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Author

Laylander, Don

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Inferring Settlement Systems for the Prehistoric Hunter-Gatherers of San Diego County, California

DON LAYLANDER, Calif. Dept. of Transportation, 1352 West Olive Ave., Fresno, CA 93778.

Recent discussions of prehistoric settlement systems have often been framed in terms of a simple typological contrast between "foragers" and "collectors." This dichotomy does less than full justice to the potential complexity of prehistoric adaptive systems and to their expression in the archaeological record. Settlement systems are proposed to vary in several partially independent dimensions. A number of variables in the archaeological record may be argued to reflect aspects of this variation. The potential, the difficulties, and some partial successes in inferring settlement systems from the prehistoric archaeological record of San Diego County are discussed.

UNDERSTANDING the spatial organization of prehistoric hunter-gatherers is among the most ambitious archaeological objectives in the study of such peoples. In recent decades, substantial advances have been made, both in conceptualizing settlement systems and in developing archaeological criteria for their recognition. However, much work remains to be done in both respects.

Lewis R. Binford's (1980) distinction between "foragers" and "collectors" is a commonly applied classification, but one which only imperfectly captures the diversity of hunter-gatherer settlement systems. Alternatively, some 15 settlement dimensions are suggested here as potentially significant, and their manifestations in the ethnographic record for San Diego County (Fig. 1) are briefly discussed. Finally, variables in the San Diego archaeological record that shed additional light on these settlement dimensions are identified.

BEYOND FORAGERS AND COLLECTORS

In the literature on hunter-gatherer settlement systems, Binford's 1980 article, *Willow Smoke and Dogs' Tails*, has become a modern

classic. The distinction between "foragers" and "collectors" has been applied to the classification of prehistoric archaeological records in various regions, including San Diego County (e.g., Graham 1981; Hector 1988; Wilke and McDonald 1989; Beck 1993; Byrd et al. 1993; Warren et al. 1993; McDonald et al. 1994).

To summarize briefly, Binford (1980) suggested that foragers move their residential bases to the resources they exploit ("mapping on"), generally do not store resources, and gather resources on an "encounter" basis. Two types of archaeological sites are produced by foragers: residential bases and "locations" (extractive sites). In contrast, collectors make use of a logistical strategy, using special task groups to procure resources from beyond the daily foraging radius of a residential base. Storage is characteristic of collectors, and resources are gathered on a more planned, "intercept" basis. In addition to residential bases and locations, collectors produce three other site types: field camps, stations, and caches. "Field camps" are overnight camps used by task groups, and therefore, by definition, indicate the use of logistical practices. "Stations" are information-gathering

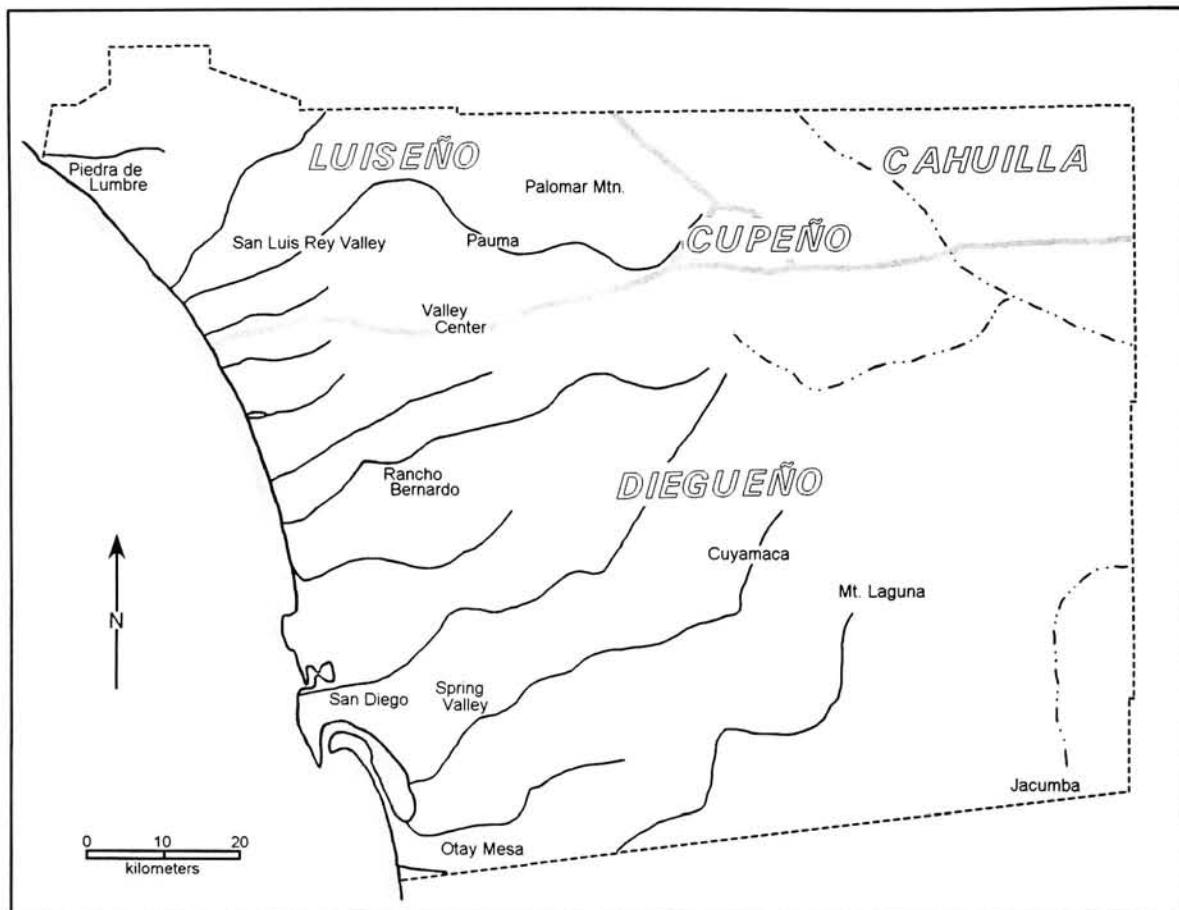


Fig. 1. Map of San Diego County, with ethnographic boundaries shown.

