California Archeological Reports
No. 16

Archeological Test Excavations Within Border Field State Park, San Diego County

by
Jeffery C. Bingham
State Park Archeologist I

August 1978

Resource Preservation and Interpretation Division

CULTURAL HERITAGE SECTION

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
P. O. Box 2390
Sacramento, CA 95811

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

CONTENTS

PREFACE

Appreciation is expressed to the following persons for their contributions and assistance to the Border Field archeological project: Leslie Lewis, Maxine Farrell, Greta Ellsworth, Nancy Ridgeway, Dan Foster, and Steve Younts of the field and laboratory crew; Philip Hines and Lloyd Findley for the Faunal Analysis, and Christina Carter for the Shellfish Seasonality sections of this report; Paula Pennington and Terry Roeder (State Park rangers), Troy Jordan (State Park Historian), and Dom Gotelli (State Park District Interpretive Specialist) who aided the project on behalf of the State of California, Department of Parks and Recreation; and Paul Chace and Ken Hedges (San Diego Museum of Man), James Moriarty (University of San Diego), and Ron May for invaluable technical help and free advice. Lloyd T. Findley and Sandra Hull graciously volunteered their time in the excavation of CA-SDi-4281. A special "thanks" goes to Lloyd Findley for helpful suggestions on an earlier draft of this report.

Field excavation commenced on January 6 and was completed February 10, 1976. All of the excavation data and cultural material recovered during the Border Field project are currently retained in the Cultural Heritage Data Recovery Center in West Sacramento.

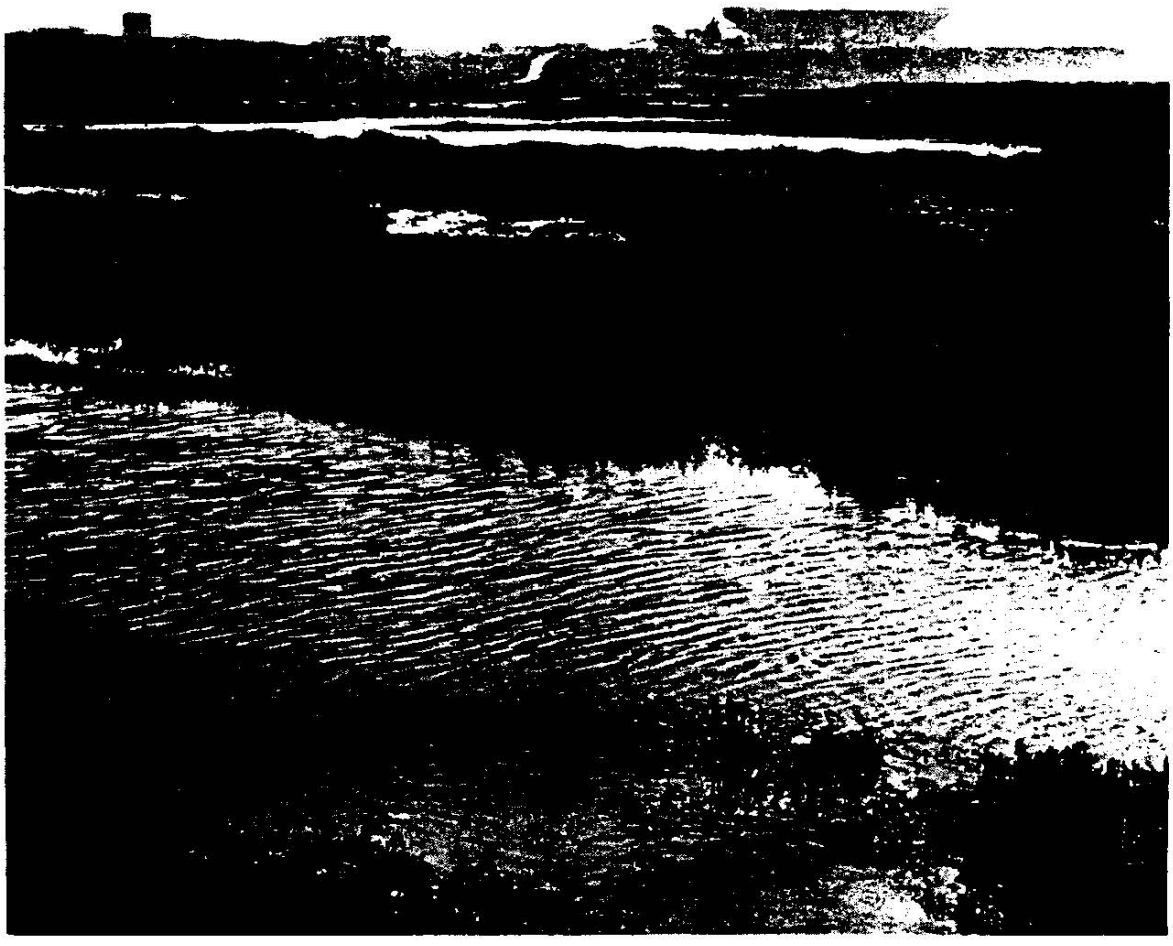
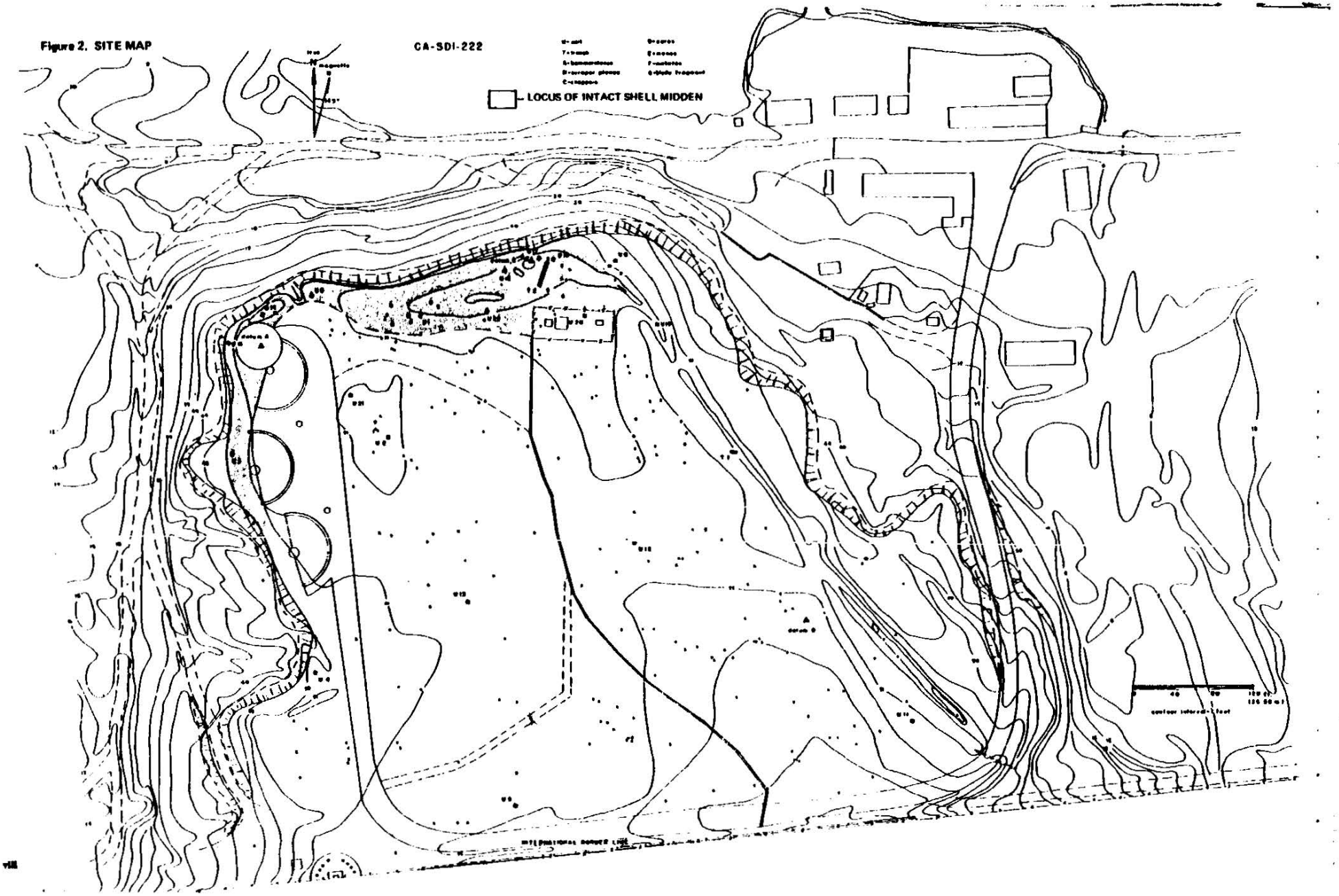


Figure 2. SITE MAP

CA-SDI-222

LOCUS OF INTACT SHELL MIDDEN



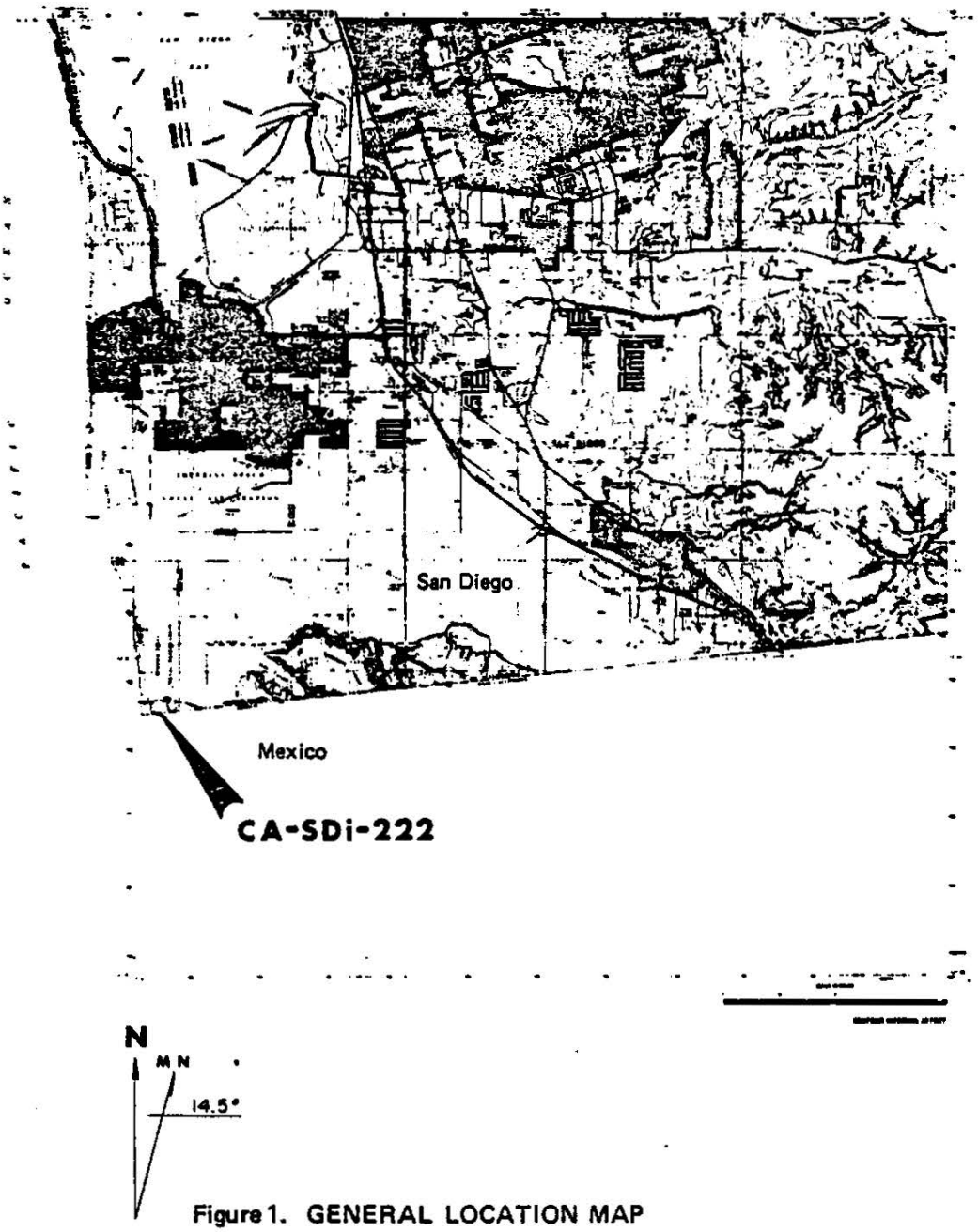


Figure 1. GENERAL LOCATION MAP

LOCATION

CA-SDi-222 is in the southeast quarter of the northeast quarter of Section 7, Township 19S, Range 2W of the U.S. Geological Survey, Imperial Beach Quadrangle, 7.5 minute series, 1967. The exact map location is U.T.M. 48865E/359958N. The site is located on the northern edge of a marine terrace approximately 50 feet above mean sea level, and is unique in that it is situated in the southwesternmost corner of the continental United States. SDi-222 is only a few feet north of the international boundary where Mexico and United States meet on the Pacific Coast (see Fig. 1).

The Monument Mesa is the first of three steep-faced bluffs which rise easterly from the beach along the international border for about 3.5 miles and reach a height of approximately 400 feet. These dissected Pleistocene beach terraces mark the southern margin of the Tijuana River floodplain; the north edge is bordered by 20 to 50-foot beach terraces. The floodplain rises gradually to the east until it meets the foothills of the Laguna Mountains.

The mesa due east of SDi-222 harbors a dark shelly midden which is over a meter deep. This prehistoric deposit is designated SDi-4281. The U.T.M. coordinates of SDi-4281 are 48900E/359958N.

ENVIRONMENTAL SETTING

The southern California coastal region in lower San Diego County west of the Laguna Mountains is characterized by subtropic Mediterranean type climate. The seasonal rainfall averages 9 to 10 inches per year on the coast. The upper portion of the Tijuana River drainage basin which extends 40 to 60 miles inland to the coastal ranges, receives up to 25 inches of rainfall annually (San Diego Planning Commission Report, 1974).

The Tijuana Slough, one of only two true estuaries in San Diego County, was the resource center for local prehistoric gathering cultures. Today the estuary contains about 270 acres of tidal salt marsh, 145 acres of tidal channels and mudflats, and a maritime zone which comprises about 760 acres (Department of Fish and Game, 1972). The floodplain obtains a width of approximately 1.5 miles. The Tijuana River, an ephemeral stream draining portions of the United States and Mexico, traverses the floodplain and flows into the estuary at the north end along the low-lying peripheral marine terraces. The river originates at the confluence of Cottonwood Creek and the Rio de las Palmas near the city of Tijuana. The total watershed equals 1,731 square miles, with 462 square miles in California (Ocean Science and Engineering Report, 1971).

Only about 500 acres of the salt marsh are flooded regularly by tidal waters. The estuary system is cut off from the Pacific Ocean by sand strands, except for a narrow opening at the mouth of the Tijuana River. The gradual post-Pleistocene silting-in of the prehistoric bay is nearly complete. (See the discussion section for further details.)

The soils of the lower Tijuana River valley are comprised of sands and silts derived from the granitic rocks of the upland basin and the coastal mountains. The three classes of these valley soils, arranged from most widespread to least abundant, are: the Chino silt loams composed of alluvial deposits of gravel, clay, sand, and silts; the Tidal Flats soils composed of clays and silts deposited in a wide band extending from the beaches to about 4,000 feet inland; and the Tijuana Sands which are confined to the river channel (San Diego Planning Commission Report, 1976).

The marine terraces to the north and south of the Tijuana floodplain are uplifted sea floor platforms of Pleistocene origin. The younger rocks found in the region are largely sedimentary, both marine and terrestrial. These range in age from Cretaceous to Pleistocene. Rocks of marine origin are exposed mostly in the dissected coastal terraces (Sharp, 1972) (see Pl. 1, p.3).

Flora

The marine terraces, the Tijuana River estuary/bay, and the coastal foothills and mountains comprised a varied ecosystem which could be exploited by the aboriginal inhabitants. These terraces and foothills to an elevation of about 400 feet are now characterized by south coastal scrub-type vegetation. The estuary and floodplain comprise the riparian vegetational zone. Many native plants in these zones are recorded as being used by southern California coastal ethnographic populations by Sparkman (1908) and Jepson (1925) (see Appendix D).

INTRODUCTION

The Cultural Heritage Section of the State of California, Department of Parks and Recreation, was requested to test the archeological site designated CA-SDi-222 (the Monument Mesa site) and make recommendations for the mitigation of proposed impact to the midden deposit. The site is within the Border Field State Park boundaries. (See Figs. 1 and 2.) As part of a planned development project of the park, described in the Research Management Plan and General Development Plan (January 1974), a paved parking facility, a picnic area, and interpretive facilities for the estuary, beach, and historic monument will be constructed. These planned improvements will probably destroy the remaining intact portions of the prehistoric midden.

No other archeological sites in the vicinity of the Tijuana River valley have been thoroughly tested and reported. Careful examination of the cultural remains on Monument Mesa, owing to its unique location and rare cultural sequence, has contributed data important to future interpretations of other sites within Border Field State Park and the whole of coastal southern California.

