This had the added benefit of establishing the Mono in critical black oak acorn patches earlier in the year than their Penutian neighbors, resulting in first access to montane resources (ultimately a passive form of territorial maintenance). In this light, it is clear that slightly modified Numic behaviors helped the Mono efficiently exploit the western slope of the Sierra Nevada, giving them a competitive edge over other groups—operating outside of Numic cultural traditions—who might also have sought to exploit these locales. Ultimately, it indicates that the Mono outcompeted their Penutian neighbors in large part as a result of the efficient and risk-reducing capacity of what were fundamentally Numic subsistence behaviors.

INCORPORATION OF CALIFORNIA STRATEGIES

It is clear that modified Great Basin-derived behaviors helped the Mono cope with Little Ice Age environmental variability, and that this played a pivotal role in their coming to occupy the drainages of the south-central Sierra Nevada. However, contrary to many depictions of the Numic spread, the Mono migration did not entail a wholesale replacement of California lifeways, but rather the adoption by the Mono of many traits usually thought of as Penutian, or as being otherwise common to central and southern California. In fact, Mono intergroup relations, social and ideological constructs, technologies, and relationships to regional and interregional economies indicate an extensive borrowing and adoption of Californian cultural elements. That this borrowing occurred at all levels of Mono society—economy, social structure, and ideology—indicates that while successful migrations may be inextricably linked to the ecological efficiency of migrating adaptations, they may in some situations require cultural and adaptive flexibility, especially when occurring in complex social contexts.

Intergroup Relations and Territoriality

If the Mono competed to occupy lands frequented or claimed by proto-Yokuts or Miwok groups, we might expect to see evidence of intergroup conflict (see Sutton 1986). Archaeological evidence has thus far not been forthcoming and ethnographic evidence is spotty with regard to this subject (the Mono usually cremated their dead, and acidic forest soils quickly dissolve bone that might retain evidence of interpersonal violence). Ethnographies, however, indicate that the Mono had close, though not always amicable, ties with neighboring groups.

Three main linguistic groups bordered and interacted with the Mono: the Owens Valley Paiute, the Southern Sierra Miwok, and the Foothill Yokuts (Gayton n.d.; Kroeber 1925; Spier 1978a, 1978b) (Figure 4). A fourth group, the Tübatulabal, had little or no contact with the Mono. Relations with Owens Valley groups were mainly congenial and were based on shared kinship and language. Trans-Sierran treks, intermarriage, and visiting between the two groups were common. A degree of territoriality, however, is indicated by Gayton (1948:259), who claims that the Owens Valley Paiute were not allowed to permanently reside in more southerly Mono territory (though Owens Valley people were allowed permanent residence further north). To the north were the *Pohonochi*, a Southern Sierra Miwok group who lived on the Merced River, in environments similar to those occupied by the Mono. North Fork Mono groups interacted regularly with the *Pohonochi,* primarily as trade partners operating out of the vicinity of Crane Valley (IRI/TCR 1985). Merriam (1955:76), however, notes that the "Mono Paiute" came over the Sierra and fought "bloody wars" with the Miwok for access to black oak groves.

Mono relations with Foothill Yokuts groups were variable and marked by intermarriage, similar lifeways, and coresidence on the one hand, and intergroup conflict on the other. Mono-Yokuts intermarriage and coresidence was so common in the Kings and Kaweah river watersheds that Gayton (1948) identified coresiding groups simply as "MonoYokuts." This suggests that the only difference between the two groups in these areas may have been language and, to some extent, territory. But Powers (1976), writing some 70 years earlier, recorded that the Mono "don't intermarry," and "came from the lower Owens River Valley and conquered themselves a territory on the upper reaches of the San