sites, such as game observation or ambush sites, and therefore (at least in some cases) reflect acquisition of resources by intercept rather than encounter. "Caches" are storage sites. Collectors also tend to make fewer residential moves, to have more "complex" settlement systems, and to produce archaeological records with a greater range of intersite variability.

Some problems may be noted with Binford's scheme, or at least with the ways in which it has been applied typologically to particular regions and periods. Three main interpretive variables distinguish the types of settlement systems: mapping on versus logistics, nonstorage versus storage, and encounter versus intercept. The forager/collector typology can be described as

polythetic and nonrigorous, in that several defining variables are involved, but in an essentially undefined manner. Typologies based on polythetic, nonrigorous definitions work well only under certain conditions: when the relevant variables are so numerous or complexly related that a monothetic and/or rigorous definition is impractical, and when the variables are strongly correlated with one another, so as to produce few ambiguous cases. Under these conditions, much information can be effectively compressed into the typology. On the other hand, in cases where the correlations among the variables are only moderate or weak, two problems are likely: particular cases will be inconsistently assigned to types, and values for some variables may be in-

correctly inferred from known values for other variables.

Both of these problems appear to apply to the forager/collector dichotomy. Although Binford (1980) may have been correct in seeing a worldwide correlation between the three forager/collector variables, there is little reason to suppose that the correlations are strong enough to justify the application of the forager/collector dichotomy, as it is defined, to any particular case. One can easily imagine hunter-gatherers whose settlement system involves any combination of values for the three variables: not moving resources logistically, but storing them; not moving resources logistically, but acquiring them on an intercept basis; not storing, but acquiring by intercept; and so on. Therefore, even when the values for the variables are all well known, there is no assurance that two observers will consistently distinguish a particular ethnographic or archaeological case as foraging or as collecting. Inferring one of the three variables from known values for one or two of the others will be precarious at best. Archaeologically, identification of a "field camp" does not imply intercept procurement or storage; a "station" does not imply logistical movement or storage; and a cache does not imply logistical movement or intercept procurement. None of these site types necessarily imply infrequent residential moves or substantial settlement system complexity.

Binford's discussion has been valuable for calling attention to potentially important variables, both in settlement systems and in the archaeological record. However, to reconstruct particular prehistoric settlement systems, it is essential that archaeologists move beyond a simple forager/collector dichotomy and consider a range of dimensions, which may vary partially or fully independently of each other.

INTERPRETIVE DIMENSIONS

In this section, an attempt is made to identify some significant settlement dimensions and

to note briefly their application to prehistoric San Diego County, as inferred primarily from the local ethnographic record or from worldwide ethnographic patterns.

Character and Composition of Communities

The first group of dimensions relates to the character and composition of communities. "Community" is defined herein as a group of people of both sexes and potentially all ages, living in proximity to each other for an extended period of time. Societies based on units other than communities are known ethnologically, but they are not likely to be relevant to prehistoric San Diego County. The principal contrast intended here is between communities and task groups of narrower composition and more limited duration.

Community dimensions of interest include community size, settlement nucleation, community fission/fusion, and fluidity in community membership.

Community Size. Community size refers to the number of people who composed the community. In a survey of the worldwide ethnographic literature, Kelly (1995) found hunter-gatherer community sizes ranging from 10 to 1,500 persons, with a median of about 100 persons for "sedentary" groups, and around 25 for "nomadic" groups. Late Prehistoric San Diego County groups seem to have been relatively large, at least at their seasonal maxima. White (1963) suggested an average of 200 persons per Luiseño territorial ranchería, although such a ranchería might contain more than one village. Cahuilla territorial lineages were estimated at about 75 persons. The Cupeño, with an estimated population of 500 and only two settlements (at least in historical times), would have had an anomalously large average community size of 250 persons (Kroeber 1925:689). True (1970:57) suggested that among the Diegueño "as many as 200 people may have lived in one location. A hundred seems a more reasonable

estimate . . . and 8-10 families per settlement would not be too few under some circumstances." Hicks (1963) evaluated ethnohistoric evidence and concluded that western Yuman lineage-bands formed communities with an average population of 50 to 150.

Settlement Nucleation. Settlement nucleation is defined as the extent to which community residence was clustered or dispersed. Settlement nucleation has received little attention in the regional ethnographic literature, but it is an important dimension in interpreting the archaeological record.

Late Prehistoric settlement in San Diego County seems to have been more strongly nucleated into compact "villages" than, for instance, that of the agricultural Yumans of the Lower Colorado River, but some tendency toward dispersion may have been present. Several archaeologists have interpreted scattered habitation sites as outlying portions of ethnohistorically identified villages (e.g., Graham 1981; Kyle 1988; McDonald et al. 1993). Shipek (1982:297) wrote of Diegueño territorial units as containing both a "central primary village and a number of outlier homesteads." It is not clear how these homesteads were perceived: as year-round family residences showing weak nucleation with respect to the community's central village, as settlements occupied by seasonal fission of the main village community, or possibly as logistical camps.