The Monument Mesa archeological site is important to the understanding of early prehistoric man's adaptation to the San Diego seacoast during a geological period when the physical features of the region differed from those of today. In the millennia which followed the last cold period of the North American Ice Age (Pleistocene epoch), an altithermal occurred which caused a general rise in mean sea level. The amount of annual precipitation which ensued was greater than the current yearly average; the faunal and floral zones were shifted; and the mean annual temperature was higher than today.

Thus, the physical conditions of the San Diego seacoast contrasted with contemporary conditions when the earliest aboriginal peoples were using SDi-222. This archeological site embodies lithic artifacts of the enigmatic culture referred to as San Dieguito, which is the first known on the south coast. The stone tools of the coastal San Dieguito hunting complex may have an antiquity of over 9,000 years.

The remnants of a shell midden on the Monument Mesa site reflect the importance of the prehistoric bay in the subsistence pattern of subsequent native groups. These groups comprise the south coastal La Jollan culture. The La Jollan people relied primarily on vegetal and animal foods which could be gathered locally at varying seasons of the year.

SDi-222 and SDi-4281 (an adjacent terrace midden which was minutely sampled) would have been ideally situated for optimum resource exploitation of the local ecozones. Fresh water would have been readily available in the upper valley and peripheral drainages. The Pleistocene terraces also contain thick strata of fine-grained to cryptocrystalline stream cobbles for tool manufacture.

The record of human history on SDi-222 is interrupted by a gap of approximately 3,500 years. There is no recognizable trace of the post-La Jollan (Yuman) aboriginal culture groups which persisted elsewhere in southern California into contact times, nor are there artifactual or architectural remains from the Hispanic or early European culture periods.

The first tangible human remains subsequent to the La Jollan midden on the Monument Mesa are World War II naval installations and associated debris. Damage to the site which occurred during the naval occupation may have obliterated any material remains of intervening cultural periods. In 1971, the United States quitclaimed to the state of California for park purposes the 370-acre site of the Border Field naval facility.

It is assumed that the vegetational communities have not changed much over the past millennia. There is evidence, however, that in the late Pleistocene, precipitation was somewhat greater than now (Moriarty, 1969). Also, a slight shift in the ecological zones to a lower elevation may have occurred (Warren, 1968). Palynological studies were conducted on samples from the Border Field middens in an effort to reconstruct prehistoric plant communities; however, the results were inconclusive.

Faunal Analysis

Mammals that were observed in the vicinity during the project include the blacktail jackrabbit, desert cottontail rabbit, and California ground squirrel. Birds include the red-tailed hawk, marsh hawk, western meadowlark, greater roadrunner, Anna's hummingbird, sandpiper, willet, and several species of seagulls. Offshore sea mammals observed include grey whales, bottle-nose dolphins, and several sea lions. There are several species of clams and other invertebrates and various crustaceans, including multiple species of shrimps and crabs in the estuary (see also Shell Analysis).

The faunal remains from the Border Field archeological project indicate that at least five different classes of vertebrates were hunted by the prehistoric inhabitants of the two sites (SDi-222 and SDi-4281). These classes include fishes, sharks and rays, reptiles, birds, and mammals (Table 1). In addition to the faunal remains, a human medial phalanx was recovered from SDi-4281, in the 20 to 30-cm level.

A total of 44 mammals is native to the Border Field area (Appendix E). Of these, 38 are land mammals, and 6 are sea mammals. Only seven genera or species of mammals could be identified from the excavation residue. A total of 296 bones was sorted out (from both sites). No sea mammal bones were identified.

At least 5 rabbits (including 2 jackrabbits), 6 gophers, 1 mule deer, 1 dog or coyote, and 1 cow are represented. All but the cow are known from ethnographic data to have been used as aboriginal food sources.

The above faunal counts were obtained by separating the most common element (bone) into right and left components and adding them (White 1953: 397). For example, 2 left gopher tibiae indicate 2 gophers.

Both archeological middens contained a number of intrusive bones (Tables 2-4). Two of the gophers found at SDi-4281 are intrusive, as are 2 of the gophers, 1 rabbit, and the cow calcaneus from CA-SDi-222. The use of the coastal terraces as a grazing pasture for cattle explains the presence of the cow calcaneus. The condition of the other intrusive bones is indicative of digestive waste from predators such as coyotes and other carnivores. It is conceivable, however, that the rodents may have simply died within their burrows.

SDi-222 contained 28 charred bones (Table 2). The majority of these (15) were shaft fragments from large or medium-sized mammals. The charred and fragmentary nature of these long bones suggests that they had been heated and then cracked open to extract the marrow (Gilbert 1973:10). SDi-4281 (Table 4) contained only 2 charred bones. (Only 1 test square was dug on SDi-4281 versus 29 on SDi-222.) Eleven of the bones from SDi-222 were calcined, indicating that they had been left in a fire or in hot coals for an extremely long time. Only 1 bone from SDi-4281 was calcined.

All of the rabbit and rodent bones were fragmentary, possibly indicating that the animals were pounded or crushed prior to cooking or eating (Schwartz 1968:120).

One unusual feature of the faunal remains from SDi-4281 is the large number (67) of caudal vertebrae from a raccoon-sized, juvenile animal (neither epiphyseal end was fused). Sixty-four of the vertebrae were found between 0 and 30 cm. Their presence may indicate that a raccoon or similar-sized animal was skinned at the site, with the skin and tail then being discarded as a single piece (White 1954:255).

The vertical distribution of faunal remains for SDi-222 (Table 3) shows that 158 of the bones (90.8%) were found in the upper 50 cm of the midden, while only 16 bones (9.2%) were found in the lower 50 cm. The reason for the drop is that only 3 units were excavated below a depth of 50 cm (see Appendix F).

Table 4 shows a stratigraphic break in the vertical distribution of the faunal remains from SDi-4281. Within the 0 to 30-cm levels, 76 whole bones or fragments (62.3%) were found, while only 8 (6.5%) were found at the 30 to 100-cm level, and 38 whole or fragmented specimens (31.4%) were found at the 100 to 140-cm level. This break may denote a lapse in prehistoric occupation of the site (see Shell Analysis).

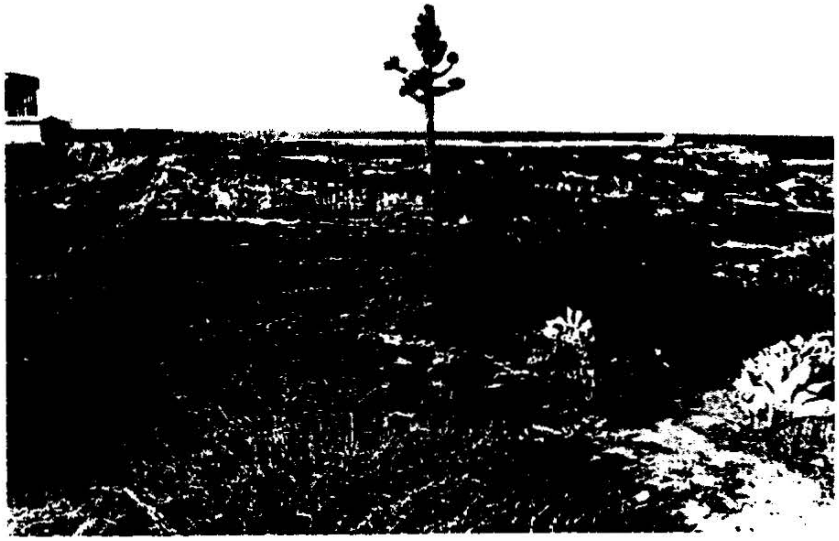
If the caudal vertebrae from SDi-4281 indeed belong to a juvenile raccoon, as indicated by their size and the fact that the animal is native to the

PLATE 1. GENERAL VIEWS

SDi-4281 Bull Ring SDi-222

Looking southwest from estuary

Terrace stratigraphy



Looking west at SDi-222
(rare agave in foreground)

Table 2
CA-SDi-222 Horizontal Distribution of Faunal Remains

UNIT	Lepus Californicus	Sylvilagus sp	Thomomys Bottae	Canis sp	Odocoileus hemionus	Lagomorpha	Rodentia	Lagomorpha Rodentia Avis	Avis	Fish	Shark or Ray	Large Mammal	Medium Mammal	Small Mammal	Mammal unidentifiable	Bos taurus	Total Bone per unit
1				1								5[B]					6
3		1															1
5													2			1	3
10	2		1	2					1	2		1	3	3	1[B]		16
12														1			1
13						2[◆◆]											2
14		3[●]	5[●]			1[●]	6		1	1	1	1[B]	1[=]	3	1		24
15	2	3		1			2[◆]					15	6[B B=]	1[B]			17
16												3[B]			1		4
17			1									[B]	2[B]	1			4
18	3		8[◆◆◆◆ ◆◆◆◆◆]		1		2[◆◆]				1	5[=B]	1	6[=B]			29
19												2[B B]		3			5
21				1	1[B]										3		5
22		1							1	1		1[B]	1				5
23			2[◆B]		1				1[◆]	1[◆]			1[=]	4[=B]	2[●◆]		11
24	1		1[◆]									5[B=]	1	2	1[=]		11
25			3				1			1		2	1	4	2[B]		13
26	1[B]										1[B]	1					4
27	1							2[B B]				5[=]					7
28														2[B]			2
29												1[B]		3[B◆]			4
TOTAL	10	8	21	5	3	3	11	2	4	6	3	34	19	33	11		174

Legend:
◆ Intrusive
B Charred
= Calcined
● Weathered

Large Mammal – Deer size
Medium Mammal – Badger to coyote size
Small Mammal – Rabbit to rodent size
Mammal unidentifiable – Cannot identify size

Lagomorpha, Rodentia, and Avis – Could not identify shaft fragments to a specific class

Table 1

Vertebrate Faunal Remains Present in Column Samples from CA-SDi-222

Category	Identified Bone	% Identified Bone	Approximate Minimum No. of Individuals
Lepus californicus	4	1.10%	1
Sylvilagus sp.	10	2.80%	1
Lagomorpha	36	10.00%	1
Lagomorpha – Rodentia – Avis	2	0.55%	Unknown
Thomomys bottae	6	1.70%	1
Perognathus sp.	2	0.55%	1
Peromyscus sp.	1	0.28%	1
Neotoma sp.	2	0.55%	1
Microtus californicus	5	1.40%	1
Rodentia	193	53.60%	Unknown
Avis	1	0.28%	1
Fish	41	11.40%	Unknown
Shark or Ray	8	2.20%	Unknown
Lizard	3	0.83%	3
Reptile	4	1.10%	Unknown
Large Mammal	1	0.28%	Unknown
Medium Mammal	12	3.30%	Unknown
Small Mammal	4	1.10%	Unknown
Unidentifiable Mammal	25	6.90%	Unknown
TOTAL	360	99.92%	

Table 4
CA-SDi-4281 Vertical Distribution of Faunal Remains (Unit A)

LEVEL	Lepus Californicus	Sylvilagus sp	Thomomys bottae	Procyon lotor	Rodentia	Rodentia Aves	Aves	Fish	Shark or Ray	Reptilian	Large Mammal	Medium Mammal	Unident. Mammal	Total Bone per level
0-10 cm		1						1			2	15●•		21
10-20 cm								1			2	27•		31
20-30 cm								1			1	22•		24
30-40 cm								1						1
40-50 cm	1		1								1	1•		3
50-60 cm											1			1
60-70 cm	1		1											1
70-80 cm														
80-90 cm	1◆		1◆					1						2
90-100 cm	1◆		1◆	1				1			2▪			5
100-110 cm	1◆		1◆					2	1	2			3	9
110-120 cm								1			3▮		1	5
120-130 cm		1▮						1	1	1		1•		5
130-140 cm	3◆		3◆		4	1	3			1			2	14
Total bone per animal	2	2	8	1	4	1	3	10	2	4	12	67	6	122

Legend:
◆ Intrusive
▮ Charred
▪ Calcined
● Weathered

Large Mammal – Deer size
Medium Mammal – Badger to coyote size
Small Mammal – Rabbit to rodent size
Mammal unidentifiable – Cannot identify size

• Caudal vertebrae – All juvenile, raccoon size

Table 3
CA-SDi-222 Vertical Distribution of Faunal Remains

Level	Lepus Californicus	Sylvilagus sp	Thomomys bottae	Canis sp	Odocoileus hemionus	Lagomorpha	Rodentia	Rodentia Avis	Avis	Fish	Shark or Ray	Large Mammal	Medium Mammal	Small Mammal	Mammal unidentifiable	Bos tarus	Total Bone per level
0-10 cm	2	2		1		2	1	2	1			6	3	3	2		25
10-20 cm					1						1	11	4	4	4		25
10-sub														2			2
20-30 cm	2		4	1					1	2	1	6	6	5	1	1	30
30-40 cm	2		4	3	2				2	3		8	3	13	3		43
40-50 cm	2	3	12			1	8				1	2	2	1	1		33
50-sub										1		1		3			5
50-60 cm		3											1	1			5
60-70 cm	1						1							1			3
70-80 cm	1						1										2
80-90 cm			1														1
Total bone per animal	10	8	21	5	3	3	11	2	4	6	3	34	19	33	11	1	174

Legend:
- ◆ Intrusive
- ▮ Charred
- ▬ Calcined
- ● Weathered

Large Mammal – Deer size
Medium Mammal – Badger to coyote size
Small Mammal – Rabbit to rodent size
Mammal unidentifiable – Cannot identify size

area, the site would have been occupied during the winter. Raccoons are born between April and May, and would display a juvenile skeletal structure during the winter (Burt and Grossenheider 1952:55) (see Seasonality Study).

The presence of shark or ray vertebrae in the midden indicates that the prehistoric inhabitants may have fished in shallow waters. The rabbit and rodent remains imply that open grasslands and brushy areas, such as coastal sage/chaparral, were used for hunting. Raccoon bone is an indication that a riparian environment was also used for hunting. Mule deer are found in open grassy or brushy areas bordering forests (Ingles 1965/423) (see Appendix E).

Sixteen 20 x 20-cm column samples were removed from selected test units on SDi-222. All were excavated from surface to base level in 10-cm increments. Samples were extracted from pits 1-4, 8-11, and 13-20. Of these, only 7 were examined for faunal remains – 3, 4, 11, 13, 14, 16, and 24 (see Site Map). These units were selected to ensure an adequate horizontal sample from the site.

The column samples were wet-screened through a 1/16-inch-mesh sieve, whereas the excavation unit material was dry-sifted through 1/4-inch screens. Flotation residue was also examined. Samples were hand-sorted by unit and level.

A total of 360 bones or bone fragments was found during analysis of the column samples. Only 296 bones or bone fragments were sorted from the meter-square excavation residue. The faunal tabulations from the column samples seem comparatively high, considering that 13 m^3 of soil were sifted from 1/4-inch sieves, while only .094 m^3 was processed through 1/16-inch mesh.

Nineteen categories of vertebrates were distinguishable (Table 1). The majority of these were rodent long-bone shaft fragments (approximately 70%), 209 being recovered from the column samples. Only 33 rodent bones were retrieved from the excavation units. Four genera of rodents not found with the 1/4-inch sieves were identified from the 1/16-inch, including: *Perognathus* sp.; *Peromyscus* sp.; *Neotoma* sp.; and *Microtus californicus*. Forty-one fish bones were found with the 1/16-inch-mesh screen, while only 6 fish bones were recovered with the 1/4-inch. For a complete comparison of the faunal remains from the columns and test units, see Figure 3.

Of the 360 bones found in the column, 351 were from excavation units 14, 16, and 24, all located in the least disturbed portion of the midden (see Site Map). Eighteen intrusive bones were present, including: 8 rodent; 7 rabbit; 2 reptilian vertebrae; and 1 lizard mandible. All but 1 of these came from the least disturbed midden.

Fifty-six bones were charred, including: 48 rodent; 1 medium-sized mammal; 4 rabbit; and 3 rabbit-rodent-bird-sized. Ten bones were calcined: 6 rodent; 2 rabbit; and 2 fish vertebrae.

The column sample data indicate that rodents comprised a portion of the aboriginal diet. The proportion of rodent bones and bone fragments per volume of soil appears too high for natural occurrence. Squirrels, mice, rats, and gophers are known to have been used for food by ethnographic populations in southern California.

SHELL ANALYSIS

All shell fragments were collected at SDi-222 and SDi-4281 with 1/4-inch-mesh screen. Because of the high degree of disturbance at the site (SDi-222), many of the shells are highly fragmented. In addition, many are so weathered that genus and species identification and growth ring analysis were impossible. The topsoil and midden layers were highly leached.

The relatively small quantity of identifiable shells recovered from SDi-222 made statistical distribution analysis unfeasible. Only general statements can be advanced with the existing data.

It was noted that units 10, 14, and 15 showed proportionately more shells occurring in the 30 to 50-cm levels. Disturbance is the probable cause for this phenomenon, as the upper levels of these units appear to be composed of fill material. The other excavation squares seemed to exhibit a much more even vertical shell distribution.

