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Number 15 June, 1972

THE EARLY HORIZON IN CENTRAL CALIFORNIA PREHISTORY

Sonia Ragir

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PREFACE

In the four years since this report was written a number of papers bearing upon one or another aspect of the subject have appeared in print. The present paper therefore should be read as of 1968. The reader is referred here to some of the more important publications to appear since that date.

Named projectile points whose time range is known are commented on briefly - to the references cited there see also a series of papers on this subject in Report No. 71, University of California Archaeological Survey, Berkeley, 1968.

The uncertain age of the Clovis fluted points at the Borax Lake site (referred to on p. 123) has recently been clarified to some degree by the work of C. V. Haynes and C. Meighan published in Southwest Museum *Masterkey*, Vol. 42, No. 1, 1968, and in *Science*, Vol. 167:1213-1221, 1970. Fluted points reported from California have been discussed by S. W. Glennan in Southwest Museum *Masterkey*, Vol. 45, No. 1, 1971, and it now is pretty obvious that there was a widespread occupation in Central and Southern California of Paleoindians bearing the fluted point projectile tradition, and that this is pre-Windmiller in age.

Age of the earliest human occupation of Gypsum Cave in southern Nevada (referred to on p. 133) has been discussed in Contribution No. 7, University of California Archaeological Research Facility, 1970.

The human burials at the Tranquillity site in Fresno County have been radiocarbon dated at 2550 ± 60 years which is surprisingly recent (see Contribution No. 12, Archaeological Research Facility, 1971, pp. 47-48). The Rose Spring site (CA-Iny-372) radiocarbon dates have been reassessed in Contribution No. 7, Archaeological Research Facility, 1970 (pp. 19-25).

A useful survey of the evidence for early post-Pleistocene archaeology in California has been published by C. Meighan in *The Quaternary of the United States*, ed. by H. E. Wright and D. G. Frey, 1965.

Since 1968 no publication of substance on Windmiller Culture sites or materials has appeared in print.

The author wishes to thank the following persons for assistance rendered during the preparation of this report: Professors S. F. Cook, J. A. Graham and R. F. Heizer who constituted the doctoral dissertation committee under which the thesis on which this monograph is based was written; Mr. E. Prince, Lowie Museum of Anthropology, for help in photographing artifacts; Professor R. B. Langston, Department of Ceramic Engineering, for petrological identifications; Mr. John Strc ,erg, Department of Statistics, and Mr. Tom Rich, Department of Paleontology, for assistance in developing the computerized analytical techniques employed here; and Dr. James A. Bennyhoff who gave generously of his time, advice, and expert knowledge.

CHAPTER I

INTRODUCTION

All the archaeological material described in this report comes from six low mounds in the Sacramento-San Joaquin River Delta area of Central California (Map 1). Amateur and professional excavations in settlements have resulted in few published accounts over the years. Those accounts comprise five major papers: (1) Schenck and Dawson (1929), (2) Lillard and Purves (1936), (3) Lillard, Heizer and Fenenga (1939), (4) Heizer (1949b), and (5) Olsen and Wilson (1964).

The present monograph includes a description, analysis, and comparison of what has been called the "Early Horizon" of Central California and attempts to place it within the framework of Western North America prehistory. The analysis is based on a study of the "Early Horizon" field notes, artifact records and museum collections at Berkeley, as well as on the published accounts mentioned above.

Detailed descriptions are given of one hitherto unreported settlement and one large previously unanalyzed collection. The new site, Erich Mound (Sac-168), was excavated in 1952 by the University of California Archaeological Survey, Berkeley (see Chapter II). The collection, from Blossom Mound (SJo-68) was extensively excavated in 1947 by the University of California, Berkeley. Up to that time there existed only publication of brief summaries of the limited excavations conducted in 1923-24 and 1938 (see Chapter III).

Analysis of data from these two sites gives some clues as to the possible and/or probable social organization, subsistence base, and ceremonial practices of the inhabitants, and thus provides important information about their culture which, until this time, has been unavailable.

History of the Archaeological Work in the Central California Delta Area.

The discovery of Indian artifacts in the Sierran auriferous gravels in the 1860's (Holmes, 1901) brought California into the archaeological literature. However, the proper study of prehistory in the Sacramento-San Joaquin Delta did not begin until the early 20th century. Publication began with an article on the private collections of J. A. Barr and Reverend H. C. Meredith in Moorehead's volume, Prehistoric Implements (1900). Enthusiastic collectors, Reverend H. C. Meredith and B. W. Hathaway, and semi-professional investigators, J. A. Barr and E. J. Dawson, merely "scratched the surface" of some of the rich archaeological sites of the Stockton, Bethany and Lodi regions of the Delta, about 100 miles east-northeast of San Francisco.

In 1900, P. M. Jones carried out systematic archaeological excavation near Stockton for Mrs. Phoebe A. Hearst on behalf of the University of California, digging principally at Sac-82. Barr, present at some of the work, gave Jones access to his collections which were later incorporated into the summary and conclusions of Jones' work published in 1923.

W. H. Holmes in his "Anthropological Studies in California" (1902) dealt largely with the Barr and Meredith collections.

Barr first excavated sites near Stockton in which recent investigators have identified the presence of two cultural traditions (Bennyhoff, pers. comm.). His material, now housed in the Lowie Museum of Anthropology, still forms the basic reference collection for the Stockton locality. Dawson, a high school student trained by Barr to record grave lots and site provenience, began the first systematic exploration of the Lodi area in 1912 and continued working until about 1930. He presented four volumes of field notes, a collection of about 8,000 specimens, and an unpublished manuscript report of his analysis and conclusions to the University of California in 1945 (UCARF-Ms 98). W. E. Schenck published Dawson's collection (Schenck and Dawson, 1929) and compared it to the Barr and Hathway collections.[1] This appeared shortly after a similar survey of the southern San Joaquin Valley by Gifford and Schenck (1926).

Dawson had consciously looked for cultural difference between sites. He described three cultural traditions in his notes and suggested that each had temporal significance. He recognized the relatively early position of Phelps Mound (SJo-56) and Blossom Mound (SJo-68) and made his opinions as well as the material available to Schenck, then a research associate in the Department of Anthropology, University of California, Berkeley. If Schenck had been less cautious about taking Dawson's suggested sequence, the "early," "middle," and "late" traditions might have been recognized ten years earlier in 1929. Instead Schenck tentatively suggested an amorphous culture sequence with little temporal significance.

> On the evidence of part of the material culture which they exhibit, we have divided the sites of the Lodi region into three age-groups. (The Stockton data are insufficient to permit a similar classification there. Sites 80 and 82 probably belong to group II.) Some of the main characteristics of these groups are summarized below.
>
> Group I. Site 1 only. Very recent. American period. Majority of artifacts Caucasian. Base mound on level of surrounding land. Situated on

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[1] Superior numbers refer to Endnotes which appear following Appendix D.

high bank of Cosumnes river near eastern edge of valley floor. Artifacts: Abundant; poorly worked obsidian arrowpoints; some plain clay balls; unusual quantity of glass beads; no charred material, curves, crystals, or plummet-like stones; many other types also absent.

Group II. Sites 6, 8, 19, 43, 48, and possibly 66. Age: Between groups I and III; glass beads show site 6 partly historical. Structure: Ash pockets prominent; light, burned soil; many bone fragments, frequently of large size; base generally higher than surrounding land; ground comparatively soft and works easily. Situation: Banks of Cosumnes and Mokelumne rivers; all above swamp area; built on natural ridges or knolls. Artifacts: Abundant; many delicate arrowpoints; abundance of baked clay objects; no rectangular olivella beads (except at site 66); obsidian curves (site 6 only); shell ornaments unusually abundant; ornamented bird-bone tubes, whistles, pipes, drill-discs, pestles, small mortars, plummet-like stones (very few), crystals (scarce), tool grinders, all present.

Group III. Sites 56, 59, 68. Age: Oldest, prehistoric. Structure: No ash pockets; heavy black soil; few and small-sized, animal bone fragments; base lower than surrounding land; ground very hard and difficult to work. Situation: Sites 56 and 59 about eighth of a mile from Mokelumne river, site 68 a mile and a half from the same stream; all in or near swamp area and on flat ground. Artifacts: Comparatively few; notably absent are delicate arrow points, baked clay balls (a very few), clam disc beads, stone beads, curves, charred material, drill-discs, ornamented tubes, mortars, pestles, pipes, whistles, tool grinders; present are mica ornaments (site 68 only); plummets; crystals very abundant; shell ornaments rare and of characteristic types (particularly at site 68).

If site 68 is indeed representative of an earlier culture its characteristic features are of interest. The notable absences have been recorded. Some of the artifacts which it presents and which are characteristically different from those of Group II are

> as follows: Bone, or perhaps turtle shell, ornaments, Bird-bone (wishbone) ornaments. Small, well shaped, baked clay balls with encircling, longitudinal cut groove. Horn chisels or gouges, rectangular abalone beads. Rectangular Olivella disc beads drilled in center. Circular abalone pendants with two perforations, both near center or one near center and the other near edge. Abalone, rectangular, bar-like pendants with two holes one above the other near one end. Large, leaf-shaped chipped blades. Ground obsidian perforator(?). Ground leaf-shaped chipped blades. Slate pendants. Double-pointed pieces of slate, Mica ornaments. Schenck and Dawson, 1929:402).

Despite these observed cultural differences, the sites, including SJo-68, were not considered very old. Schenck (Ibid:410) estimated that a time-span of 1500 years would account for the entire prehistoric development of Central California.

A complete analysis of one of Dawson's sites, SJo-68, forms the basis for Chapter III of this paper.

The description of local collections did not encourage intensive work in the delta:

> Local archaeology seemed to promise so little of positive value that the resources of the department [of Anthropology at the University of California] were diverted to rescue ethnographic information from the survivors of the last aboriginal generation of California Indian groups. Archaeology in Central California was shelved for twenty years, except for a foray to salvage remains from the famous Emeryville Site when it was leveled to the ground (Schenck, 1926). The effort was made to preserve existing data, however. Surface collections in the Southern San Joaquin Valley were published (Gifford and Schenck, 1926) and the personal collection of Elmer J. Dawson from the neighborhood of Stockton and the Sacramento River Delta was also described and illustrated by him and Schenck (1929). These were projects requiring little manpower and financial commitment. The establishment of other institutions with interest in California areas relieved the University of sole responsibility for archaeological research in California, but departmental expeditions for survey and excavation opened new horizons in the Columbia River Valley and the Santa Barbara area (Beardsley, 1954:3-4).

Work in the valley continued under the auspices of an archaeology program begun in 1933 by J. B. Lillard, president of Sacramento Junior College. Intensive exploration and excavation was carried out in the region of the Deer Creek-Cosumnes River confluence in 1933 (Lillard and Purves, 1936:1). At that time Lillard hired a professional archaeologist, R. Van Valkenburg, to lead weekend field parties and give instruction in field techniques.[2]

Sacramento Junior College reported the excavation of three sites in its first Bulletin (Lillard and Purves, 1936). Two of the sites, Booth Mound (Sac-126) and Augustine Mound (Sac-127) contained protohistoric (Hotchkiss and Cosumnes Cultures, see pp. 8-11) and historic Indian materials of a sort already found frequently by collectors in the Delta area. The third site, the Windmiller Mound (Sac-107), was more significant because it contained physically stratified material first identified as coming from two separate cultural traditions. The University of California Department of Anthropology carried out further excavations in 1937 at the Windmiller Mound while the Sacramento Junior College continued at two other sites (Hicks Mound, Sac-60; Morse Mound, Sac-66). Working together the two groups of investigators identified a third cultural tradition intermediate between the two previously isolated traditions in the Windmiller Mound. The three traditions were summarized for a number of sites in 1939 in Sacramento Junior College Bulletin No. 2 (Lillard, Heizer and Fenenga, 1939).

Other sites containing a cultural tradition similar to that found in the lowest stratigraphic level of the Windmiller Mound include the following: Phelps Mound (SJo-56) excavated briefly by Dawson and extensively in 1938 by F. Fenenga for the Sacramento Junior College; McGillivray Mound (SJo-142) discovered by E. B. Niehaus in the mid-1930s, was excavated in 1938 (Lillard, Heizer and Fenenga, 1939).

In 1952, the University of California Archaeological Survey discovered and excavated a second stratified site (Sac-168). In 1958, the State Indian Museum in Sacramento salvaged a partially destroyed site (SJo-112) on Bear Creek near Stockton (Olsen and Wilson, 1946).

In the 1950's and early 1960's publication of archaeological site reports came mainly from the coastal area. Beardsley (1954), Davis and Treganza (1959) and others published fairly complete reports on coastal sites and examined their relation to the Delta. However, interest in the valley, especially the Delta region, did not slacken. During this period, Cook, Heizer and Treganza developed a series of techniques for quantitative and qualitative analysis using material from a number of Delta sites (Heizer and Cook, 1949; 1950; 1952; Cook and Heizer, 1951; 1952; 1959; Cook and Treganza, 1947; 1950).

Development of the Cultural Sequence

A few pioneers had suggested chronological distinctions in the Central

California archaeological record even earlier than Dawson, but these proposals were not followed up. Rowe (1962:399) discussed these early estimates with relation to Kroeber's contributions to California archaeology:

> It is interesting that Kroeber, who was later to become a pioneer of chronological interpretation himself, was involved in the rejection of one of the soundest earlier efforts in this direction [establishing a chronology in the coastal mounds], Max Uhle's claim to have found a record of cultural change in the shell mound at Emeryville, on San Francisco Bay, where he dug for Merriam in 1902 (Uhle, 1907:73).
>
> Uhle recorded the objects from his excavation by natural levels of which he distinguished ten in all. He distinguished two phases ("people") in the occupation. . . Speaking of the people of the earlier phase he says: "They may have been neolithic, they may have been connected with the following generation by some common traits, although there is little evidence for this; but the two people certainly differed in cultural characteristics" (Ibid:40).

Kroeber did not publish his belief in the existence of cultural change in the Valley until 1936 after D. B. Rogers (1929), and R. L. Olson (1930) had reported the cultural sequence from the Santa Barbara coast and work on the Windmiller Mound (Sac-107) had already begun.

D. B. Rogers published on the prehistory of the Santa Barbara region in 1929, the same year Schenck and Dawson's Stockton-Lodi survey was printed. Rogers' work in the Santa Barbara area from 1926 to 1929 led him to describe three different cultural traditions, the Oak-Grove, the Hunting, and the Canalino which presumably succeeded one another on the Santa Barbara coast. Olson's work in the same area from 1928-1929, published in 1930, supported Rogers' cultural sequence, although Olson did not recognize the intermediate culture defined by Rogers as the Hunting people. Olson's "Intermediate culture" consisted of sites immediately pre-dating European contact.

The Development of the Terminology of Culture Classification in Central California

The Windmiller mound became the first stratified site explored by modern methods in the Central Valley and stimulated the development of a culture classification scheme for Central California.[3]

Lillard and Purves (1936) distinguished three cultural periods in site Sac-107: "Early," "Intermediate," and "Recent." As in Olson's Santa Barbara chronology, only the addition of artifacts of European manufacture distinguished the "Recent" period from the "Intermediate." In 1937 transitional period or phase was identified at the Morse Mound (Sac-66) and this was shortly after recognized at Sac-107 as lying stratigraphically between the "Early" and "Intermediate" periods and also at the Hicks Mound (Sac-60) where it lay stratigraphically below the "Intermediate" (Lillard, Heizer and Fenenga, 1939:44-45). A new classification thus emerged:

Lillard and Purves (1936)	Lillard, Heizer & Fenenga (1939:23)
Recent	Historic
Intermediate[4]	Late
	Transitional
Early	Early

Between 1935 and 1939, the Sacramento Junior College and the University of California excavated various other pure (single component) culture sites for both the "Early" and "Transitional" periods as well as for the pre-contact "Late" period, and found further stratigraphic support for the new cultural sequence. Extensive fieldwork continued in the Central Valley and on the coast during the 1940's and, by 1946, had led to the recognition of the extensive temporal and spatial duration of the "Transitional" period. Heizer (1949b:2) suggested that the name be changed to the "Middle" period, giving it a classificatory status equal to the "Early" and "Late" periods. In addition, Heizer (Ibid) introduced a new system of cultural classification, heavily influenced by the rethinking which classification systems were then undergoing in the Southwest and Midwest. He introduced the terms "horizon," "province" and "facies" to denote cultural groupings delimited in time and geography:

> We are now abandoning our earlier, over-simplified classification of cultures by expanding them into what appear to be related intracultural groups.
>
> The present classification, made up in a series of informal conferences at Berkeley, represents the ideas of local workers as of early 1946. The introduction of a new series of terms ("horizons," "province," "facies") is intentional, since to employ either the Midwest or Gila Pueblo terms would imply strict semantic equivalence. . . Our term "horizon" is roughly equivalent to "phase," and we carry over our older terms of "Early," "Middle," and "Late" to represent broad temporal levels (i.e., time periods) which have been observed stratigraphically and which exhibit distinctive trait assemblages or cultural complexes. We have selected the term "province" because our provinces are essentially geographic subdivisions within horizons. To what extent these provinces are culturally distinct must yet be demonstrated, but we feel

> that the regional differences are not based simply upon different environments (e.g. littoral as against interior) but are, rather, divergences which, evolving through spatial separation of groups, resulted in regional subtypes. . . . Our "facies" is more or less similar to "focus," designating a group of settlements which may be distinguished from another group within a province, again on the basis of recurrent trait assemblages. A series of closely related settlements becomes a facies; communities within a facies are generally assumed to be contemporaneous. (Heizer, 1949:2).

Heizer suggested the replacement of the general term site with the precisely defined "settlement":

> Our "settlement" is, of course, the familiar "component" or "community," replacing our older term of site, which had to carry additional qualifying terms, since more than one horizon settlement can occur at one site. Where only one occupation period is represented, we have a pure culture site, and the terms "site" and "settlement" are synonymous. Stratified sites (multi- or series-settlement sites) are very abundant in the Interior Valley, and this method of referring to different horizon settlements at the same site makes description much simpler. The capital letters A, B, C, etc., in connection with settlement numbers or names refer to stratigraphic-cultural deposits, A being latest and uppermost, B and C indicating successively deeper and older remains. (Ibid.)[5]

In the following pages, I have continued with minor modifications to use this 1949 terminology.

Modification in Culture Classification

Based on considerable evidence that several "Early" sites represent more than just burial complexes, this report introduces some modifications of Central Californian archaeological nomenclature. The combination of village and cemetery had long been recognized in "Late" and "Middle" period sites of the Central Valley. With the presence in "Early" sites of both habitation midden and cemeteries, a record of the major portion of the cultural activity taking place would exist, and the settlements would deserve the status of a cultural tradition. Although the designation of "Culture" to archaeological materials had not yet come into use, Heizer implied such a status in his paper on the "Early Horizon" (1949b).

Jose Setzer's work (1947) despite many faults, demonstrated that the soils of all sites investigated by him (with the possible exception of SJo-142) had a carbon and nitrogen ratio well above that of the surrounding farmland suggesting use of a living area. Sac-107C, Sac-168B, SJo-56 showed evidences of occupation in the form of unassociated artifacts, charcoal, baked clay fragments, animal and fish bone, and unworked shell. Early excavators did not give such evidence proper weight largely because they concentrated almost exclusively on the interments and grave accompaniments.

Despite the fact that reliable reports of earlier sites have not as yet come from the Delta, growing evidence of very early cultures in Southern California presents another pressing reason for this change in classification.[6] The unique elements of the "Early Horizon" strongly suggest an earlier "in situ" development (cf. Heizer, 1949b).

Given the present system of naming groups which are typologically and temporally related, one would have to call an earlier culture, the "Pre-Early Horizon" or "Earlier Early Horizon." Furthermore, the tripartite system in a local sequence invariably causes confusion when one compares sites from one area to those of another which has either temporarily or permanently classified its local sequence in a similar fashion. Thus, one finds the Early Lovelock culture coeval with the "Middle Horizon" in Central California and the Late Phase of the Desert Archaic. Temporary classifications devised during the development of a local sequence might easily use roman numerals prefixed by the geographical region in which the sequence occurs. Such a system would not inhibit the precise definition of the phases of cultural change through time. "Early," "Middle," and "Late" designations limit prehistory to three phases despite the fact that evidence sometimes suggests four or more changes important enough to warrant equivalent classificatory recognition.

Enough information on the Central Valley exists to allow the distinction in the archaeological record between archaeological cultures, as opposed to random or phase changes. These archaeological cultures ought to be named after type localities or, where adequately excavated type localities do not exist, after geographical regions where large numbers of the sites occur and there is a possibility of further work. Beardsley (1948, 1954), Bennyhoff (1961) and Baumhoff and Dempsey (1963) have undertaken reappraisals of this sequence, occasionally using quantitative methods. The following paragraphs include a brief summary of possible changes of nomenclature, a description of some of the sites on which these changes are based, and an indication of the sources of relevant data.

Relatively little is known about the six early sites known as the Windmiller Mound (Sac-107C), Phelps Mound (SJo-56), Blossom Mound (SJo-68), McGillivray Mound (SJo-142), Bear Creek Site (SJo-112) and Erich Mound (Sac-168). Olsen and Wilson (1964) fully documented SJo-112; no one has described Sac-168; Heizer briefly described Sac-107, SJo-56, SJo-142 and a partial excavation of SJo-68 (Lillard, Heizer and Fenenga, 1939; Heizer and Fenenga, 1939; and Heizer, 1949b). Dawson's small collections from

SJo-56 and SJo-68 are briefly summarized in Schenck and Dawson (1929).

The name "Windmiller" is closely associated with the "Early Horizon" and, in 1949, Heizer named the single facies of the Early Horizon the "Windmiller" facies. Because of the Windmiller site's long association with the definition of this "early cultural horizon," the new term Windmiller Culture replaces "Early Horizon" in the following chapters of this work.

Even less published material deals with the "Middle Horizon" sites than with any other sites in the Delta. Fenenga's promised summary has never appeared and the notes and records from the more extensive excavations are lost or destroyed, although the University of California's Lowie Museum houses many of the artifact collections. Lillard, Heizer and Fenenga (1939), Heizer and Fenenga (1939), and Beardsley (1948; 1954) have briefly sketched "Middle Horizon" settlements.

Beardsley (1948:9) summed up the knowledge then extant of the "Middle Horizon":

> There is no doubt that Central California was well populated during the Middle Horizon. Sites are plentiful in the interior and, on the coast are at least a numerous as Late Horizon components. Broad culture similarities link all components of the horizon, but the Coastal Province is clearly distinguishable from the Interior Province by various trait differences, not least of which is reliance on different food sources.
>
> Interior Province components are divided into five facies in recognition of the differences among more than twenty components excavated in the low lying river delta and in higher ground along stream courses to the north and east. These are the Morse, Deterding, Brazil, Need, and Orwood B Facies, of which the Morse Facies is best represented. The two facies of the Coastal Province are Ellis Landing, with twelve components around the shores of San Francisco Bay and on the ocean coast south of the Golden Gate, and McClure, with three sites on Drake's Bay and Tomales Bay north of the San Francisco Bay entrance (Beardsley, 1948:9).

Beardsley's doctoral dissertation, <u>Temporal and Areal Relationships in Central California</u> (1954:59-60, 7-76) compared coastal "Middle Horizon" sites on the basis of trait lists indicating items present or absent. At that time Beardsley identified more than twenty components in the Interior Valley as belonging or being closely related to the "Interior Province, Middle Horizon."

> Five of the seven sites mentioned provide the main body of data; these are Morse (C66), Hicks C (S60), Deterding (S99), Brazil (S43), and Need (C151). . . Sites having Middle Horizon components are almost without exception permanent habitation sites, located on the valley floor conveniently near water courses or ponds, and built to depths ranging from 36 inches to over 100 inches. Intensive occupation is obvious from the ash and charcoal permeating the deposit in flecks and lenses, from burned and fire-cracked stones, and from animal, bird, and fish bones in the soil. A perceptibly greasy texture (strongly characteristic of later deposits) is evident in the soil, which is invariably compact and indurated to a moderate or extreme degree. The hardness may be expressed, in default of a scale of measurement, as intermediate between that of midden matrix in Early and Late Horizon components (Beardsley, 1954:71).

Heizer and Cook (1949) discussed Sac-151, Sac-43, and Sac-60 in their published work on the chemical analysis of bone from Central California sites (1949). Davis and Treganza (1959) published a report of the Patterson Mound (Ala-138) on San Francisco Bay which compared this "Middle Horizon" Bay site to contemporaneous sites in the valley. Because complete excavation and analysis details of any single delta "Middle Horizon" site have not been published, it would perhaps be better to call these settlements the "Cosumnes Culture," after the geographic area in which they cluster.[7]

The "Late Horizon" from the Central Valley is no better published than the Cosumnes Culture. Careful analysis and complete reports do not exist for any "Late" Delta site. The first published account of a Delta "Late Horizon" mound (Augustine, Sac-127) appeared in Lillard and Purves (1936).

Various authors have dealt briefly with the unique stratified site, Hotchkiss Mound (CCo-138), making it one of the best known Central Valley "Late" sites. An amateur, E. N. Johnson, first excavated it in 1936. The unpublished field notes from excavations carried out in 1936-1940 are in the files of the Archaeological Research Facility and the skeletal and artifact material is stored in the University of California Lowie Museum. Several field classes have conducted small excavations there between 1953 and 1967. Heizer and Johnson published a brief description in Lillard, Heizer and Fenenga (1939); Cook and Heizer reported on the chemical analysis of the mound soil (1949, 1962), and Beardsley (1948, 1954) and Bennyhoff (1961) discussed the implications of the archaeological material of this site.

The mound contained all five subphases of the late culture. No items of European manufacture have been found. From the only partially excavated mound, E. N. Johnson and the University of California parties have recovered over 250 burials. In this report, "Late Horizon" is designated as "Hotchkiss Culture" after CCo-138, because of the completeness of the late prehistoric record found there.

The cultural classification proposed here should not be considered as final. Present knowledge of the archaeology of California as a whole offers a distinct possibility that earlier "in situ" phases of development will be discovered. The classification proposed above could alleviate confusion otherwise arising when such cultures are discovered and named. Furthermore, the frequent occurrence of "Early," "Middle," and "Late" designations in areas outside of California mentioned in this work make the change an economic one. I have, therefore, chosen to classify the temporal-cultural divisions defined by California archaeologists as <u>cultures named after the type sites or regions important in their discovery or early recognition</u>.

A table originally printed by Beardsley (1948:4) and adapted by Heizer (1949) utilized what was then the new classification of cultural horizons. The present author has modified this chart once more, incorporating the above suggestions (see Table 1).

<u>Early Attempts to Order the Windmiller Site Chronologically</u>

As soon as archaeologists had isolated Windmiller settlements, inter-horizon sequencing of sites on the basis of the comparison of assemblages was attempted. Lacking stratigraphic evidence of earlier and later Windmiller components, Heizer and others compared Windmiller with Cosumnes and Hotchkiss assemblages. Heizer argued that younger Windmiller components would resemble the Cosumnes components more closely than would the older. He considered SJo-68 and SJo-56 young and SJo-142 old. The slight amount of intra-component comparison which had been attempted appears inconclusive. There is no guarantee in any of these pioneer comparisons that resemblances or differences are functions of time. In his <u>Early Horizon</u> paper Heizer (1949) finds no stylistic trends which might be used as evidence of temporal differences between the several Windmiller culture sites. The geographic proximity of all the Windmiller sites suggest that if these sites were in fact contemporary, they should show similar artifact styles and distributions, instead of the stylistic diversity actually present.

If temporal differences are in fact present, a common assumption made in archaeological seriation--that sites closer together in time ought to demonstrate more similarity in material culture-- should be valid. However, the possibility exists that geographical differences and cultural specialization among contemporary groups within a small geographic area might also affect artifact assemblages.

To estimate relative age Cook and Heizer (1947); and Heizer and Cook, 1949) used comparative soil chemistry (the organic carbon-nitrogen ratio) and bone chemistry (nitrogen loss in human bone) from Windmiller sites Sac-107C, SJo-56, SJo-68 and SJo-142. Both chemical methods yielded estimates which might easily have been affected by local differences (especially precipitation, drainage, and differential use during occupation) and which Heizer and Cook (1953) believed to be very unreliable. Their minimal estimate of the absolute age of the Windmiller Culture later proved to be surprisingly close to radiocarbon dates (Heizer and Cook, 1949).

Belous (1953) and Baumhoff and Dempsey (1962) adapted Brainerd and Robinson's (1951) method of seriation for chronological ordering to reexamine the Central Valley sequence. Different results were obtained in each ordering attempt.

Baumhoff and Dempsey (1962) criticized the Brainerd and Robinson seriation method, as well as Belous' earlier work, and suggested the adoption of a perfected method, "contextual analysis," in which they believed the problems of weighting types in analysis were solved. Baumhoff and Dempsey marked artifacts present or absent, in this way eliminating the necessity of weighing variables. Careful scrutiny of this method, however, reveals that it really amounts to just another arbitrary decision concerning how to weigh the data. This is not the most satisfactory solution. Certainly in a situation where all the cultural components resemble each other strongly, the frequency of occurrences of particular types will be tremendously important in isolating changes through time.

Baumhoff and Dempsey indicated the weaknesses in Belous' method of chronological ordering and in his classification of California materials, but the only justification they could give for contextual analysis was a simple criterion--that it obtained results compatible with Lillard, Heizer and Fenenga, 1939. Using no stricter criteria, Belous' method also worked. The same logical difficulties pointed out in Belous' work also exist in Baumhoff and Dempsey's paper. In both papers lumping of artifact types and subtypes mask differences which could have temporal significance.

All the methods used for typological ordering cited above attempted only to order the major cultural divisions, not the sites within the divisions. Thus, a method succeeded if it lumped all Windmiller, Cosumnes, and Hotchkiss sites into distinctive groups (Heizer, 1949; Heizer and Fenenga (1939). Because investigators did not design the analytical tool to distinguish between very similar sites (those within a major cultural horizon), the ordering of sites within a major cultural division had little significance. Table 2 summerizes the various attempts at chronological ordering summarized above.

In Chapter IV of this report, a new method of comparing sites is introduced. It utilizes the frequencies of each subtype of artifact (in this case projectile points) in the description of the cultural component. The method allows one to calculate the probability that artifact assemblages from any two sites come from the same statistical population.

CHAPTER II

SITE SAC-168 [8]

When the Erich Mound (Sac-168) was first recorded by R. K. Beardsley on July 13, 1945, the site appeared as a low mound of loose black midden on the southwest bank of a large drainage canal cutting into the western bank of the Cosumnes River.

The mound was approximately 100 feet long and 30 feet wide, and rose about three feet above the level of the surrounding area. Its western border was partially obscured by cultivation, while its eastern edge lay under a levee cut by a drainage canal which may have followed the course of a former slough of the Cosumnes River.

To the west were a few oak trees, the only remains of the vegetation which must have covered the general area during the period of aboriginal occupation. At the time of Beardsley's report, most of the mound was covered with meadow grass. A water tank and pump sat near its center.

Local people had occasionally collected the surface of the site. During the spring of 1952, however, a flood cut away the entire center and upper few feet of the mound's southern half. Surface collection expeditions after this flood yielded "banjo" pendants (G type), clamshell disc beads, a flanged steatite pipe, and a series of small, serrated projectile points, all of which are typical of the Hotchkiss Culture. On the other hand, presence of either the Windmiller or the Cosumnes Culture, or both, were suggested by the presence of C type (circular) and B type (rectangular) shell pendants of Haliotis shell, large hollow-based points, large straight-based tanged points, and charmstone fragments. All the artifacts mentioned above are found in the C. H. Johnson and W. Ehrich collections.

Both the danger that the mound would be totally destroyed by further flood and the imminent prospect that it would be leveled for cultivation led to the site's partial excavation in the summer of 1952 by an archaeology field class led by R. K. Beardsley. Later that same summer, J. Bennyhoff and A. Elsasser led a University of California Archaeological Survey party to continue the work.[9]

A sketch contour map of the mound shows those portions of it destroyed by flood (Map 2). The grid system and the areas excavated by the two work groups are super-imposed on the contours.

The excavators established two datum points: Datum A, at the base of the foundation of the fixed irrigation pump on the northwest extension of the midden, and Datum B, the main datum point (0-0 on the grid). The base lines run compass north-south and east-west. The field party laid out five-foot grid squares and numbered them consecutively starting at one from west, and north (or south), of Datum B. The result is a series of two numbers for every location. The first designates the number of squares west of Datum B; the second designates the number of squares either north or south of Datum B. For example, square 6-N7 was located six squares west and seven north of Datum B.

Most work was done in the northwest section of the mound, where deep, undisturbed midden was found. All squares down to sterile subsoil (yellow-red sandy clay), which lay between 50 and 63 inches below the surface in the deeper portions of the mound were excavated. Only four pits (1-S4, 4-S2, 6-S1 and 7-S1) were dug to the subsoil southwest of Datum B. Other southwest pits went only as deep as the hardpan, which caps a compact brown lower midden, and which served as a horizontal marker from which excavators took all vertical measurements.

The original 1945 surface of the site had been badly disturbed by floods, ditching and pothunters, and the hardpan composes the only readily distinguishable geological marker extending over the entire site. Measurements given in this report are preceded by a negative sign (-) when they are to be interpreted as extending from below the top of the hardpan and into the compact brown midden. A positive sign (+) indicates measurements above the hardpan (i.e., in a loose black midden). Measurements prefixed by neither a plus nor a minus sign (for example: 0-6") refer to measurements from the site's surface.

Location

The Erich Mound, designated as Sac-168 in the University of California Archaeological Survey is located in Township 5N, Range 5E; NE quarter of the SE quarter of Section 1, MDB and M, Bruceville Quadrangle. This site lies on the twenty-foot contour elevation of the southwest bank of a large drainage canal near the edge of the Cosumnes River. The mound forms part of the property of W. Erich of Lodi, California.

Environment

Characteristics of the site include features which were probably the major prerequisites for aboriginal occupation during the early prehistoric period. The river insured a year-round supply of water. The elevation of the mound itself provided protection from seasonal floods. The oaks bear quantities of acorns which would have been an important source of food. On the east side of the drainage ditch, about 200 yards north of Sac-168, lies Sac-184, a shallow midden approximately 150' x 150' and about 18-24 inches deep. The hard-textured, brown clay dirt shows rather thinly scattered evidence of occupation: baked clay lumps, ash, charcoal, and animal bone. The surrounding soil type, an orange-brown clay loan, resembles that of Sac-168. Two test pits dug in 1952 yielded no further information.

Soils and Midden

In the profile of the Sac-168 deposit, four strata are apparent (see Fig. 1). (1) a sterile alluvial clayey cap from 0-6" thick; (2) a layer of soft black midden with ample evidence of occupation (charcoal, animal bone, shell and organic material, as well as several flexed and cremated burials); (3) a distinctive light-tan hardpan from 3-30 inches below the surface (this cemented layer lay deepest on the upper slope of the mound, and the cap approached the surface at the mound's outer edge); and (4) a compact dark-brown, sandy-clay midden containing scattered artifacts and extended burials and little or no charcoal. This fourth layer changes gradually into the sterile yellow-red sandy clay subsoil at a maximum depth of 66 inches in grid square, 7-N11/8-N11 on the steepest slope of the mound.

Stratum 2 forms Component A, while strata 3 and 4 are referred to as the B Component. The components are culturally as well as stratigraphically distinct.

Both aboriginal and recent events had heavily disturbed the mound. Several late prehistoric pits originating in the black midden had intruded into the lower brown one. Intact burials seldom occurred in the brown midden. The graves of several individuals overlapped earlier remains, which had been broken and scattered by succeeding grave diggers before the hardpan had begun to form.

The black midden, Component A, possessed soft, slightly "greasy" textured soil heavily charged with organic material characteristic of Hotchkiss sites (Beardsley, 1954). The color and texture of the B component of Sac-168 corresponds closely to that described for SJo-56, SJo-68, SJo-142 and SJo-112. Several important features of Windmiller mound structure and mortuary complex occurred: (1) the hardpan cap over a compact, brown, sandy-clay midden, (2) prone, fully-extended interments oriented to the southwest, and (3) a distinctive complex of grave goods (Heizer, 1949).

Excavation revealed the outlines of grave pits at the bottom of the B component midden, where darker midden fill stood out strongly against the yellow-red pit walls of burials nos. 4 and 24. In burial no. 9, a softer dark-brown grave fill outlined a faint pit in the lighter, compact mound material. The undisturbed extended burials typical of the Windmiller Culture in and under an unbroken hardpan layer between 10-24 inches thick suggest the hardpan developed sometime after the early, but before the late, occupation. "Negative evidence" such as absence or very slight occurrence of food debris, charcoal, feature structures (hearths, storage pits and shelter remains), artifact manufacturing waste, and shallow depth of deposit, suggest that the brown midden does not represent an occupation accumulation.

The presence of food preparation paraphernalia, such as mortars and pestles, may be taken as positive evidence that some habitation of the mound during the formation of the brown midden did occur. The presence of living debris, animal bone, baked clay and unassociated artifacts, in larger amounts than found in most other Windmiller sites supports the conclusion that a group of people lived on or near the mound during both phases of its formation.

Description

The excavated material separated into two readily-discernible components: the later black midden, Sac-168A,* and the earlier brown midden, Sac-168B. The top of the hardpan layer formed a striking stratigraphic division between the two.

Brown Midden, Sac-168B

The hardpan and compact brown midden, Component B, yielded a total of 25 burials and 8 features (feature no. 7 is probably the skull of burial no. 10 and feature no. 15 the skull of burial no. 4). Five of the features (nos. 1, 8, 13, 14, 16) contained fragmentary human remains and will be considered with the burials (Fig. 2). Three features (nos. 4, 9, 12) did not contain bone and are called "caches." Seventeen burials (60%) had accompanying grave goods. However, the majority of artifacts lay unassociated in the midden, a fact which lends some support to the idea that this was an occupation strata.

Features

Eight features (nos. 1, 4, 8, 9, 12, 13, 14, 16) occurred in the brown midden. All but three contained human bones and will be considered disturbed burials. The other three (features nos. 4, 9, 12) were clearly caches. Feature no. 7 and no. 15 are probably the skulls to burial nos. 10 and 4 respectively and have been included in the discussion of those two burials.

Feature no. 1 lay 28 inches below the datum plane (the top of the hardpan) and represents six charmstones associated with human ulna and radius fragments. Three of the charmstones had asphaltum impressions of two-strand s-twist

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* [Editor's note. With the permission of Dr. Ragir the lengthy text description of the "black midden, Sac-168A" and its burials and artifacts has been omitted. This component (Sac-168A) of site Sac-168 is assignable to the Hotchkiss Culture. Dr. Ragir identifies these Hotchkiss phases at the site: Phase 1 (1400-1500 AD), Phase 2a (c. 1500-1700 AD), and Phase 2b(1700-1750 AD). Bennyhoff (1961) has proposed the chronological subdivisions cited above. Until such time as Dr. Ragir's analysis of the site Sac-168A data can be published, it will be filed as No. 421 in the manuscript collection of the Archaeological Research Facility. As an indication of what was recovered from the black midden of Sac-168A, the reader may consult Tables 3-8].

cords probably used to suspend them. All three of the B1b3 charmstones occurred with this disturbed burial, along with three type B1b2 charmstones.

Isolated skulls represent six of the features (nos. 7, 8, 13-16). Burials in the brown midden were so incomplete that it is doubtful whether any of these skulls represent trophy heads. It may be noted that burial no. 25 is only a skull, mandible and scapula, while seven other incomplete burials lacked skulls. As mentioned earlier, there is little doubt, that feature no. 7 is actually the skull from burial no. 10 and feature no. 15 that of burial no. 4. Feature no. 13 represents an isolated skull with two Haliotis ornaments (one type C.(2).1.a and one fragment which may represent type B.1.).

The field group excavated feature no. 8, another isolated skull with incomplete closure between sagittal-coronal sutures, -24 inches from the datum plane in the brown-sandy midden. No artifacts accompanied this skull, or the other three skulls (feature nos. 13, 14 and 16).

The three caches each contained only one class of artifact or object. Feature no. 4 contained a cache of 25 white quartz pebbles, 20-30 mm in diameter. The cache, measuring nine inches in diameter by five inches deep, lay in the brown sandy clay midden about 45 inches below the disturbed surface and 13 inches below the datum plane.

Feature no. 9, at a level about 46 inches below the surface (well below the hardpan), contained an accumulation of 14 baked clay objects. One very large, unshaped object about 15-18 cm across flanked the other smaller unshaped pieces, smooth fragments, discs and balls. Feature no. 12 consisted of a cache of four charmstones found 24 inches below the surface of the hardpan. Single examples of types A1b, A2a1, A3b, and A3c are represented.

Burial Complex

Several specific aspects of the burial complex are discussed: (1) burial posture, (2) orientation of the skeleton, and (3) mortuary offerings. Table 10 treats burials associated with artifacts. The discussion in the text covers burials without associated artifacts.

Burial Posture and Orientation

Twenty of the burials lay fully extended in a prone position: four burials (nos. 15, 17, 22, 27) lay extended on their backs; and one lay on its side (burial no. 9). Excavators found 24 of the interments oriented west to southwest and only two (nos. 14 and 27) oriented in directions other than west. (Table 9).

Five of the burials (nos. 14, 15, 17, 22, 27) appeared at variance with the extended, ventral, southwest oriented pattern of the Windmiller Culture in at least one respect. All the variant burials were interred with grave goods. The field crew identified one individual as probably male (no. 27), and one as female (no. 17) and left the rest unknown; four interments were adults and one (no. 22) was adolescent. Nine burials without grave goods lay ventrally-extended and were oriented south-westerly; four were too disturbed to obtain orientation. To date the reasons for these variations in burial positions have not been understood, and mortuary offerings do not seem in any way correlated to burial position in this site.

Mortuary Offerings

Seventeen of the burials from the lower midden yielded human skeletal remains. Only four burials (nos. 11, 12, 24) and one feature (no. 1) had four separate items. Even those interments with *Haliotis* beads (type 1a) rarely had more than six (six occurred with the skull, originally called feature no. 7, called here burial no. 10). Grave goods appeared scarce. Seventeen of the 49 charmstones accompanied 9 burials (4 occurring in caches) while numerous broken as well as whole specimens lay unassociated in the midden (Tables 6, 10, 11).

The skeletons of the two juveniles were accompanied by grave goods. Two square-cut *Haliotis* beads and a unique turtle carapace ornament accompanied burial no. 15, a child between three and six years old (Plate 1). A mortar rim fragment, shaped both inside and out, its rim edged neatly squared (Plate 2), lay near burial no. 22, that of an adolescent. No firm association can be shown to have existed between particular grave goods, age, or sex. Based on the rough sex determinations given in the field, half of the female adults and one-fourth of the males had grave goods. These figures possess doubtful significance in view of the fact that the fragmentary condition of over one-half of the skeletal material made sexing impossible. Of the unsexed material, slightly less than three-fourth had associated grave goods.

Shell beads, *Olivella* 2b (3 specimens) and *Haliotis* 1a (15 specimens), followed by charmstones (17 specimens) and baked clay objects (7 specimens) accompanied burials most frequently. Artifacts were concentrated around the head and neck and in the region of the pelvis. Shell beads decorated the head and neck region almost exclusively, while charmstones lay in the pelvic region, often between the legs. The four chipped points occurred around the legs and middle body.

Grave Pits

The inhabitants of the mound during the Windmiller period prepared a grave pit to receive the body. Burials nos. 4 and 9 lay in clearly outlined pits. The nature of the deposit made it impossible to estimate the depth of the grave; the lack of grave markers made pit origins impossible to trace. Several later burials cutting through earlier interments suggested that graves were unmarked. For example, burial no. 29 may have disturbed burials nos. 26 and 28; the skull fragments beneath no. 29 could have belonged to burial no. 26.

The prehistoric diggers apparently threw the original bones back in with the grave fill, a practice which probably accounts in part for the presence of disassociated, often fragmentary, human bones and artifacts. Grave digging, however, could not account for all the incomplete or disturbed skeletons. All Windmiller sites have produced some incomplete skeletons (Heizer, 1949:15).

Material Culture

Shell Beads

Shell occurs infrequently in the lower midden and only in finished form. Shell beads made from *Haliotis* (sp.?) and *Olivella biplicata* accompany only five and three graves respectively. Only two types of beads occur with burials: *Olivella* type 2b (burial nos. 4, 13, 14) and *Haliotis* type 1a (burial nos. 10, 11, 13, 15, 28. See Table 2). An *Olivella* type 1b bead and a *Haliotis* type 4 bead (large disc with central perforation) lay unassociated in the brown midden. Both types are typical of the Cosumnes Culture and may indicate a short transitional Windmiller-Cosumnes occupation.

Haliotis Shell Ornaments

Only two *Haliotis* ornaments occurred with early burials, while four specimens (types B, C, and H) were recovered unassociated in the upper 36 inches of the brown midden (Table 3). Central perforations occur on two specimens. The type B.1.n. specimen is made from *Haliotis cracherodii*, while the H.3 pendant is made from *H. rufescens*; the others have ground backs.

Most examples occurred in the upper part of the brown midden. All but one came from the -0-24 inch range, generally within the hardpan layer. These ornaments may therefore have represented transitional types or, more likely, specimens from disturbed burials which were scattered in the upper grave fill of later burials.

Charmstones (Plates 1, 2).

A relatively large number (49) of charmstones (Table 12) were recovered from the lower midden, both unassociated and associated with the B component burials (Table 4 and Table 9). Among the 18 types of charmstones, A1 and A2 occurred most frequently, nine and seven times respectively. The site contained the largest variety of charmstone forms of all of the Windmiller Culture sites. Nine burials (30% of the graves) contained 17 charmstones, representing 8 charmstone types. Feature no. 1(a disturbed burial) contained six charmstones of two related types (three B1b3, three B1b2). Feature no. 12 was a cache of four charmstones of four different types (A1b1, A2a, A3b, A3c).

All Sac-168B charmstones have a biconical perforation at one end except for those fragments broken presumably below the perforation. Some of the perforated ends have traces of black asphalt with cord impressions leading from the hole to the tip, especially in types A1, A2, and B1b2. They seem too heavy to be worn as pendants, but the cord impressions and an occasional groove ground from the perforation to the tip imply hanging of the objects (Table 13). The charmstones show no evidence of rough usage, and probably served some ceremonial function.

Three broken charmstones of Phallus form (E1 and E2) occurred unassociated in the brown midden; all are made of blue schist (Pl. 2m, o).

Ground Slate Pencil

Burial no. 24 produced the only ground slate object found in the lower portion of the site. It is 174 mm long by 12 mm in diameter with a shallow groove near one end.

Steatite Bowl Rim Fragment

A steatite bowl rim fragment not previously described has disappeared from the museum collection. Field notes report it recovered -12-24 inches below the hardpan in square 7-N11.

Mortars

The literature described only four mortars from the Windmiller Culture collections, two from SJo-68 and two from Sac-107C (Heizer, 1949:20). A total of 13 mortar fragments came from Sac-168B; ten were firmly located in the brown midden unassociated with any burials; one lay near and possibly associated with burial no. 22; the other two lacked provenience. The rim and wall fragments (9) have work both inside and out, with one exception.

Mortar rims, body walls and bottom fragments, made from sandstone, granite and basalt, ranged in thickness from 77 mm to 21 mm. The thinner sherds are usually composed of the softer stones. Over half the specimens are between 30 and 50 mm thick. Three specimens (cat. nos. 1-34037, 1-65115, 1-65114) have square-angled rims carefully worked inside and out; the rest have rounded rims. A fragment consisting of almost half of a basalt bowl (cat. no. 1-65127) found -26 inches below the hardpan may have been part of a circular bowl slightly thicker along the sides than at the bottom. Traces of red ochre occurred on the inside (Plate 7c). Two wall fragments and one of the angular rims found on the surface of the red-clay subsoil suggest that the subsoil-transition layer was at one time the surface of the site and was at least occasionally inhabited.

Pestles

Food preparation implements rarely occur in Windmiller Culture sites. Heizer (1949:20) reported only two pestles from Sac-107C. One granite pestle fragment and one spherical schist stone (perhaps used for grinding) came from Sac-168B. One fragment lay in the subsoil transition some 60 inches below the surface. The second specimen (cat. no. 1-71729) now missing from the collection, is reported as from the hardpan 12 to 24 inches below the surface.

Quartz Crystals

None of the interments included quartz crystals among their grave goods. Eleven unassociated crystals, however, came from the brown midden. Six small specimens found -12 inches below the hardpan range between 10 and 20 mm in length, one is about 30 mm long and two specimens are 37 and 27 mm in length. Two very large crystals with one end ground (51 and 70 mm long) lay 28 to 30 inches below the hardpan.

Flaked Stone Implements

Chipped implements, projectile points, and knife blades accompanied only four burials, the balance lay scattered throughout the brown midden. The typology of chipped implements (Fig. 3) follows that of Heizer (1949: Fig. 11a) with some modifications. Specific items fit into 7 broad classes based solely on gross morphology. In this report, all items have been classified according to both the modified and the older classifications (Heizer 1949: Fig. 11), because all comparative material used the original type terms. Stone artifact typology has existed in a state of flux for many years; therefore, all whole specimens and typeable fragments, have been illustrated to facilitate their reclassification and comparison to other collections. Type 3b (originally NAb_3) a hollow-based, leaf-shaped point occurred with burial no. 26. The other burials yielded knife or point tip fragments. An obsidian knife lay in the hardpan-brown midden transition 28 inches below surface.

Obsidian, slate and occasionally basalt and chert occur in the point collection. Points range from 96 to 36 mm in length (averaging between 40-50 mm), and 37 to 12 mm in width (about 20-30 mm average), and 11 and 3 mm in thickness (an average of about 5-10 mm). The largest specimen, a common Windmiller type (5a) made of chert, lay in the stream-disturbed portion of the midden (Table 14).

The flaking of all the points (Figs. 9-12) is excellent and occurred on both sides of the specimens. Flake scars, predominently ribbon-like, continue diagonally about halfway across the blade. Obsidian accounts for just under 50% of the material used; slate for about 25%; chert and basalt for 12%, and crystalline quartz for about .5%. Type 3b, common only in SJo-68B and absent from three of the six Windmiller culture sites, is represented by only one specimen in Sac-168B. Perhaps this type occurs primarily in the early Windmiller (Phase 1, for which, see Chapter IV). Burial no. 26 in which the Sac-168B specimen occurs is the deepest of the Windmiller burials lying -34 inches below the datum plane. Burial no. 26 also contains a small baked clay pot stained with red ochre. It may represent an earlier Windmiller phase than the other Sac-168B burials.

Scrapers

Scrapers (Figs. 12-14) non-formalized flakes, and chucks and cores with scraper use or retouch along one or more edges lay scattered through the midden. Of the 12 scrapers in the Lowie Museum collection, 5 had no provenience, one came from the black midden and 6 from within or below the hardpan. Two of these 6, a scraper on a split pebble and a chopper, lay in the subsoil-midden transition.

Heizer noted no scrapers from SJo-107C, SJo-142 or SJo-56 (1949). Olsen and Wilson (1964:21) reported some informal chert flake scrapers from SJo-112.

Utilized Waste and Debitage

Either four or five (the position of one piece is in question) utilized pieces, one chert, and obsidian occurred in the brown midden (Fig. 13).

Twelve unworked flakes and fragments occur in the Lowie Museum's collection; one of quartz, six of obsidian, three of chert and two of granite. The two complete flakes have side struck, plain platforms.

Quartz Pebbles

Feature no. 4 consisted of a cache of 25 white quartz pebbles which ranged between 30 and 40 mm in diamter. The quartz pebbles mentioned in the field notes accompanied burial no. 19 in large numbers along with river mussel shell (*Anodonta*?).

Antler Artifacts

Only two worked pieces of antler occurred in the brown midden. These are tentatively identified as flakers. One piece of tine measures 70 mm in length and has scratches along the side near its blunted point. In fashioning the second specimen, the manufacturer had cut the base of an antler obliquely 75 mm up from the bottom, perhaps to facilitate its use as a wedge. The base appears battered.

Turtle Carapace Ornament

One thin ornament of turtle carapace accompanied burial no. 15, that of a child from three to six years. The remaining section of the broken ornament resembles the Haliotis ornament type FH (Lillard, Heizer and Fenenga, 1939:17), a trapzoid shouldered near the widest end and expanding to a squared base from the constriction. It is 32 mm long, 16 mm wide and about 2 mm thick.

Baked Clay Objects

Eighty-two baked clay objects, the most numerous variety of artifact from the lower midden, consisting predominantly of unshaped (40) and smooth fragments (42), were scattered throughout the brown midden (Table 8). Excavators found 14 clay pieces piled together in feature no. 9. No evidence of a fire or a burial accounted for the cache (the charcoal and ash may have been leached from the deposit). One disc fragment (cat. no. 1-5159) 82 mm in diameter and 44 mm in thickness has three deep pits the diamters of which approximate that of a pencil. The pits look as if the manufacturer stuck a small stick into the soft clay before firing.

In the lower brown midden, seven baked clay objects accompanied five burials. Burial no. 17 contained one clay ball, 80 mm in diamter. Burial no. 12 held two smooth fragments and an unshaped clay object. Burial no. 27 contained one clay disc. A clay bowl fragment (84 mm wide, 42 mm deep and 23 mm thick) accompanied burial no. 26, traces of red ochre pigment staining its inner wall. Five bi-conical and two grooved, pecan-shaped pieces came from the brown midden, ranging from 15-28 mm in diameter and 23-49 mm in length (one from burial no. 10).

Evidence for Basketry and Cordage

The baked clay objects exhibit impressions of twined basketry (3), cordage (10) and incising (4). The basketry impressions resembled those illustrated by Heizer (1949: Fig. 5f) from SJo-68, although the impressions do not cover as large an area. Heizer (1949:29) identified the technique of basket making as close-twined. One disc has very clear fingernail impressions. Impressions in asphalt on the end of five A2 grooved charmstones and one B1b charmstone attested to the existence of fine, two-ply twisted string.

Warfare and Head Taking

The disturbed nature of the site and the small size of the sample do not permit definite conclusions about associations between skeletons and projectile points. The points either may have killed the persons or accompanied the corpse as grave offerings. Five isolated skulls (burial no. 25, feature nos. 8, 13, 14, and 16) may represent heads taken from war victims, but one could also attribute them to aboriginally-disturbed burials.

