Of the Old Summer Fishing Camp: The Archaeological Heritage of ORA-1429, Los Trancos Canyon, Crystal Cove State Park

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Abstract

A buried archaeological deposit was encountered during the widening of Pacific Coast Highway through the Newport Coast Planned Community in Orange County. Recorded as the ORA-1429 site, this previously unrecognized habitation area is situated along an ancient stream bench in the lower portion of Los Trancos Canyon, about 500 feet from the ocean, within Crystal Cove State Park. The site consists of a dense stratum of ancient food debris with unusual integrity, having long been sealed beneath an erosional slump. The buried archaeological materials, radiocarbon dated at about 4,000-3,900 years ago, primarily is mussel shell, plus the bones of sardines and a variety of other ocean fishes. The people occupying this camp followed cultural preferences for certain tasty foods and an avoidance of others, with highly focused economic strategies in support of these food preferences. Many similar camps have been reported along the nearby coastal slopes of the San Joaquin Hills, within two miles. Analyses of the food debris at these sites suggest they represent a local pattern of summer season camp occupations for ocean fishing and the gathering of certain shellfish along the rocky shore. These summer camps probably were occupied by people from settlements around distant Newport Bay, because many of the camps include the remains of certain bay shellfish foraged and transported to this rugged coastal region. A total of 101 radiocarbon dates from 19 of these ancient camps indicates this settlement pattern of summer fishing-shellfishing camps along the local coast may have spanned five thousand years. This settlement pattern was abruptly abandoned however about 3,700 years ago, and this area was little occupied over the next two thousand years.

Prologue

Of the Old Summer Fishing Camp—at Crystal Cove

Early each summer Grandfather led us down to the fish camp places near the ocean (near what is called Crystal Cove now), where we spent the warmer months. We had good times there at the shore. We ate well because we could catch many fishes from the big ocean. We gathered layers of big black mussels growing on the ocean rocks when the tide was out. We had so much meat that our camps had piles of stinky garbage and bugs, so we sometimes made our camps in different spots. We sometimes captured rabbits and gathered certain seeds and greens from the hillside. Summer was fun. Mostly, we spent the afternoons playing along the beach or just relaxing. I can tell you the story about the old summer fishing camp.

Our family regularly made itself a comfortable summer camp near the ocean with the cool breezes coming from the water. The family including my cousins hiked all together down to the ocean. We carried most of the family's important things in the big baskets slung in nets over our backs. The load was not really heavy because we could make many of our tools when we got to the fishing place. We cleared the bushes to make a clean patch of ground for our camp. Sometimes our fish camp was by some shade trees, and some years we built a sunshade on tall sticks. For this warm and dry season, we did not need a shelter. When it was colder, we slept closer together or near the warm fire hearth.

Uncle usually was in charge each summer of making a new fishing boat of lashed bundles of hollow reeds. The reeds grew behind a big lagoon nearby (now called Newport Bay). Uncle and some of the men would paddle the new reed boat out into the ocean and down the coast to our new fishing camp. On the days when the ocean was calm and smooth, the large reed boat could comfortably support four or more men. Women never got onto the reed boat; it just wasn't done. Most days at first light several men would drag the boat from the beach to the surf, paddle out to the great sea kelp, and spend the calm-ocean morning hours catching fishes. They brought back many different kinds of good white and pink meat. Sometimes they captured a shark or even a seal. Our family made special dip nets with extra small mesh, so we could catch the many little sardines. Sardines were Grandmother's and Aunties' favorite food, and they sun-dried hundreds of these little tidbit fishes for eating later in the year.

The nearby hillsides were dry during the hot summer, and the grasses became brown and thin. My aunts and the other women sometimes went out in the morning for a few hours with the baskets to gather certain ripening seeds from the bushes. Elder Aunt was an expert at knowing when seeds, nuts, and so forth were ripening on different hills. She also knew how to gather the special plants for making baskets, nets, twine, and things.

A stream of fresh water in the nearby canyon drained from a small spring up in the hills all the way to the beach. We usually camped right above the edge of the stream. The water was always sweet, and we played in the big trees and in the thickets growing along the creek. We encountered rabbits, birds, and other little creatures, like frogs and crickets, enjoying the nice water that flowed along the canyon bottom.

The boys sometimes went with a young man to capture rabbits for dinner. It required much practice with a throwing stick to club a bounding rabbit. For special occasions, we organized a rabbit drive with a line of people chasing the rabbits into a long net stretched across a rabbit trail. The rabbits got stuck in the netting and then were easy to club. Afterwards, the furry skins were woven into warm blankets for the winter.

One year, some strangers came over the hills. There was a conflict of some kind; something bad happened (about 3,700 years ago, according to radiocarbon dates). Grandfather would never tell us this sad story. Only a few people lived after that. Since that time, the old summer fishing camp (near Crystal Cove) was not reoccupied. The old fishing camp just became an archaeological site!

(Many things changed, and four thousand years later, when the Pacific Coast Highway was built, in the 1920s, other new people built summer cottages above the beach there at Crystal Cove. Those were wooden houses; but that is a story of another time.) *PGC*

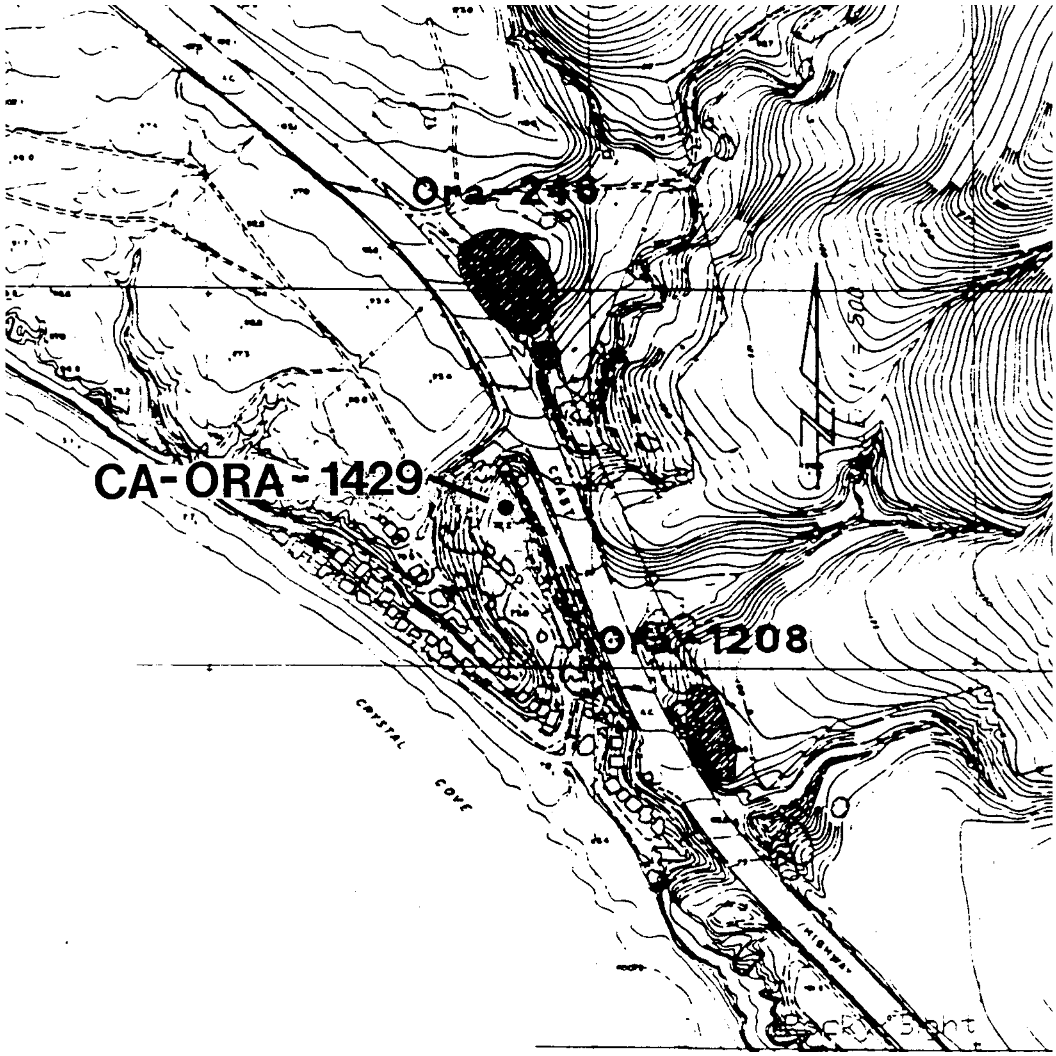

Fig. 1. General location of the CA-ORA-1429 site, with nearby major sites. The project site is on the southwestern side of Pacific Coast Highway in Los Trancos Canyon, within the Crystal Cove State Park. (scale 1:6000)

Legal Requirements and Project Organization

During the construction for the widening of Pacific Coast Highway by the County of Orange through the Newport Coast Planned Community (Tentative Tract 13337), a buried and previously unrecognized archaeological site deposit was encountered during the trenching for the installation of the "System 47 Storm Drain." The Keith Companies had been contracted by the County of Orange to monitor the highway construction for archaeological and paleontological resources along the two-and-a-half miles of the highway construction. The location of the discovery site is shown in Figure 1.

As soon as the buried shell-midden stratum of the archaeological site deposit was recognized in early March, 1994, the contractor's trenching operation was curtailed and a formal site inspection and evaluation was immediately conducted. At that point, the south-sloping trench down to a planned drain junction box location had exposed approximately twelve feet of buried shell-midden stratum. This intact stratum was near the bottom of the sloping trench and had become evident as the base of the trench was cleared prior to the installation of the next sections of drain pipe. Further trenching still was required to complete the storm drain installation. An east-sloping trench from the end of the existing trench also would cut through and further impact the ancient shell-midden stratum. This trenching would necessitate the removal of additional archaeological deposit in a trench about three feet wide for an estimated distance of about ten feet. (The schematic plans for the highway "System 47 Storm Drain" construction are reproduced as Figures 2 and 3.)