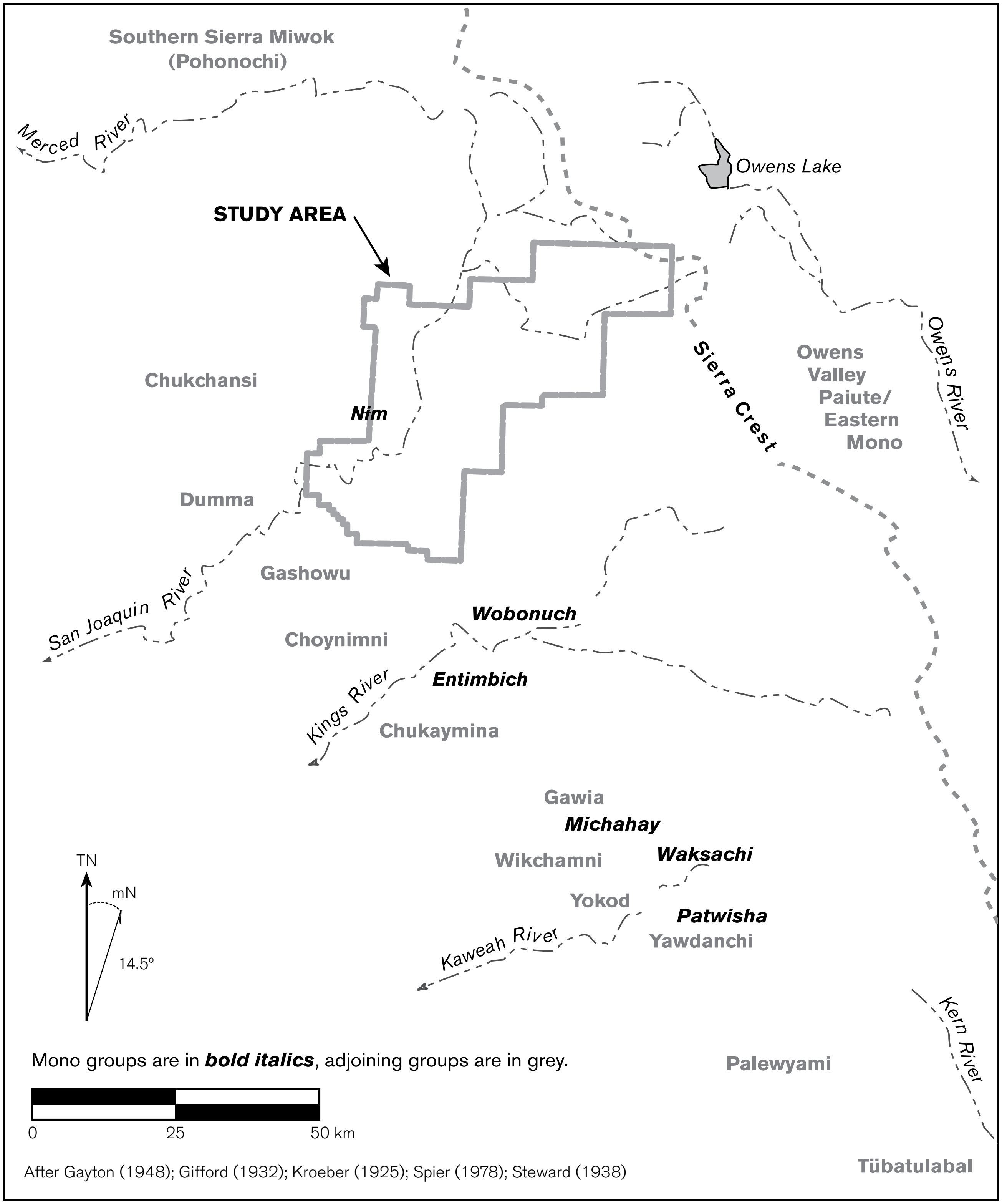

Figure 4. Ethnographic groups and territory.

Joaquin and Kings Rivers," and that their "business is with war." About the Yokuts he wrote, "this peaceful race was slowly giving way before the incursions of the more powerful and warlike Paiute."