Community Fission/Fusion. The extent to which communities broke down seasonally into smaller communities or joined into larger ones is known as community fission/fusion. Spier (1923:306) reported that the eastern Diegueño spent the winters in the eastern foothills of the Peninsular Range, "in groups of mixed gentile [kin group] affiliation," but during the summer, in their main territories, "they lived in little groups about the valleys." Hicks (1963:138) argued that among the western Yumans, "seasonal movements . . . were regularly made to other

localities, some of them shared with other bands, others supporting only a portion of one band."

A somewhat ambiguous attitude toward the fission/fusion model was taken by True and his collaborators (True 1970, 1993; True et al. 1974; True and Waugh 1982). In several discussions, a simple, one-to-one matching of lowland winter and upland summer settlements was proposed, which would minimize fission/fusion tendencies (True 1970:54-55, 1993:16; True and Waugh 1982:34). In other discussions, reference was made to "subsidiary camps" and "satellite gathering or hunting stations," (True 1970:55; True et al. 1974:78) which may be community fission settlements, logistical camps, nonresidential work stations, or a mix of all three. In one formulation, the pattern was seen developmentally as a fusion process: originally separate, kin-based communities were proposed to have retained their distinct territories in the summer upland phase but to have consolidated into larger communities in the winter lowland phase (True and Waugh 1982:37).

Fluidity in Community Membership. Fluidity in community membership refers to the extent to which people changed the community to which they belonged. Inter-marriage between communities would have tended to promote membership fluidity, both in the original emigration of one marriage partner and by creating ties which could serve as a basis for a nuclear family to move from one spouse's original community to the other's. Tendencies toward smaller communities and toward kin-based territorial units would have promoted local exogamy, while larger and less strictly kin-based communities would have permitted more local endogamy. Shipek (1982:297) argued that Diegueño kin groups crosscut territorial bands, which "facilitated movement of individuals or families from one area to another in times of necessity." Luomala (1976:257) reported that Diegueño "residential groups vary in size, form, and composition of kinfolk from place to place, season to season,

and year to year, according to the food supply.” Diegueño *kwitxal*, or “drifters,” discussed at length by Luomala, seem to be a prime example of community membership fluidity. Owen (1965, 1966) also stressed the absence of rigid barriers to the movement of people between western Yuman communities. The ethnographic literature seems to indicate that western Yuman communities were more fluid than those of the Uto-Aztec peoples to the north.

Community Mobility

A second set of interpretive dimensions relates to community mobility, including daily catchment size, annual range size, distance of residential moves, frequency of residential moves, rate of catchment reoccupation, and rate of site reuse.

Daily Catchment Size. Daily catchment size is defined as the foraging radius within which members of a community travelled during a day, moving out from and returning to a long-term residential base or a temporary camp. Binford (1982) suggested a 10-km. hunter-gatherer foraging radius, but specific ethnographic evidence on prehistoric catchment sizes in San Diego County is lacking.

Annual Range Size. The area encompassed by a community's catchments throughout a year is known as annual range size. In cases where an exclusive community territory was established, the annual range might correspond with that territory, although there might also be areas not claimed by any community, into which the community could move during portions of the year.

Sparkman (1908) reported that each Luiseño band had an allotted territory in the San Luis Rey Valley, another on Palomar Mountain, and, according to tradition, also went to the coast in the winter. Exclusive and comprehensive community territories, typically on the order of 80 km.², seem to be implied in White's (1963) model of Luiseño settlement. Shipek (1982:297)

suggested that Diegueño “territorial bands . . . generally controlled from 10 to 30 miles along a drainage and up to the drainage divides.” This would suggest a community territorial unit on the order of 500 km.², which would probably be manageable as a single daily foraging catchment from a fixed base. However, Shipek (1982) also proposed the existence of a “national” level of sociopolitical organization among the Diegueño, with some lands, including some coastal areas and the pinyon and acorn areas in the mountains, “owned” at this level. Such lands would imply that a community's annual range was substantially larger than the community territory, whether the additional areas were accessed residentially or logistically.

Distance of Residential Moves. In Kelly's (1995) worldwide sample, the average distance of residential moves ranged from 4 to 70 km., with a median of around 12 km. The model of lowland-upland seasonal shifts for the inland Luiseño and Diegueño implies residential moves on the order of 10 to 20 km. Residential moves by these same groups to the coast would have involved 40 to 60 km. of travel, probably in two or more stages.

Frequency of Residential Moves. Frequency of residential moves refers to the number of moves made in the course of an annual round. Kelly (1995) found that hunter-gatherers worldwide moved from zero to 60 times annually, with a typical figure of around 10 moves.

The catchment-sized territories projected for Late Prehistoric groups in San Diego County suggest that no residential moves might have been necessary. The “bipolar” settlement models frequently proposed for both the Late Prehistoric and Archaic periods, usually with a coastal/interior or lowland/upland axis, would suggest two residential moves per year (cf. Sparkman 1908; True 1970, 1993; True and Waugh 1982; McDonald et al. 1994). However, Spier (1923: 307) evidently envisioned an extended series of residential shifts by the eastern Diegueño as they

moved from winter desert settlements up toward summer sites in the mountains. In northern San Diego County, considerably greater mobility was suggested for the San Luis Rey I Period than for its successor, and Archaic settlement was envisioned as "a pattern of mobility and short-term residency" (True and Waugh 1982; Waugh 1986:27).