Conclusions

Burial position and orientation definitely place the site within the

Windmiller Culture. The percentage of burials with artifacts (60%), although lower than any other Windmiller site described by Heizer (1949:13), still appears significantly higher than the average association in Cosumnes Culture sites, where the figure varies between 25-50%. The percentage of burials with mortuary offerings is approximately equal to that of SJo-68. Charmstone stypes, charmstone material and point types strongly resemble those from Sac-107C which lies six miles down the Cosumnes River. These two sites may have been occupied simultaneously, and represent a distinctive Windmiller temporal and/or regional variant. In any event, the artifact assemblages from these two sites resemble each other more than they resemble the assemblages from other Windmiller Culture sites. A detailed comparison of Sac-168B with other Windmiller components is included in Chapter IV of this report.

Summary

Sac-168 is a small stratified mound comprised of two components. The A component contains material representative of both subphases of the Mosher facies of the Hotchkiss Culture, the initial occupation about 1400 A.D. (Phase 1) and terminal occupation about 1750 (Phase 2a). The B component probably represents a later phase of the Windmiller Culture. The disturbed condition of the deposits makes analysis of associations among artifacts and skeletal information practically impossible.

CHAPTER III

BLOSSOM MOUND, SJo-68

Site SJo-68, a pure Windmiller Culture site, lies in the alluvial plain, 1.2 miles south of the Mokelumne River and 1.5 miles northwest of the town of Thornton (northwest quarter of the southeast quarter of Sec. 32, T. 5N, R.6E, MDB and M, New Hope Quadrangle sheet).

The first excavator, Elmer J. Dawson, gave the site dimensions as 130 by 65 feet, the long axis lying in a northeast-southwest direction. Before the owner scraped 1 to 1.5 feet from the crest of the mound, it rose 3 to 3.5 feet above the valley floor. Heizer reports (1949:7) that the mound rose only 24 inches above the valley floor prior to the first University of California Archaeological Survey[11] excavation, and that it measured 93 by 68 feet.

SJo-68 occupies an unfavorable situation for recent aboriginal settlement, and this is underscored by the fact that surveys show no known recent sites in the immediate area. The nearest fresh water--the river--is 1.2 miles away, and the surrounding country is quite swampy, with tule and brushy vegetation. Prior to flood control, the mound would have been inundated during high water, making habitation of such an area extremely difficult.

Since the last occupation of the site, physiographic alteration by alluvial filling and shifting of water courses has taken place (Heizer, 1949:7). Geological evidence indicates alluvial filling and that the shifting of the river or one of its sloughs from a bed close to the northeastern edge of SJo-68 has occurred. Extensive auger borings by the UCAS in 1947 show that the base of the mound lies several feet below what is now mean sea level, which is also the level of the surrounding alluvial plain. Borings approximately 30 feet northeast of the mound produce river sand from about 4-7.5 feet below the valley floor, rather than the adobe clays found in the south and west. These sands indicate the existence of a fast-moving stream adjacent to the mound during the time of occupation. At that time the mound had access to fresh water and an elevation well above the surrounding land level. As the area was subjected to annual inundations, higher elevation would have been prerequisite for year round aboriginal occupation on the floor of the Central Valley.

Geography and Soils

The recent alluvium in the Mokelumne area occupies tracts that range in altitude from sea level to a few feet above sea level (Piper, Gale, Thomas and Robinson, 1934:34). In this part of the delta, stream-borne alluvium becomes more or less intermingled with tidal muck or peat. Before the government built levees along a majority of the Delta channels 80 years ago, the major streams would normally overflow the banks at high stages, and tidal marshes would intermittently cover all the land. Prior to reclamation, a dense growth of tule (Scirpus lacustris), with a fringe of willows and other woody plants along the slightly higher stream banks, covered the entire area (Weir 1950:37). The peat profile, as deep as 30-50 feet in some places, is composed of the remains of plants very similar to those growing on the surface at the present, and this indicates that surface topography has remained relatively constant over a long period (Ibid). However, in times past knolls or rises relieved the essentially level terrain.

Several lines of evidence, geologic and cultural, suggest that rapid alluvial sedimentation of this area may have begun just after or during the SJo-68 occupation. Stearns' (1930:32) calculation that the rate of accumulation equaled one foot of peat each 75 years,[12] and the fact that nearby delta areas contain layers of peat 50 feet deep yield a conservative estimate of 3,750 years of peat formation since the end of the Altithermal, the approximate time of the abandonment of SJo-68.[13]

Thus, the present topography of a sea-level flood plain has evolved since man occupied this region (Heizer, 1949, p. 12). Heizer (Ibid) follows Stearns' explanation of the topographic change, assuming "isostasy and the depression of land levels [adjusting] to sediment load thus maintaining the constant land level" (Ibid). Aborigines probably selected the site of SJo-68 because of the natural rise of the ground, and the abandonment of the site resulted from the progress of alluviation to a point where the mound no longer provided protection against periodic flooding, a condition assumed to be characteristic of the Medithermal.

The selection of raised ground for habitation and burial areas suggests an ancient environment and a cultural response resembling, but not necessarily identical to, that prevailing during the late prehistoric and early historic times. On the other hand, the Windmiller Culture groups may have chosen natural elevations as village or burial sites for better drainage, good visibility, or for reasons not now understood.

The cultural deposit of SJo-68 rests on a red-yellow sandy clay or adobe natural ridge, possibly a part of the levee of the ancient river channel which runs 30 to 100 feet to the north of the mound base. This red adobe and the fine silt and sand of the river bed rests in turn on a blue-gray clay of unknown depth (cf. Piper, 1934:37). To the west of the mound, the recent alluvium, a light reddish-brown sandy loan, lies directly over the blue clay deposit. Around the edges of the mound the recent alluvium, also covers the yellow-red clay of the ancient levee and the dark compact occupation deposits.

The mound, largely a sub-surface feature, exposes only two of its roughly six feet of deposits. A large area of the mound deposit, especially to the west, extends out beneath the present surface of the alluvium. Neither Dawson or the University of California, Berkeley, excavated this buried part of the mound.

Climate

The Delta lies in an area of moderate temperature and rainfall (12-20 inches), where most crops require irrigation (Weir, 1950:41). High evaporation, on the average of 2,000 mm per year, and low precipitation, 300 mm per year, cause almost continuous movement of moisture from watertable to surface. The high evaporation prevails even in winter. Salinization and calcification of the ground water take place to the extent permitted by the parent material of the deposit. Deposition of these carbonates and salts near the surface forms a calcareous hardpan over the cultural deposits of the Windmiller components (Setzer, 1947:67).

Midden Profile

The midden profile (Fig. 4) of SJo-68 consists of 65 or 70 inches of calcareous accumulation of refuse, with burials occurring at depths of 6 to 66 inches from the surface.

The deposit contains four fairly distinct strata: a loose topsoil cover not more than 6 inches thick underlain by an extremely compacted cement-like occupation "hardpan";[14] a thick layer of compacted brown midden; and at the bottom the sterile red-yellow clay of the basal mound structure.

The hardpan layer, deepest at the center and to the east, thins out to the west. Not a homogeneous component, it separates into three discontinuous layers. The first, or upper hardpan, forms a continuous cover for the entire surface of the exposed mound. A softer, dark soil underlies this cement-like cap from 12 to 18 inches below the surface, rarely more than 8 inches thick. This soil grades into a discontinuous second or lower hardpan, less cemented than the first. Excavation notes mention the second hardpan in the western half of the mound, around its northern and southern edges, but not to the east. In the center of the mound, this second hardpan may mark the base of Dawson's pits 30 to 36 inches below the surface. Dawson mentions a second cemented layer which he did not penetrate (Dawson, field notes, 1923:24).

Below the second hardpan lies about 30 to 36 inches of compacted (but not cemented) medium- to dark-brown cultural deposit, which thins from east to west. The profile along the north-south lines of trench A-B (see site plan, Map 3) in the western third of the mound, shows between 6 and 8 inches of the first or upper hardpan, 6 inches of soft dark soil, 6 inches of the lower or second hardpan, and about 34 inches of brown midden.

At the corner of square K/N-2 in the eastern third of the mound, the profile consists of about 5 inches of sterile topsoil followed by 15 inches of top hardpan, 12 inches of softer soil, 18 inches of the second hardpan, and 37-47 inches of soft mound deposit containing considerable ash and baked clay debris. At this corner the red clay subsoil lies 87 inches below the surface. This greater depth of the eastern half of the deposits appears to be partially due to the dipping of the mound base. More intensive use of the eastern edge of the mound, which had been adjacent to the river, as a living area may also have caused there greater accumulations of occupation debris.

A series of auger borings taken by Cook and Heizer in 1947 along the east-west datum line and north-south perpendicular to about 80 feet east of the west datum give a general cross-section of the mound without distinguishing the first and second hardpans. Only part of the detailed stratigraphy can be reconstructed from the burial records. Dawson only hints of a division in the hardpan layer in reports of his 1923 excavation, and Heizer (1949), in his pre-1947 excavations near the center of the mound, does not mention in his notes this second cemented layer.

Heizer's field notes from the 1947 season record that

> ....the surace hardpan is not nearly so hard near the east end of the site from about 70 feet along the east-west datum line except on the north and south edges (lower slopes). The second hardpan continues on the lower slopes of the northeast and southeast edges.
>
> The east end of the site from about 70 feet east shows a difference in the nature of the mound mass. The lower levels are soft (mostly below water level) and have more ash, animal bone, and baked clay than the more westerly part of the mound. This lower level also has no deep burials. The lower eastern section of the mound may represent a living area.

Some midden may have been destroyed by scraping prior to 1923. Although Dawson makes no mention of skeletal material or Indian artifacts uncovered during the supposed scraping process, he includes in his notes that many artifacts were found at or near the mound's surface. Treganza notes one flexed burial above the hardpan in testpit C of his 1946 excavation.

Intensity of Occupation

At SJo-68, ash concentration and the relatively high incidence of unworked animal bone, shell, stone fragments, and smooth and impressed baked-clay fragments give good evidence of intensive occupation (Heizer, 1949:12; Heizer and Cook, 1949; Setzer, 1942). Occasional whole or broken artifacts including mortars, pestles, stone points, point fragments, bone awls and other bone artifacts, are found unassociated in the deposit.

The midden of SJo-68 differs from that of later cultures in its lack of charcoal, and in the relatively low incidence of animal bone, fish bone and shell (especially the fresh water species, Anodonta margaritifera).

Age

Heizer (1949) suggests an age of about 4,000 years for the Windmiller Culture.

> It is not unreasonable to propose that the four sites herein discussed [~~SJo-68~~, SJo-68, SJo-56, SJo-142, and Sac-107] may have been occupied a millenium before the Middle horizon culture blossomed, and a 'date' of 2,500 B.C., is tentatively advanced for the early horizon (Heizer, 1949:39).

Although comparative bone chemistry is extremely limited in usefulness this method supported Heizer's estimate of an approximate 4,000 year antiquity of the Windmiller Culture (Heizer and Cook, 1939: Table 13). Radiocarbon dates on wood charcoal and burned human bone also confirm the estimate.

In 1957, Heizer (1958:2) sent two combined samples of charcoal collected from the mound matrix to two laboratories for dating:

> C-440 & C-522 (combined sample). Two small lots of charcoal screened from the midden mass of this Early Horizon site provide a direct date for this culture period. Of the several sites [Sac-107, SJo-142, SJo-56, SJo-68] known of this period, SJo-68, from which sample C-440/C-522 comes, is believed to be the latest (Heizer, 1949, p. 34).

Sample M-645 consists (like the original sample, No. C-440/C-522) of a screened sample of small bits of wood charcoal from the midden between 24 and 60 inches below the surface. Sample M-646 contains one lot of calcined human bone from a cremation, but as Dr. J. B. Griffin states, "The specimen did not fill the counter, so that this date (3080 $\pm$ 300 B.P.) does not have quite the reliability of that from our M-646 [sic: I believe sample M-645 is meant] of charcoal (Heizer, 1958:2)."

Heizer writes (1958:3);

> Sample M-647 was a large batch of calcined human bone from a cremation, and Dr. Griffin's opinion is that "this is certainly a more reliable date than for M-646, and I think that ~~that~~ (i.e., M-646) should be more or less ignored in your considering the age of the Early Horizon of the Windmiller Complex."

> A point of interest here is the closeness of dates of two different materials--wood carbon (C-440/C-522 and M-645) and calcined and carbonized human bone (M-647).
>
> We conclude that there are now three reliable radiocarbon dated samples for this site which are 4052 ± 160, 4100 ± 250, and 4350 ± 250 years old.

Subsequently, four radiocarbon dates were run on bone collagen from four SJo-68 burials: Isotope's sample no. I-2749a from burial no. 23 (cat.no. 12-7571), 47 inches below the surface (Phase 1), dated 3583 ± 110 B.P. Collagen was extracted from the sample by the first method outlined by Berger (1964). Humic acids were not removed from this sample and a rerun was subsequently done on bone from a burial nearby. Isotopes sample no. I-2749b from burial no. 24 (cat. no. 12-7572), 47 inches below the surface (Phase 1), dated 3775 ± 160 B.P. Recent humic acids were removed from this collagen sample by soaking in a cold dilute solution of 2N.NaOH overnight. An increase in age of about 200 years resulted from the treatment.[15] Finally isotopes sample no. I-3038 from burial no. 22 (cat. no. 12-7570), 11 inches below the surface (Phase 5) dated 2980 ± 110 B.P. This collagen sample was also treated with the NaOH solution. Thus, if we accept these bone collagen dates, occupation of SJo-68 seems to have taken place from about 2500 to somewhat more than 1000 B.C., a period of about 1500 years. The range seems too large--it is hard to believe the site was occupied even intermittently for 1500 years (see Chapter V). The wood carbon dates range about 300 years older than those on collagen.

Excavations of 1923-24.

E. J. Dawson[16] of Thornton discovered and excavated site SJo-68 in 1923-24.[17] Dawson worked sporadically from May 1923 through at least March 1924 with a total of approximately 15 1/2 days of excavation. He probably did most of the fieldwork himself, although he was occasionally accompanied by other local enthusiasts. He certainly wrote all the notes (5 volumes) on the Thornton area, now on file (Mss. nos. 95 and 96 in the University of California Archaeological Research Facility files) but he left only a sketch of the mound (Map no. 6, which is a duplicate of the original), and gave only an approximate idea of the total number of burials found. No photographs exist of the original mound, Dawson's excavations, or the "in situ" artifacts. Dawson's notes form the basis of the following discussion.

Dawson reported the skeletons in graves as largely undisturbed and extended, with their head to the west and feet to the east. In their abundance, burials lay touching each other. Unexplained disturbances of the deposit or of the bodies prior to burial had caused the loss of various skeletal parts. The northeast corner of the mound contained the most fragmentary skeletal material. The ground appeared unusually hard, and Dawson needed a pick to loosen the dirt around the burials.

He took much of the material, especially shell and bone artifacts, to his home, where he must have spent literally hundreds of hours hand-cleaning, counting, and stringing _Olivella_ and _Haliotis_ beads. Except for grave lots nos. 15 and 16, each of which consists of a single complete adult and a fragmentary infant skeleton, and grave lot nos. 5, 32, 34, 47, 74, 75, which contain isolated skulls with few artifacts other than beads and shell discs (no traces of post-cranial skeletal material occur), Dawson's grave lots represent single interments and their accompanying mortuary goods. No complete skeletons come from areas immediately surrounding isolated skulls in the northeast tip of the mound. It is suggested that these skulls represent war trophies or sacrifices (Heizer, 1949:26).

The UCAS 1947 excavation notes mention occasional skull-less burials (burial nos. 11, 38 and 93; evidence of recent digging occurs near burial no. 93, in the northeastern section of the mound).

The largest cache of skulls (Dawson's grave lot no. 75), contained about 10 to 15 skulls, skull fragments and occasional upper vertebrae. Immediately adjacent to grave lot no. 75, lay grave lot no. 74 containing about five skulls. Grave lot no. 34 contained two or three skulls. The other grave lots contained only one skull each. Literally thousands of _Olivella_ spire-lopped beads (1a) accompanied grave lot no. 75. Grave lot no. 74 contained over 150 _Haliotis_ type B.1 ornaments in addition to B.2, C.(2) and C.(1) _Haliotis_ shell ornaments. The UCAS excavation did not extend to this north-eastern corner of the mound. To have excavated here would have meant sorting through Dawson's reburied skeletons and backdirt.

Dawson mentions a tendency for burials to cluser at about 12 to 24 inches, with fewer occurring at about 30 inches. Only three of Dawson's come from below 30 to 36 inches. Dawson reports that some portions of the mound yield hardly any skeletons and that higher burial frequency occurs toward the center. Although the notes of the 1947 excavation do not mention clustering among burials in the upper 36 inches, the laboratory analysis of material from the 1947 excavation allows corroboration of both observations. The center of the mound contains a greater concentration of burials at all levels, and in general the hardpan yields a greater number of burials than the subhardpan midden. Some confusion exists as to the total number of burials excavated by Dawson. He states in his original field notes he found a total of 75 to 80 burials. Dawson lists 40 of these burials in his "group lot" finds (Schenck and Dawson, 1929). Sixty-six burials with grave goods appear in Dawson's original field notes, although only about 40 involve multiple grave goods. Nine burials have artifacts nearby but not necessarily associated. The fact that practically 100 percent of the interments have grave accompaniments suggests that the non-accompanied burials went unrecorded. Only 60 percent of the UCAS burials contain grave goods.

To give some idea of horizontal provenience, Dawson refers each grave lot to one of nine sections labeled "Center," "Southeast," "West," "Southwest," "North," "South," "Northeast," "East," and "Northwest." However, Dawsons' excavation barely covers the north-central and northeastern portions of the exposed mound (cf. Map 7). Thus, all graves except those in Dawson's "West," "Southwest," and "Northwest" sections are considered to come from near the northern UCAS trenches K-O/S1,N1-2. Dawson's "Western" graves are probably from the area of UCAS trenches F-J/N1-3.

Dawson's notes list the exact depth of the more important burials; otherwise graves are recorded in one-foot levels below the surface.

UCAS Excavations, 1938-1952

In February, 1938, R. F. Heizer and G. Hewes uncovered burial no. 1 of the University of California collection in a test pit. A skull cap also lay imbedded in the hardpan layer (feature A). Cleaning uncovered a few Haliotis beads (type 1a) inside the skull, which may have been used as some kind of container. Heizer and Hughes noticed more bones below the burial, and planned further excavation.

In June and July, 1938, the Archaeological Survey of the University of California carried out further excavations of the site. Notes include the description of two pits, A and B (5 x 7 feet and 20 x 2 feet, respectively), containing twelve burials and one cache of bear bones (Feature B) excavated in one-foot levels to the water table which then lay about 46 inches below the surface (Map 3).

In September, 1941, the Archaeological Survey, working over a weekend, excavated a pit containing four burials. In July, 1946, A. Treganza, collecting soil samples from a series of sites in the Delta area for chemical analysis (UC-ARF ms. 267) recovered six burials from SJo-68. Treganza reports one burial from the upper portion of the hardpan of Pit A, and two more below the water line at the base (ca. 60 inches) of the mound. Pit B, in the center of the southern edge of the exposed mound, contained no burials.

Treganza's notes refer to a disturbed burial on top of the hardpan layer of Pit C, at about 13 to 14 inches, a second in the hardpan, and a third just below the hardpan layer. Data sheets exist for only four of Treganza's six burials, and these four are included in the analysis.

The high water table in the mound prevented sampling to the base of the site. Treganza took sub-mound samples in the four cardinal directions at about 10 feet from the exposed mound with a five-foot long core auger. The mound apparently drops off rapidly to the north, south, and east. The auger boring to the west revealed about four inches of hardpan just under the surface, and a yellow subsoil at 59 inches.

From the end of June to the end of August 1947, a UCAS field party including A. Miller, D. Lawford, J. Bennyhoff, W. Y. Adams, R. Greengo, A. Pilling, and supervised by R. F. Heizer, financed by a University research grant, excavated SJo-68. Partitioning the site along its long axis, the excavators marked off an east-west datum line. Datum points lay 20 feet to the west and about 16 feet east of the exposed mound along the long axis. A grid of five-foot squares provided horizontal control. Starting from the northwestern edge of the exposed mound, excavators dug trenches in one-foot levels. They proceeded from west to east until they encountered previously disturbed portions of the site. For the sake of convenience, the present writer has grouped the grid squares into 12 sections from east to west, Trenches A-E, F-J, K-O (the west, middle, and eastern thirds of the mound respectively); and from north to south, squares N3-4, N1-2, S1-2, and S3-4. The southern trenches, S3-4 were not excavated. As the excavation proceeded, back dirt filled in the previously excavated areas.

Working below the water table created a problem in vertical control; the inability to drain the site even temporarily hampered excavation. Digging had to stop just below water level, and probes located burials in the bottom few feet of deposit.

Undiscovered burials presumably remain in the sections of the mound which lie beneath the alluvium to the west and perhaps below 36 inches in the sections dug by Dawson. However, Heizer's notes and UCAS records indicate that few deep burials were found beyond 70 feet east of the west datum. High water conditions may have obscured some burials below the water table. The UCAS 1947 group uncovered a total of 84 burials and 23 features (Figs. 5-8).

In the summer of 1949, a section of a summer field school class supervised by A. Miller, excavated burials from the southeastern section of the mound, the upper levels of which were previously dug by Dawson.

In 1950, A. Pilling and M. Baumhoff collected carbon samples from the southeast section of the mound. Heizer and Treganza found one burial in 1956 while engaged in an attempt to secure sub-hardpan charcoal for radiocarbon dating. No further excavation has occurred at this site to date.

Various people have made sex and age determinations on the University of California skeletal material. Dr. Ingrid Brabender carefully studied a total of 154 individuals from SJo-68 ms.(1963) for evidences of pathology and skeletal abnormalities. James Cadien, graduate student and teaching assistant in Physical Anthropology, reclassified the material according to sex and age (Appendix C).

Due to student turnover and to the considerable amount of material to be reviewed, the SJo-68 collection has remained unreported except for two short resumes (Heizer, 1949a; Lillard, Heizer and Fenenga, 1939) for nearly 20 years. The problems of analyzing the collection have increased with time: pieces loaned from the collection have not been returned, the original field notes are no longer complete; and more important, valuable impressions obtained during excavation have been forgotten.

Fauna

The 1947 excavation recovered, identified and grouped by horizontal and vertical provenience, whenever possible, mammal, bird and fish bones, presumably food debris. In 1952 May Lou Perry, a student in the Department of Palaeontoloy, University of California, Berkeley, identified the animal bones from the 1947 University of California excavation. Appendix A, adapted from Perry's data, identifies animal remains from the site and gives tabulations of juvenile and adult specimens for each of the different parts of the skeleton.

The animals most frequently represented in the midden are elk, deer and antelope (Cervus nannodes, Odocoileus, Antilocapra americana). The midden also contains remains of many birds, most unidentifiable as to genus and species. Among those identified, water birds are dominant, especially those fond of swamps and tule marshes: teal, tule goose, mud hen and Canadian honker(Anas sp.?, Anser albifrons, Fulica americana, Branta canadensis), raven (Corvus corax), cormorant (Phalacrocorax) and turkey vulture (Catharites aura). Carnivore remains are sparsely represented by coyote (Canis sp?), otter (Lutra canadensis), raccoon (Procyon lotor), badger (Taxidea taxus), beaver (Castor canadensis), bear (Ursus americanus?), unidentified rodents and rabbits, ground squirrel (Citellus beecheyi), pocket gopher (Thomomys bottae), jack rabbit (Lepus californicus) and marsh rabbit (Sylvilagus auduboni). In 1952, W. I. Follett, Curator of Fishes, California Academy of Sciences, identified a turtle, Clemmys marmorata (the Pacific pond turtle) and two cyprinid fish, the chub and squawfish (Gila crassicavada and Mylopharodon conocephalus).

Heizer (1949:30) mentions the presence of Pacific salmon (Onochrynchus) and the steelhead trout (Salmo) although Follett named neither in his identification of fish remains (pers. comm. to Heizer, 1952). The fauna found in the mound resembles that which inhabited the Central Valley in late prehistoric and early historic times.

The use of incidental rather than systematic sampling invalidates any conclusions concerning distribution. Heizer's field notes stress a change in mound matrix about 70 feet east of the west datum; he suggests that bone and living debris (baked clay, ash and stone waste) increase to the east of this point. Careful screening during the 1950 testing by A. Pilling and M. Baumhoff revealed a considerable amount of bone from small mammals, particularly rodents. Fish, turtle and large mammals comprise only a small portion of the remains. Small unshaped pellets of baked clay, slightly larger than a grain of rice, constitute the bulk of the material left in the screen after cleaning.

The field party recovered a partial skeleton of a dog(feature no. 26) identified unconditionally by the curator of the University of California Museum of Vertebrate Zoology, Dr. Hall. Only SJo-68 yields evidence of the dog in ancient California (Heizer and Hewes, 1940; Kroeber, 1941). The rare occurrence of the dog in ethnographic Central California and its absence from all Central California prehistoric sites (except SJo-68) have no satisfactory explanation.

The dog remains from SJo-68 consist of a cranium, a mandible, an atlas and several cervical vertebrae, a pelvis, femora and some tail vertebrae. These lie in anatomical articulation so that one assumes that the partly dismembered skeleton was buried still bound by integument (Haag and Heizer 1952:263). Haag and Heizer (Ibid) remark that:

> The dog remains lay at a depth of thirty-four inches from the surface, solidly imbedded in calcareous hardpan, and in proximity to human burials. Indeed, the whole deposit was heavily charged with human skeletons, and it is reasonable to assume that the dog had been intentionally buried. Animal burials are not uncommon in later culture horizons in the same area. (Heizer and Hewes, 1940).

Heizer and Hewes record a total of 13 articulated coyote interments from Hotchkiss culture sites Sac-16, Sac-32 and SJo-66, and from Cosumnes culture sites Sac-99, and Sac-66. The hindquarters from four of these coyote skeletons were, apparently, removed prior to interment (Heizer and Hewes, 1940:601).

Heizer and Hewes (Ibid.) present one explanation of the SJo-68 dog: "It is possible that the burial of dogs where it has been recorded is explicable as a transference from the interment of pet coyotes. . ." Windmiller people interred a coyote skull with SJo-68 burial no. 38, and commonly used coyote teeth as grave goods. The dog at SJo-68, perhaps a chance intruder from the north coast, may have been caught, kept as a pet, and was buried when it died.

Unworked beaver, canid, and artiodactyl remains, as well as a small amount of worked bone, occur in Windmiller graves. The distribution of unworked artiodactyl fragments suggests that they compose a part of the grave fill rather than grave offerings. Deer and antelope long bones occur frequently in feature nos. 6, 7, 10, 12, 27, and 28, and are probably food debris. Half beaver mandibles occur in four burials (nos. 6, 9, 49 and 111). Burial no. 38 contains a *Canis*, probably coyote, skull; while six canines, decorate the neck region of burial no. 86. One bear tooth (*Ursus americanus*) accompanies burial no. 9, while an unassociated bear ulna occurs in square K/N1, and in feature B in the center of the mound. Three University of California burials (nos. 6, 62, and 88) contain bones of various water birds.

Dawsons' group finds or "grave lots" (artifacts found together in a single grave) also contain these same animals, but Dawson did not keep unworked bone. Dawson's worked bone is discussed later in these pages dealing with mortuary goods.

Computer Analysis of SJo-68 data

The size of the SJo-68 collection made ordinary methods of data analysis unwieldy. One hundred and thirteen graves from the University of California 1938-56 excavations, some of them containing double, triple, and even quadruple interments, and 75 grave lots with adequate information for analysis from Dawson's 1923 excavation required analysis and comparison. The 1947 excavation recovered five cremations; and in the northeastern corner of the mound Dawson notes caches of isolated skulls up to 15 per grave lot.

A simple computer program was used to collate the material. Tom Rich, a computer programmer for the University of California, Berkeley, and a graduate student in Palaeontology adapted a program for the material from one used on fairly large populations of fossils. Although not ideal for archaeological purposes, the program provides a means of collating each variable with every other, and of comparing two or more groups in order to test their distinctiveness.

All the burial information was compiled and coded for computer analysis, including variables such as burial position, vertical and horizontal provenience, sex, age, position of artifacts around the body, and the number of various artifact types (see Appendix for list of variables). Each variable has a code position. Each grave lot is considered separately. The number of any particular type of artifact occurring with a burial is placed in the appropriate code position for each grave.

> The program was originally written in FORTRAN IV which performs a number of standard statistical tests on a population. Among the data generated are the correlation coefficients between every pair of variables within a population and the number of individuals which have both variables present (Tom Rich, pers. comm., 1966).

Several statistical calculations test the significant differences between two groups. If the distribution of a large number of variables proves to be significantly different between the two groups, then the groups probably belong to separate populations. In other words, the groups act with regard to artifact styles and grave accompaniments in significantly different ways.

A computer analysis of the type attempted here involved data organization not very different from that used by archaeologists in their original field notes. One describes each burial on a separate sheet with a list of the accompanying artifact types. The description includes burial depths, stratigraphic units, horizontal provenience, position, orientation, sex, age, pathology, and any other interesting details. Coding and the punching and coded data on to IBM cards requires several days. Five cards containing a total of 65 variables held burial information for each grave. The computer prints out results which include specimen counts, contingency tables, and group comparisons. The data analysis took approximately 2-1/2 minutes.

The group comparison resulting from the first computer run suggested an additional division of the materials, the separation of the UCAS burials into two groups, a shallow component (0-30 inches below the surface) and a deep component (30-60 inches below the surface). A comparison of burial data between these components, and Dawson's grave lots, in which the groups run separately, yielded the results discussed below. These results support the view that the shallow and deep burials in the University of California excavation could have come from populations with significant cultural differences, and that a single population could have produced both the assemblages from the Dawson excavation and the shallow burials in the University of California collection. In the description of mortuary goods, graves are further divided into five occupation phases based on charmstone styles and point associations.

The small numbers of artifacts and the small number of graves in which any one artifact type occurs makes a statistical evaluation of associations between variables difficult. The statistical tests in the program, designed for much larger samples, are inconclusive.

Burial Complex

The UCAS recovered a total of 154 individuals at SJo-68 (Tables 15-21). Each grave is assigned a single burial number, although individuals from very disturbed contexts have none. Only 132 individuals have known provenience. The five Windmiller Culture cremations are described separately from the primary interments in a later part of this chapter.

In SJo-68, aboriginally-disturbed graves often lie in the vicinity of fully articulated individuals (for example, burial nos. 26 and 33). Thus the bones from graves disturbed by aboriginal digging constitute part of the fill.[18]

The first foot of mound soil includes six inches of sterile alluvium deposited after the site was abandoned. This accounts in part for the smaller number of graves in the upper foot, while haphazard exploration may account for the small number of graves below the water table.

The computer analysis correlates information on vertical and horizontal distribution. Shallow burials increase and deep burials decrease to the northeast.

Heizer's fieldnotes mention a lack of sub-hardpan burials in the section 70 feet east of the west datum at about the K trench. Twenty-six of the 35 burials from trenches K-O lie within the hardpan layers, from 0 to 30 inches deep (Table 21). Nine lie below 30 inches, four of these in square K-O/N3-4, outside the range of Dawson's excavation at the very northern edge of the exposed mound, two in K-O/N1-2 and three in K-O/S1-2. The picture differs considerably in the central and western sections of the mound: 9 shallow and 15 deep graves comprise the graves from trenches A-E, while 15 shallow and 23 deep graves come from trenches F-J. A change in the mound matrix recorded by Heizer in his field notes accompanies variation in the pattern of distribution from a greater frequency of deep burials in the west to almost no deep burials in the excavated portion of the mound to the east.

The variation of deep burial frequency in the east portion compared to that characterizing the central and west portions suggests a change in mound use differentiating the eastern third. Difference between shallow and deep graves with reference to both burial position and mortuary offerings suggest some cultural change between the lower mound matrix and the hardpan layer.

Pathology

Ingrid Brabender described the pathologies of the SJo-68 population (ms. 1963:1965; and in an unpublished PhD. thesis, 1966). She found 157 manifestations of gross pathologies or anomalies in 85 of 154 skeletons examined. The sample of 85 afflicted individuals consists of seven children, two subadults and 76 adults, with a higher incidence of pathology in females than in males (Brabender, 1963). The following pages outline the pathologies described by Dr. Brabender in her 1963 manuscript. Brabender identified more skeletons as female than James Cadien whose sex and age identifications are used in this report (Appendix C; Table 25 and Table 28).

Arthritis, Degnerative (Hypertrophic) and Traumatic Forms

Table 26 records the incidence of arthritis in the group of a total of 154 skeletons. Arthritis is present in 38 male adult skeletons from SJo-68 (34.2 percent) and 40 female skeletons (45.0 percent). The skeletal material does not reveal cases of arthritis in immature individuals. The 35 cases of arthritis diagnosed from the total of 109 adult skeletons reveals an incidence of 32.1 percent (Brabender ms., 1963:9).

Table 27 shows the incidence of _spondylitis_ _deformans_ (vertebral osteoarthritis) in SJo-68, with the comparative figures for Ala-328. In SJo-68 the number of the cases encountered (65) involves 49.5 percent of the 109 adult skeletons (_Ibid_:10).

Inflammatory Lesions

> Osteomyelitic lesions were found in five cases of 154 skeletons examined. The left mastoid process was involved in two burials [burial no. 32, cat. no. 12-7559 and burial no. 40, cat. no. 12-7592] and the left sinus maxillaris in [burial no. 33a, cat. no. 12-7582]. (Brabender, 1963:13.)
>
> A solid fusion of the vertebral bodies of the 4th and 5th lumbar vertebra was found in [burial no. 68, cat. no. 12-7622]. There is marked bone reaction demonstrable, particularly over the anterior aspects. Individual cat. no. 12-7622 showed nearly

> complete fusion of two lumbar vertebrae with deformation of the vertebral bodies, which could be regarded as the consequence of an infection possibly of a tuberculin nature (Brabender, 1965: 217, translation from the German).
>
> The skull of [burial no. 55] cat. no. 12-7607, showed striking pathological lesions. A complete, irregularly-shaped perforation is seen in the center of the frontal bone. The lesion is longer in the sagittal direction (maximum diameter 35 mm) than in the transverse (maximum diamter 30 mm). The edges of the bone are rough and porous. Beyond this is a zone of fine striations. They probably represent increased vascularity. The frontal bone also bears a second and larger lesion of the left side. It is oval in shape (sagittal maximum diameter 55 mm, transverse maximum diameter 45 mm), separated from the mid-frontal lesion by a strip of bone (minimal width 10 mm), and extends into the left parietal bone. Both lesions have sharp, undercut edges. A third and smaller lesion is found in the right parietal bone. Turning from the skull vault to the base, there is a perforation (10 mm in diameter) of the medial half of the left _glenoid fossa_. The posterior half of the left _ramus ascendens_ of the mandible is missing, leaving sharp, undercut and porous edges at the border of the preserved part of the ramus.
>
> Each defect represented a gross destructive process with no evidence of any healing taking place at any time. No evidence of inflammatory response other than this destruction was noted (Brabender, 1963:13-14).

Brabender feels that burial no. 55 suggests an osteosarcoma. This diagnosis does not attempt to decide if syphillis is present.

> Periostitis occurred in two cases of the total of 154 skeletons investigated. The disease was located at the sacral bone [burial no. 113, cat. no. 12-7330] and the pubic bones [burial no. 20, cat. no. 12-7567] (_Ibid_:14).

Traumatic Lesions

> Fracture of the skull was found in one case [burial no. 33a, cat. no. 12-7582], which showed a depressed, circular, healed lesion at the left frontal-parietal border.

Of the total of 154 specimens examined, fractures of the extremities were encountered in two cases [burial no. 30, cat. no. 12-7578] a healed fracture of the left ulna, and [burial no. 32, cat. no. 12-7579] a healed fracture of the right ulna.

The fossa olecrani of a left humerus [burial no. 85, cat. no. 12-7640] reveals a perforation, with a projectile point in situ without signs of an inflammatory bone reaction. This lack of any osseous reaction indicates death of the individual at or shortly after the sustained injury, however, not necessarily as the primary cause (Ibid:15).

Dental Pathologies

Dental granuloma (abscesses)

Dental granuloma (abscesses were found in 15.6 percent of the individuals of SJo-68 as compared with 7.3 percent for Ala-328 (Ibid:18).

Attrition

. . . the teeth of the people of the San Francisco Bay site Ala-328 show a relatively higher degree of attrition than those of the site SJo-68 (Ibid:18).

Caries

Caries are found in 20.8 percent of the specimens of SJo-68, whereas only 7.3 percent of caries are reported for Ala-328 (Ibid:18).

Other Anomalies

Twelve cases of developmental anomalies occur: three cases of transitional lumbo-sacral vertebra in cat. nos. 12-7575, [burial no. 27], 12-7603 [burial no. 51] and 12-7612 [burial no. 60]; two cases of spina bifida, cat. no. 12-7621 [burial no. 67], sacral; and cat. no. 12-7668 [no burial number], cervical; three cases of perforated sternum in cat. no. 12-7606 [burial no. 54], no. 12-7614 [burial no. 62a] and no. 12-7652 [burial no. 97]; the left occipital condyle separates into two individual joint surfaces in cat. no. 12-7569 [burial no. 21b]; the atlas has two separate joint surfaces for articulation with the left occipital condyle in cat. no. 12-7567 [burial no. 20] (the second surface formed by a spur); the atlas has bilaterally unusual strong transvere procession in cat. no. 12-7597 (burial no. 45]; the spine of one specimen (cat. no. 12-7646 [burial no. 91] shows spondylolisthesis of three lumbar vertebra, L3-L4-L5.

Oblique asymmetry occurs in a child's skull, cat. no. 12-7587 [burial no. 35]. No cases of artificial head deformation occur.

Miscellaneous pathologies

Cat. no. 12-7644 [burial no. 89] has a partial fusion of two ribs, and cat. no. 12-7596 [burial no. 44] has a fusion of apophyseal joints of two dorsal vertebra, without deformities; and a bone-cyst-like cavity in the mandible. The sagittal suture has premature closure in burial no. 57 (cat. no. 12-7609) and burial no. 74a (cat. no. 12-7628), both children between six and twelve. Burial no. 74a also shows malposition of the left upper molar.

A cyst-like cavity occurs in the left iliac bone of burial no. 67 (cat. no. 12-7621) (Ibid:20-21).

The data computed for site SJo-68 show a higher incidence of pathology (55 percent of the entire population) than that found in site Ala-328 (43 percent of the entire population) (Ibid:23).

Age and Sex

J. Cadiens' age determinations (Tables 22-24) for approximately 154 individuals in 113 burials and five cremations from SJo-68 (Appendix C) are based on Vallois' (1960:194) guide lines for aging skeletal material, with some modifications:

Infans I to the eruption of the permanent dentition, 0-6 years.

Infans II from the beginning of the eruption of the permanent teeth to the end of the eruption of the second molar, 6/7-12/13 years.

Juvenis to the almost complete closure of the sphenoccipitalis synchrondrosis and the first appearance of the closures of the vault; it is the period of union of the epiphyses of the large limb bones, 12/13-21 years.

Adultus to the closure (on the exocranion) of at least a third of the sagittal sutures and of at least half of the coronal suture, 21-40 years.

Maturus period of completion of synostosis of the three great sutures of the vault; partial closure of the peri-temporal sutures, 40-59 years.

Senilis completion of closure, alteration of the articular surfaces; marked change of the bone structures, 60+ years.

Singer recommends modifications at the end of Vallois' 1960 paper:

I pointed out about ten years ago, in work on suture closures in various population groups, that one has to be

> even more conservative than Professor Vallois proposes, giving a possible age variation of five years for a particular skull. Of course, you find in a particular population group that the variability of suture closure is so tremendous that if you found one skull and you had a look at his or her suture, you couldn't be quite certain sometimes whether the individual was twenty-five or forty-five (Singer, in Vallois, 1960:212).

Guided by this, Cadien separates the SJo-68 skeletons into only two adult groups: adults, 21-49 years, and old people, 50+ years.

In the University of California skeletons from SJo-68, 16 individuals are infants, 0-6 years old; 9 children, 6-12 years old; 14 adolescents, 12-21 years old; 73 adults, 21-49 years old; and 17 old people, over 50 years old. Twenty-four individuals are too fragmentary to yield approximate ages (Table 28).

Brabender's 1963 manuscript uses Hooton's age categories. The sex identifications differ noticeably between the 1963 and 1966 analyses (Table 25).

Infant burials form just 10 percent (16/154) of the SJo-68 skeletal material. Among North American archaeological populations, 10 percent represents an amazingly low infant mortality rate. A large number of old people (12 percent over 50 years) and adults in their late 40's form another unusual feature of the age distribution of SJo-68. The majority of the population seems to live 40 years, a long life in an aboriginal population.

Table 29 shows a very high percentage over 55 years of age and a very low percentage under one year as compared to the later prehistoric group at Ala-328.

Data from Cook (1947) Snow (1948), Johnston and Snow (1961), and Vallois (1960) yield estimates of comparable aboriginal and modern groups. Cook (1947: 86-87, Table 11) gives comparative longevity figures for aboriginal populations and modern American Indians. Brabender's and the author's data from SJo-68 have been added. SJo-68 longevity figures parallel those of several prehistoric groups (Tables 29 and 30) but not those of modern Indians.

> For six of the aboriginal populations cited in Table 2, estimates of mortality between birth and nine years of age are available. The unweighted mean of these is 19.1 per cent. If the figures are weighted by the numbers of deaths, the mean is 27.6 percent. If we take 20 per cent as generally representing the situation, it is safe to assume that half of these deaths occurred in infancy. (Vaillant's data for the Valley of Mexico show one tenth of the skeletons to have been infants.)
>
> That among aboriginal or primitive populations no more than approximately ten per cent of all deaths are of infants is certainly at

> variance with current conceptions. It is possible that the archaeological data are at fault, either through failure of the tribesmen to bury dead infants or through negligence on the part of the excavators. Neither of these possibilities appears very likely, however, particularly in North America, where infants were generally interred carefully and where the archaeological technique has been quite adequate.
>
> It must be remembered that modern concepts regarding this matter are derived largely from observation of (1) decadent aboriginal tribes which are heavily infected with disease and pushed beyond tolerance economically, and (2) vast and grossly overpopulated areas such as India and China where disease is rampant and where the inhabitants are living on the barest margin of subsistence. Truly aboriginal peoples were remarkably free from infections and epidemic disease (cf. Cook, S. F., Hispanic American Historical Review, 26:320, 1946). Moreover, they were, barring invasions and cataclysms, in equilibrium with the food supply. The factors predisposing to infant mortality, therefore, exerted a relatively mild influence. (Cook, 1947:89).

Cook's statement concerning the low mortality among California Indian infants seems to be somewhat uncritical. The possibility of data sampling errors relative to infant mortality figures is widely entertained. However, the large percentage of old people cannot be as easily explained.

Johnston and Snow (1961) describe the population composition of the Indian Knoll mound, an Eastern Archaic site dated at about 5,302 years B.P. The site contains ground stone but no evidence of agriculture, pottery or the bow. Snow's reexaminations of 873 out of 1,234 individuals, compares the results to the original report (Snow, 1948).

High infant mortality appears in the Indian Knoll population: "20.48% of the total are under one year of age." (Johnston and Snow, 1961:240). Table 31 arranges the Indian Knoll data into age unit comparable to those made for SJo-68. In SJo-68, adults cluster around the age of forty rather than around twenty-five and thirty as in the Indian Knoll population. Johnston and Snow (1961:241) state:

> In the Indian Knoll population, the peaks of mortality are 25-29 years (14%) and 30-34 years (15%), the average age at death was 19 years. Omitting infants under one year the average is raised to 22-23 years. If an Indian Knoller could survive the first year of life his life expectancy would increase 4.37 years. (Ibid.)

In his studies of prehistoric Southwest Indians, Cristy Turner found that 40 percent of all skeletons from most sites are less than one year of post-natal age, and 50 percent of all skeletons are less than five years of age (pers. comm., 1966). However, the skeletal material from the Central California area and from most large pre-Columbian cemeteries is noticeably deficient in infants (Turner, pers. comm., 1966). McCown (pers. comm., 1966) states that California Indians from early prehistoric through historic times probably had a high rate of infant mortality, but that an individual who managed to live through the first six years had an excellent chance to live to a mature age.

Any one of the following circumstances would lower the percentage of infant finds: (1) The archaeologists may not be saving or reporting infants; (2) the infant skeleton may have been destroyed by weathering prior to excavation because most of the skeleton is still cartilage; (3) in specific cemetery areas, infants may not be buried proportionately to adults; (4) post-burial disturbances are more likely to destroy infants, who are smaller and harder to recognize than adults; (5) infant mortality rates may be low; (6) the original population may be unstable or may have a peculiar sex ratio, and infants may not have been born for a specific limited period.[19]

In SJo-68, vertical distribution of interments of various age groups (Table 32) is fairly even, except among infants. Only two out of 16 infants lie below the hardpan. Considering the vertical distribution, differential preservation may partially have caused the small number of infants. Aboriginal grave digging continually disturbed the softer layer, probably disrupting and scattering infant burials. However, even when the number of infants in the lower mound is increased to equal the number found in the hardpan, infant mortality still reaches only 16 percent which is remarkably low for an aboriginal group.

A combination of several or all of the factors mentioned above could account for the low frequency of infants. The author assumes that excavators recognized all undisturbed infant burials with artifact accompaniments in SJo-68, the presence of artifacts making the interments more easily recognizable. Differential disposal of infants could have occurred but no evidence exists for separate burial places.

Distribution of Artifacts by Age Groups

Several facts possibly indicative of status differences emerge from the distribution of artifact accompaniments especially in infant and child burials. Infant burials occur overwhelmingly in the upper hardpan layer (14 in the hardpan to two below the hardpan) and 11 infant burials are accompanied by grave goods. Children (6-12 years), adolescents, adults, and old people appear to be fairly evenly distributed, both with and without artifacts, although more adult graves contain grave goods in the upper than the lower levels. The latter may be due merely to a general increase in mortuary offerings in the upper levels in the central and eastern section, or to a specific increase in infant and female adult interments accompanied by artifacts.

A change in a group's social structure from acquired status to hereditary status could explain this change in burial pattern. In societies with hereditary status, every member of a status unit theoretically shares the special privileges accorded to the group. Thus, in a society with acquired status, only adult males might be buried with grave goods, while in a society where status was inherited all individuals of a high status family, male adults, women, and infants, might be elaborately interred.

Both in increase in population or change in subsistence could account for this change in the social order. Indirect evidence exists for both possibilities in SJo-68. The frequency of burials increases in the mound's upper level. Groups expanding in size may adopt hereditary status systems as the population becomes too large for everyone to know a man's personal accomplishments. An increased amount of fishbone and fishing equipment appears in the late Windmiller and the early Cosumnes Culture (Heizer and Fenenga, 1939:382). Fishing often requires ownership of good fishing spots and necessitates complicated cooperative behavior. Status differences provide the mechanism for organizing a village to take quantities of fish during a seasonal run. But more important, fish, as a stable and plentiful source of protein, will allow rapid population expansion. For example, the population explosion which took place during the late Upper Palaeolithic in Europe seemed to be accompanied by a shift in subsistence from predominately hunting to a more efficient mixed hunting and fishing economy.

Burial Position

The majority of burials lie extended ventrally, head to the west, feet to the east (Table 33). All individuals with known burial position are considered in this report, although occasionally disturbed fragmentary burials in multiple graves are not taken into account. A total of 116 individuals have distinguishable burial positions. Twenty-five percent of the interments lie extended dorsally. These dorsal burials come predominantly from below the hardpan. Dorsal burials cluster in the west and center, particularly in trenches F-J, while ventral burials occur primarily in the central and eastern sections of the mound, in which the majority of the shallow graves are concentrated (Table 34).

The greatest variation in burial position occurs in the west and center of the mound among the deep burials. Less variation in burial position appears among female adults than among male adults. Male burials concentrate in trenches F-J in the center section, which also contains the highest percentage of burials with artifacts. Perhaps high status men were interred in the center of the mound (Tables 35, 36).

Of the seven loosely flexed burials in SJo-68, four appear over 50 years of age, while the others seem to be in their late 40s (Tables 37a, 37b). Three of these old people may be women; one is a man. Three are too old to sex. The flexed burials are the first reported for the Windmiller Culture, although they apparently do occur in SJo-142 and Sac-107C where some, but not all, are intrusive. The flexed burials in SJo-68 lie mainly in the sub-hardpan deposits. They are possibly elderly women who had no living relatives to bury them, and whose bodies as a result were dumped without ceremony into pits. As a rule these burials did not contain artifacts. One, (burial no. 38) was found with a Canis skull.

Mortuary Complex

Sixty of the 113 graves contain artifacts. Seven contain only ochre, and 46 occur without grave offerings (Tables 33-36).

Eighteen (39 percent) of the 46 UCAS burials without accompanying artifacts lay in an extended ventral position oriented west. Nine (19 percent) lay extended dorsally and oriented west, three are extended ventrally and oriented northwest or east, six are flexed, three are extended on their side, and seven were severely disturbed. Of the 67 skeletons accompanied by mortuary goods, 37 (55 percent) lay extended ventrally and 18 (27 percent) were extended dorsally; six graves were disturbedand five burials were oriented northwest or east. A multiplicity of factors seems involved in the association between extended ventral west burials, extended dorsal west burials, and the presence or absence of grave goods.

The concept of differential status between men and women may provide the key to understanding who was buried with artifacts and who was not. Perhaps the generally higher status of males required burial with goods, a consideration which women did not necessarily merit. What can one determine from the fact that the male skeletons occur in a larger variety of burial positions than do those of females? If abundant grave goods are status symbols indicating wealthy individuals, then traditional posture might also be accounted for in terms of status. Some additional explanation, however, is necessary, for the extended dorsal west position, largely associated with male interments. An explanation may be inferred from the frequent association of dorsal burials, red ochre and projectile points.

Among the burials of undetermined sex, those with and without artifacts are fairly equally divided. This group includes 15 infants, six children, about one-third of the adolescents, and a few of the old people. Five of these unsexed burials (one infant, three adolescents, and one very disturbed multiple adult burial) contain only ochre.

The artifact types which accompany Windmiller graves are described in detail by Heizer (1949) and the present author (Chapter II of this report). Since only a few specimens are unique enough to require description, the following section will deal almost exclusively with associations among artifacts and various attributes of the interments. These grave associations will better characterize the mortuary complex than would a description of artifact types.

Charmstones

The original California charmstone typology published in Sacramento Junior College Bulletin No. 2 [20] (Lillard, Heizer and Fenenga, 1939: Heizer, 1949: Fig. 7) was considered inadequate for my analysis. Therefore, a new typology has been worked out by the author with the assistance of J. A. Bennyhoff and is described in detail in Appendix D and illustrated in Figs. 7-17.

At SJo-68, 77 charmstones are associated with 15 burials, in which nine skeletons lie in the extended ventral west position, and two lie in the extended dorsal west position. Two graves have been disturbed. Disturbed remains of additional individuals surround two skeletons with charmstones. Two unassociated charmstones occur within the mound's hardpan layer (Table 38).

The majority of the burials with charmstones were found in the mound's center. Nine of these burials come from the hardpan layers and six from below.

The number of charmstones per grave increases in the lower mound matrix. Fifty-eight of the total of 79 charmstones lie below the hardpan. Sixty percent (40 out of 79) occur in two burials lying side by side just below the water table in squares A/N-1, A/N-2. These are: burial no. 23, a late adolescent male, and burial no. 24, an adult male also associated with the fragmentary remains of a late adolescent male. Six adult and adolescent males, two adult and adolescent females, and five interments of unknown sex (two infants, one child, and two adolescents) are accompanied by charmstones.

Charmstones appear to accompany primarily the adult male extended burials located near the center of the mound. Although both hardpan and sub-hardpan graves contain charmstones, the largest number of specimens occur in the latter.

Charmstone Type A5

Only one A5 charmstone occurs in SJo-68 in one of the deepest and, perhaps one of the oldest graves in the site. Other A forms appear somewhat later: a number have been found in Sac-168 and Sac-107C (see Chapter IV). The A5 charmstone is characterized by a narrow flattened cross-section with little or no midbody bulge and thus resembles type C3a. It is 175 mm in length, 20 mm at its maximum width and 16 mm in thickness (Plate 1e).

This type was found in the northwestern section of SJo-68 accompanying burial no. 23, a late adolescent male burial lying fully extended, ventrally, with its head to the west. In the grave were several other charmstones (types C2a, C2b, C3a, C3b, C4a1) and points (types 3b, 5c, and 7a).

Charmstone Type B1a3

The B charmstones mark a later phase of occupation in SJo-68. One B1a3 charmstone, a quartz crystal, and red ochre accompanied a female burial, no. 66. The grave lay 32 inches below the surface, in the north central part of the mound. Shaped from white marble, it measures 177 mm in length, 35 mm at maximum width and 26 mm in thickness. Flattened in crosssection, it enlarges smoothly toward the center in plan view. Both tip ends are flattened.

The B1a3 type closely resembles charmstone type B4b found in burial no. 16 at 26 inches below the surface both of which may be the predecessors of the B2 and A3c type charmstones found in sites Sac-107C and Sac-168B.

Charmstone Type B1b1

A B1b1 charmstone, made in fine-grained grey rock (perhaps schist), is unique to burial no. 83, an infant found in the hardpan about 28 inches below the surface. The specimen is broken at the perforation leaving it only 210 mm in length (it may originally have been as much as 238 mm in length). Almost round in crossection, its maximum width and thickness are 25 mm and 22 mm. A second perforation was evidently begun, leaving a shallow pit on one face of the piece; then a third was begun some 10 mm farther down along the same face. Between the pits, two narrow ground parallel bands encircle the charmstone. The manufacturer probably abandoned his attempts to perforate the charmstone because the object was too slender and brittle to survive the pecking process.

Burial no. 73 contained another unique charmstone, type C1b as well as shell beads (Olivella 1a, Haliotis 1a), Haliotis ornaments (35 circular ornaments with a single central perforation and a single rectangular ornament), a piece of worked antler, and a pestle.

Charmstone Type B1b3

Seven charmstones of type B1b3 were found in two of Dawson's grave lots (nos. 15 and 16) at 15 inches below the surface.[21] Fashioned from serpentine gabbro and schist the charmstones are medium to short in length, 106-144 mm, and 28-34 mm at the maximum diamter (Plate 8, see also Heizer 1949:Fig. 7f). The specimens show a pronounced shoulder at the middle of the body and straight to concave sides which taper to tips flattened at both ends.