One general trend is worth noting. Of the bay mussel shells recovered from the site, 87% were found at 30 cm or more below datum. This could support the hypothesis that a change occurred in the valley topography through time – a change from a relatively deep bay with a rocky foreshore and thriving mussel populations to the nearly silted-in estuary of today with very restricted, rock-dwelling shellfish habitats.

The inhabitants of SDi-222 were collecting most varieties of their shellfish foods from the Tijuana River bay/estuary. They also used the open coast of the Pacific to collect the Pismo clam and the tiny bean clam. (See Appendixes for habitats and inventories of the identifiable shellfish found at SDi-222 and SDi-4281.)

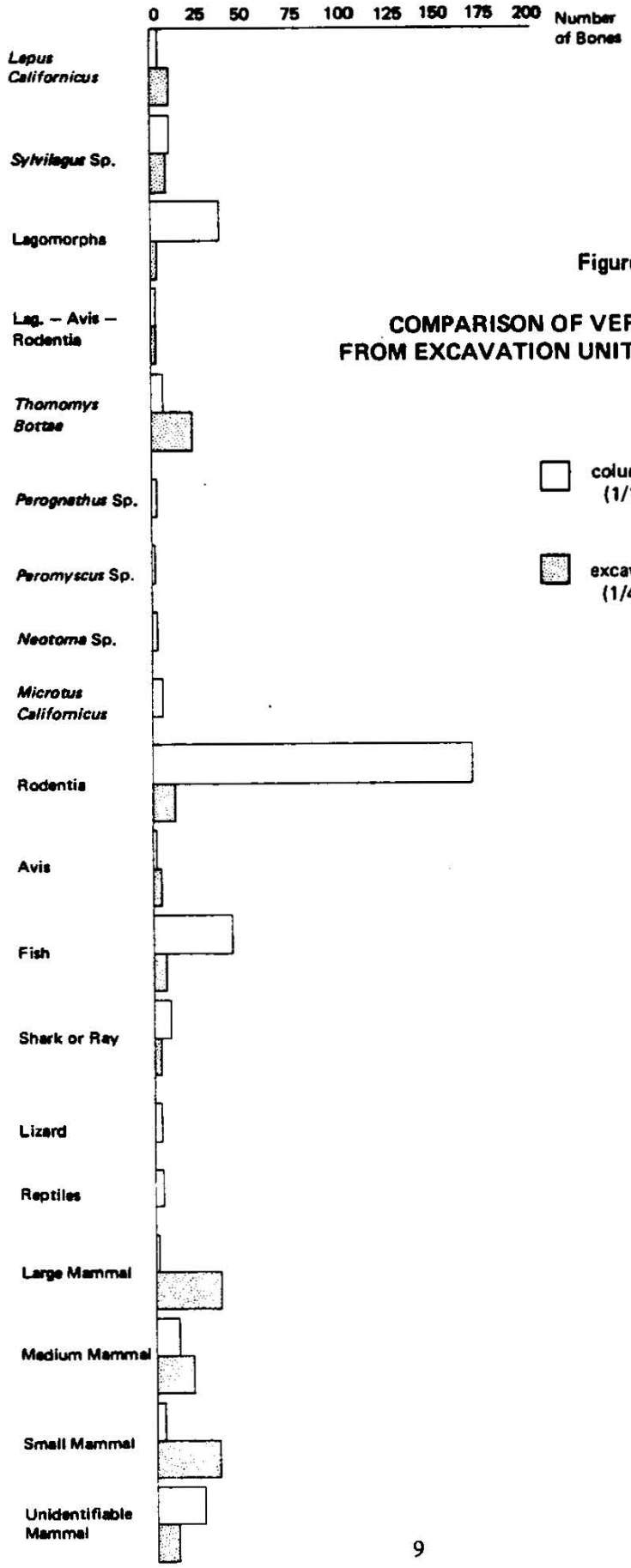


Figure 3

COMPARISON OF VERTEBRATE FAUNA FROM EXCAVATION UNITS AND COLUMN SAMPLES

obtrusive ridges. *Chione undatella* comprised the most abundant species of Chione clams recovered from SDi-4281.

Analysis of the seasonal growth bands on these Pelecypoda has provided an indication of the seasonal exploitation pattern of the area's shell-fish gathering occupants. A single meter-square excavation unit cannot provide a statistically valid representation for the entire archeological site; this study merely serves to suggest possible trends in the seasonal use pattern and explores the usefulness of this technique.

To determine the season in which each shellfish died (when growth ceased), the ventral margins of the valves were examined. Shells collected in the winter were readily discernible by the presence of an annual groove on the ventral margin, with no further fortnightly ring formation following. Examination of the laminae between the annual winter grooves is necessary to determine collection during other seasons.

Barker (1970:78) averaged the number of growth rings added to the shell each year. He found that in the first year an average of 16.9 fortnightly growth ridges was added, 8.8 in the second year, 4.5 in the third, and only 4.0 in the fourth. The average number of rings added each year to the study shells from SDi-4281 was 19.6 for the first year, 8.4 in the second, 4 in the third, 2.6 in the fourth, 1.7 in the fifth, and 1.38 in the sixth.

To interpret the growth during a single season, each yearly average was divided by three, for each of the growing periods. However, this method assumes that each season will last an equal amount of time, when in reality the growth seasons vary proportionally with increasing age of the animal. Of the 64 valves analyzed from SDi-4281, all were at least two years old. The results of the analysis showed that:

2 valves (3.1% of total) were two years old
9 valves (14.1% of total) were three years old
17 valves (26.6% of total) were four years old
23 valves (35.9% of total) were five years old
13 valves (20.3% of total) were six years old

Of the six-year-olds, 77% were gathered during the winter.

After each shell was examined and the season of collection interpreted, a chart was constructed to show the percentage of seasonal distribution for the entire 0 to 150-cm sample (see Fig. 4). The chart demonstrates the possibility of two main periods of shellfish collection. During the late spring there appears to have been a short period which was followed by a longer more intense one, beginning in the fall and extending into the winter months. The data indicate that the peak of yearly collection occurred during winter.

Analysis of the excavated material from SDi-4281 indicated that there is a stratigraphic break in the vertical distribution of bone, shell, and lithic artifacts. A marked drop in material occurred in the 30 to 40-cm level. Of the 64 shells comprising the sample, 19 valves were from the 0 to 40-cm levels. Seasonal growth band charts were also constructed to test the nature of this stratigraphic anomaly.

As can be seen in the graphs of Figure 4, a distinct distributional change occurs by breaking the data as dictated by the cultural stratigraphy. All of the shells from the 0 to 40-cm levels were collected during the fall and winter, peaking at winter, with little or no shells from the spring and summer seasons.

The 45 *Chione undatella* valves from the 40 to 150-cm levels are grouped quite differently. Within these levels there are two main gathering seasons indicated, a short period during the late spring and a second broader span of collection which occurs over fall and winter.

The three graphs indicate that essentially none of the specimens of *Chione undatella* comprising the study sample died (were collected) during the summer. This apparent pattern could be solely a consequence of the restricted sample, not reflecting the actual subsistence model. However, hypotheses based on these seasonality data suggest interesting research possibilities.

Shellfish were possibly collected only in the spring, fall, and winter (primarily winter). SDi-4281 may not have been occupied by aboriginal peoples during the summer months; or, perhaps shellfish collection was reduced during this season. The presence of red tides, which affect coastal waters from June through September (especially during July and August), would have made shellfish lethal to warm-blooded animals during the summer (Fitch, 1953) and probably affected the food collection pattern.

Also, based on the relative proportions of shell, bone, and lithic material recovered from unit A, there appears to be a stratigraphic break in the midden deposit. In the 40 to 150-cm levels, shellfish collecting seems to have occurred in late spring and during the fall and winter months. In the 0 to 40-cm levels only fall and winter gathering

Seasonality Study

As part of the analysis of an archeological site, the interpretation of several types of ecofactual material found in the midden can be used to imply the season or seasons that the area was occupied by the aboriginal inhabitants. Invertebrate remains are the most abundant component of the midden deposit on CA-SDi-4281. The growth rings of *Chione undatella* were studied to determine the season the shellfish were gathered (i.e., the season of death). The shell sample from SDi-222 was inadequate for analysis.

Recently, several studies have been conducted that involve the analysis of seasonal growth bands on certain species of shell. Margaret Weide's (1969) seasonality research on the growth rings of Pismo clam, *Tivela stultorum*, substantiated her hypothesis for a late winter collection and occupation of the archeological site designated CA-Ora-82.

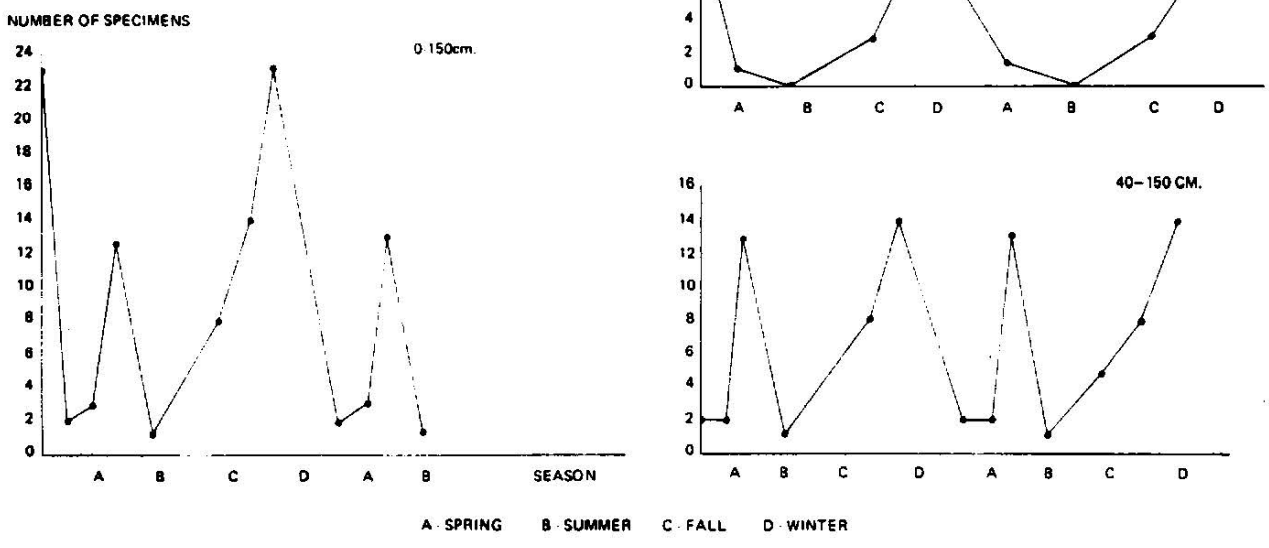
In 1970, Richard Barker observed that living Pelecypoda built up incremental growth bands of laminae on their shells throughout life. This process is checked during the winter season, a period of nongrowth..

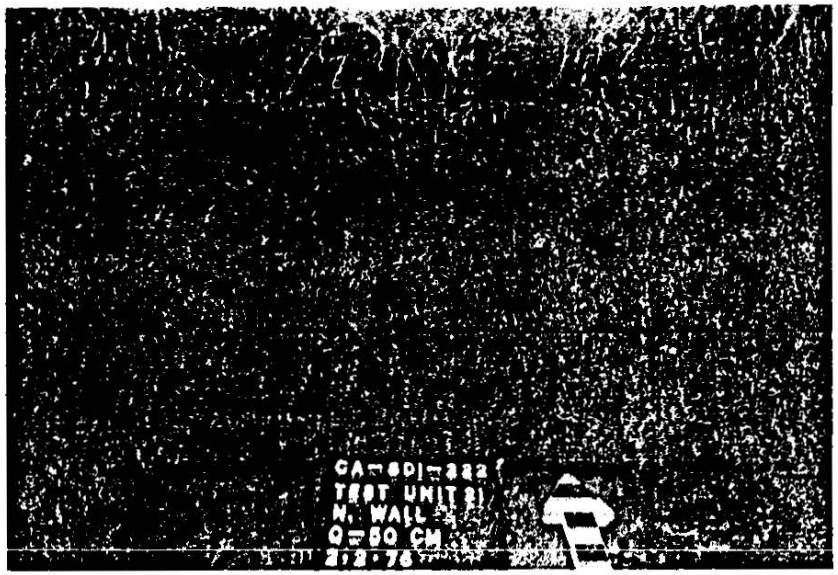
Daily growth laminae are thought to be formed during feeding when the valves are open. According to Barker (1970:42) fewer than 365 bands are formed within a major year increment. The second type of increment is the fortnightly concentric ridge; these are believed to form in response to tidal disturbances. Fourteen or 15 of these laminae are regularly produced between the annual growth increments. The final characteristic of the cycle is the formation of the annual groove. During the winter the shell goes through a period of inactivity when the mantle contracts, stopping growth. The resulting semi-opaque concentric annual groove is visible on the external portion of the shell (Barker 1970: 159-161). The winter hiatus lengthens with increased age, resulting in a decrease in the number of fortnightly laminae occurring between the annual grooves (Barker 1970:64).

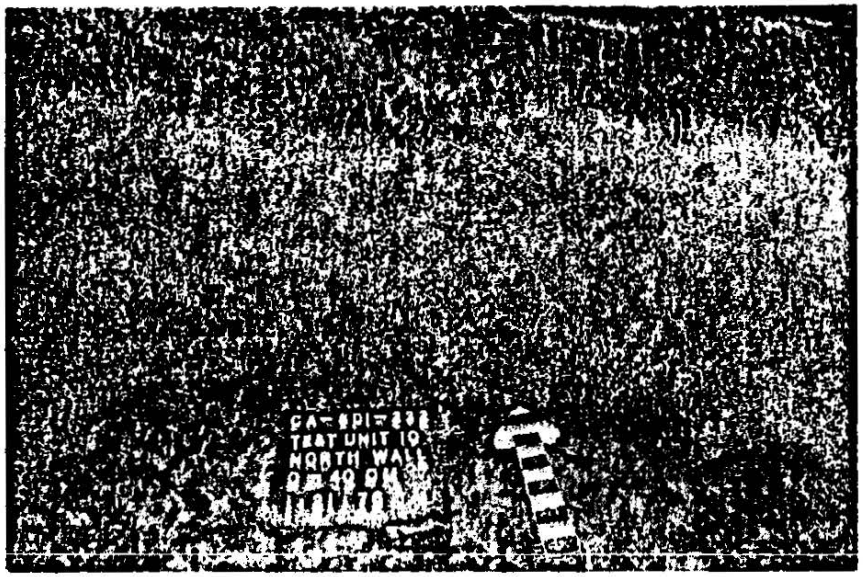
Using the findings from Barker's study, Theodore Cooley (1971) and Christopher Drover (1974) studied the growth bands of *Chione undatella* recovered from Ora-291 and Ora-119 to determine the season of aboriginal occupation.

The shell sample under study from CA-SDi-4281 consisted of 64 *Chione undatella* valves from a 1-m excavation square (150 cm in depth). According to Morris (1966:28), *Chione undatella* is the most common species of this genus on the California beaches, and it has the most

Figure 4
SHELL SEASONALITY GRAPHS (SDi – 4281)

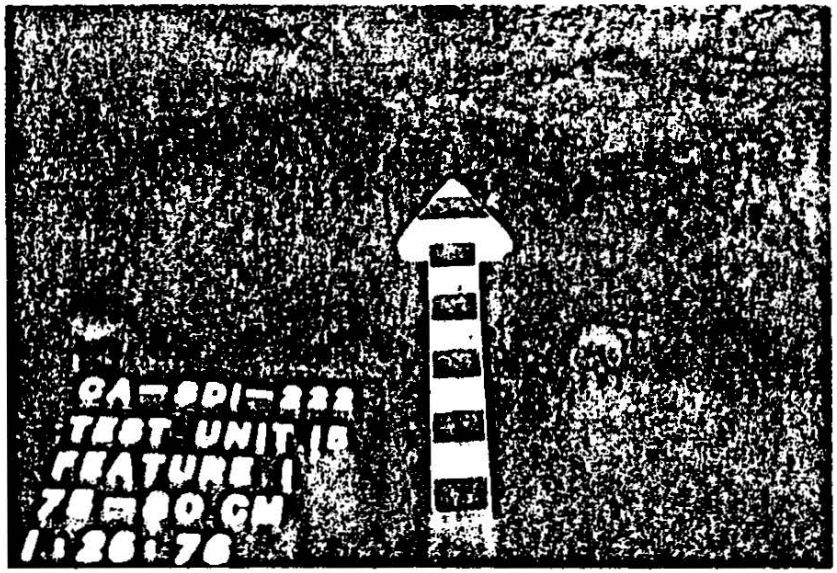






(Note chunks of road asphalt)

Unit Wall Profiles



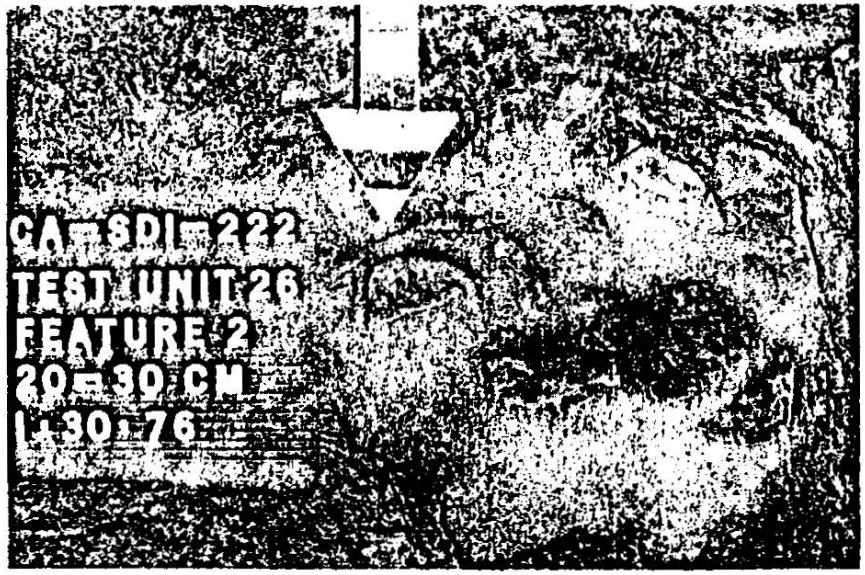


PLATE 2. WALL PROFILES AND FEATURES

Features

is indicated. This implied shift in the exploitation pattern could be due to environmental or cultural changes through time.