Rate of Catchment Reoccupation. The frequency or regularity with which a given catchment was reoccupied by a community in successive years is called rate of catchment reoccupation. Binford (1983:381) reported that a Nunamiut band in northern Alaska went through a cycle involving reoccupation of catchments only after about 40 years. For Late Prehistoric western San Diego County, it appears likely that many lowland catchments were reoccupied at close to a 100% rate. However, some upland catchments exploited during the fall acorn harvest may have been less regularly reoccupied, depending on the local vagaries of the acorn crop. Similarly, agave harvesting areas and lowland desert catchments may have been used only periodically or irregularly, depending on varying resource availability and community needs.

Rate of Site Reuse. Rate of site reuse refers to the frequency with which a given site was reused by a community or task group. Site reuse implies catchment reoccupation, but the reverse is not true. The ethnographic record has little to say directly about this variable. True and his collaborators (True 1970; True et al. 1974; True and Waugh 1982) argued that Luiseño and Diegueño settlements were "relatively stable and permanent," although acknowledging that they may occasionally have been relocated. "Village names" which were recorded ethnographically or ethnohistorically would seem to argue for prolonged use of particular locations (Oxendine 1983; True and Waugh 1987). However, on closer examination, the application of these names to particular sites appears to be questionable. The names may have been terms

for communities that were situated at varying locations, or terms for general geographic areas.

Spatial and Temporal Incongruities

A third and final set of interpretive dimensions relates to the ways in which spatial and temporal incongruities between resource availability, labor availability, and consumption needs were managed, other than by residential moves. These dimensions include logistical transporting of resources, storage of resources, intercommunity exchange of resources, exclusivity in land and resources, and intensity of resource use.

Logistical Transporting of Resources. Logistical transporting of resources refers to the movement of resources to a consumption location outside the catchment of their procurement. The sizes projected for Late Prehistoric community territories, which amount to single catchments, would seem to rule out the need for any logistical exploitation of those territories.

True et al. (1974:79) argued that Luiseño community territories did not include areas more than one-half day's travel from either the summer or the winter residential base, eliminating most or all need for "temporary field camps." The question remains whether resources located outside of the territories were procured directly by their consumers, and if so, whether procurement was done by task groups or through community residential moves. The ethnographic record refers to movements which may have been either residential or logistical. One relatively clear case of logistical movement relates to agave procurement, which was said to have been done by male-only task groups spending several days away from the base settlement (Bean and Saubel 1972).

Storage of Resources. The ethnographic record contains references to the storage of numerous plant and animal resources (cf. Laylander 1993:B.4). The majority of these references relates to the Colorado Desert rather than to western San Diego County, but this may merely re-

flect the greater attention given to the ethnobotany of the desert region. Storage of acorns seems to have been an important element in the subsistence of the western groups.

Intercommunity Exchange of Resources. Surveys of the San Diego ethnographic literature suggest that formal interregional exchange systems were not highly developed or important, particularly among the Luiseño (cf. Davis 1961). However, intercommunity participation in ceremonial activities that included hosted feasts and gift-giving is well attested, and this may have been a significant mechanism for adjusting resource incongruities in the region.

Exclusivity in Land and Resources. Exclusivity in land and resources is the reservation of catchments or resources for particular communities or their subunits. The practice of exclusivity manages the problem of incongruities between consumption needs and resource availability by containing the incongruities within a limited social unit rather than allowing them to spread regionally. It also creates conditions favorable to the intensification of resource conservation and management.

White (1963), Shippek (1986), and some other ethnographers have suggested strongly developed aboriginal exclusivity at several levels in western San Diego County, whereas some earlier ethnographers specifically denied it (cf. Laylander 1991). True (1970) contended that ownership of resource-producing areas was characteristic of both the Luiseño and the Diegueño, although it was perhaps more strongly developed among the former. True and Waugh (1982) maintained that Luiseño community territories and resources were defended against trespass, but they also suggested that this pattern of exclusivity had only gradually developed from a more permissive policy earlier in the Late Prehistoric Period.

Intensity of Resource Use. Intensity of resource use includes intentional stimulation of the productivity of particular locations, or the ex-

ploitation of lower-ranking resources. Intensive resource use generally reflects a higher regional population density (greater community size and/or smaller annual range), greater community circumscription (greater exclusivity), or a cultural choice of greater sedentism (fewer residential moves). Because they represent an investment of labor toward a future return, resource management practices tended to occur only when there was a definite intention to reoccupy the catchment in question and probably when some exclusive rights to do so were present. The most intensive form of resource management is agriculture. It has been suggested that agriculture was practiced in prehistoric San Diego County (Bean and Lawton 1973; Shippek 1986, 1993), although the validity of these claims has been questioned (e.g., Laylander 1987). A less ambitious form of resource management would be the setting of fires to promote pre-climax vegetation communities, which is also claimed for prehistoric San Diego County (Shippek 1986, 1993).

Intensification through the use of lower-ranked resources was probably a much more significant process, although it has as yet been little addressed in the region. Modelling the optimal resource exploitation strategies for particular regions has become a popular anthropological pastime (cf. Bettinger 1991; Kelly 1995), but one fraught with problems. In one preliminary application to San Diego County, a model proposed by Christenson (1990) suggested that the optimal subsistence strategy would have involved the use of only two resources: acorns and rabbits. If this is even approximately correct, the wide range of resources whose use is attested ethnographically would be evidence of substantial intensification. Another model for Late Prehistoric subsistence intensification was proposed by Hildebrand and Hagstrum (1995).