Grave lots no. 16 and 15 contained adult and fragmentary infant skeletons. Grave lot no. 15 included a single grooved baked clay pecan form ball. Grave lot no. 16 held a type 1 point, a point fragment, a baked clay pecan and 181 Olivella 1a shell beads. In his field notes Dawson describes burial no. 16 in great detail:

> Four of the plummets were found on the face and two were found on top of the head, mixed with the bones of one hand. A grooved clay ball was found on the upper part of the skeleton. On the level

> of the shoulder blade of the adult were found portions of a child or infant. No relics were found on the infant. The six plummets on the skeleton were found about four feet south of two other plummets. It is strange that the two plummet finds should be so close together when no other plummets have been found to date (January 1, 1924). These plummets range from 5-3/4 to 4-1/2 inches. The diameter varies from 1-1/4 to 1-1/2 inches. The shortest plummet has the largest diameter. There is a black substance on them. Although no other objects have been reported to date as having been found with asphalt or similar substances on them from this locality many have been found in the southern part of the state. I feel that it is possible that the black substance on these specimens is such a material. Three of the specimens have blotches of it in several places while the other three have very little (Dawson, fieldnotes).

Charmstone Type B3

Only Dawson's grave lot no. 15 contained a type B3 charmstone (Heizer, 1949: Fig. 8g, Plate 8). Made from serpentine, the short broad specimen measured 83 mm in length, 51 mm in maximum width and 36 mm at maximum thickness. The B3 charmstone is associated with one B1b3 type charmstone and may be an example of extreme variation within this type.

Charmstone Type B4b

Charmstone type B4b closely resembles type B1a2 and B1a3 although it is shorter in length and smaller in width and thickness. The type is morphologically similar to, although four to five times larger than the miniature charmstone B5. B4 charmstones are good late Windmiller phase markers. Type B4b was found in the ventrally extended male burial (no. 10) 26 inches below the surface. In addition, two grooved baked clay pecans, 47 Olivella 2b shell beads and a single Haliotis ornament (C.(1)) were found in the grave. The morphology and placement of charmstones in the mound implies a sequence of forms decreasing in size; B1a3, to B4b, to B5b. Burial no. 62a at 33 inches in depth accompanied by a single 5b charmstone must then be considered intrusive from a later occupation phase. This assumption is supported, or at least not refuted, by some of the other associated artifacts.

Charmstone Type B5b

This miniature form occurs twice in the upper levels of SJo-68. It occurs once with burial no. 62a, a ventrally extended adult male in the northern central segment of the mound accompanied by many unusual artifacts: a bird wishbone, bone awl, unidentified worked bone, five quartz crystals, a slate pencil, one pestle, 14 projectile points (types 1, 2, 3a, 6c, 7a, and 7c), Olivella shell bead types 1a (46) and 2b (1), Haliotis shell bead type 1a (391) and 4 shell ornaments (type c.(2)). The second occurrence is in burial no. 88, a ventrally extended adult female from the northeastern segment of the mound also accompanied by a bird wishbone, quartz crystals (16), Haliotis bead type 1a(3) and two Haliotis ornaments (type c.(2)). The only other charmstone to occur with a female interment is a related form, B1a3, in burial no. 66.

The miniature form has a greater vertical distribution than most other charmstone types suggesting that burial no. 62a is intrusive from a later phase of occupation.

Charmstone Type C

In the old typology (Lillard, Heizer and Fenenga, 1939), the tip treatment in type C was secondary, and size primary. During the analysis of the SJo-68 charmstones three size divisions emerged from the bipointed group in all three categories of tip treatment, plain notched and grooved. The stratigraphic occurrence of these charmstones at SJo-68 and Sac-107 make more than two size divisions necessary. Type C1c may still require further division.

SJo-68 reveals a clear trend from grooved through notched to plain, so, rather than preserve the 1939 typology, I think it advisable to make the tip treatment primary and size secondary. Thus type C1 (plain), type C2 (notched), and type C3 (grooved) have the same size subgroups: a (long), b (medium), c (small) and d (very small). The C charmstones are evidently the oldest forms in SJo-68 occurring only in burials deeper than 28 inches under the surface.

Charmstone Type C1a

A long, straight-sided, shouldered charmstone, tapering to narrow but flattened tips (type C1a) resembles type B1b3 (found in Dawson's grave lots) except for the long groove ground from tip to perforation in the Dawson specimen. Four specimens occur in two burials (nos. 79 and 87) 31 and 27 inches deep respectively. (Plate 2 d,e). Burial no. 79 is an adult male ventrally extended and oriented to the west. The grave contained six identifiable whole charmstones (one type C1a, three type C2b and two type C2c), three projectile points (one type 3a and two fragments), Olivella 1a beads (4), Haliotis 1a beads (60) and a Haliotis C.(1) ornament. Burial no. 87 contains the remains of an infant, five charmstones (3 type C1a and 2 type C1b), and a single type 2 projectile point.

Charmstone Type C1b

Three C1b charmstones occurred in two shallow burials lying at 27-28 inches deep. Burial no. 87, described above, and burial no. 73, also an infant, are accompanied by 3 charmstones (one B1b1 and two C1b types), many Haliotis 1a beads (35), Haliotis C.(1), ornaments (35), one Olivella la bead, one Haliotis B.1 ornament and a pestle.

Charmstone Type Clc

One Clc charmstone occurs in burial no. 75 an adult of undertermined sex ventrally extended and oriented west lying about 36 inches below the surface. A C2a charmstone and two Haliotis la beads were also found in the grave.

Charmstone Type Cld

The Cld charmstones have an angular mid-body shoulder similar to though not as pronounced as Blb3. The type has traits transitional between Cla and Clb (which have a lower placement of the perforation and more pointed ends) and Blb3 (which is very angular at the shoulder and perforated very close to the tip). Unfortunately for the seriation, the single SJo-68 burial containing Cld occurs below burials containing Blb3 and Cla-Clb charmstones. Four Cld charmstones were found in SJo-68 with an adult male (burial no. 67) 36 inches below the surface in the north central section of the mound. Also accompanying burial no. 67 were three C2b charmstones, one C3a charmstone, ten quartz crystals, a bone awl, 91 Olivella la and 123 Haliotis la beads. Two narrow bands of ochre are painted across the backs of the femora.

Charmstone Type C2a

Five C2a charmstones occur in three burials (nos. 23, 24, and 75) all 36 or more inches below the surface of the mound. (Plate 2g) Burials no. 23 and 24, interred 47 inches below the surface lay side by side in the northwestern segment of the mound. The graves include late adolescent male and adult skeletons accompanied by large numbers of charmstones and charmstone fragments. All of these charmstones are C2 and C3 varieties (except for one A5 charmstone in burial no. 23 which looks like a type C3a without a groove), perhaps the oldest of the Windmiller charmstones. In addition to charmstones, burials no. 23 and 24 contain projectile points types 5c, 3b, 7a (no. 24 also contains type 5a and type 6c perhaps a variant of type 5a). The bones in both graves are covered with red ochre.

Burial no. 75, 36 inches below the surface in the north central mound segment contains only two charmstones (one type C2a and one type Clc) and two Haliotis la beads.

Charmstone Type C2b

Shorter, more flattened in cross-section and wider than C2a, C2b charmstones are the most numerous type in SJo-68. Twenty-five specimens occurred in four burials (nos. 23, 24, 67 and 79) seventeen of these were in burial no. 24 (Plate 2c,f,i,j). The burials lie at 47, 36 and 31 inches below the surface in the northwest and central segments of the mound.

Charmstone Type C2c

The shortest of the C2 charmstones, type C2c occurs in burials no. 24 and 79 and may be a variant of type C2b with which it is associated (Plate 2n).

Charmstone Type C3a

As mentioned earlier charmstone type C3a looks much like type A5. The three C3a specimens accompany three deep burials, nos. 23, 24 and 67 at 47, 47 and 36 inches below the surface respectively.(Plate 2h). The C3a charmstones resemble the C2 charmstones found in the same graves except for the shallow groove ground from tip to perforation and the pointed form of the tips.

Charmstone Type C3b

Shorter than C3a, charmstone type C3b is found only in burials no. 23, 24. Two specimens were found with burial no. 23, seven specimens occurred in burial no. 24, which aside from the seventeen C2b charmstones in burial no. 24, is the largest cache of any single type. The occurrence of these two morphologically similar types in such large numbers and in the same graves suggests that the tip to perforation groove and the tip notch which distinguish these types may be typologically insignificant. However, the disappearance of C3 forms and the continuation of C2 forms in the next Windmiller phase indicates a transitional type.

Charmstone Type C3c

C3c charmstones occur only in burial no. 24. C2c, its counterpart without tip to perforation groove, also occurs in burial no. 24. Perhaps the charmstones from burials no. 67, 75 and 79 support the hypothesis that C3a, C3b, C3c developed into C2a, C2b and C2c respectively. The C3 forms tentatively mark the first phase of occupation at SJo-68 (Table 38).

Charmstone Type C4a1

The 1939 type C3 becomes the new C4 type. The C4 charmstones may always be an odd group--they occur in Oak Grove sites in southern California, yet are most common in the Cosumnes tradition in Central California. Since C4a is stratigraphically early in the Windmiller Culture at sites SJo-68 and Sac-107, it has to go with the other C's, yet C4b is possibly Cosumnes and may ultimately prove to be related to the unperforated channeled forms, C5.

The groove from tip to perforation found variously developed on all C charmstones completely encircles C4a1. The specimen is unique to SJo-68 and found only in burial no. 23. Similarly grooved but morphologically quite different charmstones, types C4a2 and C4b were found in site Sac-107C. Their relationship to the C4a1 specimens is unknown.

The function of the grooves in C2, C3 and C4 charmstones is still unknown. If they were to guide the line suspending the charmstone, the upper part of the perforation should exhibit greater wear, yet superficial examination shows no such wear. A few specimens show cord marking in traces of asphaltum around the tip section, suggesting that the groove was to recess the suspension cord, the whole tip being wrapped with twine set in asphaltum mastic. This wrapping would serve to protect the weakened tip of the stone from breaking and might prevent differential wear at the perforation. If the purpose of the groove was to aid in suspension, however, both the specimens notched only at the tip (all C2 types) and the full grooves encircling type C4 remain unexplained.

C4a1 charmstones may be a holdover from an earlier form which functioned as an atlatl weight in which the groove helped to bind the stone to the atlatl. Thus the gradual loss of the groove may have been due to a change in charmstone function, from atlatl weight to purely magical object. One would then have to consider the C4a charmstone the oldest charmstone type.[22]

Charmstones Types D8 and D9

Unique types occurring singly in shallow burials, D8 is a shattered specimen reconstructed by Bennyhoff, and D9 is found in Dawson's grave lot no. 34, 6 inches below the surface is only a partially ground quartz river pebble. Grave lot no. 34 contained various types of ground stone which Dawson in 1923 took as indicative of the individual's special talent.

> Nine false topaz were found near the head and lower jaw. Two zinc blend splinters and three slate pencils, long, slender and coming to a sharp point at one end (one was blunted at both ends), were found on the ribs. It seems that this individual on whom all of these specimens were found was a sort of a stone worker. A piece of milky quartz grooved around the top was found 8 inches south of the head with some topaz. This specimen (the unfinished charmstone) shows workmansip of the abrading type (Dawson fieldnotes).

Charmstones as Windmiller Phase Markers

Table 40 illustrates an attempt to build a sequence of charmstone types. On the basis of grave depth and typological change, five tentative phases have been distinguished. These phases are further discussed with regard to projectile points later in this chapter, and again in a discussion of the other Windmiller culture sites in the Central Valley (Chapter IV).

Charmstone types C3, C4a1 and A5 are tentatively suggested as markers of phase 1 (burial nos. 23 and 24, 47 inches below the surface). Types C2, C1d and C1c seem to mark Phase 2 (burial nos. 67 and 75, 36 inches below the surface). Phase 3 with charmstone types C1a, C1b, B1b1 and B1a3, is confused perhaps because of the relatively poor definition of B1-B5 charmstones. Burial nos. 62a, 66, 79, 87 and 73 all seem to fall into this phase lying from 32 to 26 inches below the surface. Burial no. 62a is probably intrusive from the following phase. Phase 4 is represented by a variety of charmstones; types B4b, B5b, D8, B1b3 and B3 occur in burials no.10, 88 and 12 and grave lot nos. 15 and 16 respectively from 26 to 15 inches below the surface. B4b has been tentatively assigned to this phase, burial no. 10 containing a single B4b charmstone was found disturbed and scattered in the upper 20 to 25 inches of the mound. The occurrence of B4b and B5b charmstones at the same levels in SJo-56 support their contemporaneity.

Phase 5 consists exclusively of Dawson's grave lots no. 8a, 12, 21, 29, 32, 34 and 35, the only lot containing a charmstone (type D9) lying six inches below the surface. Charmstone type D9 is unique to SJo-68. Charmstone types F2 (typical of the Cosumnes Culture) D1a and D1b (found in Sac-107C, SJo-112, and Sac-28) resemble the D9 most closely.

Charmstone Fragments

Two burials contain charmstone fragments (burials no. 23 and 24). Burial no. 24 lies on a "pavement" of charmstones and fragments which extend under the skeleton's right elbow, visceral region, pelvis, and femur. Approximately 18 complete or fragmentary charmstones compose the pavement. Whole charmstones and fragments surround the head and shoulders of burial no. 23. Both burials no. 23 and 24 contain young males whose skeletons lie extended ventrally with head to the west. Together with burials no. 25 and 29, they rest at or below the water table, deeper than most of the other graves. Mud obscured the excavators' observations and the skeletons were never sketched.

Petrography of Charmstones (Table 39)

Soft rock used in the manufacture of charmstones such as serpentine, claystone, white marble or limestone, often show grooves on the tip of the perforated end. One altered igneous and one metamorphic stone possess grooves just at the tip, but not down either side. Thus, the softer materials appear to be grooved, while harder rocks are simple ground flat at the perforated end.

The source of white marble or "alabaster" is probably the limestone caves of the Sierra Nevada directly to the east of the Sacramento Delta, although thermal spring deposits in Solano County may also have served as quarries (Waring 1915:162; Heizer and Treganza, 1944:342).[23]

Charmstones: Conclusions

Small numbers of charmstones appear to be associated mainly with extended dorsal male adults and late adolescents. They occur with infants (burials no. 73 and 87); in fact, infant bones may have been recognizable largely because of the artifact accompaniments. Two female interments contained single charmstones (types Bla3 and B5b). These women may have had some special power and brought these rare types to SJo-68 from some other village at marriage. Bla3 charmstones also occur in Sac-168(b2) and SJo-56E.

The graves containing the greatest numbers of types C2 and C3 charmstones and fragments all lie in the brown midden probably belonging to the two earliest Windmiller phases at SJo-68. Type Blbl, Bla3, B4b, B5b, Cla and Clb charmstones occur within the cemented layers (Phases 3 and 4).

Dawson's grave lots contained Blb3 and B3 charmstones (probably Phase 4). These four phases can be only tentatively defined by the few charmstones present in the site, but their existence is strengthened by similar groupings of charmstone types by depth in other Windmiller sites (cf. Chapter IV).

One may assume that the Windmiller people attributed supernatural powers to these artifacts, as did immediately precontact and post-contact California Indians. Heizer (1949:19) states: "Apparently these objects were anciently in fairly general use by any individuals who wished to use them." The SJo-68 evidence suggests a much more restricted use of charmstones. They appear in only 15 of the sites 193 documented graves, and only six of these hold more than two. Their association with male burials and projectile points, at least in the earlier phases of the deposit, suggests that they may be associated with the magic of hunting and/or warfare.

Flaked Stone Implements

Thirty-eight graves encountered by the UCAS contain a total of 108 projectile points (including four cremations and one very disturbed unnumbered burial in square N/N2). Twenty-five of Dawson's graves contain 52 points. Points occur in more graves than any other type of artifact, although shell beads occur in larger numbers.

Single points or point fragments were found in 22 graves excavated by UCAS. The remaining 16 graves contained two or more points. Burial no. 62a is unique with 15 projectile points, cremation no. 1 contains 17 points and cremation no. 5 contains 9 points. Dawson's grave lots nos. 6 and 17 contained 8 and 6 projectile points respectively. The single occurrences may represent weapon heads which perhaps caused death, but it is unlikely that the multiple points were all originally embedded in the bodies of the deceased. These points were probably either the property of the deceased or or mortuary offerings of his relatives and friends.

From the UCAS excavation 19 interments with projectile point accompaniments lie ventrally extended and oriented west; 10 were found extended dorsally, and oriented to the west. One ventrally extended burial with points was oriented in a direction other than west. More dorsally extended burials contain points than any other grave accompaniment except red ochre (see Table 53).

Points occur primarily in graves in the western sub-hardpan (30-60 inches in depth) and in the central and eastern hardpan deposits (0-30 inches in depth). Trenches K-O contain a majority of the graves in which projectile points occur as grave goods; almost all (20 out of 25) of Dawson's grave lots with points and 19 of the 38 UCAS graves with points are from these trenches.

The vertical distribution of projectile point types varies from the brown midden (30-60 inches below the surface) to the hardpan (0-30 inches below the surface). The point typology (Fig. 3) adapted from Heizer (1949), may not be as sensitive to stylistic changes as the more recent charmstone typology devised by J. Bennyhoff and the present author. Devised 30 years ago (Lillard, Heizer and Fenenga, 1939), it remains practically unmodified in this report. Nine categories are identified which correspond with Heizer's classification (Heizer, 1949: Fig. 11a). Table 40 illustrates the vertical distribution of points in graves. A tentative division into 4, possibly 5 phases has been made comparable to those suggested by the charmstone analysis. However, in the present state of knowledge, points alone cannot identify a burial as to phase. A probably reason for this is that point and charmstone style changes are not necessarily synchronous.

Phase 1 includes all those burials from 36 to 53 inches below the surface except for burial no. 91 and possibly cremation no. 3. Projectile point types 3b, 5a and 7a are present, type 5a being the most common. Phase 2 extends from about 30 to 36 inches below the surface. Cremations nos. 1, 4, and 5 may belong to Phase 2 despite the fact that cremation nos. 4 and 5 lie slightly above (at 28 inches) and cremation no. 1 lies considerably below (at 47 inches) the other Phase 2 graves. Type 3b points dominate Phase 2 (burial 62a is probably intrusive). Phase 3 graves fall between 24 and 30 inches below the surface of the mound. Types 1, 7a and 3a points are most numerous. Types 7c and 3b points are common, while one or two 7d, 6c, 5d, 2 and 5a types occur. Despite its considerable depth, cremation no. 3 may belong to this phase. Phase 4 graves, from about 11 inches to 24 inches in depth, contain primarily type 3a points but also include types 1 and 2. Phase 5, 0-10 inches in depth, may or may not be differentiated from Phase 4, it contains three type 3b points along with one type 7a, 6c, 7c, 1, 2, and 3a. The 3b points may be typologically distinct from the deeper specimens; further analysis is needed.

Graves containing points cluster in the upper 30 inches of the eastern section of the mound and spread throughout the middle and western sections becoming more numerous below the hardpan layer (30-60 inches). The University of California graves include those of both males and females, but predominately the former. Eighteen male burials (47, 4 percent of the males) and seven female burials (18.4 percent of the females) are accompanied by points (Table 41). Only one possible female burial (no. 29) lies well below the hardpan in the tentative Phase 1. The others are found in Phase 3, just at the transition between hardpan and brown midden, and in Phase 4. Adolescents and adults are accompanied by the majority of the projectile points, one child (burial no. 6) and two infant (burial nos. 80 and 87) graves contain points, red ochre and other mortuary goods. Again, more female and infant interments are accompanied by points in the shallow graves (above 30 inches).

Both charmstones and points accompany nine skeletons (four male, three adults of unknown sex, one child (burial no. 6), and one infant. These include all but one of the deep burials accompanied by charmstones. The number of occurrences of both points and charmstones with male interments is not statistically significant.[24]

Two hundred and twenty-one of the total of 363 points collected from the SJo-68 mound occur unassociated in the midden (Table 43). Of these, 99 (22 percent) are unclassifiable fragments. Table 44 classifies the points according to types and vertical provenience. The unassociated points come almost exclusively from hardpan layers in the western half of the mound. Aboriginal grave diggers and recent digging or scraping may have scattered many of these points but probably cannot have been responsible for all of the displacements.

Projectile Point Type 1

Twenty-two, bi-pointed, type 1 points (originally NAa) occur in 13 graves (six of Dawson's grave lots and seven UCAS burials) (Plate 3a-f). Ten of these graves lie in trenches K-O, three in trenches F-J. Eight graves lie between 18 and 32 inches below the surface in what has been tentatively called Phase 3. Cremation no. 3 contains a single type 1 point 50 inches below the surface, the greatest depth from which any example of this type has been excavated. Although the pit containing cremation no. 3 probably originated higher in the deposit, its exact level of origin remains unknown; its Phase 3 origin was suggested earlier in the discussion. The older four graves containing type 1 points lie above 18 inches. Type 1 points accompany two adolescents, two adult, and two infant interments. Only two graves with type 1 points also contain charmstones (UCAS burials no. 62a and 87).

Projectile Point Type 2 (Plate 3g-i)

Ten leaf-shaped convex based points, type 2 (originally called type NAb1), occurred in nine graves (seven of UCAS burials and two of Dawson's grave lots). Six of these graves lie between 12 and 24 inches in depth; these are tentatively attributed to Phase 4. UCAS burial no. 91 lies 46 inches below the surface in the brown midden; burial no. 62a lies approximately 32 inches below the surface at the hardpan--brown midden transition. One grave in grid square N/N2 was too badly disturbed to determine vertical provenience.

The points occur in graves from all mound sections (two from trenches A-E, four from trenches F-J, and three from trenches K-O). Only UCAS burial no. 62a and Dawson's grave lot no. 17 contain both type 1 and type 2 points. The separation of type 1 and type 2 points despite their similar vertical distribution perhaps suggests incompatible functions. Five males and one female (one adolescent, four adults and one old person) have been identified among the UCAS graves containing type 2 points.

Projectile Point Type 3

Sixteen graves contained 19 straight-based, leaf-shaped, points, type 3a (originally classed as NAb2). Fifteen graves contain 31 concave-based, leaf-shaped, points, type 3b (originally NAb3). The type 3a points (Pl. 3j-k) lie between 12 and 32 inches below the surface and belong to Phase 4, except for Dawson's grave lot no. 29 found between 6 and 12 inches in depth, UCAS burial no. 17 at 9 inches in depth and UCAS burial no. 75 at 36 inches below the surface. Type 3b (Pl. 3m-v) is found between 28 and 50 inches in depth, belongs to Phases 1 and 2, except for Dawson's grave lots nos. 12 and 35 and UCAS burial no. 17, all between 6 to 12 inches in depth. These four points may be typologically distinct from the stratigraphically earlier concave-based points. The three subtype 3b points from Dawson's collection are broader, thicker, and the bases more concave. The bases are noticeably thinned by numerous vertical flutes (see Heizer, 1949: Fig. 11v, w; Plate 20). These late concave-based points which continue into the Cosumnes Culture may perhaps form a third subdivision of type 3.

UCAS burial no. 17 is the only grave to contain both 3a and 3b point subtypes. The specimens could not be located in the collection but a field photograph of burial no. 17 clearly showed one concave and one straight-based point near the middle and to the outside of the right femur. The vertical separation of subtypes 3a and 3b suggests some kind of temporal sequence.

In the UCAS collection, three graves containing type 3a points are male, one is female and one unsexed; five graves accompanied by type 3b points are male, one is a multiple burial although the points seem to accompany an old female and two interments (a child and an adolescent) are unsexed. Both females lie at the transition between the hardpan and brown midden in Phase 3. Subtype 3a occurs with type 1 points in UCAS burials no. 62a, 42 and Dawson's grave lot no. 6. They occur with type 2 in UCAS burial no. 62a and Dawson's grave lot no. 18.

Projectile Point Type 5

Type 5 points have a triangular body, and corner notches which angle toward the tip creating an acute angle at the shoulder or "tang." The subtypes, 5a through 5f, are differentiated on the basis of stem morphology and tang length. Subtype 5a (originally SAa) is characterized by a converging stem and short tangs (Pl. 4a, c, d), 5b (SAb) by a converging stem and long tangs, 5c (SBb) by a parallel sided stem and long tangs (Pl. 31, 4b) 5d (SCb1) by an expanding convex-based stem and long tangs, 5e (SCb2) by an expanding straight-bases stem and long tangs, and 5f (SCb3) by an expanding concave-based stem and long tangs. Although much larger and cruder, the outline of type 5f strongly resembles the Desert side-notched or Elko corner-notched point (cf. O'Connell, 1967; Clewlow, 1967). Dawson's collection contains one subtype 5f; its exact provenience is not recorded. The artifact is made of translucent gray obsidian with diagonal ribbon flakes removed. Subtype 5f and 5e specimens also come from SJo-56 and SJo-142 and they continue to appear in Cosumnes Culture sites. A small version of 5f and 5e are also found in the Hotchkiss Culture.

The eight burials containing type 5a points occur primarily in Phase 1 in the northern central and western sections of the mound. Again the vertical segregation of subtypes suggests that their occurrence may have some temporal significance. Four of the UCAS burials are adolescent and adult males, one is an adult female. Morphologically subtype 5a merges into the parallel stemmed, side-notched point, type 7a. Some difficulty in distinguishing between types 5a and 7a was experienced, and may account for their apparent scattered vertical distribution.

Subtype 5c accompanied Dawson's grave lots nos. 6, 9, and 29 (Phases 3 and 4).

Points found in cremations cross-cut the usual vertical distribution of types. Point type 1, ordinarily accompanying hardpan burials, occurs in cremation no. 3, 50 inches below the surface. Subtypes 3b and 5a, usually in Phases 1 and 2, occur in cremations nos. 4 and 5, 28 inches below the surface. Cremation no. 1, at a depth of 47 inches, contains subtypes 3b, 5a, 5c and 5d, as well as a large number of burned bone artifacts which resemble bone artifacts found in burial no. 6, 36 inches below the surface. Cremation no. 1 lies "in situ" below undisturbed layers of the hardpan and may belong to Phase 2 or 3 despite its greater depth.

Projectile Point Types 6c and 6d (Plate 4e-f, k)

Type 6a (SAc) and 6b (SAa2) points do not occur in site SJo-68, although they occasionally appear in other Windmiller components. Type 6c, a triangular point with sloping shoulders and parallel-sided stem, angular in outline, resembling and often difficult to differentiate from type 5a, occurs in UCAS burials nos. 24 and 62a, cremation no. 5, and Dawson's grave lot no. 29. Most of these interments contain large numbers of points which make its significance more difficult to determine.

The distinctive 6d form similar to 6c except for its expanding, straight-based stem, occurred only once in Dawson's grave lot no. 9. Although points of this type are rare in the Windmiller Culture, similar points have been described from the Humboldt Valley in Nevada.

Projectile Point Type 7

Type 7 is a triangular to leaf-shaped blade, side-notched with a parallel or expanding stem and a straight to concave base. Subtypes 7a (SBa), 7c (SCa2), and 7d (SCa3 and SCa4) occur in SJo-68. Subtype 7d closely resembles the Pinto point type (Harrington, 1933).

Ten graves hold a total of thirteen type 7a points (Pl. 4g, i). Four of these interments are male, two are female; two infants and an adolescent are unsexed. Three graves lie 42 to 53 inches below the surface in Phase 1, four from 24 to 30 inches in Phase 3, and only three graves in Phases 4 and 5. The Phase 1 graves contain forms typologically transitional between 5a and 7a.

Subtype 7c occurs in three graves -- once in Phase 5 and twice in Phase 3. Subtype 7d (Pl. 4h) can be identified only from Dawson's grave lot no. 6 (phase 3). The type 7 points do not appear to seriate through time, and perhaps their typological relationship needs reconsideration.

Projectile Point Type 9

Type 9 is a triangular point with an elaborately notched stem and a straight or convex base (originally SCa6 and SCa7). Type 9a occurs in Dawson's grave lot no. 42 (Pl. 41). Three unassociated specimens occur both in the hardpan and below.

Projectile Point Fragments and Unassociated Points

Fragments of points occur in 24 burials, many of which contain additional identifiable points; however, most of the fragments lie unassociated in the mound matrix (Tables 45 and 46). Point tips are embedded in the pelvis of UCAS burial no. 24 and in the left humerus of UCAS burial no. 85.

Raw Material

All points are identified as to their raw material in Table 42. Eighty-five percent were made out of obsidian (Table 45), 7 percent of chert, 6 percent of schist, 2 percent of quartz or quartzite, and less than 1 percent of basalt and petrified wood. Only type 7 has a significant percentage of non-obsidian specimens; 50 percent of subtype 7a is chert or schist. Eighty-three percent of subtype 7c (5 out of 6) are chert. Thirty-three percent of subtype 6c points are non-obsidian. Increases in chert points seem to occur in the third and fourth occupation phase (Table 45).

Obsidian is easily obtained in California. Foothill Indians traded obsidian into the Interior Valley during late prehistoric and historic times (Davis, 1965). During the Windmiller period, Valley groups may have also engaged in trade with groups nearer obsidian deposits.

So little stone waste occurs in the Windmiller mounds that it seems unlikely that much chipping was done on the sites.

The majority of the projectile points from SJo-68 are associated with extended supine male interments, although in the shallow graves females and children also occur associated with points. Too few burials are accompanied by both points and charmstones to firmly correlate the temporal phases suggested by both classes of artifacts. However, a tentative correlation based on depth can be proposed. Phase 1 graves would be expected to lie approximately 36 to 54 inches below the surface; Phase 2 graves approximately 30 to 36 inches below the surface; Phase 3 graves approximately 24 to 30 inches below the surface; Phase 4 graves approximately 12 to 24 inches below the surface; and Phase 5 graves approximately 6 to 12 inches below the surface. Phase 5 remains poorly defined and may in the long run be indistinguishable from Phase 4.

Bone Artifacts

Thirty-six bone implements occur both in 14 UCAS burials which are all oriented to the west in both extended ventral and extended dorsal positions, and in one cremation. Two main categories of bone objects occur with burials. Ceremonial pieces probably used as ornaments or in connection with magic; animal teeth, claws, skulls and jaws, birdbone tubes and bird wishbones; and bone tools; bone awls and needles perhaps used in basket making and sewing; bone and antler points possibly used in fishing and hunting; fishhooks; chisels and gouges used in working wood, bone or other soft material; and antler flakers used in retouching projectile points and knives. Both types of bone items occur in SJo-68 and occur mainly in the central and eastern half of the mounds' northern section.

Ornaments occur in graves of eight individuals, including those of four females, three males, and one child. Bone and antler tools, bone awls, antler flakers and other miscellaneous worked bone and antler occur in eight burials. Hardpan burial nos. 5 and 22 were the only female interments containing bone tools. A child (burial no. 6), and an infant (burial no. 73), and four adult male burials (nos. 51, 60, 62a, and 67) contain the remainder of the bone tools. The sexing of burials no. 38 and 9 is difficult because of the shrinkage and loss of masculine traits in the skeleton which accompanies old age. Both skeletons are of individuals 50 or more years old and have been only tentatively identified as female. Burial no. 22, an adolescent, is also only tentatively placed as female.

A slightly different distribution of bone ornaments and tools appears to distinguish male and female interments. Four of the six females are accompanied by bone ornaments; five of the six men are accompanied by bone tools.

Projectile points, shell beads and shell ornaments variously accompany bone artifacts in 6 out of 15 graves. The significance of these bone artifact accompaniments is difficult to assess. Most of the specimens are unique in this culture horizon. Worked bone tools of any sort are rare in the Windmiller Culture. Bone tools and ornaments proliferate in the subsequent Cosumnes Culture.

Bone of all kinds from Dawson's excavation in the shallow eastern section of the mound is considerably more plentiful than bone from the UCAS excavation. Twenty-four of Dawson's grave lots contained a total of 60 bone items, exclusive of 64 bird wishbone fragments from grave lot no. 38. Nineteen burials are interred with ceremonial items and ten with possible tools.

Dawson's grave lots yielded plentiful wolf, or coyote canines, and five turtle carapace pendants both infrequent in UCAS graves. Again, no pattern is apparent between bone and other artifacts. Ten lots between 16 and 27 inches in depth contain points; 12 lots contained shell beads mostly Olivella la and Haliotis la, and less commonly Olivella 2b; eight lots contained shell ornaments (Tables 46, 47, 48, 49).

Bone Ornaments: Bird Wishbones

Bird wishbones occur in three UCAS graves (burials no. 6, 62, and 88) and in two Dawson grave lots (nos. 38 and 39). Dawson's grave lot no. 39 contains only a single bird wishbone. Grave lot no. 38 contains 64 wishbones, shell beads and ornaments. In Dawson's words:

> Portions of bird wishbones lay under the chin and on the face between shell discs and beads as if in stringing order. Five discs and portions of discs show the decayed thong used in stringing. It is black and completely fills the perforation. One disc was found with a small square bead sticking to it. . . [The occurrence of a leather thong] is extremely rare. This was the first find of wishbones used as ornaments. Unfortunately, these wishbones were broken in excavating. About 19 individual birds are represented (19 mid pieces) of varying sizes, probably from more than one kind of bird (Dawson's fieldnotes on specimen no. 1166).

Animal and Bird Claws

Bird talons and animal claws found in the region of the neck and chest occur in a few SJo-68 graves. A single large bird talon lay on the chest of burial no. 84, a shallow burial of an adult male (Pl. 5h), uncovered in the UCAS excavation. Another comes from Dawson's grave lot no. 62, and two bear claws come from Dawson's lot no. 22.

Animal Teeth

Animal teeth decorated the neck and chest of several hardpan interments excavated by Dawson, and two from the UCAS excavation. Below the hardpan a single large canine tooth, possibly bear, and a beaver jaw accompany UCAS burial no. 9, that of an adult female.

Eight grave lots in Dawson's collection contain animal teeth arranged around the neck of the interment. The teeth, wolf or coyote canines, generally lie with the roots up, except in lot no. 20 where they are paired to form crescents.

One UCAS burial yielded six wolf (?) teeth (burial no. 86), and lies in Section K-O/N3-4, the northeast section of the hardpan, slightly to the north of Dawson's major excavation (Pl. 5i). The teeth lie root up, tip down, just beneath the mandible. In Dawson's grave lot no. 20, paired wolf teeth forming crescents were found clustered on the neck and probably formed a necklace or the neckline decoration of a garment. Coyote or wolf teeth in other grave lots (no. 7 with 11 wolf teeth, no. 20 with two wolf teeth and no. 40 with five coyote teeth) are also placed around the neck and shoulders.

A few single specimens, deer or tule elk molars (Dawson's lot no. 57), are possible, part of the grave fill, since deer and tule elk form the most abundant unworked animal bone in the mound matrix. One should note, however, that perforated elk or deer teeth frequently occur in Cosumnes Culture graves. None of the Windmiller Culture teeth are perforated for suspension.

Animal canines occur primarily in shallow burials with relatively few other grave goods. The two sexed individuals decorated with teeth are females.

Beaver Mandible and Canis Skull

Half beaver mandibles occur in four graves in SJo-68, four specimens in UCAS burials no. 6, 9, and 49, and one in Dawson's lot no. 13. One *Canis* skull, probably that of a coyote, occurs in UCAS burial no. 38.

All the University of California burials listed above lie deep in the sub-hardpan mound matrix (Phases 1 and 2). Grave lot no. 13, described by Dawson as that of an adult male, lies in the hardpan (18 inches deep). It is accompanied by a beaver jaw, almost a thousand beads, to shell ornaments, and three points.

Birdbone Tubes

Birdbone tubes come from Dawson's grave lots nos. 2 and 14, and from UCAS burial no. 6. Between 70 and 80 mm long and approximately 10 mm in diameter, the undecorated tubes are carefully cut at one end and left rough or broken at the other. One bird bone tube is without provenience.

Turtle Shell Ornaments

Five turtle carapace ornaments in Dawson's collections come from five different grave lots (nos. 12, 18, 47, 61, and 62). The five pendants strongly resemble the rectangular Haliotis shell, B, ornaments in shape (Heizer 1949: Fig. 5d). The multiple perforations of some of these specimens suggest that they decorated a head piece or garment by being sewed on instead of being strung on a necklace. A rectangular turtle shell carapace is the only accompaniment of grave lot no. 47, a cache of four or five isolated skulls. The ornament measures 25 x 45 mm and has four perforations, one in each corner (Heizer 1949: Fig. 5e).

Elk-tibia "Sword," "Sweatscraper" or "Spatula"

Burial no. 51, that of a subhardpan adult male, holds what Gifford (1940) describes and illustrates as an elk-tibia "sword," (Pl. 5a). The specimen meansures 28.5 cm long by 5.5 cm at its widest. The base is concave. The sides taper to a point, and the edges near and at this point are worn very smooth. The "sword" may be made from an elk scapula. Average thickness is 3 mm.

A fragmentary antler tine"sweatscraper" or "spatula" lies in a disturbed context in Square M/N2, as does an unbroken, small, flattened horn spatula (cat. no. 1-73526). The horn item which measures 115 x 19 x 2 mm is highly polished except at the break, and is perforated at the broken end. Its rectangular shape is reminiscent of the slate pendants.

Four spatulas are known from other Windmiller sites, three from Sac-107, and one from SJo-56. Similar pieces occur in some Cosumnes sites (Lillard, Heizer and Fenenga, 1939:45, 48, 51; Gifford, 1940:172). Antler composes the raw material of two of the Sac-107 specimens which are from 3 to 5 mm thick, about 3 cm wide, and taper to a point; both specimens are broken. Writes Heizer:

> The third piece from [Sac-107] is very thin, being fashioned probably from a scapula blade. It is 22.5 cm long and 3.5 cm wide at the broad end, tapering to a point at the other.
>
> The [SJo-56] spatula [Heizer 1949: Fig. 17e] is made of antler (probably elk) and is complete. It has a concave base and lenticular cross section and measures 32.8 cm long and 4.5 cm wide.

It is possible that the Windmiller people used these "swords" primarily as strigils for scraping sweat from their bodies while taking steam baths, and only secondarily as weapons. Gifford (1940:173-174) quotes Fages from Priestley (1937:67-68) who says of the Indians of Monterey region:

> If two of the natives quarrel with each other, they stand body to body, giving each other blows as best they can, using what might be called spatulas of bone, which they always carry for the purpose of scraping off their perspiration while in the bath and during the fatigue of their marches.

The SJo-68 specimen (cat. no. 1-73500) resembles the scapula specimen from Sac-107 most closely both in size and in shape (Heizer 1949:Fig. 17f). The striking similarity in form between this early implement and later ethnographically-known pieces (Gifford's type M-1, 1940:173-174), suggests that they were probably used in a similar fashion.

Bone Tools

Antler Tools

Shaped antler objects come only from the subhardpan graves. Worked, but unshaped, antler pieces occur in hardpan burials no. 22 and 73 (Plate 32). Dawson notes little antler in his excavation. A broken antler chisel (cat. no. 1-55161, Heizer 1949:Fig. 18a) came from Dawson's grave lot no. 50 (Schenck and Dawson, 1929: Plate 79B).

Antler Points

Antler points occur in UCAS burial no. 6, the elaborate grave of the six to eight year-old child 36 inches below the surface (Heizer, 1949: Plate 3b; Plate 34). The antler points in burial no. 6 occur in two groups of three, one at the shoulder and a second at the waist. Heizer hypothesizes that the notched antler or bone points once formed heads of fishing tridents:

> The trident is an exclusively Early Horizon tool, evidenced from three of the four excavated settlements. The individual points average 7 cm in length, and are cylindrical with a definite curvature. The base on the outside of the arc is notched for attachment to a chamfered or mortised shaft end, as illustrated by us earlier. Our evidence for the reconstruction employing three points rests upon finding three points in this approximate position in a child's burial at [Sac-68]. In site C.56 a single point was found in the mound deposit without association. Of the five C.107 pieces, three occurred in one burial and one each in two burials (Heizer 1949:28).

Cremation no. 1, a multiple interment, also contains six charred antler tips, possibly the remains of points from trident spearheads similar to those in burial no. 6.

Antler Flakers and Antler "Wand"

A worked fragment of antler tine in burial no. 22(the hardpan grave of an adolescent female), a polished antler tip in burial no. 73 (a shallow infant grave), and a long antler "wand" in burial no. 49 (a subhardpan adult male's grave) comprise the remaining antler pieces (Pl. 5b). The worked antler tines in burials no. 22 and 73 are called "flakers" although their exact use is not known.

The antler "wand" from burial 49 occurs with a beaver jaw, twenty Haliotis la beads and eight Haliotis disc ornaments. The association of this completely unique piece with these presumably decorative and ceremonial objects suggests a ceremonial, if not a magical function, although no concrete evidence indicates its specific use. The stick is a single elk antler tine 69.2 cm long and approximately 2.5 cm in diameter. At one end, a small tine projects about 7 cm at right angles to the main shaft. The "head" of the stick is formed by a projecting tine; the end of the main shaft is worked into a smooth knob. The entire surface of the artifact is sanded or rubbed smooth until practically all cutting marks have disappeared. The blunt point to which it tapers shows no signs of use.

Several antler pieces lie unassociated in the mound matrix: a flaker fragment from Square A/N-2 comes from a depth of 13 inches; a cut antler tip about 100 mm long comes from the back dirt; yet another antler tip flaker (Pl. 5k) lies in the southern half of the mound about 12 to 24 inches below the surface; and an entire horn worked at one end lies in Square L/N-1 about 40 inches below the surface.

Some bone and antler specimens are missing from the SJo-68 collection, although fortunately several of them have been described earlier. Schenck and Dawson (1929:Plate 79, 81) provide photographs of antler artifacts from SJo-68 which apparently occur unassociated in the mound or on the surface.

Awls (Plate 5c-g, 1-m)

Awls are the most numerous of the bone tools. Eight specimens occur in seven UCAS burials (nos. 60, 6, 67, 62a, 73, 5, and Cremation 1) in Phases 1, 2 and 3.

The bodies in these graves all lie in the extended ventral west position except for burial no. 6 which rests upon its back. The awls are of various lengths with flattened to oval cross sections, and are shaped from mammal ulnae and split birdbone. The most common type is the ulna awl which comes in both a large and a small size (Plate 35). Five Dawson grave lots from Phase 4 contain eight awls (lot nos. 14, 17, 28, 62, and 66).

Among University of California graves containing awls, three contain beads, and three, including cremation no. 1, contain stone points. In Dawson's grave lots three out of eight containing bone awls also contain stone points, and three contain beads.

Many awls in the University of California collection occur unassociated in the mound matrix. Seven occur in trenches F-J below the hardpan, one of them 74 inches below the surface in J/N-2. The three specimens in the eastern third of the mound (trenches K-O) are from 23 to 18 inches below the surface in the second hardpan; the three awls found in the Western trenches (A-E) lie within 10 to 15 inches of the surface. Two of Dawson's awls have no provenience, and may have been found unassociated in the mound matrix.

A few of the unassociated specimens have been burned. Usually only the tips of the animal ulna awls are worked, although the shafts often show polish. Many of the University of California specimens of split birdbone, curved in profile, taper at one end and are carefully rounded or blunted at the other (Plate 34). These fragile specimens are often broken.

Some of the specimens are centrally or peripherally grooved with one or two shallow incisions around the circumference. A shallow groove encircles half the flattened circumference of one specimen (Plate 5j) just below the squared, cut end. One awl-like piece found 44 inches below the surface in Square I/N-3 is rounded and grooved at both ends, and measures 76 mm long, 7 mm wide and 5 mm thick. Cordwrapping impressions appear in asphaltum covering one end (cat. no. 1-73504).

Two of the bone awls appear to be perforated and a perforated specimen is reported by Heizer (1949:28):

> It is cylindrical and made of solid dense bone 1 cm in diameter with a drilled hole 3 mm in diameter, 8 mm from the end. It has been broken, its present length being 9 cm but originally it may have been 20 cm long, judging from the fact that the portion we possess shows no decrease in diameter.

A splinter of bone (cat. no. 1-73506) notched at one end on both edges is broken several millimeters above the notches. The break in this specimen, which has no provenience, looks as if it occurred through a perforation. Another possibly perforated specimen comes from an unknown depth in Square J/S-1, and consists of a fragment of long bone with a long groove cut half way through the section along the longitudinal axis. Again the break at one end appears to have taken place at a perforation.

Like their recent counterparts, these bone tools were possibly used in weaving baskets and sewing skins.

Single-Piece, Curved, Bone Fishhook

The single-piece, curved fishhook from burial no. 6 is 65 mm long and

32 mm from tip to outside of shank and lies in close association with a slightly curved bone gorget resembling notched antler and bone points from both this burial and other Windmiller sites (Sac-107 and SJo-65).

> A single specimen (Fig. 18,f) came from the burial of an adolescent male [no. 6] in SJo-68. It is unlike other single-piece bone or shell fishhooks from the Santa Barbara and Humboldt Bay localities, which are the only sites outside our area known to yield such hooks.
>
> The hook lay in the grave with a notched bone "point" lying along the shank of the hook proper in such a position as to suggest that the two were originally bound together. . . the end is somewhat enlarged to permit attachment of the line. . .
>
> The only other single-piece curved bone fishhook known from our area comes from site [Sac-117], a Late horizon settlement. It is in the private collection of Mr. S. Martine of Sacramento (Heizer, 1949:27).

Notched Bone Points

The notched bone points from SJo-68 are similar in size and shape to the antler points from burial no. 6; one may therefore infer similar functions. Heizer (1949:27-28) describes the type specimen from burial no. 6:

> This is a difficult piece to describe, and the reader is referred to the illustration in Fig. 18g. The bone piece is 5 mm thick, 7 cm long, 9 mm wide at center and somewhat less on the ends, one of which angles off slightly. Both ends, like the shank end of the fishhook with which it was associated, are slightly bulbous or enlarged, presumably to allow a line to be tied securely.
>
> We may be in error in supposing that the two pieces found comprise a compound hook. It may be that the curved fishhook is complete in itself, the notched bone "point" being a separate shank with a wooden barb attached. In evidence may be cited the definite scoring on the angled end, which may have served to hold the binding of the base of the wooden barb to the bone shank.
>
> It may be observed that similar "points" occur commonly in settlements of the Middle Culture Horizon [Cosumnes Culture] and that no instances of single-piece curved

fishhooks are thus far recorded from this culture.

One unassociated specimen (cat. no. 1-73521) is a curved piece of bone partially notched at one end and bluntly pointed at the other, with cord wrapping marks impressed in asphaltum at the center (Plate 35). The heavy curvature, the notch at one end, and the evidence of cord wrapping around the center suggest the bi-pointed or trident fishspear points described from burial no. 6. One burned fragment of a slender notched bone artifact, possibly a point or gorget was found with cremation no. 1. Similar items occur unassociated in sites SJo-56 and Sac-107. A separate fishhook barb or bone point (Heizer, 1949:Fig. 18j) was found in the midden at SJo-56, and shows binding marks at the angled, flattened end (Heizer, 1949:27-28).

Bennyhoff (1950:296) describes some possible uses for this type of bone implement which he classifies as type MM2b:

> A variety of uses has been proposed for these artifacts. Uhle [1907:75] suggested their utilization as arrow points, similar to implements of the Bororo, but the pieces seem needlessly specialized for such a use. Schenck [1926:266, Pl. 43F, H] interprets them as composite fishhooks. At the Early horizon site of SJo-68 the assemblage shown in Fig. 1j [Heizer, 1949] was uncovered _in situ_ [Lillard, Heizer and Fenenga, 1939: Fig. 9, 10]. The bladelike object has been considered an MM2b type [Beardsley, 1947:152], although both tip and base are atypical. Its purpose is difficult to imagine since the hook is complete in itself and needs no supporting member. It has been suggested that it acted as a wiggling lure to attract fish. That all implements of this type found in the succeeding horizon had a similar use seems doubtful. In no other instance were these blades found associated with curved fishhooks or with any artifact suggesting a composite fishhook. The numerous rounded tips would make them unfit for fishhook barbs. Use as a shank would imply wooden barbs, though the opposite combination, that is, wooden shanks and bone barbs, is the usual native construction. One general characteristic which should be noted is the tendency for the side opposite the basal projection to be straight, lacking the angularity needed in a composite fishhook to separate the barb from the shank. This straight side would be an advantage if the implement were lashed against a shaft (possibly grooved as in Fig. 1-u) to be employed as a fish spear; the attaching cord would then be held in place by the projecting foot (see Fig. 1-t). Many retain evidence of binding at the basal end. At site Sac-66 twelve of the twenty nine

found were definitely paired. The four examples from Sac-60 were found with one burial. This again suggests a bi-pointed fish spear.

Most of the examples of notched bone points (MM2b) seem limited to the Cosumnes Culture. The local center appears to have been Morse facies of the interior province from whose settlements came 74 percent of the specimens (Bennyhoff, 1950:207).

Gouges

Dawson calls the bone implements in lot nos. 18 and 53 "gouges" (Dawson and Schench, 1929, Plate 79A). Heavy fragments of long bone 59 mm long, they are crudely pointed or curved at one end.

Miscellaneous Worked Bone

Miscellaneous or unidentifiable pieces of worked bone occur in two UCAS burials(nos. 22 and 62). Dawson's grave lot nos. 18, 23 and 39 also contain non-specific fragments of worked or cut bone, and many others from the mound matrix.

Bone from SJo-68 is scarce and very heterogeneous in morphology. Many bone tools and worked fragments occurred unassociated. Canine teeth appear closely associated with Phases 3 and 4, while awls occur throughout the deposits. Turtle carapace ornaments are found only in Phases 4 and 5 (Pl. 6k-l). Other bone items are too scarce to understand their distribution. However, ceremonial objects, with the possible exception of beaver mandibles, antler "wands" and Canis skulls, occur above 32 inches in depth, in Phases 3, 4 and 5. Bone tools dominate bone offerings in Phases 1 and 2.

Shell Beads

Twenty-five University of California burials contain 1,833 shell beads, whole spire-lopped Olivella (1a), square-cut Haliotis (1a) with one central perforation, and some square-cut, perforated Olivella(2b) beads. The majority of these burials are in the eastern hardpan. The shell bead typology is shown in Fig. 14.

Five UCAS burials with beads are shallow interments of females, ten are of males (five shallow and five deep). Of the graves containing shell beads, seven are infants, one is a child's burial (no. 65); two are of adolescents; fourteen of adults; and two probably of people older than 50. Shell beads occur in more infant interments than any other artifact.

Gradual changes in both Haliotis and Olivella bead size may take place as has been found of clam shell disc and magnesite beads in the Hotchkiss Culture. However, a detailed analysis of Central Californian shell beads still remains to be done. Hotchkiss Culture Olivella 1a beads measure 5 to 9 mm in length as compared to the 15 to 30 mm length of Olivella 1a beads in the deeper burials of SJo-68.

Beads seem to change from the large Haliotis 1a and large Olivella 1a beads of Phases 1 and 2 to a mixture of small spire-lopped Olivella 1a, Olivella 2b, and small Haliotis 1a, Haliotis 2 and 3 beads in Phases 3, 4 and 5.

In the UCAS collection, beads occur with charmstones in 6 out of 15 possible times, with crystal 7 out of 11 possible times; and with shell ornaments 12 out of 17 possible times. In the Dawson grave lots, beads occur with 7 out of 12 graves with crystals, with 5 out of 10 occurrences of baked clay pecans, and with 17 out of 23 offerings of Haliotis shell ornaments.

Beads and bone artifacts occur together 6 out of 14 possible times in the UCAS graves and 11 out of 24 in Dawson's grave lots. One of Dawson's graves (lot no. 38) held an arrangement of shell beads, pendants and bird wish-bones placed around the neck and shoulders of the interment suggestive of a necklace or neck decoration. Beads and projectile points are found together in only 8 UCAS burials and 6 Dawson graves. The association found between points and shell beads is less strong than that which would occur if the distribution of points were random with respect to beads.[25]

Shell beads are found with decorations such as quartz crystals, shell ornaments, bone, and occasionally religious or magic paraphernalia-like charmstones. Dawson provides an exact count of all, including a description of their placement on the body. From his notes, one can easily distinguish those beads and discs strung into necklaces from those possibly sequined onto garments, scattered onto the floor of the grave pit, or stuffed into small, now-disintegrated containers of skin basketry or wood.

He also mentions that some of the beads are of various colors, believing that the beads were dyed or stained brown, yellow, and sometimes red. Dawson's grave lot no. 37, containing the skeleton of an adult (about 16 inches below the surface) yielded:

> Forty-one Olivella 1a beads, some brown, others white, from the ribs, under the chin and around the neck joints; four lay inside the skull. The beads near the neck lay as if in strings. Beads and discs lay together (Dawson, 1923: fieldnotes no. 1164).

Evidently shell beads and ornaments were strongly associated with the ceremony surrounding death. The three most closely associated items, shell beads, shell ornaments, and crystals, were probably used in the personal decoration of the body, and may have been sewn on to clothing and head dresses.

Olivella la Beads

The whole, spire-lopped Olivella la bead (Pl. 60) appears to be the most popular type of bead in the Windmiller Culture. Five hundred and thirty one of these beads are in the University of California collections and 6,878 of them in the Dawson collection. A breakdown on the lengths of these objects (Table 52) shows a bimodal distribution of lengths, one mode centered around 9 mm and the other around 18 mm. The break appears to be at about 15 mm. Beads which were 15 mm and above in length are called "medium" and those up to and including 14 mm in length are called "small." If specimens cluster around one of the modal points in any of the UCAS or Dawson grave lots, then all specimens of that group are classed together, even though one or two individual beads fall over the arbitrary dividing line. They are placed in two categories when these odd specimens are very far over the dividing line. In the UCAS excavation, small Olivella la beads occur in 10 graves ranging in time from Phases 2 through 5, while medium beads appear in six graves attributable to Phases 2 and 1. Burial no. 71 at 44 inches in depth contains only the medium whole spire-lopped Olivella beads. Three female and four male adult interments contain Olivella type la beads. Burial no. 71 contains an unsexed adult; burials no. 59 and 65 contain an infant and a child respectively.

These medium Olivella spire-lopped beads are associated with small Olivella la beads in two burials, nos. 65 and 67, perhaps transitional between Phases 2 and 3. Dawson notes Olivella la beads in 24 grave lots, a total of 6,878 beads, about half of them (3,372) from the northeastern corner of the mound in grave lot no. 74 (original lot no. 42a), a cache of about 10 to 15 skulls and skull fragments. Only four grave lots have a few medium sized beads, perhaps larger only by chance.

