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CULTURAL TRADITION AND ECOLOGICAL ADAPTATION ON THE SOUTHERN CALIFORNIA COAST

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Introduction

Wallace's (1955) "Suggested Chronology for Southern California Coastal Archaeology" marks a turning point in southern California archaeology. Wallace provided a chronological framework and pointed to broad cultural similarities on the southern California coast. He made order out of site reports of varying quality and completeness. Wallace's chronology has continued to serve as a means of organizing southern California prehistory up to the present time, even though there have been modifications in content and corrections in dating. It was not only a timely synthesis, but also a source of stimulation to many archaeologists working in the area. It was a necessary step that has served as a basis of many of the ideas presented here.

The data accumulated since 1955 have split the seams of this organizational device, and to force the data into the four horizons as defined is no longer feasible. We have therefore attempted a synthesis of southern California coastal prehistory using two concepts as vehicles of presentation: (1) cultural tradition and (2) cultural ecology.

A cultural tradition is here defined as a generic unit comprising historically related phases. Cultural traditions are identified and distinguished from one another on the basis of differences in cultural patterns reflected in differences in artifact types and assemblages and differences in cultural features within site units. Ideally a tradition is defined in an environmental vacuum with ecology playing no part in the definition.

Cultural ecology is viewed as the interrelationship between a cultural tradition and its environment(s). It is assumed that at the archaic stage of evolution the major ecological factor is the point of articulation between the technology and the environment in the production and processing of materials necessary for subsistence, especially foods. It is assumed that this ecological relationship is often a major influence if not the determining factor in other kinds of ecological relationships such as settlement patterning and certain aspects of socio-political organization. We have, therefore, focused our attention on this aspect of cultural ecology.

It must be stressed that cultural ecological factors are not a part of the definition of a cultural tradition, but that a cultural tradition is the mechanism by which prehistoric populations adapted to their environments. A single cultural tradition is logically capable of adapting to several environments through time and/or space.

Cultural Traditions on the Southern California Coast

Wallace (1955) defined four horizons for the southern California Coast: I. Early Man; II. Milling Stone; III. Intermediate; IV. Late. Of these, the first three may be interpreted as traditions. The Late Horizon, which lacks adequate archaeological data from many areas, probably represents several traditions. This suggestion is made on the basis of ethnographic and linguistic as well as scanty archaeological data. We would suggest a minimum of three traditions which correlate with the three major linguistic groups: Chumash, Shoshonean and Yuman.

Beginning with the earliest we may define the traditions as follows: I. San Dieguito. This tradition is characterized by a wide range of scraper types made on side-struck flakes and finished by well-controlled percussion flaking, leafshaped knives or large points of several varieties, leafshaped, lanceolate and slightly shouldered points in small number. Chipped stone crescents, often eccentric in form, hammerstones and crudely flaked tools are few in number. Milling stones and manos are noticeably absent.

The San Dieguito tradition is dated by

radiocarbon method as beginning sometime before 7080 B.C. ± 350 (A-733A) and persisting until sometime between 6540 ± 400 B.C. (A-724 and A-725) and 5670 ± 380 B.C. (A-723) (Haynes and others 1967).

The geographic distribution of this tradition on the southern California coast is poorly known. At the present time only one site has been described in any detail (Warren and True 1961; Warren 1966). but it apparently had a distribution over much of western San Diego County (M. J. Rogers 1929).

The ecological adaption of the San Dieguito tradition is not known. although some hunting activities may be inferred. This tradition will not be discussed further in this paper.

II. Encinitas: The second tradition suffers from an overabundance of names such as La Jolla. Topanga and Oak Grove. These are all rejected in favor of Encinitas, a name M. J. Rogers applied to a local expression after one of the sites he excavated. This name has not previously been published and its use should limit confusion between the local expressions and the cultural tradition.

Sites of the Encinitas Tradition share a common technology and range of artifact types. The flaked stone tools are characteristically crude. the great majority being percussion flaked and made from local macrocrystalline rock. A large percentage of the tool assemblage is composed of crude chopping, scraping and cutting tools and hammerstones. Projectile points are rare, crudely made and rather large. suggesting the use of darts. rather than bow and arrow.

Ground stone items include large numbers of manos and milling stones, usually shaped through use, and occasional items such as doughnut stones. discs and cogstones. Charmstones and stone sculpture are found rarely in the northern area. Bone tools are rare. but include awls, antler flakers. beads and perhaps atlatl hooks. Shell items are also limited. but include beads. pendants, and in the north possibly abalone shell dishes (Owen and others 1964; Greenwood 1967; Eberhart 1961; Wallace 1955).

Basketry is represented by tarring pebbles and basketry impressions on asphalt fragments from a few sites and a single rush mat which was preserved in a La Jolla site (Curtis 1964; Moriarty 1966).

Loosely flexed burials are found throughout the area. Extended burials are found as far south as Los Angeles County and may also occur rarely in San Diego County (Hubbs, Bien and Suess 1963: 264-5). Reburials are reported for only the Los Angeles area. Stone cairns and/or milling stones are sometimes placed over the individual. Grave goods are never numerous with shell beads and milling stones being the most common (Johnson 1966; Owens and others 1964; D. B. Rogers 1929; Wallace 1955).