ARCHAEOLOGICAL SIGNATURES

It should be possible to refine the knowledge of the settlement system dimensions discussed

above through comparative ethnological studies and ecological modelling, through further critical reexamination of the regional ethnohistoric and ethnographic records, and, possibly, through the collection of additional ethnographic data. However, the best prospects for advances now lie in archaeological analyses. A number of observational variables is relevant. Several are listed below, with indications of their bearing on settlement issues and with notes on the ways in which they have been addressed in San Diego County archaeology. Table 1 summarizes the suggested links between archaeological variables and settlement system interpretive dimensions.

Individual Artifacts, Ecofacts, or Features

The first group of variables is evidenced in individual artifacts, ecofacts, or features. These variables include dwelling construction, storage facilities, resource management facilities, evidence of use of low-ranked resources, exotic material, processing stage, and tool use wear and formality.

Dwelling Construction. Dwelling construction refers to the extent of effort made to establish and improve residential facilities, archaeologically recognizable as excavated housepits, rock walls or foundations, or postmolds. Evidence for substantial construction effort, relative to the functional requirements imposed by the climate, would tend to imply a low frequency of residential moves and a high rate of site reuse. The ethnographic record for San Diego County suggests that dwellings representing investments of substantial effort were constructed, but few indications of this have survived or been recognized archaeologically. Rock enclosure features, sometimes interpreted as dwellings, have been found in several areas (Minor 1975; Van Wormer and Carrico 1993).

Storage Facilities. Storage facilities reflect a temporal but not a spatial incongruity between the procurement or processing of a resource and its consumption. They may indicate a low fre-

quency of residential moves, or a high rate of catchment and site reuse, and site exclusivity.

Rock rings on large boulder or bedrock outcrops have been reported from many areas in San Diego County and have commonly been interpreted as acorn granary foundations (cf. James 1995). Stone-lined cache pits have been reported (Kyle 1988; Wilke and McDonald 1989). Some ceramic vessels have been identified as storage containers; for instance, on the basis of the vessel form (cf. Van Camp 1979), an absence of burning on sherds (Hector 1988), the presence of stored materials in them (cf. Treganza 1947), or the contexts of their occurrence. Caches of lithic tools and cores have been reported from various sites. In cases in which evidence of storage suggests an intention to conceal the stored materials, this may argue for irregular use of the catchment and a lack of exclusivity. Wilke and McDonald (1989) noted this factor with respect to a rockshelter cache pit. Occurrences of ceramic storage vessels and presumed granary foundations at locations that are some distance from habitation sites have been noted (True et al. 1974; Laylander and Christenson 1988a).

Resource Management Facilities. Resource management facilities are features intended to increase the productivity of the land, such as irrigation ditches or check dams. Management facilities would be expected to be associated with a low frequency of residential moves, regular catchment reuse, and exclusivity. Carrico (1988) reported stone diversion walls in the Rancho Bernardo area which may be prehistoric. However, archaeological confirmation of the extensive management facilities suggested by Shipek's (1986, 1987, 1993) ethnographic accounts has generally been lacking. This may reflect subsequent destruction of the features, their incorporation into historical period facilities, a failure by archaeologists to recognize the evidence, or a genuine prehistoric scarcity or absence of such facilities.

Table 1
PROPOSED RELATIONSHIPS BETWEEN SETTLEMENT SYSTEM DIMENSIONS
AND ARCHAEOLOGICAL VARIABLES*

Artifact/Ecofact/Feature Variables	Community Size	Settlement Nucleation	Community Fission/Fusion	Fluidity in Community Membership	Daily Catchment Size	Annual Range Size	Distance of Residential Moves	Frequency of Residential Moves	Rate of Catchment Reoccupation	Rate of Site Reuse	Logistical Transporting of Resources	Storage of Resources	Intercommunity Exchange of Resources	Exclusivity in Land and Resources	Intensity of Resource Use
Dwelling Construction	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-
Storage Facilities	-	-	-	-	-	-	-	+	+	+	-	+	-	+	-
Management Facilities	-	-	-	-	-	-	-	+	+	-	-	-	-	+	+
Low-Ranked Resources	+	-	-	-	+	-	-	+	-	-	-	-	-	+	+
Exotic Material	-	-	-	+	+	+	+	-	-	-	+	-	+	+	-
Processing Stage	-	-	-	-	+	-	+	+	-	-	+	+	+	-	-
Tool Use Wear and Formality	-	-	-	-	-	-	+	+	+	+	-	+	-	-	-
Site Variables															
Site Area	+	+	-	-	-	-	-	-	-	+	-	-	-	-	-
Quantity of Cultural Residues	+	-	-	-	-	-	-	+	-	+	-	-	-	-	-
Activity Diversity	+	-	-	-	-	-	-	+	-	+	+	-	-	-	+
Tool Diversity	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-
Seasonal Range	-	-	-	-	-	-	-	+	-	+	-	+	-	-	-
Intrasite Feature Redundancy	+	-	-	-	-	-	-	-	-	+	-	-	-	+	-
Resource Depletion	+	-	-	-	+	-	-	+	+	-	-	-	-	+	-
Stylistic Uniformity	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Regional Variables															
Site Density	-	+	-	-	+	-	+	+	+	+	-	-	-	+	-
Local Site Redundancy	-	+	-	-	+	-	+	+	+	+	-	-	-	+	-
Local Site Complementarity	-	-	-	-	+	-	+	+	+	+	-	-	-	+	-
Catchment Resource Diversity	+	-	-	-	+	-	-	+	-	-	-	-	-	-	+
Settlement Pattern Variability	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-

* + = the archaeological variable on the left is related to the settlement dimension above;
 - = no relationship is proposed.