Dawson's grave lot no. 33 is one of the most elaborate burials found by him. He wrote:

> Finds comprised 321 Olivella la beads, white, red, yellow, and brown, possibly dyed, in a small compact bunch on the breast; one Calaveras topaz [a quartz crystal] near the head; and about 564 rectangular Olivella beads (Type 2b) and seven rectangular Haliotis beads (Type la) under the chin in five rows colored yellow and white; none were scattered on the head. One chipped stone item, a scraper measuring 3-1/8 x 2 x 1-1/16 inches, of chert, was found near the head. Red ochre was abundant on the beads around the head and chest.
>
> This was one of the most beautiful finds that I ever made. Digging from the west, I found the leg bones, next the hips, ribs, etc., toward the head. I first found the beads listed in catalogue no. 131 and separated them from the dirt [these are the 321 Olivella la

> beads found in a small compact bunch on the breast]. I next located the approximate position of the head and proceeded to pick the dirt around it so I could remove it without breaking it or any of the objects that I might find with it (it was too hard to shovel). I finally broke away a section exposing the left side of the chin. There lay four or five rows of beads side by side just as they had been worn perhaps hundreds of years ago. They were covered with a coating of red pigments (vermillion or red ochre) which came off as soon as any attempt was made to clean the beads. I took my small garden tool and loosened the beads and let them fall into my hand. Row after row was removed and then the dirt around the head was sifted. The other objects were found while removing the head. These beads comprise one of the best worked strings of this kind from this mound to date (December 19, 1923, Dawson fieldnotes).

Small Olivella la beads dominate Phase 5 and share popularity with Olivella 2b beads in Phase 4.

Olivella 2b Beads

Square-cut, single-perforated Olivella beads, type 2b, occur in three UCAS graves (Plate 6m) and in 10 of Dawson's lots. All of these graves lie about 36 inches in depth. Two are possible Phase 3 graves, the remainder are from deposits belonging to Phase 4 and 5.

Haliotis la Beads

Nine hundred and eighty-one square-cut Haliotis la beads occur in 16 of the UCAS burials. The specimens measure about 10 x 7 mm, ranging from as large as 14 mm to as small as 5 or 6 mm, and come from graves both in and below the hardpan (the size change may have temporal significance). The Phase 1 burials usually contain only the square Haliotis la bead type. Except for burial no. 71, small Haliotis la beads appear in large numbers only toward the end of what has been called here Phase 3, the graves of which lie about 28 inches below the surface.

Haliotis Type 2 Beads

The rectangular Haliotis Type 2 bead, a common Cosumnes Culture type distinguished by two, instead of one, central perforations, occurs in three Phase 4 UCAS burials, and in three Phase 4 and 5 grave lots from Dawson's collections. The largest number, 21, come from grave lot no. 49, one of the skull caches. Haliotis 2 beads and other typical Cosumnes Culture bead types are evidence of the comparative lateness of Phases 4 and 5 in the SJo-68 deposit.

Haliotis Type 3 Beads

Haliotis type 3 beads (Pl. 6n) are circular with a small central perforation. They occur in Windmiller Culture sites, although they are more frequent in the Cosumnes Culture. In the hardpan of SJo-68, four specimens are associated with UCAS burial no. 84, Phase 4.

Bead Associations

Shell beads seem to change their artifact as well as age and sex associations between the lower mound matrix and the hardpan. Associations are with shell ornaments and occasional bone tools in the sub-hardpan deposits and increase to include quartz crystals and a few points and charmstones in the hardpan layers.

Bead size may decrease through the deposit, while additional bead types, *Olivella* 2b, *Haliotis* 2 and 3, mark the beginning of Phase 4.

Haliotis Ornaments

A typology of shell ornaments (Fig 15) was made shortly after the 1947 excavation and is included below.

> The Dawson-Heizer collection of *Haliotis* shell ornaments were treated together for the purpose of classification but separated in the tabulation of grave lots. A total of 479 specimens were classified as ornaments and three others were missing. The Lillard-Heizer-Fenenga classification was followed throughout. All specimens were classified according to the type which they most closely fit. *Haliotis* types B and C made up over 95 percent of the collection. Most specimens have had the backs removed; of others 41 were definitely or most probably of *Haliotis rufescens*, 48 of *Haliotis cracherodii*. Of the latter, however, 36 were from what was probably a single group lot excavated by Dawson (grave lot 75). Among specimens associated with known burials or grave lots, there were 13 *Haliotis rufescens* and eight *Haliotis cracherodii*. Thirty-one types were recognized, but only 15 of these included as many as three specimens and four types together included 81 percent of the total, B.1, B.(1).1, C.(2), and C.(2).a. The only other types which were fairly frequent (10 or more specimens) were B.2, C.(1) and C.(1).1. It was noteworthy that only type C.(2) and C.(2).a occurred abundantly in the identified grave lots

(quoted from the preliminary analysis sheet, 1947).

The Haliotis disc C is found in two sizes (a large and a small disc) which appear to have different uses. The small size (from about 15 to 20 mm) usually has two central perforations and a decoration of small incisions or notches around the edges. This type often lies around the head, and may have been used to decorate a headdress or some other garment. The smaller specimens occasionally occur at the side of the head (ear decorations) and paired inside the mouth. The larger specimens often cover the eye sockets and mouth, or lie about the neck and shoulders. Sometimes Haliotis discs appear to have been strung, alternating with smaller beads (both Olivella 1a and Haliotis 1a types), wolf teeth, and bird wishbones. The largest Haliotis ornaments, type C.(2), sometimes 5 to 6 cm in diameter, occur singly at the knees and feet of several skeletons, on the back of the skull, over the eyes, and occasionally paired, one on either side of the head. In burial no. 19, two large discs lie near a stone earplug (?) containing traces of asphaltum. Heizer reports the plug in a list of unique artifacts found at SJo-68, unfortunately, the specimen cannot be found.

Sixteen UCAS graves contain a total of 103 Haliotis shell ornaments (Table 50). All but four graves are found in Phases 3, 4, and 5, the majority from Phases 3 and 4. Rectangular pendants occur more frequently in Phase 3 graves than in Phase 4, while circular discs with double perforations are common throughout the deposit. Fifteen interments are located in the central and eastern thirds of the mound. Burial no. 19 comes from trench A. Twelve of the burials with Haliotis ornaments are male. Burial nos. 19 and 88 are female; burial no. 65 contains an unsexed child, burial no. 73 an infant, while burial no. 104 is too fragmentary to determine sex. Shell ornaments, more than other types of shell artifacts, appear restricted to burials of male adults.

Graves with shell ornaments are customarily found in the hardpan of the central and eastern portions of the mound, where extended, ventral, west-oriented male skeletons generally lie. Haliotis ornaments occur most frequently with quartz crystals (eight times) and shell beads (ten times) (Table 51).

Haliotis B.1 and B.1.a Pendants

B.1 and B.1.a pendants were found in five graves (2 excavated by UCAS and 3 by Dawson). Three graves lay in deposits holding Phase 3 interments, the others in Phases 1 and 5. The graves also contained other rectangular shell pendants and disc ornaments.

Haliotis B.1.1, B.(1).1, B.2 and B.2.a Pendants

Seven UCAS graves and only one of Dawson's lots (no. 75, a cache of 4-5 skulls) contained these rectangular pendants with double perforations.

B.2 pendants were found with burials nos. 19 (1), 84 (1), 65 (2) and 48 (7), interments from Phases 5, 4, 3, and 2 respectively.

B.(1).1 pendants lay in burials no. 45 (1), 96 (2) and 85 (3) (Platd 34). Burial no. 84 also contained a B.2.a pendant. Dawson's grave lot no. 75 was accompanied by 111 B.1, one B.1.a, 31 B.(1).1, three B.1.1 and one B.2 pendants. Five of the interments are male, one female and one an unsexed child. All of the interments also contained other types of shell ornaments, five held quartz crystals and five shell beads.

Haliotis B.1.1.1 and B.2.(1).1 Rectangular Ornaments

These rare types were probably sewn on garments or head bands. Burial no. 48 contained a B.1.1.1 ornament and Dawson's grave lots no. 31 and 49 contained B.2.(1).1 ornaments. All three graves lie between 12 and 18 inches below the surface and are tentatively attributed to Phase 4.

Haliotis Discs, C.(1)

Three UCAS burials (Nos. 104, 79, 85) and six Dawson grave lots (nos. 21, 52, 54, 23, 75, 6) contained centrally perforated discs. The graves are scattered throughout the vertical sequence, although they cluster in the northeastern trenches of the mound.

Haliotis Discs, C.(1).a and C.(1).n

C.(1).a discs were found in Dawson's grave lots (nos. 8, 9, 5, and 6) in UCAS burial no. 10 and in a disturbed burial in UCAS grid Square N/N2. All three interments probably took place during Phase 3. C.(1).n or notched discs occurred in Dawson's grave lots nos. 62 and 14 and UCAS burial no. 85. One C.(1).c disc occurred in Dawson's lot no. 9.

Haliotis Discs, C.1

The edge perforated disc occurs in the same graves as the centrally perforated type C.(1) and C.(1).a, Dawson's grave lots nos. 8, 54, 9, 5, 75 and 6 and UCAS burials No. 104 and 85. The off-center perforations may be the result of a distinct function perhaps as sequines or pendants; such a distinction cannot be substantiated without knowing the disc's exact position on the interment.

Haliotis Discs, C.(1).1, C.(1).1.a

These discs also occur in UCAS burials no. 85 and 104. Dawson's grave lots nos. 21, 52, 38, 5, 6 and 65 contain C.(1).1, while nos. 9 and 10 include C.(1).1.a. Most of the graves fall within Phases 3, 4, and 5.

Haliotis Discs, C.(2) and C.(2).a

By far the most numerous shell ornaments in SJo-68, these centrally perforated discs were found in a total of 27 graves, 11 UCAS burials and 16 of Dawson's grave lots. Nine males and two females are buried with the discs. The two Phase 1 graves contain only C.(2).a discs, and several of the Phase 3 and 4 graves contain C.(2) and C.(2).a in addition to other types of discs and pendants (Pl. 6h). Five of the UCAS burials were also accompanied by quartz crystals and five had worked bone accompaniments. Nine of the UCAS interments contained some form of shell beads. These discs were apparently primarily used by men for personal decoration along with quartz crystals and shell beads.

Other Types of Haliotis Ornaments, C.3, C.(2).1, C.(1).2.a, and C.(1).n Segment

Haliotis ornament types C.3, C.(2).1 and C.(1).2.a occur singly in graves with other Haliotis discs, either E.(2) or C.(2).a. These triple perforations may be C.1 or C.(2) ornaments reperforated to adapt them for a new function.

The C.(1).n segment in UCAS burial no. 51 is unique in SJo-68, but these cut discs do occur in other Windmiller Culture mounds. The Haliotis discs and segments may be the oldest types of shell ornaments.

Other Types of Haliotis Ornaments F.1, F.2, F.3.a, H.2, H.3 (Pl. 6i-j).

Shallow graves, the deepest 33 inches below the surface (burial no. 65), contain these pendants. They appear to be variations on the popular rectangular B form. As in so many other artifact categories the number of types proliferate in the later phases of the site. Most occur in graves containing other types of rectangular shell ornaments. Only Dawson's grave lot no. 24 contains a single H.2 ornament.

Modified Haliotis Ornaments, M.F.(2), M.F.2, M.E.1, M.E.(1).1, M.E.(2), M.E.2, M.B.1, Amorphous 1, Amorphous 2.a

The modified ornaments are crudely made or are irregular in some way, but they have recognizable shapes. They appear primarily in the later Phases (4 and 5) of SJo-68, and occur in graves with other types of shell ornaments. Many of the modified shell items appear in Dawson's grave lot. no. 75 in which about 150 Haliotis shell ornaments, mostly Type B.1, occur with a cache of 10 to 15 skulls.

Twenty-three of Dawson's grave lots contained Haliotis ornaments, and for the most part affirm associations suggested by the UCAS excavation. Shell beads are found most frequently with shell ornaments. Quartz crystals, stone points and objects of bone are occasionally found in the same grave.

Shell ornaments again emphasize the increasing elaborateness of the hardpan burials. Their distribution suggest a superior status for men in the society, being restricted to male interments almost exclusively. Despite the apparent loosening of customs in the upper levels of the site, a modification one may infer from the fact that women and infants appear more frequently and begin to be accompanied by objects which in the lower levels belong almost exclusively to men, shell ornaments maintain a stricter sexual division than any other type of artifact except charmstones.

Quartz Crystals

Quartz crystals occur in 11 UCAS burials (9 extended ventral west and 2 extended dorsal west), largely in the center third of the mound (Table 52). Ten of the burials lie in the hardpan, and one in the sub-hardpan (burial no. 67). They represent graves from Phases 3, 4, and 5. Three interments are of females (burials no. 19, 66, and 88), seven of males; one (Pl. 6f) is of an unsexed child.

In both the UCAS and the Dawson excavations, beads and shell ornaments are in interments containing quartz crystals. Unlike the ethnographic quartz crystals, the Windmiller specimens seem to have no prominent magical function. In a few cases, crystals do occur with other obviously ceremonial-magical artifacts (the charmstones or slate pencils); however, much more often, they are mixed with decorative items. They seem, therefore, to serve a decorative function. Evidently, men, women and children used them in large numbers:

> The most ancient sites of the Sacramento Delta region yield human burials accompanied by great numbers of perfectly clear, flawless quartz crystals (Lillard, Heizer, and Fenenga, 1939, passim). The total number of these crystals runs to many hundreds, and it is obvious that this ancient population made a particular effort to secure them. The Mokelumne Hill locality, not far distant, was probably the source (Heizer and Treganza, 1944:332).

Ochre

Twenty-five burials in SJo-68 are covered with red ochre, either in lumps, powdered over the entire body, or painted in bands across parts of the body (Table 53). Burial no. 67, for instance, has pairs of bands painted across the backside of the femora. These ochre-covered burials are concentrated in the northwest and northcenter portions of the mound. Two graves were excavated by Dawson (grave lots nos. 9 and 33) and the remainder by the UCAS.

Ten ochre covered burials occur in Phases 3 and 4, and 15 in Phases 1 and 2. Dorsal burials (14) exceed ventral (8) burials. Elven of the burials are of males (eight dorsal extended and three ventral extended), six of females

(2 dorsal and 4 ventral) and six of undetermined sex (1 ventral, 4 dorsal and 1 disturbed).

All but one female interment lay in the hardpan. Burial no. 29, a possible female young adult, lay at 53 inches below the surface. All artifact accompaniments, points and ochre, and its association with burials no. 23 through 28, all adult or adolescent males, suggest that no. 29 is an adolescent male of somewhat light build.

One infant (burial no. 16) accompanies an adult female; the other infant (burial no. 43) lay alone, its bones imbedded in a large lump of hematite (see Plate 11). Six burials are of late adolescents (burials no. 13, 21, 22, 23, 25, and 63). Burial no. 24 contains skeletons of both an adult male and an adolescent male, although the artifacts appear to associate with the adult. Burial no. 22, identified as that of a female, may actually be that of an adolescent boy (the sex of adolescent skeletons is difficult to distinguish). More ochre occurs in adolescent and dorsal interments than any other type of grave offering.[26]

Ochre-covered interments appear primarily to be young men distinctively interred on their backs. Eleven of these ochre-covered adult and adolescent interments contain stone projectile points, while one infant (burial no. 43), four adult and two adolescent interments (burials no. 13, 14, 21, 25, 52, and 63), lack additional artifacts. Three interments, burials no. 24, 85 and 106a, have projectile point fragments imbedded in the pelvis, humerus and shoulder blade respectively.

The picture, though never complete in such cases, is provocative. These young men, as well as a few of the women and children, may have died as a result of inter- or intra-group fighting. Their scattered horizontal and vertical distribution suggests intermittent skirmishes or raids. These raids could have caused the death of a few women and children. The group of sub-hardpan burials no. 23 through 29 (23, 25, 27 and 28 were all adolescents; 26 was a mass of unidentified mixed bones), in Squares A/N1-2, may perhaps all be the remains of victims of a single struggle.

Thus, after a raid, the dead may have been buried quickly without full ceremony. They were either positioned without regard to custom, or buried in a special ceremony utilizing the dorsal position. The regularity with which the dorsal burials appear and the care with which dorsal skeletons are treated (they all point west and many contain elaborate grave goods, including ochre) support the hypothesis of special treatment for individuals killed in battle. The ochre in burial no. 67 occurs painted across the dorsal sides of the two femora in two wide bands about 10 inches apart. Either the legs, a leg-length garment, or a mat spread over the body could have received an application of ochre paint. As the clothes and body decomposed, the ochre paint would doubtless settle down over the bones. Probably the paint was applied directly to the flesh on the legs, for ochre stains are not reported on either side of the body. Clusters of quartz crystals, types C1d, C2b, and C3a charmstones, small spire-lopped Olivella(1a) and small square-cut Haliotis at the neck also accompany burial no. 67.

Baked Clay Objects

Biconically-shaped objects, "pecans," with a cut or cord-impressed groove encircling the longitudinal axis, seldom occur in the mound matrix, as is evidenced by the fact that only eight specimens occur unassociated in the UCAS collection. These pecans are found singly or in twos among the other grave goods. The UCAS excavated six pecans from five graves (burials no. 10, 15, 58, 59 and 86: Phases 3 and 4). All five of the UCAS burials lie extended ventral and oriented west (Pl. 6g).

Dawson found twelve pecans in eleven of his grave lots. Dawson's burials lay outstretched to the west between 10-24 inches below the surface (Phases 3 and 4) except lot no. 26, which lies below the hardpan at 36 inches.

Two pecans from the UCAS excavation come from infant graves. One female and two male adults' graves contain one clay pecan each. Two pecans in Dawson's collection come from two graves containing both adult and infant bones. No trend of association seems to exist for these objects along the lines of age or sex.

Pecans are also known from one burial in the Windmiller component of Sac-168. Heizer writes (1949:25):"No baked clay objects were found with burials in [SJo-] 56 and [SJo-] 142, although the site deposits show evidence of baked-clay fragments and chunks which may occasionally bear a smoothed surface indicating hand-molding." Baked clay pecans are absent from SJo-112 burials. Only two fragments of fired clay were excavated from the deposit.

> A Cosumnes site [Sac-] 66 yielded one flat perforated disk, one cache of 6 baked-clay objects in three matched pairs (2 longitudinally grooved and 4 loaf-shaped), 1 tule-impressed, and 3 plain, spool-shaped objects. The perforated disk and plain ball forms, known only from single occurrences in one Early horizon deposit [SJo-68], carry over to Middle horizon times, but the small pecan-shaped form with cut groove is unique to the Early horizon where it is known from only the [SJo-] 68 and [Sac-] 107 communities.

Two of Dawson's burials, lots nos. 9 and 69, contain single small well-shaped perforated clay discs about one inch in diameter and one-fourth inch thick (Schenck and Dawson 1949:185, g.h.j; Plate 37). These clay discs have been found previously only in Cosumnes and Hotchkiss sites.

Whether baked clay pecans and discs are introductions to the Delta or are an "in situ" development required clarification. No similar baked clay objects occur to the north, south or east, although Cressman records strikingly similar objects ground in stone from the Dalles, Oregon (1960).

These clay specimens are probably substitutes for common items, perhaps "slingstones," or "netweights" elsewhere made from stone. A morphological similarity does exist between pecans and the larger stone net sinkers found in later interior and coastal sites in both the Cosumnes and Hotchkiss Cultures. However, the pecans are too small and too light to be net sinkers; they could have been used as fishline weights. Burial no. 6, the only burial accompanied by a fishhook and by objects which were probably points from fishing spears, contains no clay pecans. These clay objects are somewhat similar to ethnographic slingstones which Kroeber (1925) described as used by the Pomo against waterbirds, the bones of which are numerous in Windmiller deposits.

Shaped, Baked-Clay Objects: Discs, Balls, and Cylinders

Shaped baked-clay is common in both the mound matrix and in features of SJo-68 (feature nos. 17, 18 and 23). Large, flattened, disc-shaped pieces are the most common, although spherical, cylindrical, or slightly biconical shapes also occur. Some are perforated (Pl. 6d-e). Most of the site's smooth clay fragments seem to have been originally part of these disc forms. Some specimens bear finger and/or fingernail impressions on their smooth surfaces (Tables 54, 55, 56).

Finger holes and fingernail impressions punched into the clay's surface may represent deliberate decorative attempts. No other obvious explanation for the phenomena exists. Specimens sometimes have tule reed imprints. Many appear to have been pressed against twined baskets (Heizer, 1949:Fig. 5f), clear imprints remaining on one or more sides of the clay. On one surface, one biconical object bears a tule matting imprint.

Six round fired-clay balls occur unassociated in the mound, four of them from 22 to 60 inches below the surface. Four cylinders and nine biconical pieces also come from the mound. The distribution of cylindrical and biconical pieces is similar; more of these artifacts occur in the hardpan than below it. Some of the biconcial pieces may be "unfinished" (ungrooved) pecans, although these specimens are generally larger.

Pecans are the only clay pieces which were deliberately used as grave offerings. Ten specimens, however, are unassociated, and come from locations in or near the hardpan. Seven of the 10 specimens occur in the mound's western third. Dawson notes three pecans from 12 to 18 inches below the surface in the center of the mound, perhaps from disturbed burials.

Plummet-Shaped Objects

Dawson and the UCAS both report two plummet-shaped clay objects (cat. nos. 1-49075 and 1-55352) from trenches F-J/N2 in the northern half of the mound. Neither of these specimens can be found in the collection. Sketches indicate that they were triangular to pear-shaped in outline and circular in cross-section, the Dawson specimen being 5/8 inch long by 3/8 inch in diameter.

Pots

Three small clay pots or cups are also reported. One (cat. no. 1-73628) from 61 inches below the surface in Square J/N4, is 69 mm high, 59 mm in diameter, and has a wall thickness from 10 to 20 mm from the thinnest part of the bottom to the thickest part of the side wall at the corner. The inner walls of this pot are stained with red ochre (Plate 6a).

The other two specimens (nos. 1-73757C and 1-73822) are small wall fragments which suggest vessels very similar in curvature and shape to the one described above. Both of them came from an unknown depth in the western third of the mound. Specimen no. 1-83722 (Pl. 6b) appears to have thinner walls and to be more finely made. All three of these specimens probably represent pots used for the storage of ground ochre until its use as body paint.

Unassociated Baked-Clay Objects

Eleven features contain clay chunks and fragments. Only features nos. 7, 8 and 18 yield complete clay balls. Feature no. 7 lies in the hardpan between 12 and 24 inches, and feature no. 8 comes from below the hardpan, between 36 and 47 inches below the mound's surface. Both are in the mound's western third. Feature no. 18 lies 24 to 35 inches below the surface in the eastern part of the mound near five other sub-hardpan features which also contain clay objects. The existence of numerous features in the eastern third of the mound supports the comment found in Heizer's fieldnotes that unassociated baked-clay, shell, and bone objects (living debris) increase in frequency in this lower northeastern section. The remaining features, no. 2, 4, 5, 17, 22, 23, and 24, contain unshaped clay chunks. These accumulations of baked clay and bone may mark ancient hearths from which any evidence of ash or charcoal has long since been washed away. Two of these features, nos. 7 and 22, contain cooking or grinding stones and mortars. Feature no. 28 contains a cache of unworked animal bone. Feature nos. 6, 10, and 12 contain mortars but no clay.

Baked-Clay Fragments

Baked-clay fragments occur scattered throughout the grave fill and mound matrix. Screened sections of the mound yield hundreds of tiny, rice-sized clay pellets red and yellow from firing. These as well as larger fragments of baked clay lie scattered throughout the grave fill of several burials. They are never found as intentional grave offerings.

These baked-clay pieces may have been used for boiling liquids in lieu of cooking stones, because stones of the proper size are rare in the valley floor. Some cooking stones in the form of fire-cracked rocks, occur in features nos. 7 and 12, and some occur in the mound matrix. They are too rare to have been in common use.

Many baked clay fragments, smoothed on one side, are pieces of the discs mentioned in the previous discussion of shaped-clay. These fragments were probably also split by heating and used as pot boilers. Among early historic Indians, baked clay was used instead of stone not only in the Central Valley but also in many North American river valleys where stone was difficult to obtain.

Table 55 gives the horizontal and vertical distribution of the larger baked-clay fragments noted. Most have no recorded vertical provenience.

Evidence of Basketry

A basket-impressed ball came from Square B/52 (Pl. 6c).

The example from SJo-68 (Heizer, 1949: Fig. 5f) has a rectangular shape about 10 x 7 x 4 cm; the twine basketry impressions occur on the flat surfaces, sides, and flattened ends. Heizer (1949:28) states:

> The several heavy flat, eyed bone needles described were probably used in making twined mats of rush or reeds.
>
> Fine two-ply twisted string (probably of Apocynum or Asclepias fibers) is attested by impressions in asphalt on the ends of charmstones and bone objects.
>
> The rarity of sharp-pointed bone awls has suggested to us the possibility that coiled basketry was not present in Central California in Early horizon times. Coiling must have entered Central California from either the east (Great Basin) or south (Southern California). The close twining shown in the textile impressions on the two baked-clay objects from C.68 [SJo-68] and C.142 [SJo-142] reminds one of recent Northwestern California and Pomo fine-twined basketry.

Table 56 gives a breakdown of the surface finish of the baked-clay pieces. Many contain imprints of perishable materials including fiber, basketry, cord, twine, and human fingers. Most of the basketry appears to have been twined.

Ground Stone

Slate or Schist "Pencils" or "Rods"

Slate pencils come in a variety of lengths, cross-sections and body finished (typology in Olsen and Wilson, 1964:14-17; Plate 40). Because so few occur in SJo-68, all sizes and shapes of schist rods will be discussed together. Few of the burials noted in the hardpan of SJo-68 by the UCAS yield slate rods or pencils. Burial no. 29 (Phase 1) contains slate rods (Pl. 7d) and four obsidian points; burial no. 62 (Phase 3 or 4; Pl. 7i) the very elaborate male burial described earlier, is accompanied by slate rods, points, a pestle, mortar, and crystals; and burial no. 96 (27 inches in depth) also of a male, contains slate rods, shell beads and about 40 shell discs.

Three of Dawson's grave lots hold schist rods, but in much larger quantities. Lot no. 7, 24 inches in depth, contains 16 rods of various shapes in a tight bundle on the skeleton's chest:

> Specimens nos. 403 through 422: slate pencils, mica ornaments, and asbestos ore pencils (Plate 11) were all found beneath the chin in a compact bunch, about 18 inches by 12 inches. The objects were not piled together but fell in every direction probably originally in some sort of container (Dawson, 1923: fieldnotes).

The slate pencils found in this burial were of various sizes and shapes, circular to flat in cross-section, and ranged from 1-1/4 to 5-1/2 inches in length. Half of them have been ground to a sharp point, and the other half blunted or rounded at the ends. Four slate rods (Pl. 7f-h) occur in Dawson's grave lot no. 12 (8 inches in depth):

> Specimens nos. 920 and 921 were long oval pieces, one end squared and one end rounded. They both measured 6 inches by 7/16 inche by 5/16 inch. Specimens 922 and 923 were thinner and wider than those described above and spotted with asphaltum. The ends were squared thin and blunt. They measured 5-3/16 inches by 1/2 inch by 3/16 inches and were placed in matching pairs on the rib cage (Dawson 1923 fieldnotes)[27].

Three pencils occur in grave lot no. 34, six inches in depth, along with 19 quartz crystals and two zincblend splinters (Dawson's notes mention a single obsidian point, but this specimen is not in the collection).

Slate Pendants

A single rectangular slate pendant occurs in the UCAS burial no. 80 (Pl. 7e). The specimen is notched on both edges at one end, and is associated with numerous square Haliotis la and four round Haliotis 3 beads. The burial lies in a disturbed area (Phase 4), although the notes mention that the interment itself is probably not disturbed. The fragmentary nature of some of the bones and the absence of others indicates a secondary burial.

Dawson mentions two perforated slate pendants unassociated in the mound (Schenck and Dawson, 1929: Plate 79-E) one found by him in grave lot 7 is shown in Plate 7j.

Asbestos Splinters

Dawson's grave lots nos. 7 and 12 (Phase 4) yield unworked asbestos splinters. In both lots they occur with slate pencils, possibly indicating similar function.

Zincblend Chunks

Zincblend chunks occur in UCAS burial no. 6(Phase 2) and in grave lot no. 34 (Phase 5) of Dawson's collection, both very elaborate graves (Heizer 1949: Fig. 9h). Zincblend (sphalerite) is found in the Sierra Nevada Mountains (Heizer and Treganza, 1944).

Ground Obsidian Awl (Schenck and Dawson, 1929: Pl. 98H)

Dawson found a single ground obsidian rod or awl, 72 mm long in grave lot no. 32 (Phase 5), an isolated skull with 32 whole spire-lopped Olivella beads (Type la). The flake scar facets of the obsidian awl are completely ground off, one end is ground to a point, the other blunted and grooved around the circumference. Ground obsidian occurs in Sac-107 in conjunction with unworked obsidian splinters called "bangles" (Heizer 1949: Fig. 14 u,v; Plate 40).

Malachite Fragments

Three small green malachite pebbles occur in burial no. 6 (Phase 2) close to a fishhook in the region of the right pelvis.

> Archaeologists occasionally turn up bits of bright green malachite in ancient sites of the lower Sacramento Valley. The Copperopolis mineral locality immediately to the east was probably the source of this green pigment (Heizer and Treganza, 1944:341).

Mica Ornaments

Circular mica ornaments bearing a single central perforation occur in burial no. 6 and in two of Dawson's grave lots, nos. 7 and 25. The mica has weathered, making it impossible to determine the original number of ornaments. UCAS burial no. 6 contains five or six ornaments. Dawson's grave lot not 7 contains about five, while grave no. 25 has one or two.

Ground Stone Discs

Three ground disc-shaped stone pebbles without perforations occur in two of Dawson's grave lots (nos. 9 and 13; Phase 4) and one was found unassociated in the mound matrix (Square J/N1 at 35 inches below the surface). These discs have no obvious uses and may simply be decorative objects.

Mortars

Mortar fragments occur in two burials (nos. 49 and 62), five features (nos. 6, 7, 10, 12, and 22), and throughout the mound matrix (Table 57). Although large fragments do occur, no complete mortars have yet been found. A whole rectangular pallètte of ground stone occurs in one of the burials at Sac-107C, in the Windmiller Culture level, but nothing comparable has come from SJo-68. In the Central Valley, where stone must have been carried in from the Sierra or Coast foothills, stone mortars are not common grave offerings. Specimens were apparently used until they wore out.

Burial no. 49, a Phase 2 male interment, contains one of the most complete metates found (cat. no. 1-73684), flatter and thinner than other mortar fragments. Burial no. 62 contains a small fragment which may perhaps be part of the grave fill (Phase 3).

UCAS feature nos. 6 and 7 contain four mortar fragments each. From feature no. 12 comes half a mortar, well-shaped both inside and out (cat. no. 1-73683 a, b); feature nos. 10 and 22 yield only single small fragments. Two of Dawson's grave lots (nos. 13 and 63) contain mortar fragments.

It is difficult to determine whether any of these grave occurrences represent deliberate grave offerings or merely accidental associations with burials as part of the grave fill. Only the metate in burial no. 49 gives a convincing impression of association.

Twenty-nine fragments of mortars were found unassociated in the mound soil.

Mortar fragments occur largely in the central and eastern third of the mound. The number of mortar fragments appears greatest below the hardpan layer from about 40 to 70 inches below the surface. Features containing mortars are distributed fairly evenly throughout the site.

Mortars, though varied, have a basically globular shape with rounded bottom and rim, and a medium to deep depression. Several specimens (cat. nos. 1-73683a, 1-73708a, and possibly 1-73708g) have flattened bases. One mortar fragment comes from a square-rimmed vessel originally about eight inches in diameter, a deep, round-based mortar.

The usual material of these artifacts is a grey basalt, but diorite, sandstone and granite fragments also occur.

Pestles

Pestles and pestle fragments occur less frequently than do mortar fragments, and seem even less formalized. Many are simply water-worn cobbles or "manos" with one or both ends used as pecking or grinding surfaces. Pestles occur in four UCAS burials (nos. 44, 62a, 73 and 80) and in cremation no. 1 (Pl. 7a-b). They occur in Dawson's grave lots no. 22, 61, and 62. No pestles, pestle fragments or manos come from the features.

Three pestles (cat. no. 1-73689, 1-73700, and 1-74001) have red paint on their grinding points. Two (cat. nos. 1-73668 and 1-73674) have pointed ends similar to those found in recent sites and used in wooden mortars. Two cobbles have severely chipped and battered ends, perhaps from use as hammerstones in the manufacture of other stone tools.

The vertical and horizontal distribution of pestles appears quite different from that of the mortars (Table 58). Pestles seem to cluster in the mound's shallow western third; however, the sample is too small and the method of collection too haphazard to eliminate the chance of sampling error.

Waste: Flakes, Flake Fragments, Pebbles, Core Choppers

Stone waste with provenience data is most abundant in the central trenches (J-F) 24 to 36 inches below the surface (Tables 59, 68). Most pieces lacking provenience come from the west (trenches A-E). Much of the stone waste was probably not recorded at the time of excavation. The dominant waste materials are green chert and a coarse igneous rock. Flakes are predominantly of flint and igneous rock. Only a few obsidian flakes occur. Choppers are made almost entirely of light green chert similar to that found at Farmington, which is brittle and difficult to work. Unworked pebbles are sometimes of white quartz. One obsidian disc core about 2 cm in diameter (cat. no. 1-73957) comes from the mound. The edges are very battered, and it may have had a secondary use as a scraper.

The lack of evidence of stone chipping in SJo-68 on a scale as large as the number of finished projectile points would require, indicates that the inhabitants brought finished items to the mound. The materials must have come to the site either as partly prepared preforms or blanks or fully-manufactured items. The beautifully finished projectile points (dart or spear points) were evidently either traded into the valley or the material quarried and fashioned by the inhabitants elsewhere.

Pecking and grinding of mortars, charmstones, slate pencils, crystals and other stone objects may have taken place on the site, although the raw material must have come either from the Sierra foothills or from the Coast Range, the latter also being the probable source of some of the soft mudstones and sandstones.

Eleven pebble and core choppers similar to those described by M. J. Rogers, (1929; 1939), Campbell (1935:19) and A. L. Treganza (1950; 1958) from early sites in Southern California also appear in the collection. The 18 irregularly-flaked scrapers follow no formal typology; several look like the heavy, keeled scrapers illustrated from early Southern California sites (Plate 38). One cannot use these pieces as evidence of cultural relationship--the morphology of such artifacts seems to have been governed largely by function. They occur in cultures of all ages and types of organization.

Only two pieces are typologically cores--the small obsidian disc core mentioned earlier and a medium-sized green chert bi-conical core, which may also have been used as a chopper. Few flakes were utilized as scrapers, and flaked or split chert and basalt cobbles may have been used instead. The core tool itself was probably the primary object of the manufacturer.

Cremations

The five cremations found in 1947 by the University of California and mentioned in this report in discussions of the artifacts accompanying them, present definite problems of interpretation. Cremation no. 1 comes from about 47 inches below the surface of Square B/N2. The cremation is just under, and disturbed by, the cluster of male adolescent and adult interments (burial no. 23-29) in Square B/N2, and represents a number of individuals. It contains seven type 3b points (hollow-based with multiple basal thinning flakes and occasional basal grinding) three type 5a points, three type 5c points, 4 point fragments, several charred bone artifacts, 6 antler tine tips (notched fragmentary pieces of bone 15-50 mm long), and an awl. A small animal tooth and jaw fragment, probably from a rodent, are also mixed with the remains. Both first and second molars of several humans are present, two of them probably from adults. In 1957, two pints of bone from this burial were radiocarbon dated. The sample yielded an age of 4,350 $\pm$ 250 B.P., the oldest of the three reliable carbon-14 dates (Heizer, 1958). The cremation was probably interred during Phase 1 or 2.

Burial no. 33 (Phase 3) had disturbed cremation no. 2, which lies at a depth of 27 inches in the lower level of the second hardpan in Square C/N2.

Cremation no. 2 lies about 1.5 feet above and 5 feet east of cremation no. 1. No artifacts accompany these remains. Burned shell is mixed with the charred bone but identification of any as shell artifacts is impossible. Cremation no. 3 comes from 50 inches below the surface of Square K/N3 in the northeastern corner of the mound, and represents a single individual, probably an adult. It is one of a few deep graves in this eastern sector of the mound. A bi-pointed, leaf-shaped type 1 point (NAa), the only type 1 specimen found below 30 inches, a twine-impressed, baked-clay fragment, and a small bit of red ochre, accompany the cremated bone. Most of the cremation was sent to the University of Michigan for radiocarbon dating in 1957. The sample was insufficient to fill the counter and yielded the date of 3080 $\pm$ 300 B.P.

The situation of the cremation is interesting. The only deep burial in the site to contain a late phase Windmiller point, it occurs in an area of the mound where "earlier" deep burials are rare. The cremation may be a later component burial (as late as Phase 4) dug down into the softer mound soil through the then-unconsolidated second hardpan of this area. The pit holding the cremation is one foot in diameter and of unrecorded depth. The unburned pelvis of a small mammal, probably a rodent, is present among the cremated bones.

Cremation no. 4 lies 28 inches deep, just under the second hardpan in Square L/N3 (the northeast corner of the mound). A complete cremation in a one foot pit about six inches deep, it contains one type 3b point, one point fragment, and a worked obsidian flake. The type 3b point is the shallowest occurrence of this type in the mound. The cremation may belong to Phase 2.

Cremation no. 5, also 28 inches below the surface at the lower hardpan transition, is only partially consumed by fire. The remains of an adult male who had heavy supra-orbital ridges, it appears to be the only post-interment cremation as is evidenced by the existence of much ash and many small burned clay pieces. The pit is an oval, 37 inches by 17 inches and 4 inches deep, and lies in Square M,N/2, about 5-10 feet from cremation no. 4. Three type 3b points, one type 5a point, and one type 7a point accompany the interment suggesting it is Phase 2.

No evidence suggests that cremations were intrusive through the first or the second hardpan layers. The three cremations with artifacts show predominantly "earlier" type 3b and 5a points. The type 1 point in cremation no. 3 is confusing; it fails to follow the dichotomy between early and late points maintained by the other interments. No hardpan seals the eastern deposits above cremation no. 3; therefore, the burial may have originated higher in the mound.

> Cremation is common in Central California, the Miwok, the group occuping the Delta region protohistorically and historically practiced mixed cremation and primary interment (Gould, 1963:151, see Map 3, p. 168).

> The cultures shown practiced burial (primary interment) as the primary means of disposal of the dead and cremated only those individuals who, for one reason or another, died away from home. For the most part, these individuals were men killed in skirmishes with neighboring groups while on hunting trips or raids. The most obvious reason one can point to for the cremation of the body on the spot was to make it easier to carry the remains back to the home village. If the person was killed at a considerable distance from home, it would be much simpler for his companions to carry the ashes back in a container than to attempt transport of the complete corpse (Gould, 1963:155).

The practice of mixed burial methods may have its origins early in Central California prehistory, at least from the time of the SJo-68, Phase 2, occupation, which may mark the beginning of this practice. That cremation is associated with warfare even in the Windmiller Culture is tentatively supported by the fact that all the cremations with burial accompaniments contain one or more stone projectile points. Furthermore, cremation no. 1 was disturbed by the graves of a group of young men whose situation suggests that they participated in warfare.

Features

Features are man-made concentrations of items accumulated during the aboriginal occupation of the site; they include baked clay, animal and fishbones, stone, and shell, as well as peculiar changes in soil characteristics such as color, density, or texture. Disturbed burials originally noted as features have been assigned burial numbers. Feature nos. 13, 16, 19, 20 and 25 have been numbered as burials No. 98-102.

The UCAS excavated features A and B in 1939, and photographed them. Feature A consists of single calvarium found embedded in the top of the hardpan layer. When it was taken "en bloc" to the museum to be cleaned, about six Haliotis la beads were found embedded inside. The edges of the skull may have been cut to fashion a container similar to that found in Sac-107C (Heizer and Fenenga 1939:391; Heizer, 1949:25, pl. 5h). Feature B consists of a cache of bear bones (Ursus americanius) from a pit in the hardpan. Information noted about them at the time of excavation is scanty.

The UCAS 1947 expedition noted 23 features, 15 of them from the northwestern and central portions of the mound, all but three (nos. 8, 14, and 21) above 30 inches. Nine features come from eastern trenches, K-O, seven of them from below 30 inches. River mussel and clam shell (Gonidea angulata) occurs in caches in feature nos. 9 and 15; mortar fragments occur in feature nos. 6, 7, 10, 12 and 22; and baked clay objects occur in feature nos. 2, 4, 5, 8, 17, 18, 23, and 24. Animal bone concentrations occur in feature nos. 10, 11, 27 and 28.

Dawson's 1923 excavation includes two caches of human skulls lacking accompanying post-cranial skeletal material (grave lot nos. 74 and 75). Dawson notes three other isolated skulls (grave lot nos. 5, 32 and 49). All five features come from the northeastern corner of his excavation.

The following is a description of grave lot no. 74, the largest of the groups of skulls.

> At a depth of about 24 inches were found skeletal remains of about ten to fifteen individuals close together. Many have no more than heads. The skulls were well preserved and are quite thickly buried in very hard ground. Beads of the Olivella la type were very numerous; an occasional arrowhead was found in digging, though none seemed to have been associated closely with any one individual. Some shell ornaments were also encountered. Small and large beads were generally found separate, but some were so close they could not very well be separated. Most of the skulls were complete. Incomplete skulls were generally without relics. The beads lay in rows and were probably strung. The small rectangular beads and the Olivella beads made of small sections of shell were also found with whole Olivella beads. (Adapted from Dawson's 1923 fieldnotes.)

This cache of skulls is unparalleled in any other early California excavation, and adds weight to the supposition that head-taking was as common a practice during the Windmiller Culture as it was during the historic period in California (Heizer, 1949:29). Single skulls occur in other Windmiller sites (in Sac-107C and in Heizer's 1939 excavation of SJo-68), but only Dawson's excavation of the northeast corner (probably Squares M-N/2) of SJo-68 yielded several skulls together. Feature lot no. 75 contains only shell ornaments; feature lot nos. 32 and 74 contain only shell beads. Feature lot no. 5 contains 71 Olivella la beads and 64 Olivella 2b beads. Feature lot no. 49 contains mostly (366) Olivella la types, but also two Olivella 2b, nine Haliotis la and 21 Haliotis type 2 beads, the latter usually found only in the Cosumnes culture.

Conclusions and culture content of Phases 1-5

The following section attempts to integrate the interpretations mentioned above so that one may begin to understand the way of life led by inhabitants of SJo-68 some 4,000 years ago.

SJo-68 was probably intermittently occupied by a fairly small group (25 to 50 individuals) over a long period of time (Howells, 1960:163).[28] Radiocarbon dates suggest the mound was occupied as long as 1,000 years. The information of two successive carbonate layers is the only physical evidence that the mound may have been abandoned and then reoccupied. The interpretation of what faunal evidence exists does not support a seasonal occupation. The population probably increased through time and the mound may have been abandoned before or during Phase 3 and served solely as a cemetery during Phases 4 and 5. The nearby Windmiller sites of SJo-56 and SJo-142 are occupied during the last two Windmiller Culture phases.

The vertical and horizontal patterning of burials suggests differential use of the mound over time. Burials occur more frequently in the sub-hardpan deposits in the west and central portions of the mound, and are infrequent in the eastern third. Shallow burials tend to concentrate to the center and east. In addition, charcoal flakes, baked-clay objects, bone tools and caches of unworked mussel shell and bone occur in quantity in the deposit's lower eastern section, and are almost absent in the west. Assuming that the distribution of cooking debris is significant and is not a product of sampling error, the north-central and northeastern areas of SJo-68 might have been the location of early habitation, while the western section and the southern and northern peripheries of the mound may have served as burial grounds.

The village was probably abandoned before the second or lower hardpan began to form. After the formation of this lower hardpan, the area above the former village along with the rest of the site began to receive intensive use as a cemetery. Perhaps the village site was abandoned because alluvial deposition raised the surrounding plain to a point where the mound was no longer safe from periodic flooding. After its abandonment, a related group returned to the mound only to bury their dead. These later burials may have been dug into the hardpan already forming on the higher parts of the exposed mound. To the center and northeast, the hardpan cap was broken; a soft, disturbed layer formed as a result of the digging. This disturbed and broken hardpan became what the author has called the discontinuous second or lower hardpan. In some cases, Phase 3 burials may have been dug through the second hardpan into the brown midden. Finally, when the site was permanently abandoned, the first or upper hardpan formed and remained a solid cap over the mound just below the present surface.

Very little evidence of house floors or other structures exists. Burial no. 53 (from Square F/S1 at 42 inches) lies just below a very compacted layer, considered in the field records of J. Bennyhoff, the excavator, to be a possible house floor.

The shallow burials (Phases 3, 4, and 5) largely in the cemented layers, exhibit cultural differences from the deeper interments (Phases 1 and 2). Five phases of occupation have been tentatively suggested on the basis of changes in charmstones and points. The later phase graves contain material more frequently associated with Cosumnes burials, although they still have strong Windmiller affiliations (Table 61).

Phase 1

Graves with mortuary goods from the first phase of SJo-68 occupation (36-60 inches in depth) contain primarily extended ventral and extended dorsal male interments. The largest number of graves with ochre occur in this phase. Graves are found with the following mortuary goods: charmstones C2c, C2b, C2a, C3a, C3b, C3c, C4al and A5; points 5a, 3b, 5c, and 6c; shell bead types Haliotis la (large) and a few large Olivella la; Haliotis ornaments C.(1), Cl(1).a, C.(1)ln, C.(1).1 and a few C.(1).a, C.(1).n, C.(1).1 and a few B.1, B.(1), and B.(1).1 pendants; bone items such as awls, bone points, beaver mandibles and Canis skulls, an antler "wand," and sweat scraper. Phase 1 lacks quartz crystals and baked clay pecans so common in the later phases of occupation. Slate rods were found in a single grave.

Phase 2

Female interments with grave accompaniments are still absent in Phase 2 of the SJo-68 occupation (30-36 inches in depth). Two infants and a child in this phase are accompanied by artifacts. Flexed interments of older individuals were found in Phases 1 and 2 of the occupation; lack of artifacts (except for burial no. 38) prevents exact temporal placement. The following artifact types are typical of Phase 2: charmstones C3a, C2a, C2b, Cld and Clc; point type 3b; shell bead types Olivella la (large) and Haliotis la (large?); Haliotis ornaments B.2, F.1 and F.2 (only one Phase 2 grave contains shell ornaments); bone items such as birdbone tubes, bird wishbones, awls, antler points, a gorget, a fishhook, and a beaver mandible; exotic minerals in the form of mica discs, malchite pebbles and ochre. No clay pecans or crystals were found.

Phase 3

Female interments and increasing numbers of infants are found with artifacts in the third phase of occupation (24-30 inches in depth). The following artifacts are typical of Phase 3: charmstone C2b, C2c, Cla, Clb and Blbl; points 7a, 3b, 5d, 6c, 7c and 7d; shell bead types Olivella la (small - a few large beads occur), Olivella 2b, Haliotis la (small?) and Haliotis 2; Haliotis ornaments C.(2), C.1 (all varieties), C.2 (all varieties except C.(1).1.a), F.2.a, H.2, M.B.1, Amorph. 1, Amorph. 2.a and C.(1).2.a; bone items such as claws, antler flakers, bird wishbones, awls and teeth; crystals, baked clay pecans and ochre. Two graves contain slate rods. The bone and shell as well as the crystals, baked clay and charmstones from this phase are quite distinct from earlier phase assemblages.

Phase 4

Interments of both sexes and all ages are found with grave goods in the fourth phase of the mound occupation (about 10-24 inches below the surface). The following artifacts are typical of Phase 4: charmstones B4b, B5b, D8, B3 and B1b3; points 2, 3a, 6d, 5c and 9a (types 1, 5a and 7a occur infrequently); bone items such as turtle shell pendants, chisels, teeth, beaver mandibles, birdbone tubes, and awls; shell bead types Olivella 1a (small), Olivella 2b, Haliotis 1a (small), Haliotis 3 and Haliotis 2; Haliotis ornaments C.(2), C.(2).a, C.(1).1.a, C.(1).1, C.1, C.(1).a, C.(1), C.(2).1, C.3, B.2.(1).1, B.2, B.(1).1, H.3, M.E. 1, M.E.1.1 and M.W.2; and ochre. Pecans, slate rods, a slate pendant, asbestos splinters, ground stone discs, mica discs and many crystals are also found in Phase 4 graves. No B.1 Haliotis pendants occur, and very few other rectangular ornaments mentioned above were found in this phase. Dawson's data confirms the trend of increased frequency of grave goods in the upper northeastern section of the mound.

Phase 5

A possible fifth phase of occupation may be represented from 0-10 inches from the surface of the mound. Distinctive patterns of sex and/or age distribution, and variation in burial position are unknown. Some artifact categories, points, shell ornaments and bone, seem mixed with or indistinguishable from earlier phases. The point category 3b may in fact lump two types which would account for their sudden reappearance in the top few inches of the mound. The following artifacts occur in Phase 5 graves: only charmstone type D9 in SJo-68; point types 3a, 1, 7c, 6c, 3b and 7a; bone items such as awls, bird wishbone, claws, teeth, turtle shell pendants, chisels and antler flakers; shell bead types Olivella 1a (small), Olivella 2b. Haliotis 2 and a few Haliotis 1a (small); Haliotis ornaments C.(1), C.(1).n, C.1, C.(1).1, C.(2), C.(2)a, F.2, F.2.a, M.F.3, H.2, and M.E.1; crystals and ochre. Slate rods, a ground obsidian awl and zinc blende lumps occur in a single grave lot. Some of the shell ornaments, the D9 charmstones and the ground stone remind one of Cosumnes assemblages. This fifth phase is more fully represented by Windmiller sites, Sac-107C, Sac-168 and SJo-56.

Social Organization

The largest concentration of burials with artifacts is found in the shallow deposits of trenches F-J/N1-4, KO/N1-4 (the north-central and northeastern mound). The greatest percentage of the central hardpan burials are of males. This suggests that men were given special attention in both grave accoutrements and placement, while women, although frequent in the shallow layers, may have been deliberately buried in the less elevated western section of the mound. In general, burial position is less varied among women; however, the flexed burials may exclusively be those of old women.

Mortuary goods may mark the possession of higher status. Women are less frequently accompanied by artifacts than are men in all phases of mound occupation. Women and infant interments with mortuary goods are more frequent in Phases 3 through 5 than in the first and second phases. The change in associations may indicate a change in community status for women and infants during the period of mound use. The increase of grave goods accompanying women possibly represents the beginning of the transfer of the husband's or father's status to the woman, or the acquisition of status by women on their own merits, perhaps as magicians or curers. The placing of elaborate grave goods with children and infants is interesting because it appears to negate the assumption of a simple hunting and gathering society:

> It is proposed that among egalitarian societies status symbols are symbolic of the technological activities for which outstanding performance is regarded by increased status. In many cases they will be formally technomic items manufactured of "exotic" material or elaborately decorated and/or painstakingly manufactured.
>
> Infants are not traditionally elaborately buried because they have not yet acquired any respect, status or wealth. Among hunting and gathering poeples infants are often not ceremonially buried at all--they are simply dumped in a hole in the kitchen midden, under the hearth (Binford, 1962: 222).

The change in burial pattern could be explained by a shift in social structure in which a system of acquired status changed to one of hereditary status. In societies in which status and wealth are hereditary, every member of a family theoretically shares access to status goods and services. Therefore, an infant would require an elaborate burial.

Why such a change should occur in the late Windmiller Culture is still unknown. Increase in population and change in subsistence are possibilities, though evidence for these remain inconclusive. Certainly the number of burials per unit area increases in the upper level of the mound.

An increased amount of fishbone and fishing equipment is evident in the early Cosumnes Culture and may offer an economic explanation for remarkable population expansion during the late Windmiller and Cosumnes Culture periods. The large number of Cosumnes Culture sites known both in the Central Valley and on the coast suggests extensive population growth.

The relatively large percentage of old people and the small percentage of infants seem at first glance to indicate a healthy population with low infant mortality and high longevity. To Cook (1947:86-87, 89) this longevity distribution is not unusual in aboriginal populations. There is a good possibility, however, that the infants were not consistently buried among the adults, or that they disintegrated in the mound before excavation took place. Therefore, infant mortality may be much higher than Cook's estimate and Cadien's count of 10 to 20 percent. In California young women are sometimes found buried with foetal skeletal material, suggesting death during childbirth. Four burials of this nature occur in SJo-68.

Economic Complex

Heizer suggests (1949:30) that acorn grinding did not play a part in this early culture, but his conclusions are not based on the analysis of the complete SJo-68 excavation. Compared to other objects, mortar fragments are fairly common in the deposit of SJo-68, and seed and acorn grinding may have played a substantial part in Windmiller Culture subsistence just as they did in later Central California cultures. Manos, pestles and pestle fragments are rare.

The scarcity of cooking stones mentioned by Heizer is more than made up for by the enormous concentration of baked clay fragments, which may have been substitutes for stone. The historic California Central Valley Indians and many archaic groups in the Plains and large river valleys used fired-clay balls in lieu of stone as pot boilers. The clay chunks may have been broken in the process of heating and immersion involved in stone boiling. Feature no. 7 near the surface of the hardpan contains a melange of cooking stones, mortar fragments, baked clay discs and fragments.

The reported absence of charcoal and ash concentrations in fire pits where clay pieces could have been heated is interesting. Feature nos. 2, 4, 5, 8, 17, 18, 23, and 24 contain caches of fist-sized fragmented baked chunks, and may be fire pits from which ash and charcoal have been leached away. Leaching could have been accomplished by the capillary action of the water in the mound, which has distributed charcoal and ash throughout the deposit.

Chipped points, largely of obsidian, are the most common unassociated objects in the mound. They are also the second most common grave item. Points occur embedded in the bone of burials no. 24, 85, and 107. In burial no. 24 the tip of an obsidian point lies in the upper part of the ilium 3/4 inch from the iliac crest. In burial no. 85, the point fragment is embedded in the left humerus. The lack of bone inflammation indicates that death took place soon after the wound was inflicted, although this may not necessarily have been due to the injury. Burial no. 106a, that of a male, is found with a type 3b point lightly embedded in the shoulder. Considering the apparently highly-developed warfare evidenced by the skull caches in the northeast corner of the mound, it is surprising that more skeletons are not found with such evidence of violence.

Chipped points were probably used primarily as tips for hunting weapons, or, hafted, as knives:

> The former is more likely in view of the fact that
> a contracting stemmed or rounded base blade is

> difficult to haft firmly as a knife. The weapon used is unknown, but it has been suggested (in Lillard, Heizer and Fenenga, 1939:397; Heizer and Fenenga, 1939) that the atlatl may have been known to the Early culture horizon groups, this suggestion being based on the large, heavy, size of the chipped points (Heizer, 1949:30).