The exposed shell-midden stratum was immediately judged to be significant as an ancient archaeological resource that retained an unusual integrity. This buried and long-protected

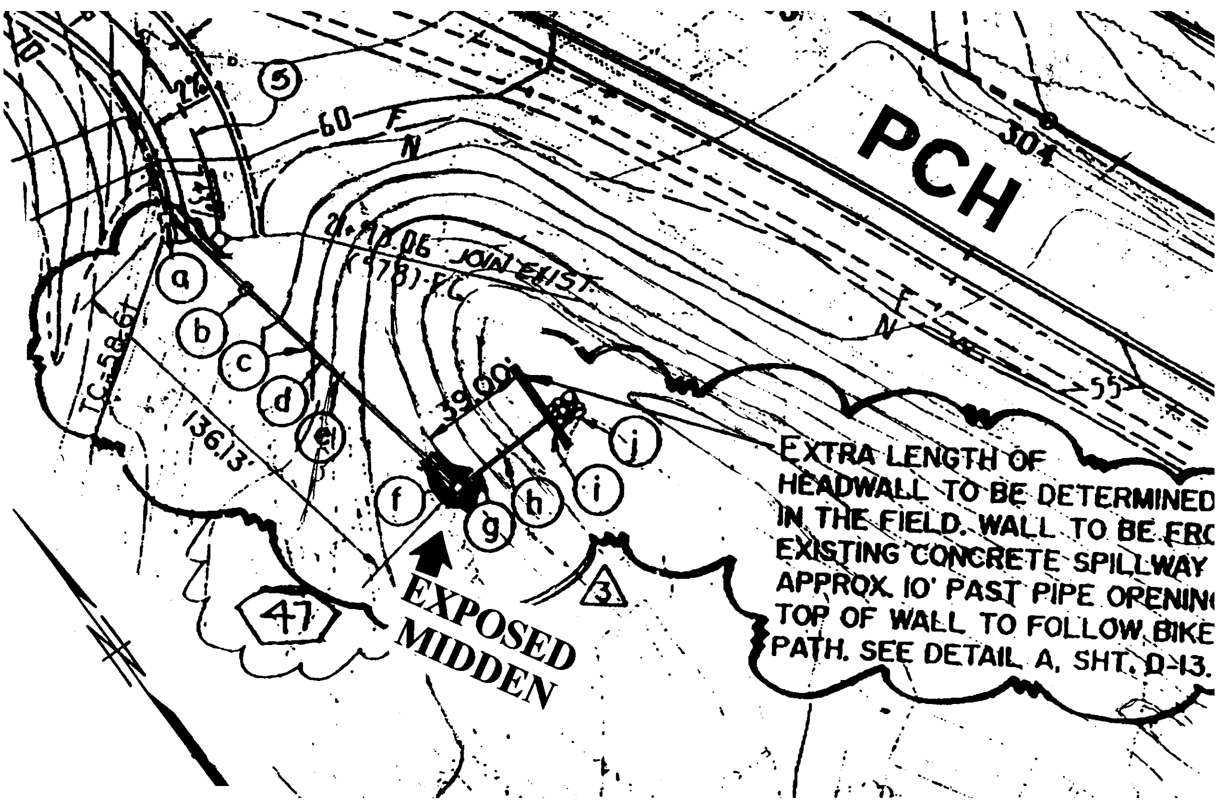

Fig. 2. Schematic ground plan for the Pacific Coast Highway System 47 Storm Drain. The drain will divert storm water from the new entrance road which leads to the Crystal Cove Historic Community. (scale 1:600)

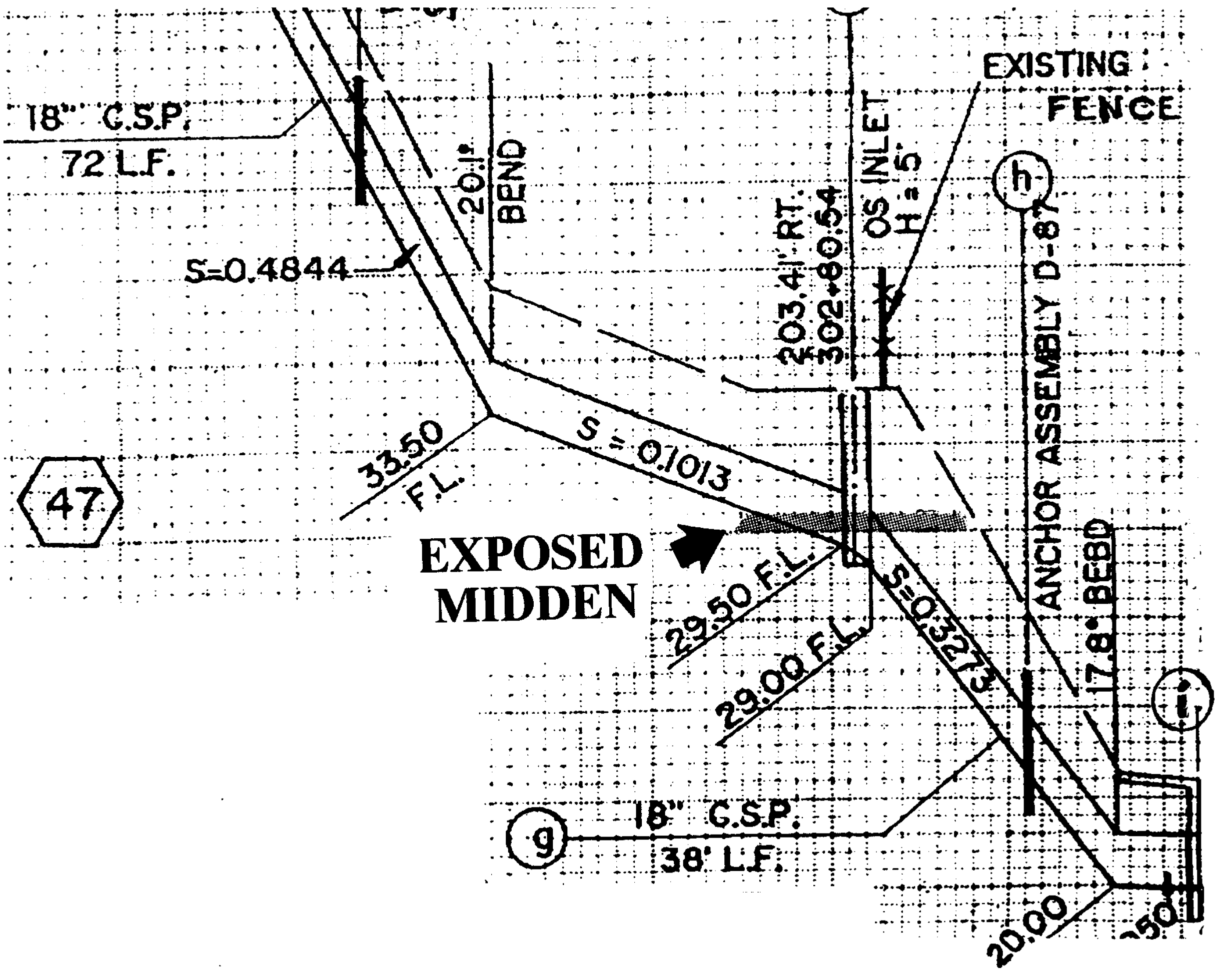

Fig. 3. Elevation plan for the Pacific Coast Highway System 47 Storm Drain. (Vertical scale 1:60)

midden was exposed in both walls of the sloping construction trench and obviously contained an unusually dense concentration of ancient food debris. It appeared as a distinct layer of dense mussel shells in a dark midden soil. This ancient midden was distinct from the natural soil below it and the nearly four feet of deposits covering it (see Figures 4 and 5).

This County highway widening project was conducted under the California Environmental Quality Act, P.R.C. Section 21,000 et seq., which required that adverse impacts to significant archaeological resources be mitigated to a satisfactory level. Additionally, being situated on State Park property, various State Park regulations required that the construction impacts be considered and satisfactorily addressed. The State's Temporary Use Permit to the County allowing for the highway construction along the property stipulated that all State Park Department rules and regulations regarding archaeological site excavations and collections be followed.

Fig. 4. The western wall of the trench excavated for the System 47 drain line and junction box, exposing the ORA-1429 archaeological site.

A conference of concerned parties was organized at the excavation site. Dr. Paul G. Chace, as The Keith Companies' Archaeologist for the highway monitoring, outlined an archaeological program to mitigate the construction impact on the site deposit. In order for the construction to proceed, it was proposed that the midden materials from the still unexcavated trench area easterly from the junction box would be excavated by hand to provide a scientific sample of the buried archaeological site. The construction then could proceed, the drain could be installed, and the system could be completed. Further trenching in the area would be carefully monitored. The salvaged archaeological midden materials would be removed to The Keith Companies laboratory facilities to be fully analyzed. Thereafter, a comprehensive technical report on this archaeological site would be prepared. All parties concurred with this mitigation approach.

All the involved parties are to be commended for their participation and support for this archaeological undertaking. Representing the State of California, Department of Parks and Recreation, was Michael Sampson, Associate State Archaeologist for the region. Representing The Irvine Company's Coastal Community Builders, was Tony Talamante, as Director for Construction in the Assessment District. Representing the County of Orange, Environmental

Fig. 5. The trench excavated for the System 47 drain line and junction box, exposing the ORA-1429 archaeological site, looking south.

Management Agency, Construction Division, as the highway project overseers, were David Marshall, Chief, and his assistant, Max Anderson. Representing Griffith Company, the construction contractor, was Jay Baca, Underground Foreman.

The actual archaeological sampling excavation at the ORA-1429 site was conducted in one day, March 14, 1994. The work proceeded under the direction of Dr. Paul Chace. The overburden down to the midden stratum was precisely removed by Rudy Gandara operating a Case 580 Super K Backhoe, for the Griffith Company. Charles Reeves and Diane Reeves, archaeologists with The Keith Companies and both with many years of archaeological field and laboratory experience, assisted with the removal of the archaeological stratum (see Figures 6 and 7). They excavated the stratum by hand using shovels. The midden material was screened, bagged, and removed for later laboratory processing. The subsequent drain system excavations later the same day were carefully monitored by Diane Reeves and Charles Reeves, but no additional archaeological material was encountered.

Fig. 6. Removing the overburden deposits above the ORA-1429 site, looking northwest towards the fill slope for Pacific Coast Highway.

Fig. 7. Shoveling and dry screening the materials from the ORA-1429 site, looking southwest.