The Encinitas Tradition apparently begins at about the same time in San Diego and Santa Barbara counties. The earliest date is 5580 B.C. in San Diego and 5340 B.C. in Santa Barbara (Bright 1965: 370.) The Encinitas Tradition persists until sometime after 1 A.D. in San Diego County. but terminates betwen ca. 3000 and 1500 B.C. in Santa Barbara County. In the Los Angeles area influences of two cultural traditions are recognizable by about 3000 to 2500 B.C. (Harrison and Harrison 1966; Johnson 1966; Warren 1964).

III. Campbell: The Campbell tradition is most clearly documented for the Santa Barbara coastal area. This tradition is equated with the artifact assemblages and sites of the Hunting People (D. B. Rogers 1929; Harrison and Harrison 1966) and apparently related sites farther south. The Campbell Tradition contains side notched. stemmed and lanceolate or leaf shaped points, larger knives, and a variety of flake scrapers and drill-like implements. The hopper mortar, stone bowls or mortars and pestles occur for the first time. New types of ornaments of shell, bone and stone are present.

D. B. Rogers (1929) reports interment of bodies in fully flexed position, face down with the heads usually pointing to the west. Harrison and Harrison (1966:80) report fully flexed burials on their back or side with heads usually oriented toward the north. Burials are sometimes covered with cairns of rock and/or broken artifacts and

red ochre is often found with the burials, and abalone shell dishes sometimes occur with burials.

The Campbell Tradition has been dated as early as 3030 B.C. by radiocarbon at the Aerophysics site (SBa-53) in Goleta. Two other samples from the same site assayed at 2940 and 2670 B.C. (Harrison and Harrison 1966:34) support this date.

An interesting problem of historic relationship between sites of the Campbell Tradition and of the Encinitas Tradition occurs in the Santa Barbara area due to the apparent contemporaneity of these manifestations. At site SBa-78, Encinitas burials are dated at 3350 B.C. and 2500 B.C., bracketing the dates for the Campbell Tradition at the Aerophysics site.

Harrison argues that this represents in fact two contemporaneous populations with different cultures and that the Encinitas Tradition persisted until about 1450 B. C. on the basis of dates from site SBa-119 (Harrison 1964: 124-79; Harrison and Harrison 1966: 70). However, this interpretation of the latter site is not entirely convicing since it contains many traits of the Campbell Tradition. It does appear, however, that the Campbell tradition is intrusive to the Santa Barbara coast. There are no known precursors of the Campbell Tradition locally and it now appears to be at least in part contemporaneous with the Encinitas Tradition.

Influence of the Campbell tradition is also apparent in Los Angeles County at the Zuma Creek Site (Peck 1955) where projectile points, knives and mortars are found in some number and dated at 3000 B.C. (Bright 1965:370). However, Zuma Creek was probably occupied for a fairly long period and the characteristic tools of the Encinitas Tradition are found in great number, while the tools of the Campbell Tradition appear relatively infrequently.

The Topanga Canyon cultural development as described by Johnson (1966) also suggests some influence from the Campbell Tradition in the introduction of stemmed and notched points and mortar and pestle during the Topanga II phase and their continued use through Topanga III. Johnson would place this at 3000 to 4000 B.C. which we feel is perhaps too early.

Farther south, on Catalina Island, Meighan (1959a) has described a well-developed hunting component at Little Harbor, dating from 1924 B.C. The Little Harbor site exhibits many similarities with the Campbell Tradition of the Santa Barbara coast, especially in projectile point types, the presence of mortar and pestle, charmstones and vessels of steatite.

At approximately 3000 B.C., certain changes in artifact types occur along the San Diego coast. Projectile points occur more regularly, but are still rare and mortars and pestles occur for the first time though few in number (Warren 1964). Also a single intrusive site unit, distinct from the Encinitas Tradition, but apparently of short duration, has been recognized at the C. W. Harris Site in western San Diego County. This unit, termed Locus II by M. J. Rogers (Warren 1966) is a small erosion island near the middle of the San Dieguito River bed, and physically separated from the deeply stratified cultural deposits of the left bank. It has been dated by radiocarbon at 2770 B.C., and contains broad thin knives, notched projectile points, a few nondescript scrapers and a single flat millingstone.

During the 1967 excavations in the deeply stratified deposits of the left bank, a single projectile point and several knives similar to those from Locus II were recovered in a stratigraphic position near the middle of a component of the Encinitas Tradition. It therefore appears that the changes in artifact types noted on the San Diego coast may have been stimulated by an intrusive but short-lived cultural unit with affiliation with the Campbell Tradition. This intrusive cultural unit was assimilated, however, and the Encinitas Tradition continued relatively undisturbed on the San Diego coast.