Hunting was probably the major technique for securing food. Animal bones representing food debris occur in relatively small numbers. However, several kinds of large game animals appear in quantity. Remains of mule deer (Odocoileus), tule elk (Cervus nanodes), antelope (Antilocapra), several kinds of water birds, rabbits and rodents have been recovered from SJo-68 in moderate numbers, and these animals are known to have occurred until historic times in the Delta region. The scarcity of bone may be due to inadequate sampling of the mound debris, especially in the lower eastern section.

> Worked animal bone was relatively scarce. Various types of bone tools, many with blunted ends, indicate specialized implements for doing specific work, but these uses cannot be guessed (Heizer, 1949:30).

The bone awls may have served any number of purposes, ranging from scaling fish to making mats. A relatively large number of bone awls occur unassociated, most of them in the eastern third of the mound. Awls probably function as basketry or sewing implements. Several kinds exist: small mammal ulna awls with strong shaft and sharp point (perhaps "perforators") long, narrow, tapering, flat implements, blunted at both ends (possibly implements used in basketry and mat-making); and flat, short awls cut square at one end and pointed at the other (possibly needles). The needles are sometimes grooved at the square cut end, while the tip is noticeably worn, additional evidence of their use as sewing implements. It is likely that some kind of sewing of skins or mats took place.

> Fishing is attested not only by the presence of salmon vertebrae ribs and jaws of smaller species, and plates of the sturgeon, but also by a peculiar trident fishspear and two types of angling hooks. The trident tips are made of antler and are attached by binding a basal notch to the end of the shaft (burial 6 and cremation 1). They are attested from all settlements except SJo-142 (Heizer, 1949:30).

Large net sinkers are not recorded, and there is no indication of nets. Impressions of two-ply string occur in baked clay and in asphaltum at the ends of bone points. Such string could serve as net cord.

> The small baked-clay balls with cut grooves would have served nicely as fishline sinkers, but there is no evidence that they were so employed (Heizer, 1949:30).

In the author's opinion, fishing as a whole was not a very important part of Windmiller subsistence activity, despite a change to greater emphasis on fishing at the beginning of the Cosumnes period. The evidence for the shift to fishing is afforded by the proliferation of fishing equipment and fish bones in Cosumnes Culture sites. The new emphasis on fishing provides evidence for a major economic shift in prehistoric Central California, and must be considered one important cause of many socio-economic changes observed between the early Windmiller and the Cosumnes Cultures. The economic shift may even partially explain the social organizational shift between the early and late phases of the Windmiller Culture. The shift from a hunting to a fishing-based subsistence is probably a major factor of the astounding population growth evidenced in aboriginal California. The harvesting of wild foods, particularly fish, their preparation, storage and trade are of primary importance in explaining many of the puzzling aspects of the social structure of protohistoric and early historic Central Valley tribes. Complex culture traits such as chieftainship, functional families, trade for subsistence items, and the political unity among villages along major fishing rivers can be attributed to the development of the practice of taking immense harvests of anadromous fish, once, twice and sometimes three times a year (cf. McKern, 1922; Kroeber, 1925, 1961; Gifford, 1926; Goldschmidt, 1949).

Ceremonial Complex

Ceremonial items: charmstones, crystals, Haliotis and Olivella shell beads are enduring traits in Central California from early Windmiller to historic times. Stylistic differences mark regional variants, the passage of time, and also possible variation in ceremonial function.

Charmstones seem to be made of "lithic materials chosen for their color and beauty rather than for ease of working" (Heizer, 1949:31). Thus, metamorphic rocks, schist, gabbro and serpentine are dense and difficult to work, but yield a beautiful finished object.

The majority of the charmstones from SJo-68 are of white translucent marble. From SJo-56, less than two miles to the east, come even larger numbers of white marble B1a charmstones. Igneous, metamorphic and schist specimens, largely B1b1, B1b3, and C1 and C2 forms are frequent; but the A1 type, common in Sac-107 and Sac-168, is completely absent. In SJo-68, claystone, sandstone and two special metamorphosed rocks, serpentine and gabbro,[29] identified as mottled limestone in earlier reports, are occasionally made into B1b3, B3, C2b, C2c and C3c type charmstones. These materials have not yet been identified from other Windmiller sites.

The charmstones are ceremonial objects upon which the Windmiller people expended extra care and effort. They are not usually battered, worn, or chipped, and, considering the small number of fragments and the complete lack of unassociated specimens, must have been carefully guarded against injury and loss. All the charmstones have a bi-conically drilled perforation at one end except for the "unfinished" specimen found by Dawson (Heizer, 1949: Fig. 9h) which is unique in both material and shape, and may not be a charmstone at all.

Heizer (1949) describes traces of asphaltum near the perforations of certain charmstones which bear the imprints of fine twisted twine. The perforations and string impressions suggest that charmstones were suspended, though they give no clues as to how. Placement around the pelvis, legs and head of interments in most cases precludes suspension from the neck. Bennyhoff writes of the historic use of charmstones among the Miwok: "Charmstones were hung from the boughs to lure game and insure good hunting to the owner." (Bennyhoff, 1961.) Considering their strong association with male interments, charmstones may have had magical functions even during the Windmiller Culture.

Elsasser (1955:29) cites Yates (1889:303-305):

> An old Indian in Napa County informed Yates (ca. 1885) that plummet-shaped implements were used as charmstones; that they were used by being suspended by a cord from the end of a pole, one end of which was stuck into the bank of a creek in such a manner as to leave the stone suspended over the water where the Indians intended to fish. In other places they were suspended at points in the mountain favorable for hunting.

Elsasser goes on to say:

> The Wintu people of the Sacramento Valley looked upon strangely shaped stones as being possessed of supernatural power. For example, flat ovate stones pierced at one end for suspension were identified as luck charms. "Were the particular attributes of the charm not disclosed by its shape, a shaman might be asked to reveal them by consulting his spirits. Usually, however, the shape of the stone denoted the type of charm and pragmatic evidence of its efficacy often revealed to the owner its attributes." (DuBois, 1935, p. 82).

He offers testimony that charmstones may have a purely utilitarian use, "that they were used in some way as shaped throwing stones."

> The author was informed by Mr. Dale (age ca. 80 years) of Dale's Station, located some 20 miles northeast of Red Bluff, that as a boy he had observed the Indians using such girdled stones in pairs strung like a bola for hunting geese.

Plummet-shaped stone pieces from historic California had a cord tied at one end and were probably thrown, after being whirled around the head (Elsasser, 1955: see Plate 1b for comparison to "unfinished" charmstones from SJo-68). The majority of the SJo-68 perforated charmstones appear too fragile and elaborate for use as slingstones.

It is possible that the SJo-68 charmstones were considered to contain war magic. Burials nos. 23 and 24 yield by far the largest cache of charmstones in the mound, and their dorsal burial position, ochre and projectile point accompaniments suggest these individuals were participants in and victims of some kind of warfare. B1a3 and B5b charmstones, which appeared accompanying female interments, may have had social powers.

Crystals have an ethnographic use as bangles or tinklers and also as magical paraphernalia. The placement of quartz crystals in the graves at SJo-68 supports the idea that they were hung in some way about the neck, serving perhaps the same decorative and musical function as in ethnographic times. Occasionally crystals occur single or in pairs near the hands; they were perhaps originally mounted on a wood shaft as on the historic shaman's wands. Found most frequently with men, crystals also occur with female and infant interments in the hardpan deposit. Their primary placement in clusters around the neck and unresticted associations with reference to age and sex suggest that crystals had less of a magical function during Windmiller times than during the early historic period.

Unworked animal teeth, bird claws, and bird wishbones are also probably decorative. The numerous exotic ornaments of mica, zinc, asbestos and slate found around the head and espcially the neck may also be decorations and/or symbols of status.

Shell beads and ornaments are obviously strongly associated with the ceremony surrounding death, for they are used extensively in personal decoration of the deceased. Burial no. 50, an extended dorsally positioned infant about 40 inches below the surface, lies covered with square-cut *Haliotis* 1a beads which may have been sequined onto a mat or garment. Burial no. 62a yields square one-holed *Haliotis* beads thickly scattered over and under the upper body, especially around the left arm, circumstances indicating that they were possibly sequined onto a grament.

Bead types and their individual associations change from the bottom to the top of the deposit. Haliotis shell ornaments are almost exclusively associated with male burials both deep and shallow, and maintain a sex linked distribution through the hardpan layer far more strictly than do most other types of artifacts.

Several small mortars, some pestles, and two small clay pots are all stained with ochre. Perhaps these represent steps in the manufacture and storage of paint, the mortars and pestles having been used for grinding and the clay pots for storing the powder until use.

The skull cap from the 1938 University of California excavation, the caches of isolated skulls from Dawson's excavation, and the few University of California graves with skulls missing are evidence of head-taking, presumably from fallen enemies: "This is a widespread trait of the war complex in recent California Indian culture"(Heizer, 1949:31). This warfare was probably also associated with body painting, for red ochre appears associated with older adolescents and young men frequently dorsally extended and accompanied by stone points. In three cases, point fragments are actually embedded in the bone of the skeletons. Evidence exists then, that special practices applied to warfare and victims of fighting.

Ethnographic accounts and grave associations suggest that the cremations are remains of members of the group who died while raiding foreign camps.

The trends described in the material from the graves and the nature of the mound matrix make the above hypotheses reasonable. When one deals with a time span of several thousand years, speculative conclusions are unavoidable. However, Heizer comments (1949:31):

> It is also worth noting that charmstones, quartz crystals (ochre), birdskin regalia and other items mentioned above are part of the recent Central California Indian culture and that a cultural stability of these elements through a very long time period is thus implied.

The author described five phases which probably represent occupation intervals in SJo-68: the early Windmiller Culture represented in sub-hardpan, Phases 1 and 2; a group of transitional burials in second hardpan, Phase 3; and the later Windmiller, Phases 4 and 5, in which the material strongly resembles the Cosumnes Culture. The differences between these phases lie not only in artifacts which accompany graves but also in the frequency of graves with accompanying grave goods, in the age and sex ratios of individuals with offerings, and in the comparative frequencies of the artifacts themselves.

The relative temporal position of SJo-68 occupation phases to occupational levels in other Windmiller sites is discussed in the following chapter.

CHAPTER IV

THE WINDMILLER CULTURE SEQUENCE

The ordering or seriation of sites presents a major problem in the archaeological analysis of the Windmiller Culture. Several methods of ordering sites were attempted during this work. John Stromberg (Stromberg, 1967; Ragir and Stromberg, 1972) developed a method of statistical analysis, based on a Bayesian statistical technique capable of distinguishing with a high degree of sensitivity, differences and similarities among artifact assemblages. The results of a statistical analysis of projectile point assemblages confirm the results of the more traditional seriation of charmstones and of a series of C14 dates on collagen from human bone from each of the sites.

The Statistical Analysis of Points

A Multinomial Probability Model

A multinomial probability model calculates probabilities for all ways of combining like, and of separating different, assemblages. The probability that any one combination has any validity ranges from 0 to 1. In the analysis of the Windmiller assemblages, projectile points were chosen to form the statistical populations. Projectile point frequencies describe a "parameter vector," a traditional trend related to projectile point use and loss typical of a site. It is assumed that these traditions of projectile point use and loss are for the most part culturally determined and that two or more sites inhabited by peoples with the same culture will contain points indistinguishable from each other in terms of style and frequency. Thus, assemblages with similar parameter vectors belong, in effect, to a single statistical population, this statistical population representing a single cultural tradition.

A second important assumption made in the following analysis was that projectile points (any part of the total artifact assemble or for that matter any part of the total cultural tradition, material culture, for example) could be representative of the culture as a whole. This second assumption rests on a host of undefined concepts, the most important of which is "culture." Therefore one must for the sake of the hypothesis accept the statement that each parameter vector (defined by projectile point frequencies) sufficiently characterizes the archaeological component. The specific problem then becomes that of determining which of these parameter vectors has the highest probability of coming from the same statistical population.

The method of analysis organizes the parameter vectors of the Windmiller components into all possible combinations. For example, if the experiment dealt with only three burial sites, a, b, and c, and if each site contained only a single cultural component, the following possibilities would be considered: that vectors a, b and c are identical; that vectors a and b are the same and c different; that a and c are the same and b different; that b and c are the same and a different, and, finally, that vectors a, b and c are all different. These five situations include all possible combinations or "states of nature" (Stromberg, 1967). Two hundred and three possible states of nature exist for the six Windmiller Culture components.

The statements have two particularly desirable properties: (1) only one can hold true at a time; and (2) they exhaust all logical possibilities. Also, they provide a convenient framework in which to express the results of the analysis; in other words, a set of probabilities dealing with various logically generated states of nature would completely contain our knowledge concerning the similarities and differences among projectile point assemblages.

In an essentially unique "solution" to the problem, one state of nature will have a very high probability (say greater than .90). On the other hand, if our sample data do not permit us to "solve" the problem completely, several states might appear nearly equally probable. The latter situation might result when sites overlap in time, when one has inadequately defined the meaning of similarity and difference, and/or when, as in the case of the six components under consideration, more than one cultural phase is represented by any one assemblage.

A statistical device in the form of the extension of a statistical result known as Bayes' formula was used to determine the probabilities of the various states of nature (Stromberg, 1967). This formula enables one to use the sample data to move from one set of probabilities for the states of nature to a second set of probabilities for the states of nature. The first set of probabilities, referred to as the prior distribution, reflects all knowledge available concerning the states of nature as they existed prior to utilization of the information contained in the sample data. To eliminate bias in the present experiment, all states of nature were assumed equally probable. The second set of probabilities, referred to as the posterior distribution, reflects the knowledge expressed in the prior distribution as it has been modified by the additional information contained in the sample data. This is, in effect, a use of conditional probability. Probabilities determined by various multinomial probability laws express the information contained in the sample.

In the case of the Windmiller components, Stromberg (1967) decided to keep the results of the analysis independent of other information (for instance, C14 dates and cultural changes known to exist within SJo-68) and of subjective assessments of the probabilities of the states of nature. Use of what is known as "uniform" prior distribution expresses this desire. The uniform prior distribution assigns equal probability to each state of nature and, in effect, allows the sample data to determine the more likely states.

Finally, Stromberg (1967) transformed the set of posterior probabilities for the various states of nature into a set of probabilities expressing the likelihood that both members of each of the possible pairs of vectors came from a single statistical population.

Assumptions

The results of the statistical analysis described above apply to the real-life problem under consideration only to the extent that the model approximates reality. Several major assumptions underlie the model. In order to use the results of this analysis to determine contemporaneous burial sites, it is assumed that sites separate in time have different parameter vectors.

The question of whether or not increasing temporal separation produces a proportionate difference among vectors is irrelevant. Using the above method, any difference whatsoever in the cultures of the sites will result in a difference in parameter vectors.

The question of whether or not increasing temporal separation produces a proportionate difference among vectors is irrelevant. Using the above method, any difference whatsoever in the cultures of the sites will result in a difference in parameter vectors. Archaeologists make similar assumptions in their use of all seriation techniques.

The major assumption made by the author in dealing with the statistical treatment of data from Windmiller sites is that differences between parameter vectors are a function of time. Obviously this cannot be true in the case of cyclic behavior. For instance, if one were to attempt seriation of women's skirts on the basis of skirt length, the resulting developmental series would be wholly misleading (cf. Richardson and Kroeber, 1940:111-153). However, cyclic behavior in the Windmiller sites with reference to changes in point types is very unlikely. Using many different types of points, the probability that most or all of them would be changing in congruent cycles is very small.

A perhaps more important assumption involves the validity of using multinomial probability laws to describe the process of collecting an archaeological point sample. The author does not have the competence to deal with this important question, but for a discussion of it, the reader is referred to Stromberg (1967).

Certain situations could seriously invalidate the statistical method's results. In particular, if the persons collecting points at one of the sites were biased toward certain point types, this might render the results meaningless; the same would be true if different investigators classified the various artifact assemblages and if they applied their various subjective classifications differently. In effect this would violate the assumption of random sampling which is necessary for the application of the multinomial probability law. In the case of such large and important items as projectile points, sampling bias probably did not occur. The author reclassified all available Windmiller points in order to insure comparability of the population.

Another facet of the analysis, although not properly an assumption, warrants discussion here. Two sites are different when their parameter vectors differ. However the concept of the difference between two parameter vectors has an ambiguous definition in statistics, and in fact several ways of measuring this difference exist, all of which have considerable validity. Consequently, one must remember that statistical methods using different measures of the difference between two parameter vectors may yield separate results from the same data, especially when relatively fine distinctions are concerned. When statistical results involving this ambiguity are reported, mention should be made of the statistical method utilized. In this case, a Bayesian technique was used on a uniform prior distribution (Stromberg, 1967; Ragir and Stromberg, 1972).

The statistical analysis used here distinguishes identical parameter vectors from any differing ones. One should perhaps distinguish those parameter vectors which are almost comparable from those which are quite different. However, the method does not depart as seriously from reality as might appear because: (1) if the occupation of the delta sites which lie within 12 miles of each other had been contemporaneous, then the respective living groups would probably have shared a common culture with respect to points; and (2) although the analysis attempts to distinguish identical vectors from those differing in any way, the limitations of the data are such that the method could not determine if two parameter vectors differed when they showed approximate resemblance. The major limitation of the data as it was used lies in the fact that several sites are multi-phased. The model assumes that each site is a single phase occupation or that the sites have been divided into single phase components. Seriation of both charmstones and points from Sac-107C, SJo-56, SJo-68, SJo-68B, and Sac-68A show significant changes in both charmstone and point styles and frequencies through the deposit. As many as five phases are suggested for SJo-68 (two in SJo-68B and three in SJo-68A) and Sac-107C. Four Windmiller phases are suggested for SJo-56 with a fifth phase consisting of two intrusive Cosumnes Culture burials. Sac-168B may contain two Windmiller phases. SJo-142 and SJo-112 may or may not be single component sites; lack of information prevents division. A breakdown of these sites into single phase components makes the point assemblages too small to analyze.

The Data

Projectile points from each of the six Windmiller components fall into 18 categories according to blade, stem and base shape (Fig. 5). This initial analysis compared only projectile point frequencies, although, with minor modifications, the computer program could handle additional variables such as charmstones, bone, beads, ornaments, burial position, age, sex, etc. Projectile points are used because they occur abundantly in the Windmiller Culture in a large variety of morphological types (Table 62). Furthermore, archaeologists describe these same types from various other parts of the western United States (Southern California, the Great Basin, Southwest and Northwest Plateau) and have demonstrated that point assemblages make fairly good time markers (Cressman, 1960; Lanning, 1963; Baumhoff and Heizer, 1965; Gruhn, 1963; Butler, 1961; Clewlow, 1967; O'Connell, 1967; Fenenga, 1953; and Baumhoff and Byrne, 1950).

One cannot determine the usefulness projectile point frequencies will have for precise chronological distinctions until such a seriation has been attempted several times and verified by independent evidence (for example, radiocarbon dates). The author has, however, tentatively ruled out major regional variations in the Delta, and has considered major differences among point population as functions of time. All points known to come from the Windmiller levels of each site in the samples have been included.

The Results

The posterior probabilities of the various states of nature are:

States of Nature	Probability
SJo-142, SJo-56/Sac-107, Sac-168B/ SJo-68A/SJo-68B	.3022
SJo-142, Sac-107, Sac-168B, SJo-56/ SJo-68A/SJo-68B	.2891
SJo-142, Sac-168B, SJo-56/Sac-107/ SJo-68A/SJo-68B	.2482
SJo-142, Sac-107, Sac-168B/SJo-68A/ SJo-68B/SJo-56	.0610
SJo-142, Sac-168B, SJo-56/Sac-107, SJo-68A/SJo-68B	.0455
SJo-142, SJo-56/Sac-107, Sac-68B/ Sac-168B/SJo-68A	.0180
SJo-142, Sac-107, Sac-168B, SJo-56/ SJo-68B/SJo-68A	.0167
SJo-142, Sac-107, SJo-56/SJo-68B/ Sac-168B, SJo-68A	.0054
SJo-142, SJo-56/Sac-107/SJo-68B/ Sac-168B/SJo-68A	.0030
SJo-142, SJo-56/Sac-168B, SJo-68A/ Sac-107/SJo-68B	.0030
Sac-107, SJo-68B, Sac-168B/SJo-142 SJo-56/SJo-68A	.0029

Note: Only the grouping and separation of sites have meaning; the listed order within and among subgroups has no significance.

The probabilities calculated for all the other states of nature come individually to less than .003 and collectively to less than .0036, both statistically insignificant.

Listed below are the posterior probabilities of the states of nature transformed into probabilities that any two vectors come from the same population:

Pair	Probability	Pair	Probability
SJo-142, SJo-56	.92	SJo-142, Sac-107C	.37
Sac-107C, Sac-168B	.65	Sac-107C, SJo-56	.29
SJo-142, Sac-168B	.64	Sac-107C, SJo-68A	.05
Sac-168B, SJo-56	.60	SJo-68B, Sac-168B; Sac-168B, SJo-68A	$<$.009
		SJo-142, SJo-68B; SJo-142, SJo-68A; Sac-107C, SJo-68A; SJo-68B, SJo-68A; SJo-68A, SJo-56	$<$.006

The probabilities allow a tentative ordering of sites. Interpretations of these results, however, involve the same problem of determining direction of change in all seriation techniques. The author has listed SJo-56 as the youngest and SJo-68B as the oldest in the sequence.[30]

Occupations at SJo-56 and SJo-142 probably overlap in time. Sac-107C and SJo-168B may also overlap in time. Sac-168B however, appears to occur nearly as close to SJo-142 as to Sac-107C, which suggests its occupation began later than that of Sac-107C.

The point analysis does not place SJo-68A or SJo-68B in the temporal sequence, because both components seem to differ so radically from all other Windmiller communities analyzed.[31] Olsen and Wilson (1965) suggest a recent occupation of SJo-112, perhaps more recent than any other Windmiller component. The artifact assemblage discussed below seem to support this contention.

Sac-168B and Sac-107C lie 6 to 12 miles from other Windmiller sites. SJo-142, SJo-56 and SJo-68 are clustered within two miles of each other. Identical charmstone types A1a, A2, A3 and A4, E1, E2, and E3 found in Sac-107C and Sac-168B do not occur in other Windmiller collections. The similarities noted between Sac-107C and Sac-168B in point frequencies and charmstone types may result in part from regional styles. Sac-107C, SJo-56 and SJo-68A share miniature charmstones (less than 40 mm long), the ones from SJo-56 being somewhat distinctive in form.

The ordering suggested by the point analysis differs from the time ordering of sites suggested by Heizer (1949), Heizer and Cook (1949), Setzer (1947), Belous (1953), and Dempsey and Baumhoff (1963). However, the earlier methods of analysis are open to the criticism that they were imprecise.[32]

The statistical method of analysis used in this paper detects temporal, spatial and stylistic differences as reflected in the projectile points of the six Windmiller components. Corollary lines of evidence separate, as far as possible, the factors of time and space. Thus, the evidence of similarity and difference between sites provides a framework for ordering the Windmiller communities into a relative temporal order.

Corollary Lines of Evidence in Comparing Windmiller Cultures

The comparison of other types of artifacts from the Windmiller components (Tables 63a, 63b) and the absolute dating of those components yields corollary lines of evidence from the temporal order described above. A comparison of the total Windmiller Culture assemblage from each of the excavated sites confirms, to a great extent, the temporal and spatial relationships between sites and establishes the characteristics of "five" Windmiller phases. A general characterization of the Windmiller Culture also facilitates comparisons between the Windmiller and contemporaneous cultures which existed outside Central California (see Chapter V).

Earlier attempts to order Windmiller sites chronologically used the relative increase of certain bone, shell and stone artifact types, items also found in the Consumnes culture, as criteria for determining relative age.

The following analysis attempts to seriate charmstones and points in order to arrive at a more precise arrangement. The vertical depths of graves with charmstones and points in sites SJo-68, Sac-168 and SJo-56 establish the direction of style change.

The following tables summarize the comparison of artifacts from all Windmiller Culture sites. For all but charmstones, only grave associated artifacts are recorded due to inconsistencies in the site records on unassociated artifacts.

Artifacts Common to the Windmiller Components

Shared styles are interpreted as constituting evidence of cultural contact between components sharing traits. Contradictory evidence does occur, but until one performs a complete analysis of all artifact information using either seriation or the multiple decision theory framework, no way exists to determine the significance of the various conclusions reached.

Other than the skeletal material from SJo-68, none of the remains from Windmiller sites has been reliably identified as to age and sex. This lack of comparable data leaves the interesting increase in infant and female graves containing artifacts in Phases 3, 4 and 5 of SJo-68 unexplained. In

Chapter III, the author hypothesizes temporal significance for this increase. Without comparable data from other Windmiller sites, however, this significance must remain speculative of the Windmiller Culture, are included below. These particular types have occurred too infrequently to have value for comparative use.

Cremations

Cremations occur in SJo-68B and Sac-107C.[33] These cremations (Gould, 1965; cf. Chapter III) perhaps constitute evidence to the custom of returning the ashes of persons to their home for burial, possibly remains of warriors who died away from the village. Historic Central California Indians cremated persons dying away from home at the place of their death, then carried the ashes back to the village for burial. The evidence suggests cremations away from the pits in which the calcined bones occur. Fire has not altered the soil of the pits, and at least some of the artifacts are unburned.

Flexure

Flexed burials occur in SJo-68B, Sac-107C, SJo-68A and SJo-112 and are lacking from the Windmiller components in SJo-142, SJo-56 and Sac-168.

Human Bone Artifacts

Human bone artifacts have been found in SJo-68A, SJo-56, Phase D (burial no. 53) and Sac-107C. Cut skull caps come from SJo-68A and Sac-107C and a human fibula dagger from SJo-56 (Heizer, 1949). The cut skull cap found in SJo-68 was not found in association with a human burial. The skull cap from Sac-107C was associated with burial no. S164, 36-48 inches in depth. No one has reported caches of skulls in Windmiller Culture sites similar to those Dawson excavated from SJo-68A. These burials or caches of unworked isolated skulls found in SJo-68A and SJo-112 may be related to the practice of headtaking, a known warfare practice of historic Central California Indians. Kroeber (1925) reports that heads and other parts of dead enemies were taken for victory dances in California, but he does not mention the disposition of these body parts after the ceremonies.

Seriation of Charmstones and Points in the Windmiller Sites

As early as 1936 Kroeber singled out charmstones as the thread which, if followed, might untangle California prehistory. The analysis of graves containing charmstones in site SJo-68, SJo-56 and Sac-168 has provided the direction of style change (Table 65). Five tentative phases emerge: Phase 1 represented by graves greater than 36 inches deep in SJo-68 is characterized by charmstone types C2, C3, C4a1 and A5. At least 2 graves in Sac-107C may also fall within the Windmiller Phase 1; Phase 2, graves 30 to 36 inches in depth, SJo-68 is characterized by C1d and C1c charmstones. Only one grave in Sac-107C contains a Clc charmstone, although Clc charmstones were found unassociated in the midden of Sac-107C and Sac-168; Phase 3 charmstones found in graves 24 to 30 inches deep in SJo-68, in Sac-168, Phase B, and in SJo-56, Phase E, consist of types Cla, Clb, Ala, Bla3, Blbl, Blb2, Bla2 and Blal. Some of these types also occur in Sac-107C; Phase 4 represented by items from 12 to 24 inches in SJo-68, Phase b_1 and b_2 of Sac-168, Phase D of SJo-56, and the majority of the charmstones from Sac-107C. Charmstone types Albl, Alb2, A2, A3, A4, Blb3, B4, B5, B2 and B3 appear characteristic; Phase 5 may be represented by SJo-68 graves from 0-12 inches in depth, Phace C of SJo-56, SJo-142, SJo-112, and some graves in Sac-107C. Numerous charmstone types appear characteristic of this phase, however, a complete analysis of Sac-107C is necessary to fully define Phase 5. The variety of temporal charmstone types found in this latest Windmiller phase suggests that further temporal division may be possible.

A single blue amphibolite schist Albl specimen identical in every respect to the Sac-107C and Sac-168 specimens comes from SJo-56, Phase D. This charmstone may have found its way into the SJo-56 deposit by chance, however, two Phase D charmstones are types common in Sac-107C and Sac-168 (D7 and Blb3) suggesting that the deposits were contemporaneous and that there was trade between sites.

Translucent white marble occurs most commonly in SJo-56 and SJo-68 (Phases 3 and 4), although charmstones of marble occasionally occur in other sites (10 specimens in Sac-107C, 1 specimen in SJo-142). A distinctive blue amphibolite schist dominates the raw material used for charmstones in Sac-107C and also occurs at Sac-168. Charmstones are made in serpentine (called "mottled limestone" by Heizer) in Sac-107C, Sac-168, SJo-68, and SJo-56 (one specimen). Gabbro and porphyritic igneous rock identified by Howel Williams (Department of Geology, University of California, Berkeley) is found in SJo-68 and Sac-168 and may occur in other sites wrongly identified as diorite or granite (Heizer, 1949:19, Table 5).

The seriation of projectile points appears less clear-cut than that found among charmstones (Table 64). This is partially due to the small number of points found in Sac-168 Windmiller graves. Differences occur in frequencies of various common types rather than in the appearance of new types. The following points characterize the phases of SJo-68: The SJo-68 Phase 1 contains 5a, 3b, 7a, points in that order of frequency (the 4 or 5 points with cremation 1 and 3 may be intrusive from Phase 3); Phase 2 contains 3b points; Phase 3 contains 1, 3a, 7a and 3b points in that order of frequency; Phase 4 contains 3a, 3 and 1 points in that order of frequency; and Phase 5 contains 3a, 2 and a possibly new type of 3b (leaf-shaped, concave-based) point.

SJo-56 Phase E contains only three point types, 5c, 5d and 5a. Types 5c and 5d are found only in Phases 3 and 4 of SJo-68. SJo-56 Phase D contains 7a and 5 a points in two burials but also types 6c, 7c, 2, 1, and 3a strongly suggesting contemporaneity with the latter part of SJo-68 Phase 3. SJo-56 Phase C contains no graves with points, while SJo-56 Phase B includes two rare subtypes, 7b, 5e, as well as types 5a and 7a. Type 5e occurs in SJo-68 only once, unassociated in the upper midden. SJo-56 Phase B may be contemporary with or later than SJo-68 Phase 5. SJo-142 has been treated as a single component. The assemblage resembles SJo-56 Phases D and B. Sac-107C clearly representing several phases is probably contemporary with SJo-68 Phases 3 through 5, the largest part of its graves contemporary with SJo-68, Phase 3. A few graves may represent earlier phases. The single 3b point in Sac-168 supports its contemporaniety with SJo-68 Phase 2 or 3.

Thus the seriation of both charmstones and points suggests the following temporal sequence:

Windmiller Phases	SJo-68	Sac-107C	Sac-168B	SJo-56	SJo-142	SJo-112
	Components					
5		X	B_1	B	X	X
4	4/5	X	B_2	C	X	
3	3	X		D		
2	2	(1 grave?)		E		
1	1	(2 graves?)				

At least five or perhaps six phases of the Windmiller can be distinguished in the Windmiller Culture. Any problem about the distinctiveness of Phases 5 and 6 can only be resolved with a reappraisal of Sac-107.

Ground Stone Objects

Windmiller components yield fewer ground stone objects than those of the Cosumnes Culture. Slate pendants occupy a conspicuous place only in later Windmiller assemblages (SJo-68A, and SJo-112). Windmiller sites SJo-142, SJo-68, Sac-107C and Sac-168B yield manos while mortars, milling stones and pestle fragments occur in SJo-68 and Sac-168B. A finely-made rectangular paint palette comes from a grave (S164) in Sac-107C. These rare objects may not be very useful in placing sites in various Windmiller phases. Three graves in Phases B, C, and D in SJo-56 contain large, stone balls with a pecked groove around the circumference, common Cosumnes items called "net weights." Morphologically identical, large, grooved clay balls occur in Cosumnes site SJo-43. These stone balls are very much larger than clay pecans and somewhat rounder in shape.

Unworked River Pebbles

Unworked river pebbles often of white quartz come from SJo-142, SJo-68 and Sac-107C graves. The use of river pebbles, mullers and manos as grave accompaniments is also diagnostic of the Oak Grove Culture of the Santa Barbara region.

Shell Beads

Olivella beads, types 3b and 3e, both considered Cosumnes Culture bead types, occur in SJo-142, Sac-107C and SJo-112. In addition, both SJo-142 and Sac-107C contain several intrusive Cosumnes burials with beads of these types. Saddle Olivella beads (3b) occur in five intrusive burials dug through the hardpan in SJo-142, and in three other burials not noticeably intrusive. However, SJo-142 burial nos. 15, 18, and 30 are noted as occurring at the same depth below the surface as the intrusive Cosumnes burials (SJo-142 burial nos. 24, 29, cremation nos. 1, 2, and 3), between 18 and 29 inches deep. Only beads accompany these SJo-142 and Sac-107C graves. The difficulty experienced in separating Sac-107 graves into Windmiller and Cosumnes Cultures on the basis of stratigraphy alone necessitated the earlier investigators' dependence on the use of artifact accompaniments (Lillard, Heizer and Fenenga, 1939; Heizer, 1949). The fact that these graves (Sac-107C, burial nos. C20, C9, S179) contain no diagnostic Windmiller artifacts leaves their inclusion in the Windmiller component in doubt. The possibility exists that both SJo-142 and Sac-107 graves containing this type of Olivella bead come from the Cosumnes Culture habitation period.

The same three graves in SJo-142 (Nos. 15, 19 and 30) yielding Olivella 3b beads also yield Haliotis 3 beads, a common Cosumnes Culture type. Four Sac-107C graves contain Haliotis 3 beads, a few of which also occur in the hardpan of SJo-68.

Square mussel-shell beads and Olivella 1b beads occur in large numbers only in SJo-56. Heizer and Baumhoff (1958) considered the large Olivella 1b beads to be diagnostic of the Cosumnes Culture.

Ornaments

SJo-68 Phase 1 and 2 contain very few graves with Haliotis shell ornaments. Rectangular Haliotis pendants occur in all Windmiller sites. The more elaborate variations on rectangular shapes, H and F occur in SJo-68, Phases 3-5, SJo-56 and SJo-112. Types I, J and K occur in Sac-107C and SJo-112. A Haliotis shell ornament, type A.1 (a curved rim of shell perforated at one end), common in the Cosumnes Culture, occurs only in Windmiller sites SJo-56 (Phase C) and Sac-107C.

Miscellaneous Items

Bone ornaments and tools occur too infrequently for diagnostic use. Turtle carapace ornaments occur in fairly large numbers in the later Windmiller phases of Sac-168, SJo-68 (Phases 4 and 5) and SJo-56 (Phase B). The rare bear and bird claws also occur in SJo-68 and SJo-56 (Phase D). Small numbers of bone and antler "spatulas" and bone "points" come from SJo-68 (Phases 1 and 2), SJo-56 (Phase D) and Sac-107C.

Baked clay objects, small, biconical, grooved ovals called "pecans," similar in shape to net or line weights occur only in SJo-168 and SJo-68 (Phases 3 and 4).[34] The middle Windmiller (Phases 3 and 4) sites may mark the initial use of shaped clay in the Central Valley. Unshaped clay comes from the middens of all sites except Sac-107C and SJo-142. Windmiller people may not have used these two sites as habitation areas.

Unique Artifacts by Sites

SJo-142 contains bone beads, unique points of types 5e, 6a, and 7b (the 5e points are also found in SJo-68 and SJo-56, and Cosumnes Culture sites), magnesite stone beads (also found in Sac-107C), and a conical steatite pipe.

SJo-68 Phase 2 contains a child burial unique in both number and kinds of mortuary goods, which include bone and antler points possibly forming the prongs of two trident fishing spears (also occurring in SJo-56 and in many Cosumnes sites), a single-pieced curved bone fishhook and malachite pebbles. Other unusual items from the SJo-68 (Phase 1) include an antler "wand," an elk scapula spatula (also found in Sac-107C), and a Canis skull. From Sac-107C come Haliotis type A.1 shell ornaments (found also in SJo-56), a cut human skull receptacle, a "conch-shaped object" (lost from the collection although listed), a rectangular ground stone palette stained with red ochre, stone beads, asbestos splinters (also found in SJo-68 (Phase 4) and SJo-112) and obsidian bangles (unworked splinters of obsidian which have probably been heat-treated).

From SJo-68 (Phases 3 and 4) come malachite pebbles (Phases 4 and 5), zincblend fragments and asbestos splinters, a horn chisel or wedge, and a small baked clay perforated disc (also found in several Cosumnes sites).

From SJo-56, an unusual site, come many exotic items: ground stone balls (sometimes grooved around the circumference), square mussel shell beads, several type A.1 Haliotis shell ornaments (also from Sac-107C), type 1b Olivella beads, falcon skulls and a human fibula dagger.

Sac-168B and SJo-112, the smallest Windmiller components, yield only the more common artifacts. The bone and shall artifacts in Sac-168B are very badly preserved; therefore, only a few of the shell objects can be typed.

Typical Features of the Windmiller Culture

At this juncture, it seems appropriate to present a description of approximately 20 artifacts, as well as the common burial positions and the mound structure, which occur in all Windmiller settlements. These can be used to characterize the culture.

All Windmiller sites contain primary ventral fully-extended burials oriented with the head to the west. A small percentage of dorsal, fully extended burials occur in all sites except SJo-56, while flexed burials and cremations occur in very small numbers in all sites except SJo-56 and Sac-168B.

Thus, the extended ventral burial position dominates the Windmiller graves; on the other hand, flexed burials of varying orientations dominate Cosumnes and Hotchkiss Cultures, although a small percentage of extended burials both ventral and dorsal continue to occur.

Unique mound structure and midden components also characterize Windmiller sites. Invariably located on natural mounds or levees near permanent rivers, a cement-hard, calcareous "occupation" hardpan 6 inches to 2 feet thick seals the midden of every Windmiller component (see Setzer, 1947; Treganza, 1946; Heizer, 1949; Heizer and Fenenga, 1939).

Characteristically the middens have lost much of their organic carbon through decomposition, and many inorganic carbons through the physical breakdown of charcoal and ash deposits. The capillary action of water breaks charcoal and ash into minute particles and disperses them throughout the mound in colloidal state.

Bone appears heavily mineralized, and unassociated artifacts and living debris occur with conspicuously less frequency than in Cosumnes and Hotchkiss sites. Many of these midden characteristics may be due to the greater antiquity of the Windmiller sites, the prevailing water table and the high evaporation rate characteristic of the poorly-drained Delta area.

Specific point types do not appear exclusively in the Windmiller Culture, although types 2, 5a and 7a (leaf-shaped convex-based, and two varieties of stemmed points) occur in a relatively large number of graves in practically all Windmiller sites.[35] The more elaborate tanged varieties are prominent in the later phase Windmiller sites and in Cosumnes collections. Typology alone does not differentiate between Windmiller and Cosumnes points. The Cosumnes people made their points more carefully. Long parallel ribbon-flakes were pressed off diagonally across the blade. Although certain types remained as large or even larger than the early spear and dart points, suggesting continued use of those implements, certain stemmed varieties are noticeably smaller.[36]

Human Bone Artifacts

Artifacts made from human bone occur in SJo-68, Sac-107C and SJo-56. Skull recipticals in SJo-68, Sac-107C, a human fibula dagger in SJo-56, and a possible worked human tibia in burial no. 24 in SJo-68 (Phase 1). Although rare these worked human bones are characteristic of the Windmiller Culture.

Miscellaneous Items

Slate rods of various sizes and shapes are among the only items of ground stone except charmstones to appear in all Windmiller components except SJo-142. They continue on in larger numbers in the Cosumnes Culture.

Items of personal decoration, quartz crystals, for example, occur in many graves in all sites except SJo-112. These crystals continue to be common grave items throughout Central California prehistory. Quartz crystals, along with charmstones and ochre, are unique to California in the Western United States They are only rarely found in the early sites of the Southwest and the Great Basin. Several of the early sites on the Northwest Plateau, however, yield quantities of ochre, some quartz crystals and unperforated charmstones (cf. Chapter V). Biotite mica ornaments occur in one or two graves in all but Sac-168B and SJo-56.

Red ochre, either in lumps, powdered, or in the form of paint, occurs in every site. SJo-68 shows a strong association between graves containing red ochre, dorsal extended male burials and projectile points. Individuals interred with red ochre may have been warriors or war victims given some kind of ritual burial. Red ochre declines in frequency in the latter phases of the Windmiller (Phases 4 and 5).

Shell beads of all types occur in more graves, and in greater numbers than any other material culture items in Windmiller components. Olivella la (whole, spire-lopped), Olivella 2b (square-cut), and Haliotis la (square-cut, single perforation) beads occur in every site. Haliotis 2 beads (square-cut, double perforation) come from SJo-68A, Sac-107C and SJo-112. Haliotis shell ornaments seem to increase in frequency in the later phases of the Windmiller sites.

Circular Haliotis ornaments (type C) particularly those with two central perforations (C2) and often a simple incised line decoration around the circumference (a), the only decoration, commonly appear in the Windmiller components. Every site component yields bone awls and bird wishbones in varying numbers.

Conclusions

Considering the entire body of evidence, the Windmiller may be divided into five, perhaps six phases.[37]

The age range of the known Windmiller Culture sites seems to fall between 3,000 and 4,000 B.P., overlapping to some extent the Cosumnes Culture occupation on the coast (Heizer, 1958b; Davis and Treganza, 1959).

The Cosumnes Culture may have expanded into the Central Valley from the Central Coast about 3,000 years ago having originated between 4,000 and 5,000 B.P., on the southern coast of California, the La Jolla complex.

CHAPTER V

A COMPARISON OF THE WINDMILLER CULTURE TO CONTEMPORANEOUS CULTURES IN SOUTHERN CALIFORNIA, THE GREAT BASIN AND THE NORTHWEST PLATEAU

Introduction

The description of the Central California Delta Windmiller sites (Chapter IV) is followed here by an examination of the important question of their relationship to industries presumably contemporaneous in other parts of the western United States. While investigators understand fairly well the archaeological development which took place in the bordering area of the Great Basin and the Northwest Plateau, the description of material from Southern California is greatly confused. Comparison of the archaeology of these areas suggests hypotheses regarding the origin of the initial Delta population and the major influences on that population throughout its prehistory.

Some important literature has already been produced concerning this problem. Heizer (1951:8) expresses the opinion that the cultures of north-central California had strong connections with the Great Basin Desert Culture. Kroeber (1935:7) explicitly states that the ancient Hokan culture stratum (from northeastern California) had Basin--that is, Desert Culture--affiliations. Lowie (1923:156) and Gayton (1948) reach a similar conclusion based on shared folktales, ceremonials, and material traits of ethnographic peoples from both California and the Basin.

Wallace (1955:121-122) cites Sayles and Antevs (1941:30), Gladwin (1937:34, Map 2), Treganza and Malmud (1950:151), Sauer (1941:1-25), Macgowan (1956:126-129) and Haury (1950:339-340), in his discussion of Basin Desert Culture and Southern California cultural connections. Jennings (1956:69) states his opinion that the Desert Culture diversified to produce all southwestern cultures, including that of Southern and Central California.

Heizer (1949) and Beardsley (1954), however, feel that the Windmiller complex contains too many non-Desert Culture traits[38] to be explained by a southwest origin:

> It may not be out of order to recall that one or two features archaeologically continuous and important from Early Horizon, such as the charmstones, large projectile point style without specific knife form, and quartz crystal, share distributions which follow the seaboard on both sides of the continent and continue in South America, as well as occurring sporadically in early horizons from the Middle West to the Atlantic Coast. While the puzzle of such a distribution cannot

> be answered at this time, there is at least the certainty that what became California culture did not simply intrude into California from the Southwest, and there is some suggestion that California was touched by a wide dispersal of elements antedating the integration of the Southwestern culture sphere. (Beardsley, 1954:104.)

Heizer (1964:117-119) concludes:

> The western continental fringe clearly has not been an area into which massive population movements or major culture complexes have flowed and spread out as they have east of the Rockies but, rather, has been a marginal area, generally difficult of access, into which many small groups have been pushed or found their way over a long period of time, with the result that extraordinary complex series of local cultures have taken root, developed, and interinfluenced their neighbors over the past several thousand years. Although Kroeber (1962) warned against too easy acceptance of the "fish-trap theory, according to which the multiplicity of languages in California is due to the successive crowding into this more desirable habitat, of waves or bands of unrelated immigrants from less favorable territories, to which none of them were ever willing to return," a considerable body of evidence and opinion indicates that acceptance of the fish-trap theory helps to account for some of the considerable linguistic, cultural, and somatic variability on both the ethnographic and the prehistoric time levels of the west-coast region (Heizer 1952b: see also Dixon 1905; Putnam 1880). Only in this way can we reasonably account for the high degree of linguistic diversity and cultural fractionation exhibited anciently as well as ethnographically along the Pacific Coast.

The following discussion compares the Windmiller archaeological assemblage to archaeological assemblages collected outside the Central Valley.

The Age of the Windmiller Components

Comparisons between the Windmiller and other cultures depend to a certain degree on knowledge of the absolute age in years of the deposits in question. Investigators have only tentatively established the age range of Windmiller components. The absence of charcoal concentrations of sufficient size has prevented accurate radiocarbon dating of all but one site, SJo-68.

Dating

Heizer and Cook (1949) estimated over twenty years ago that the absolute age range for the Windmiller Culture lay between 4,000 and 7,500 years ago. A single series of three organic samples from SJo-68 dates this Windmiller site between 4,000 and 4,500 years B.P. (Heizer, 1958:2-3, 9-11). Isotopes, Inc., New Jersey, and Geochron Laboratories, Cambridge, Mass., ran radiocarbon dates on collagen extracted from human bone from four Windmiller sites: SJo-68, SJo-142, SJo-56, and Sac-107C.[39]

The difference between charcoal and collagen dates is not surprising in view of past experience with bone dating, including that of radiocarbon assays of extracted bone collagen. Tamers and Pearson (1956:1055) of the University of Texas Radiocarbon Laboratory conclude in their summary of bone dating problems that:

> . . . it can be seen that the majority of radiocarbon dates on bone are in error. Most of the bone dates appearing in the literature were obtained with acid-washing pretreatment methods similar to that described as our fraction C. Very few of these values should be correct, except possibly in those situations where the bones were not buried or for relatively recent sites (less than a few hundred years old). The use of the carbon present as acid-soluble carbonates for the dating is not advisable in any case. The best method is clearly that involving the acid dissolving of the bones, in this way ensuring the complete removal of the carbonate fraction. However, even the treatment gives incorrect dates in more than half the samples and the results should be used with caution.
>
> A very important factor in the errors connected with bone dates is that all cases of measurements on known-age bones, both those presented in this paper and samples described in the literature, the observed errors are in the same direction, that is, giving falsely young ages. It can be suggested, on the basis of this evidence, that a more realistic use of bone dates would be to use them as only lower limits, and to precede the dates with a sign indicating 'greater than or equal to.'
>
> The extent of the errors is not such as to make bone entirely unsuitable in cases where an upper limit to the age of the material is of principal interest. As expected, the absolute values of the deviations tend to increase with the samples' ages. For the bones

> described in this paper, which range from 200 to 10,000 years old, the maximum error is 3,000 years. In the best of the treatment methods (Fraction A), only one sample out of fourteen measured has error greater than 2,000 years. With scrupulous physical cleaning of the bone specimens, it might be hoped that the errors of unknown-age samples, up to at least 18,000 years old, will not exceed a few thousand years.

Dr. Rainer Berger (University of California, Los Angeles, Institute of Geophysics, pers. comm.) states that collagen and carbon dates should be the same if the laboratory treats the samples with a 2N solution of NaOH. Porous bone apparently absorbs humic acid from the decay of present-day vegetation. The acid might, according to Berger, be removed by leaving the collagen in the solution of NaOH over night. Dr. Berger feels that, regardless of the adsorption of humic acid, the collagen sequence, at least among samples dated by the same laboratory, would yield internally consistent dates. Humic acid lasts in the soil only about 500 years, so specimens greater than 500 years old would contain humic acids with the same range of old and young carbons.[40]

Despite several efforts to obtain reliable radiocarbon dates, the absolute age of the Windmiller Culture remains uncertain due to contradictions between dates obtained from different materials and the uncertain stratigraphic provenience for the SJo-68 charcoal samples (Table 66). Even Isotope sample no. I-2749b treated with a NaOH solution is about 300 years younger than the dates run on wood charcoal and burned human bone.

According to radiocarbon dates of charcoal, San Francisco Bay was occupied by a culture very similar to the Central Valley Cosumnes Culture by about 3,500 years (Heizer, 1958b:7). This culture is stratigraphically directly above Windmiller deposits in many Valley sites. The stratigraphic position of Valley Windmiller and Cosumnes components strongly support the greater age of the Windmiller Culture, unless one can prove that the Cosumnes Culture entered or developed on the Central Coast while the Windmiller still flourished in the Central Valley.

Dating based on shell from the Oak Grove Culture of the Santa Barbara region in parts supports a 7,000-to 4,000-year age estimate for the early phase of the Windmiller.[41] The Oak Grove complex strongly resembles the Central Valley Windmiller Culture.

The southern California sites may have been occupied slightly earlier than those in the Central Valley.

The author tentatively accepts the 4,000 B.P. age for the early part of the Windmiller Culture occupation. Little evidence exists to substantiate the estimate of 7,000 B.P. for the six sites in the Central Valley. Assuming that Phase 1 of SJo-68 is among the earliest of Windmiller occupations (cf. Chapter IV) the maximum age might be about 5,000 B.P. Windmiller Culture occupation of the California Central Valley may have continued to about 3,000 B.P. contemporary with the Cosumnes Culture occupation on the Coast. Additional wood charcoal dates must be obtained in order to solve the problem of the absolute age range of the Windmiller Culture.

Pre-Windmiller Sites in Central California

Only three sites require discussion with regard to a pre-Windmiller occupation in the Central Valley: Borax Lake in Lake County (Harrington, 1948); Tranquillity in Fresno County (Hewes, 1943; 1946; Heizer and Cook, 1952; Angel, 1966) and Buena Vista Lake in Tulare County of the Southern San Joaquin Valley (Wedel, 1941).

Harrington's (1938, 1948) first excavation of Borax Lake led him to assume that stemmed-side notched and willow-leaf points found in the excavation were older than fluted points collected from the surface. The concave-based points, "Borax Lake fluted," lack the characteristic Folsom base--they show multiple, rather than single, fluting scars. Antevs believes that the alluvial fan which contains the Borax Lake artifacts built up during a dry period, presumably the Altithermal (Wormington, 1957:64).[42] However, the mixture of point types, stratigraphically distinct in other California sites, suggests a redeposition of the artifacts, perhaps in somewhat inverted order during the Medithermal.

Several Windmiller deposits yield similar concave-based points, Phase 2 and Phase 5 of SJo-68 and some Cosumnes sites. Supporting a Cosumnes or late Windmiller origin of the fluted points Krieger (1953:240-241) describes the Borax Lake complex as a manifestation of the Central Californian Cosumnes Culture (also see Wallace 1955:121). Meighan (1955) defines the Borax Lake complex as the earliest of three phases in the Coast Range north of San Francisco Bay. Meighan's Coast Range site near Willits contains Borax Lake artifacts associated with many additional traits which link the component to the Cosumnes Culture of the Central Valley.

Several archaeologists have judged the Tranquillity site near Fresno earlier than the Windmiller Culture. Bryan (1963:163-164), Meighan (1959a), Wormington (1957:231-232) and Angel (1966) at least tentatively accept it as an early man site. Excavated by G. Hewes, W. Massey, L. Satterthwaite and M. Lloyd, and briefly reported by Hewes (1943; 1946), the site produced 6 to 8 flexed burials of adults, fragments of 22 additional adults, 5 adolescents and children, 3 infants, extinct forms of mammalian fauna, and some artifacts (Angel, 1966). Angel (1966:2) in the description of human skeletal material says:

> Dr. Satterthwaite has postponed reporting his archaeological results until carbon 14 or a geologic date is available since he feels that a break in the hardpan layer from recent erosion in the slough at Tranquillity prevents perfect proof of contemporaneity of Camelops with human bones on the opposite sides of this recent break. My report was to have been appended to Satterthwaite's. I am publishing it now separately for two reasons: first, I think that contemporaneity of the extinct mammal and human bones has been virtually proven by Heizer and Cook (1952), and I note Wormington (1957), Beals and Hoijer (1959), and others, accept this as highly probable; second, it seems to me that contemporaneity is the simplest explanation according to Hewes' (1946) report.

Hewes' report describes the abundant cultural evidence (1946:214):

> A few complete points, fragmentary points and blades, a drill, some scrapers, and chipped pieces too incomplete to identify, make up this category of the collection. . . The obsidian points and blades include some with transverse flaking, but really fine secondary flaking is lacking.
>
> Among the artifacts of ground stone are numerous roughly oval mullers (manos), two fragments of metates, several fragments of pestles, and parts of at least two mortars made from boulders with little or no finishing of the outside surface. Two flattish stones with roughly chipped side notches probably were used as net sinkers. Several quartzite hammerstones, a possible "charmstone" with grooved end, and sherds of steatite which may have been fragments of crudely finished steatite vessels were found. An unworked quartz crystal, some lumps of asphaltum, and a large quantity of broken stone, foreign to the locality, may be mentioned, although they are not artifacts in a strict sense.
>
> Bone implements include a long dagger-like cannon bone awl; three blunt points, two of which are illustrated; two spatulate fragments with a high polish; and one awl made of the ulna of an ungulate. Shell objects, in addition to the Olivella beads associated with the burials and the disk bead, are represented by two cut shell pieces, one triangular, both of rather crude workmanship and about 7 cm wide.

> . . . Lumps of burned clay, two with stick and pole impressions and one with imprints of tule leaves and of unidentified plant fibers, suggest structures or matting.

The assemblage reminds one very strongly of the Cosumnes Culture. The steatite vessel, bone tools and disc beads are suggestive of Cosumnes affiliations.