FIELD METHODS

Twenty-nine test units were excavated at SDi-222 within a four-week period. Placement of the pits was arbitrary and dependent upon multiple factors, such as the presence of shelly midden, surface artifacts, degree of disturbance, and the like. Two weeks of subsurface testing indicated that only the northern and northwestern peripheries of the site harbored a reasonably intact midden. Hence, for the remainder of the field session most of the work was concentrated in this portion of the site to ensure a representative vertical sample (see Fig. 2, p.viii).

One test unit was excavated in the heart of the midden on SDi-4281. It was located on the northeastern edge of the terrace.

Each unit measured 1 m^2 and was aligned along a magnetic north axis. The southwest corner was consistently used as the horizontal unit datum and the highest corner served as the vertical datum. Excavation was by arbitrary 10-cm levels with pick and shovel. The excavated soil was sifted through 1/4-inch-mesh screens. (Because of the compacted nature of the soil, the use of smaller mesh screens was not feasible without a freshwater source for wet-screening.) A stratigraphic profile was drawn of a selected wall in each completed unit. All pits were then backfilled by hand.

Virtually all of the screening residue was saved for future analysis, including aboriginal and historic artifacts and fire-cracked and unmodified rocks (for material identification). All bone and shell were saved. Some charcoal samples were retained, but none was adequate for dating purposes.

Because of the size of SDi-222, three datum points were used. Existing permanent survey markers were chosen for their strategic locations. The test units, trenches, and all surface artifacts were mapped with respect to one of these datums.

Points were plotted by angle and stadia distances from the nearest datum. Each surface artifact was given a sequential field number, for future identification, as it was mapped-in and collected. Due to the plethora of surface flake material, unmodified percussion flakes were not consistently collected but were noted in areas of heavy concentration. Dense ground cover, which hampered collection, also tended to skew the surface artifact sample.

The 20 x 20-cm^2 column samples were carefully excavated in 10-cm increments from selected test units. These samples were wet-screened in the laboratory through 1/16-inch mesh for flotation residue, faunal remains, and general volumetric midden analysis. Prior to wet-screening, palynological samples were extracted from several columns.

FIELD OBSERVATIONS

Most of the site boundary is formed by the eroded bluffs, with the south end artificially delimited by the international boundary fence and federal border easement roadway. How far south of the border fence the cultural deposit may have extended at one time is unknown. Construction of the bullring on the Mexican side drastically altered the landscape and none of the site remains. However, lithic materials similar to the complex at SDi-222 were scattered about in the bullring area and in a vacant lot just southeast from the ring approximately 200 m from the site.

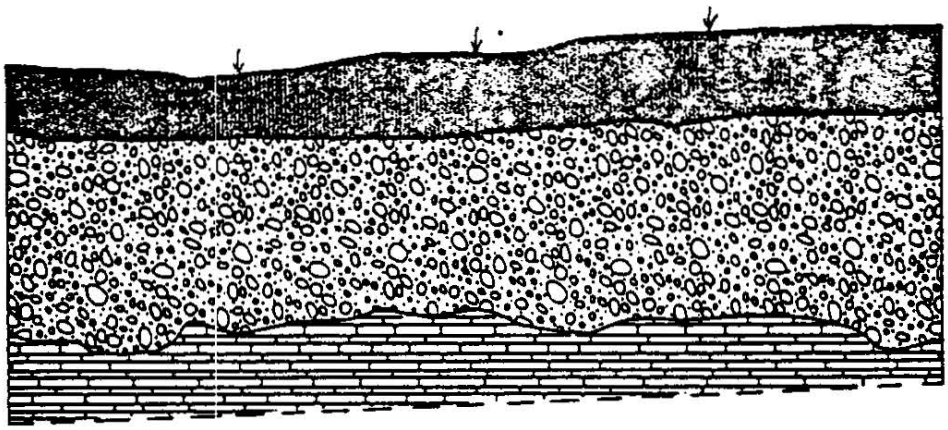
Monument Mesa measures approximately 180 m north/south by 204 m east/west. The archeological deposit is more restricted due to peripheral disturbance, and, as defined by the surface artifact scatter, it averages 70 m east/west by 150 m north/south.

The archeological deposit has been heavily disturbed. As mentioned above, none of the original midden remains south of the border fence. An asphalt roadway runs along the southern and western periphery of the mesa. The area served as a shoreline defense station during World War II, and three circular concrete artillery pads – remnants of the naval installation – flank the west bluff. The northern periphery of the site is marred by an abandoned naval radar tower and accompanying buildings, numerous concrete footings, and several telephone poles. Several concrete structures and foundations from the same period still exist on the flats just northeast of the bluff. A log barrier bisects the mesa into an east and west half. The portion east of the barrier, which comprises about 40% of the site, currently serves as a parking lot with moderate to heavy daily vehicular traffic. The remains of an abandoned asphalt roadway, probably also from the naval occupation, flank 50% of the eastern periphery. The international border monument and accompanying flagpoles are situated in the southwest corner of the site. This monument is on the National Register of Historic Places.

CA–SDi–222

STRATIGRAPHIC PROFILES

Figure 5



West wall UNIT 1

STRATUM 1

STRATUM 2

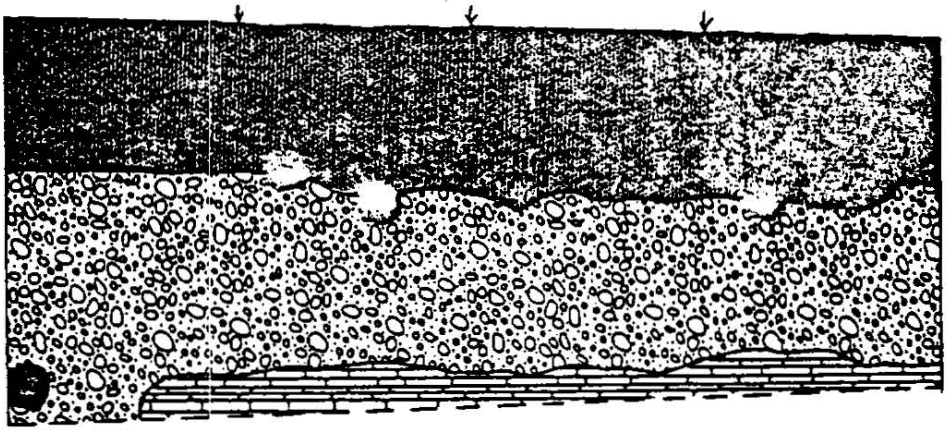
STRATUM 3

STRATUM 5

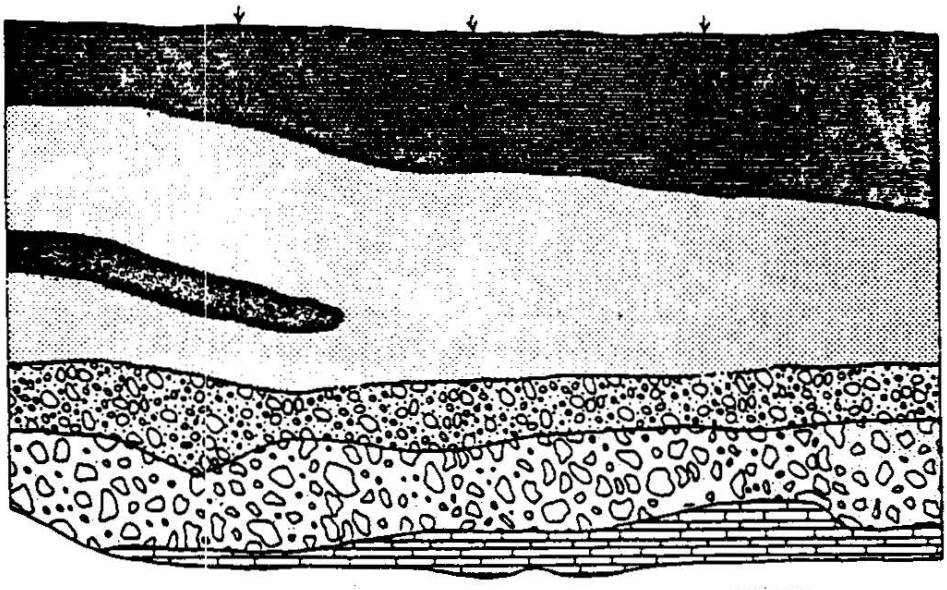
STRATUM 6

RODENT BURROWS

20cm.



North wall UNIT 10



North wall UNIT 14

Mr. James R. Moriarty of the University of San Diego believes that 1.5 to 2 feet of the original midden was graded off and used as fill for the parking lot (personal communication, 1976). Surface collection and excavation data tend to support this observation. Apparently, about 85% of the site (north of the border) has been graded. Presently, the only intact portion of the original midden components includes the northern periphery (north of the dirt road) and a narrow wedge along the western bank between the gun pads and the edge of the bluff. Areas of the peripheral deposit are partially capped with a topsoil and midden mixture graded from other parts of the site. Fill mixture also comprises the narrow ridges which stretch along the north and east bank of the mesa. These may have been designed for drainage control to check erosion of the bank. This "embankment" is dissected by erosion on the northern periphery but remains intact along the east margin of the parking lot.

Previous grading destroyed the natural ground cover and most of the underlying porous topsoil and midden deposit, leaving a nonpermeable sandstone base very near the surface. Hence, the mesa, and thus the archeological deposit, is rapidly being eroded away by sheet wash and the omnipresent high coastal winds. This accounts, in part, for the plethora of surface lithic artifacts on the graded locus, which are constantly being uncovered from the ancient sands by wind, rain, and automobiles.

Subsurface disturbance is indicated by the presence of numerous underground cables and pipes. Road asphalt and modern historic artifacts also extend to uncharacteristic depths in some areas. Rodent disturbance is moderate to heavy in the friable topsoil and midden layers.

Six general strata are present on SDi-222 in varying proportions. Approximately 85% of the southern part of the site (the graded portion) is stratigraphically somewhat distinct from the northern periphery.

In the disturbed areas there is consistently a 3 to 5-cm topsoil layer composed of yellow brown, loose sandy loam (Stratum 1), largely aeolian in origin. This topsoil layer is often formed over the fill layer(s) described above (Stratum 2). Stratum 4 is generally a sandy, unstratified and compacted, grey brown loam nearly devoid of shell. This stratum contains core and flake tools of probable San Dieguito origin. It varies from 5 to 30 cm in thickness and is quite disturbed. Stratum 5 occurs sporadically and appears as a clayey mixed zone composed of grey brown sandy loam and red brown decomposed sandstone substratum. This layer, which is very compacted, averages 5 cm in thickness. The underlying red brown sandstone (Stratum 6) is brick hard and sterile (see Fig. 5, p.16).

The northwestern and northern peripheries of the mesa, which received fill material from the southern and central portions of the site, were apparently not graded. Concentrated excavation in this more or less intact portion of the site led to the following stratigraphic observations.

The topsoil (Stratum 1) on the northern periphery is similar to that described on the graded locus but contains some shell. It averages 17 cm in thickness and is often mixed with grading fill. The fill layer(s) designated Stratum 2 is mottled, clayey, grey brown in color and of varied compaction. This deposit reaches 40 cm in thickness and varies in consistency and appearance throughout the site. The shell midden (Stratum 3) averages 15 cm in thickness. It is characteristically a grey, sandy and friable loam with shell and typical La Jollan flaked and ground stone tools. This unstratified deposit grades into a mottled transitional layer (Stratum 5). This mixed zone is about 6 cm thick, commonly compacted, and smudged with leached calcium. The sterile sandstone substratum (Stratum 6, as described above) is capped with a thin caliche coating and encountered at an average depth of 38 cm below surface. Throughout the site there is a general soil gradation with depth: in grain size from sandy to silty, and in compaction from friable to dense and hard (see Fig. 5, p. 16).

The lithic artifacts from Stratum 4, which was observed only within the graded portion of the site, constitute a typical San Dieguito assemblage. Stratum 3 (confined to the north and northwest periphery) is a La Jollan shell midden. None of the excavation squares revealed both cultural components in stratigraphic sequence (i.e., Stratum 3 overlying Stratum 4).

On the northern periphery, test units which bisected the "drainage embankment" or were excavated adjacent to the gun pads revealed an overburden of fill material (Stratum 2) averaging 25 cm in thickness. The shell midden displays marked rodent disturbance. Occasional thin lenses of burned earth were noted in the upper disturbed strata, which were probably the result of historic grass fires.

The surface artifact scatter is further evidence for the extensive disturbance of SDi-222. The artifacts were heavily concentrated in the graded locus. This phenomenon is undoubtedly a function of previous landscaping. Grading and concomitant erosion effectively removed the loose, sandy shell midden, leaving many of the more massive lithic artifacts on the surface. Surface artifacts were rare on those portions of the site with ground cover and/or shell midden remaining (see Fig. 2, p.viii).

Previous disturbance certainly affected the horizontal distribution of the surface artifacts. However, the general surface scatter is most dense on the northern one-third of the site. The distribution allows the hypothesis that the northern and eastern portions of the site, which open onto the estuary (prehistoric bay), were most heavily utilized. The surface artifact types seem to be randomly scattered (see Fig. 2, p. viii).

Two features were exposed during excavation (see Pl. 1, p. 3). Feature 1 was a lense of charred earth located in Unit 15 at approximately 65 cm below the surface. This burned area was probably of recent origin, owing to the presence of charred wood and the vertical proximity to historic artifactual material. Unit 15 (edge of gun pad) was covered by at least 40 cm of fill material.

Feature 2 comprised a cluster of thermal-fractured rocks located in Unit 26 (Trench 2) at 16.5 cm below surface. Fifteen rocks were removed, including one felsite core and several flecks of charcoal were associated (see Pl. 2, p.14).

The test unit excavated on SDi-4281 indicated that the midden deposit in the central portion of this site is at least 1 m thick. The deposit is a dark grey, loose sandy loam containing abundant shell remains which are markedly less weathered than those from SDi-222, while the relative amount of lithic material is comparatively low (see Shell Analysis). The Monument Mesa may have served in part as a cobble quarry and tool manufacture station for the occupants of SDi-4281.

Five other archeological sites fringing the slough were located and surveyed during the project. SDi-4281 (Site 2) lies on the same terrace as SDi-222, across an arroyo, at a slightly higher elevation. Another site (Site 3) is located on the west flank of the 400-foot terrace to the east of SDi-4281. A surface deposit with flaked and ground stone, it is elevated 10 to 20 feet above the floodplain. Site 4, designated SDi-3627, is on the southern rim of the floodplain. It is a shallow ridgetop lithic tool scatter overlooking Goat Canyon to the north and elevated about 300 feet above sea level. Site 5 is a shell midden situated on the terraces at the north end of the Tijuana floodplain about 10 feet above sea level (west end of Ream Field airstrip). A brown sandy deposit of moderate depth was observed here.

Three of these five were newly discovered during this project. An expansive shell midden is north of the estuary and just west of the naval airport. A shallow lithic scatter is on the west flank of the upper (400 ft.) terrace to the east of SDi-4281. Another shallow site, which is about 3 miles inland and just west of Monument and Dairy roads, has a thin scatter of stone tools and debris of possible San Dieguito origin.

ARTIFACT ANALYSIS

Over 1,300 prehistoric artifacts were cataloged from SDi-222. Included are specimens excavated from test units and column samples and those that were collected and plotted from the surface of the site and adjacent areas. The material is generally described and sorted into typological categories. (Refer to the Artifact Inventory, Appendix G.).

Flake Scrapers

This category includes primary and secondary flakes that exhibit single or multiple edge flaking through purposeful unifacial retouch (retouched) or merely casual use flaking (utilized). They come in all shapes and sizes and exhibit a range of degree of utilization. The edge angle is apparently not patterned, nor is the amount or configuration of peripheral flaking on the retouched specimens.