IV. Chumash: The Chumash culture is characterized by a highly developed technology, elaboration of utilitarian objects, and a wealth of "effigies," ornaments, and "ceremonial" and/or "artistic" items. The bowls, mortars and pestles, stone balls, grooved stones, doughnut-shaped stones, stone beads, pendants, pipes, tubes, effigies of mammals and stylized objects, are all pecked and ground. Chipped stone objects include small and large projectile points

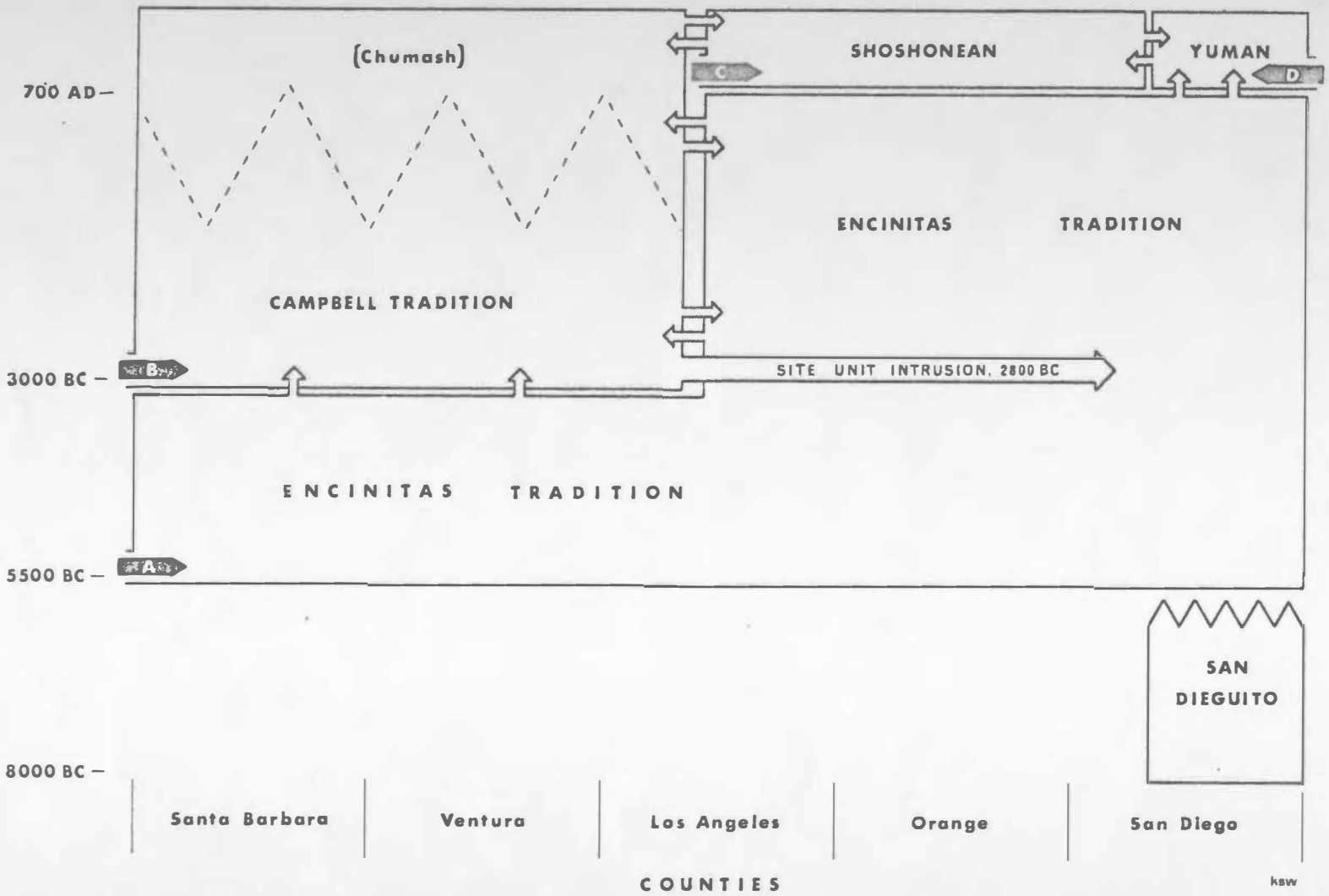

Figure 1: Schematic representation of temporal and areal relationships among cultural traditions on the southern California coast. Arrow A represents the establishment of the Encinitas Tradition through influences and migration (?) from inland area. Arrow B represents establishment of Campbell Tradition through influences and perhaps migration from inland (?) area. Arrow C represents Shoshonean migration to the coast and establishment of Shoshonean Tradition. Arrow D represents the influence and perhaps migration from Colorado River establishing the Yuman Tradition on the San Diego coast.

most often non-stemmed with convex or concave bases. drills and various scrapers and cutting implements. Bone awls. fishhooks. whistles and tubes overlayed with shell beads are found; shell fishhooks, abalone shell dishes, and a very great variety and large number of shell beads and ornaments are characteristic.

Not only are items well made, but the beauty of objects such as bowls. pestles, pipes. etc. is often enhanced by an inlay of shell beads and engraving. Steatite is commonly used for bowls. pipes and ornaments.

Burials are nearly always placed face down in a flexed position with their heads to the west or north. Burials often occur in overly crowded cemeteries and are frequently marked by whale bone placed vertically in the ground. Great quantities of ornaments and utensils are often placed with the dead.

V. Shoshonean and Yuman: Farther south in Los Angeles, Orange and northern San Diego counties there is linguistic evidence for a late Shoshonean intrusion from the interior. The late coastal sites of Los Angeles county appear to resemble the Chumash in a few traits (Walker 1951). However. the inland sites, sometimes at least, appear to have affiliations with the desert (Ruby 1966: 116-7). It is not possible at this time to identify a Shoshonean Tradition in Los Angeles county on the basis of archaeological data. It can only be postulated.