Bones of Camelops, Equus, and Bison (possibly a modern species) come from the same Tranquillity location. Heavy mineralization marks them all, as well as the human remains. Fluorine tests by Heizer and Cook (1958:297-298) on the bones yield similar fluorine content for both the extinct mammalian and human skeletons:

> In Hewes' latest paper, he proposes two alternative interpretations of the finds. First, the remains of the extinct mammals may be older than the human skeletons, and the association of these, together with artifacts may be accidental and the extreme mineralization of the human and extinct animal bones is "irrelevant." Second, he suggests that the earliest occupation by man may have been contemporary with the Camelops, Bison and Equus assemblage, with other artifacts and burials being later than some of the earliest mammal material. Our chemical tests. . . examine the issue of "irrelevance" of the mineralization factor. The mammal bones (horse and camel) contain slightly more fluorine and carbon, slightly less water, and approximately (within the experimental error) the same amount of nitrogen as the human bones. In terms of the separate criteria, the fluorine and water would indicate the animal bones as slightly older, the carbon would point to the animal bones as slightly younger, and the nitrogen would place them as equivalent in time. However, considering the relatively small number of samples and their inherent variability these deviations must be regarded as random, and the two lots of bones must be considered as practically identical in checmical constitution. The conclusion follows that they are all of approximately the same age, and that the Tranquillity human bones are of Late Pleistocene age. If the differences expressed between the two bone lots are considered significant and not due to experimental error, the human bones would be slightly later, and therefore be immediately post-Pleistocene. The word "Pleistocene" is used loosely here in the sense that the date of mammalian extinction marks its termination. C. L. Camp and R. A. Stirton assure us that the paleontologists are also in the dark as to when this event occurred.[43]

However, Hewes (1946:215) quotes Satterthwaite, expressing doubt that the human and animal bones are geologically associated.

> In a consideration of the archaeology of the Tranquillity site and its possible significance in the study of Earl Man in California, its paucity of in situ associations of faunal remains, artifacts, and burials cannot be too strongly emphasized. With the exception of the beads and other materials found with the burials, only one artifact (the large obsidian blade, Fig. 28q) can be said to have been excavated from a position in the soil which it had occupied without disturbance for a long period of time . . . As Satterthwaite will show in his paper, the weight of evidence from his stratigraphic work, concerned primarily with sequences of soil layers, does not seem to indicate contemporaneity of burials with at least the Camelops mandible found in situ on the surface of the Fresno Hardpan.

Angel, having thus accepted the contemporaneity of human and animal bones, uses Hester's (1960) synthesis of carbon 14 dates for the extinction of Pleistocene mammals in the West to estimate the age of the human skeletal material. Only one dated locality yielding an extinct horse and camel fauna comes from California--the Rancho La Brea tar pit. The dates from the tar pit lie between 15,390 ± 230 and 13,890 ± 280 years ago (samples Y-354a, b, and Y-355a, B). All the younger dates quoted by Hester come from Great Basin and Plains localities.

In any event, 8,000 B.P. seems far too early for the flexed burials and associated assemblage. There is some evidence that a Rancho La Brea fauna existed in California as recently as 3,000 years ago (Donald Savage, Department of Palaeontoloy, UCB, 1967, pers. comm.). However, all evidence points to a geologic disconformity separating the animals from human skeletal and cultural remains. The association accepted by Angel is far from proven.[44]

Wedel (1941) excavated the third presumably early site deserving of consideration, which was at Buena Vista Lake (Ker-116). Buena Vista III produced Windmiller-like burials and artifacts in its bottommost layers. The cemented deeper layers yielded few artifacts other than mealing slabs and mullers, which occurred to a greater depth than any other class of artifacts. Red ochre, the occasional presence of crude stemmed and leaf-shaped points, an occasional bit of worked bone, and one example each of mortar and pestle accompanied extended line-encrusted burials. Wedel (1931:147), Wallace (1954:120-121), Orr (1943:3; 1952:217), and Heizer and Fenenga (1939:395-396) note the striking resemblance of of Buena Vista III to the Oak Grove. Recent excavations in 1965 and 1966 by D. Fredrickson and others at Ker-116 uncovered more material suggestive of the Windmiller and Oak Grove Cultures. A cultural level in which occurs shell refuse and a few chipped stone artifacts about 9-12 feet below the level of the extended burials yields a carbon-14 date on burned and unburned Anodonta shell of about 8,000 B.P.[45]

Comparison of Windmiller and Early Southern California Sites

Many different names identify the earlier industries in Southern California: Oak Grove, Playa, San Dieguito, Lake Mohave. The La Jolla industry appears stratigraphically above the Oak Grove, San Dieguito and Playa industries. The Pinto-Gypsum industry follows the Lake Mohave industry. The Armargosa industry in the northern Mohave Desert, may be contemporary with or later than the Pinto-Gypsum complex.

The Oak Grove complex from the Santa Barbara Coast described by Rogers (1929) strongly resembles the Windmiller complex. California archaeologists feel that the superior workmanship of Windmiller artifacts and early carbon-14 dates[46] on marine shell from the Oak Grove Glenn Annie site in the Goleta Valley suggest a slightly earlier occupation of the southern sites (Wallace, 1955:121).

Despite the scanty description of this culturally and geographically closest Windmiller relation, Heizer states:

> One might infer a distribution of the Early Central California culture type Windmiller extending from the Mokelumne River region as far south as the Tehachapi and present between Santa Barbara and Point Sal (Heizer, 1949:35).

Oak Grove deposits consist of cemented, disintegrated shall midden (Rogers, 1929:345):

> We find that in every case the body had been laid at full length, with the arms straight along the sides and with the face either down or up. The favorite depth of a grave appears to have been about thirty inches.
>
> Very few personal belongings have been found with the skeletons, and these are, with two exceptions, confined to very crude flint weapons and tools. The two exceptions noted are much disintegrated bone bodkins, tentatively designated as hair pins and red ochre.
>
> Red ochre was used in abundance in the graves of this period, the soil being fairly stained with it, but the exact method in which it was employed is a mystery. I found no molded cakes or even granules. I believe

> that it was used as a thick paint over the body before it was deposited in the grave.

The skeletons, very poorly preserved, lay extended with the face up or down. Bone ornaments and shell ornaments had also disintegrated.

Certain elements, like stone grave coverings, differed markedly from the Windmiller tradition:

> Immediately over the skeleton, at the level which marked the surface at the time of the burial, is usually found an aggregation of stones that once served as a grave marker. These markers were, doubtless, at one time upon the surface, but, owing to the settling of the graves and the subsequent accumulation of debris above them, they are now at varying depths below the present surface. These markers vary considerably in the nature of the objects used, and also in their arrangement. A favorite arrangement is a circular platform about two feet in diameter, composed of small, flat beach stones. In some instances, two or three much larger, elliptically outlined, flat stones have been laid horizontally with edges touching. Rarely we find cairns of rounded boulders piled in a pyramidal heap.
>
> Probably the most striking of these efforts to embellish the graves is in the frequently recurring superimposed platforms that contain objects of household use. Sometimes these alone served the purpose, or they were associated with unworked boulders. The artifacts thus used were chiefly the massive, uncouth metates, or mealing stones, interspersed with numerous manos, or hand stones. The metates were almost invariably found with the face or cavity down (Ibid:346-347).

The only complete report of an Oak Grove burial complex comes from the shell midden of the Glen Annie Canyon site, SBa-142 (Owen, Curtis, and Miller, 1964), where a single feature contains three fully-extended burials oriented east-west. A large pile of unworked *Saxidomus nuttallii* and *Tivela* sp. shell covers the graves. Mortuary goods include chipped and ground stone: 5 manos, 5 mano fragments, 1 large metate, 2 scraper planes, 1 concave scraper and 3 hammerstones. Unassociated artifacts in the midden closely resemble those from the Windmiller Culture: red ochre; a nearly round sandstone ball; five unperforated charmstones, one stained by red ochre; a serpentine bowl stained with ochre; spire-lopped *Olivella* 1a beads, clam disc beads, rectangular *Olivella* 2b beads (found in the broken serpentine bowl), and *Dentalium* beads; and chert points, types 7a and 7c (a crude, side-notched specimen resembling an early Pinto Point).

Owens, Curtis and Miller (1964) compare the Glen Annie site to La Jolla II (see Moriarty, 1966:21) sites in Southern California, including the Scripps Estate Site I and the Tank Site (LAn-1) whose mortuary complex resembles the Windmiller's more closely than it does the La Jolla. The La Jolla II custom of flexed primary burial differs considerably from the extended burials of the Windmiller Culture and feature no. 1 in the Glen Annie site. Excavators of Glen Annie describe disturbed burials, perhaps originally flexed, in feature nos. 2 and 3, suggesting the presence of both the Oak Grove and the Hunting cultures.

The cultural association between the Oak Grove and La Jolla II, based primarily on shell dates which may be inaccurate, is poorly reasoned. The artifact assemblages show no strong resemblances except for the presence of ground stone and scrapers.

Although the Oak Grove culture, partly due to poor preservation, lacks many items common in the Windmiller Culture, the Windmiller differs in one major respect, the low frequency of metates and manos and the absence of stone cairns. This difference may result from the geology of the Sacramento-San Joaquin Delta, an alluvial deposit of great depth devoid of natural accumulations of stones. Ethnographically, valley tribes carried stone into the Delta from both the Coast Ranges and the Sierra Nevada foothills.

Wallace (1954:118; 1955) describes a complex in Ventura County, from the Little Sycamore site and others which is reminiscent of the Windmiller and Oak Grove, but which, in the final analysis, is probably more closely related to the later Hunting Peoples (Santa Barbara)[47] and the Cosumnes complex (Central California Delta). The Little Sycamore artifact assemblages and those of the Oak Grove resemble each other except for the increased frequency of mortars and pestles, pitted stone hammers, curved stone blades and flexed burials.[48]

From Malaga Cove at Redondo Beach in Los Angeles County come "small chipped stone tools which may represent the earliest coastal culture yet found" in its lowest level (Wallace, 1954). The chipped stone assemblage, in which Wallace found a few small leaf-shaped points, apparently does not look like anything else in California. Shell from the lower three feet of the 28-foot deposits dates 4551 $\pm$ 200 B.C. (LJ-3), but the exact location of the sample with respect to cultural material seems to be in doubt (Bryan, 1965: 161; Wallace, 1955:215). The shell date may refer either to Zone I (the lowest level) or to Zone II. The two zones of deposit may in fact contain culturally mixed midden (Wallace, 1955:215), the whole sequence starting later than the shell date implies.

Zone II resembles the Oak Grove complex, with leaf-shaped points dominating an assemblage which also includes corner-notched varieties. Grinding tools absent from Zone I appear in Zone II, in addition to reburials under cairns of stones, red ochre, soapstone objects, abalone shells plugged with asphaltum, and clamshell discs, traits regarded as chronologically late.

Inland, LAn-1, the Tank Site, in Topanga Canyon yields an assemblage similar to both the Oak Grove and Windmiller complexes to the north and to the Southern California Desert industries.

> Comparison [of Topanga] with the earliest horizon yet recognized to the north, the Oak Grove of the Santa Barbara region (Rogers, 1929) seem to offer the most satisfactory parallels as related to mortuary practices and milling activities; however, inasmuch as the Oak Grove Culture is not characterized as having a well-defined flake and core industry we are forced through necessity to seek further comparative data as expressed in the cultural inventory of the San Dieguito complex in the extreme southern coastal area of southern California and among the remains from the region of ancient Lake Mohave in the eastern desert. . . in addition to this early-man complex there remains a residue of material [Topanga II] which appears to be best associated with cultural traits characteristic of a "middle" time position. Such middle cultures can be tentatively identified with Point Dume, Santa Rosa Island [Orr, 1943], the lower levels of Malaga Cove, the Little Sycamore, the Hunting Culture of Santa Barbara, the Pinto-gypsum of the desert, and the La Jolla Phases of San Diego although the latter are at present poorly defined. At the Tank Site (LAn-1) these traits, which are of "middle" position have been named Topanga Phase II, and significantly enough they are confined to the upper 18 inches of the deposit (Treganza and Bierman, 1958:45-46).

If archaeologists had based comparisons of California assemblages on stratigraphy, artifacts, and burial complexes alone, the La Jolla phases might not merit comment. However, radiocarbon dating on shell yielding ages of four to seven thousand years seems to indicate that the La Jolla industry was contemporaneous to the Windmiller; the material, therefore, demands comment.[49] A strong resemblance exists between the La Jolla burial complex, the "Hunting People" identified by Rogers around Santa Barbara, and the Cosumnes Culture in the Central Valley.[50]

If one accepts the shell dates, which the author does not, they alone suggest the possibility that the Milling Stone Complex ("La Jolla" or "Hunting People"), as Wallace (1955) calls it, moved into Central California, replacing the Windmiller at the end of the Medithermal.

Recently reported Southern California sites, all associated with the La Jolla Complex, add little to an understanding of the relationships between areas; again shell dates rather than cultural similarity form the basis of the classification.[51]

M. J. Rogers (1939:27-28) finds sites containing the Playa-San Dieguito industries scattered all the way from north-central San Bernardino County, through Riverside County, to the Pacific Littoral around San Diego. Rogers feels that the geographic, topographic and physiographic position of the eastern Playa industry (and the often associated, ill-defined Malpais industry) is distinctive from the presumably later Pinto-Gypsum complex and suggests the existence of a climate of slightly greater humidity than that suggested by the Pinto-Gypsum zoning. ". . The stemmed blade, specialized scrapers and the eccentric stones. . ." mark the industry (Ibid.). These artifacts are similar to those in the Windmiller and Oak Grove Cultures.

The Playa appears contemporary with and almost identical to the West Coast's widespread and better established San Dieguito industry. This predominantly flake-scraper and chopping-tool industry contained a few crescents, Lake Mohave-and Silver Lake-type projectile points.[52]

Rogers and others associate circles of stones, identified as house rings, with the San Dieguito and Playa industries (Ibid: Plate 10). The Harris site near San Diego confirms the stratigraphic positions of the San Dieguito phase which occurs underneath a complex identified as La Jolla containing flexed burials, and many varieties of points, mortars and pestles) (Warren and True, 1961):

> The C. W. Harris Site (SDi-149) is a stratified site located on the flood plain of the river. The lowest level is composed of river deposited sand, gravel and boulders and contains San Dieguito cultural materials. A stratum of sterile stream deposited silts and clay is found above the San Dieguito stratum. In the upper part of this deposit a feature consisting of a concentration of stones was located as well as 2 small hearths, and a few artifacts. A carbon-14 date of 6,300 ± 200 (Hubbs, personal communication) from one of the features suggests La Jollan affiliations. Immediately above this material was a Late camp deposit containing small triangular projectile points and pottery (Warren, True and Eudey, 1961:7).

Excavators have secured two carbon dates on material from the C. W. Harris Site. Rogers' date of 4,720 ± 160 years B.P. comes from shell (*Chione californiensis*, sample LJ-136) (Hubbs, Bien and Suess (1960:220). Hubbs et al (1960:220) states:

> Shells were in a sandy layer, Stratum M, that he [Rogers] interprets as part of an ancient sandbar. This sandy layer, he states, was in a residual hummock on the flood plain of a now intermittent stream below a concrete-like layer and, before erosion, was under ca. 5m. of valley fill. Within the sand, Rogers found shell only in the upper part, in contact with the concrete and just below (the cemented layer may have prevented the solution of the shells). From the same sand layer Rogers took artifacts (amulets, notched points, etc.), regarded by him as characteristic of what he has termed San Dieguito III[53]

The cultural material, insufficient to associate the hearths with the La Jolla, might just as easily come from a San Dieguito component.

> In stratum IIB the soil is compact and almost indurated. There is little or no soil alteration resulting from human occupation. However, the few artifacts and the stone features clearly evidence such occupation. This stratum is called the La Jollan Component in spite of the fact that the cultural material recovered is not conclusive proof of that affiliation. This identification was made because Rogers termed the material he recovered from this stratum La Jollan, and the carbon-14 date we have obtained on a sample from one of the features in this stratum supports such a conclusion (see below).
>
> The La Jollan Component was almost void of artifacts but contained 3 and possibly more features. These features (numbers 5, 6, and 7) are all concentrations of stones with very definite borders. Only Feature 6 contained artifacts, but all contained small fragments of charcoal (Warren and True, 1961:255).

Warren and True found charred pinon and Malvacea seeds in the hearths.

Campbell and others (1937:1935) define Lake Mohave industries to the east of the Playa-San Diego complex on the basis of surface collections made from lake terraces of the Pleistocene Lake Mohave. Culturally, the Lake Mohave assemblage resembles that of the San Dieguito-Playa industries. It, too, lacks grinding stones, and contains many crude chopping and scraping tools, a distinctive "Lake Mohave" stemmed point, and an occasional crescent (Rogers, 1939; Haury, 1950; and Warren and True, 1961).[54]

The Stahl site near Owens Lake hints at a confirmation of a Lake Mohave-Silver Lake, Pinto-Gypsum sequence in the eastern desert (Lanning, 1963:265; Harrington, 1957; Appendix II).

Pinto points with side-notches and indented bases dominate the assemblage. The broad-leaf and willow-leaf points of the Little Lake Series occur in small numbers. The site also contains a few Lake Mohave and Silver Lake points, and a short square-stemmed form. These types tend to concentrate at lower levels than the others (Lanning 1963:265). Lanning notes the occurrence of many metates and both shaped and unshaped manos (Lanning, 1963). Harrington (1957) mentions the occurrence of choppers, core scrapers and large leaf-shaped knives from the same site.

Southern California has produced the greatest number of Pinto-Gypsum camps and the bulk of the lithic material (Rogers, 1939:47). Very little evidence of this industry occurs in Nevada, except for Gypsum Cave, where it is said to appear in stratigraphic context (Harrington, 1933). Only the Stahl site and Salt Spring Basin (a Pinto-Gypsum camp buried by a fossil dune) contains the cultural material in situ (Lanning, 1963).

According to Rogers (1939), the Pinto-Gypsum industry possesses a more compact distribution along river courses and drying lakes than the presumably earlier San Dieguito-Playa-Lake Mohave industries. This perhaps adds to the impression of an increased number of artifacts from this horizon. Large, triangular, tapering-stemmed, Gypsum points make up about 40 percent of Rogers' surface collection (1939:57). Rogers also mentions side and corner-notched, straight-, convex- or concave-based points,[55] chipped stone drills and a marked decline in the numbers and types of scrapers.

Investigators outline two different interpretations of the temporal position of the Pinto-Gypsum complex. Rogers (1939) considers the occupation Altithermal, while Lanning (1963) and others consider it early Medithermal, contemporary to the Cosumnes in the Central Valley and to the Lovelock Culture in western Nevada.

The Amargosa industry in the north central part of the Mohave Desert differs from the Pinto-Gypsum mainly in superior workmanship. The early Amargosa phase occurs in California within the Pinto-Gypsum complex area, the second phase occurs farther north and in Nevada. Haury (1950) compares this industry to the Altithermal industry found in Ventana Cave, Arizona, which he calls Chiricahua-Amargosa I and II. The Amargosa Phase II in California and Nevada, represented by small scattered sites, produces few artifacts, perhaps due to extreme dessication in the southwest deserts during the time of occupation. On the western periphery of its distribution, Rogers (1939:64) finds the Amargosa associated with the use of green slate for biconically-drilled pendants, and the widespread distribution of manos and metates, the earliest in that area. Early Pinto-Gypsum levels of the Stahl site in Owens Valley and the early Amargosa phases appear contemporaneous and culturally very similar (Lanning, 1963).[56]

Bryan writes:

> Carefully flaked, often serrated, leaf-shaped and triangular projectile points, and stemmed forms

> with bifurcated bases were assigned to the Chiricahua Amargosa II phase on the basis of relationships with the Chiricahua stage of the Cochise and with Pinto points . . . (Bryan 1965:148).

This assemblage from Ventana Cave firmly links the Desert Culture to the Southern California desert, at least by late Altithermal times (cf. Haury, 1950).[57]

A possibility remains that the Pinto-Gypsum complex represents the expansion of an earlier southwestern culture; the Altithermal industries, Ventana Cave (Amargosa I-II), the Chiricahua Phase of the Cochise industry and Rogers' (1939) and Campbell's (1935, 1937) surface finds in the Southern California Desert, expanding north into Central Nevada and Eastern California during the early Medithermal. Representative of this Medithermal expansion are the assemblages from the South Fork Shelter (NV-El-11), Gypsum Cave, and the Stahl site. The temporal and spatial distribution, is convincing evidence that the corner-notched varieties of points found throughout the Great Basin, Southwest, Southern California and to a certain extent Central California originally developed in the Southern Great Basin, an integral component of the Desert Culture. The Desert Culture diffused north through Nevada into the Northwest Plateau, west into Southern California, and across the Sierra Nevada Mountains (cf. Martis Complex) into Central California at least by the end of the Altithermal, 4,000 years ago.

Several possibilities might explain the relationship between early Southern California archaeological complexes and the Windmiller of the Central Valley. The two most acceptable explanations are: (1) that the shell dates may err by being too old, and the actual date of the deposits may be 2,000 years younger, thus permitting contemporaneity between the San Dieguito, Oak Grove and Windmiller[58] --extended burials, the use of red ochre, large leaf-shaped and simple stemmed points, ground stone mortars and metates, occasional charmstones, small rectangular Olivella and Haliotis beads, and an amorphous assemblage of scrapers and stone debris characterize the culture; (2) that the La Jolla dates are approximately correct and Southern and North-Central California form separate culture provinces. The Southern province is characterized by flexed burials, side-notched points, stone bowls, grinding tools, etc., while the contemporaneous culture of the northern province is characterized by the burial complex and hunting culture outlined in the first hypothesis. The two provinces would have had separate cultural origins; the southern province from the Great Basin (the Desert Culture), and the northern province from the Northwest Plateau, as is detailed below.

The material does not lend itself to a clear solution of the problem, but the author tends to favor the second alternative. Certainly the cultural traditions of both northern and southern California shared many items of material culture during the Medithermal, due to both direct North-South trade and direct contacts with the Great Basin. The La Jolla complex may have expanded north to the San Francisco Bay about 3,500 years ago and heavily influenced the Central Valley peoples shortly thereafter.

California Trade with the Great Basin

Shell Trade. --Great Basin cave deposits yield Pacific Coast shell up to 9,000 years old. The literature cites eight Anathermal and Altithermal occurrences and innumerable Medithermal and recent occurrences of California Pacific Coast shell in known stratigraphic sequences. Heizer (1951:92-93) mentions shell beads from Area B in the guano layer of Leonard Rock Shelter, Humboldt Valley, Nevada:

> . . . we recovered a tan flint blade (Fig. 42,e), two *Olivella biplicata* shells with rubbed or broken off spires to enable the shells to be strung as beads (Fig. 41, b,c), and portions of cordage nets. Derby, as related above, had recovered some artifacts from this area; these include a complete atlatl dart (Fig. 42, a,b) measuring 130 cm in length with cane shaft, long greasewood foreshaft with simple tip, and two tangential feathers. The dart is light (38.5 grams) and is decorated with a red-painted spiral sinew seizing at the cupped end. In addition, Derby recovered a complete greasewood atlatl foreshaft with a buckskin wrap at the large end (Fig. 42, f), and a string of about 50 *Olivella biplicata* shell beads. These finds have been fully described elsewhere [Heizer, 1938]
>
> In 1937, the University of California checked Derby's findings and recovered from the lower guano layer three additional greasewood forehsafts (which constitute Libby's sample 298 [7037 ± 350 B.C.]) and a fragment of chipped obsidian blade (Heizer 1951:92-93).
>
> The *Olivella* shell beads [from the Humboldt Culture dated between 5694 ± 325 B.C. and 7038 ± 350 B.C.] are of high interest, since they could have come from the California coast, some 250 airline miles west across the forbidding Sierra Nevada mountains. Unless we are to believe that the earliest inhabitants of Leonard Rockshelter themselves visited the California coast and brought back shell beads, a

> proposition which I rank only as a hypothetical possibility, we may propose that the occurrence of these beads in west central Nevada indicates the presence of man on the California coast at this date, as well as the existence of groups in the intervening area who passed these items on to the east by way of intertribal trade (Heizer 1951: 94-95).

The following Altithermal Age sites in Utah yield artifacts of California marine shell: Black Rock Cave (in addition to small side-notched, and leaf-shaped varieties of points, Steward, 1937:106-121), Promontory Point and Deadman Cave (Malouf, 1940:121; Jennings, 1956:106).[59]

Heizer and Bennyhoff (1958), and Lanning (1963) crossdate Central California and Great Basin sites by matching beads found in Great Basin assemblages with diagnostic Central California shell bead and ornament types. They interpret the Basin shell beads as trade objects from particular California culture horizons. Several important groups of shell, "the complex of square Olivella, Haliotis and mussel shell beads and associated forms" (Lanning, 1963:277) occur in the Early Lovelock and Karlo sites in Nevada, in the Windmiller and Cosumnes complexes of the California Delta, and in early assemblages on the San Francisco and Santa Barbara coasts.[60] On the basis of cross-dating, Heizer and Bennyhoff (1958) believe the Nevada sites to be coeval with the California Cosumnes; Lanning (1963) pushes them as far back as Windmiller Culture times.

Cosumnes and Hotchkiss period shell beads commonly occur associated with Tivela disc beads from the Southern California coast in the later Basin and southwestern sites (Jennings, 1956; Heizer and Bennyhoff, 1958).

Heizer (1951:94-95) notes:

> . . . we have a number of Dentalium shells from the Lovelock sites which could have come only from Southern British Columbia coast; many Olivella bead types and abalone (Haliotis) shell ornaments whose origin is certainly the Central California coast; a single tubular bead of Tivela stultorum (Pismo clam) which certainly hails from the Santa Barbara region; and numerous pieces of beautifully made coiled basketry fragments with feather decorations. These last are so distinctive in technique and decoration that we look to the Central California region for their source.

Thus, by Cosumnes times the western Great Basin peoples traded with all areas of the Pacific Coast.

Some of the earliest evidence of Basin-California contact comes from the northernmost periphery of the Great Basin. At Fort Rock Cave in South, Central Oregon, scraper planes, large drills, manos, a shaft polisher, and a simple Olivella la bead help compose the pre-pumice assemblage. Cressman dates sandals found with the assemblage at 7237 ± 480 B.C. and 6965 ± 540 B.C. (C-428). Large corner-notched and small side-notched points with rounded or contracting bases dominate the assemblage (Bryan, 1965:169; Cressman, 1940).

Just east of Fort Rock Cave, Cowles (1959:28) notes Olivella la beads in Cougar Mt. Cave, just below an ash bed deposited by one of several Newberry Mountain eruptions.[61] A sandal from near the top of the lowest 12 inches of deposit dates 6550 ± 250 B.C. (Bryan, 1965:169). Whole and broken manos, pestles and bowls were found scattered throughout the deposit, and a flattened elliptical charmstone-like object (charmstone type D 10) carefully ground and polished, with a central perforation lay three feet above the deposit's bottom (cf. Heizer, 1949: Fig. 9f; Cowles, 1959). From the lowest part of the deposit come tanged and short indented-based, stemmed points, succeeded by triangular and broad-leafed points and the first notched varieties, while bi-pointed knives are found throughout.[62]

The red sands (early Altithermal) of Ventanta Cave contain the Amargosa I industry and marine shell (Haliotis fulgens) from the Gulf of California (Haury, 1950:528), indicating contact with the Gulf of California by at least 5,000 B.C., Rogers (1958) equates the Amargosa I deposit in Ventana Cave with San Dieguito I, a relationship suggested by Haury (1950).

Trade between the Basin and the Pacific attests to: (1) trade with the California coast at least as early as 9,000 B.P. in the northern periphery of the Basin; (2) Central California-Central Basin trade in progress during the thermal maximum (the Altithermal 7000-4000 B.C.); (3) evidence of trade radically increasing in volume and variety during the Medithermal, perhaps concomitant with an increase in Basin population, and finally, (4) the appearance of Basin type points (corner- and side-notched varieties) in Central and Southern California sites during the Altithermal (ca. 7000-4000 B.P.), long after Pacific coast shell first appears in the Basin.

The early evidence for trade of marine shell to the northwest Basin serves to support indirectly the hypothesis that groups inhabited Central California at least sporadically during the Anathermal. Unfortunately no sites of those people have yet been found.

Windmiller Culture Contact With the Early Transitional (Riverine) Phase in the Northwest Plateau

Many traits in the Windmiller and Oak Grove complexes do not appear in contemporary Great Basin sites. For instance, the Great Basin lacks the Windmiller mortuary complex, except for the grinding implements and corner- and side-notched points. Grave offerings such as charmstones, the use of ochre, quartz, crystals, obsidian spalls, grooved clay balls, and large parallel-stemmed projectile points, components of the basic Windmiller complex, do not occur in the Desert Culture. Charmstones first appear in the Santa Barbara area at the time of occupation of the Glen Annie site, and a few crude specimens come from Topanga Phase I, but both the number and variety of charmstones is distinctive in many Windmiller components. Large parallel-stemmed points dominate all the early California assemblages.

Extended burials emerge as an important diagnostic trait for the California and Oak Grove cultures of California. Unfortunately, Altithermal sites in the Basin yield few burials, while San Dieguito burials appear to be unknown. From the Tank site in Topanga Canyon Phase I, come several extended burials.

Martin, Quimby and Collier (1962:452-460) report both extended and flexed burials from the Columbia Plateau and the Snake-Clearwater region. The Rabbit Island site yields extended supine burials, stratigraphically below a component with flexed burials (Crabtree, 1957). Osborne (1959:50) mentions the site briefly:

> None of the earlier sites excavated in the Plateau has yielded any indication of a culture as strongly river oriented as were the later occupations. Indeed, the burials found on Rabbit Island (N.P.S. -U. of Washington - Washington State Coll. excavations (1951-52) near Pasco on the Middle Columbia, below a caliche layer, are in some ways most reminiscent of the Early Horizon of California; extended burials and percussion chipped projectile points with point tangs like those illustrated by Heizer (1949, Fig. 12) were found there. Pestles occurred but none of the typical mauls or mallet-pestles were found. Fishing may well have been practiced (the burials were on an island which must have already been an island or a part of a strand of the river when it was used as a cemetery), but no artifacts or remains indicated that fishing was ever practiced (Crabtree 1957). Sites that are presumably later, but which yielded percussion-chipped basalt tools rather than the fine late pressure-chipped cryptocrystalline pieces, bear evidence of extensive use of shellfish and some use of fish (Osborne, 1958:50).

Cressman (1956:457) describes flexed burials from Kawumkan Springs in Southeast Oregon:

> Four well-defined burials among the remains of eighteen individuals were excavated. They were all distributed throughout the midden from Level IV [the lowest midden deposit] through Level II. The bones were well fossilized. Explanation of the origin of the scattered fragmentary

> remains is at present impossible. The burials were fully flexed and buried on the side but neither consistently on the same side nor oriented in the same direction and consequently they faced in different directions. Sudden violent death seems to have been common.[63]

Some of the Archaic Cultures in the Northeastern United States, Laurentian I and Adena, for example, practiced both extended and flexed burials. The Mound Building cultures of the Midwest, and Northeast Texas (Hopewell and Caddo) practiced extended burial, although earlier peoples in the same areas apparently preferred to flex their dead (Jennings and Norbeck, 1965; See Heizer, 1948).

Charmstones. -- Cressman describes and illustrates four charmstone-like objects from Five Mile Rapids (1956:429):

> Nine of these objects were found, three in the fourth level, five in the third, and one in the second (fig. 51). Similar objects have not been found before in any of our excavations in the Northern Basin. Two of the specimens seem to be unfinished. One, No. 1-13358, varies in shape from the others but probably belongs to the same class of objects. This specimen is flat on one end and the diameter reduces gradually and evenly to the rounded other end. Possibly the specimen from Level II was intended to be the same shape when finished for it conforms to the same general outline.
>
> The general shape of the specimens is spindle-like with the greatest diameter in the center; then the size is gradually and evenly reduced to each end. Three of these objects were found together near a burial (No. 11-222) (fig. 57-5), but they were some distance from the body and I do not think associated with it.

Cressman (1956:429) concludes:

> The only thing in the literature remotely resembling these specimens is the wide category known as "Charm Stones" or "plummets" from central California. A careful comparison indicates that these are not like any of the widely variant forms illustrated for that region. I am uncertain whether the grooved pieces of our collection should be classed with the others. The grooving suggests suspension

> but since there is a groove at each end it suggests that they were fastened to some object by tying at each end. If so, they were hardly pendants.
>
> There is no sign of paint on them as would have been the case if they had been used as paint-grinding pestles. In view of the tenacity with which paint adhered to the metates, one could rightly expect it here if these were paint pestles.
>
> If they are utilitarian objects, I am inclined to suggest they were atlatl weights. They could have been fastened to the atlatl by sinew and pitch. They do not occur in any association which indicates their use. The three which were found together in Level III at the level of the burial were not associated with it in my opinion, for they were too far away from it. They are much more likely associated with the other materials from the stone platform or habitation level in which the grave had been dug. If this is the case, they could have been some kind of household articles or atlatl weights, for it would not be out of keeping to find the tools of both sexes who used the living space.
>
> Since the above was written our excavations east of the Dalles at Five Mile Rapids has shown the use of bolas. The further suggestion is now offered that these objects might have been the same kind of weapon.

Cowles has described and photographed an elliptical object with a central perforation from Cougar Mountain Cave similar to one illustrated by Heizer (1949: Fig. 9f). Unfortunately the California specimen from near Woodbridge (cat. no. 1-56150) lacks provenience.

Cressman describes items called "plumbobs" from an early middle deposit.[64] in the Five Mile Rapids, found together with corner notched points, ochre and fish-bone (1960:94, Fig. 48a). They resemble Type D9 and F2 unperforated charmstones (Heizer, 1949:Fig. 9h).

Flattened, grooved, elongated ground stones presumed to be atlatl weights (called "boat stones") occur all over the western United States. Heizer and Elsasser (1953) report them from the Sierra Nevada province, Great Basin and the Southwest.

Grooved stone balls found in SJo-56 in one burial (Heizer 1949: Fig. 16d) resemble specimens from the Dalles (Cressman 1960:93). Cosumnes sites in Central California yield morphologically similar objects made out of baked clay. Stone balls also appear in Manzano Cave in New Mexico:

> On the same level as the projectile points were found five stone balls. Four were encircled by grooves, and it is thought that they may be weights which were tied with thongs, forming a bolas. This is a weapon still used by South American Indians who throw the weighted cords around the legs of game animals they wish to capture. Three of the Manzano specimens lay together and may represent a set (Wormington, 1957:160-161).

Davis (1960; Bryan, 1965:47) report longitudinally-grooved sinker stones from the Carrollton focus phase in northeast Texas.[65]

Cowles (1959:22, Plate 12) illustrates a conical steatite pipe similar to those from SJo-142 (Heizer, 1949: Fig. 16c, e). Conical pipes apparently come from the Western Great Basin as well.

Many early cultures in Southern and Central California and the Northwest Plateau made and used slate pendants during the Altithermal (Cressman, 1956, 1960; Crabtree, 1957).

Quartz crystals, rarely occurring in Altithermal deposits in the Basin (reported from Etna Cave by Wormington, 1957:190) and from the Humboldt Valley sites, which are probably later in time, come from several sites in the Northwest Plateau. In addition, Cougar Mountain Cave contains obsidian spalls (Cowles, 1959:21, Plate 4), seemingly identical to those from Sac-107C and SJo-56.

The Plateau literature makes frequent references to the use of ochre (Cressman, 1960; Cowles, 1959; Crabtree, 1957). Investigators find metates and manos heavily stained with ochre powder:

> A wide range of flaked stone tools with both flake and core products exists along with abrading and grinding tools used mostly for the preparation of red ochre. The presence of large amounts of prepared ochre, along with the tools for preparation which we found, suggests that there was some important ceremonial complex with which that material, the birds, and probably some of the antler artifacts were associated. . . (Cressman, 1960:68).

Desert Culture sites do not yield ochre-stained metates despite the early and frequent appearance of metates in Basin and Southwest deposits.

Bone spear points and bipointed gorge-hooks occur in the Sacramento Delta and are early in the Dalles sequence (Cressman, 1960:47, Fig. 20; Crabtree, 1957).

Stemmed Projectile Points

Butler (1961) and Bryan (1965) suggest that the large parallel-flaked, narrow, parallel-stemmed points ("Lind Coulee" points, Daugherty, 1956) and Willow-shaped ("Cascade" points, Butler, 1961) form a tradition first expressed in the Northwest Plateau[66] which spread from there into the Northern Plains and California, forming the basis of the earlier Central and Southern California cultures.

Large stemmed and bi-pointed projectiles do not appear in the Great Basin. Bryan (1965:50) states that:

> . . . parallel-flaked point forms were derived from Willow-Leaf Bi-Point Tradition which had evolved at an earlier time to the west of the High Plains. An incipient form of the technique of parallel-flaking could have diffused from the Cascades across Oregon, the Snake River Plain, and through the Wyoming Gap onto the High Plains during the Anathermal phase.

Bryan (1965:60) distinguished the "Parallel Flake Tradition" from a contemporaneous "Notched-Point Tradition" found in the Great Basin:

> The evidence from Danger Cave shows that a distinctive and closely adapted culture type associated with a Desert Culture Tradition was innovated at an early time. . . Many technological traditions, including the Notched Point Tradition, became associated and developed within the Desert Tradition.

Evidence for an early development and persistence of the "Desert Tradition" variants has a complete record in Danger Cave, Deadman and Promontory Caves, Utah; in Cochise and Ventana Cave, Arizona; in Frightful Cave, Coahuila, Mexico; and in Leonard Rockshelter, Humboldt Cave, and Gypsum Cave, Nevada (Bryan, 1965:60-61). Furthermore:

> The Parallel-flaked Point Tradition is nearly absent in the most arid central portions of the desert; however, it is very much evident in eastern New Mexico along the shifting borders of the Great Plains, and on the Snake River Plain of southern Idaho. Wilson Butte Cave [Gruhn, 1961] in the latter area has yielded a significant correlation between the presence of early projectile points in the Parallel-flaked Point Tradition which are associated with large extinct fauna; and the replacement by stemmed, indented base points in the Desert Cultural Tradition when the climate became more arid on the

Snake River Plain (Bryan, 1965:61).

Butler (1961) proposes an "Old Cordilleran Culture" which links early cultural developments along the Pacific Cordillera from Southern British Columbia to Southern California. Heizer (1965:122-123) summarizes the evidence for a stemmed-point tradition in a discussion of early hunting culture in California.[67]

> . . .The lower levels of the site [Harris site (Warren & True (1961))] which was excavated earlier by M. J. Rogers, produce materials of the San Dieguito I culture, named by Rogers (1939) and equated by him on the basis of shared traits with the Lake Mohave-Playa cultures of the interior lake basins of southern California. The San Dieguito culture inventory is limited to chipped-stone forms including scraper planes, a wide variety of scrapers (keeled, flake, snubnose, side, end, etc.), heavy bipointed blades or knives, eared crescents, leaf-shaped projectile points, choppers, pebble hammerstones, and hammerstones made from cores or nuclei. If we accept the Harris site materials from the bottom level as providing an adequate sample of material culture of the San Dieguito culture, the absence of grinding tools is worthy of comment. Wallace (1958) has discussed the lack of seed-grinding tools in the Death Valley I culture and points out that it appears to be a non-seed-using culture whose primary economy rested upon hunting and that these characteristics do not permit its classification in the "Desert Culture" tradition. Warren and True (1961) suggest that the San Dieguito culture may represent evidence of an early "Western Hunting Culture," different from and older than the Desert Culture, and that the Lake Mohave-Playa cultures of the interior lake basins are manifestations of this hunting culture. Although manos were found at Lake Mohave, they incline to accept Amsden's explanation (1937) that these are attributable to the later Pinto Basin culture. Absence of portable stone mortars or metates at camp or village sites does not necessarily prove that a group did not grind seeds, since the site may have been occupied for reasons or at times when seed-grinding was impossible or inappropriate. Alternatively, the wooden mortar (Kroeber 1925) in wide use in southern California in ethnographic times (and in central California prehistorically in the Middle Horizon period), if used, would leave no archaeological

> vestiges. Clearly, we should be careful not to decide too hastily that we are dealing only with hunters when we fail to find, in a very small series of sites producing very few material objects, familiar forms of seed-grinding implements. Indeed, to prove that a prehistoric culture group avoided seeds and subsisted on hunting requires direct evidence of the latter pursuit. Incorrect deduction of prehistoric economic practices are very common (Heizer, 1960:122-123).[68]

Dogs

An interesting and unique find in the Plateau region, but of uncertain diagnostic value, deserves mention. From Cressman's excavations, Haag describes a series of seven dog burials from Kawumkan Springs midden on Upper Klamath Lake (Cressman, 1956:455). From the lowest accumulation of midden[69] comes an immature specimen of what Haag identifies as a Kodiak Island Small dog. Cressman reports an example of Northwest Coast Shell Heap dog from Level III.[70] In the same midden level, slightly above the Northwest Coast Shell Heap dog another Kodiak Island Small dog occurs. The two types (the Kodiak Island small dog and the larger Shell Heap variety) probably overlap in time, the smaller dogs developing earlier than the larger ones. Cressman reports several large Siberian-type Eskimo dogs from Midden Levels I and II, one from beneath the floor of a house pit.

Cressman suggests the association of a mandible of a wolf, Canis lupus fuscus (Young and Goldman, 1944:501), with burial 11-222. The burial lay in a pit in the top of Midden Level IV.

Cressman also reports a large Siberian-type dog and the maxilla of a Northwest Coast Shell Heap variety in nearby Medicine Rock Cave, above the Mount Mazama pumice, and therefore less than 6,500 years old.

Haag states:

> It is not clear what the relation of the Kodiak Island large dog is to the Siberian type, but a recent report (Haag and Heizer, 1953) describes the former type from a horizon in the Sacramento Valley with a radiocarbon date of 4,052 years. This would seem to be in line with the dates suggested above (Cressman, 1956:456).

Up to this time, archeologists had considered the California dog from SJo-68 the earliest specimen in the western United States. Haag reports that small dogs occur in the Kentucky Archaic: ". . . Radiocarbon dates push back the Kentucky Archaic, where the dog is somewhat smaller than the Kodiak Island Small dog, to approximately 3,500 B.C." (Cressman, 1956:475). Wolf, coyote and dog burials in the Northwest Plateau parallel animal interment practices found in the early California sites.

More than just isolated artifacts and mortuary practices link the Northwest Plateau to the Central California Valley. Rabbit Island I (Crabtree, 1957) strongly suggests a cultural relationship between the Plateau and the Delta.[71]

Crabtree (1957:115-116) characterizes Rabbit Island by extended supine burials associated with large points of a modified-triangular contracting-stem outline, antler wedges, pestle-like mullers, and amorphous choppers and scrapers. See Crabtree's Table 2 (1957:13-15) reproduced here as Table 67. He considers this component representative of the Frenchman Springs phase, with a conjectured age no later than 1500 B.C.

A re-evaluation of the geology of the Plateau and the Post-Pleistocene time scale led Swanson (1962:83) to place Frenchman Springs near the end of the Altithermal, between 2,000 and 3,000 B.C. Swanson (1953) first describes the Frenchman Springs phase for the Vantage region. The phase also occurs at Moses Lake and at Cold Springs and Hat Creek sites nearby in the McNary reservoir.[72] Extensive hunting and gathering, and well controlled fishing lacking special fishing equipment characterize the phase. It sets the stage for later developments in Plateau culture.

Crabtree describes Rabbit Island II "characterized by flexed and semi-flexed burials, associated with polished nephrite celts, perforated awls, large points with convex sides and straight or concave bases, small triangular points with side notches, heavy antler and bison bone wedges, antler digging stick handles, beaver teeth dice, large quantities of marine shell beads and pendants, a two-piece stone pipe, maul and pentagonal points." (Crabtree, 1957:13-15).

Comparisons with nearby sites in the McNary Reservoir indicate that this component represents a somewhat distorted example of the late phase in the McNary Reservoir, which Crabtree terms the Walula Gap phase. This phase contains a developed southern aspect of the American Plateau, characterized by a full array of fishing paraphernalia, although hunting still appears important. The assemblage shows extensive evidence of the use of animal bones for important tools for the working of hides and ornaments. Gathering still continues, with some specialized tools such as digging sticks, and deep hopper mortars. The presence of a well-developed basalt industry apparently persists from earlier periods (Crabtree, 1957:116).

The distinctive traits of the Rabbit Island I component consist of <u>primary extended burials</u> (Table 67), pestle-like grinding stones, <u>large modified-triangular points</u> (mostly basalt and of rather poor execution), <u>medium- to large-shouldered points with contracting stems</u>, small antler wedges, bone points, perforated shell disc beads, cut marine and fresh-water mussel shells, percussion-flaked chopped and red ochre (a common mortuary accompaniment). The inhabitants emphasized hunting, the frequency of heavy points probably attesting to the use of the atlatl. Crabtree infers the probable economic importance of wild seed and root gathering. The presence of marine clamshells attests to a certain amount of trade with the coast, or at least Puget Sound (Crabtree, 1957:61).

Several sites in the Plateau area yield similar artifact assemblages, although they lack burials.

Crabtree (1957:61) mentions two sites:

> Between twenty and twenty-five miles downstream on the Oregon bank with materials similar to Rabbit Island I Site 35 UM 7 (Osborne & Shiner, 1950), is a two component village and midden site. The earlier component, Cold Springs I, is above a layer of volcanic ash (Ibid, p. 9-10), but it is not, as yet, clear if this is the same as Stratum II at 45 BN 15. Cold Springs I is characterized by leaf-shaped points of medium to large size, some basalt, large basalt knives constricted slightly toward one end, double notched sinkers, and cobble choppers and hammerstones worked most by use. The rather unsatisfactory assemblage from this component suggests a hunting culture similar to Rabbit Island I, but with a better adjustment to the resources of the river (Ibid, p. 16-22). Cold Springs II is similar to Cold Spring I only in crude tools, and the rest of the assemblage, meager as it is, suggests that it is precedent to the Walula Gap Phase, or perhaps represents an early period of it. It does not have enough similarities to be linked closely to Rabbit Island I. Nearby the Cold Springs site is the Hat Creek Site, 35 UM 5 (Shiner, 1951). This is a midden site, capped by volcanic ash. Here again the most distinctive artifacts are the medium to large leaf-shaped points with convex or concave bases, also present are cobble choppers and hammerstones (Ibid, p. 14-19). A curious item here and at Cold Springs I are abundant quantities of hematite in the midden.
>
> Feature 1 at 45 GR 27 [Moses Lake, Grant Co., Wash.] (Daugherty, 1952:377) is a stone 'roasting oven.' also called earth oven by other writers, which is clearly stratigraphically precedent to the adjacent house pit village (Ibid.). The major artifactual associations are medium length points with straight sides and contracting stems, a quartz crystal pendant, pestle-like

> mullers, associated with large cobble metates with shallow, circular depressions in the center. A conical, unstemmed pipe with a perforated flange on the bowl was present. Other artifacts were flat cobbles with the sides flattened from abrading (mano?), and a fragment of an incised bone object, suggested by Daugherty as a gaming piece (Ibid, p. 379-382). These artifacts are strongly reminiscent of Rabbit Island I, especially the points and the pestle.

Crabtree (1957:62) indirectly dates the Rabbit Island I component by comparing it to the Frenchman Springs phases I-III in Cedar Cave (see Swanson 1956:1962):

> In the Vantage region two sites have comparable material, two components of Cedar Cave and the Shalkop site (Swanson, 1956). From Cedar Cave are two points similar to the specimen illustrated in Plate IX f, that is, points with slight shoulders. These are derived from components assigned to the first and third periods of the Frenchman Springs phase (Ibid, Plate XII). The Shalkop site is characterized by house pits, apparently the mat type, coming stratigraphically later to a pit house, earth ovens, pebble adzes, flake adzes, stone drills and awls, and small tanged points, these latter are similar in outline to the Rabbit Island stemmed points. This site has been assigned to the third, or final period of the Frenchman Springs phase (Ibid, p. 118).

Recently Swanson (1962:83) placed Frenchman Springs I at the end of the Altithermal and Frenchman Springs III no later than 1,500 B.C.

Crabtree (1957:63) develops a regional Frenchman Springs phase " . . . characterized by pebble and flake adzes or choppers, the latter, a new introduction or innovation of this phase, points with contracting stems (Rabbit Island Stemmed), points or knives varying from triangular to leaf-shaped in outline (Modified-Triangular) sometimes concavo-convex in the long axis; semi-subterranean and mat lodges, the latter a late phase trait;" . . .Earth ovens appear to be an innovation of this phase," along with . . . bifaced cobble grinding stones and pestle-like milling stones with shallow metates; wedges, extended burials, conical pipes, and, perhaps toward the end of the phase, the use of net sinkers in fishing." Specialized fishing appears later. Lack of spears or harpoons with bone tips attests to the unspecialized nature of the fishing. Crabtree (1957:64) suggests a relationship between Rabbit Island the Early Horizon of Central California:

> The question of the predecessors to Rabbit Island I and the related manifestations remains unanswered, at least in terms of local data. There are, however, tantalizing hints in the material from the Early Horizon in Central California, where there are, among other things, extended burials with large shouldered, contracting stemmed points (Heizer, 1949). These alone would not ordinarily be enough of a similarity to mention, but the rarity of extended burials in other than late historic contexts highlights the resemblance. This, coupled with the similarity of at least one major point type, is suggestive.

The question of predecessors to Rabbit Island I has subsequently been solved, Cressman (1962), Butler (1958), Borden (1960) and others having demonstrated *in situ* development of a Riverine adaptation in the Northwest Plateau, beginning as early as 9,000 years ago (Davis, 1965).

Thus, it seems likely that the basic Central California Valley Culture originates in the Northwest Plateau as Hurt (1953) and others (Bryan, 1965; Butler, 1961, 1958; Daugherty, 1956; Beardsley, 1958, Heizer, 1951) have for some time been suggesting. Hurt hypothesized (1953:218):

> During the first half of the W5B cycle at about 4,500 B.P., a stream of traits may have diffused southward along the Pacific Coast. Several of these traits apparently had the same ultimate origin as some of those of cultural complexes in eastern North America. These include such traits as red ochre in graves, use of asphaltum for cement, adzes, steatite vessels, affixing beads on objects with asphalt, and quartz crystals with burials, as Haag and Beardsley have noted (Haag, 1942; Beardsley, 1948). None of these traits have been found in the Southwest-Great Basin.[73]

The time and the mechanism of cultural contact must remain uncertain until more is known about the intervening areas of Northern California.

Heizer suggests (1951:8-9):

> The whole eastern trans-Sierran border of the state from the Oregon line to Mono Lake and including the Modoc Plateau, and from Mono Lake south and west to the Pacific, an area which is open to penetration from the Basin-and-Range province, was probably settled very early, perhaps in the late Pleistocene period. I should say that 10,000 or 11,000 years ago

> ago would be a reasonable age estimate for this occupation. It is easier to find old archaeological remains by surface reconnaissance in the arid portions of interior Southern California than in most other portions of the state because of less topographic alteration and obscuring of evidence by vegetation. In addition the really habitable areas of the past, as well as present, are somewhat limited, so that directed and intensive search for remains can be carried out. In the Sacramento-San Joaquin delta region, by contrast, man made artifacts have been recovered from the alluvial sediments up to 70 feet below the present surface. The finding of really ancient evidences, if they are present, will come here by accident, and not by conscious, directed search. At key points in the Great Basin area, specifically in southcentral Oregon caves, Leonard Rockshelter in west central Nevada, and Gypsum Cave in southern Nevada, we have [more or less] reliable radiocarbon dates--i.e., taken from good materials in clear association--indicating man's presence at least 10,000 years ago. Recent work in the Lovelock region of Nevada has yielded indications of a stone tool complex which resembles the Lake Mohave-Playa complex of Southern California. One might propose that the whole region from the Columbia River southward into the Peninsula of Lower California, and from the Pacific to the Rockies forms a grand unit, where local sequences have evolved, and within which cultural connections between neighboring sub-areas did operate and will probably be definable.

In 1963 he concludes:

> The suggestion of an early (pre-7000 years ago) simple and widespread hunting-based culture in the Pacific Coast area, exemplified by the San Dieguito-Lake Mohave-Playa-Death Valley cultures, must be, for now, only a possibility, which later work will support or deny. No reliable radiocarbon dates have been determined for the San Dieguito culture. One radiocarbon determination (LJ-136) of <u>Chione</u> shell, 4720 years old, believed at one time to refer to this culture, is rejected by Warren and True (1961) as reliably dating the San Dieguito culture level at the Harris site (Heizer, 1963:123).

The author suggests on the basis of the evidence from the Columbia Plateau that the expansion of groups into California, comes from the Northwest and not from the Basin, perhaps during the Anathermal or early Altithermal. The evidence does not indicate expansion into the Great Basin (Heizer, 1965; Davis, 1965), but rather the continuing development of a riverine economy all along the North Pacific Coast.

The Bipointed Willow-leaf and other simple leaf-shaped points (Cascade, Agate, Basin, Lerma, etc.) appear ubiquitous over the entire early west, and last to the Protohistoric time (Davis, 1965). Such points found in the earliest deposits of all the western sites accompany the Fluted Point Tradition, the Desert Culture Notched Point Tradition and the Pacific Slope Parallel Flaked Stemmed Tradition. Davis (1965) argues that each of these chipped tool traditions modified a basic leaf-shaped point, but the author does not see the value of such speculation (see Bryan, 1965).

In terms of economic or regional specialization, the Fluted Point Tradition occurs in big-game kill sites; the Desert Culture occurs with evidence of seed gathering and hunting of small mammals. Cressman (1956:1960) points to a hunting base with an early shift in emphasis to riverine economy for the Northwest Plateau Stemmed-Point Tradition. The Dalles sequence evidences: "a very ancient manifestation with abundant fish bone . . . which may indicate fishing groups as old as some of the later big game hunters such as Folsom." (Osborne 1957:50).

The Altithermal Population Movement

Once one accepts the hypothesis of a Northwest Plateau tradition which diffused into California just prior and during the Altithermal, the problem of when other influences enter the Central Valley falls into place.[74]

How can one account for the easily-recognized desert side- and corner-notched points which begin to occur in Southern and Central California and in the Northwest Plateau assemblages during the late Altithermal and early Medithermal (7,000 to 4,000 B.P.)? Archeologists on the Northwest Plateau have discussed this problem at length. Butler (1962;1961; 1959) in his report of the Palouse and Craig Mountain sections (Weis Rockshelter and Cold Springs, Idaho) feels that the evidence points to an intrusion of Desert influence during a period of maximum warmth and dryness ending about 4,000 years ago (Butler, 1962:77). He reports that the intrusion of "large side-notched points mark the end of the early period of settlement in those areas" (Butler, 1961:19).

Sierra de Tamaulipas in Mexico yields a similar sequence with the spread of Desert Culture about 7,500 to 5,000 years ago during the Altithermal. The Nogales phase, characterized by implements associated with the Desert Culture, succeeds the Lerma phase, which presumably represents an unspecialized hunting-gathering culture (MacNeish, 1958:154; Bryan, 1965). The Nogales phase probably extended from 7,000 to 5,000 years ago, an estimate more or less confirmed by radiocarbon dates from the subsequent La Perra Phase (MacNeish, 1959: 199, Table 31; Butler, 1961:19).