Retouched Flakes: Most of these scrapers are made on flakes; split cobbles, core fragments, and blade fragments are also utilized. Many are battered on upper surfaces (hammerstone and core fragments). Some exhibit a morphology and utilization that suggest functions of drilling, reaming, and graving. Certain of these tools exhibiting prepared and utilized notches probably functioned as spokeshaves. Numerous surface specimens have asphalt adhering to them and exhibit fresh breaks indicating recent disturbance. Many are patinated.

Of the total 394 retouched flakes, 258 were recovered during surface collection; 136, during excavation (5 from column samples). Specimens of felsite (294), basalt (84), andesite (8), obsidian (1), and glass (7) are included.

Figure 6.

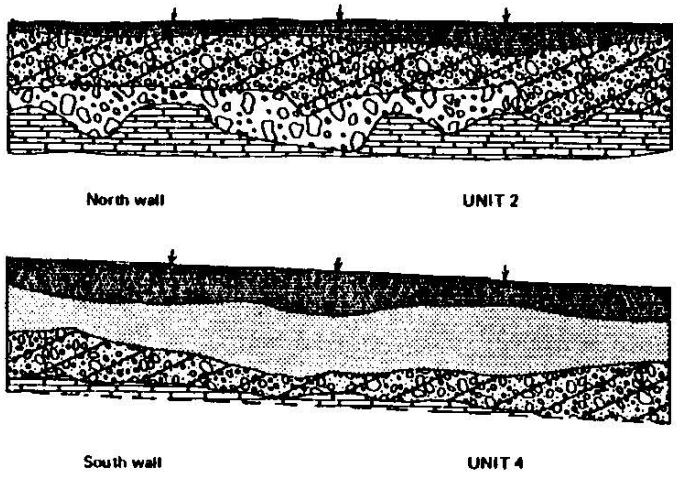
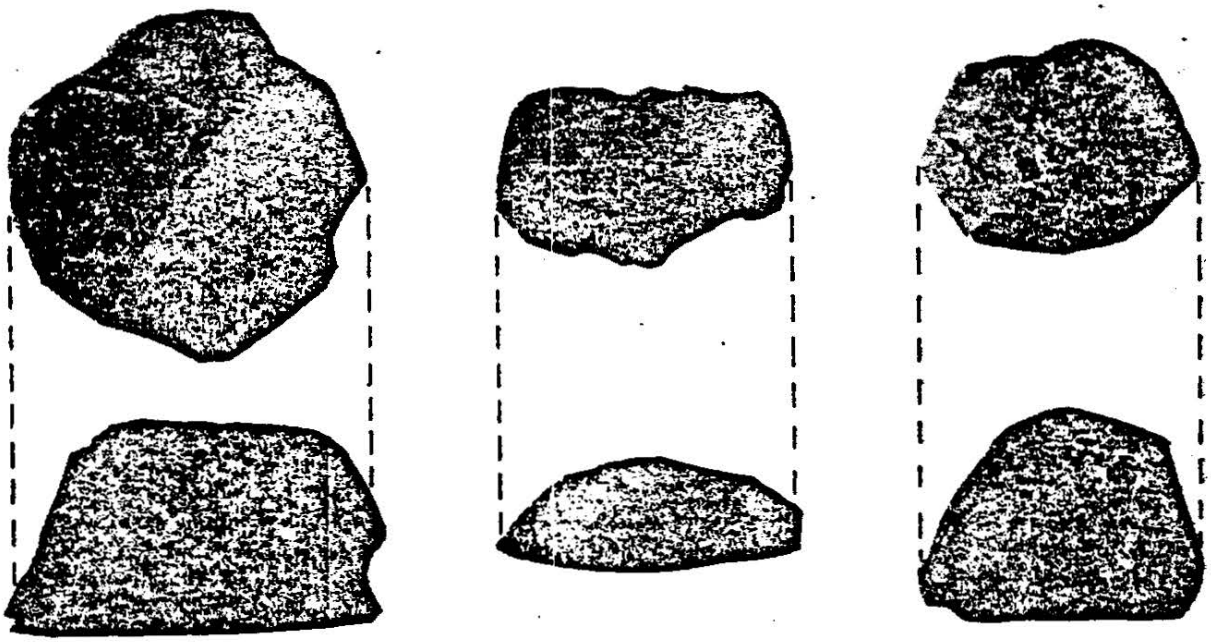

North wall
UNIT 2
South wall
UNIT 4
STRATUM 4
UNIT 7
UNIT 6
North wall
TRENCH 1

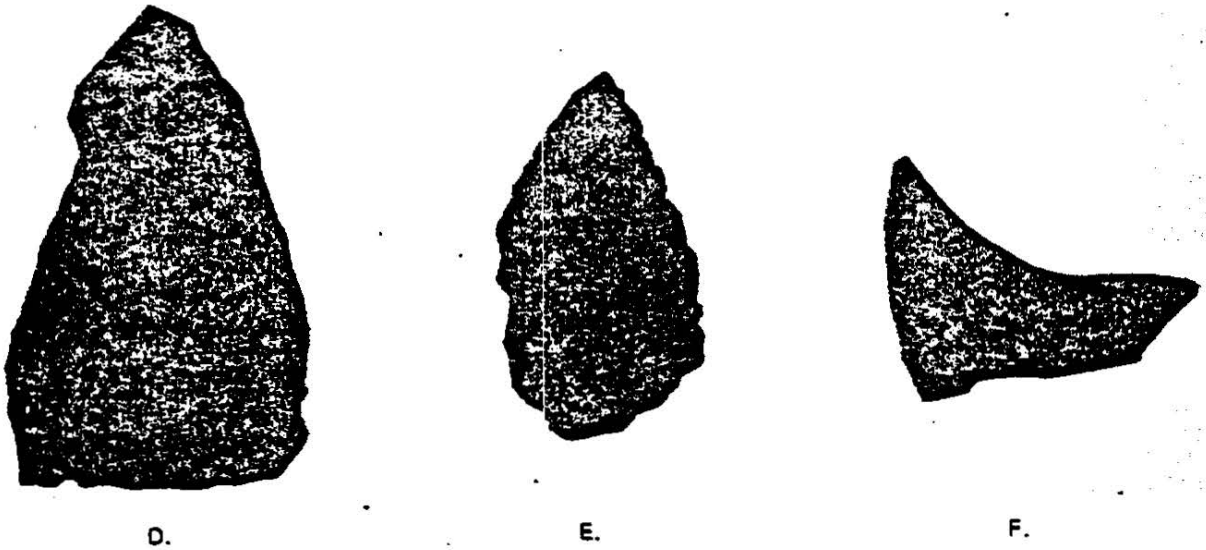
PLATE 4



A. B. C.

5CM.

A. – C., SCRAPER PLANES
- A. Flaked – Dome
- B. Small Domed
- C. High Domed

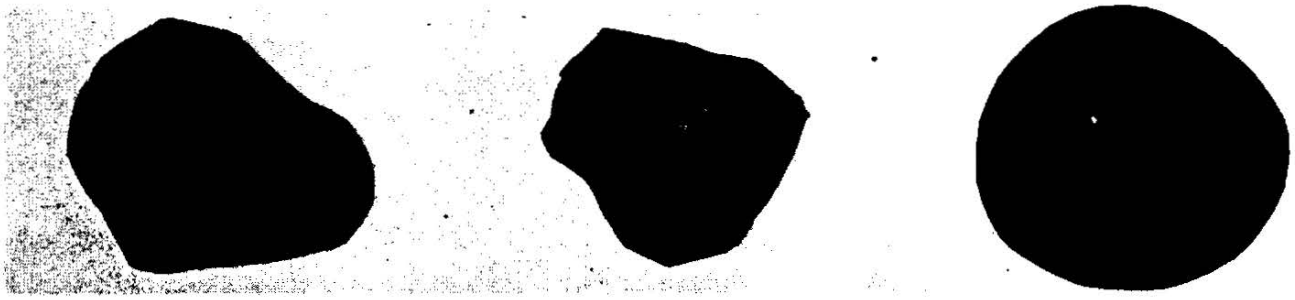


D. E. F.

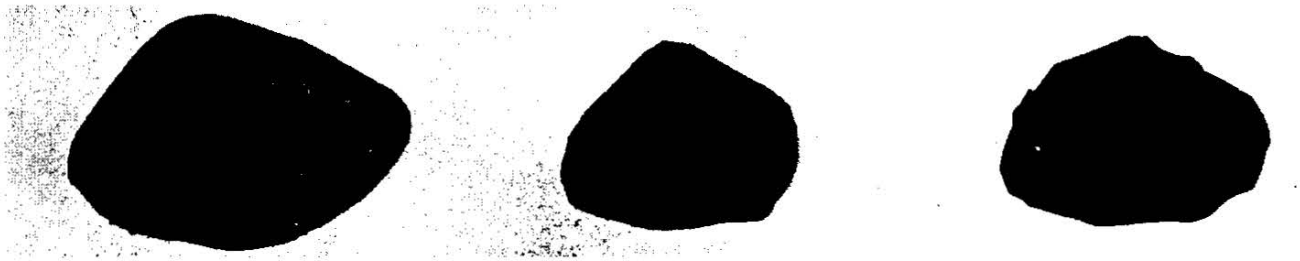
5CM.

- D. SPEAR POINT OR KNIFE
- E. LEAF-SHAPED POINT
- F. BLADE FRAGMENT

PLATE 3



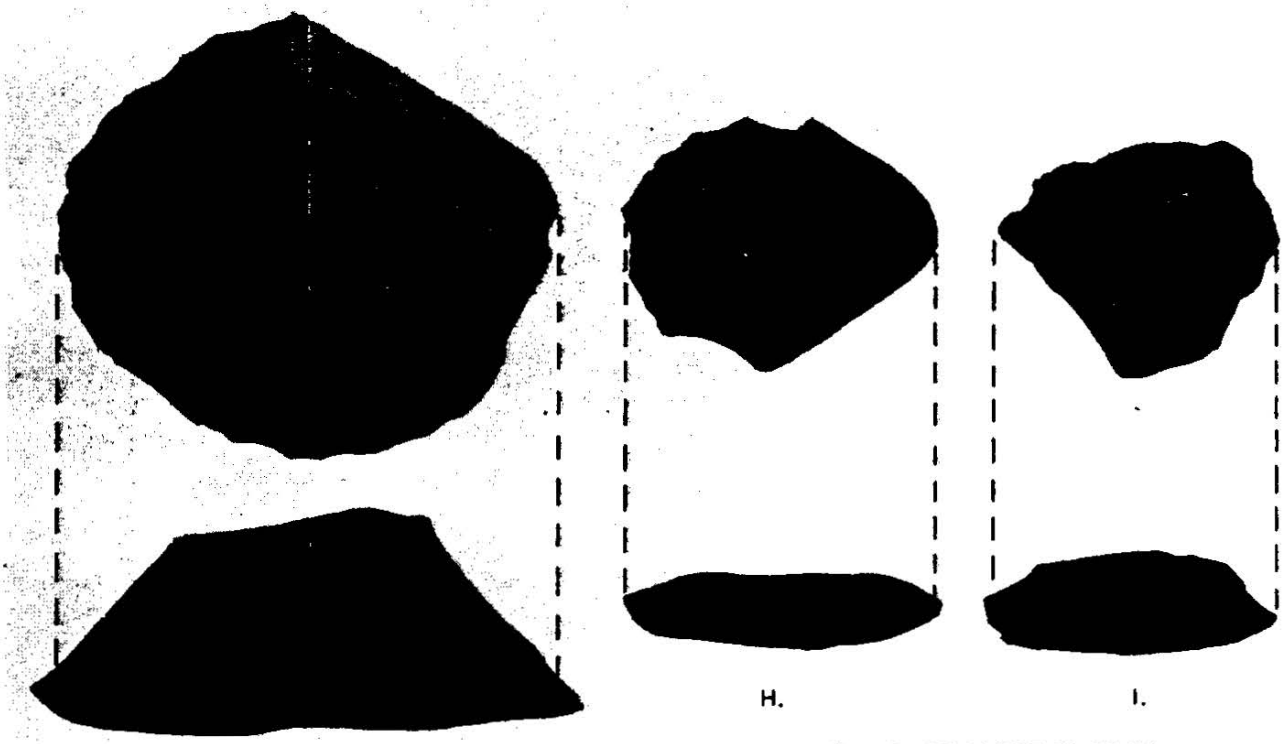
A. B. C.



D. E. F.

5CM.

A. – F., HAMMERSTONES



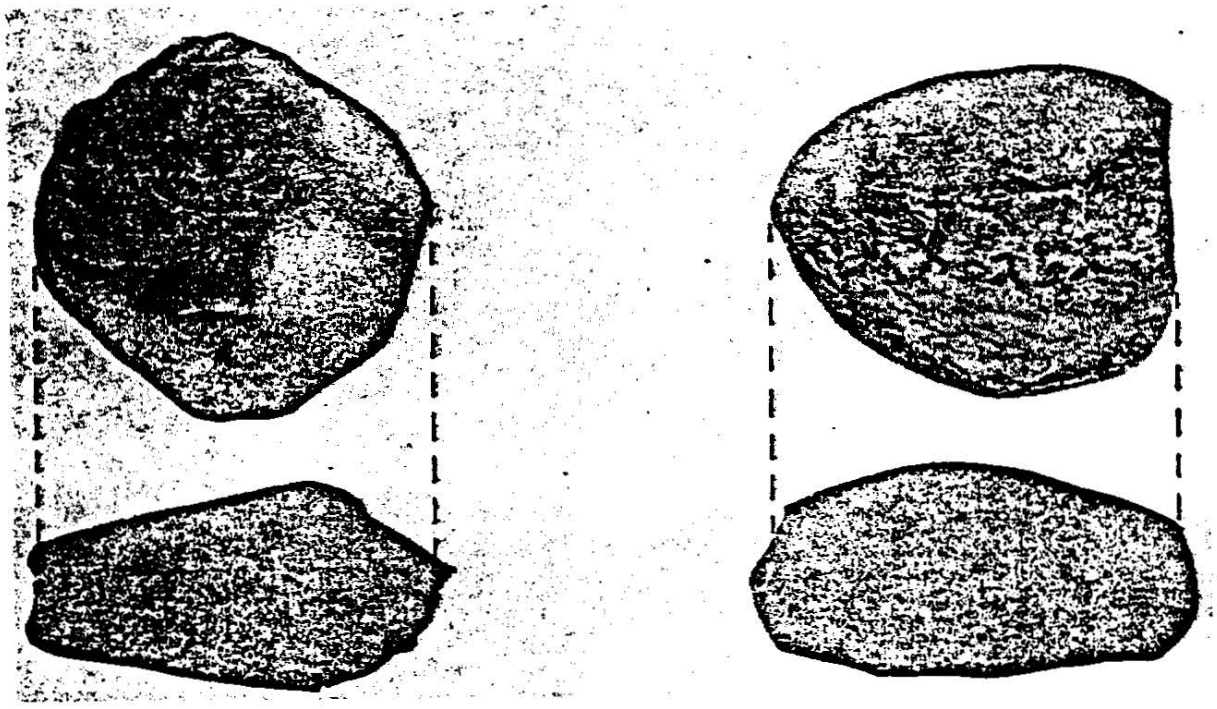
G. H. I.

5CM.

G. – I., SCRAPER PLANES

G. Cobble
H. Cortex-Backed
I. Cortex-Based

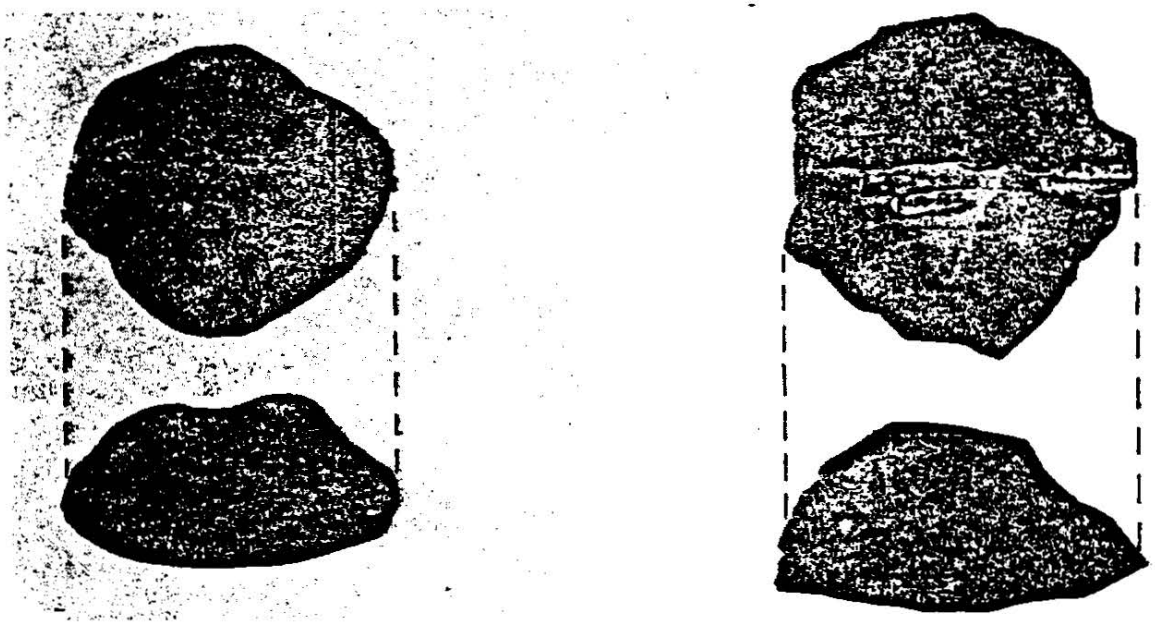
PLATE 5



A.