In San Diego county the late period is poorly known for the coastal area where sites are apparently neither numerous nor large. It is clear, however. that a new cultural influence was felt on the coast. Cremation was the method of disposing of the dead. Pottery and small triangular projectile points were introduced. The older tool assemblage apparently persists until historic times and the new traits are added to the old Encinitas Tradition. It is not possible at this point to determine whether or not we should speak of a new cultural tradition for the southern San Diego coast.

Inland between the coast and the Peninsular Ranges three phases have been defined (Meighan 1954; True 1966) which apparently represent two different cultural traditions. The Cuyamaca phase to the south can be related to the Yuman-speaking Diegueño. and the San Luis Rey I and II phases can be related to the Shoshone-speaking Luiseño.

San Luis Rey I is defined by the occurrence of small triangular projectile points, mortar and pestle. mano and millingstone. and simple flake scrapers. San Luis Rey II exhibits all of these plus pottery. cremation and pictographs.

The Cuyamaca phase is very similar. to the San Luis Rey II. exhibiting all of the general traits. However, True (1966) was able to distinguish between these two phases on the differences in projectile point and scraper types, a difference in pattern of cremation, quantitative differences in pottery. and the presence or absence of a few projectile types. Furthermore. True suggests some degree of cultural continuum between the Encinitas Tradition and the Cuyamaca phase. but not between the Encinitas Tradition and the San Luis Rey phases. On this basis it is possible to suggest that San Luis Rey and Cuyamaca phases represent two different cultural traditions: the San Luis Rey phases relating to the Shoshonean intrusion and the Cuyamaca phase relating to the Yuman influences from the Colorado River and perhaps the older Encinitas Tradition.

The temporal and areal distribution of the cultural traditions on the southern California coast is presented in a schematic fashion in Figure 1.

Ecological Adaptation on the Southern California Coast

The environment of the southern California Coast at 5500 B.C. is largely unknown. but the plant communities were probably similar to what they are now. There is some evidence for more water, and the ecological zones may have occurred at somewhat lower elevations. A major difference appears to have been present in the littoral zone on the San Diego Coast and presumably farther north. The ocean level on the San Diego coast was lower (Hubbs and others 1960; 204. 208-9; 1962:212, 233-4; Shepard 1956; Shepard and Suess 1956; Curray 1960). though tectonic movement in the Los Angeles Basin and elsewhere make this impossible to demonstrate for the entire coastal

Figure 1: Schematic representation of temporal and areal relationships among cultural traditions on the southern California coast. Arrow A represents the establishment of the Encinitas Tradition through influences and migration (?) from inland area. Arrow B represents establishment of Campbell Tradition through influences and perhaps migration from mainland (?) area. Arrow C represents Shoshonean migration to the coast and establishment of Shoshonean Tradition. Arrow D represents the influence and perhaps migration from Colorado River establishing the Yuman Tradition on the San Diego coast.

area. The ocean was also rising fairly rapidly at 5500 B.C. and under those conditions the river and stream mouths were drowned, creating numerous long narrow bays and a rocky foreshore along the coast. As Shumway and others state:

> . . . we are confronted with good indications that the period from 7300 years ago until at least 3700 years ago, the shore north of La Jolla was considerably more rocky than at present with estuaries sufficiently deep and in sufficient contact with the sea to maintain, in bay-like conditions, flourishing populations of Pecten and Chione. These conditions would be met by a rapidly rising sea level, during which the accumulation of shore sand would be kept low.
>
> The rising of sea level also would tend to keep the estuaries deep and in contact with the ocean (1961:113).

Major areal difference in environment may be suggested by differences found along the coast today. For example, in contrasting the San Diego coast to that of the Santa Barbara-Ventura area we find some significant differences that may in part be projected back in time. On the Santa Barbara-Ventura Coast: (1) the mountain ranges are closer to the beach, reducing the distance between ecological zones and providing a greater variety of resources in a restricted area; (2) there is about twice as much rainfall in Santa Barbara as in San Diego, which results in greater density of vegetation; (3) the coast line is more rugged, including rocky foreshores, as well as sandy beaches, lagoons, and salt marshes.

Ecological Adaptation of the Encinitas Tradition

The Encinitas Tradition appears on the southern California coast at a time when the ocean level was lower, but rising, creating both rocky foreshores, and bays and inlets at the mouths of streams. The great majority of tools to which we can assign functions are those relating to collecting activities. Manos and milling stones are among the most numerous tool types. Pinyon nuts, as well as pine cones and California hollyhock seeds have been recovered from sites of the Encinitas Tradition in San Diego County (Warren 1964; Warren and True 1961). These items along with plentiful remains of shell fish indicate a well developed collecting economy. On the other hand, projectile points are rare as are fish and mammal bones. The plentiful shellfish of a rocky coast and the sandy bays and inlets and the numerous edible vegetable foods found in the variety of plant communities provided environmental conditions well suited to the technology and production techniques of a basically collecting economy.

The Encinitas Tradition with its ecological adaptation through collecting persisted along the coast for about 2500 years without major interruption. There is little evidence for cultural changes recognized for this period and nothing to suggest a major ecological shift to sea mammal hunting or extensive fishing. This tradition with its ecological adaptation through collecting came to an end on the Santa Barbara coast about 3000 B.C. with the "introduction" of the Campbell Tradition, but apparently persisted until after 1 A.D. on the San Diego Coast.