With final approval of the mitigation program and contract funding for the analysis and report by the Orange County Board of Supervisors in late November 1994, the proposed laboratory processing on the archaeological materials recovered from the site could begin. Subsequently, Charles Reeves undertook the laboratory water screening and drying operations of the recovered midden materials. Diane Reeves performed the laboratory sorting operations, including the classifying of the shellfish remains. Various other specialists were subcontracted to assist with the identification and processing of certain special materials recovered. Patricia A. Singer classified the recovered lithic debitage. Mark A. Roeder identified the numerous fish bones. Wayne H. Bonner identified the non-fish vertebrate remains. Dr. Henry A. Koerper organized the oxygen isotope seasonality study of the *Mytilus* shell. The radiocarbon age determinations were produced by Dr. Jerry J. Stipp, Dr. Murry A. Tamers, and Darden G. Hood at Beta Analytic Inc.

The following report, essentially identical to the final project report of August 1995 (Chace 1995b), describes and interprets the salvaged archaeological materials which represent the heritage of the prehistoric ORA-1429 site. The archaeological collection will be deposited with the State Parks and Recreation Department.

Introduction

The primary objective of this archaeological project was to reconstruct the prehistoric economy and cultural food-ways patterns represented by midden debris at this camp. Apparently, this unique camp was occupied only briefly and then buried by an alluvial soil deposit. Protected from mixing with later occupations and from other disruptions, the camp debris retained an unusually high level of integrity, so the prehistoric cultural patterns were still represented with a remarkable clarity.

This archaeological investigation followed and was theoretically informed by the research design, study reports, and conclusions of the Newport Coast Archaeological Project carried forth in 1989-1994 (Mason et al. 1991a, 1994), as well as certain other key archaeological studies in the region, including those within Crystal Cove State Park (Drover, Koerper, and Langenwalter 1983; Barter 1987; Chace 1995a). These projects have produced studies on scores of prehistoric sites in the nearby region, so this ORA-1429 site project was organized in a form suitable for future comparisons with on-going regional heritage studies.

Regional Environmental Setting

The ORA-1429 site is situated within the property of Crystal Cove State Park, in Orange County, California. The site is located near the mouth of Los Trancos Canyon where it opens into the Pacific Ocean approximately four miles down the coast southeasterly of Newport Bay. On the USGS *Laguna Beach Quad* 7.5' map, the site is situated within a portion of Section 131 of the special land survey conducted for the vast Irvine Ranch.

Geography

The ORA-1429 site is situated near the coastline of the Pacific Ocean formed by the San Joaquin Hills. These hills extend to a maximum height at Signal Peak, 1164 feet above the current sea level. The San Joaquin Hills are sedimentary formations represented by consolidated siltstone, sandstone, and conglomerates. These sedimentary formations are dense and have eroded through geological times. Generally, the soils covering the slopes have weathered in place from the underlying sedimentary formations. These soils are generally shallow and composed of coarse to fine sandy-clay loams. A few areas are covered by marine terrace sands.

Numerous canyon drainages have eroded into the coastal slopes of the San Joaquin Hills. Even the major canyon drainages along the coastal side of the San Joaquin Hills are only about two miles in length. These canyons all tend to be narrow, steep, and perpendicular to the coastline. They drain storm waters down from the hill slopes to the coastline, and these steep canyons dissect the nearly flat coastal terrace across the base of the hills and the almost vertical sea cliffs at the coast.

A prominent feature of the area is a wide terrace eroded along the coastal side of the hills at a height of about 100 feet. This terrace was created in Pleistocene times by wave action during a high stand of the ocean. Today, this ancient terrace is fronted by tall sea cliffs that extend down to the current surf zone. This local geography of a coastal terrace, fronted by a tall sea cliff behind a rocky tidal zone exposed to the open ocean, extends for several miles both up and down the coast. The eroding tall cliffs are at the rear of a new shelf or terrace now being formed at sea level by the ocean's pounding surf. During recent glacial times, the ocean was lower than at present. The ocean level rose as the glacial ice melted, and the sea level stabilized at its current elevation approximately six thousand years ago.

The tidal zone along the local coast has a naturally rocky substratum exposed to the open ocean. Typically, only a few small areas actually capture sand and are maintained as narrow sandy beaches along this otherwise rugged and rocky coastline. Major storms may totally clean off the sands from these narrow strips of beach. Along the San Joaquin Hills, the coastal drainages have not carried major streams and substantial sandy discharges except for rare occasions of local runoff from major storms. Further, in glacial times, these local drainages did not erode substantial canyons down to earlier lower ocean levels; thus, there are no drowned submarine canyons where the rising ocean level once might have created a local marine embayment or lagoon habitat (such as Newport Bay).

Regional Biota and Fresh Water

The slopes of the San Joaquin Hills generally support a coastal sage scrub biotic community. Some areas of natural grassland biota also may have been present in the past. During the usually rainless summer season, much of the plant cover on the hills dries and becomes brown, and the animal populations are sparse.

Natural sources of fresh water are limited in these coastal hills. Natural water seeps or springs from the underlying formations exist in some of the drainages. Where the base of the canyons are slightly wider and slightly less steeply sloped, very limited areas with steady streams may have supported trees and a partial riparian habitat. In recent times, only tiny amounts of fresh water seeped along most of these coastal canyons.

A series of marine biotic environments exist at the ocean shore and in the sea beyond. The local tidal zone is a naturally rocky substratum exposed to the open ocean. Beyond the surf zone a few hundred feet, the rocky substratum provides the base for giant kelp forests. These kelp beds can be quite extensive and provide an unusually rich habitat which attracts a wide array of marine fishes and large marine animals. Beyond the kelp zone are deep ocean waters with a pelagic biota, including many large fishes, sharks, whales, and other sea mammals.

Historic Background

The area around the ORA-1429 site location has been variously utilized throughout historic times (Vicki L. Solheid, in Mason et al. 1991a:103-133). The coastal terraces have been utilized for cattle grazing since the eras of the Spanish missions and Mexican ranchos. The area became part of the Irvine Ranch in 1876. During the early decades of the twentieth century the local coastal terraces were leased to Japanese truck farmers, but roads into the area provided only limited access. The Japanese formed a local community here and even established a local school house in 1935. The Japanese were removed in 1942, at the beginning of World War II.

About 1924 friends and employees of the Irvine family began to build cabins at Crystal Cove, at the mouth of Los Trancos Canyon. There were 46 beach cottages along the beach, the canyon, and the terrace bluffs by the mid-1930s. Today, this Crystal Cove Historic District is listed on the *National Register of Historic Places*. The property comprising the 2,800 acres of Crystal Cove State Park was acquired from the Irvine Company in 1981.

Pacific Coast Highway, designated State Highway 1, was completed through this area in 1927. This was a major undertaking and required substantial grading to bridge the many canyons dissecting the coastal terraces. A major fill was required where the highway crossed Los Trancos Canyon. A ten-foot high tunnel through the base of the fill provides a drainage for Los Trancos Canyon as well as a pedestrian access from the upper canyon on the inland side to the beach community. The roadway entrance from the highway to the Crystal Cove beach community was graded down and around the hillside along the western side of the canyon (just west of the ORA-1429 site location).

Earlier Grading

The canyon slopes near the ORA-1429 site location appear to have been graded and possibly even intentionally terraced in the historic past. The foot of the major fill slope where Pacific Coast Highway crosses Los Trancos Canyon begins just a few feet northeast, up the drainage, from the site location. The source of this 1920s highway fill soil is probably from cuts graded along the hillsides in nearby portions of the highway.

The long-existing paved roadway into the entrance of Crystal Cove is a cut-and-fill roadbed down the hillside about 90 feet northwest of the site. This roadway begins at Pacific Coast Highway, at an elevation of about 65 feet, and curves down the slope to a terrace within the western side of the canyon, at an elevation of about 35 feet.

This terrace within Los Trancos Canyon, about 15 feet above the current stream bead, extends from the fill created for Pacific Coast Highway down the western side of the canyon for most of the distance to the canyon mouth. It is not easily determined whether this current terrace bench is entirely a natural feature or has been enhanced with some grading in decades past, possibly for the construction of beach cottage sites. The Ora-1429 site stratum is buried nearly four feet under the current ground surface, near the northwestern end of this terrace where it abuts the foot of the old highway fill slope.

Further, a small cut-and-fill roadbed has been graded from the terrace to the base of the canyon drainage. The grading for this small access roadway created a very steep slope from the terrace to the roadbed (and apparently truncated the eastern side of the horizontal archaeological stratum existing along the old terrace).

Los Trancos Canyon and the ORA-1429 Site Location

Los Trancos Canyon is one of the major drainages on the coastal side of the San Joaquin Hills. This erosional canyon extends for a distance of just slightly over two miles, from the heights of Signal Peak down to the coast at Crystal Cove. Apparently, springs or seeps along the slopes provide a tiny stream channel of fresh water down through the base of the canyon. The drainage is relatively steep, narrow, straight, and nearly perpendicular to the coast along most of its length.

Los Trancos Canyon is unusual in abruptly altering its course in its lower section. Here the canyon turns southeasterly and almost parallels the coastline. In this lower section, the base of the canyon widens slightly (but the natural canyon base now has been partially infilled and obscured by the fill created for Pacific Coast Highway). The natural gradient in this section of the canyon is less steep, only about 50 feet over the last 800 feet to the coast.

An old bench or stream-cut terrace exists along the southwestern side of this lower, southeasterly oriented, portion of the canyon. The ORA-1429 camp site was located here. The old ground surface where the archaeological site stratum developed is roughly ten feet above the current stream bed. The steep canyon walls, however, apparently have slumped and buried portions of this low bench in times past. The bench surface where the ORA-1429 habitation site was located is covered now by four feet of added soil deposits, as is detailed below.

Previously, seven other locations with archaeological shell-midden deposits had been discovered along the base of Los Trancos Canyon, all further up the drainage (ORA-1229, -1230, -1231, -1232, -1233, -1234, and -1235; Mason et al. 1992a). Each site apparently had occupied a small bench just above the stream channel in the canyon bottom. These sites also had been partially to totally covered by soil slumping from the steep canyon walls. These seven archaeological sites are situated one-quarter to one-half mile up the canyon from the ORA-1429 site, on the inland side of the highway. These sites were exposed and investigated in 1990 as the direct result of construction for the golf course in that particular section of the canyon and discovered by the keen observations of the project's archaeological monitors.

The Highway Widening, System 47 Storm Drain Project

The construction for widening the existing Pacific Coast Highway through the Newport Coast Planned Community expanded this major highway from four to six lanes. The new highway will have a basic width of 120 feet, and the new construction will include sidewalks, a bike path, and other features.