Evidence of Use of Low-Ranked Resources.

Faunal and botanical remains, as well as functionally specific artifacts and features, may testify to the use of resources that would have ranked less highly than others available to prehistoric inhabitants. A prerequisite for recognition of the use of low-ranked resources is more sophisticated modelling of optimal subsistence options, although a start has been made by Christenson (1990). Supporting the ethnographic evidence, documented archaeological remains in San Diego County attest to the use of a considerable range of resources, and it is probable that this indicates at least some resort to low-ranking resources.

Exotic Material. Materials which were exotic to a site location but available within one-half day's travel and abundantly represented in the site deposit may define the limits of the catchment which was exploited from the site. The presence at a site of materials from beyond the catchment implies the operations of exchange, logistical movement, or residential movement, with some indication of the direction and scope of those actions. Marine shell of Pacific Coast and Gulf of California species has been recovered from many inland San Diego County sites, although normally in small quantities (e.g., True et al. 1974; Laylander and Saunders 1993). Some types of ceramics are evidently exotic, notably Lower Colorado Buff Ware produced in the Colorado Desert, which has been found in limited quantities in many Late Prehistoric sites in western San Diego County. Obsidian is generally a minor element in San Diego assemblages, but specimens have been sourced to Obsidian Butte near the Salton Sea, San Felipe in northeastern Baja California, and the Coso Volcanic Field and other sources east of the Sierra Nevada. Cryptocrystalline silica in San Diego County sites probably came from a variety of sources, both local and exotic, but notably including material from Piedra de Lumbre in northwestern San Diego County (Pigniolo

1994). Steatite probably also came from several sources, including Jacumba, Mount Laguna, Cuyamaca, Valley Center, and perhaps Catalina Island (cf. Polk 1972).

In a few instances, the specific mechanisms involved in moving exotic materials have been proposed: exchange in the case of obsidian, based on regional frequency patterns (Laylander and Christenson 1988b); residential movement in the case of marine shell, based on seasonality analysis (Quintero 1987); and direct procurement (residential or logistical) in the case of Piedra de Lumbre chert, based on regional frequency patterns (Pigniolo 1992).

Processing Stage. Processing stage refers to the position of archaeological residues on a continuum between initial procurement of a resource and its final use. The reduction stages represented by lithic tools and debitage may suggest how far removed the activity at the site was from the initial quarrying of the material and from the final use of its tool end products. Analysis of the processing stage may help to identify the place of the site in a mobility pattern, or the mechanisms by which the material was moved, such as direct procurement or exchange. In San Diego County studies, some attention has been directed toward attempting to define reduction stages for lithic debitage (cf. Rosen 1982; Hector 1984; Laylander 1993: B.12).

Butchering stages, represented by different proportions of particular anatomical elements at processing and consumption sites, might shed some light on logistical practices in hunting. The discarding of marine shell represents a stage in processing the food content of shellfish, which is found to have occurred variously in the immediate vicinity of the procurement locations on the coast, at special purpose processing sites a short distance inland (e.g., Corum 1991), and at habitation bases, sometimes a considerable distance from the coast (e.g., Quintero 1987). Ceramic manufacturing residues, including un-

worked clay, vessel-shaping tools, and firing areas, might clarify whether ceramic vessels were used primarily at the locations where they were made (as might be expected in a substantially sedentary system), constructed as a part of logistical forays, or transported through a series of residential moves.

Tool Use Wear and Formality. A site produced by a brief occupation would be likely to contain locally manufactured tools with minimal use wear. A site produced by extended occupation or repeated reoccupation might contain tools with more extensive use wear. The expenditure of extra effort on tool refinement beyond minimal functional requirements would tend to indicate that an extended use-life was expected, which might occur through prolonged occupation of the site, by the caching of tools for later reuse, or by carrying tools to successive sites during an annual round. More casual tools might reflect brief occupations, uncertain reoccupation, or moves made too frequently or over distances too great to make the transporting of tools practical. Archaeological studies in San Diego County have devoted little attention to assessing possible contrasts in relative tool formality and use wear between subregions, between time periods, or between site types. One examination of tool formality at a Spring Valley residential base found a predominance of casual artifacts, with little evidence for any contrast between an early component and a later one (Laylander 1992).

Site Level Observations

A second set of archaeological variables relates to site level observations, including site surface area, quantity of cultural residues, activity diversity, lithic tool diversity, seasonal range, intrasite feature redundancy, resource depletion, and stylistic uniformity.

Site Surface Area. Site surface area is one of the most frequently recorded archaeological observations, but criteria for site limits are vaguely defined and applied with little consis-

tency. Christenson (1990) employed site surface area as a key element in distinguishing "villages or rancherías" from "small villages or short term habitation sites." The size of Late Prehistoric village sites in the Cuyamaca area led True (1970:57) to postulate that the communities may have numbered as many as 200 persons. A large site may reflect occupation by a large community, or it may reflect weakly nucleated activities or repeated reoccupations by a small community, which makes the interpretation of large area sites difficult. On the other hand, small habitation sites provide convincing evidence for small communities, or in some cases, for weak community nucleation. Small habitation sites seem to be present in many parts of San Diego County and pertain to the Late Prehistoric Period and probably the Archaic Period as well.