Ecological Adaptation of the Campbell Tradition

The Campbell Tradition contains a relatively large number of hunting tools such as large projectile points, knives and scrapers. That hunting was important is attested to by the faunal remains in the middens. D. B. Rogers says of the sites of the Hunting People (Campbell Tradition):

> In these heaps are to be seen in almost unbelievable quantities, the bones of land mammals that have served as food. Among these remains are to be found those of the deer, elk, puma, black bear, and smaller animals. There is also a fair proportion of seal bone and, at rare intervals, those of sea elephant. A few fish remains are also present (1929:358).

The Harrisons noted that:

> These people extensively and efficiently exploited resources from ocean and salt water of the Goleta Slough, where marine animals, fish and shellfish provided a substantial portion of their

> diet. At Aerophysics [site]. for example, 82% of the identifiable bone derives from seal (*Pinnipedia Otariidae*) and porpoise or dolphin (*Cetecea delphinidea*). Although fish bone is not particularly numerous, most of it is from larger species such as sword fish and shark (1966:73).

Whale is also reported in these sites by D. B. Rogers (1929:151) and the Harrisons (1966:74).

Shellfish from estuary and open beaches are represented in some quantity in the middens. Furthermore, the milling stones and mortars are found often enough to suggest that the collecting and processing of nuts and seeds was important.

The assemblage of tools in the Campbell Tradition clearly represents the introduction of a new set of tools and associated techniques of food acquisition and processing which broadened the range of the effective environment of man on the Santa Barbara coast and provided a richer. more plentiful food supply than had the ecological adaptation of the Encinitas Tradition.

Farther south, on Catalina Island. the artifact assemblage of the Little Harbor site is similar to the Campbell Tradition sites on the Santa Barbara coast with hunting equipment being important. The economic activities were primarily those of hunting sea mammals, fishing, and collecting shellfish. The great emphasis on the maritime resources is most easily understood as being the result of limited land resources on the island.

Southward along the coast from Ventura County, through Los Angeles. Orange and San Diego counties the influence of the Campbell Tradition becomes progressively less strongly felt. From Los Angeles County south, it is most often recognized as certain artifact types mixed with the assemblage of the Encinitas Tradition, even though site unit intrusion of what appears to be the Campbell Tradition is found as far south as the San Dieguito River in San Diego County. It also appears that the importance of sea mammal hunting becomes progressively less toward the south along the coast.

This decrease in influence toward the south may reflect more than distance from the Santa Barbara development. By the time the intrusive Campbell Tradition reached the San Diego coast certain environmental changes were taking place. The rocky foreshore had become buried beneath sand accumulating on the beaches due to the reduction in the rate of rising sea level, thus reducing the shellfish population. Presumably the size of the estuaries at the mouths of the rivers and streams was reduced by growing deltas, and sand bars extending across the mouths made them environmentally more variable and less productive in shellfish.

It appears that the aboriginal population on the San Diego Coast north of Mission Bay decreased and it is suggested that the center of economic activities and consequently the population center shifted to: (1) inland areas where fresh water and the richer ecological zones of oak parkland, chaparral and pinyon were more easily reached and to (2) the area of Mission and San Diego Bays where the littoral resources still were plentiful. Furthermore it seems likely that the straight sandy beaches of the San Diego coast north of Mission Bay were not as heavily utilized as seal rookeries as the rocky points and islands in the Santa Barbara Channel. Given the limited resources of the littoral zone and the shift inland of population and center of economic activities. the development of a maritime culture was prohibited and nothing comparable to the maritime adaptation of the Campbell Tradition is found on the San Diego coast.

The origin of the Maritime culture on the south coast has been viewed in a number of ways. Meighan (1959b) and Wallace (1955) have presented a descriptive historical sequence from littoral collecting to hunting of sea mammals and a full maritime development. Warren (1964) attempted an analytical approach, but interpreted the sequence in the same way. using environmental stress as the agent of change. D. B. Rogers (1929) and the Harrisons (1966) interpreted the maritime pattern as resulting from migration of maritime people into the area. The Harrisons went so far as to suggest the hypothesis that Palisades II complex of Cape Krusenstern may represent the origin, and rejected an

inland origin of the maritime development because "the ocean oriented economy of these people would be difficult to explain" (1966:68).

The Campbell Tradition is here interpreted as an intrusive cultural tradition since we have evidence in Santa Barbara and San Diego of culturally distinct site units which are contemporaneous with the older Encinitas Tradition. We do not, however, feel that the Harrisons' hypothesis regarding its origin is correct. If we clearly distinguish the productive techniques of a prehistoric economy from the environment and realize that the productive techniques are operative in a range of natural settings that is seldom if ever wholly represented in a given environment, then the maritime development of the south coast is not difficult to explain. There is little difference between the technology of the "Hunting Peoples" of Santa Barbara and the Pinto and similar assemblages found farther east in California and Nevada. The Harrisons (1966:17), themselves noted similarities in point types and pointed out that the obsidian of which some artifacts were made may come from the Mohave Desert, which is its nearest source.