The highway storm drain construction, which encountered the buried ORA-1429 site, was designated the "System 47 Storm Drain." This drain system was designed to divert storm water from a new entrance road to the Crystal Cove Historic Community. The planned drainage system construction involved the excavation of a three-foot wide backhoe trench down the side of Los Trancos Canyon for the installation of a drain pipe to the stream bed at the base of the canyon. This drain system began at an elevation of about 60 feet and terminated in the stream bed at an elevation of 20 feet. In all, this drain system involved about 175 feet of trenching. Where the pipe system changed directions, a pipe junction box required the excavation of a four-by-four foot area. The base of this junction box was planned at an elevation of 29 feet.

Trenching for the drain system exposed the site deposit, ORA-1429. The buried deposit was discovered in the lower side walls of the trench excavated for the drain pipe and junction box. Based on the construction plans, the buried deposit was at an elevation of about 30.0 to 30.5 feet, or approximately one foot above the base of the junction box and right along the base of the pipe trench leading down to it.

The Exposed Soil Strata

The soil strata exposed in the storm drain construction trench was composed of five layers, and each layer appeared to be essentially horizontal. The lowest was a natural substratum on which the archaeological midden had been deposited. Three additional soil strata could be identified on top of the archaeological deposit. The horizontal extent of the archaeological site deposit and the other observed soil stratum could not be determined from the exposures available. These strata extended beyond the construction trench, except on the east where the canyon slopes downward to the creek bed.

The base stratum exposed in the trenching was a yellow-brown colored clayey loam. This loam was compacted, uniformly medium to fine grain in character, and included no observed rocks. No internal bedding lines were evident. This stratum extended to a depth in excess of 60 centimeters beneath the midden zone, at least where it was best exposed in the trench easterly of the junction box. This substratum is presumed to be natural loam soil which has formed in place along the side of the canyon slope.

The stratum of archaeological midden material contrasted markedly with the soil layers both beneath and above it. This stratum was composed of abundant amounts of mussel shells mixed with a dark brown-black to gray-black colored clayey-sandy-loam soil. The soil component was fine to medium coarse in grain and included very few rocks. No internal bedding lines were evident either in the soil or in the lay of the shells. This midden layer was quite uniform and about 20 centimeters in thickness everywhere it was exposed. The exposed midden showed no bioturbation or mixing with the layers above or below it.

The stratum directly above the dark midden was a golden-brown colored clayey loam. This loam was compacted, uniformly medium to fine grain in character, and included only a very few small rocks of sandstone. The contact with the underlying midden was sharp and essentially horizontal. This layer of uniform loamy soil had a thickness of about 70 centimeters. This substratum is presumed to be natural loam soil which has slumped downward from higher on the side of the canyon slope. No internal bedding lines were evident, and there was no other evidence to suggest that this represented a flood deposition. This stratum, which initially buried the archaeological camp site, was interpreted as a local slump or landslide deposition.

Resting irregularly across the top of the golden-brown clayey-loan was a stratum of jumbled sandstone blocks mixed with medium brown colored adobe soil, like the stratum above it. Many of these sandstone blocks were large, 20 centimeters or more in size. This jumbled rocky layer was not continuous everywhere in the exposed trenches but was most strongly evident in the western wall of the initial construction trench, the up-slope side of the exposure. This stratum was interpreted as the base of a separate local slump of the canyon hillside.

The top most stratum exposed in the trench was a medium brown colored adobe or clayey loam soil. This soil layer appeared similar to the soil with the layer of jumbled rocks below it, and these two layers may represent a single deposition. This loam was compacted and uniformly medium to fine grain in character, and it included a few small to fist-sized natural blocks of the local sandstone. No internal bedding lines were evident. No trash or historic items were evident to suggest that this layer had been graded or imported as part of the historic developments of this area. This layer of brown adobe soil had a thickness of about 50 to 60 centimeters. This stratum was presumed to be natural soil which has slumped downward from higher on the side of the canyon slope and continued to weather in place.

Archaeological Field and Laboratory Procedures

Standard archaeological field and laboratory procedures were used in obtaining and analyzing the midden sample from the ORA-1429 site. The field and laboratory processing were intended to parallel the techniques utilized during the 1989-1994 Newport Coast Archaeological Project undertaken by The Keith Companies (Mason et al. 1991a).

Field Procedures

The field work involved recovering the midden materials from the planned but still unexcavated trench area extending easterly from the drain junction box. The overburden down to a level just above the top of the midden stratum was carefully removed with a Case 580 Super K Backhoe. The archaeological crew then stripped by hand the entire midden stratum using shovels. The midden was reasonably friable and could be practically stripped in this way. The midden layer was composed of friable dark clayey adobe soil, with a seemingly uniform and abundant amount of fragile mussel shells. A few scattered fire-affected-rock fragments also were present. Otherwise, except for a couple of large fish vertebrae and several fragments of spongy bone as found in sea mammal, no material diversity was noted within the archaeological stratum. No archaeological features were encountered and not a single stone tool was found.

The uniformity within the excavated material matched the apparent uniformity evident in the adjacent side-walls of the construction trench previously excavated. From a field recovery perspective, it was considered that the shovel excavation provided a reasonable scientific sample of the buried archaeological midden. The archaeological stratum was a nearly horizontal, eight inch (20 centimeters) thick layer everywhere. It was exposed in the two wings of the construction trenching. The archaeological stratum simply ended where it met the steep slope of the canyon, as if the slope here had been graded and trimmed (for the construction of the graded roadway immediate below).

The shovel-excavated trench through the deposit provided a midden sample which was approximately one-half of a cubic meter in total volume. The backhoe mechanically opened the trench with a 36 inch wide bucket (about 95 centimeters) and this width was maintained in the shovel excavation of the midden stratum. The shovel-excavated trench, easterly from the junction box, intercepted the midden stratum for a distance of eight-and-half feet (about 250 centimeters). Thus, the total volume of the midden sampled was 2.50 by .20 by .95 meters, or about .475 of a cubic meter.

The entire matrix of the midden stratum was shoveled into a screen with 1/8-inch mesh wire and mechanically sifted to reduced the bulk of the fine soil. All the material remaining in the screen, after several vigorous shakings, was immediately dumped in large storage bags. The bags were labeled, packed off to field vehicles, and transported to archaeological laboratory storage facilities to await processing. The bagged material was left to dry in storage for eight months.

Before the laboratory work began, a small selection of the most intact and larger specimens of *Mytilus* were removed from some of the bags for special studies: radiocarbon dating and oxygen isotopic seasonality determinations. The tiny numbers of these presorted shells did not materially affect the standard laboratory processes and gross quantification results.

Laboratory Procedures

A standardized laboratory process was established to organize, sort, classify, count, and weigh the material in the bags of salvaged midden material. The lab processing began by weighing the gross material in each bag. Each of the 21 bags of midden material then was separately cleaned by carefully washing it with a garden hose within a box-screen having a 1/8-inch wire mesh bottom. The material retained in the water-screen was then allowed to dry thoroughly over several days. Each separate bag-lot of cleaned midden material then was sorted. The sorting of bag-lots extended over a number of weeks, so that the rigor and exactness of the process could be consistently maintained without undue fatigue on the laboratory technician. The archaeological laboratory technician previously had been employed in the Newport Coast Archaeological Project laboratory processing, so a thorough familiarity with laboratory techniques and standards was assured.

The cleaned midden material was screened to divide it into small size and large size materials for further sorting and processing. The material was sifted on a 1/4-inch mesh screen. The smaller fraction of material, those passing through this screen, were between 1/8 and 1/4-inch in size. This smaller size fraction was weighed and, typically, it constituted about 20 per cent of the weight of each bag-lot of washed material. This smaller size fraction was composed of gravel and fragmented shell. These small materials were scanned specially for possible beads, lithic flakes, artifacts, fish otoliths, unique shellfish species, and any other special items; but the most notable items observed were small fish bones.

The larger size fraction of the cleaned midden material, those retained in the 1/4-inch mesh screen, were fully sorted, classified, and weighed in more detail. Separated out were all fish bones and teeth, all non-vertebrate animal bone (and crab claws), and all lithic debitage. Subsequently, these special materials were sent to specialists for more detailed identification. The remaining material, shellfish and gravel, in this larger size fraction then were weighed.

During laboratory processing, certain shellfish remains were further sorted and classified. From four randomly selected separate bags of cleaned midden material, the larger size fraction of midden material was sorted to identify the non-repetitive elements of the shellfish taxa represented. The identifiable elements of individual specimens of each shellfish taxon were sorted, identified to taxa, counted and weighed. The results of this shellfish identification are fully presented in a following section of this report.

Lastly, in order to more fully quantify the total weight of shell material in the midden sample, all the shell fragments were completely sorted from the gravel in the larger size fraction from three separate bag-lots of midden material. These three bag-lots were three of the four sorted to identify the shell taxa represented. The shell fragments and the gravel sorted in these samples were weighed and recorded.

The Midden Debris

The collected sample of midden debris weighed a total of about 156 kilograms (actually, 344 pounds) after being in dry storage for several months. It was estimated that the dry sifting in the field had eliminated much of the soil fraction and reduced the bulk of the sample by very roughly one-half. If so, the approximately one-half cubic meter of sampled midden matrix probably originally would have weighed slightly in excess of 300 kilograms.

Following the laboratory processing, it was possible to quantify the components of the midden debris. The material retained after being washed in the 1/8-inch screen weighed a total of 79.49 kilograms. Therefore, the soil component, the residue less than 1/8-inch in size, is estimated to have amounted to approximately 220 kilograms. This soil component would have represented approximately 73 per cent of the midden matrix by weight. The material retained by the 1/8-inch mesh screen constituted about 27 per cent of the midden debris by weight, and this material was further analyzed.

The material retained by the 1/8-inch mesh screen, first, can be classified by its approximate size. Two fist-size blocks of fire-affected sandstone rock were present and weighed 590 grams or roughly 1 per cent of the retained midden sample. The bulk of the material was retained on a 1/4-inch sorting screen. This fraction of the analyzed sample weighed about 66.30 kilograms or about 83 per cent of the retained midden sample. The material between 1/4-inch and 1/8-inch in size weighed about 12.59 kilograms or about 16 per cent of the retained midden sample. Sorting through this smaller fraction was important in that it yielded the great majority of the identified fish bone; however, this smaller fraction yielded no beads or other artifacts.