B.

5CM.



C.

D.

A. – D., COBBLE/CORE CHOPPERS

The fragments of bottle glass include 1 blue, 1 amber, 1 brown, and 4 clear. That they are retouched is somewhat dubious. Five of the specimens are patinated. All are probably of the molded type (late 1800s) and were found on the surface of the site.

Utilized Flakes: None of the specimens in this category exhibit apparent purposeful retouch. On some, the use-flaking is bifacial, indicating a cutting function (i.e., they were probably used as small knives).

Of the 662 utilized flakes, 392 were excavated from units; 18 were taken from column samples; and 252 were collected from the surface. These specimens include 496 of felsite, 153 basalt, 1 jasper, 9 andesite, and 3 quartz.

Quantitative comparison of the surface flake scrapers presents a skewed ratio as it shows retouched flakes slightly more numerous than utilized flakes. This can be explained by the selective surface collection technique that was employed (see Field Methods). The excavated specimens yielded figures that are much more meaningful for comparative purposes. Here, utilized flakes are over three times more abundant than modified (retouched) flakes.

Scraper Planes

A tool in this category is basically defined as any core or flake that exhibits steep unifacial percussion retouch around 25% to 100% of the periphery (back), with the other face commonly formed by a single flake or several flake scars (base). (The planar or basal surface is thus formed.) All specimens are generally plano-convex or triangular in cross section and ovoid to irregular in outline. These scrapers probably functioned as draw or push planes for woodworking, fiber processing, fleshing, and the like. The large, ovoid planes may have served for cleaning out basin metates (True, personal communication). Some of the scraper planes appear to have been resharpened (i.e., dull working edges were reflaked using the base as a striking platform). "Spent" planes which have been resharpened many times will ultimately exhibit nearly vertical edge retouch. The edges, heels, and other surfaces are often battered or ground. The following scraper categorization is adapted from Crabtee, et. al. (1963).

Flaked-Dome Planes: There are 4 specimens, all fashioned from felsite. They are made on platform cores, ovoid to angular in outline and triangular or trapezoidal in cross section. All are flaked around 50% or more but not the entire periphery. Nearly all of the dome has been flaked.

Cobble Planes: Of the 14 specimens in this category, 8 are felsite; 5, basalt; and 1, sandstone. They are made on cobble cortex platform cores, split cobbles, and on thick primary flakes (1). They are ovoid, triangular, rectangular, and elongate (irregular) in outline, nad plano-convex and angular (triangular and trapezoidal) in cross section. One specimen is flaked around the entire periphery.

High-Domed Planes: The height of these planes characteristically exceeds the length and the width. The 2 specimens of this type are felsite. One is made on a platform core (flaked dome) and the other on a cobble platform core (cortex backed). This latter plane has nearly vertical flaked edges and was probably resharpened many times. The 2 specimens are ovoid and triangular in outline and plano-convex and triangular in cross section. The resharpened scraper is flaked around 80% of its periphery. The other specimen exhibits total peripheral flaking.

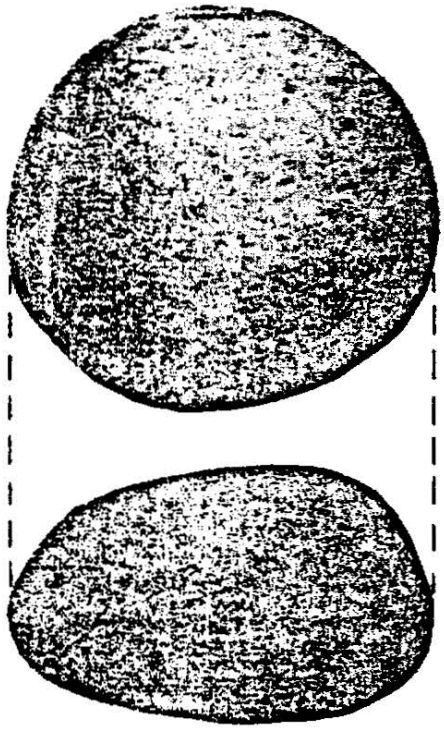
Simple Crude Planes: Of the 8 specimens of this type, 1 is quartz; 3, basalt; and 4, felsite. Seven are made on cobble platform cores and 1 on a thick flake. Edge flaking in this type is minimal. Natural edges with no modification are also used. All the specimens are irregular in outline and plano-convex and angular (triangular and trapezoidal) in cross section. Five are cortex backed and 1 is cortex based.

Keeled-Base Planes: There are 4 specimens of this type. All are fashioned from felsite, each exhibiting a keeled basal surface. The keel is characteristically formed along the line of juncture between two basal flake scars. All specimens exhibit utilization on both planar surfaces. They are ovoid and irregular in outline. All have edge flaking around 50% or more but not the total periphery. One surface specimen is coated with road asphalt.

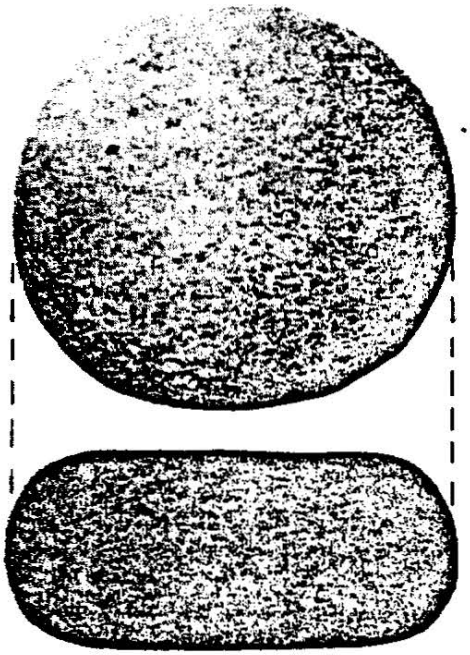
Cortex-Based Scrapers

There is 1 specimen in this category. It is made from felsite on a thick flake. It is angular in outline, plano-convex in cross section, and percussion flaked around 80% of the periphery.

PLATE 6



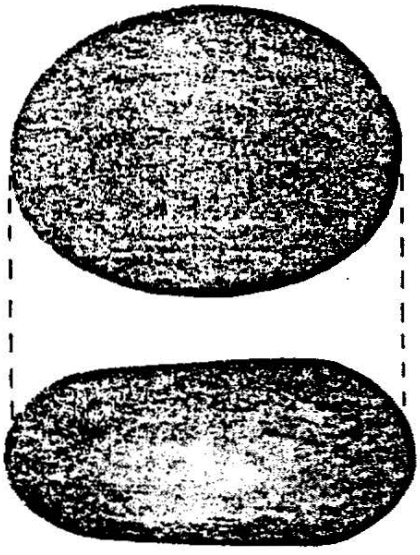
A.



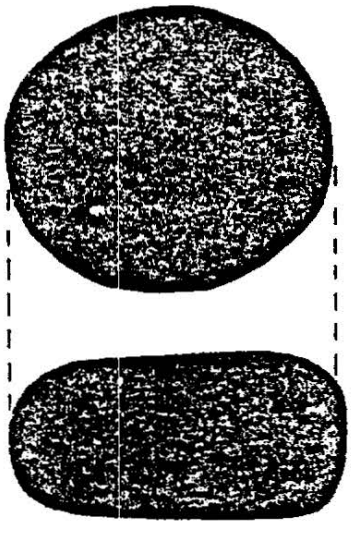
B.

5CM.

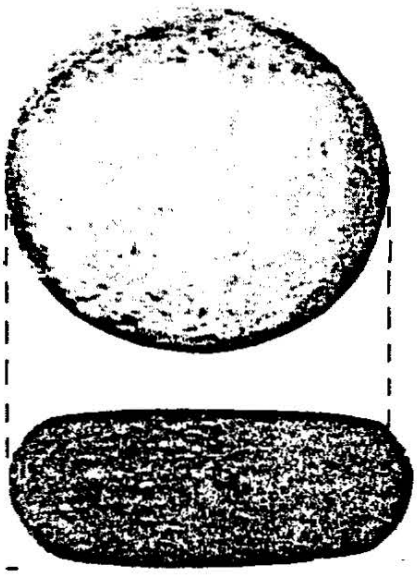
A. – E., MANOS
A. Unifacially and Edge Ground
B. Unifacially Ground (Shaped)
C. – E. Bifacially Ground



C.



D.



E.

5CM.

24

Cortex-Backed Scrapers

Of the 10 specimens in this category, 4 are basalt and 6, felsite. All are primary flakes struck from cobbles. The specimens are ovoid and angular in outline and plano-convex and triangular in cross section. Only 1 cortex-backed scraper (ovoid) exhibits total peripheral flaking. One unusual specimen has a battered chopping edge and a flaked planing edge (both patinated), opposite a more recent planing edge. This latter edge encompasses about one-third of the periphery.

Small Domed Scrapers

All specimens in this category are dome-flaked with peripheral flaking around one-quarter or more. The percussion flaking on these is generally more finely executed. There are 6 specimens; 5 are felsite, and 1 is basalt. One scraper is battered on the upper surface. Leaf-shaped, crescent-shaped, ovoid, and irregularly outlined forms are present, with triangular and plano-convex cross sectional configurations. The specimens are made on thick primary flakes and on cores. One scraper exhibits 100% peripheral retouch. Two scrapers have cortex on the upper surface.

Cores

From a total of 72 cores, 37 were recovered during surface collection; 48 are felsite; 22, basalt; 1, andesite; and 1, shale. Seven of the cores are unifacially flaked, 33 bifacially, and 32 multifacially. Four microcores are present. The sample includes whole and fragmentary cores; cobble (cortex) platform and prepared platform types are also present. Some specimens exhibit nondescript utilization and/or retouch flaking and light battering. One specimen, a surface artifact, is lightly coated with road asphalt, and another, from a unit, is coated with concrete. On SDi-222, definitive core tools (scrapers, hammerstones, and choppers) far outnumber unmodified or discarded cores.

Choppers

These are flake and cobble/core tools basically characterized by bifacial percussion flaking of one or multiple edges; unifacial specimens also occur. Virtually all of these tools exhibit edge battering and occasionally secondary flaking and grinding. However, they are distinguished typologically from hammerstones in that battering is generally restricted to the prepared edge(s). Many of these tools probably served multiple functions (some exhibit both battering and secondary use flaking). Of the 22 specimens in this category, 5 were removed from units and 17 were collected from the surface; 13 are felsite; 7, basalt; and 2, andesite. Ten are made on flakes, and the remainder are made on cores and cobbles. One specimen, which was recovered from the surface, has road asphalt adhering to it. Four choppers exhibit 100% peripheral edge retouch. Only two specimens out of the lot have unifacially flaked chopping edges.

Knives and Projectile Points

One specimen, a blade fragment, is fashioned from basalt and exhibits minute unifacial retouch. It is made on a secondary flake and was found during surface collection. The excavated specimens include a small leaf-shaped felsite projectile point; a narrow parallel-sided midsection of a point or drill made of basalt; a large triangular spear-point or knife of basalt; and a point midsection made from quartz. All of the above specimens are lenticular in cross section.

Several no-provenience surface specimens from nearby in Mexico were donated by a local collector. These were probably from the original complex on SDi-222, SDi-4281, or another local site. Included are a large-stemmed (corner-notched) basalt point fragment; an elongated triangular projectile point (straight base); and a large thick knife which is irregular in outline (probably a retouched core). All of these specimens are lenticular in cross section and fashioned from felsite.

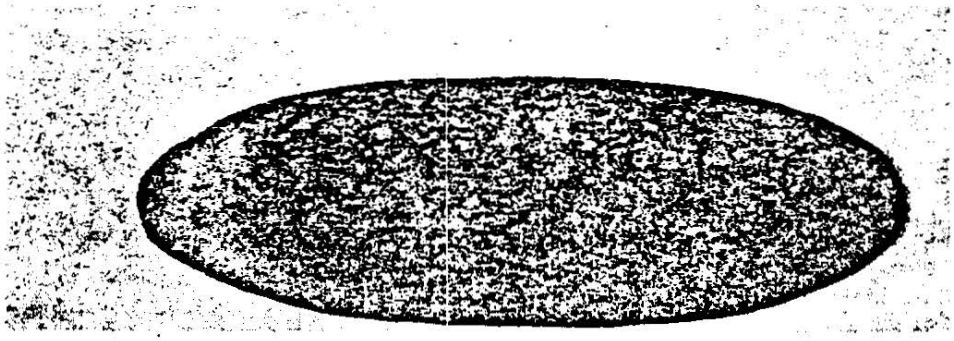
Miscellaneous Flakes

This category includes all primary and secondary flakes which show no apparent modification and/or signs of utilization. The abundance of flake debris on and below the surface supports the contention that the site served in part as a tool manufacture station. (See Appendixes H and I for Miscellaneous Flake Inventories.)

Hammerstones

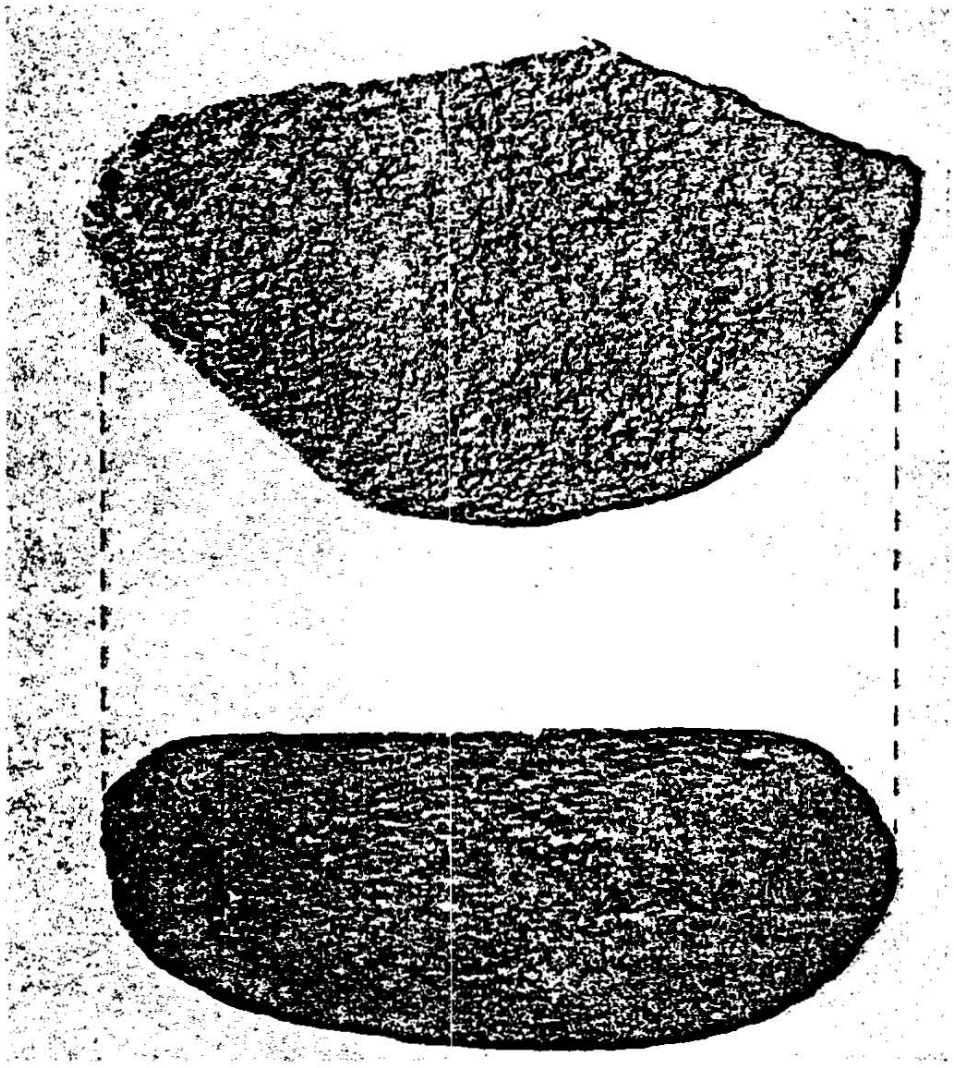
Many of the surface hammerstones are partially covered with road asphalt and battered

PLATE 7



A. 5CM.

A. CHARMSTONE



B. 5CM.

B. METATE, Unifacially Ground

from grading. Numerous specimens exhibit patination on battered surfaces, indicating great antiquity. End- and side-battering occur with similar frequency. Multifacial and 100% peripheral battering patterns are present on several cores. Many of the core hammerstones appear as "spent" choppers or scrapers. Of the 78 specimens in this category, 10 were excavated from test units. Of the hammerstones, 49 are felsite; 21, basalt; 2, rhyolite; 2, quartzite; and 4, andesite. The sample includes 50 battered cores and core fragments, 22 battered river cobbles (some broken), and 6 battered flakes.