Powers, of course, is not the most reliable source. He was not a trained researcher and he tended to dramatize California Indian cultures. Nevertheless, it is difficult to completely dismiss his comments because other researchers (e.g., Theodoratus et al. 1982), as well as Gayton (1948) herself, argue that the close relationships between the Mono and Yokuts may be a result of white incursion onto Indian lands, with remaining Indian groups fusing into larger polities in remote areas because of population decimation, white circumscription, and the policies of the prevailing American society. If this is the case, the conflict recorded by Powers may reflect precontact relations that developed when the Mono migrated into and occupied Yokuts territory. Possible contentious relations may have been preserved in Mono attitudes toward Yokuts doctors and ceremonies, which they viewed with fear and suspicion (Gayton 1930). Even Gayton (1948:15) recalls bloodshed between the San Joaquin River Yokuts and the Mono, suggesting relations between the two groups were sometimes inimical. In any case, ethnographic information suggests both productive economic and social interaction, on the one hand, and a degree of territoriality and violence, on the other, especially with Miwok and Yokuts groups.

Social and Ideological Borrowing

Mono social structure and ideology reveal historical affiliations with Owens Valley groups while also exhibiting a strong borrowing from California cultures, to the point that Gifford (1932:15) claimed the Mono were "in their cultural outlook definitely of the San Joaquin Valley drainage rather than the Great Basin." Mono social structure was based on the household. Household groupings comprised semi-autonomous hamlets forming the only supra-family Mono political unit. Within these units, patrilineage membership determined marriage patterns, kin relations, residence patterns, and ceremonial and leadership roles, much as it did for the Miwok, Yokuts and (to a lesser degree) the Owens Valley Paiute (Gayton 1945; Gifford 1922; Spier 1978a, 1978b). Mono leadership, however, was more closely affiliated with Yokuts and Miwok patterns. Where present (not all groups had chiefs), Mono chieftainship was patrilineally inherited and associated with specific lineages, a system akin to that found in Miwok and Foothill Yokuts groups. Like the Miwok and Yokuts, the Mono also had messengers whose main function was to organize ritual feasts and exchanges (Driver 1937; Gayton 1930, 1945; McCarthy 1993).

Moieties, a feature clearly borrowed from the Yokuts, also played a role in Mono social structure. Moieties are recorded mainly for the Nɨm around North Fork (though Gayton [1948:271–272] recorded reciprocal ceremonial "sides" among the Wobonuch along the Kings River). In this respect, they more closely resemble their Yokuts and Miwok neighbors to the west and north, respectively, than their Owens Valley relations. Moiety membership, however, was fluid (much like group membership in other Numic societies)—a woman could change her moiety affiliation to her husband's upon marriage if she so chose (Gifford 1918, n.d.; McCarthy 1993).

The amalgamation of Great Basin and Californian traits was also present in Mono ritual practices, ceremony, and myth (Gayton 1930). A principal example of this was the mourning ceremony. The ceremony was planned a year in advance, with bereaved families saving resources for the practice. In Wobonuch and Patwisha territory, mourning entailed reciprocal exchanges between Yokuts and Mono people, with ritualized washers and criers enacting specified roles. Among the Nɨm, people cut their hair short and went through two to five nights of public ritual, dance, song, and public crying. These characteristics are essentially Yokutsan, with the close relations between the Yokuts and Mono exhibited in the reciprocal exchanges between southern groups (Driver 1937; Loether 1990). However, the Mono also adopted the Ghost Dance in 1870, which was derived from the Great Basin, as was the belief that whirlwinds were ghosts (Gifford 1932). Mono social structures and ceremonial life were thus an amalgam of Great Basin and California beliefs and practices that reflected their placement between these two culture areas as well as their recent migration and entry into the California cultural milieu (Gayton and Newman 1940).

Economic and Technological Borrowing

Though their subsistence-related mobility and storage practices were Great Basin derived, many Mono subsistence behaviors and technologies were more clearly

Californian and were more or less indistinguishable from those of their Miwok and Yokuts neighbors. They were so alike that Gifford (1932:15) argued that "[t]heir general mode of life was more like that of the foothill Yokuts and the Miwok than of the Eastern Mono." Other researchers, however, have noted that like their Great Basin counterparts, few rules (save mainly ownership and a gender-based division of labor) governed Mono subsistence behaviors, allowing them the flexibility to make pragmatic decisions, based on environmental monitoring and other sources of information, regarding the optimal pursuit of where, when, and how to make a living (e.g., McCarthy 1993:107–127).