A culture arriving on the coast with a well developed hunting technique has built into its economy the productive system necessary for maritime hunting even though these may appear crude and not adapted to the environment. The large quantities of bones of sea mammals at sites of the Hunting People on the Santa Barbara coast and at the Little Harbor site attest to this even though in neither is their evidence of harpoons or specialized composite spears. In fact one of Meighan's major points regarding the Little Harbor site was that the tool assemblage did not betray a maritime economy.

This interpretation is as hypothetical as Harrison's, but it is based on ecological principles rather than postulated historic events, and does not ask questions regarding the processes involved in developing a maritime orientation but rather removes such questions to the coast of Alaska and outside the geopraphic area of inquiry.

We view the Campbell Tradition as resulting from an intrusion or intrusions into the coastal area by inland hunters of a single cultural tradition. However, the possibility that the Campbell Tradition as defined here may be the result of an intrusion of more than one cultural tradition into the coastal area must be considered an alternative hypothesis. We are of the opinion that this intrusive tradition does not represent a complete replacement of either the earlier population or culture any place on the southern California coast. In the Chumash area, where the greatest archaeological evidence is found to support such an interpretation, the linguistic evidence suggests otherwise. Both Chumash in the northern and the Diegueño in the southern end of the area are Hokan speaking peoples. Yet the only period when cultural similarities are extensive enough to suggest a single cultural tradition for the entire area is during the period between 5500 and 3000 B.C., when the Encinitas Tradition was to be found along the entire length of the coast from Santa Barbara to San Diego. Furthermore, there is increasing evidence that the earlier milling stones and crudely flaked tools of the Encinitas Tradition were not completely replaced by the hunting technology and the mortar and pestle (Glassow 1965; Leonard 1966).

We postulate that the Campbell Tradition represents an amalgamation of an inland tradition with well developed hunting techniques and technology and the earlier Encinitas Tradition with its well developed collecting techniques and technology. In Santa Barbara, Ventura, at least part of Los Angeles County, and most of the Channel Islands, the Campbell Tradition can be recognized. This fashion of food acquisition and processing apparently resulted in a broad based environmental adaptation, which allowed for a greater and more variable food supply.

The Ecological Adaptation of the Chumash

The late protohistoric cultural expression in the Santa Barbara area has been given the name Canaliño, but for the most part this archaeological complex has been limited

to the coastal and island area and inland sites have not been dealt with. The Canaliño archeological complex can be related directly to the Chumash of the coastal region and therefore the maritime adaptation has been stressed. The Chumash do represent a maritime adaptation with considerable emphasis placed on fishing and sea mammal hunting. However. there appears to have been an adaptation to the inland resources as well.

The maritime adaptation is clearly recognized in the ethnographic and archaeological data (Landberg 1965). The fishhook. spears, harpoons and seaworthy canoes are well known for the Chumash. Also large quantities of fish and sea mammals taken by the Chumash are recorded in the archaeological middens as well as in historic accounts of the early traveler and missionaries. There is also increasing evidence that the Chumash utilized a great many plants and land mammals and had well developed means of extracting resources from the mainland environment (Glassow 1965; Leonard 1966; Landberg 1965) It is clear that the Chumash had extended the effective environment and increased productivity through the development of efficient hunting, fishing and collecting equipment and techniques. This adaptation allowed for a population increase and cultural elaboration of a degree not known previously on the south coast of California.

The question arises regarding the degree to which the Chumash development represents external influences as opposed to an evolution from the Campbell Tradition. This question cannot be answered at this time, but it is clear that the Chumash represented a local cultural climax. This suggests that the Chumash may be in large part the result of development of the Campbell Tradition rather than resulting from extensive influence from less highly developed neighboring groups.

The cultural continuity between the Campbell Tradition and the Chumash is not clearly documented. What is clear. however. is that the introduction of the hunting assemblage with all its equipment. techniques and attitudes. increased the effective environment and made available a wealth of resources that had been essentially untapped by the collectors of the Encinitas Tradition who had lived on the same coast for at least 2000 years prior to the arrival of the Campbell Tradition.

The Problem of the Ecological Adaptation of the Shoshonean Tradition

A discussion of the Shoshonean ecological adaptation at this point would be almost pure speculation. The Shoshoean Tradition can not be adequately defined at this time and the adaptation of this tradition to the coastal ecology remains unknown. It appears. however. that the adaptation to the maritime resources was successful, since the southern Channel Islands were occupied by Shoshonean speaking maritime people. It would appear that the Shoshonean speakers, once they had arrived on the coast, borrowed heavily from the Chumash, since many of the artifacts found in late sites on the southern islands and the mainland are identical to those of the Chumash (McKusick and Warren 1959. Reinman and Townsend 1960. Walker 1951). Nonetheless, how and when the Shoshoneans adapted to the maritime environment remains one of the crucial problems of southern California prehistory.

The Shoshoneans appear to have been well adapted to the ecological zones of the Peninsular Range in northern San Diego County during protohistoric and historic times. as represented by the San Luis Rey phases (Meighan 1954). However, analysis of the faunal remains in the middens of these sites has yet to be made. The San Luis Rey phases are important. however, in illustrating the Shoshonean adaptation to the inland area as distinct from and in contrast to their maritime adaptation.