Cressman (1960:69) postulates a similar sequence of events for the Dalles and South Central Oregon:

> The Transitional and the beginning of the Late are contemporary with the Altithermal, the effect of which must have been to cause population shifting with migrations leading outward toward stabilized water and food supplies. The Klamath Lake area (Cressman, 1956) and the Fivemile Rapids Early period had two elements in common, the type of projectile point, and this was alien to the Great Basin to which the early Klamath Lake area culture was related, and the exploitation of the resources of the rivers. The similarity in these two aspects of the culture of these two different areas seems to be too close to be unrelated. If one is derived from the other we do not know the order of derivation. Since they appear to be contemporaneous the influence could have gone either way (cf. reference to obsidian flakes in cache in Feature 29). This is a hypothesis we are discussing and not a certainty. However, granted this possibility, and also the known fact that hunters did roam the country from the Great Basin to southeastern Washington as long as 9,000 years ago, the Columbia River would reasonably have been a part of the information system of the occupants of the wider area. One is tempted to attribute the stepped-up incidence of use together with the variation in projectile point types which characterized the Late period to the influence of the climatic changes on the population of the Great Basin, an influence which caused population shifts which in turn pressed on those with whom they came in contact and so on.
> We do not think Jennings and Norbeck's Desert Culture (Jennings and Norbeck, 1955) can be considered to exist in the Columbia Plateau with its many rivers to which adaptation seems rapidly to have taken place. Whatever the explanation of the new cultural developments, it is difficult to see the cause as something inherent in the stable conditions of the Transitional. There could still be, and there was as shown by the artifacts, the tradition of fine stone work and the

> same pattern of the exploitation of the river, though on a reduced scale.

Cressman (1960:73) mentions California only in passing:

> The dry Altithermal period must have exerted a profound influence on the populations of the Great Basin. While the area was not completely depopulated there must have been much out-migration. We now know that the Columbia River and at least parts of that drainage pattern were known to the early Great Basin people. The same is probably true for the Great Basin-California area. Theoretically, then one would expect some of the out-migration to be to the Columbia Plateau to the north. The earliest hunters of big game here would have been in a more favorable environment than to the south. Jennings' Desert Culture (I do not like the name) developed in response to the arid conditions of the Great Basin and while traits might be carried out with migrating people the adaptation of any such group to the different ecological conditions of the Columbia Plateau would result in new traits and different configurations.

Daugherty's (1962:145) generalization of the evidence from Washington and Swanson's (1962:7-8) reporting of Cedar Cave, Idaho, confirms the hypothesis. Bryan (1965:60) states:

> [The Southwestern Great Basin] is characterized by an indigenous development of various types of short stemmed or pentagonal points (Gymsum, Lake Mohave, Silver Lake) at a time when notched points were apparently already present in eastern portions of the arid West (Danger Cave II, Black Rock Cave). In the area farther north, the westward diffusion of the large side-notched point can be traced late in Anathermal phase deposits at Wilson Butte Cave, Southcentral Idaho, Fort Rock Cave, Southcentral Oregon, Columbia River at Umatilla and in the Windmiller phase, Central California. . .
>
> The [Notched Point] Tradition had diffused west of the Southern Rocky Mountains by about 9,000 B.C. and into the Pacific Northwest by 5,000 B.C. . .

Baumhoff and Heizer (1965) find the Northwest Pacific development to be indirect evidence of the existence of a hot, dry Altithermal which made the Central Basin practically uninhabitable from about 7,000 - 4,000 years ago. They cite Daugherty (1962), Butler (1962), and Fryxell and Daugherty (1963) with reference to evidence of movement of Basin influence into the Northwest Plateau area during the Altithermal, and propose three periods of cultural activity: (1) the Early period (9,000-6,000 B.C.), a hunting, fishing and collecting economy typified by lanceolate and large-stemmed points, manos, metates and some bone and antler tools; (2) the Transitional Period (6,000-2,500 B.C.), more concentrated along streams, and typified by side- and corner-notched points, as well as by the early lanceolate types, flat mortars and conical pestles; and (3) the Developmental or Late Period (2,500 B.C. - A.D. 1), characterized by an increased riverine specialization (Daugherty, 1962; Cressman, 1960:64 Fig. 28; Baumhoff and Heizer, 1965:702, 705, Fig. 4).

The evidence of the introduction of Desert Culture influence into Southern California appears confusing due in part to the uncertainty of the dates marking the appearance of most of the southern industries, and also perhaps to the possible depopulation of the southern deserts during the Altithermal, which was caused by dessication as severe as that in the Basin.

Side- and corner-notched points first appear in the San Dieguito Phase II or III, in Phase I of the Topanga culture, Death Valley Phase II, and the Amargosa Phase I-II, probably dating to the latter part of the Altithermal.

Due to scanty evidence of occupation during the Altithermal's climax, many archeologists (Wallace, 1962; Rogers, 1939; True, 1958) consider a decrease in population in South California probable:

> A complete exodus of population seems unlikely; but aboriginal groups may have been obliged to leave more desolated localities, such as Lake Mohave, which dried up altogether, and to seek out oaises suitable for settlement. But no cultural remains have been found which clearly demonstrate that human habitation continued during this prolonged drought.
>
> For the period following this arid phase, when a cycle of increased rainfall once again made the region attractive for settlement, there are ample traces of human occupation. . . Apparently the area supported a heavier population than during earlier times, for numerous campsites, some of considerable size and giving evidence of protracted residence, ascribable to this time span have been discovered (Wallace, 1962:175).

Trans-Sierran Movement

Small percentages of side- and corner-notched points, somewhat smaller than the leaf and stemmed varieties, accompany the assemblages from the later Phases (3, 4 and 5) of the Windmiller and testify to Great Basin influence in Central California. Very early contact between Central California and Central Nevada is evidenced by trade in shell beads. This contact probably was not channeled through Southern California until the increased moisture typifying the Medithermal allowed reoccupation of the Southern deserts. Trans-Sierran contact was implemented perhaps by the movement of Central Basin populations into the Sierran foothills, and possibly through the passes into California. Central Valley peoples' sources of most raw materials, and probably some manufactured goods, lay in the Sierras -- little chippage waste occurs in the middens, indicating that the group either manufactured away from the village or traded for finished points with foothill peoples.

Elsasser (1960:1-2) emphasizes the fact that the Sierras were not an effective barrier to trade either ethnographically or prehistorically:

> . . .That the main watershed of the Sierra Nevada represented, generally, a cultural boundary in prehistoric times is not to be doubted, if the earliest ethnographic record accurately reflects the situation of different native groups before the arrival of the white man.
>
> Nevertheless, aside from what may be looked upon as the complete spanning of the crest of the southern Sierra Nevada by the Western Mono (Kroeber, 1925:585; Lamb, 1958:97), the ethnographic record discloses smaller breachings of the gap represented by the crest of the mountains, from the northern to the southern end of the range. Sample (1950) has reviewed the evidence relating to trade and trails across the Sierra, and prehistoric commerce is shown by the wide distribution in Nevada of Pacific Coast shell ornaments and beads (Bennyhoff and Heizer, 1958). Moreover, we may observe that the Washo, who occupy the eastern slope of the Sierra and adjacent desert land at lower elevations, display traits which link them with cismontane California (Kroeber, op. cit., p. 569). Confirmation of this or of a similar type linkage is shown, apart from linguistic evidence, by parallels in design and weaving techniques of prehistoric basketry from California and the Great Basin (Baumhoff and Heizer, 1958:55).

Relatively little is known of the archeology of the Northern and Central Sierras. An industry named the Martis complex (Heizer and Elsasser, 1953) may have existed in the Sierras as early as 7,000 years ago (Elston, n.d.). Two radiocarbon dates on charcoal screened from a single two-meter pit at NV-Do-38 (Spooner Lake, Nevada) from levels IV and V (4,920 B.P. and 7,150 B. P. respectively) support the estimate. W. A. Davis and R. Elston only briefly report the excavation of NV-Do-38, a Martis complex site, in a paper presented to the Society for American Archaeology in May, 1965. Minimal cultural associations establish the ancient component, Spooner I, only hypothetically (Elston, n.d.).

Martis complex points, and many side-, corner-notched and indented-based points, appear closely related to the Great Basin varieties. Elston (pers. comm.) feels:

> What we are now calling the Martis complex had its origins in the Great Basin and where similarities between California materials and the "Martis" materials occur, as in some California sites and in the Sierra, these similarities may best be accounted for by hypothesizing an east to west contact rather than the other way around. Points, and chipped stone in general from "Martis" sites resembles material found in the Basin much more than in California.

Surveys of the territory of the Western Mono give some additional evidence of Altithermal Sierran occupation (Enfield and Enfield, 1964). E. L. Davis (1964:271-272) postulates the following sequence, based on excavations at Mono Lake and Hot Creek:

(1) Hunting Tradition I (ca. 5,000 B.C.) and II, specializing in hunting large game, and characterized by large points with simple stems or concave bases (Ibid:285).

(2) Modified Desert Culture I, characterized by continued hunting, a well-developed milling complex, and a growing emphasis on seed gathering. The assemblage contains large points with the beginning of side-notching (ca. 3,000 B.C.).

(3) Modified Desert Culture II, characterized by gathering, with emphasis on small seeds, and less reliance on hunting. The assemblage contains smaller dart points with developed barbs, tangs, and corner-notched (Elko-eared) types.

(4) Modified Desert Culture III, characterized by the introduction of the bow, and by small, long, delicate points with side-notches and expanding tangs.

(5) True Desert Culture IV, characterized by small Desert side-notched points, and by small foliate or triangular points without stems or notches (1964:271-272).

Archeologists note an abundant record of Central Sierran occupation contemporary with the Cosumnes Culture:

> Archaeological material from open sites excavated in the southern Sierra Nevada, two on the west side of the range, at Vermillion Valley (Lathrap and Shutler, 1955) and at Slick Rock Village in Tulare County (Fenenga, 1952), and one on the east side, in Owens Valley (Riddell, 1951) was not amenable to positive placement in a local sequence. While there were hints of an earlier culture manifestation in all three of these sites, shown, for example, in the presence of heavy, parallel-sided, concave based blades, also designated as large projectile points or "skinning knives" (Lathrap and Shutler, op. cit., p. 234), the great majority of the specimens from the sites evidently were associated with the late prehistoric or early historic periods of the Owens Valley Paiute and with Mono and Yokuts groups on the western side of the main crest of the Sierra (Elsasser, 1960:12).

In the limestone belt of the Sierran foothills,Hawver Cave (Wallace 1951) and Winslow Cave (Gonsalves, 1955) yielded artifacts similar to mortuary offerings from the Cosumnes Culture.

Lanning (1963:276) discusses trans-Sierra trade with reference to his Owens Valley sites:

> It is likely that neither trade nor typological influence between Owens Lake and the southern California coast was direct. Rather, they would have extended through the little-known Southern San Joaquin Valley, whose occupants would have received coastal objects and ideas and passed them on to the Sierra.

Linguistic Evidence

The speculation based on linguistic evidence seems merely to confuse the archaeological hypotheses. Taylor (1964:74-75) in his article on "Archaeology and Language in Western North America," suggests an entirely different order of events, based on Swadesh's estimated time of splitting of Penutian and Hokan about 9,000 years ago. Miller's (1965:81-88) criticism of Taylor represents the most complete assessment of the evidence found in the recent literature:

> Taylor suggests that Hokaltecan (Hokan-Coahuiltecan) speakers were the original carriers of the Desert

> culture, and that their languages either were ancestral to the modern Hokaltecan languages or was Proto-Hokaltecan itself. His argument is based primarily on two facts. First, the Hokaltecan languages are peripheral to the Uto-Aztecan languages which now occupy the area of the Desert culture, and in California they are peripheral to the California Penutian languages. Because of the broken distribution around the edges of the area it seems likely that the distribution was once continuous, but was interrupted by the Penutian and Uto-Aztecan arrivals. Taylor's argument seems to me to be well based up to this point . . . .
>
> After the Hokaltecan people had occupied much of western America, Taylor postulates the entry of the Macro-Penutian group from the north, originating perhaps in Oregon. Macro-Penutian then split into Penutian and Uto-Aztecan. Some of the Penutians moved down through Oregon and California, pushing the Hokan groups into areas peripheral to the Central Valley of California. Other Penutians and the Uto-Aztecans moved down through the Basin and into Mexico, the Uto-Aztecans dropping off various groups as they went. . .
>
> If the proposed relationship between Penutian and Uto-Aztecan (more exactly, Aztec-Tanonan) is at some future time validated, Taylor's northern homeland for Macro-Penutian is only one of several possible alternatives. Before a homeland can be postulated with any degree of certainty (assuming for the present that Macro-Penutian is a valid grouping) the internal relationships will have to be worked out to locate the area of greatest linguistic diversity. But Macro-Penutian or no, a northern homeland for Uto-Aztecan (or Aztec-Tanoan) is extremely unlikely, in fact, I think, impossible.

In any event Miller allows the possibility that certain Penutian groups entered Central California from the north some time after the split in Macro-Penutian approximately 9,000 years ago.

Conclusion

The previous pages have presented a discussion of the evidence supporting two separate hypotheses: (1) that people originally settled Central

California from the Northwest Plateau sometime after 9,000 and before 5,000 years ago, taking with them a cultural tradition characterized by large stemmed points, crystals, ochre, grooved stone balls and perhaps charmstones, extended burials and a tradition of worked-bone tools used in fishing. The increasing adaptation in both the Northwest and the California Central Valley to a riverine economy reenforced the tradition: (2) that cultural influence and perhaps even whole groups emanated from the Great Basin and entered the Northwest Plateau and Central California beginning about 5,000 years ago, impelled by the extreme dessication of the Altithermal. The same dessication may have caused groups to move from the Southern California deserts to the Santa Barbara coast. Peoples from the Basin probably moved directly over the Sierras into the Central Valley. One can only hypothesize the mechanisms of this culture contact.

If the assumptions of a sparse Altithermal population in Southern California is correct (Heizer and Baumhoff, 1965:704; Bryan, 1965:60-61; Wallace, 1955 and 1962:175; and Jennings, 1957:60, 64, 93[75])then: (1) in Altithermal times, the Great Basin could only support a small number of people; (2) the relatively large Anathermal population indicated by numerous sites older than 7,000 B.P. moved to more favorable areas on the perimeter of the Basin and southern deserts; and (3) the exodus left a small, extremely mobile population in the Basin and in the Southwest. The Columbia Plateau and the Central California River Valley and Coast probably possessed favorable local environments throughout the Altithermal, and thus felt the influence of the unsettled Desert Culture. Similar movement apparently took place south into Mexico and east into the Plains.

The events outlined above create a situation in which, except at permanent springs, the small, mobile population utilizing all available resources would leave only thin surface midden. This could account for the few Altithermal sites in the desert areas and the fairly large amount of surface material. The mobility of the population established the possibility of interchange between California and the Basin. The Basin groups probably included the relatively well-watered Sierras on their seasonal rounds. Valley groups must have traveled at least to the western foothills of the Sierras to trade for raw and manufactured materials. Serpentine and gabbro, favorite charmstone materials, occur only in a narrow belt extending north-south along the base of the western Sierras (Howel Williams, pers. comm.). Basin people would have tended to cluster in favorable fringe areas, although all did not necessarily settle there.

APPENDIX A

Faunal identifications, site SJo-68[1]

	Age Unknown	Adult	Juvenile	Axial Skeleton	Skull	Appendage
Cervus nannodes	1	41	1	4	12	26
Cervidae (spp?)		6			3	3
Antilocapra americana		26	1	7	1	19
Odocoileus sp.		24		4	3	17
Artiodactyl sp.	1	8		5		4
Phalacrocorax		3				3
Anas sp.		10		2		8
Fulica americana		4		1		3
Grus canadensis		1				1
Branta canadensis		1				1
Goose (spp?)	2	9		1	0	10
Anser albifrons		5		2		3
Anas platyrhynchos		2				2
Cygnus sp.		1				1
Falco		2				2
Cathartes aura		1				1
Corvus corax		1				1
Corvus brachyrhynchos		2				2
Corvus (sp?)		4				4
Canis (coyote)		18		3	3	12
Ursus sp.		1		1		
Castor canadensis		9		1	8	
Procyon lotor		16		1	7	8
Lutra canadensis		2		1	1	
Taxidea taxus		2			1	1
Mephitis mephitis		1			1	
Dipodomys heermanni		2			1	1
Thomomys bottae		2			2	

---

[1] Information supplied by E. L. Perry.

	Age Unknown	Adult	Juvenile	Axial Skeleton	Skull	Appendage
Lepus californicus		31		8	3	20
Sylvilagus auduboni		10		2		8
Citellus beecheyi		10			5	5
Mylopharodon conocephalus		3			3	
Gila crassicauda		4			4	
Clemmys marmorata	2			2		
Buteo sp.		1				1

APPENDIX B

Statistical Technique for Collating Burial Information[1]

In order to analyze the data statistically, a generalized statistical computer program was used.[2] In this report a sample is a group of burials with a common characteristic such as being of a given depth or excavated by a given person. A variable is any data item recorded about a burial such as position of burial, type of burial, or number of a given kind of artifact.

Only parts of the data produced by the program were useful for this problem. Within each sample, the number of associations of every pair of variables was listed. Between samples, the standard statistical tests for comparison of variables were used to determine whether there were significant differences made. Because a given variable was recorded in only a small number of burials the t-test was considered in preference to the normal test. The t-test is meaningful only for variables for which normality and a continuous distribution would be assumed. The following variables do not meet this criterion: position of burial and sex of the individual. The F-test which compares the standard deviation of two samples was made to check meaningfulness of t-test results since the latter is invalid if the standard deviations of the two samples compared are markedly different. Differences with a significance level of 5% or 1% in both the t- and F-tests were noted on the output together with the values of these tests and the number of degrees of freedom.

Calculations in the program were made in floating point arithmetic accurate to eight significant digits except where the differences of large sums were taken in which case double precision was used to obtain sixteen significant digit accuracy. The significance levels of the t- and F-tests are determined by interpolation between points of a table sorted internally within the program. Any error of interpolation tends to be on the conservative side; i.e., a significance level of 5% or 1% may be missed. In doubtful cases, there is enough information given in the output to consult significance tables.

[1] This Appendix written by Tom Rich, Department of Paleontology, University of California, Berkeley.

[2] Alicia Ewing, "A General Computer Method for Statistical Analysis of Data," Semi Annual Report, Biology and Medicine, Donner Laboratory and Donner Pavilion, Lawrence Radiation Laboratory, UCRL-11833, Fall 1964, University of California, Berkeley.

VARIABLES: key to computer analysis, (based on Heizer, 1947).

1. Extended ventral west - E V O	I-1
2. Extended ventral other - E V O	I-2
3. Extended dorsal west - E D W	I-3
4. Extended dorsal other - E D O	I-4
5. Extended side west - E S W	I-5
6. Extended side other - E S O	I-6
7. Flex west - FLEXW	I-7
8. Flex other - FLEXO	I-8
9. Artifacts in shoulder and neck reg - S NREG	I-9
10. Mid body section - MIDBOD	I-10
11. Pelvic region and upper legs - PELREG	I-11
12. Around lower legs and feet - LOWLEG	I-12
13. 0-11"	I-13
14. 12-23"	II-1
15. 24-35"	II-2
16. 36-47"	II-3
17. 48-60"	II-4
18. I (0-6 yrs) - STGI	II-5
19. II (6-12 yrs) - STGII	II-6
20. III (12-21 yrs) - STGIII	II-7
21. IV (21-50 yrs) - STGIV	II-8
22. V (50+ yrs) - STGV	II-9
23. Male - MALE	II-10
24. Female - FEMALE	II-11
25. Baked clay objects; smooth frags. and balls-BCOFRG	II-12
26. Baked clay objects; pecan, bi-conical and discs (perforated) BCOPEC	II-13
27. Antler artifacts - ANTART	III-1
28. Birdwishbones - BWISHB	III-2
29. Bird talons/animal claws - CLAWS	III-3
30. Bone Tubes - BTUBES	III-4
31. Misc. bone artifacts; turtle shell fishhooks, unidentified worked bone chisel - MISCB	III-5
32. Animal teeth - ATEETH	III-6
33. Awls - AWLS	III-7
34. Charmstones A3-CHSA3	III-8
35. " B1/B1b - CHSB1	III-9
36. " B2-CHSB2	III-10
37. " B3-CHSB3	III-11
38. " B4-CHSB4	III-12
39. " C1/C2/C3 - CHSC1	III-13
40. " frags, and unfinished-CHSFRG	IV-1

41.	Schist or slate pencils - PENCIL	IV-2
42.	Manos and pestles - PESTLE	IV-3
43.	Metates and mortars - MORTAR	IV-4
44.	Quartz crystals - QTZCST	IV-5
45.	Ochre - OCHRE	IV-6
46.	Point type 1 - PT T1	IV-7
47.	" 2 - PT T2	IV-8
48.	" 3 - PT T3	IV-9
49.	" 5 - PT T5	IV-10
50.	" 6 - PT T6	IV-11
51.	" 7 - PT T7	IV-12
52.	frags, and misc. types - PT FRG	IV-13
53.	Waste: flakes, frags, cores, chunks, pebbles, and scrapers - WASTE	V-1
54.	Olivella 1a - OLIVIA	V-2
55.	" 2b - OLIV2B	V-3
56.	Haliotis 1a - HAL 1A	V-4
57.	" 2 - HAL 2	V-5
58.	" B1 HALB1	V-6
59.	" B2 HALB2	V-7
60.	" C(1)/C(1)a/C1 HALC1	V-8
61.	" C(2)/C(2)a/C3/C(1)1 HALC2	V-9
62.	" F/H/E/ME/various B/frag - HALVAR	V-10
63.	Unworked animal bone and shell - UNWANB	V-11
64.	Beaver mandible/canis skull - MANDBL	V-12
65.	Mica and asbestos and slate orn/rare minerals - MINORN	V-13

APPENDIX C

Sex and Age Determination of Individuals from SJo-68[1]

The determination of sex was in all cases made by direct observations of a few features. Whenever possible the pelvic bones were used and took precedence in the determinations. The most important of the diagnostic features of the pelvis are the sciatic notch (broader and shallower in females), the pre-auricular sulcus (more consistently present in females), and the superior aperture (larger and more circular in the female).

In many cases the skull was all that was available for sex determination. The features used in these cases were the general robustness, muscular processes, supra-orbital ridges, external occipital protuberance, flare of the gonial regions of the mandible, and the squareness of the mental region of the

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[1] Information supplied by J. D. Cadien.

mandible--all of which are greater expressed in the male. The reliability of these features is less than those of the pelvis, so in cases of uncertainty the individual is considered sex unknown. No attempt was made to sex non-adult individuals for sex differences in the skeleton are much less in non-adults.

The determination of age was made by the sequence of tooth eruption in non-adults, using the stages set by Sour and Massler (1941). Also the fusion of the basi-occipital with the basi-sphenoid occurs at 17-20 years. Determination of the age of adult skeletons was more difficult. The closing of the cranial sutures was not used. The degree of dental attrition, loss of teeth and reabsorption of the alveolar bone, and the increase in the gonial angle were used in conjunction, making the age class of the individual reasonably certain (Sour, I., and M. Massler, 1941).

Catalog Number	Burial Number	Sex	Age	Years	
12-5824	1	2 males	old persons	40-50	
12-5825	2	1 female	old person	40-50	
12-5826	3	1	infant	2-3	
12-5827	4	1 male	adult	21-45	
12-5828	5	1 female	adult	21-45	
12-5829	6	1	child	6-12	
12-5830	7	1	early childhood	6-8	
12-5831	8	1 male	adult	21-45	
12-5832	9	1 female	mid - late adult	39-45	
12-5833	10	1 male	late adult	40-45	
12-5834	11	1 male ?	adult ?	21-45	
12-5836?	12	1			no card
12-5835?	13	1	mid-adolescence	15-18	
12-6470	14	1	adult	21-45	
12-6471	15	1 female	adult	21-45	
12-6472	16	1 female, 1?	adult and infant	21-45	
				4-6	
12-6473	17	1 male?	adult	21-45	
12-7565	18	1 ?	infant	2	
12-7566	19	1 female	adult	21-45	
12-7567	20	1 female	adult	21-45	
12-7568	21a	1 male	adult	21-45	
12-7569	21b	1 ?	adolescent	12-21	
12-7570	22	1 female	late adolescent	19-21	
12-7571	23	1 male	late adolescent	19-21	
12-7572	24	1 male	early adult,	21-25	arrow in
		1 male ?	late adolescence	19-21	pelvis

Catalog Number	Burial Number	Sex	Age	Years
12-7573	25	1 ?	late adolescence	19-21
12-7574	26	1 male, 1 ?	2 adults	21-45
12-7575	27	1 female	adult	21-45
12-7576	28	1 male	young adult	21-25
12-7577	29	1 female ?	early adult	21-28
12-7578	30	1 ?	old person	50 or more
12-75~~80~~79	31	1 female	adult	21-45
12-75~~79~~80	32	1 ?	infant (foetal?)	0
12-7581	33	1 female	old person	45-50
12-7582	33a	1 male	adult	21-45
12-7583	33b	1 male ?	adult (very lage)	21-45
12-7584	33c	1 female	adult	21-45
12-7585	33d	1 male, 1?	adult, old person	21-45, 50 or more
12-7586	34	1 female	old person	50 or more
12-7587	35	1 ?	child	6 extra tooth in palate
12-7588	36	1 ?	adult	21-45 on loan
12-7589	37	1 male	late adult	45 very large acromegaly
12-7590	38	1 female	old person	50 or more
12-7591	39	1 male	adolescence	18-21
12-7592	40	1 female	mid-adolescence	16-18
		1	infant	0-6
12-7593	41	1 female	old person	45-50
12-7594	42	1 male ?	late adolescence	17-21
12-7595	43	1 ?	infant	1
12-7596	44	1 male	old person	40-50
12-7597	45	1 male	end adolescence	19-21
12-7598	46	1 female	adult	21-45
12-7599	47	1 male	adolescent	18
12-7600	48	1 male	old person	50 or more
12-7601	49	1 male	adult	21-45 fused cervical vertebra
12-7602	50	1 ?	infant	0-6
12-7603	51	1 male	adult	21-45
12-7604	52	1 male	adult	21-45
12-7605	53	1 male ?	old person	45-50 very small
12-7606	54	1 female	adult	21-45
12-7607	55	1 male ?	old person	45-50 skull lesions
12-7608	56	1 ?	mid-adolescence	16
12-7609	57	1 ?	young child	6
12-7610	58	1 male	adult	21-45
12-7611	59	1 ?	infant	4.5-6
12-7612	60	1 male	adult	21-45
12-7613	61	1 male	adult	21-45

Catalog Number	Burial Number	Sex	Age	Years	
12-7614	62a	1 male	adult	21-45	
12-7615	62b	1 ?	late adult	45	
12-7616	62c	1 ?	adult	21-45	
12-7617	63	1 ?	child	10	
12-7618	64	1 male	old person ?	50	
12-7619	65	1 ?	child ?	6-12 ?	
12-7620	66	1 female	adult	21-45	
12-7621	67	1 male	adult	21-45	
12-7622	68	1 female	adult	21-45	2 lumbar vertabra fused
12-7623	69	1 female	early adult	21-30	
12-7624	70	1 male	early adult	21-25	
12-7625	71	1 ?	infant	<1	
12-7626	72	1 male	adult	21-45	
12-7627	73	1 ?	infant	0-6	
12-7628	74a	1 ?	child	10	
12-7629	74b	1 male	adult	21-45	
12-7630	75	1 ?	adult	21-45	
12-7631	76	1 ?	Infant	0-6	
12-7632	77	1 male, ?	adult	21-45	
12-7633	78	1 ?	child	8-9	
12-7634	79	1 male	adult	21-45	
12-7635	80	1 ?	infant	1	
12-7636	81	1 ?	child	6-7	
12-7637	82	1 female	old person	50 or more	
12-7638	83	1 ?	old person	45-50	
12-7639	84	1 male	early adult	21-25	
12-7640	85	1 male	adult	21-45	generally huge
12-7641	86	1 female	late adult	40-45	
12-7642	87	1 ?	infant	1	
12-7643	88	1 female ?	mid-adolescence	16-17	
12-7644	89	1 ?	end adolescence	19-21	
12-7645	90	1 female	adult	21-45	
12-7646	91	1 male	adult	21-45	
12-7647	92	1 ?	infant	0-6	
12-7648	93	1 female	old person	45-50	
12-7649	94	1 ?	adult	45	
12-7650	95	1 male ?	adult	21-45	
12-7651	96	1 male	old person	50 or more	
12-7652	97	1 male	adult	21-45	
	98	1 ?	infant	0-6	
	99	1 ?	adult	21-45	
	100	1 ?	foetal	0	
	101	1 ?	adult ?		
	102	1 ?	adult ?		

Catalog Number	Burial Number	Sex	Age	Years
12-8020	103	1 male ?	adult	21-45
12-8021	104	1 ?	adult	
12-8022	105	1 male ?	adult ?	
12-8053	106	1 male	adult	21-45
12-8023	107	1 female	adult	21-45
12-8024	108	1 female	adult ?	
12-8025	109	1 ?	?	?
12-7285	110	1 male	adult	21-45
12-7329	111	1 female ? 1?	2 adults	21-45
12-7328	112	1 female	late adult	40-45
12-7327	113	1 female ?	late adult	40-45
12-7330	114	1 male ? 2?	3 adults	21-45
12-7674	Cremation #1	several individuals	probably adult	
12-7675	Cremation #2	1 individual	probably adult	
12-7676	Cremation #3	1 individual	adult	
12-7677	Cremation #4	1 individual	adult?	
12-7678	Cremation #5	1 male ?	adult	

APPENDIX D

Windmiller Culture Charmstone Typology
(Revision of Lillard, Heizer and Fenenga 1939)
The typology is shown in Figs. 16-18.

A: "Spinner." Normally schist (1 marble).

A1: "Full Spinner." Pronounced central bulge; often long; always schist.

A1a: Disc-shaped bulge; very flat cross section; usually very long, includes longest Type A specimen. Pecked and asphalted binding groove normal at Sac-107; absent at Sac-168. One notched tip at Sac-107 (relates to C2).
T.S. = L16654.* Sec-107. Note: Type E2 (phallic) should be related to A1a.

A1b: Reduced bulge; flat oval cross section; length, long to very long. Body on both sides of bulge is narrower than A2. Often lacks binding groove (though may be roughened).

A1b1: Long to very long, narrow projections above and below bulge; one notched tip at Sac-107. Dominant type at 168; Sac-107 = 2; SJo-56 =1.
T.S. = L12560 Sac-107.

* T.S. means Type Specimen. Numbers prefixed with L are in the Lillard Collection in Lowie Museum of Anthropology. Numbers prefixed with 1- are LMA catalogue numbers.

A1b2: long, wider projections above and below central bulge. Limited to Sac-107 (3 spec.) T.S. = L16948, Sac-107.

A2: "Modified Spinner." Slight bulge; medium to long in length; usually shorter than A1, with broader body on either side of bulge. Always schist.

A2a: Slight bulge is still obvious, medium to long in length.

A2a1: Usually long (two very long); flat oval cross section. Narrow pecked binding groove (often with traces of asphalt) is normal. Common at Sac-168, followed by Sac-107. T.S. = 1-46348, Sac-107.

A2a2: Medium; oval cross section. No pecked binding groove. Limited to Sac-107 (fall fragments: 2 = tip, 1 = end). T.S. = 1-46531, Sac-107.

A2b: Slight bulge is barely noticeable; broader than A2a. Medium length, shorter than A2a1; larger than A2a2. Flat oval cross section. Sac-107 = 6; Sac-158 = 1. T.S. = 1-46524, Sac-107.

A3: "Reduced Spinner." Medium to long in length. No central bulge although slight thickening is often apparent. Normally schist. (1 marble).

A3a: Extremely long. Unique specimen, of marble, which has the "feeling" of Type A, but may well represent an extremely long B1a3. T.S. = only specimen: 1-133919, Sac-168.

A3b: Long, relatively narrow. Flat oval to oval cross section. Sac-107 = 5; Sac-168 =1. T.S. = L 12526A, Sac-107.

A3c: Medium length, relatively broad; very flat cross section; tip may be grooved (1-133943, Sac-168). Sac-107 = 4; Sac-168 = 2. T. S. = L12557A, Sac-107.

A4: "Incipient Spinner."

A4a: Medium length, bare trace of central bulge, pointed end (shared with A5). Oval cross section. Schist. Single specimen = 1-46322. Sac-107.

A4b: Medium length, slight but definite central bulge; probably pointed end. Perforation placed extremely far from tip (relates to Type C). Oval cross section. Schist. Single specimen = 1-46235, Sac-107.

A5: "Pencil." Medium length, pointed end, notched tip (relates to C2). Oval cross section. Variant schist. Single specimen = 1-73408, SJo-68.

B. This group is not an historical assemblage, and must eventually be revised.

B1a probably represents 2 traditions: one = B1b, and the other is a valid group (including A3a) derived perhaps from Type C or Type B2 (which belongs with Type A).

B1b probably represents a long-lived tradition, with possible sequence: B1b1, B1b2 (with the long B1a1 type), B1b3, B6, (?B7).

B2 probably belongs in the A group (between present A3 and A4). It is a valid type.

B3 is a valid type; may be distinct invention, a foreign type, or B2 derivative.

B4 is a valid type, but probably belongs in revised B1a group - related to the medium B1a1's and B1a2.

B5 is merely a descriptive category for all miniatures.

B6 and probably B7 may be final Windmiller variants of B1b3.

B1a: Dominant type at SJo-56. While Bulletin 2 shows the cross section as round, the specimens vary from round to flattened oval. Length also is extremely variable, medium to long. Normally made of marble, but rare specimens of diorite and schist occur. The single Bulletin 2 sub-type has been divided into 3 types, but B1a1, in fact the whole B1a, B2, A3c complex needs further revision.

B1a1: Very long to medium; narrow relative to other B1a types. Always round cross section. Tips and ends always flattened. One notched tip. Normally marble; 1 diorite. Dominant type at SJo-56 (6 specimens). Occurs throughout SJo-56 E, with 1 occurrence in 56 D. Also 1 occurrence (medium) at Sac-168. T. S. (long) = L19161, SJo-56 (may be shifted to B1b variant). T. S. (medium) = L19213, SJo-56. (See B5a for possible miniature.)

B1a2: Medium length, 1 short. Oval cross section. Tip normally flat, ends flat to round. Normally marble. Broader than B1a1. May be derived from Type C. Type B4b may be merely a small variant of this type. SJo-56 = 4; Sac-168 =1 (smallest). T.S. = L19267, SJo-56.

B1a3: Medium to short. Widest and flattest of B1a, but still oval cross section. Tips and end usually flattened. Normally alabaster, but schist specimens occur at Sac-168 and Sac-107. Type B2 and A3c may also be variants of this type. SJo-56 = 1; SJo-68 = 1; Sac-107 = 1; Sac-168 = 2. T.S. = L19266, SJo-56.

B1b: "Biconical."

Straight to concave sides (rarely convex in contrast to B1a) with distinct angularity at midpoint (often a distinct shoulder in B1b3) in contrast to B1a.

B1b1: "Pointed Biconical."

Very long and narrow relative to other B1b's. Distinguishing traits include both the pointed (or narrow round) end, and the perforation placed far from tip. The central bulge is rounded - never shouldered (B1b1 is the least "biconical" of the group). Always round cross section. Tip flattened. Varied materials (schist, rhyolite).

3 specimens:

Sac-107 = 1	T.S. = L16656	
SJo-68 = 1	T.S. = 1-73455	Reused - groove after tip broke.
Sac-46 = 1		

B1b2: "Long Biconical."

Concave to straight sides, with distinct angularity at midpoint. Perforation shifts close to tip, unlike B1b1 but similar to B1b3. End flattened. Always round cross section. All specimens are mottled serpentine. 4 specimens limited to Sac-168. T.S. = 1-133923.

B1b3: "Short Biconical."

Straight to concave sides with distinct shoulder at midpoint. Always medium to short relative to B1b2. Normally round cross section. (Defects may be left unground on one side in order to achieve this, rather than produce an oval cross section by complete grinding). Tip flattened, end flattened or rounded. Variable materials: mottled limestone and gabbro most common; also black schist, sandstone. (Never marble or blue schist.) 30 specimens - excellent horizon marker for Late Windmiller.

Sac-107 = 12
SJo-68 = 8 T.S. = 1-55329
Sac-168 = 7
SJo-142B = 2
SJo-56D = 1

Type B5a may represent a miniature of this type (or, less likely, B1a1). (Speculation: progressive change in a single historical type may be represented, with B1b1 ancestral to B1b2 which may be ancestral to B1b3 (C1 is an alternative for the latter). B6 and possibly B7 may be derived from B1b3.

B2: "Lenticular." (1 medium length)

Usually short with flattened oval cross section. Widest at mid-point (face view) - broad, squat shape in contrast to the elongate shape of B1a and the narrow bipoint of C. Tip rounded (rarely flattened). End rounded. Occasional pecked binding groove relates type to A, where it probably belongs. Usually blue schist (rare igneous and metamorphic; no marble specimens). Common at Sac-107, where it lasts through several phases. T.S. = L16285. Sac-168 = 1. (This type plus a single E2, are the only Delta types found in the Berkeley phase variant of the Windmiller tradition on San Francisco Bay at Ala-307).

B3: "Diamond."

Always short, (65-118 mm) with more marked angularity at the mid-point (face-view) than in B2. Also distinguished from B2 by the thick, rectanguloid cross section. Sides straight to convex. Tips and ends usually flattened (rarely rounded). Of 10 specimens, 9 are of dunite (veined serpentine); 2 from Sac-107 are of speckled serpentine. Total: 11; Sac-107 = 10 T. S. = L16280 Unperforated (probably unfinished; 2 have incipient perforations). SJo-68 =1 T.S. = 1-55324 perforated. Good horizon marker for late Windmiller; found with B1b3 at Sac-107 and SJo-68.

B4: (Probably a small variant of "Elongate" B1a.) Small, short (83-115 mm); elongate shape with convex sides; relatively narrower than B1a, lacking the marked mid-point width of B1a3. Tip flattened. End flattened, round or pointed. Total of 5 specimens, all of marble.

B4a: Round cross section. Total of 3: Sac-107=1, Sac-168=1, T.S.=1-133945, SJo-142=1.

B4b: Oval cross section. Total of 2: SJo-68=1, SJo-56D=1, T.S. = L19271. Both B4a and B4b are good late Windmiller horizon markers.The variable cross-section has no temporal significance.

B4: "Miniature." (28-56 mm. long). Heterogeneous group sharing only their very small size. It is probable that they are miniatures of larger types, but their shapes are too indistinct to be certain of the larger type, hence they are lumped together. Slender, elongate shape with little thickness at the mid-section. Tip may be pointed or flattened; end usually pointed. Variable materials: 3 marble, 3 soapstone, (1 from Ala-307 on San Francisco Bay is schist).

B5a: Round cross section; tip pointed. (28, 33 mm. long). Total of 3 specimens from 1 burial at SJo-56D. T.S. = L19254. Shape is that of C1 (absent from SJo-56). If pointed tip and end are ignored, specimens could be miniature B1b3 or B1a1.

B5b: Oval cross section. Shape is closest to B4b, followed by B1a3. Flat tip, pointed ends. Length between 28 and 56 mm. All 3 specimens are marble. SJo-68 =2, T.S.= 1-73450, SJo-56 =1, T.S. = L 19169. Both variants are good horizon markers for Late Windmiller; there are suggestions of two subphases, and SJo-68 B5b specimen would be earlier than the remaining 5 specimens.

B5c: One specimen from Ala-307, Alameda province on San Francisco Bay, has a round cross section, biconical shape with flattened ends resembling an exaggerated B1b3 (absent at Ala-307) made of local schist. Not illustrated; included merely to indicate that miniatures are limited to the Delta (as well as to indicate the problem of identifying the larger form intended.)

B6: "Bulbous." Short (75-85 mm.), fat; convex sides with maximum thickness at mid-point. Lacks the marked angularity of B1b. Shaping is less carefully done than B1b, so the normally round cross section is slightly asymmetrical. Grinding facets may remain. Tip and end slightly flattened. Perforation close to tip. Asymmetry and flattened end and tip distinguish type from C1c. Variable materials: mottled serpentine, micro-crystalline stone. Possibly derived from B1b3. Total of 3: SJo-112 =1 T.S. = Marino Col., Olsen and Wilson, 1964, Fig. 5c. Sac-107 =1 unassociated specimen (misidentified as Type B1a). Horizon marker for Terminal Windmiller.

B7: "Off-center." Medium sized (119, 126, 134 mm. long); convex sides with maximum thickness toward the perforated tip rather than mid-point. Angularity not pronounced. Shaping often careless, with tendency to asymmetry. Tip and end usually flattened. Variable placement of perforation, but placed relatively close to tip. Variable material: marble, mottled serpentine, fine-grained-granite. Possibly derived from B1b3. Total of 3 found with 1 burial at SJo-112. T.S. = Marino Coll., Olsen and Wilson, 1964, Fig. 5b (Misidentified as type Bla). Horizon marker for Terminal Windmiller.

C: "Bipointed."

Short to medium length (79-165 mm; 1 long = 180 mm). Sides convex with no trace of angularity (except Cld). Round through oval to flattened oval cross section. Termed "bipointed" because tips and ends are usually much narrower than Blb. While ends are often pointed, both rounded and slightly flattened variants occur. Tips are usually flattened in the plain variant, or have notches or grooves diagnostic of their type. Placement of perforation is variable, but is usually far from the tip in the longer specimens. Variable material, with emphasis on softer minerals (esp. marble and claystone; also mottled and special serpentines, rarely gabbro; never blue schist). Most of this group, dominant at SJo-68, is clearly a related assemblage and can be divided into three types on the basis of tip treatment: plain (1), notched (2) and grooved (3). Two additional types, channeled (4) and beveled (5) have been included but are less clearly part of the assemblage, as discussed under each type below.

When the length of the SJo-68 measurable specimens of types C1-C3 are plotted, a tri-modal curve results having no relationship to the 6-fold division presented for all charmstones. Available data suggest temporal differences are reflected in some instances, so the following special length divisions represent subtypes within C1, C2 and C3. (Too few specimens of C4 and C5 exist to merit this division, and other shape factors will be used for C4 divisions). C1, C2, C3 sybtypes based on length:

A: long: 180-136 mm.
B: medium: 103-111 mm.
C: short: 100-79 mm.
D: medium: 111-132 mm.

Relative width <u>increases</u> as length decreases in all 3 types (in contrast to Bla and B4). Type C1 has a fourth shape division absent in other types.

C1: "Plain Bipointed."

Simple tip; occasional specimens in all three size groups may have a narrow, beveled strip running between the tip and perforation on both faces (never found in Blb). Placement of perforation varies by size group. Tip flattened. End pointed or slightly flattened (always narrower than in Blb). Nearly round cross section. Width and thickness usually vary by 3 to 5 cm. (except Clc, Cld, which are usually round). C1 thus varies from C2 and C3 which usually have oval cross sections. Convex sides (except Cld) distinguish type from Blb3. Variable materials.

Cla: Long (137-159 mm., average 150).

Nearly round cross section in contrast to C2a, C3a. Perforation placed at intermediate distance from tip relative to C2a, C3a (far from tip) and Blb3 (close to tip). End pointed (3 specimens or slightly flattened (1 specimen). Distinguished from B1b3 by length, convex sides, perforation placement, cross section, narrower tip and end, and beveled tips (2). Variable material: 2 mottled serpentine (1 may be gabbro), 1 special serpentine, 1 greenish-black schist. Total of 4: SJo-68 = 4 T.S. = 1-73466 Possible horizon marker for earlier subphase of Late Windmiller.

C1b: Medium (Sjo-68 = 103-106, average 104 (3 spec.) Sac-168 = 125) Nearly round cross section. Perforation placed close to tip in contrast to C2b, C3b. End flattened (4) or pointed (1). Tip flattened. One has beveled strip and another has traces of asphalt running between perforation and tip. Distinguished from B1b3 by convex sides and cross section. Variable material: SJo-68 = 3 mottled serpentine; Sac-168 = 2 andesite ? Total of 7: SJo-68 = 3 T.S. = 1-73467
Sac-168 = 2 (1 uncertain fragment)
Sac-46 = 2 (132 mm. long, 133 mm. long)
Possible horizon marker for earlier subphase of Late Windmiller. Probable ancestor of B1b3 (if latter is not merely a reduced variant of B1b2).

C1c: Short (83-93 mm., average 88 mm. 4 spec.) with Sac-46: 81-93 mm, average 87 mm. 5 spec. Oval to round cross section. Perforation placed close to tip. One specimen has incipient perforation (Sac-107). End pointed. Tip flattened or pointed; one has beveled strip between perforation and tip (SJo-68). Distinguished from B6 by pointed end and better finish (fully symmetrical). Variable material: 2 mottled serpentine (SJo-68, Sac-107); 1 gabbro (Sac-168); 1 granite (Sac-107). 1 unknown Sac-46). Total of 4: SJo-68 = 1 T.S. = 1-73453
Sac-168= 1 T.S. = 1-165085
Sac-107= 2
Total = 5 with Sac-45 (-1)
Horizon marker for late subphase of Early Windmiller.

C1d: Medium (111-132 mm, average 122 mm). Nearly round cross section far from tip in 3 specimens, and perforation placed close to tip in 1. End flattened (3) or pointed (1). Tip flattened. One has beveled strip and 2 have asphalt traces running vertically from perforation to tip. All have a mid-point angularity suggestive of (though not as developed as) B1b3. This type, all found with a single burial at SJo-68, has traits suggestive of the transition from C1a-b (hole placement, narrower or pointed ends) and B1b3 (mid-point angularity, near round cross section, hole placement); however, this burial is stratigraphically older than those with either C1a, or C1b (and much older than B1b3), so the group must be considered an anomaly at present. Material: all mottled serpentine (2 may approach granite). Total of 4 from 1 burial at SJo-68. T.S. = 1-73446 (others have hole placement farther from tip).

Unless there is something peculiar about the interment of burial 67, the type is Early Windmiller, late subphase.

C2: Same as C1 except for notched tip.

C2a: Long (140-149 mm, average 145 mm. 5 specs.) Oval to round cross section. Perforation placed far from tip (often extremely so, as with C3a). End flattened (4) to pointed (1). Tip notched or nicked. Convex sides. Variable material: 2 marble, 2 burned serpentine, 1 greenish-gray schist (like Sac-168 B1a3). Total of 5: SJo-68 = 5 T.S. = 1-73430. Horizon marker for late subphase of Early Windmiller.

C2c: Short (85-99 mm, average 90 mm. 5 specs) Oval cross sec. Variable perforation placement; far from or close to tip. End pointed to flattened. Notched tip (usually only nicked). Convex sides. Variable material: 2 serpentine (burned); 1 claystone; 1 granite; 1 unknown. Total of 5 specimens: SJo-68 = 5 T.S. = 1-73457. Horizon marker for late subphase of Early Windmiller.

C3: Grooved tip . Perforation usually placed far from tip (usually extremely so; relatively close in 1 C3b and 1 C3c). Pointed ends. Usually oval cross section (rarely round). Convex sides.

C3a: Long (147-180 mm, average 160 mm. 4 specs.) Oval (4) to nearly round (1) cross section. Total of 5: SJo-68 = 3 T.S. = 1-73409. Sac-107 = 2 (1 + 1). Variable material: 3 marble, 1 mottled serpentine; 1 claystone. Horizon marker for late subphase of Early Windmiller.

C3b: Medium (108-128 mm, average 118 mm. 8 specs.) Oval cross section (1 round). Variable material: 3 claystone, 2 serpentine (1 burned), single examples of marble, sandstone, diorite(?), and metamorphic. Total of 9: SJo-68 = 9 T.S.= 1-73414 Probable horizon marker for early subphase of Early Windmiller.

C3c: Short (79-95 mm, average 90 mm . 3 specs) Oval cross section. Variable material: 2 marble (Sac-107); 1 serpentine (burned; SJo-68). Total of 3: Sac-107 = 2 T.S. = 1-46462
SJo-68 = 1
Probable horizon marker for early subphase of Early Windmiller.

C4: "Channeled"
Diagnostic trait is narrow, shallow channel which encircles the charmstone longitudinally. While the perforated specimens (type C4a) probably form an historical type, the unperforated group does not (some specimens are earlier in the Oak Grove Tradition of Santa Barbara; most are later, being typical of the Cosumnes Tradition) Too few specimens exist to know whether the special 3-fold size distinctions proposed for the C1-C3 group also apply to C4. In the following description, the general charmstone size categories have

been used, and the a, b distinctions are based on the configuration of the sides.

C4a: "Convex channeled." Convex sides.

C4a1: Medium length (127 mm.) round cross section. Bipointed, with notched tip and end. The single specimen is unperforated, with 2 unsuccessful attempts at perforation far from the tip. Material: sandstone. Total of 1: SJo-68 = 1 T.S. = 1-73407. Probable horizon marker for early subphase of Early Windmiller.

C4a2: Short length (111 mm) oval cross section. Notched tip and end, less bipointed than C4a1. Perforation placed close to tip. Material: translucent marble. Total of 1: Sac-107 = 1. T.S. = 1-46281. Probable horizon marker for early subphase of Early Windmiller.

C4b: "Bulging channeled". Short length (85 mm.) oval cross section. Unperforated. Distinct bulge at mid-point in contrast to convex sides of C4a. Notched tip and end. Material: vesicular basalt. Total of 1: Sac-107 = +1. T.S. = L12552A. Probably falls in the transition between the Windmiller and Cosumnes traditions. May represent foreign influence rather than continuity from C4a.

C5: "Beveled" (possib ly unrelated to C assemblage; may be shifted to D). Short (87-103 mm., average 95 mm. 2 spec.) Round cross section. Perforation variable; one specimen was originally perforated and was reworked after breakage through perforation, including an attempted redrilling; other specimen unperforated. Notched tip. Beveled tip: short triangular section flattened to channeled at tip on both faces. Flattened end, convex sides. Variable material: 1 granite; 1 mottled serpentine. Total of 2: Sac-107 = +2. T.S. = L12550A. May be horizon marker for transition between Windmiller and Consumnes traditions.

Assemblage D

Miscellaneous group of unrelated types. D will serve as catch-all for all unique and rare types which have no obvious relationship to other types.

D1, D2 (and D8 ? D9 ?) might form a related group. D4 perhaps belongs in group E. D7 might represent a reworked type B1a. The remainder are unique at present.

D1: "Pear." Very short to short length (46-84 mm, average 64 mm. 3 spec.) Oval to round cross section. Perforated; 1 redrilled after breakage through perforation. Broad to narrow pear shape. Rounded end. Tips missing (probably flattened). Variable material. May represent horizon marker for Terminal Windmiller into transition to Cosumnes. (Shape is too simple to emphasize, but similar forms are the dominant charmstones of the Berkeley and Patterson phases on San Francisco Bay.)

D1a: "Broad pear." Very short (61 mm.) Oval cross section. Broad relative to length. Material: flaky green serpentine (see D4).

Total: 1 Sac-107 T.S. = L16956. Dating: Terminal Windmiller (earliest of type D1).

D1b: "Narrow pear." Very short to short (46-84 mm., average 68 mm. 2 specs). Oval to round cross section. Narrow width relative to length. Variable materials: marble (SJo-112); gray schist? (Sac-28). Total of 2: SJo-112 =1 T.S. = Marino Coll., Olsen and Wilson, 1964, Fig. 5f. Sac-28D =1 T.S. = 1-98245. Possible horizon marker for Terminal Windmiller and Windmiller-Cosumnes transition.

D2: "Drop." Very short (44 mm.) Oval cross section. Very broad body with narrow tip. Perforation close to tip. Rounded end and tip. Material: black steatite (unique material). Total of 1: SJo-56 = 1 T.S. = L19228. Dating: Terminal Windmiller.

D3: "Triangular." Short (100 mm.) Rhomboidal cross section (hence specimen is not a reworked type A3). Triangular shape, with flattened tip and end. Gently convex sides. Material: blue schist (identical to that of Types A, B2). Total of 1: Sac-107 = 1 T.S. = L16303. Dating: Middle Windmiller.

D4: "Pendant." Short (69 mm.) Round cross section. Narrow cylindrical tip enlarging to bulbous end. Possibly phallic (type E). Unperforated. Material: flaky green serpentine (see Type D1a). Total of 1: Sac-107 = +1. T.S. = 1-46579. Dating: possibly Windmiller-Cosumnes transition.

D5: "Pestle." Extremely long (longest of all charmstones): 370 mm. Oval cross section. Outline shape is very long isosceles triangle. Unperforated. Material and associations suggest that this was a functional charmstone (it definitely was not a functional pestle). It has a polished finish and therefore it is not likely that it represents raw material for a type A charmstone. Material: blue schist (identical to Types A, B2, D3). Total of 1: Sac-107 = 1. T.S. = L16668. Dating: Middle Windmiller.

D6: "Shield." Short (92 mm.) Flat oval cross section. Oval body tapers sharply to short round tip. Unperforated. Shallow central groove runs longitudinally along most of one face. Made from large pebble (cf. D9); face ground, but "back" is that of unmodified waterworn pebble. Material: sandstone. Total of 1: Sac-107 = +1. T.S. = L15069. Dating: possibly Windmiller-Cosumnes transition.

D7: "Club." Medium length (158 mm.) Oval cross section. Narrow, elongate truncated shape; convex sides, flattened tip and end. Unperforated; double grooves encircle tip end horizontally. (Specimen might represent an extensively reworked B1a2 specimen which broke). Material: marble. Total of 1: SJo-56 =1. T.S. = L19168. Dating: Late Windmiller.

D8: "Teardrop." Short (69 mm.) Round cross section. Simple teardrop shape; convex sides; end slightly flattened; tip probably pointed. Unperforated (perhaps because of material). Material: quartz crystal; completely ground; coated with asphalt. Total of 1: SJo-68 =1. T.S. = 1-49069. Dating: Late Windmiller.

D9: "Pebble." Very short (39 mm.) Oval cross section. Pyriform shape; oval body with slightly constricted tip. Round tip and end. Body is unmodified waterworn pebble (cf. D6); tip has been shaped by careful pecking. Material: quartzite. Total of 1: SJo-68 = 1. T.S. = 1-55341. Dating: Terminal Windmiller.

D10: "Propeller." Medium length (167 mm.) Oval cross section. Central bulge with symmetrical pointed appendages on each side. Central perforation extremely large. Probably mounted on handle rather than suspended. Material: granite. Total of 1: Woodbridge = +1. T.S. = 1-56150. Dating: uncertain, but perforation suggests relationship with "doughnut stones" and "cogstones" so this may be the earliest of all Windmiller charmstones. At present there is little to suggest that D10 is stimulus for shape of Type A; details of form as well as the nature of suspension seem totally distinct.