Ethnographically, Mono subsistence was based on the California triumvirate: acorn, venison, and salmon (Baumhoff 1963), with an emphasis on deer meat and, most importantly, acorn. For the Mono, there is no doubt that acorn, particularly black oak acorn harvested and processed by women, was a preferred dietary staple and the principal component of the Mono diet (Aginsky 1943; Driver 1937; Gifford 1971). Evidence of balanophagy is ubiquitous in the area, with bedrock outcrops often pocked with bedrock mortars used for processing acorn, especially in hamlet locations (Moratto and Riley 1980), in patterns approximating those of their Miwok neighbors (Hull and Kelly 1995). That the Mono relied on the acorn harvest as an economic mainstay and on bedrock mortar technology clearly shows an adoption of California material culture and economic focus. While Numic people certainly focused on seeds and nuts, perhaps to the same degree as indigenous Californians (and also used bedrock mortars; see Haney 1992), the focus on bedrock mortars is clearly an indicator of the adoption of one of the most ubiquitous and well-recognized of aboriginal California technologies.

The Mono also went to fairly substantial trouble to include fish in their diet, often employing "Californian" technologies. They captured fish from rivers, streams, and lakes, focusing on salmon and trout. Salmon were taken in a variety of ways, from spearing fish from riverbanks to the construction of weirs and fish traps on major streams, the latter clearly affiliated with central and northern California cultures. Salmon fishing was also important enough to foster the occupation of temporary but repeatedly used fishing camps away from hamlets and other settlements along the San Joaquin River (Aginsky 1943, Driver 1937, Gayton 1948; Gifford 1932; Lee 1998).

Basketry manufacture reflects a similar pattern. In terms of style, design, and manufacture, Mono basketry is similar to Yokuts, with Mono weavers copying the Yokuts coiling style. But Mono coiling is reversed relative to Yokuts; this trait paradoxically is an unambiguous marker of Mono ethnicity and is perhaps a holdover from Great Basin basketry manufacture (Polanich 1994). In any case, Mono economies and technologies reflect much the same situation as their social and ideological structures—borrowing and copying mainly Yokutsan behaviors while retaining critical Numic subsistence behaviors and forms of cultural identity.

Economic Integration

Perhaps the strongest evidence of Mono adaptive flexibility is their incorporation into the larger California-Great Basin economic scene and their development of reciprocal economic relationships with adjoining groups. Mono groups were by no means isolated in the canyons of the southern Sierra Nevada, but rather played an important role in trans-Sierran travel and trade. In fact, the Mono are often characterized as middlemen in the south-central trans-Sierran exchange network (Davis 1961; Heizer and Treganza 1972; Hindes 1959; Jackson 1988; Snyder 2001; Spier 1978a; Theodoratus 1982; Theodoratus et al. 1978). Trade goods like obsidian, salt, acorn, dried salmon, baskets, and shell beads were exchanged between the Western Mono and the Owens Valley Paiute, with many goods passed on to Foothill Yokuts groups (Aginsky 1943; Chalfant 1933; Driver 1937; Gifford 1932; Heizer 1958; Kroeber 1941; Spier 1978a). Materials whose origin was the San Joaquin Valley and points west consisted primarily of olivella beads, clam disks, and other forms of currency, the use of which was well developed by the time the Mono settled on the western slope of the Sierra Nevada (Bennyhoff and Hughes 1987). Nuts, meat, and baskets were exchanged in either direction, but for the most part, the trend was for finished goods and salt to be traded west in exchange for currency and acorn (Table 3).