The Yuman Ecological Adaptation

The Yuman Tradition can be distinguished from the Encinitas Tradition by a series of traits which includes pottery, small finely flaked points, drills and scrapers. This tradition is nearly synonymous with True's (1966) Cuyamaca phase. due to the fact that so little else has been described. The Cuyamaca phase represents an

adaptation to the varied ecological zones of the Peninsular Range. Collecting of pine nuts and acorns is assumed to have been of major importance, as was the hunting of deer and smaller game. However, no analysis of the middens has been made and these assumptions are documented only through ethnographic sources.

On the coast the Yuman adaptation also appears to have been oriented toward collecting, with some fishing and hunting. On the basis of historic records and scanty archaeological remains, the maritime adaptation appears to be on a far smaller scale than on the Santa Barbara coast (Warren 1964). The Yuman Tradition appears to have been adapted to the same range of ecological zones as the earlier Encinitas Tradition. However, the methods and techniques of food production were somewhat different. The presence of the bow and arrow and the knowledge of how to process acorns, for example, apparently allowed for a more extensive exploitation within this range of ecological zones. This increase in food production made possible and perhaps stimulated a cultural fluorescence that was not found in the earlier Encinitas Tradition.

The Yuman Tradition, like the Shoshonean Tradition, remains poorly understood, but it appears to represent a different cultural development and a different ecological adaptation from that of the Santa Barbara coastal area and Channel Islands.

Problems of Method

The prehistory of the southern California coast is viewed here in terms of the sequence of cultural traditions and the interrelationships between these cultural traditions and the environment(s) in which they functioned. The structure of this presentation makes it possible to view a cultural tradition in different environments (ecological zones) and different traditions in similar environments. This model comprises certain testable hypotheses regarding various historical and ecological relationships. The Campbell Tradition, for example, is viewed as being intrusive into the area occupied by the Encinitas Tradition. To test this, we must show that this tradition is or is not composed of an assemblage of cultural traits distinct from the Encinitas Tradition, that it did or did not occupy the same ecological zones as the Encinitas Tradition, and that it is or is not contemporaneous with it. We feel that the evidence now available supports the hypothesis that the Campbell Tradition is intrusive and that it is distinct from the Encinitas Tradition. On the other hand, the Campbell Tradition may be viewed as a single tradition or several historically distinct cultural units penetrating to the coast and adapting to the coastal environment in similar ways. These hypotheses cannot be adequately tested at this time because the data are lacking.

The model of the prehistoric ecological relationships also sets before us certain methodological problems. Environment and cultural tradition are seen as two interrelated variables which put strictures on the comparative method. When comparisons are made between cultural units occupying different environmental zones, the similarities and differences may result from ecological factors as well as cultural historical factors. Under these conditions the units of comparison must be carefully controlled functional equivalents. That is, it does not necessarily follow that projectile points used for hunting sea mammals are formally the same as those used for hunting land mammals. Comparisons across ecological zones cannot be as well controlled as those made within a single zone.

The problem may be illustrated in more detail. Non-agricultural people generally follow a seasonal round of activities and at different periods of the year, different portions of their technologies articulate with different micro-environments. The most obvious examples from the southern California coast are the acorn harvest, where both men and women were involved during a portion of the year, utilizing certain tools in preparing this harvest and living on sites in the vicinity of the oak trees; and the collecting of shellfish and other resources of the beach and coastal terraces as well as hunting sea and land mammals and fishing. These activities required different ranges of tools and resulted in the accumulation of different cultural debris. How can the acorn

harvesting and other inland sites be related to specific coastal sites, so that the full range of material culture and activities of a people can be recognized?

The model we have presented requires that we identify the differences between the cultural traditions regardless of the convergence that results from similar adaptation to like environments, and the variability within a single tradition due to adaptation to several ecological zones. On the one hand we must demonstrate differences among cultural traditions which are adapted to the same ecological zones in similar ways, and on the other hand we must show cultural relationships among the sites of the same tradition adapted to various ecological zones.

The demonstration of differences among cultural traditions adapted to the same ecological zones in similar ways is the easier of the two problems to solve. True's (1966) study is especially significant here. He investigated two historically distinct groups who were adapted to the same environmental zones in a similar fashion and has shown cultural differences that are essentially independent of influences of the physical environment. These differences were largely *stylistic* differences in functional equivalents. He illustrated differences in point types, though they were small triangular forms in both the Yuman and Shoshonean areas. There were stylistic differences also in pattern of cremation, and several artifact types. Only a few traits showed a clear-cut presence-absence relationship. True's study involved data derived partly from poorly documented collections made a decade or more ago. His methodology can be made more sophisticated through better controlled data and use of statistics.

Comparisons of archaeological assemblages across ecological zones precludes sufficiently tight controls in comparing functional equivalents. Therefore, such comparisons are of limited value in showing culture-historical relationships. A different, but complementary method of relating sites in different ecological zones is suggested. This is the "micro-ecological" method, made possible because there is some overlap of economic activities in movement from one site to another, so that shellfish remains often occur in inland middens, and inland resources may occur in coastal middens. Furthermore due to the micro-environments of the coastal waters and beaches, and the seasonal availability of certain species, it is possible to determine from which coastal area the shellfish of inland sites derived and during what season they were available.