Secondly, the debris retained in the 1/8-inch mesh screen can be classified by material type. Fish bones and teeth, 158 pieces altogether, weighed only slightly over 5 grams. The bone material of non-fish vertebrate animals was badly fragmented; there were 588 pieces which altogether weighed only about 104 grams. Thus, altogether the bone material represent less than 2/10 of 1 per cent of the retained midden debris. Similarly, debris from lithic tool production was only 24 pieces, weighing about 60 grams.

It is more challenging to estimate the proportions of shell fragments and natural gravel. Together, these materials made up almost 100 per cent of the material by weight of the retained midden debris. For three bag-lots of processed midden material, all the shell fragments were sorted from the gravel for the fraction larger than 1/4-inch in size. The shell fragments by weight represented 66 per cent of this sampling, and the gravel represented 34 per cent. If these proportions are projected for the entire sample retained in the 1/4-inch screen, then about 44.0 kilograms of fragmented shell would be represented in this large size fraction. However, shells fragments also were prominent in the small size fraction, the material between 1/4-inch and 1/8-inch in size. It was visually estimated that shell fragments constituted a similar proportion of this small size fraction or approximately 8.5 kilograms. If these estimations are reasonably close for each size fraction, then the shell fragments in the retained midden debris would constitute approximately 52.5 kilograms and natural gravel would constitute approximately 26.5 kilograms of the sample.

Site Chronology

The deeply buried deposit of the ORA-1429 site gave the immediate appearance of being ancient. The archaeological stratum had been covered by thick soil deposits and protected from subsequent disruptions. The top of the archaeological stratum was distinctly defined, as was the base of the site deposit. It appeared that the archaeological midden had been covered, sealed and protected, since shortly after its formation. A great deal of the fragile mussel shell (valves) remained unbroken and nearly intact. The shell seemed considerably less fragmented than has been seen in most archaeological sites in the region. No evidence of rodent disturbance, plowing, grading, or previous historic intrusions was recognized. The thick deposits above the midden stratum were natural loamy soils, plus a layer of rocky loam. All the overburden strata were apparently of natural origins. No historic materials were apparent in these soils. The overburden appeared to be old sedimentary deposits.

In order to directly date the archaeological site occupation, two radiocarbon age determinations were obtained. The submitted samples were the individually largest shells of mussel (*Mytilus*) in the collected midden material. It was hoped that by dating single mussel specimens distinct age determinations could be obtained, and the time-span for the site occupation might be realized. This approach contrasted with the technique of dating fragments of many individual shells altogether as a lot, which should effect an averaging for their multiple actual ages. Unfortunately, the shell weights of about 10 to 15 grams each was just under the acceptable weight for good radiocarbon processing. In concert with the personnel at Beta Analytic, Inc., at Miami, Florida, it was determined that more acceptable age estimates would be achieved by processing each radiocarbon sample by combining just two large mussel values.

The two radiocarbon dates obtained were 3960±90 radiocarbon years (Beta-80536) and 4030±100 radiocarbon years (Beta-80537). These are conventional C-14 ages in radiocarbon years before A.D. 1950. These dates have been corrected for fractionation and the marine reservoir effects. The laboratory report from Beta Analytic Inc. is summarized in the appendix.

These statistical radiocarbon age determinations indicate that each sample was about 4,000 years old. The small standard deviation statistic (68 per cent probability at one sigma) with each date estimation suggests that both samples could be of a very similar age, and both probably are within about 100 to 200 years of 4,000 years old. These two date estimations suggest that the time-span of the site occupation may have been as brief as a few seasons. They do not suggest that this site was inhabited (or seasonally reoccupied) over many hundreds or thousands of years. Rather, the occupation of the site may have occurred over a brief time span focusing around 4,000 years ago.

Lithic Debitage

by Patricia A. Singer

A total of 24 lithic flakes and no lithic tools were recovered from the ORA-1429 site (Table 1). The collection consists of nine thinning flakes (37.5 per cent) and 15 pieces of cubicle shatter (62.5 per cent). Four material types are present: 21 quartz (87.5 per cent), one chert (4.2 per cent), one basalt (4.2 per cent), and one andesite (4.2 per cent). Thirty-three per cent of the debitage is in the 0-10 mm. size range, 16.6 per cent is in the 11-20 mm range, 45.6 per cent is in the 21-40 mm size range, and 4.2 per cent is in the greater than 40 mm size range.

Analysis of the lithic waste products from the ORA-1429 site suggests that the remains represent the limited output from a narrow set of lithic reduction activities. The low occurrence and relative percentage of cortex, together with the absence of lithic cores related to the early stages of lithic reduction, indicate that early stage lithic reduction is not represented in the site sample. There is no evidence of lithic tool manufacturing. No biface thinning flakes, notching flakes, etc., were recovered. Evidence of middle stage lithic reduction, however, is represented by the presence of tertiary flakes. Over half of the debitage is greater than 21 mm in size which suggests that larger flakes were being produced, possibly for direct use as simple, sharp-edged tools.

Table 1. Summary of Lithic Debitage Materials

	Thinning Flake		Cubicle Shatter		
Material	Quantity	Percent	Quantity	Percent	Total
Quartz	6	25.0	15	62.5	87.5
Chert	1	4.2	—	—	4.2
Basalt	1	4.2	—	—	4.2
Andesite	1	4.2	—	—	4.2
Total	9	37.6	15	62.5	100

Fish Remains

by Mark A. Roeder

Introduction

This section describes the fish remains recovered from the ORA-1429 site. Most of the remains were identified using the author's comparative fish osteological collection. The most abundant fish remains identified in the archaeological collection were those of Pacific sardines. There were numerous but less abundant remains of sheepshead, bay shark, and surfperch. Elements from a total of ten different kinds of fish were present.

Identifiable Elements

The collection included 158 identifiable fish elements (see Table 2). The most abundant elements are the small vertebrae of the Pacific sardine, a species also represented by two prootic capsules from the skull. Sheepshead are represented by both vertebra and tooth elements. The bay shark and soupfin shark are represented by identifiable teeth. The leopard shark and Chondrichthyes (sharks) are each identified from a vertebral centrum. The other identified species are represented by distinctive vertebra. The group identified as Osteichthyes, "bony fishes," include vertebra and three other bones. The sample includes no otoliths. The bones are in good condition, and only one vertebra is charred.

Seasonality

The occurrence of *Carcharhinus*, bay shark, in the sample is very interesting. There are three species of *Carcharhinus* that have been observed or taken on rare occasions along the

Table No. 2. Fish Species Identified

Scientific Name	Common Name	Total Elements	Percent
Sardinops sagax	Pacific sardine	81	51.3
Semicossyphus pulcher	sheepshead	35	22.2
Carcharhinus sp.	bay shark	17	10.8
Embiotocidae	surfperch	6	3.8
Galeorhinus galeus	soupfin shark	2	1.3
Chromis punctipinnus	blacksmith	3	1.9
cf. Heterostichus rostatus	giant kelpfish	1	0.6
Triakidae	leopard shark	1	0.6
Chondricthyes	sharks	1	0.6
Osteichthyes	bony fishes	11	7.0
Total		158	100

California coast (Miller and Lea 1972). All three are southern species and only visit the local water during the warm-water months of July through September.

Native American Fishing

The various shark remains in this site collection occur in offshore waters and indicate that the site inhabitants used some kind of sea going craft. Sheepshead, blacksmith, and the giant kelpfish probably were taken in the offshore kelp beds which occurred off the coast. No sandy beach species such as bat ray, guitarfish, or halibut were identified in the sample. The sardines probably were taken offshore with small mesh nets.

Shellfish Remains

Introduction

This section decribes the archaeological shellfish remains in the ORA-1429 site collection. The objectives of this analysis are, first, to identify the shellfish remains; and, second, to interpret the shellfish habitats exploited by the site occupants and to determine the patterns of their cultural food preferences. Although 18 different taxa of shellfish are identified, the collection is dominated by one major and one minor food pattern. The obvious preference of shellfish food consumption was mussels collected in mass from the nearby rocky open coast. A minor food preference pattern was represented by oysters selectively gathered at distant Newport Bay and transported to this coastal fishing camp for processing and consumption. These two patterns dominate the shellfish debris in the site. Therefore, it is inferred that the site inhabitants were maintaining cultural patterns of preferential foods. These people followed highly focused food collecting strategies in support of these preferences and they were not food scavenging.

Laboratory Sampling Process

The laboratory processing to identify and quantify the shellfish remains represented in the ORA-1429 site midden sample paralleled the technique utilized for shellfish sampling during the 1989-1994 Newport Coast Archaeological Project (as described in Mason et al. 1991:200-201; Peterson 1991a, 1991b, 1991c; Peterson and Petersen 1991). Because the midden collection was excavated as a single lot, however, a subsampling process was necessary. The screened midden materials had been sequentially secured in 21 large bags. Four separate bags of material were randomly selected for comprehensive shellfish processing. After the results from the first two bags of midden materials were compared, it was evident that this sampling produced very comparable results in representing the excavated midden. In all, four bags of shellfish materials were comprehensively sorted and processed. The total results are presented in Table 3. The details of the process are discussed in the following sections.

The results from each separately processed bag were compared and found to provide quantitative results very similar to the aggregate mean values. Comparing the minimum number of individuals (MNI) counts for *Mytilus* and total individuals for the four bags, the results were 57, 56, 65, and 68 per cent; while the aggregated ratio was 60 per cent. Comparing the MNI counts for *Balanus* and total individuals for the four bags, the results were 30, 26, 19, and 20 per cent; while the aggregated ratio was 25 per cent. Comparing the MNI counts for *Ostrea* and total individuals for the four bags, the results were 2, 2, 4, and 3 per cent; while the aggregated ratio was 3 per cent. Thus, the results of processing each separate bag of material consistently compared very closely with the aggregated results. Actually, the fourth processed bag contained only about half of the amount of midden materials in each of the other bags, but the process still provided comparable results.

Table 3. Identified Shellfish Remains.