Gayton (1948: 215, 259) indicated that groups of ten Owens Valley Paiute regularly traveled west in July in order to trade; Mono groups also travelled east. She also claimed that the Yokuts avoided trans-Sierran

Table 3

IMPORTANT TRANS-SIERRAN TRADE ITEMS AND DIRECTION OF TRADE

Items Moving East to West	Items Moving West to East
Salt	Shell Bead Currency
Finished Rabbit Skin Blankets	Clamshell Disk & Tubular Shell Currency
Piñon Nut	Steatite Beads, Vessels, and Raw Material
Obsidian (Raw material and finished tools)	Acorns and Acorn Flour
Deer Meat	Buckskin/Deer Hide
Foxskin Leggings	Chert Tools
Mountain Sheep Skins	Finished Baskets
Finished Moccasins	Dried Salmon
Finished Baskets	Willow Bark
Sinew-Backed Cedar Bows	Manzanita Berries
Rabbit Skin	Canes for Arrow Shafts
Red and Blue Pigments	Various Berries
Sleeveless Buckskin Jackets	
Pandora Moth and Fly Larvae	
Tobacco	
Pottery Vessels and Clay Pipes	

journeys, supporting the idea that Numic people were trade specialists. Steward (1933, 1934, 1938b), however, suggested trading and trans-Sierran treks were often unplanned and casual, with Owens Valley people often making what appear to have been spur-of-the-moment decisions to travel to the west slope of the Sierra to visit and trade with their Mono cousins. The Mono operated within this system, however, by passing on goods from east to west, incorporating themselves as critical players in a complex web of interregional exchange, a situation apparently facilitated by their close ties with Owens Valley groups.

More importantly, the Mono were manufacturers of goods moving through this exchange network. Materials whose origin was in the Sierra were mostly finished items of clothing (like moccasins and snowshoes) and (especially) sinew-backed bows (Heizer 1958). These items (sometimes also produced by the Owens Valley Paiute) were typically passed on to western groups like the Yokuts. Perhaps equally important was the production and exchange of raw acorn and finished acorn flour by Mono women. Here, though women produced acorn, exchange was somewhat ritualized and controlled by chiefs (Gayton 1930, 1948, Gifford 1932). In both cases, the Mono produced crafts and subsistence items either not typically made by adjacent groups (e.g., sinew-backed bows) or produced surplus goods useful for offsetting resource shortfalls in neighboring areas (e.g., acorn meal).

This type of economic articulation recalls the notion that, at least when it comes to economies, proximity can breed inversion. Nearby groups produced quite different items: one group obtained raw materials (e.g., toolstone), while another finished items for consumption (e.g., shell beads). This entailed a situation where regional economies were specialized enough so that no one group produced all of the goods it consumed. This means that these economies were not only articulated and interrelated, they were also inter-reliant. Such a system might have the benefit of pooling risk and reducing the likelihood of resource shortfalls (e.g., if Yokuts blue oak or valley oak acorn harvests were poor in a given year, they might have been able to rely on the perhaps more robust harvests of black oak acorn by the Mono) (e.g., Hegmon 1991; Rautman 1993). In any event, the fact that the Mono were traders, producers, and consumers in a complex, inter-reliant California-Great Basin economy strongly suggests that they not only benefited economically from participation in that network, but that the benefits (whether it be pooling shell bead money to pay for food during resource shortfalls or perhaps just having a greater diversity and quality of subsistence goods available) also helped condition their successful maintenance of territory in the western Sierra.

Ethnographic Summary

Ethnographic information presents a dichotomous picture of the extent to which the Mono migration was an out-and-out cultural replacement and the degree to which it represented an integration into the California scene. The relationships of the Mono to their neighbors, especially the Penutian neighbors they ostensibly displaced, were mixed. They verged on aggression on the one hand, and interaction, intermarriage, and nearly complete assimilation on the other. When it comes to social structure and ideology, the Mono clearly borrowed elements mainly from Yokuts groups, especially regarding moiety divisions, leadership roles, and ceremonies. Technological and economic borrowing is shown in the wholesale adoption of bedrock milling technology, California fishing practices, and the copying (or attempting to copy) of Yokuts basketry styles. Lastly, the Mono integrated or found themselves incorporated into a complex regional economy as traders, producers, and consumers who were both contributing to and reliant upon reciprocal economic interaction. The degree to which this helped the Mono maintain territory is of course open to debate, but the fact that so much borrowing was economic suggests it likely played a significant role. In this light, it might be interesting to quantitatively assess the degree to which the Mono profited by their integration into the California economy, and how this integration may have helped them cope with Little Ice Age environmental variability.