Glassow (1965:67), on the basis of the shell in a rockshelter in Conejo Valley in Ventura County, suggested that the prehistoric occupants had "close relations" with the "Mugu Lagoon Dwellers."

Leonard (1966:237) investigated Ven-70, a Chumash site also located in Conejo Valley, and made the following statement:

> The nearest coastal village to Ven-70 is Shuwalashu, which can be reached by travelling south from Ven-70 through Big Sycamore Canyon. The shellfish remains from Ven-70 reflect an occupation from Shuwalashu rather than one from the villages around Mugu Lagoon. *Mytilus californianus* is the dominant species of shellfish at Shuwalashu and Ven-70. *Sacidomus nuttalli*, *Plagioctenium circularis*, *Tivela stultorum* and two species of Chione dominate the shellfish at the coastal villages around Mugu Lagoon and represent a large percentage of the shellfish present at the inland sites of La Jolla Valley. These species comprise less than 10% of the shellfish remains at Ven-70.

Leonard (1966: 235-6) made a more complete ecological analysis of site Ven-70 in Conejo Valley and presents the following argument for seasonal occupation:

1. Late spring and fall are the times when the greatest abundance of vegetal resources is available in the vicinity of Ven-70.
2. In the fall, the small stands of coastal oak and the surrounding belts of chaparral and scrub oak could be exploited.
3. During the late spring, the seeds from numerous species of sage can be collected.
4. Mortar and pestle are associated with acorn harvest and mano and milling stone with processing of sage.
5. The relatively few mortars and pestles as compared with the number of manos and millingstones suggests that the site was

occupied during the spring.

6. Remains of the pelagic fish occur in inland middens. Summer and fall is the time schooling fish were abundant at the coast and when the greatest number of pelagic fish would be available. None of the fish remains at Ven-70 were from pelagic fish, which suggests the site was not inhabited during the summer or fall. Also, there were relatively large quantities of shell, which was primarily exploited during the winter, further indicating a main focus of activities during the spring.

Further innovations in micro-ecological analysis are being made. Margaret Wiede (1966) is developing a technique for analyzing the growth bands on Pismo clams. Through the use of this technique, at a site in Orange County, she was able to tell not only what season of the year the site was occupied, but also was able to give a close approximation of the duration of the occupation in number of weeks. Micro-ecological studies of this kind provide a basis for relating sites of different environments to a single cultural unit and provide a sound basis for further comparative studies of cultural traits, as well as providing information regarding how these traits articulate with the environment in which they are found.

Summary and Conclusions

The prehistory of the southern California coast is viewed in terms of cultural traditions and their relationships to the environment. Following the poorly-defined San Dieguito Tradition and beginning about 5500 B.C., the Encinitas Tradition is found throughout the area extending from the Santa Barbara region to the Mexican border. It is characterized by numerous milling stones and manos, crude core and flake tools, and a paucity of projectile points and bone and shell items. The technology appears simple and the production of tools is crudely executed. Faunal remains are limited primarily to shellfish, with land and sea mammals and fish occurring infrequently.

The economic pattern of the Encinitas Tradition seems to have centered around collecting activities with little attention given resources of the sea and land that required hunting equipment. This economic pattern was apparently well adapted to the various plant communities and the littoral zone, with a rocky foreshore and long, narrow estuaries at the mouths of the streams.

The Encinitas Tradition persisted without major change for about 2000 years on the Santa Barbara coast and even longer on the San Diego coast, where it terminated sometime after 1 A.D.

The Campbell Tradition represents the introduction of a new technology and economic pattern on the southern California coast. The hunting implements and possibly the mortar and pestle broaden the effective environment, and hunting is extended to the sea mammals, which provided a virtually unlimited resource. The hunting pattern appears to have adapted easily to the environment of the Santa Barbara Channel and the Channel Islands, but only slightly influenced the Encinitas Tradition in San Diego County. This represents a major divergence in the prehistory of the southern California coast. From this point in time down to European contact, culture of the Santa Barbara Channel area is maritime oriented and that of the San Diego coast is not. The divergence is tentatively explained in terms of changes in the environment of the littoral and adjacent ecological zones in San Diego County, which reduced their productivity of foods. This resulted in a shift of economic activities inland to the richer zones of oak parkland, pinyon and chaparral. Hunting was apparently not productive on the San Diego coast, and therefore the Campbell Tradition never fully penetrated the San Diego coastal area.

The Campbell Tradition apparently served as the base from which the ethnographic Chumash culture developed. Farther south, the Shoshonean "wedge" may be postulated as representing a distinct cultural tradition deriving from the east and adapting to the coastal environment. The Yuman speakers of San Diego appear to represent a break from the earlier Encinitas Tradition, with an influx of cultural traits from the Colorado. This Yuman Tradition appears to combine these new traits with some of the older Encinitas traits and adapt to an environment range similar to that of the Encinitas Tradition, but more efficiently.

It is our view that by keeping the concepts of culture and environment distinct from one another and investigating relationships between them, we find basis for understanding certain prehistoric developments on the southern California coast. Furthermore, this approach brings into focus problems of method that are generally not apparent and gives direction toward finding solutions to these problems. Although our view of prehistory of the southern California coast may have provided a fleeting and incomplete understanding of some of the developments, we believe that the approach is valid and will provide sound answers, bringing into focus many problems that are not now readily apparent.

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