Manos

The shaped manos that are whole generally exhibit outline modification by pecking and grinding and are oval to circular in outline. Thirty-four manos were recovered, and 19 of these are whole specimens. Twenty-eight of the 34 were recovered during surface collection. One specimen, a fragment, exhibits battering and grinding on its broken edges and was probably reutilized as a hammerstone or a chopper. Two of the manos have road asphalt adhering to them; 2 are fire-smudged and thermal-fractured. One specimen is circular in shape and unifacially ground and has a central "pit" on one face; it may be termed a "discoidal."

Diverse materials were utilized: 20 manos are quartzite; 6, sandstone; 4, granite; 3, andesite; and 2, basalt.

The nonmaterial attributes cluster as follows: 4 manos are shaped and bifacially ground; 7, bifacially and edge ground; 12, bifacially ground; 3, bifacially and end ground; 1, shaped and unifacially and edge ground; 2, unifacially ground; and 2, unifacially and edge ground.

Metates (Grinding Slabs)

Seven metates were recovered, 6 from the surface. Five are quartzite, 1 is sandstone, and 1 rhyolite. Six of the specimens are fragments. Three are unifacially ground, and 4 are bifacially ground. One surface fragment is unifacially coated with about 2 cm of concrete. All of these grinding slabs are made on large tabular river cobbles.

Charmstone

This single specimen, fashioned from quartzite, is circular in transverse cross section and lenticular in longitudinal section. It is pecked and ground to form a cylinder that tapers at both ends.

Worked Bone

The one specimen in this category is unclassifiable. It appears to be the fragment of a long bone from a medium-sized mammal. This specimen could be a bone awl or hairpin fragment. The surface of the bone was ground and polished (worked) during shaping of the tool.

Historic Artifacts

Seven fragments of patinated bottle glass were found. Each appears to have been retouched and/or utilized on one or multiple edges (see Retouched Flakes).

Many modern historic artifacts were recovered during excavation. Of interest are those relating to the occupation of the mesa by the military during World War II. Artifacts from this phase include hundreds of machine gun clips, numerous bullet shells and casings of various calibers, and one bomb shell. Large amounts of asphalt and concrete debris from the roads and gun emplacement pads were also found.

Other modern historic artifacts from the mesa include such items as glass, rubber, nails, paper, clay pigeon fragments, metal fragments, and textiles. Much of this refuse is undoubtedly from the numerous park visitors.

RADIOCARBON DATES

Five shell samples from the Border Field sites were sent to the Mount Soledad Radiocarbon Laboratory for dating. The samples consisted of *Chione undatella* and *C. californiensis.*

Dr. Timothy W. Linick (personal communication, 1976) points out that the derived ages of the shells (from the time of death of the animal) are apparent ages only. Marine shells contain the radiocarbon levels of the dissolved carbonate in the seawater where the mollusks grew. Thus, apparent ages found for marine shells are some 400-300 years too great. Another contamination factor is that calcium carbonate exchange occurs when the shell is buried in the soil, as the ground water contains dissolved carbonates.

DISCUSSION

The earliest accepted cultural tradition in San Diego County was recognized by Rogers (1929) as the San Dieguito or "scraper maker culture." The origin of the San Dieguito Culture is still an enigma.

The presence of this cultural component on the Monument Mesa (SDi-222) is suggested by the range and abundance of stone scrapers, scraper planes, cores, and hammerstones which are weathering out of a brown sandy soil stratum in the graded portion of the site. The exposed San Dieguito material has been subject to selective looting by local collectors for decades—a probable reason for the paucity of stone knives and projectile points which are characteristically found on regional sites of similar antiquity.

According to Wallace (1955), San Dieguito sites are typically situated on mesas, hilltops, or elevated marine terraces, with lithic material as the only occupation refuse occurring either on or slightly below the surface. Warren (1967), referring to the C.W. Harris site, a prehistoric deposit on the San Dieguito River (and type site for this cultural tradition), describes the percussion flaked artifacts from the San Dieguito component as generally including stone scrapers and scraper planes, as well as knives, projectile points, engraving tools, cobble hammerstones, and cores.

The San Dieguito cultural epoch in southern California seemingly began prior to 9000 B.P. and persisted until ca. 7500 B.P., based on radiocarbon dates (Haynes et. al., 1967). The nature of the coastal San Dieguito assemblages suggests a subsistence economy based primarily on hunting (and probably supplemented by fishing and shellfish gathering). Excavation on SDi-222 did not clearly reveal the types or quantities of animals that were hunted. Presently there is no archeological evidence of plant collecting (Wallace, 1955). The Monument Mesa probably served as a temporary camp and workshop/quarry for these early people.

The La Jollan, or Encinitas Tradition as it is more widely known (Warren, 1968), first appears archeologically in southern coastal California at about 7500 B.P. (Bright, 1965:370). It is basically distinguished for the emphasis on milling tools. The La Jollan cultural epoch is generally seen to terminate sometime after 1 A.D. in San Diego county (Warren, 1968). This ancient culture was recognized by Rogers (1929) as of the "shell midden people."

The identifiable San Dieguito assemblages found along the present coast exhibit incipient technological changes from earlier (inland) hunting sites, probably in part due to environmental pressures. The subsequent La Jollan complex may have rudiments in, or have evolved from, the coastal San Dieguito. It could represent a maritime adaptation of the inland Millingstone tradition or have cultural affinities as yet unsuspected. Obviously, present knowledge of the origins and dynamics of early prehistoric cultures in southern California is in a state of flux. Insufficient data (especially for the coastal San Dieguito sequence) dictate that the current body of theory must remain highly speculative.

The grey sandy shell midden on SDi-222 suggests that the mesa was used by prehistoric people with a subsistence emphasizing invertebrate marine food resources. Local mammals, birds, and fishes were hunted. The grinding implements found on the surface and during excavation imply that processing of plants (and small animals) was another subsistence activity. The La Jollan cobble-millingstone complex generally includes crude (usually percussion flaked) cobble choppers, retouched and utilized flakes, and cobble hammerstones, with projectile points rarely occurring. Also, an abundance of manos and millingstones is common; charmstones are rarely found, and usually only in the northern area of San Diego County (Warren, 1968). In contrast, grinding stones are noticeably absent from San Dieguito complexes.

This change or evolution in culture traditions in the southern California coastal area is thought to have been primarily signaled by environmental factors. The general rise in the post-Pleistocene sea level caused the formation of rocky foreshores, bays, and lagoons with flourishing populations of clams, mussels, and oysters. With a subsistence system based primarily on collecting, people of the La Jollan Culture could be more or less sedentary. As Warren observed, "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" (Warren, 1968).

SDI-222 may have been occupied only seasonally as dictated by the availability of food resources. The analysis of growth bands on *Chione* clams from SDi-4281 suggests that they were gathered primarily in winter and not at all in

The results of the radiocarbon tests are as follows:

3621	CA-SDi-222	30-40 cm	7260±80
3622	CA-SDi-222	20-30 cm	6540±70
3624	CA-SDi-222	0-10 cm	3640±60
3618	CA-SDi-4281	100-110 cm	4340±50
3619	CA-SDi-4281	10-20 cm	3840±60

All of the dated shell samples from SDi-222 were excavated from the northern periphery of the site. These dates imply that the shell midden deposit (Stratum 3) is stratigraphically intact and that the mesa was utilized by prehistoric peoples for several millennia.

The shell dates from SDi-4281 suggest that this site was occupied for a proportionately short timespan. However, the midden deposit here is in excess of 70 cm deeper than that on SDi-222, implying that the former served as the primary camp or village. The ratio of midden depth to apparent duration of occupation suggests that a fairly large number of people were utilizing the resources of the Tijuana bay/estuary by 4000 B.P. SDi-4281 is the deepest shell midden presently known in the vicinity of the estuary.

Taken at face value, these radiocarbon dates from the Border Field sites fall within the accepted time frame for the La Jollan (Encinitas) Culture Tradition in coastal southern California. The date of 7260+80 B.P. (L.J.-3621) from the base of the midden on SDi-222 corresponds to the earliest shell dates for La Jolla from several other archeological middens in San Diego County (Moriarty 1966). This holds true for the uppermost level of the deposit which was dated at 3640+60B.P. (L.J.-3624). Hence, SDi-222 was apparently utilized for the duration of the coastal La Jollan cultural epoch.

following recommendations are requisite for adequate mitigation of the proposed impact to the cultural deposit CA-SDi-222:

3. The placement of sand fill atop the cultural deposit prior to asphalting the parking lot will both protect the deposit and serve as a stratigraphic marker.

4. A wall along the southern margin of the shell midden should be constructed.

5. At least one of the World War II artillery pads should be preserved.

6. A thorough inventory of cultural resources should be made to provide complete information for National Register of Historic Places nomination.

summer. The location of SDi-222 (exposed sea bluff) and the nature of the deposit indicate that the mesa served as a collecting camp, as opposed to a permanent village. The lack of hearths supports this contention. There are indications (i.e., the abundance of cobble grinding stones, cores, hammerstones, and flake debris) that the mesa also served as a source of raw materials and a tool manufacture workshop. Virtually all of the artifacts recovered (from both cultural components) were fashioned from materials eroding out of the bluff in the form of river cobbles. Felsite is available in abundance and was the preferred material.

Apparently, the eventual end of the La Jollan maritime collecting economy in coastal southern California was also basically due to environmental factors. The rate of sea-level rise gradually ebbed, and by 5000 B.P. the bays, inlets, lagoons, and estuaries were silting-in. The shellfish population was thus reduced. Eventually, migrations of San Diego coastal dwellers to the north and east ensued (Warren, 1968).

Radiocarbon dating of shell samples from CA-SDi-222 and CA-SDi-4281 has shown that the former was occupied throughout the accepted duration of the coastal La Jollan culture (ca. 7260±80 to 3640±60 years B.P.). SDi-4281 was apparently occupied for a portion of this cultural epoch (ca. 4340±50 to 3840±60 B.P.; Linick, personal communication).

The vertical and horizontal relationship of the San Dieguito component to the later La Jollan component is not clearly demonstrated on SDi-222. The major portion of the cultural deposit is so disturbed that its original nature and extent cannot be readily determined.

The intermediate and late cultural periods on the San Diego coast are distinguished by the presence of successive new cultural influences. By 700 A.D. arrow points, pottery vessels, containers, and ornaments made of steatite; personal ornaments of shell, bone, and stone; and other innovations occur in some areas. Evidence for the presence of these post-La Jollan influences is lacking on the Monument Mesa. Previous disturbance to the site could have removed all the later occupational debris, but this is doubtful. Except for some dubious specimens of retouched bottle glass found on the surface, no diagnostic late or contact period artifacts were recovered.

An Indian village existed within the historic Rancho Melijo. This rancho encompassed most of the Tijuana River floodplain and adjacent areas. It is probable that the main aboriginal village existed further inland than the Monument Mesa (judging by the lack of period artifacts on SDi-222). Early historic reference material relating to this village is being compiled for another report.

National Register of Historic Places

The archeological sites of Border Field State Park and adjacent properties comprising the Tijuana Slough and fringing terraces meet the federal criteria for National Register significance as specified in 36 CFR60 and 36 CFR800. Based on their antiquity, intrinsic research potential, and present condition, the sites appear eligible either singly or as components of a district.

RECOMMENDATIONS

Test excavation on the Monument Mesa has shown that previous disturbance effectively destroyed a large percentage of the prehistoric cultural deposit. Concentrated excavation in the remaining midden has yielded an adequate sample for the Phase II archeological investigation. A Phase III excavation (full-scale salvage) of the northern site periphery will be required if the intact shell midden deposit is to be destroyed by the planned development of park facilities.

It is recommended that the northern periphery of CA-SDi-222 be preserved. This action would basically require the relocation of a proposed sidewalk and the construction of a stout fence along the southern edge of the midden deposit to serve as a check against runoff and heavy foot traffic. Landscaping and other surface disturbance should be avoided on the shell midden.

The shore artillery pads along the western periphery of Monument Mesa represent another important cultural feature unique to the area. At least one of these should be retained and included in the development plan. Preservation and interpretive facilities for these historical resources would serve to enhance the intrinsic value of the unit.

This archeological site, although disturbed, is an extremely significant cultural resource in the State Park System. Its probable antiquity, scientific value, and unique relationship to the Tijuana River and estuary system make it, and the other local archeological sites, eligible for inclusion in the National Register of Historic Places. The

Keen, Myra A. and Eugene Coan
1963 *Marine Molluscan Genera of Western North America.* Stanford: Stanford University Press.

Moriarty, J.R.
1966 Cultural Phase Divisions Suggested by Typological Change Coordinated with Stratigraphically Controlled Radiocarbon Dating in San Diego. *Anthropological Journal of Canada*, Vol. 4, No. 4, pp. 20-30.

1969 The San Dieguito Complex: Suggested Environmental and Cultural Relationships. *Anthropological Journal of Canada*, Vol. 7, No. 3.

Morris, P.A.
1966 *A Field Guide to Pacific Coast Shells.* Boston: Houghton Mifflin Company.

Ocean Science and Engineering, Inc., Report
1971 *Tijuana River Flood Control Project, Draft Environmental Statement.* MS., on file at State Department of Parks and Recreation, Sacramento.

Ricketts, E.F. and J. Calvin
1939 *Between Pacific Tides.* Stanford: Stanford University Press.

Rogers, M.J.
1939 Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas. *San Diego Museum Papers*, No. 3. San Diego.

1958 San Dieguito Implements from the Terraces of the Rincon-Pantano and Rillito Drainage System. *The Kiva* Vol. 24, No. 1, pp. 1-23. *Journal of the Arizona Archeological and Historical Society.* Tucson.

San Diego Planning Commission Report
1976 Tia Juana River Valley Plan Environmental Impact Report. MS., on file at San Diego City Hall, San Diego.

Schwartz, Charles A.
1968 Mammalian Remains from Archaeological Sites LAn-227 and LAn-229. *Archaeological Survey Annual Report* No. 10, pp. 119-123.

Sharp, R.P.
1972 *Geology, Field Guide to Southern California.* Dubuque: William C. Brown Company, Publishers.

Sparkman, P.S.
1908 The Culture of the Luiseno Indians. *University of California Publications in American Archaeology and Ethnology*, Vol. 8, No. 4, pp. 187-234. Berkeley.

Wallace, W.J.
1955 A Suggested Chronology for Southern California Coastal Archaeology. *Southwestern Journal of Anthropology*, Vol. 11, pp. 214-230, Albuquerque.

Warren, C.N.
1967 The San Dieguito Complex: A Review and Hypothesis. *American Antiquity*, Vol. 32, pp. 168-185, Salt Lake City.

BIBLIOGRAPHY

Barker, Richard M.
1970 *Consistency and Origins of Cyclic Growth Layers in Pelecypod Shells.* Space Sciences Laboratory Series 11 (43).

Barry, J. and J. Hiehle
1974 Border Field Project, Resource Inventory Report. MS., on file at the State Department of Parks and Recreation, Sacramento.

Bright, M.
1965 California Radiocarbon Dates. *Archeological Survey Annual Report,* pp. 367-80. Department of Anthropology, University of California, Los Angeles.

Burt, William H. and Richard P. Grossenheider
1952 *A Field Guide to the Mammals.* Cambridge, Mass.: The Riverside Press.

California. Departments of Fish and Game and Parks and Recreation
1972 A Review of Land Uses, Tijuana River Valley, MS., on file at the above departments, Sacramento.

Cooley, T.G.
1971 Macro and Microscopic Analysis of *Chione undatella:* A Feasibility Study. Xerox on file at Archeological Research Inc., Costa Mesa, Calif.

Coyer, J.C. and J.R. Moriarty
1975 A San Dieguito Sawing Tool. *Masterkey.* Southwest Museum, Vol. 49, No. 2. Los Angeles.

Crabtree, R.H., C.N. Warren and D.L. True
1963 Archeological Investigations at Bataquitos Lagoon, San Diego County, California. *Archaeological Survey Annual Report,* Department of Anthropology, University of California, Los Angeles.

Drover, Christopher E.
1974 Seasonal Exploitations of Chione Clams on the Southern California Coast. *The Journal of California Anthropology,* Vol. 1, No. 2.

Fitch, John E.
1953 *Common Marine Bivalves of California.* Department of Fish and Game, Marine Fisheries Branch, Fish Bulletin No. 90. Sacramento.

Gilbert, B.M.
1973 *Mammalian Osteo-Archaeology: North America.* Missouri Archaeology Society, Inc., Columbia.

Haynes, C.V. et al.
1967 Arizona Radiocarbon Dates VII. *Radiocarbon* Vol. 9. New Haven.

Ingles, Lloyd G.
1965 *Mammals of the Pacific States.* Stanford: Stanford University Press.

Jepson, W.L.
1925 *A Manual of the Flowering Plants of California.* Berkeley and Los Angeles: University of California Press.

1968 Cultural Traditions and Ecological Adaptation on the Southern California Coast. *Eastern New Mexico University Contributions in Anthropology*, Vol. 1, No. 3.