SYNTHESIS AND CONCLUSIONS

Reconstruction of the basic Mono economy and a review of some critical aspects of Mono ethnography presents a situation that at first glance might suggest a conflicting picture as to how Numic migration and territorial maintenance worked on the southwestern periphery of the Great Basin. On the one hand, it is clear that Great Basin Numic behaviors gave the Mono an adaptive advantage during their Little Ice Age migrations. Flexible mobility patterns incorporating elements of residential and logistical mobility, fluid group composition, and resource caching reduced risks associated with living in highly seasonal and unpredictable Little Ice Age mountain environments. These behaviors allowed continuous occupation at fairly high elevation winter hamlets and first access to critical resource patches in the spring, summer, and fall. In effect, this type of "first access," similar to that proposed by Sutton (1984a), was territorial maintenance and defense by default—by the time a Yokuts or Miwok forager showed up, the Mono were already there and had taken a big bite out of available resources. That this bite was predicated on a form of mobility that brought consumers to spatially discrete resource patches just when they became productive, and that much of the foodstuffs garnered from these patches was stored or cached for later, indicates a particularly efficient and risk-reducing system well tuned to coping with environmental variability. Such an economic system was clearly one (if not the) fundamental force behind Mono success in the Sierra and formed a large part of the competitive edge they held over other groups.

But while the process of occupying the Sierra Nevada entailed the replacement of one linguistic group (and likely a population) by another, it did not entail cultural replacement. On the contrary, the Mono clearly adopted many basic California cultural traits and involved themselves as significant players in integrated Californian economic patterns. Nowhere is this more evident than in their shift from a Great Basin, pine-nut (*P. monophylla*, not present on the west slope of the Sierra) oriented economy to a Californian acorn economy, which though similar in some respects, involved differences in seasonal and yearly nut production and associated monitoring, ownership, and harvest behaviors (McCarthy 1993; Sutton 1984b). Though it is conceivable that the spread of coniferous forests in the Sierra during the Little Ice Age may have expanded the range of montane forest pine-nut producing species like sugar pine (*Pinus lambertiana*) and thus been a "pull" factor encouraging the spread of pine-nut adapted people like the Mono onto the west slope of the Sierra (this would have occurred, however, at the expense of the range of *P. sabiniana* at lower elevations), it is also quite clear that the Mono quickly adopted the California acorn economy, settling in areas dominated by black and blue oak (*Quercus kelloggii* and *Q. douglassii*, respectively) (Morgan 2006), rapidly borrowing or developing a sophisticated, multifaceted BRM technology (McCarthy et al. 1985), and incorporating acorn into nearly every aspect of their economic, social, political, and even ideological structures (Lee 1998; McCarthy 1993). Their borrowing was thus much more than simply superficial—it affected all levels of society, from the basic subsistence economy to fundamental social structures and ideology. That so much of this borrowing was economic in nature strongly suggests that the Mono benefitted here as well, not by holding on to ancestral Numic behaviors, but rather by adopting many of those of central California.

Though economic competition is certainly the principal component of this and likely other migrations, it is clear that simple models of population and cultural replacement—where one group displaces, outcompetes, or replaces another by dint of their superior technology or economic behavior—might be too simple or miss important behavioral variability in this case. This appears especially true when migrating groups enter places where populations are circumscribed and already socially and economically integrated. While simpler models may apply in cases of low population density (and perhaps in cases of extreme violence or genocide), it appears here that the success or failure of a competitive migration was predicated not only on environmental and economic conditions, but also on the social and cultural contexts in which it occurred, with the latter becoming increasingly important as sociocultural and economic complexity increased (this recalling early evolutionists like Powell [1888] on the inverted relationship between environmental and social forces and the increasing importance of the latter in the evolution of complex societies). It remains to be seen, however, exactly what the costs and benefits of borrowing and economic integration are, but it appears likely that they are just as important as the things we have become accustomed to looking at, like mobility and diet, when considering adaptedness and cultural evolution.

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