	MNI Count	Per cent	Element Count	Weight	Per cent
Palecypoda					
*Mytilus cf. californianus**	1012	60.2	2023	1785.75	90.3
Ostrea lurida	45	2.7	90	23.81	1.2
*Septifer bifurcatus**	11	0.7	22	3.22	0.2
Gastropoda					
*Acanthina spirata**	3	0.2	3	1.39	0.1
Acmaea sp.*	67	4.0	67	2.57	0.1
Cerithidea californica	5	0.3	5	0.23	
*Chama pellucida**	2	0.1	2	2.57	0.1
Crepidula sp.*	1	0.1	1	0.05	
Crepipatella sp	2	0.1	2	0.17	
*Fissurella volcano**	19	1.1	19	0.92	
Haliotis sp.*				trace	
Littorina sp.*	1	0.1	1	0.05	
Margarites succiutus	1	0.1	1	0.04	
Protothaca sp.*	40	2.4	40	6.25	0.3
*Serpulobis squamigerous**				3.66	0.2
Polyplacophora					
Chiton sp.*				0.44	
Crustacea					
Balanus sp.*	420	25.0	420	130.62	6.6
*Pollicipes polymerus**	52	3.1	206	15.14	0.8
Totals	1681	100	2902	1977	100

* Inhabit rocky intertidal open coast.

Eleven taxa are identified that are quite rare in the site collection. These rare kinds of shellfish ranged from a trace up to 0.3 per cent of the total MNI. These rare types were not found in each processed bag; however, in carefully processing this many bags of material, even these rare taxa were sampled and encountered in a consistent manner. The quick sorting of materials in the other bags of materials yielded no additional identifiable shellfish species.

Shellfish Quantification

The quantitative sampling orientation is focused on establishing the minimum number of individuals, MNI. MNI counts for Palecypoda (bivalve) species are calculated by dividing the counted number of identifiable hinge elements by two. The MNI for gastropod (univalve) species is based upon the count of identifiable spire or operculum elements. For *Balanus*, the MNI count is based on the number of bases greater than 50 per cent whole, while *Pollicipes* counts are based on the number of whole platelets divided by four.

Comparison of MNI calculations for gooseneck barnacles, *Pollicipes*, are troublesome. Each whole platelet of *Pollicipes* is counted as an element and each animal has multiple platelets. The procedure for the Newport Coast Archaeological Project established that the *Pollicipes* count would be the number of identifiable platelet elements divided by four (Mason et al.1991a:200). The quartering of the reported *Pollicipes* element counts was done for many local sites; however, it was not done consistently, so comparisons with certain nearby sites are problematic. (Non-quartered counts and calculations were reported for ORA-660, -664, -665, -666, -667, and -1231; see Peterson, in Mason et al. 1992a, 1992c). In this ORA-1429 report, the count of *Pollicipes* platelet elements is quartered to establish the MNI.

Only the larger size shellfish materials were sorted and identified. The fragmentary shell materials retained in 1/4-inch mesh screen were carefully sorted for taxonomic identifiable elements. Smaller size materials, those passing through the 1/4-inch mesh screen, could not be efficiently sorted and identified; however, it was briefly scanned for notable items. This scanning yielded no additional shellfish specie identifications.

The presentation of weights for the identified elements warrants some commentary. This weight refers only to the specifically identified elements. The quantitative processing was focused upon MNI, and the sorting only addressed the specific identifiable elements to be counted and weighed. The weighed elements were limited to the hinge portions of the bivalves species, to the identifiable spire or operculum elements of the univalves, the *Balanus* bases greater than 50 per cent whole, and the *Pollicipes* whole platelets. Thus, weights for identified elements represent only specific portions of the various types of shells. Peterson (1991a) has argued the problematic nature with weights of archaeological shell fragments and the inappropriate use of such quantification.

The shell weights presented from this type of MNI sampling process do not compare directly with different sampling processes, as recognized by Peterson (1991a). The shell weights presented in the regional reports of the 1960s and 1970s were different (i.e., Chace et al. 1967, Chace 1969, and Ross 1970). The shell processing technique in those earlier site reports typically focused on identifying the total weigh of all fragments of shell identifiable to each taxon. The processed shell sample typically was based on the shell fragments retained in a 1/4-inch mesh screen from a midden column sample or similar small unit. The total weights and percentages resulting from such different quantification processes provide only a crude comparability, but presenting the weight data from this MNI sampling processing may help resolve comparisons of the data from these two distinct approaches.

Collecting Habitats and Shellfish Foods

The principal shellfish collecting habitat represented in the site collection is clearly the rocky, intertidal, open coast. Dominating the collection are mussel shell, identified as *Mytilus* sp. Almost certainly, these represent the California mussel, *Mytilus californianus*. (Technically, as fragmented archaeological specimens, it was not practical to disprove the presence in the collection of some smaller specimens of the bay mussel, *Mytilus edulis*, which occurs in the regional estuaries.) *Mytilus californianus* inhabits the surf-splashed rocky shore in the tidal zone along the open coast. There they often grow in vast beds blanketing the surface, anchored together by byssal hairs to the hard substrate (Ricketts and Calvin 1962:163; Jones and Richman 1995). This type of habitat undoubtedly was close by the archaeological site. It would have occurred along the rocky coastline at the mouth of Los Trancos Canyon, where beach sand did not accumulate in the pounding surf.

Other characteristic species of this rocky open coast habitat represented in the collection are the gooseneck barnacle, *Pollicipes polymerus*; the volcano limpet, *Fissurella volcano*; the angular unicorn, *Acanthina spirata*; and the abalone, *Haliotis sp*. The small and abundant acorn barnacle, *Balanus glandula*, also much represented in the site collection, is characteristically found in this rocky open coast habitat; almost certainly this is the *Balanus* represented in the site collection (but technically it was not practical to disprove the presence in the collection of similar species of this genus which can occur in other environments). Additionally, many of the other shellfish identified at the genus level are most commonly represented by forms occupying the rocky open coast. Thus, as shown in Table 3, the vast majority of the identified shellfish inhabit the rocky open coast. In total, shellfish from this habit account for essentially 97 per cent of the estimated minimum number of identified individual.

The California mussel, *Mytilus californianus*, was far and away the most frequent shellfish represented in the collection. Undoubtedly, mussels meat was a primary focus of the site inhabitants' local food collecting strategy. Each mussel provides a large morsel of tasty meat. Mussels usually grow in colonies which may blanket the rocky tidal zone. After a rocky area is harvested, new mussels rapidly replace and recolonize the habitat. By slightly shifting camp locations and corresponding harvest regions each summer season, a highly sustained level of mussel procurement is practical (Jones and Richman 1995).

During low tides, substantial amounts of California mussels easily can be collected from the rocks. Only simple tools would be involved; a pry or chisel made of wood, or a sharp edged stone wedge would facilitate breaking the byssal hairs which hold the mussels to the rocks. A simple collecting basket or net would facilitate carrying hefty loads of collected mussels back to camp for processing. At the camp, the meat was removed from the shells, and the shells were discarded. The processing technique left the shells partially fragmented but unburned. Presumably, the meat then could have been eaten raw; roasted or boiled for dining; or possibly dried for later consumption.

The other frequent rocky open coast shellfish identified may have been inadvertently collected and may not have been selected as food sources. The two barnacles represented in the collection often grow upon or alongside *Mytilus californianus*, and many of these barnacles may have attached to large masses of mussels stripped from the rocks. The tiny acorn barnacle, *Balanus glandula*, often grows in groups right on the back of large mussels (i.e., Ricketts and Calvin 1962: Plate XXV). The gooseneck barnacles, *Pollicipes polymerus*, live in clusters alongside and sometimes intertwined with mussels. These two barnacles simply may have been carried back to the camp attached to masses of mussels and then discarded into the midden as the mussel shells were processed for their favored meat. Similarly, the little limpets, *Fissurella* and *Acmaea*, also live in close association with the mussels and may have been inadvertently collected.

If these barnacles and small limpets were not collected for consumption, the food frequency represented by mussels in the MNI numbers is even more impressive. When the figures for barnacles and limpets are eliminated, then mussels represent over 90 per cent of the number of shellfish represented in the camp debris. This is important because it indicates that the inhabitants of the fish camp probably were highly focused in their selection of shellfish food. A strong cultural preference is evident for the meat of *Mytilus californianus.*

Conversely, the limited diversity and low frequency of other open coast shellfish suggest the inhabitants of the ORA-1429 fishing camp were not scavenging for alternative food sources. The meat of most shellfish can be eaten; however, many do not have preferred tastes or are not efficiently collected for their meat value. The fleshy neck of the gooseneck barnacle, in some cultures, is considered a delectable food. The tough foot of the abalone, in some culture but not others, is considered delectable and worthy of processing. Abalone should have been rather abundant locally (as they were in historic times), but it was not a focus of collecting by the inhabitants of the ORA-1429 site. Additionally, some shells simply may have been picked up because they were pretty and colorful, and they later might be discarded in the camp debris. No actual shell beads, ornaments, or fragments were identified in the site collection. All in all, the shellfish frequencies and limited array of coastal shell taxa suggest that the site inhabitants had a highly focused collecting strategy and were not food scavenging.

There are a few shellfish identified in the site collection which do not inhabit the local open coast but are characteristic of a protected bay/estuary, such as Newport Bay. The native oyster, *Ostrea lurida*, lives in a protected bay environment where they attach themselves and may completely cover rocky outcrops and other hard surfaces (Ricketts and Calvin 1962:216). The few California horn shell, *Cerithidea californica*, in the collection are also typical inhabitants of bays but inhabit mud flats; these shellfish have a somewhat handsome conical shell and probably were not a collected food source. (Certain other taxa have forms that occupy the open coast and others that are quite common in protected bay habitats, as the *Protothaca* sp. clams.) Notably absent in the site collection are *Chione* and *Argopecten* which are common constituents of many archaeological middens around Newport Bay (Wojdak 1993).

Originating in a protected bay/estuary habitat, native oysters, *Ostrea lurida*, account for about three per cent of the individual shellfish present in the camp debris. (Other bay/estuary species are rare and do not increase the percentage from this habitat.) There are two possible explanations for the presence of protected bay shellfish at the ORA-1429 site. Four thousand years ago, a very small local area of protected marine estuary may have existed as the rising post-glacial sea level drowned and filled the mouth of Los Trancos Canyon; however, both the restricted variety and limited numbers of bay-type shellfish suggest it is unlikely that a marine estuary existed locally.

Alternatively, the bay environment shellfish actually could have been gathered at Newport Bay, which is only about four miles distant from the site. This alternative would suggest that the inhabitants of the ORA-1429 fishing camp either came from or through the Newport Bay area when they occupied this coastal fishing camp and brought along some shellfish food, or that while they occupied this coastal fishing camp they occasionally visited and transported back certain favored shellfish food from the bay area. This highly favored shellfish food clearly was the succulent sweet meat of oysters. It seems most likely that the oysters in the ORA-1429 camp debris actually were selectively gathered at Newport Bay and transported to this fishing camp for processing and consumption. This further indicates that the site inhabitants were not food scavenging but were maintaining cultural patterns of preferential foods and highly focused food collecting strategies.