Quantity of Cultural Residues. "Midden accumulation," sometimes cited as an indicator of site function, is effectively an expression of cultural residue quantity at a site. This variable can be used as a rough index to the amount of certain types of activities which occurred at the site, which in turn would be a composite function of community size, length of occupation, frequency of reoccupation, and site function. As with site size, the quantity of remains is most easily interpretable in instances where the quantities are very small, attesting to brief occupations, with few or no reoccupations, by small communities. General impressions of the quantity of residues have emerged for many archaeological sites in San Diego County, but the representative sampling which would provide a statistical basis for estimates of total assemblage sizes is rare. Waugh (1986:29) proposed increasing quantity of remains as an indicator of decreasing Late Prehistoric mobility.

Activity Diversity. The range and proportions of different activities represented in an assemblage is called activity diversity. A relatively high activity diversity would support an argument for occupation by a community rather than

merely by a task group, occupation by a large community rather than a small one, and prolonged occupation or repeated reoccupation rather than a single, brief occupation. Activity diversity has commonly been recognized in classifying San Diego County sites, although not generally in a formal manner. The tool sets recovered from lowland and upland residential sites in the Pauma-Palomar area were reported as being "seemingly the same," indicating that "most essential activities" occurred at each location and that the upland sites were seasonally sedentary settlements rather than mere hunting camps (True et al. 1974:80). Waugh (1986:27, 29) saw Archaic Period "functional assemblages of limited quantity and diversity" as indicative of sparse population and high mobility, and greater diversity in Late Prehistoric Period assemblages as indicative of decreasing mobility.

Lithic Tool Diversity. Worldwide ethnographic data appear to indicate that the number of distinct functional tool types employed by a culture is strongly negatively correlated with the frequency and distance of residential moves (Shott 1986). This presumably reflects the costs involved in transporting an extensive tool kit. Elaborate lithic tool typologies have been applied to some San Diego County assemblages (e.g., Warren et al. 1961; Kaldenberg 1982), but it is not clear whether these typologies truly reflect functional diversity or merely arbitrary segmentation of a continuum of accidental variability.

Seasonal Range. Seasonal range refers to the portion of the year for which occupation is evidenced at a site. Seasonal range has bearing upon frequency of residential moves and, in some circumstances, upon frequency of site reoccupation. Because only limited success has been achieved in recognizing archaeological seasonal signatures (as distinct from a priori ecologically or ethnographically based modelling), few San Diego County sites can be confidently assigned seasonal ranges. Quintero (1987) presented faunal evidence that an inland valley site

in northern San Diego County was occupied during the late fall, winter, and early spring, alternating with settlement on the coast. Robbins-Wade (1988) reported that a coastal settlement in northern San Diego County was occupied all year. Byrd (1996) argued that seasonality data, along with assemblage size, indicated a strong presence on the northern San Diego County coast during the Late Prehistoric Period.

Intrasite Feature Redundancy. The extent to which multiple examples of functionally equivalent features are present within a site is known as intrasite feature redundancy. Substantial redundancy could suggest occupation by a large community, while its absence would point to occupation by a small one. A difficulty with using this index to demonstrate large community size is that functionally equivalent features may have been multiplied for reasons other than needs for simultaneous use. Respect for ownership rights or avoidance of features associated with deceased persons may have been factors. It has been argued that the dense clustering of milling features on some outcrops and the proliferation of agave roasting pits are among the indicators of a practice of avoiding the reuse of features in prehistoric San Diego County (Laylander 1993: B.7).

Resource Depletion. Resource depletion is the extent to which a decline in the quantity or quality of local resources is reflected diachronically at a site. This variable would have a bearing on community size, daily catchment size, frequency of residential moves, and frequency of catchment reoccupation. The decline of marine shell size as a possible indicator of shellfish overexploitation has been examined elsewhere in southern California, although not in San Diego County. The possibility of local depletion of sources of Santiago Peak metavolcanic rock, the most widely used material for flaked stone tools in the region, has been discussed, but with negative results as to any convincing evidence of depletion (Norwood 1980; Laylander 1992).

Stylistic Uniformity. Stylistic uniformity is the extent to which artifacts or features within a site show a strong uniformity of style, in comparison with comparable remains in other contemporaneous sites in the region. A high degree of stylistic uniformity would suggest a high degree of community membership stability; stylistic diversity might indicate that individuals or families tended to shift their community membership through time. Shackley (1984) considered the question of stylistic uniformity or diversity in the design of agave roasting pits as evidence for the strength of community or ethnic group traditions in southeastern San Diego County.

Regional Level Observations

The final set of archaeological variables relevant to settlement systems consists of observations made on a regional scale. These include site density, local site redundancy, local site complementarity, catchment resource diversity, and regional settlement pattern variability.

Site Density. Site density refers to the number of sites identified within a given area. Site density has an evident, if complex, bearing on community nucleation, daily catchment size, distance of residential moves, frequency of residential moves, rate of catchment reoccupation, and rate of site reuse.

Several portions of San Diego County have been thoroughly inventoried for sites, but the greatest difficulty in applying such data to interpretations concerning settlement systems lies in establishing a broad contemporaneity among sites. This problem is least severe for the Late Prehistoric Period, which has a relatively short duration (probably less than a millennium) and relatively dependable survey-level diagnostics (pottery and small projectile points). Sparkman (as cited in Waugh 1986:62) noted the proliferation of "old village sites" in Pauma Valley, attributing their number in part either to seasonal residential shifts or logistical practices. The

number of "major villages" that have been identified in the Cuyamaca area suggested to True (1970:57) that community size was more reasonably estimated at 100 rather than 200 inhabitants. Waugh (1986:270) linked the low inland Archaic Period site density with sparse populations, and higher Late Prehistoric Period densities with localized, semisedentary settlement.