Weide, M.L.
1969 Seasonality of Pismo Clam Collecting at CA-Ora-82. Los Angeles: *University of California Archeological Survey Annual Report* No. 11, pp. 127-141.

White, Theodore E.
1953 A Method of Calculating the Dietary Percentage of Various Food Animals Utilized by Aboriginal Peoples. *American Antiquity*, Vol. 18, No. 2, pp. 396-398.

1954 Observations on the Butchering Technique of Some Aboriginal Peoples No. 3, Small vs. Large Animals. *American Antiquity*, Vol. 19, pp. 254-259.

Appendixes

Mactra nasuta (Gould)	Pacific surf clam
Fissurella volcano (Reeve)	volcano limpet
Haliotis corrugata (Gray)	corrugated abalone
Lottia gigantea (Sowerby)	owl limpet
Tresus nuttalli (Conrad)	gaper
Tegula aureotincta (Forbes)	gilded top
Isognomon recognitus (Mabille)	purse shell
Collisella asmi (Middendorff)	black limpet
Collisella pelta (Eschscholtz)	shield limpet
Laevicardium substriatum (Conrad)	egg cockle
Tegula gallina (Forbes)	speckled top
**Notoacmea insessa* (Hinds)	seaweed limpet

**These limpets attach to and feed directly on kelp – implying that the Indians were utilizing kelp in some manner.*

APPENDIX A

Identifiable Shells from SDi-222/4281

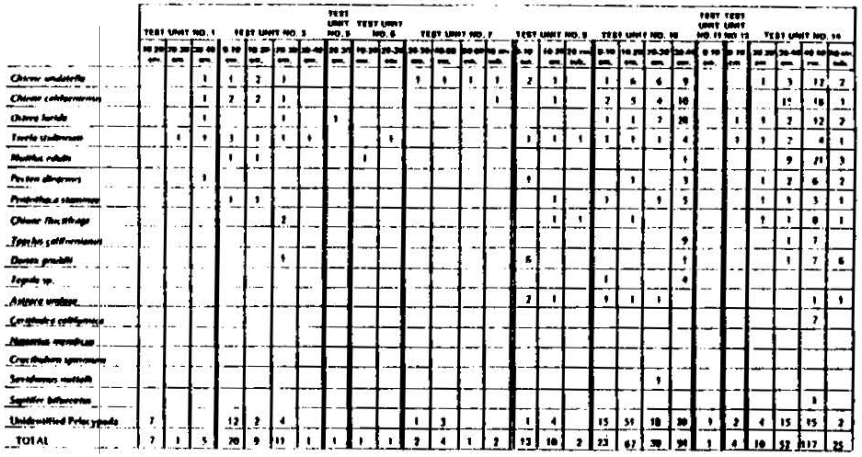
Note: The shell remains are listed in order of relative abundance, from the most to the least abundant. The common names were taken from Morris (1966).

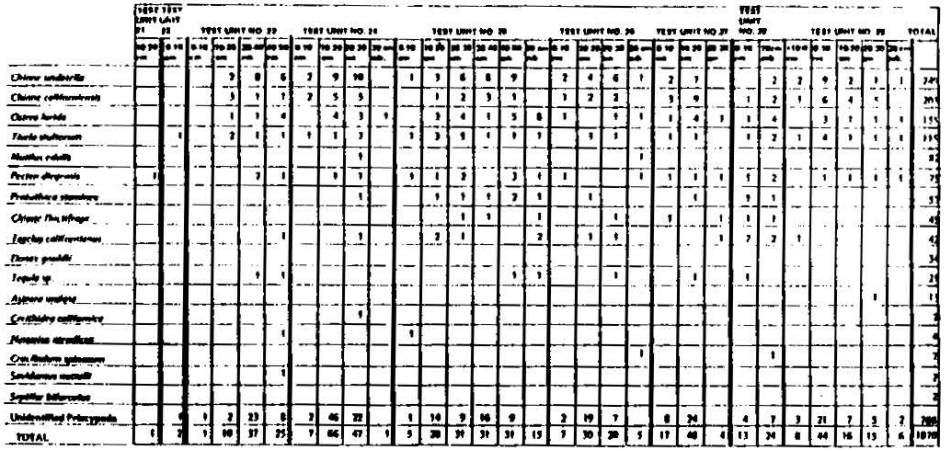
Mytilus californianus (Conrad)	California mussel
Ostrea lurida (Carpenter)	California oyster
Chione undatella (Sowerby)	frilled California venus
Mytilus edulis (Linne')	bay mussel
Argopecten aequisuleatus (Carpenter)	speckled scallop
Protothaca staminea (Conrad)	Pacific littleneck
Tivela stultorum (Mawe)	Pismo clam
Chione californensis (Broderip)	California venus
Tagelus californianus (Conrad)	jackknife clam
Donax gouldii (Dall)	little bean clam
Astraea gibberosa (Dillwyn)	red turban
Chione fluctifraga (Sowerby)	smooth California venus
Septifer bifurcatus (Conrad)	platform mussel
Astraea undosa (Wood)	wavy turban
Protothaca laciniata (Carpenter)	folded littleneck
Stenoplax conspicua (Pilsbry)	conspicuous chiton
Saxidomus nuttalli (Conrad)	Washington clam
Protothaca tenerrima (Carpenter)	thin-shelled littleneck
Acanthina spirata (Blainville)	angular unicorn
Cerithidea californica (Haldeman)	California shell
Serpulorbis squamigerus (Carpenter)	scaled worm shell
Crucibulum spinosum (Sowerby)	cup-and-saucer limpet
Crepidula onyx (Sowerby)	onyx slipper shell
Tegula eiseni (Jordan)	banded tegula
Nassarius mendicus (Gould)	lean dog whelk

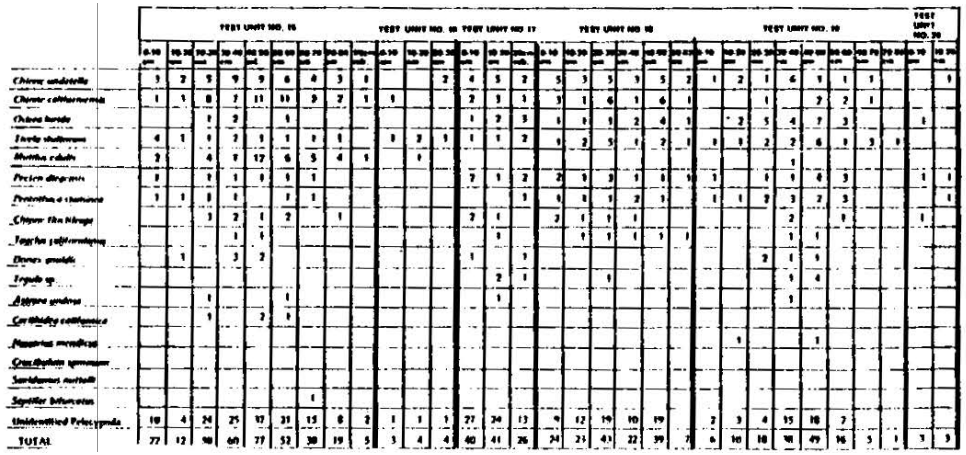
APPENDIX B
Shellfish Distribution Inventory

The following charts list the total number of identifiable shellfish species recovered from SDi-222 and SDi-4281 per unit and level. A full list of species is found in Appendix A.

Only whole shells and hinge fragments were counted for the following charts to enable an estimation of approximate number of individuals per each species. Examples: *Mytilus californianus* (bivalve) a total of 1929 identified shells indicates a sample of approximately 965 individuals; *Cerithidea californica* (univalve) 7 identified hinge fragments indicate that the remains of 7 individuals were recovered.







APPENDIX D

Aboriginal Use of Plants

South Coastal Scrub

Agave *(Agave shawii):* The flower, stalk, and leaves were cooked (often dried) and eaten; fiber used for making sandals, baskets, netting, and the like.

California buckwheat *(Eriogonum fasciculatum):* Used medicinally; a juice was extracted from the leaves for pain, and a flour was made from the grain; it was also applied as an eye-wash.

Black sage (*Salvia melifera):* The seeds were used for seasoning and as a food.

Lemonadeberry *(Rhus integrafolia):* A drink was made from the berries.

Prickly pear cactus *(Opuntia occidentallis* var. *littoralis):* The fruit was eaten both fresh and dried; the seeds were ground into meal.

Saltbush *(Atriplex* spp.): The roots were used as soap; the seeds were ground to flour.

White sage *(Salvia apiana):* The fresh shoots were eaten raw; the seeds were used for seasoning and as a food.

Wild cucumber *(Marah marcocarpus):* The toxic root was ground and used to stun fish.

Riparian/Estuarine

Arrow-weed *(Pluchea sericea):* The plant was used for roof thatching and arrow shafts.

California croton *(Croton californicus):* The plant was possibly used to induce abortions

Elderberry *(Sambucus mexicans):* The fruit was dried or cooked; a black dye was produced from the stem.

Fremont cottonwood *(Populus fremontii):* The inner bark was used for clothing and construction.

Honey mesquite *(Prosopis juliflora* var. *glandulosa):* The beans were ground into flour.

Rush *(Juncus* spp): The many forms were used primarily in weaving.

Tule *(Scirpus* spp): The young shoots were eaten raw; the plant was also used for thatching, boat construction, weaving, etc.

Willow *(Salix* sp.): The wood was used for making bows and basketry warps.

APPENDIX C
Shellfish Habitats

Acanthina spirata	Rocky shores of the bay and estuary
Collisella asmi	Attaches itself to snail shell, usually of the genus *Tegula*
Notoacmea insessa	Attaches to various sea plants and algae
Collisella pelta	Attaches to rocks along shoreline
Astraea gibberosa	30-80 feet. Bay and estuary
Barnacles	Common on rocks in low tide zone
Cerithidea californica	Bay and estuary mud flats
Chione californiensis	Bay and estuary sand flats
Chione fluctifraga	Bay and estuary sand flats
Chione undatella	Bay and estuary sand flats
Crepidula onyx	Rocky shores (found in conjunction with Ostrea)
Crucibulum spinosum	30-80 feet. Bay and estuary
Donax gouldii	Sandy beaches of the open coast
Fissurella volcano	Rocks in tidal area to 30 feet
Haliotis corrugata	On rocks in bay from 30-80 foot depth
Stenoplax conspicua	Under rocks in the intertidal zone
Isognomen recognitus	Tidal area to 30 feet on brush or stones
Laevicardium substriatum	30-80 foot depth
Lottia gigantea	Rocks between tides
Mactra nasuta	Sand in bay and estuary – 30-80 feet
Mytilus californianus	Rocky shores of the bay and estuary
Mytilus edulis	Rocky shores of the bay and estuary
Nassarius mendicus	30-80 feet. Bay and estuary
Ostrea lurida	Bay and estuary rocky shores – lowtide area
Argopecten aequisulcatus	Sand flats of the bay and estuary
Protothaca laciniata	Rocky shores of the bay and estuary
Protothaca staminea	Rocky shores of the bay and estuary
Protothaca tenerrima	Rocky shores of the bay and estuary
Saxidomus nuttalli	Moderately deep water
Serpulorbis squamigerus	Just below the low-water line
Tagelus californianus	Bay and estuary mud flats
Tegula aureotincta	Rocky shores
Tegula eiseni	Rocky shores of the bay and estuary
Tegula gallina	Rocks between tides
Tivela stultorum	Sandy beaches of the open coast
Tresus nuttalli	Deep in mud near low-water line
Trophenopsis lasius	80-200 foot depth

(Habitats from Ricketts and Calvin, 1939, and Morris, 1966)

Rodentia

Family: Sciuridae
Citellus beecheyi (California ground squirrel)
Eutamias merriami (Merriam chipmunk)

Family: Geomyidae
Thomomys bottae (valley pocket gopher)

Family: Heteromyidae
Perognathus fallax (San Diego pocket mouse)
Perognathus longimembris (little pocket mouse)
Perognathus californicus (California pocket mouse)
Dipodomys agilis (Pacific kangaroo rat)

Family: Cricetidae
Onychomys torridus (Southern grasshopper mouse)
Reithrodontomys megalotis (Western harvest mouse)
Peromyscus maniculatus (deer mouse)
Peromyscus californicus (California mouse)
Peromyscus truei (pinon mouse)
Peromyscus boylei (brush mouse)
Peromyscus eremicus (cactus mouse)
Neotoma lepida (desert woodrat)
Neotoma fuscipes (dusky footed woodrat)

Family: Microtidae
Clethrionomys californicus (California redback vole)
Microtus californicus (California meadow mouse)

Lagomorpha

Family: Leporidae
Lepus californicus (blacktail jackrabbit)
Sylvilagus audubonii (desert cottontail)
Sylvilagus bachmani (brush rabbit)

Artiodactyla

Family: Cervidae
Odocoileus hemionus (mule deer)

Cetacea

Family: Balaenidae
Eubalaena sieboldi (Pacific right whale)

Family: Rhachianectidae
Rhachianectes glaucus (gray whale)

Family: Balaenopteridae
Balaenoptera physalus (finback whale)
Balaenoptera acutorostrata (Picked whale)

Family: Physeteridae
Kogia breviceps (pigmy sperm whale)

Family: Delphinidae
Tursiops gilli (Pacific bottlenose dolphin)

From Burt and Grossenheider (1952)

APPENDIX E

Mammals Native to San Diego County (Southern Portion along Coast)

Insectivora

Family: Talpidae
Scapanus latimanus (broad-footed mole)

Family: Soricidae
Sorex ornatus (ornate shrew)
Notiosorex crawfordi (desert shrew)

Carnivora

Family: Procyonidae
Procyon lotor (raccoon)

Family: Bassariscidae
Bassariscus astutus (ringtail cat)

Family: Mustelidae
Mustela frenata (longtail weasel)
Mephitis mephitis (striped skunk)
Spilogale putorius (spotted skunk)
Taxidea taxus (badger)

Family: Canidae
Urocyon cinereoargenteus (gray fox)
Canis latrans (coyote)

Family: Felidae
Felis concolor (mountain lion)
Lynx rufus (bobcat)

Pinnipedia

Family: Otariidae
Zalophus californianus (California sea lion)
Arctocephalus townsendi (Guadalupe fur seal)

Family: Phocidae
Phoca vitulina (harbor seal)
Mirounga angustirostris (elephant seal)

APPENDIX G

Artifact Inventory

	*0-10		10-20		20-30		30-40		40-50		50-60		60-70		70-80		80-90		SUR-FACE	NO LOC.	TOTALS
	u	c	u	c	u	c	u	c	u	c	u	c	u	c	u	c	u	c			
Utilized Flakes	72	7	107	2	84	3	52	1	40		15	4	10	1	11				245	7	661
Scrapers	30		27	2	23		24	1	11	1	6		9	1	4		1		302	2	444
Cores	6		7	1	10		5		3		1				1				36	2	72
Choppers	2				1		2												17		22
Hammerstones	1		2		3		2				1								66	3	78
Knives & Points			1		1										1					2	5
Manos			3		1		2												28		34
Metates							1												6		7
Charmstone																				1	1
Worked Bone							1														1
TOTALS	111	7	147	5	123	3	89	2	54	1	23	4	19	2	17		1		700	17	1325

*This level includes unit surface finds

u = unit

c = column sample

APPENDIX F

Excavation Depth Chart

Test Unit No.	Depth of Excavation (cm)															
	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
1						X										
2	X															
3				X												
4		X														
5						X										
o6													X			
o7												X				
8		X														
9		X														
10						X										
11						X										
12		X														
13	X															
14										X						
15																X
16			X													
17				X												
x18									X							
19														X		
20	X															
21									X							
22		X														
x23								X								
x24						X										
x25									X							
x26						X										
x27				X												
x28		X														
x29				X												

o Trench 1
x Trench 2

APPENDIX I

Miscellaneous Flake Inventory (Column Samples)

MATERIAL	EXCAVATION LEVEL (cm) *0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	TOTAL NO. OF FLAKES
felsite	133	128	113	49	40	30	38	15	546
basalt	27	38	41	12	12	8	8	2	148
quartz(ite)	2	6	1	1	2	2			14
TOTALS	162	172	155	62	54	40	46	17	708

*includes surface finds
Note: Column samples screened with 1/16" mesh

UNIT COLUMN SAMPLE NO.	DEPTH OF EXCAVATION (cm)
1	35
2	15
3	32
4	20
8	18
9	20
10	30
11	20
13	10
14	56
15	80
16	26
17	27
18	50
19	76
24	30

APPENDIX H

Miscellaneous Flake Inventory (Test Units)

MATERIAL	EXCAVATION LEVEL (cm)									TOTAL NO. OF FLAKES
	*0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	
felsite	249	371	223	189	97	60	43	11	3	1246
basalt	184	310	158	151	69	33	26	6	2	939
andesite	14	37	12	2	4			1		70
quartz(ite)	13	13	12	6	2	3				49
chalcedony	2	2								4
sandstone	1	1	1							3
Totals	463	734	406	348	172	96	69	18	5	2311
% of felsite flakes	54%	50%	55%	54%	56%	62%	62%	61%	60%	54%

*includes unit surface finds

Note: apparent decrease in misc. flakes with depth due to varying limit of excavation (See Appendix F)