Non-Fish Vertebrate Remains
by Wayne H. Bonner

Faunal Sample

A total of 588 non-fish vertebrate remains were recovered during trenching operations at the ORA-1429 site. Total weight of this bone was 103.97 grams. Burned fragments, weighing 9.61 grams, accounted for 30 of the specimens. The calculated number of individual specimens (NISP) and minimum number of individuals (MNI) is charted below. The vast majority of bones were highly fragmented and could only be identified as undifferentiated mammal, undifferentiated small mammal, undifferentiated medium mammal, or undifferentiated rodent. Only two mammalian taxa, undifferentiated rabbit and pocket gopher, could be determined (see Table 4). Some of the medium sized mammal fragments may represent marine mammal. In addition to the vertebrate material, a pair of crab claws, most likely *Randallia ornata*, also was recovered. These weighed 1.15 grams.

Table 4. Non-Fish Faunal Remains Recovered

Animal Group	NISP	MNI	Weight (grams)
Undiff. Mammal	97	--	6.42
Undiff. Small Mammal	60	--	1.35
Undiff. Medium Mammal	399	--	93.43
Undiff. Rabbit	7	1	1.93
Undiff. Rodent	21	--	0.50
Pocket Gopher	4	1	0.34
Subtotal	588	2	103.97
Purple Crab	2	1	1.15
Total	590	3	105.12

Fauna

Rodents in general and pocket gophers specifically are often the most numerous taxa identified from coastal archaeological sites. Among the rodent elements recovered from the ORA-1429 site were one pelvic fragment, one tibia, one femur, two incisors, one partial premaxilla, one metapodial, one rib, and one fragmented left mandible. None of the specimens exhibited butchery marks or evidence of burning.

All undifferentiated rodent and pocket gopher remains can be ascribed to non-cultural occurrences. That is, they represent animals that were intrusive to the cultural deposits and not present as the result of human activity.

Undifferentiated rabbit is represented in the ORA-1429 collection by two vertebrae, one phalange, one pelvic fragment, one carpal/tarsal, and two cranial fragments. None of the pieces show alteration by human activity such as butchery marks or burning. Nevertheless, rabbits were a vital source of protein for the prehistoric populations of Orange County. They were a resource which was available year-round and were relatively easy to catch. Use of snares, nets, or traps, as well as bow and arrow, dart or throwing stick, would have required minimal labor for successful capture.

Although the remains were highly fragmented, the porous nature of the bone fragments identified as medium-sized mammal suggest the presence of marine mammals. None of the numerous specimens were sufficiently preserved to permit element identification, let alone genus and species.

The occurrence of marine mammals is not unexpected. At least six marine mammals have been recovered from archaeological sites along the Orange County coast (Table 5). All of these species inhabit nearshore environments as well as the open sea. Marine mammals have been exploited by prehistoric populations in Orange County for at least 5,000 years.

The presence of marine mammals permits the postulation of several research questions. What type of hunting skills were utilized to capture these animals? What season was the site occupied?

Table 5. Marine Mammal Species Recovered from Prehistoric Sites in the Newport Area. (After Koerper 1981; Langenwalter 1981, 1990; Yohe and Bleitz 1990).

Scientific Name	Common Name	Period		
Pinnipedia	seals	M	I	L
Arctocephalus townsendi	southern fur seal			L
Enhyda lutris	sea otter	M	I	L
Phoca vitulina	harbor seal	M	I	L
Zalophus californianus	California sea lion	M	I	L
Ondontoceti	whales		I	L
	M = Milling Stone		I = Intermediate	L = Late

The taking of marine mammals would have required significant manpower and skill. Harpoons and a form of water transportation would have been required to seize extremely large mammals such as whales. Within the marine environment, the prey would have many advantages over the hunter who would be at risk of injury or death. Onshore, however, the pursuer would have the advantage, and there would be less risk and greater chance of success. The most likely manner of capture would have been clubbing, though spearing and/or harpooning and netting could have been utilized. Occasionally, dead animals simply wash ashore.

Rabbits and crab can be captured any time of the year, but spring is the most opportune time to hunt marine mammals when many are coming ashore to bear and raise their young.

Purple crab, *Randallia ornata*, have been reported from Corona del Mar. They currently range from Mexico north to central California. It is found partially buried in sand at times of lowest low tide. This species is not as common in Orange County today as other crab taxa (Allen 1969:125). Crab parts are frequently reported from midden deposits.

Interpretation

The rocky shore environment adjacent to the ORA-1429 site would have provided a diversified ecosystem which contained abundant and assorted flora and fauna. The Ora-1429 faunal sample represents a diverse exploitation system of the vertebrate and invertebrate resources available along the Orange County coast. A number of exploitation techniques are represented. They range from simple foraging for crabs and other invertebrates along the seashore and within the tidepools to the slightly more complex capture of rabbits to the most complex and labor intensive exploitation of marine mammals.

Reconstructing the paleoenvironment of the Newport coast is crucial to understanding the subsistence patterns of the prehistoric inhabitants who lived there. As Bixler (1980) stressed, in reference to prehistoric sites along the Santa Barbara Channel, the changes in the size and nature of environments (with different sets of resources) are important factors for explaining changes in subsistence strategies, site locations, and shift in socioeconomic organization. The ORA-1429 site faunal sample provides new and intriguing insights for this period of prehistoric Orange County, 4,000 years ago.

Oxygen Isotope Seasonality Study

A series of nine valves of mussel (*Mytilus*) shell from the ORA-1429 site have been processed by Henry A. Koerper and his colleagues to determine the season (or seasons) in which these shellfish were harvested (Table 6). The work on this site specific series of shell samples is part of a larger regional archaeological study of *Mytilus* collecting patterns and changing ocean surface temperatures. As a distinct scientific approach to understanding seasonality in shellfish collecting, this study is based on a technique pioneered by John Killingley and applied to archaeological shell from sites along the nearby Pacific Coast (Killingley 1980, 1981, 1983; Koerper, Killingley, and Taylor 1985; Koerper and Killingley, 1998; Dunbar, Koerper, Mucciarone, and Macko 1998).

The technique measures the ratio of oxygen isotopes along the growth-wise length of a *Mytilus* shell. It is recognized that the profile of oxygen isotopes, and specifically O-18, directly reflects the changing water temperatures of the annual round of seasons. The annual profile derived from along the growth-wise length of each single shell approximates a sine wave, with higher temperatures through each summer season and lower temperatures during the winter season. Thus, at the terminal edge of a shell, the ratio of oxygen isotopes, in comparison to the previous ratios determined up the length of the shell during its prior growth, should indicate the season in which that shellfish was harvested.

This regional technical study still is in progress. Preliminary results and interpretations have been presented (Dunbar, Koerper, Mucciarone, and Macko 1998). The number of local sites (three) and the number of *Mytilus* tested from each of these sites remains limited and relatively small. At this juncture, Koerper prefers to interpret the oxygen isotope ratio at the terminal edge of each tested shell in terms of a calendar month while recognizing each terminal determination probably has a plus-or-minus deviation of about one-and-one-half months. This factor may be refined by tests with further samples.

At the ORA-1429 site, one should recall that all the *Mytilus* shells were recovered from a single sampling trench, and they were not randomly recovered from a wide breadth of camp debris. Thus, the sample tested may represent only a very limited number of *Mytilus* harvesting-processing-deposition episodes at this fishing camp. The shells tested from the ORA-1429 camp indicate *Mytilus* was harvested only during summer seasons. The terminal determinations of individual specimens span from May through October, but each has a plus-or-minus factor of about one and one-half months as presently interpreted, so this site sample suggests the harvesting seasons might range only from July through August.

Table 6. Harvest Seasons on *Mytilus* Determined by Oxygen Isotope Ratios.

Shell 1	Sept.	Shell 7	Sept.	Shell 10	Sept.
Shell 4	Sept.	Shell 8	June	Shell 11	Sept.
Shell 6	Oct.	Shell 9	May	Shell 12	Sept.

Comparisons, Comments, and Conclusions: Recognizing an Ancient Prehistoric Heritage

A number of ancient archaeological camp sites have been identified on the nearby coastal slopes of the San Joaquin Hills that were occupied at about the same period as the ORA-1429 fishing camp, based upon reported radiocarbon dates. Presumably peoples with the same or very similar cultural patterns occupied these camps. All of these coastal sites are close by, within two miles, between modern Corona Del Mar and Abalone Point at the northern end of Laguna Beach.

It is practical to make comparisons which reveal the important cultural patterns shared by the occupants of these various camp locations. A total of 19 ancient camps have been identified, investigated, and reported for the nearby region (Barter 1983, 1987, 1991; Cameron 1983, 1985; Chace 1995b; Mason et al., 1991a, 1991b, 1992a, 1992b, 1992c, 1992d, 1994; Schroth et al., 1987; Strudwick 1998). Unlike the ORA-1429 site, however, most of these nearby archaeological site deposits were not buried and protected. The ancient heritage at many of them has become disrupted, mixed, and confounded with materials from much more recent occupations, typically dating from more recent and distinct Late Horizon times. The ancient cultural patterns, however, sometimes still can be isolated and recognized.

The 19 ancient camp locations identified in the nearby region are summarized in Table 7 below. In this table, a recognized cultural pattern in the datable ancient portion of the site deposit is symbolically indicated by XXX if the pattern is strongly represented, by X if the pattern is weakly represented, by O if the pattern is clearly absent, by ? if the cultural pattern probably is represented but confounded by debris of more recent occupations, and by ??? if a pattern is too confounded by later occupation debris to resolve if it was represent in the ancient portion of the site. Many of these 19 nearby sites have radiocarbon dates documenting more recent occupations (typically Late Horizon dates), but these clearly distinct recent dates and recent cultural patterns are not included in the tabulation in Table 7.

Settlement Pattern

Most of the comparable sites listed in Table 7 are situated on the wide terrace at the top of the sea cliff, or upon a knoll or ridge line along a canyon drainage. Two ancient sites are recognized on stream benches within canyon drainages (ORA-1429 and ORA-1231); other such locations in these canyons probably have been obscured or completely removed by erosion.

Of course, any camp site deposits located on the coast at the base of the sea cliff would have been eroded away by wave action during major storms. All in all, there is a recognized plethora of ancient camp site locations in the region, and still others may have existed but have been lost to natural processes.