Local Site Redundancy. The extent to which broadly contemporaneous residential sites are identified within the same catchment is called local site redundancy. This bears most directly upon community nucleation and the frequency of site reuse, and more indirectly upon catchment size, frequency of residential moves, and rate of catchment reoccupation. The problem of establishing broad contemporaneity arises again, along with the problem of establishing functional equivalency. The issue has been explicitly addressed in a few studies (Laylander and Christenson 1988a; Laylander 1989), in which it has been argued that substantial redundancy is present, probably reflecting a high frequency of residential moves, a high rate of catchment reoccupation, and only a moderate rate of site reuse.

Local Site Complementarity. The extent to which functionally subordinate sites, such as processing stations, logistical camps, or residential travel camps, are found within the same catchment or local area as habitation bases is known as local site complementarity. Such complementarity points to the reuse of a catchment or local area from an external habitation base. This pattern is therefore relevant to catchment size, distance of residential moves, frequency of residential moves, rate of catchment reoccupation, and rate of site reuse. Local site complementarity has been noted in a few studies (Laylander and Christenson 1988a).

Catchment Resource Diversity. Catchment resource diversity refers to the extent to which site locations maximize access to a wide or narrow range of resources. High catchment resource diversity would suggest that site locations

were selected for use over an extended period of time, to harvest a succession of resources, or by a community with different members focusing on the collection of different resources. Low catchment resource diversity would suggest that site locations were selected to optimize access to a single set of resources, perhaps for a brief time period and possibly by a task group rather than a community. One index of catchment resource diversity is the proximity of site locations to ecotones. Shackley (1980) argued that sites in Cuyamaca Rancho State Park were preferentially located near contact lines between two biotic communities. Robbins-Wade (1992) found some limited confirmation for a hypothesis of greater resource diversity around "residential bases" than around "temporary camps" on Otay Mesa.

Regional Settlement Pattern Variability.

Regional settlement pattern variability is the extent to which different patterns in such variables as site area and site density are found in different subregions. Significant variability of this sort may indicate the presence of a fission/fusion settlement system. A pattern of small habitation sites would indicate the fission portion of the annual cycle; large habitation sites in areas with low site densities would suggest the fusion phase. True (1970:56) argued that patterns of residential sites in Diegueño lowland and upland settings were sufficiently similar to support a bipolar, one-to-one relationship. In the Pauma-Palomar area, however, a larger number of upland sites seems to have suggested a bipolar, fission/fusion relationship (True et al. 1974; True and Waugh 1982).

CONCLUSIONS

The hunter-gatherer settlement systems of prehistoric San Diego County are best conceptualized in terms of variability along a number of different, partially independent dimensions. These relate to the composition and character of the communities involved, their mobility, and their strategies for dealing with spatial and

temporal incongruities between resource and labor availability and consumption needs. The region's ethnohistoric and ethnographic records provide important testimony regarding at least some of these dimensions. Yet the relevance and reliability of this testimony is limited by its shallow time depth and by the processes of distortion which are inherent in any historical testimony, exacerbated in this case by the cultural distance between aboriginal lifeways and the experiences of their modern recorders.

To advance beyond this limited ethnohistoric and ethnographic knowledge, San Diego County settlement research must now rely primarily upon the archaeological record. Although not without severe limitations and distortions of its own, archaeological evidence is gradually being brought to bear on a variety of issues. Probably the most crucial methodological problem is to develop the ability to infer convincingly the specific functions or activities which are represented by particular artifacts, ecofacts, features, sites, and site distribution patterns. Refinement of chronology is important in establishing contemporaneity or succession. Intra-regional variability needs to be examined more closely to distinguish social boundaries and contrasting functional poses. Paleoenvironmental reconstruction and the identification of prehistoric source areas for faunal, botanical, and mineral resources are also important.

Substantial ambiguity and uncertainty obscures the application of the forager/collector dichotomy to prehistoric San Diego County. One conventional conclusion has been that Archaic peoples were essentially foragers, and that their Late Prehistoric successors were collectors. This may be little more than a preconceived notion, based on an evolutionary model of increasing complexity and an apparent increase in site density through time. Evidence for Archaic settlement is plentiful near the coast, but is more meager inland. Were coastal and inland areas inhabited by separate, perhaps essentially seden-

tary, Archaic communities? Or were inland areas exploited by coastal communities through seasonal residential shifts, or by logistical task groups, or both? Did Archaic groups store resources? Were Archaic subsistence strategies less intensive than those of their successors, or were they merely different? Convincing answers to these questions have not yet emerged.

The picture of Late Prehistoric Period settlement is more circumstantial, but still far from definitive. The evidence seems compelling that most communities practiced residential mobility to some extent. There are more ambiguous hints of logistical mobility as well. Whether communities were stable in composition or fairly fluid in membership and given to seasonal fissions and fusions is still open to debate, although the latter view is perhaps better supported. Storage of resources seems to have been important, and some signs of intensive resource use are evident.

Basic conceptual tools for discussing prehistoric settlement systems are at hand. Middle-range theory to link archaeological observations with interpretive conclusions is being developed, and some of those necessary tools are available. The most serious obstacle to advances in settlement studies in San Diego County seems to be the weakness of the mechanisms which are in place for ensuring that the host of particularistic archaeological investigations produce relevant and comparable empirical data and that these data are effectively integrated into a regional scheme of research. To the extent that this latter obstacle is overcome, significant advances can be expected.

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