Summer Occupations

A pattern of summer season occupations is recognized at many of these ancient coastal camp sites. The principal types of evidence for this pattern have been: (1) the capture of fishes locally resident only during the summer, as found at ORA-1429; and (2) studies of the seasonal growth rings on otoliths (ear bones) of captured fish. These patterns have been studied and recognized at a number of nearby sites.

The use of the oxygen isotope ratios for determining the season of harvest of mussels has not been widely applied in seasonality studies heretofore. The limited sample of shells tested from ORA-1429 indicated only summer season mussel harvesting. This new technique provides an important and independent approach for determining the seasons represented in local site occupations.

Table 7. Comparisons with Nearby Ancient Camp Sites

Site Number	C-14 Date(s)	No. of Dates	Summer Fishes	Summer Otolith	Kelp Fish	Sardine	Coast Mussel	Bay Shellfish	Reference
130	4700 - 3800*	3	—	—	XXX	—	XXX	X	Barter 1987
246	8600 - 8400	2	—	?	???	0	???	X	Mason 1992c
280	4000*	1							Barter 1991
281	8000 - 4400*	2					XXX		Barter 1991
323	4500 - 3700*	3	—	—	XXX	—	XXX	X	Barter 1987
327	4600 - 3500*	3	—	???	???	—	???	???	Cameron 1985
339	9300 - 8700	2	?	?	???	?	???	???	Mason 1991b
660	6500 - 4700	12	—	—	XXX	0	XXX	X	Mason 1992a
664	5600 - 3700	14	—	—	XXX	0	X	XXX	Mason 1992a
665	5600 - 5200	8	X	X	XXX	0	XXX	X	Mason 1992a
666	5300 - 4800	4	—	XXX	XXX	0	XXX	X	Mason 1992a
667	5700 - 3600	25	—	XXX	XXX	0	XXX	X	Mason 1992d
684	3800 - 3700	2	—	—	XXX	0	0	X	Mason 1992b
928	4800 - 4300	6	—	X	XXX	X	XXX	X	Mason 1991b
929	6300 - 4400	7	—	XXX	XXX	0	XXX	X	Mason 1991b
1208	3600	1	—	?	???	?	???	???	Mason 1992c
1231	7300 - 7000	3	—	X	XXX	0	XXX	X	Mason 1992a
1429	4000 - 3900	2	X	—	XXX	XXX	XXX	X	Chace 1995b
1482	4400	1					XXX	?	Strudwick 1998

* Uncorrected dates

Dating

A total of 101 radiocarbon dates have been secured on debris from 19 ancient camp sites. The occupation of these nearby coastal camps continued over a lengthy time period. In Table 7, the dates have been rounded to the nearest century. These rounded dates span from approximately 9,300 down to 3,700 or 3,500 years ago, and there are nine sites with reported radiocarbon dates within a few hundred years of 3,700 years. (Century rounding provides a fair age approximation, considering the usually reported statistical counting errors for local radiocarbon dates. These dates, however, more probably would be within two centuries; thus, a date of about 3,600 or even 3,500 could be 3,700 years. The actual calibrated ages for the many radiocarbon dates for the Newport Coast Archaeological Project are adapted from Mason et al., 1994, Appendix I-D).

Abruptly, approximately 3,700 years ago, the ancient camps in this region were no longer being seasonally reoccupied. There was very little or no occupation in this coastal portion of the San Joaquin Hill over most of the next two thousand years. Some form of major cultural change occurred; the settlement pattern of seasonal camps along this portion of the San Joaquin Hills coast was abandoned. For the entire period between about 3,700 and 1,900 years ago, only eight radiocarbon dates have been secured from six sites. These dates are listed in Table 8. (In further contrast, there are multitudes of radiocarbon dates reported for nearby coastal sites since about 1,900 years ago, which represent a major re-settlement pattern for the Late Horizon.

Table 8. Radiocarbon Dates Between About 3,700 and 1,900 Years Ago from Nearby San Joaquin Hills Coastal Sites

Site Number	C-14 Date	Reference
340	3400	Mason 1994
339	2800	Mason 1994
327	2700*	Cameron 1985
327	2400*	Barter 1991
221	2600	Mason 1994
221	2500	Mason 1994
662	2500	Mason 1994
ICD-13	2400	Mason 1994

* Uncorrected dates

Ocean Fishing

Almost all of the nearby coastal sites have evidence that a major pattern of economic activities was the catching of ocean fishes. For capturing some specific fishes a water craft almost certainly was required, and the primary fishing location probably was around the off-shore kelp beds. Sheepshead are the most commonly represented fishes in almost every site. Capturing this kelp bed fish implies fishing with a hook-and-line. Sufficient equipment probably would be a baited toggle hook of pointed wood or bone secured on a twined piece of cord, with an attached stone as a sinker.

Most sites actually include a variety of different kinds of fish. Many of these normally could be encountered around the kelp beds. These include sharks and pelagic fish feeding around the rich kelp forest zone. Ocean fishing around the kelp beds appears to have been a prominent part of the economic pattern of the local life-way.

The remains of large marine animals occur in small frequencies in many of these coastal sites. Sea mammals live around the kelp beds where much of the fishing occurred, although these mammals sometimes also may come ashore to bask and breed, where they might be clubbed. It is unclear if these large animals were captured as an adjunct to off-shore fishing activities; but if so, some additional equipment would be required and a harpoon would suffice. The small number of sea mammal remains in the debris of these camps suggests that the hunting and the processing of such large animals was, at best, a minor pattern in the local economic pursuits.

Various fish sometime may occur close to shore, and such fish are represented at several sites. Ocean fishing actually may have involved a number of techniques at different locations, including capture from shore by cast net, beach seine, harpoon, and line. Such other cultural fishing patterns, apart from kelp fishing, are not so strongly represented as to be clearly recognized in site debris. (More diverse cultural fishing patterns appear evident in Late Horizon occupations, and such recent debris may be mixed into ancient site deposits where they were not sealed.)

Sardines

The capturing of small sardines is not a cultural fishing pattern that has been recognized at most of the nearby sites. Capturing sardines requires special equipment, probably very fine nets. A dip net with fine mesh utilized from a boat situated offshore around the kelp beds would be suitable. A few sardines may enter a midden deposit as part of the stomach contents of captured sea mammals, big birds, and large fishes. At ORA-1429, however, there is a high frequency of sardine elements and an apparent low frequency of their predators. The strong pattern of sardines represented in the site deposit is not considered to be stomach contents of other predatory animals but the result of an ancient fishing pattern.

Recovering and recognizing the tiny vertebrae and other such bony sardine elements from archaeological site debris requires special procedures. Attention must be devoted to processing the smaller size fraction of the midden debris. Many local studies have not fully pursued appropriate techniques. It is highly likely that the identification of this cultural fishing pattern may have been missed in many regional investigations. This local cultural fishing pattern actually might be more common than is currently apparent in the studies summarized in Table 7.

Mussel Collecting

The collecting of masses of mussels along the rocky shore is a cultural pattern strongly represented at most local sites. Previous studies have not fully considered that the other rocky coast shellfish in site debris may just be ancillary junk attached to the favored mussels.

Still other rocky coast shellfish species should have been available for food but apparently were not favored and not normally collected. Among the shellfish which should have occurred nearby and represent potential foods, but apparently were not favored are abalones, top shells, turbans, and limpets. Sea urchin, crabs, and sea birds also should have been locally available, but apparently they were not regularly collected and deposited in camp debris. Thus, coastal shellfish collecting appears to represent a cultural pattern of food acquisition focused specifically upon tasty mussel meat as a particularly favored food.

Bay Shellfish Collecting

Many of the nearby ancient sites include a cultural pattern of bay shellfish collecting. Almost certainly these bay shellfish were foraged from Newport Bay and transported to these camps along the rocky open coastline of the San Joaquin Hills. At the ORA-1429 camp site, this pattern is limited to succulent oysters, which appear to have been a particularly favored meat. As a transported food, this cultural pattern at ORA-1429 is represented by only a modest amount of debris.

The pattern of bay shellfish collecting includes a wider variety of bay shellfish species in many nearby sites. The bay species in those sites were from a variety of habitats. This wider and more diverse food pattern of bay shellfish dominates the two nearby coastal sites situated closest to Newport Bay (ORA-684 and ORA-664). An even wider diversity of bay shellfish species is evident in more recently occupied Late Horizon site deposits, and debris from this later pattern of bay shellfish collecting may become mixed into ancient deposits where the sites were not sealed.

Conclusions

The heritage in the ancient archaeological debris of the ORA-1429 fishing camp represents a cultural tradition followed by people that successfully occupied this coastal region over a lengthy time period. This particular camp was established on a stream bench in a canyon near the coast, and the camp debris was buried by an erosional slump or landslide. Radiocarbon dates suggest that this location was occupied for only a brief period before the midden was covered and sealed. Thus, the ORA-1429 debris is unusual in representing an ancient prehistoric tradition that has not been disrupted and confounded by later occupations in the region.

A series of cultural patterns can be recognized in the archaeological deposit of this ancient camp. These cultural patterns are focused upon fishing around the kelp beds and collecting mussels from the shore. The people occupying this camp appear to have followed clear cultural preferences for certain tasty foods and a cultural avoidance of others. This indicates that the site occupants were not scavenging for food. Rather, these people were maintaining developed cultural patterns of preferential foods and following highly focused economic strategies in support of these food preferences.

This series of focused cultural patterns represents a long maintained and highly successful tradition maintained by people occupying this coastal region. Then, abruptly about 3,700 years ago, there was a major disjunction in this cultural heritage.

Epilog
Of the Old Summer Fishing Camp—at Crystal Cove

...We had good times there at the shore. We ate well... (Then) something bad happened. Grandfather would never tell us this sad story...

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Appendix: Report of Radiocarbon Dating Analyses

BETA ANALYTIC INC.

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REPORT OF RADIOCARBON DATING ANALYSES

FOR: Dr. Paul G. Chace
The Keith Companies

DATE RECEIVED: February 15, 1995
DATE REPORTED: March 16, 1995

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-80536	3530 +/- 80 BP	+ 1.2 o/oo	3960 +/- 90 BP

SAMPLE #: # 1 & 2
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT:(shell): acid etch

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-80537	3590 +/- 90 BP	+ 1.8 o/oo	4030 +/- 100 BP

SAMPLE #: # 3 & 4
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT:(shell): acid etch

NOTE: One additional sample, # 5, is "on hold" as instructed.

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.