E: "Phallic." This group probably forms an historical assemblage, with three distinct types.

E1: "Simple Phallic." Medium (147, 165 mm.) to long (180, 188 mm.); average medium 170 mm. Oval cross section (1 round). Central shaft slightly expanded at mid-point; symmetrical bulging tip and end. Tip bulge longitudinally grooved (ground), with notch. Simple end rounded. Perforated and unperforated: 1 specimen (Sac-168) has perforation just below tip bulge; the complete specimen from Sac-107 is unperforated. Two end fragments. Variable materials: 2 micaceous schist; 1 blue schist, 1 rhyolitic tuff. Total of 4:

Sac-107 = 2	T.S. = 1-46529
Sac-168 = 1 (+1)	
SJo-142 = 1 (+)	T.S. = 1-48808

Dating: Middle Windmiller: probably later than E2.

E2: "Spinner Phallic." Basic shape with central bulge relates to type A1.

E2a: "Flanged." Short (101 mm.) through medium (170 mm.) to long (194 mm.) Oval cross section. Central shaft has disc-shaped or reduced bulge centered around mid-point. Symmetrical tip and end expand to flange which is equal to or wider than central bulge. Tip notched, with <u>pecked</u> groove extending longitudinally through flange. Simple end rounded or flattened. Always perforated below flange, far from tip. Uniform material: blue schist. Total of 4: Sac-107 = 2 T.S. = L11734, L16302
Sac-168 =+2

Dating: Middle Windmiller; probably earlier than E1.

E2b: "Unflanged." Medium (158 mm.) Oval cross section. Bulging central shaft. Symmetrical tip and end expanded without ridged flange of E2a. Tip notched, with longitudinal pecked groove. Simple rounded end. Perforated below expanded tip. Material: blue schist. Total of 1: Rio Vista. T.S. = SIM (see Heizer, 1949: Fig. 10c). Dating: probably Middle Windmiller, contemporaneous with E2a.

E3: "Round Phallic." Short (76 mm.) Round cross section. Naturalistic head of penis. Unperforated: smaller and grooved horizontally. Material: marble. Total of 1: SJo-56 = 1. T.S. = L19226. Dating: Terminal Windmiller.

Assemblage F: Maul-like charmstones which probably represent related historical types. Short. Unperforated.

F1: "Barrel." Short (76 mm.) Round cross section. Nearly cylindrical; flat tip and end. Single horizontal encircling groove - narrow. Material: marble. Total of 1: Sac-107 = +1 T.S. = 1-86886. Dating: Probably Windmiller-Cosumnes Transition.

F2: "Bottle." Short (91, 95 mm.) Near-round cross section. Expanded body with constricted neck (for binding) and slightly expanded tip. Tip end flattened. Material: 1 marble; 1 unknown. Total of 2:

Sac-28D = 1 T.S. = 1-98250
Sac-46 = 1

Dating: Windmiller-Cosumnes Transition.

F3: "Nail." Short (102 mm.) Round cross section. Oval body (rounded end) separated from mushroom-shaped tip by very wide horizontal groove which encircles specimen. Material: granite. Total of 1: Sac-28D = 1. T.S. = 1-98244. Dating: Windmiller-Cosumnes Transition.

Endnotes

1) The Hathaway collection forms the body of the State Indian Exhibit at Sutter's Fort, Sacramento.

2) Richard Van Valkenburg, a student of J. P. Harrington, had previously excavated skeletal material from Southern California sites for Dr. Roy L. Moodie (1929), a Southern California physician interested in the pathology of early California Indians and A. Woodward of the Los Angeles County Museúm.

3) Sac-107 is the only site on record containing the three major cultural components identified for this region. Between 1935 and 1937, Sacramento Junior College recovered over 200 burials from Sac-107. The field crews were financed by the Federal Emergency Relief Administration and the National Youth Administration.

4) It is now recognized that the "Intermediate" period at sites Sac-107, Sac-126, and Sac-127 was actually a mixture of the "Late" and "Transitional" periods mentioned above.

5) R. F. Heizer, R. K. Beardsley and F. Fenenga were the main contributors to these talks.

6) Fergusson and Libby, 1964:320; Treganza and Malamud, 1950; Heizer, 1967; Heizer, pers. comm., regarding the 8,000 B.P. dates on Buena Vista Lake archaeological deposits.

7) The Middle Horizon tradition was actually first described from the San Francisco Bay site, Emeryville, by Uhle (1907). The tradition was first recognized at Morse Mound (Sac-66) in 1937 but the Sacramento Junior College Bulletin No. 2 report is inadequate to serve as a type description. It may be advisable to change the name to Morse or Emeryville Culture after more complete analysis of the collections from the two sites.

8) I owe special thanks to Dr. James Bennyhoff for his help and guidance during the preparation of this chapter.

9) Artifacts in the University of California Lowie Museum of Anthropology are catalogued from 1-133681 to 1-134056; 1-134101; 1-34126-1-134140; 1-165093-1-165170; 1-171669-1-171682; 1-171770; 1-171801.

10) At least one burial (assigned the letter C) probably represents early Phase 2 (A and B would be late Phase 2) because the small magnesite disc and thin-lipped Olivella beads are early Phase 2 markers. (Table 1 looks misleading because Burials 1 and 6A also have "thin-lipped"; however, the thin-lipped type actually has two subtypes--the late ones (burials 1, 6A) are all oval thin-lipped while the early ones are round thin-lipped (Bennyhoff, pers. comm. 1967).

11) Hereafter referred to as UCAS. The UCAS was established in 1948 and in 1960 was abolished and succeeded by the Archaeological Research Facility of the Department of Anthropology (ARF).

12) . . . near the axis of the Great Valley under some of the islands west of Lodi, where the land has been reclaimed from sea level marshes, the peat attains a thickness of more than fifty feet. Such a condition indicates that the historic environment of sedimentation has prevailed for many centuries and that the tidal flats in the axis of the trough have subsided continuously in that period, for tules do not grow in water much more than 10 or 15 feet deep, and the accumulation of a foot of peat is conservatively estimated to require about 75 years (Stearns, 1930:32).

13) Increased rainfall probably marked the end of the Altithermal (at approximately 2500-2000 B.C.), causing flooding of rivers. Inhabitants may have abandoned the site at this point. Antevs (1950) gives probable rainfall figures for this period (cf. Baumhoff and Heizer, 1965).

14) In ancient mounds [in the Central Valley of California] a zone of visible concentration of $CaCO_3$ can be noted in the upper half of the profiles, and another one close to the bottom, when the submound soil is less permeable. This is due to a redistribution of $CaCO_3$ (in the form $Ca(HCO_3)$ which moves upward during most of the year, the evaporation being stronger than the precipitation, and moves downward during the short rainy seasons. In the oldest mounds such redistribution is almost entirely complete. A carbonate calcareous hardpan is formed at a depth of 1 or 2 feet, while on the bottom of the mounds no concentration of $CaCO_3$ can be found, being entirely washed out by the seasonal oscillation of watertable, and, perhaps to a lesser extent, by the percolating waters of the rainy seasons (Setzer, 1947:80).

Although the parent material which is fluviatile alluvium, cannot be considered as calcareous sediment, the high carbonate content of the mounds has a tendency to concentrate with time into a calcareous hardpan near to the surface, at a depth established by the downward push of the biotic factor. High $CaCO_3$ content is probably due to the fixation of Ca from burned wood, plant and animal residues [and shell], while K an Na carbonates were leached (Setzer, 1947:67; cf. Cook and Heizer, 1962:13-16; 1965:20).

15) Tamers and Pearson (1965) argue that radiocarbon bone dates even on burned bone are usually between one and two thousand years too young.

16) In this report, Dawson's finds are treated as a separate unit. Twenty-four years separate this first reported excavation and the major University of California excavation in 1947. Numerous changes in archaeological technique took place during this time, rendering the data incomparable. However, one must admire Dawson's excavation recording techniques. He did an excellent job of recording artifact locations and associations. He catalogued and described every artifact, and retained everything except skeletal material, which he reburied. Because the author has been unable to recheck the skeletal material, Dawson's sex and age determinations have been ignored. Vertical and rough horizontal provenience, drawing and the exact measurements of each artifact were made by Dawson. All association between artifacts and between the artifacts and skeletal material are recorded. In these pages, Dawson's material is used primarily to corroborate or to contrast with the results from the more recent and complete University of California excavations.

17) Heizer is in error in reporting the excavation as taking place in 1921 (1949:7).

18) Unlocated pits probably come from near the center of the mound. Pit 1, 1937 excavation, perhaps Pit A on the original site map (F-J/N2), contains burial nos. 1-4 (cf. site map); Treganza's Pit A, somewhere on the western edge of the mound, contains burial no. 10; Pit C, on the eastern edge of the mound, contains burial nos. 111, 112, and 113; Pit B lies on the central-southern edges; Burial nos. 14, 15, 16 and 17 come from an unlocated pit dug in 1941.

19) In short-period occupation sites, this could easily happen; it occurred in the Aleutians at Nikolski from 1952 to 1962, where only one or two infants were born and died in the entire ten-year period (Turner, pers. comm., 1966).

20) Hereafter referred to as S.J.C., Bull. 2.

21) Grave lot no. 24 at 30 inches below the surface may have contained another charmstone (Dawson's fieldnotes).

22) Bennyhoff considers charmstone type D10 the oldest Windmiller charmstone probably due to its resemblance of "doughnut stones" and "cogstones."
The single specimen of this type, found at Woodbridge, California, has no stratigraphic provenience. It is morphologically identical to the un-

named groundstone object from Cougar Mountain Cave, Oregon (Cowles, 1959), which is also apparently quite old. In this case the original function may have been a digging stick weight and/or warclub head.

23) Asphaltum, traces of which occurred on many charmstones, is found in many localities in Southern California (Heizer and Treganza, 1944:332). In Central California, Marin County's Duxbury Point is a well-known asphaltum locality. The use of this seep was inferred by Schenck (1926:212); and by Heizer and Treganza (1944:333). In the Central Valley, seeps lie west and south of Buena Vista Lake and in the vicinity of Maricopa and Hazelton, Kern County (Wedel, 1941:37-38; Heizer and Treganza, 1944:333).

24) Assuming random distribution, the probability that points and charmstones would appear in the same male interment is calculated by multiplying:

$$\frac{\text{Males with points}}{\text{Males with artifacts}} \times \frac{\text{Males with charmstones}}{\text{Males with artifacts}} = \text{Probability}$$

or $\frac{18}{30} \times \frac{11}{30} = \frac{198}{900} \quad \frac{22}{100} \sim 1/5$

The actual number of male graves with points and charmstones is four out of thirty ($\sim$1/7).

25) $$\frac{\text{burials with beads}}{\text{burials with artifacts}} \times \frac{\text{burials with points}}{\text{burials with artifacts}} = \text{Probability of both beads and points in the same grave}$$

$$\frac{60}{127} \times \frac{61}{127} = \frac{3660}{16129} \sim \frac{25}{100}$$

26) Hematite was mined by the Sierra Miwok Indians from a mountain between Lake Eleanor and Cherry River called Voloamu (Barrett and Gifford, 1933:244; Heizer and Treganza, 1944:309-310).

27) Asphaltum was obtained by Bay Area Indians from Duxbury Point in Marin County (Schenck 1926:212), and in the Valley from Buena Vista Lake in the vicinity of Maricopa and Hazelton, Kern County (Heizer and Treganza, 1944: 332-333).

28) Log Population = 1/2 log of the area of the mound in square meters.

$$\text{Log } P = 1/2 \log 987 \qquad P = \sim 31.4$$
$$1.49725 = 1/2 \times 2.9943$$

The method of estimating population suggested by Howells based on an average death rate (1960:170) is not applicable given the probable intermittent nature of SJo-68's occupation.

29) Serpentine and gabbro deposits exist in a narrow outcrop along the western foothills of the Sierra Nevada mountains (H.Williams, 1966, pers. comm.). The strongly ferruginous mudstone is found fairly close to SJo-68 in the Ione formations of the northern and central coast ranges (Victor Allen, 1929).

30) SJo-56 appears to be the youngest of the Windmiller communities because of the large number of shell, stone, and bone artifact types in its assemblage similar to those from Cosumnes Culture components. Various soil and bone chemistry analyses also tend to support a young age for the site, although these same tests contradict the contemporaneousness of SJo-56 and SJo-142 (Heizer and Cook, 1949; Setzer, 1947). The possibility that SJo-142 contains only a cemetery, and hence no habitation midden, may account for the difference in soil chemistry.

31) The SJo-68B component appears to contain fewer artifact types which continue into the Cosumnes components. The lack of more recent forms of artifacts and SJo-68B's stratigraphic position below a younger and distinct Windmiller component support its early position in the sequence.

32) See Chapter I. Comparative bone chemistry yields results of limited reliability between sites, and archaeologists have never deliberately attempted to distinguish between Windmiller sites using matrix analysis.

Belous orders the sites: SJo-56, Sac-107C, SJo-142, SJo-68, from oldest to youngest. Dempsey and Baumhoff (1963:508, Table 5) place Sac-107C oldest, followed by SJo-142, SJo-68, and SJo-56. Heizer (1949) reaches still another arrangement by scanning the assemblages from the sites; he lists SJo-142 as the oldest, followed by Sac-107C, SJo-56 and SJo-68. Setzer (1957) places SJo-142 oldest, followed by Sac-107C and SJo-68. This paper orders the sites as follows, from oldest to youngest: SJo-68B, Sac-107C, Sac-168B, SJo-68A, SJo-56, and SJo-142.

33) Shell fragments occur in cremation no. 3 in SJo-68B. Only part of the obsidian points found in several cremations in SJo-68, SJo-142 and one cremation in Sac-107C are altered by heat.

34) Spencer and Jennings (1965) mention the use of small grooved clay balls or pellets by historic California Indians as slingstones for hunting water birds (cf. Cressman, 1960).

35) In general, fewer Cosumnes than Windmiller graves contain artifacts (Heizer, 1949; Heizer and Fenenga, 1939; Heizer and Cook, 1949).

36) This shift to smaller points suggests a change in emphasis, possibly in the size or kinds of game exploited, with perhaps greater emphasis on fishing (Fenenga, 1953).

Weights of Chipped Stone. Early [Windmiller] and Middle [Cosumnes] Horizons (Cultures). (Fenenga, 1953:314, Fig. 1).

	Weight in grams																	
Site	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	20+
(Sac-99) Deterding		4		3		1	1		1	1	1	1						4
(Sac-66) Morse		1	2	3		3	4	3	1	3	2	2		4		1	1	10
(Sac-60) Hicks						1	1		2	1	1	3	1	1		1		4

Site	Weight in grams (cont'd)																
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	20+
(Sac-43) Brazil			1		1	1	1	3	2	1	1	1		1	4	1	2	13
(Sac-151) Need					1	2	1			1	1	1			1		1	4
(SJo-56) Phelps	1	6	6		6	5	9	4	1	3	5	3	1	4	3			5
(SJo-68) Blossom		2	7		3	3	2	4	2	2	1	4	2	1	4	1	1	4
(Sac-107C) Windmiller		1	1		2	2		4	1	1	1	4	2	1		1	1	11
(SJo-142) McGillvray			1			2	3		3	3	1	1				2		3

37) A series of radiocarbon dates on bone collagen, run by Isotopes Inc., and Geochron Laboratories, substantiated the above order. Bone from SJo-142 burial nos. 15 and 16 (cat. nos. 12-5676, 12-5677) and SJo-56 burial no. 53 (cat. no. 12-7016) yield the youngest dates. The Geochron date for SJo-142 is considerably older than the one completed by Isotopes Inc. Considering the similarity between artifact assemblages from SJo-142 and SJo-56, the author is inclined to accept the Isotope date. Sac-107C burial nos. 27 and C8 (cat. nos. 12-5616, 12-5595) yield dates two to five hundred years older, while SJo-68, burial no. 23 (cat. no. 12-7571) is still older (cf. Chapter V).

38) The author has listed the evidence for cultural contact below in the order of its reliability: (1) trade items--Pacific Coast shell beads and specific raw materials; (2) stylistic similarities between projectile points, ground and polished stone charmstones, basketry, bone and grinding implements; (3) mortuary practices--the use of quartz crystals, canid, beaver and/or bear jaws and teeth, the extended burial position, and ground ochre as body paint; (4) similarities in subsistence.

Cultures could have had indirect contacts, perhaps passing goods or ideas from one area to another, in this way covering distances prohibitive to lone individuals or groups.

39) The Graduate Division of the University of California (from an NSF grant for the improvement of graduate research), the University of California Archaeological Research Facility, and the Committee on Research provided funds for the collagen dating.

40) The collagen dates obtained without treatment for humic acids by Isotopes

Inc., on SJo-56, SJo-142, Sac-107C and SJo-68B support the projectile point seriation described earlier (Chapter IV). The correspondence between the two independent orderings of components appears to substantiate the reliability of multinomial probability theory for this comparison of archaeological samples.

41) Between about 7,000 and 4,000 years ago, we have a number of radiocarbon-dated sites from the southern California coast region extending from Santa Barbara to San Diego. From Santa Rosa Island an age determinitation of midden shell (M-1133) gave an age of 7,350 years for what is apparently the Dune Dweller culture (Orr 1956). For the later Highland and culture on Santa Rosa Island there are two determinations--4,790 (UCLA-105) and 5,370 (L-446B) years old. On the mainland there is the Topanga site, as yet undated (Heizer and Lemert 1947; Treganza and Bierman 1958); Zuma Creek site (Peck 1955) date 4,950 years old (LJ-77); Malaga Cove site at Redondo Beach (Walker 1951) with an age of 6,510 years (LJ-3); the undated Little Sycamore site (Wallace 1954); the undated Oak Grove culture (D. B. Rogers 1929); [the date on the Oak Grove, Glen Annie Canyon site of 6,980 $\pm$ 620 B.P. (UCLA 606)]; the Pauma complex (True 1958); and the Scripps Estate site (Shumway, Hubbs, and Moriarty, 1961), which is radiocarbon dated as occupied between 5,460 and 7,370 years ago (samples LJ-79, LJ-109, LJ-110, LJ-221) . . . The trait inventory of the sites listed varies somewhat and may thus reflect regional subphases of a fairly simple and uncomplex culture type. The culture is generally characterized by the following: abundance of deep-basined metates; manos; scraper planes; flake scrapers; choppers; pebble hammerstones; pitted hammerstones; lesser frequency of bone tools (awls, punches); "cogstones" (cf. Eberhart 1961); flexed burials (at Little Sycamore site, Scripps Estate site; [In my opinion these sites should be grouped with later Cosumnes sites (cf. Treganza and Bierman, 1958; Wallace, 1955; prone extended burial, usually covered with a cairn of metates (Oak Grove sites, Topanga site [Phase I]); and reburial (Little Sycamore site, Topanga site [Phase II]). The economy was based on seed-gathering, which was supplemented with hunting and shellfish-collecting. The Milling Stone Horizon sites [generally] lack cremation, pottery, and C-shaped shell fishhooks. Use of ocean resources is limited . . . (Heizer, 1963:123).

42) This author has assumed the essential correctness of Antevs' division of the Post-Pleistocene. Baumhoff and Heizer (1965) have concisely presented both criticism and defense of the Antevs sequence. Their article contains convincing evidence of a moist period, a dry period and then another moist period, with regional variations according to the altitude, latitude and local physiography.

43) The assemblage is typically Late Pleistocene, or what Savage (1951) calls "Rancho la Brean," for which see also Stock (1946).

44) Isotopes Inc. reports that the Tranquillity bone, both animal and human, is too mineralized for collagen dating (J. Buckley, 1967, pers. comm.).

45) Shell dates also seem to fall consistently one to two thousand years older than expected. Carl L. Hubbs of the La Jolla Radiocarbon Laboratory states: "Doubts have been expressed on the validity of dates based on Anodonta shell, but our previous tests (see La Jolla IV, p. 69) have been consistent with expectation. The circumstance that burned and unburned shell gave identical age estimates is reassuring" (Hubbs, letter to Heizer, 1967). However, dates on shell and burned bone from the same level of the Planview site (Bryan, 1965: also Tamer and Pearson, 1965) illustrate the disparity often found between carbon and shell. The burned bison bone dates at 5145 ± 160 B.C., while the shell dates at 7,844 ± 500 B.C. Archaeologists date the Oak Grove and La Jolla components (except the Harris site) on shell, and all the dates are unfortunately subject to the same suspicion: shell may have absorbed carbonates from ground water both during and after the death of the organism. This carbonate could have affected the date, making it either too old or too young, depending on the source of the carbonates in the ground water. The same exchange, though to a lesser extent, occurs between bone and ground water carbonates. Laboratory technicians can remove this inorganic carbon only from bone.

46) UCLA-605-608: 6880 ± 120, 6980 ± 120, 7270 ± 120, 6380 ± 120 B.P. respectively (Ferguson and Libby, 1963:329).

47) Shell dates on this complex fall between 5,000 and 4,000 years ago (Libby and Ferguson, 1963).

48) Specific types of shell ornaments also link this site to the later complex (Wallace, 1954).

49) A series of dates for La Jollan sites ranges from 3900 ± 100 years to 7370 ± 100 years B.P. (Hubbs, Bien and Suess, 1960; Moriarty, Shumway and Warren, 1959; Warren True and Eudey, 1961).

50) The Cosumnes Culture has some charcoal dates ranging from two to four thousand years ago (Heizer 1958b).

51) Owen, Curtis and Miller (1964:466) claim all these sites date between 7,000 and 4,000 years ago:

(1) Triunfo Rockshelter (Ven-15) may have contained an early occupation assemblage which shared many non-perishable elements found in the Oak Grove. Kowta and Hurst (1960) equate it with Tank Site and Little Sycamore.

(2) Several sites in Bataquitos Lagoon and the Lower San Diequito Valley which fall within the geographic area of the La Jolla Complex (Rogers, 1929, 1945) share many traits with the La Jolla site at Scripps Estate Site I (Crabtree, Warren and True, 1963).

(3) Warren, True and Eudey (1961) consider the Green Valley sites a marginal phase of the La Jolla complex.

(4) True (1958) considers a number of the Valley Center sites and the San Marcos-Escondido area to be more representative of the Pauma

complex. Warren, True and Eudey (1961) discuss the relationship between the Pauma and the La Jolla complexes, which they feel form two aspects of a single culture.

(5) King (1962) thinks the Parker Mesa (LAn-215) assemblage looks like that of Zuma Creek and the Tank Sites.

52) Rogers, 1939; Plate 6b, 8a, b, c (crescents); Plate 9a, b, c, d (Mohave type points), 9e, f (Silver Lake points); and 9g, h, i (typical of the Gypsum Cave point).

53) A possibility exists that the shell intrudes into the sandy layer. Large rodent holes continue from the surface to the top of the conglomerate stratum.

54) "A similar degree of obscurity, which necessitates withholding acceptance, surrounds the age of artifacts associated with former beach lines in Southern California lake basins such as Lake Mohave and Lake Manix (Roberts 1940). A radiocarbon age (LJ-200) for fresh-water mussel shells from the high shore line of Lake Mohave of 9640 years may indeed date the lake stand, but it does not answer the problem of whether the stone artifacts occurring on the surface of that beach are the same age as the molluscan remains imbedded in the beach deposit. The most persuasive indication to date that the Lake Mohave materials may predate 7,000 years ago come from the recent excavation of the Harris site near San Diego (Warren and True 1961)" (Heizer, 1963:120-121).

55) Similar points, Types 5d, 5e and 7c in the Central Valley typology, sometimes occur in the later Windmiller phases. Assemblages from the Central Valley include only two or three Pinto points. The Glen Annie report illustrates several from the Oak Grove culture (Owen, Curtis and Miller, 1964). The points occur fairly commonly in the Cosumnes and La Jolla sites.

56) Contradictory dates come from the Pinto-Gypsum assemblages. Harrington assigns the Pinto assemblage from Stahl site at Little Lake to the early Medithermal, 3000-4000 years ago. In support of this dating, he cites radiocarbon dates of 3,870 ± 250 and 4,050 ± 300 B.P. for a Pinto deposit in Stuart Rockshelter, Moapa, Nevada. Similar dates come from the lower deposits of the South Fork Shelter (2397 B.C.) associated with a Pinto-Gypsum component (Baumhoff and Heizer, 1965:704). UCLA Geophysics Laboratory dates for charcoal from the early levels of the Stahl site, provisionally identified by Lanning (1963) as Little Lake Culture range between 3,500 and 3,900 B.P. (Heizer, pers. comm.). An early series of dates attributed to projectile points of Gypsum Cave type, based on sloth dung from Gypsum Cave, are 10,455 ± 340 and 8,527 ± 250 B.P. Wormington (1957) questioned the association between the dung samples and the artifacts. Heizer (pers. comm. 1967) had two wooden artifacts dated. The material, Harrington positively states, is coeval with the sloth-dung. The resulting dates are 2,400 and 2,900 B.P.

A series of 9,000-7,000 B.P. dates on the stratigraphically-older Sulphur Springs phase (Bryan, 1965:146) and the 4,000 B.P. dates on the younger San Pedro phase supports the age estimated for the Southwest.

57) The occurrence at the Rose Spring sites of these same corner-notched points associated with Elko-points in deposits dated no earlier than 4,000 B.P. convince Lanning, however, that the Stahl site, and the similar Pinto-Gypsum sites in north-central Nevada ought to fall between 3,000-1,500 years B.C.

58) These complexes would then have formed an early hunting gathering culture which expanded into California from a single center sometime at the end of the Altithermal, about 7,000 to 8,000 years ago (see Warren and True, 1961: 278).

59) Deadman Cave and Promontory Caves have yielded leaf-shaped points stratigraphically lower than a Pinto-like stemmed variety (Steward, 1937; Wormington, 1957:196-197).

60) Jennings, 1956, lists all California species of marine shell and their sources along the coast found in the Basin and Southwest.

61) The Newberry eruption occurred after the Mount Mazama eruption, which dates at 5,500 B.C., and before Newberry crater's last known eruption which took place 2,054 ± 230 B.P. (C-657) (Wormington 1957:181).

62) Davis (1960) questions the interpretation of stratigraphic associations in Cougar Mt. Cave.

63) Cressman suggests a minimum date of 7,000 years ago for the skeleton buried into the top of Level IV (Wormington, 1957:185).

64) The deposit is dated 4,132 ± 80 B.C. (Bryan, 1965:171-172).

65) C-14 date 3,986 ± 200 B.C.

66) Fort Rock Cave, Cougar Mountain Cave, Kawumkan Springs, Five Mile Rapids, The Dalles, Umatilla, Lewis River, and Wilson Butte Cave testify to a primary cultural deposition of parallel-stemmed and bi-pointed forms and the entrance of side- and corner-notched forms stratigraphically higher in the sequence during the Altithermal--about 6,000 B.P. (cf. Bryan, 1965:169-175).

67) Similar hypotheses have been suggested by other archaeologists: Daugherty (1956), MacNeish (1958) and Warren and True (1961).

68) Milling stones also appear absent from the lower levels of many Northwest Plateau sites (Cressman, 1960; Bryan, 1965).

69) Level IV's estimated time of deposition is about 7,500 B.P., during a period of increasing dessication.

70) Deposited about 3,500-2,500 B.P.

71) Rabbit Island [45BN15 in the Columbia River Basin Surveys, in the western half of Section 30, Township 8 North, Range 31 East, of Benton County, Washington] lies on the Columbia River, three miles downstream from its confluence with the Snake River.

The strata composing the site appears as follows: (I) wind-deposited sand over the whole site, 0.3 feet to 2.1 feet thick; (II) a hard, white layer of silt and volcanic ash present in the areas of burial concentration between 0.3 feet and 2.1 feet below the surface, and 0.4-2.0 feet thick; (III) evidence of erosion a loose, coarse, grey-brown sand with irregular horizontal distribution between 1.2 feet and 2.8 feet below the surface, and up to 2.8 feet thick, intersperses with lenses of fine silt (for the most part, these lenses lie south of the main burial concentration); (IV) the cobble base of the island, from 2 to 5 feet below the surface.

72) Butler (1961:34) dates Cold Springs I between 6,000 and 8,000 B.P., his estimate being based on the dates of volcanic ash falls which bracket the component. Swanson (1962) also reports on the Hat Creek site.

73) Idaho evidence of an influx of Great Basin traits into the Northwest Plateau during this time suggests these traits diffused somewhat earlier.

74) For discussion of additional evidence of contact given by basketry styles see Baumhoff and Heizer (1958), Heizer and Krieger (1956), Loud and Harrington (1929), Cressman (1942, 1956).

75) Evidenced by: (1) a break in the occupation of Danger Cave during the Altithermal maximal; (2) the shrinking of population illustrated by the smaller number of Chiricahua components than either Sulpher Springs or San Pedro components in Arizona (Sayles and Antevs, 1941); (3) the Altithermal sites in all but the Northern Basin; (4) the contraction of the Pinto-Amargosa Phase in the Mohave (Rogers, 1939); and (5) the Altithermal break in the occupation of San Luis Rey (True, 1958:255).

TABLE 1

CENTRAL CALIFORNIA CULTURE CLASSIFICATION

			LITTORAL ZONE		INTERIOR VALLEY ZONE	
			MARIN PROVINCE	ALAMEDA PROVINCE	DELTA PROVINCE	COLUSA PROVINCE
HOTCHKISS CULTURE		Historic Tribes	Coast Miwok	Bay Costanoans	Plains Miwok S. Patwin, Nisenan	Patwin
	Phase II	facies	Estero	Fernandez	Mosher	Miller
		1860				
	b	1700				
	a	1500				
	Phase I	facies	Mendoza	Emeryville	Hollister	Sandhill
		C 1100				
		B 700 A.D.				
		A 300 A.D.				

		COASTAL PROVINCE			INTERIOR PROVINCE				SOUTHERN CALIFORNIA
COSUMNES CULTURE	facies	McClure	Ellis Landing	Morse	Deterding	Brazil	Need	Orwood	

			San Joaquin	Sacramento	SOUTHERN CALIFORNIA
WINDMILLER CULTURE		facies			
	Phase II		SJo-112 SJo-56 SJo-142 SJo-68A	Sac-168B	
	Phase I		SJo-68B	Sac-107C	Topanga, Phase I? Oak Grove? Buena Vista III? San Dieguito?

TABLE 2

COMPARATIVE SEQUENCING OF WINDMILLER SITES

Setzer, 1946: 60, 63, Table 27	Belous, 1953:351	Heizer and Cook, 1949:87,92		Baumhoff and Dempsey, 1962:508
		SJo-56*		
SJo-68	SJo-68	SJo-68	SJo-68#	SJo-56
			SJo-56	SJo-68
SJo-56	SJo-142B	Sac-107C	Sac-107C	SJo-142B
SJo-142B	SJo-56	SJo-142B	SJo-142B	Sac-107C

* Cook's suggested sequence on the basis of comparative bone chemistry placed SJo-56 in the age range of the Cosumnes Culture.

Heizer's sequence from archaeological evidence.

TABLE 3

DISTRIBUTION OF GRAVE GOODS FOR BURIALS OF THE HOTCHKISS CULTURE, Sac-168A

TRAIT	LATE				TRANSITION			EARLY								GRAND TOTAL
	Bur. 1	Bur. 6A	Feat. 2A-C	Total	Feat. 11	Feat. 6A B	Total	Bur. 2	Feat. 5	Feat. 17	Bur. 3	Bur. 6B	Bur. 7	Feat. 10	Total	
Flexed simple interment									X						1	1
Flexed, grave-pit burning	X*	X	X	3	X	X	2	X		(X)	X	X*	X	X	6	11
Orientation SW	X			1				X?				X			2	3
" NW													X		1	1
" unknown		X	X	2	X	X	2		X	X	X			X	4	8
Grave lot probably inc.			X	1	X	X	2		X	X				X	3	6
Shell beads (total)	533	530	180	$1,243^{3}$	14	465	479^{2}	85	5	8	14	660	159	352	$1,283^{7}$	$3,005^{12}$
Clam shell disc beads	516	362	163	$1,041^{3}$	13	352	365^{2}	42	4	8	3	618	106	48	829^{7}	$2,235^{12}$
Olivella beads (total)	17	168	17	202^{3}	1	113	114^{2}	43	1	0	11	42	53	303	453^{6}	769^{11}
Type 1a (_O. biplicata_)	1			1^{1}		2	2^{1}				8	1	30		39^{3}	42^{5}
Type 1a (_O. baetica_)	2			2^{1}		6	6^{1}						4		4^{1}	12^{3}
Type 2a3 (trapazoid)						4	4^{1}	2				1		46	49^{3}	53^{4}
Type 3a1 (full-lipped)	10	149	9	168^{3}		14	14^{1}							1	1^{1}	183^{5}
Type 3a1 (thin-lipped)	4	19	(8)	(31^{3})	1	87	88^{2}	38	1		2	30	19	240	330^{6}	449^{11}
Type 3e (cupped)								3			1	10		16	30^{4}	30^{4}
Haliotis ruf. large disc bead														1	1^{1}	1^{1}
Magnesite disc beads (total)	1		(1)	2^{2}	2	8	10^{2}	30	3		1	10	5	93	142^{6}	154^{10}
Large disc	1			1^{1}												1^{1}
Medium disc					1	2	3^{2}	3							3^{1}	6^{3}
Small disc			(1)	(1^{1})	1	6	7^{2}	27	3		1	10	5	93	139^{6}	147^{9}

TABLE 3 (continued)

DISTRIBUTION OF GRAVE GOODS FOR BURIALS OF THE HOTCHKISS CULTURE, Sac-168A

TRAIT	LATE				TRANSITION			EARLY								GRAND TOTAL
	Bur. 1	Bur. 6A	Feat. 2A-C	Total	Feat. 11	Feat. 6A B	Total	Bur. 2	Feat. 5	Feat. 17	Bur. 3	Bur. 6B	Bur. 7	Feat. 10	Total	
Steatite small disc	2	4		6^{2}												6^{2}
Haliotis ornaments	7	9	3	19^{3}	2	20	22^{2}	17	0	3	2	5	17	13	57^{6}	98^{11}
Type A.2 segment				0		1	1^{1}					1	1		2^{2}	3^{3}
B.1				0			0	2		1		1	1	1	6^{5}	6^{5}
B.1.1	3	5		8^{2}		6	6^{1}	2				1	8	1	12^{4}	26^{7}
B.1.1.a				0			0							2	2^{1}	2^{1}
B.1.1.a.c(B.1.a.c?)				0			0				1				1^{1}	1^{1}
B.1.1.c				0			0							1	1^{1}	1^{1}
B.2.1				0			0						1		1^{1}	1^{1}
C.1				0			0							1	1^{1}	1^{1}
C.1.1			1	1^{1}	1		1^{1}								0	2^{2}
C.1.1.a				0			0						2		2^{1}	2^{1}
C.1.1.c				0			0	1					1	2	4^{3}	4^{3}
C.4.1.c				0			0	1							1^{1}	1^{1}
D.1		1		1^{1}			0								0	1^{1}
D.2.1	1			1^{1}			0								0	1^{1}
D.4		1		1^{1}			0								0	1^{1}
E.1.1				0		1	1^{1}						1		1^{1}	2^{2}
F.1				0		1	1^{1}	4							4^{1}	5^{2}
F.1.1	2	1		3^{2}	1	1	2^{2}							1	1^{1}	6^{5}

TABLE 3 (continued)

DISTRIBUTION OF GRAVE GOODS FOR BURIALS OF THE HOTCHKISS CULTURE, Sac-168A

TRAIT	LATE				TRANSITION			EARLY								GRAND TOTAL
	Bur. 1	Bur. 6A	Feat. 2A-C	Total	Feat. 11	Feat. 6A B	Total	Bur. 2	Feat. 5	Feat. 17	Bur. 3	Bur. 6B	Bur. 7	Feat. 10	Total	
Haliotis ornaments (cont.)																
Type F.1.1.a				0			0							1	1^{1}	1^{1}
F.1.1.c (F.1.c ?)	1			1^{1}			0								0	1^{1}
G.1.G				0			0			1					1^{1}	1^{1}
G.1.K				0		1	1^{1}								0	1^{1}
K.1				0			0	1							1^{1}	1^{1}
M.2.2				0			0			1					1^{1}	1^{1}
M.2.2.c				0			0						1		1^{1}	1^{1}
M.C.3		1		1^{1}			0								0	1^{1}
P.2				0			0	1							1^{1}	1^{1}
S.1.1			1	1^{1}		1	1^{1}								0	2^{2}
S.1.(1).1				0			0					1			1^{1}	1^{1}
T.1				0			0	1							1^{1}	1^{1}
T.1.1				0		1	1^{1}								0	1^{1}
W.1				0		1	1^{1}	2					1	1	4^{3}	5^{4}
Amorphous				0			0							1	1^{1}	1^{1}
Gorget				0		1	1^{1}								0	1^{1}
Unclassifiable frag.			1	1^{1}		5	5^{1}	2			1	1		1	5^{4}	11^{6}

TABLE 3 (continued)

DISTRIBUTION OF GRAVE GOODS FOR BURIALS OF THE HOTCHKISS CULTURE, Sac-168A

TRAIT	LATE				TRANSITION			EARLY								GRAND TOTAL
	Bur. 1	Bur. 6A	Feat. 2A-C	Total	Feat. 11	Feat. 6A/B	Total	Bur. 2	Feat. 5	Feat. 17	Bur. 3	Bur. 6B	Bur. 7	Feat. 10	Total	
Whole <u>Haliotis</u> shell											1		1		2^{2}	2^{2}
Projectile points	1	1	2	4^{3}						6			2		8^{2}	12^{5}
Type A_3			1	1^{1}						3					3^{1}	4^{2}
Type A_1													1		1^{1}	1^{1}
Type B_3										1					1^{1}	1^{1}
Type C_2			1	1^{1}												1^{1}
Type C_1	1	1		2^{2}						1			1		2^{2}	4^{4}
Type D										1					1^{1}	1^{1}
Slate knife													1		1^{1}	1^{1}
Obsidian knife fragment											1				1^{1}	1^{1}
Obsidian scraper											1			1	2^{2}	2^{2}
Unworked chert											1				1^{1}	1^{1}
Pestle fragment					1		1^{1}									1^{1}
Incised bird bone tube	1			1^{1}												1^{1}
Bipointed bird bone pin					1		1^{1}									1^{1}
Basketry frags. (carbonized)								4							4^{1}	4^{1}
TOTAL	545	544	186	$1,275^{3}$	20	493	513^{2}	136	8	17	21	675	185	459	$1,501^{7}$	$3,290^{12}$

* On back.

Superscript entries indicate number of burial occurrences.

( ) Entries are probably early Phase 2.

TABLE 4

DISTRIBUTION OF SHELL BEADS IN Sac-168

	Black Midden					Brown Midden									
	Burials		Midden (Unassoc.)	No Provenience Hotchkiss Type	Total Hotchkiss Culture	Burials		Unassociated				Total Midden	No Provenience Windmiller Type	Total Windmiller Culture	Grand Total
	#B	#S				#B	#S	0-8"	-8-16"	-16-24"	-24-34"				
Haliotis bead Type 1a						5	15	4	2	3	3	12	9	36	36
*Haliotis rufescens large disc bead (Type 4)	1	1		1	2										2
Haliotis rufescens large epidermis disc bead				1	1										1
Haliotis Type 2													2	2	2
Olivella beads (Total)	11	769		281	1,505	3	3	1		1	1	3	2	8	1,058
Spire-lopped (Total)	5	54		11	65			1		1	1	3		3	68
(Type 1a, O. biplicata)	(5)	(42)		(8)	(50)					(1)	(1)	(2)		(2)	(52)
(Type 1a, O. baetica)	(3)	(12)		(3)	(15)										(15)
(Type 1b, O. biplicata)								(1)				(1)		(1)	(1)
Type 2b						3	3						2	5	5
Type 2a3	4	53		7	60										60
Type 3a1 (Total)	11	632		258	890										890
(Thin-lipped)	(11)	(449)		(200)	(649)										(649)
(Full-lipped)	(5)	(183)		(58)	(241)										(241)
Type 3e	4	30		5	35										35

TABLE 4 (continued)

DISTRIBUTION OF SHELL BEADS IN Sac-168

	Black Midden					Brown Midden									
	Burials		Midden (Unassoc.)	No Provenience Hotchkiss Type	Total Hotchkiss Culture	Burials		Unassociated				Total Midden	No Provenience Windmiller Type	Total Windmiller Culture	Grand Total
	#B	#S				#B	#S	0-8"	-8-16"	-16-24"	-24-34"				
Saxidomus clam disc beads (Thick variant)	12 (1)	2,235 (1)	78	1,258 (1)	3,571 (3)										3,571 (3)
Tivela clam disc bead				1	1										1
Hinnites multirugosus globular bead				1	1										1
Total	12	3,005	78	1,543	4,626	7	18	5	2	4	4	15	13	46	4,672

#B = number of burials.

#S = number of specimens.

*_Haliotis_ bead Type 4 - a circular disc _Haliotis_ bead with a single central perforation occurred in disturbed midden at the surface of the site. The type is typical of the Cosumnes culture.

TABLE 5

DISTRIBUTION OF HALIOTIS ORNAMENTS - Sac-168

TYPE	Black Midden Sac-168A					Brown Midden Sac-168B							Grand Total
	Burial		Unassociated Midden	No Provenience Hotchkiss Type	Total Hotchkiss Types	Burial		Unassociated			No Provenience Windmiller Type	Total Wind-miller Types	
	#B	#S				#B	#S	0-12"	12-24"	24-36"			
A2 Segment	1	3		3	6								6
B1	5	6		2	8								8
B1n									1			1	1
B1c				1	1								1
B1.1	7	26	1	15	42								42
B1.1.a	2	2		2	4								4
B1.1.ac	1	1			1								1
B1.1.c	1	1		2	3								3
B2.1	1	1		1	2								2
B2.2.c				1	1								1
B3.1.c				1	1								1
B3.3				1	1								1
C1	1	1		1	2								2
C(1)n Segment										1		1	1
C1.c				1	1								1
C1.1	2	2		2	4								4
C1.1.a	1	2			2								2
C1.1.c	3	4	2	3	9								9
C(2)n								1				1	1
C(2)1.n						1	1					1	1
C2.1.c			1		1								1
C4.1.c	1	1			1								1
D1	1	1			1								1
D1.1.e				1	1								1
D2 (eared)				1	1								1

TABLE 5 (continued)

DISTRIBUTION OF HALIOTIS ORNAMENTS - Sac-168

TYPE	Black Midden Sac-168A					Brown Midden Sac-168B							Grand Total
	Burial		Unassociated Midden	No Provenience Hotchkiss Type	Total Hotchkiss Types	Burial		Unassociated			No Provenience Windmiller Type	Total Wind-miller Types	
	#B	#S				#B	#S	0-12"	12-24"	24-36"			
D2.1	1	1			1								1
D2.2				1	1								1
D2.2 (eared)				2	2								2
D4	1	1		1	2								2
D4.e				1	1								1
D6				1	1								1
E1				1	1								1
E1.1	2	2		4	6								6
E1.1.a				1	1								1
E2				1	1								1
E2.2.e			1		1								1
F1	2	5			5								5
F1.1	5	6		2	8								8
F1.1.a	1	1			1								1
F1.1.c (F1c?)	1	1			1								1
F2.1				1	1								1
G1.G	1	1			1								1
G1.a.H				1	1								1
G1.J				1	1								1
G1.K	1	1			1								1
G1.L				1	1								1
G1.M				1	1								1
H3									1			1	1
K1	1	1			1								1
L1				1	1								1

TABLE 5 (continued)

DISTRIBUTION OF HALIOTIS ORNAMENTS - Sac-168

TYPE	Black Midden Sac-168A					Brown Midden Sac-168B							Grand Total
	Burial		Unassociated Midden	No Provenience Hotchkiss Type	Total Hotchkiss Types	Burial		Unassociated			No Provenience Windmiller Type	Total Windmiller Types	
	#B	#S				#B	#S	0-12"	12-24"	24-36"			
MB.2.2	1	1			1								1
MB.2.2.c	1	1			1								1
MC.3	1	1			1								1
N1				2	2								2
P2	1	1			1								1
S1				1	1								1
S1.1	2	2		2	4								4
S1.1.ac				1	1								1
S1.1.c				1	1								1
S1(1)1	1	1			1								1
T1	1	1			1								1
T1.1	1	1			1								1
W1	4	5			5								5
Amorphous	1	1		1	2								2
Gorget	1	1			1								1
Unclassifiable	6	11	1	5	17	1	1					1	18
Totals	10	98	6	72	176	2	2	1	2	1	0	6	182
Whole Haliotis shell	2	2			2								2

#B = Number of burials and features with ornaments.
#S = Number of specimens with those burials and features.

TABLE 6

STONE ARTIFACTS FROM Sac-168

	Component A					Component B										
	Black Midden					Brown Midden										
	Burials		Midden (Unassoc.)	No Prov. Hotchkiss Type	Total Hotchkiss Culture	Burials		Unassociated					Total Midden	No Prov. Windmiller	Total Windmiller Cul	Grand Total
								Hardpan								
	#B	#S				#B	#S	0-8"	-8-16"	-16-24"	-24-32"	-32-42"				
Magnesite Beads	10	154	6	54	214											214
(small discs 4-9 x 2-4)*	(9)	(147)	(6)	(47)	(200)											(200)
(medium discs 10-17 x 4-11)	(3)	(6)		(5)	(11)											(11)
(large disc 27 x 22)	(1)	(1)			(1)											(1)
(small cylinders length = 18, 9 diam = 15, 8)				(2)	(2)											(2)
Steatite Disc Beads (8-12 x 2-6)	2	6	1	11	18											18
Siltstone Disc Bead (diam = 28 th = 2)				1	1											1
Charmstones						10	21	3	4	3	4	2	16	12	49	49
Type A1a						1	1								1	1
A1b1						4	5	1	1				2	4	11	11
A2a1						1	1		1		2	1	4	4	9	9
A2b														1	1	1
A3a											1		1		1	1
A3b						1	1								1	1
A3c						1	1				1		1		2	2
B1a1						1	1								1	1

TABLE 6 (continued)

STONE ARTIFACTS FROM Sac-168

	Component A					Component B										
	Black Midden					Brown Midden										
	Burials		Midden (Unassoc.)	No Prov. Hotchkiss Type	Total Hotchkiss Culture	Burials		Unassociated					Total Midden	No Prov. Windmiller Type	Total Windmiller Culture	Grand Total
								Hardpan								
	#B	#S				#B	#S	0- -8"	-8- -16"	-16- -24"	-24- -32"	-32- -42"				
Charmstones (cont.)																
Type Bla2														1	1	1
Bla3						2	2								2	2
Blb2						2	4								4	4
Blb3						1	3	1	2				3	1	7	7
B2						1	1								1	1
B4a						1	1								1	1
Clb										1			1	1	2	2
Clc										1			1		1	1
El								1					1		1	1
E2										1		1	2		2	2
Slate rod						1	1								1	1
Mortars and metates						1	1		1	2	3	6	12	2	15	15
Pestle	1	1			1	1	1	2		1	2	1	6	2	9	10
<u>Points</u>	5	14	2	10	26	4	4	4	7	3	3	4	21	16	41	67
Hotchkiss																
A1	1	1			1											1
A3	2	4	1	1	6											6
B3	2	2			2											2
C1	4	4		4	8											8
C2	1	1			1											1
D	1	1		1	2											2
Slate knife	1	1	1	1	3											3
Fragment				3	3											3

TABLE 6 (continued)

STONE ARTIFACTS FROM Sac-168

	Component A					Component B										
	Black Midden					Brown Midden										
	Burials		Midden (Unassoc)	No Prov. Hotchkiss Type	Total Hotchkiss Culture	Burials		Unassociated					Total Midden	No Prov. Windmiller Type	Total Windmiller Culture	Grand Total
								Hardpan								
	#B	#S				#B	#S	0- -8"	-8- -16"	-16- -24"	-24- -32"	-32- -42"				
Points (continued)																
Windmiller																
1											1		1	2	3	3
2												1	1	1	2	2
3a									2	1			3		3	3
3b						1	1								1	1
5a												1	1	5	6	6
5b														1	1	1
7d								1					1		1	1
5e									1				1		1	1
7a												1	1	1	2	2
7b								1					1		1	1
7c								1					1		1	1
Fragment						3	3	1	4	2	2	1	10	6	19	19
Steatite pipe						1	1								1	1
Quartz crystal								1	2		2	1	6	2	8	8
Ochre						1	1								1	1
Flake scr.												2	2	2	4	4
Thumbnail scr.			1	1	2											2
Core scr.												4	4	2	6	6
Worked stone	1	1	1	2	4			2					2		2	6
Unworked stone	1	1	7	1	9			2		8		1	11		11	20
Total	11	177	18	80	275	15	30	14	14	17	14	21	80	38	148	423

#B = number of burials. #S = number of specimens.

* Size in millimeters increases progressively from early Phase 2 to historic times.

TABLE 7

BONE, ANTLER AND TURTLE PLASTRON DISTRIBUTION, Sac-168A.

Type	Black Midden			Brown Midden			No Provenience
	B#	S#	Unassoc.	B#	S#	Unassoc.	
Bird-bone tube	1	1	1				
Bi-pointed bone rod			2				
Awl							2
Antler flaker						1	
Cut antler						1	
Turtle plastron ornament				1	1		

TABLE 8

DISTRIBUTION OF BAKED CLAY IN Sac-168

BAKED CLAY OBJECT	Black Midden				Brown Midden							No Provenience	Burials	Grand Total	Decoration				
	Component A				Component B														
					Hardpan														
	0-8"	8-16"	16-24"	Total	0-8"	-8-16"	-16-24"	-24-32"	-32-40"	-40+"	Total				Cord Impressed	Basketry Impressed	Incised	Pitted	Fingernail
Unshaped		6		6		1	4	8	15	3	31	7	2(2)	46					
Globular (shaped)	4_4			4				1	7		8	1		13	4				
Smooth fragment	5_1		1	6	3_1	3	2_2	7_1	5_2	9_2	29_9	4	$9^{(2)}$	48	4	3	1		1
Disc	2_1		2_2	4	1	1			3_x		5	2	$4^{(2)}$	15			3	1	
Perforated disc	1			1										1					
Ball										1	1		$4^{(2)}$	5					
Biconical			1	1	1			1		1	3		$1^{(1)}$	5					
Grooved bi-conical (pecan)									1_1		1_1	1_1		2	2				
Unclassified	2	1	3	6	3		1				4	1		11					
Spools(?)												3		3					
Bowl													$1^{(1)}$	1					
Total				28							82	19	21	150					

Note: Burial nos. 27 (disc), 17 (ball), 26 (bowl), 10 (biconical), all contained one shaped clay object except burial no. 12 which contained two smooth fragments and an unshaped piece.
Feature no. 9 consisted primarily of a cache of baked clay (4 unshaped, 3 discs, 3 balls, 4 fragments).

Superscript = number of burials and/or features. Subscript = impressed or incised piece.
( ) = brown midden. x = pitted or fingernail impressions.

TABLE 9

BURIAL POSITION, ORIENTATION AND GRAVE OFFERINGS IN SITE Sac-168B

	With Grave Goods		Without Grave Goods		Totals	
	Number	Percent	Number	Percent	Number	Percent
Position						
Extended on face	11	37	9	30	20	67
Extended on back	4	13	0	0	4	13
Extended on side	1	3	0	0	1	3
Indeterminate	2	7	3	10	1	3
Totals	18	60	12	40	30	100
Orientation						
Westerly	14	47	9	30	23	77
Other	2	7	0	0	2	7
Indeterminate	2	7	3	10	5	17
Totals	18	60	12	40	30	100

TABLE 10

POSITION OF GRAVE GOODS IN THE BURIAL PITS OF Sac-168B

Body Area	Charmstone	Shell	Pestle/ Mortar	Point	Slate Pencil	Baked Clay
Head and neck		7	1			1
Chest			1	2		1
Legs				2		
Pelvic	6				1	
10" from body	1					
Unknown	2					3
Total Burials	9	7	2	4	1	5

TABLE 11

DISTRIBUTION OF GRAVE GOODS FOR BURIALS OF THE WINDMILLER CULTURE (INCLUDING THREE CACHES), Site Sac-168B

Trait	BURIALS																								
	4	5	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Extended on face	X	X	X		X	X	X	X	X		X		X	X	X	X		X	X	X	X		X	X	X
Extended on back										X		X					X					X			
Extended on left side				X																					
Disturbed																									
Oriented W	X	X	X			X		X			X					X				X					
Oriented SW (WSW)				X	X		X			X		X	X	X	X		X	X	X		X		X	X	X
Oriented SE (SSE)									S													SE			
Unknown																									
Skull missing							X									X	X	X	X						X
Skeleton <u>very</u> incomp.	X			X	X	X	X	X	X							X	X	X	X		X		X	X	
Isolated skull																				(X)*					
No associations		X	X								X		X	X	X	X		X		X					
<u>Olivella</u> 2b beads	1							1	1																
<u>Haliotis</u> 1a beads					6	4				3					1								1		
<u>Haliotis</u> ornament C(2)1a																									
<u>Haliotis</u> ornament fragment																									

TABLE 11 (continued)

DISTRIBUTION OF GRAVE GOODS FOR BURIALS OF THE WINDMILLER CULTURE (INCLUDING THREE CACHES), Site Sac-168B.

Trait	BURIALS						CACHES			GRAND TOTAL BURIALS AND CACHES
	F.1	F.8	F.13	F.14	F.16	Total Burials	F.4	F.9	F.12	
Extended on face										20
Extended on back										4
Extended on left side										1
Disturbed		X	X	X	X					6
Oriented W										8
Oriented SW (WSW)										16
Oriented SE (SSE)										2
Unknown	X	X	X	X	X					7
Skull missing										6
Skeleton _very_ incomp.										14
Isolated skull		X	X	X	X					5*
No associations		X		X	X					13
Olivella 2b beads						3^{3}				3^{3}
Haliotis 1a beads						15^{5}				15^{5}
Haliotis ornament C(2)1a			1			1^{1}				1^{1}
Haliotis ornament fragment			1			1^{1}				1^{1}

Superscript numbers in total column indicate number of grave occurrences.

TABLE 11 (continued)

DISTRIBUTION OF GRAVE GOODS FOR BURIALS OF THE WINDMILLER CULTURE (INCLUDING THREE CACHES), Site Sac-168B.

Trait	BURIALS						CACHES			GRAND TOTAL BURIALS AND CACHES
	F.1	F.8	F.13	F.14	F.16	Total Burials	F.4	F.9	F.12	
Baked clay objects						7^{5}		14		21^{6}
Unshaped						1^{1}		1		2^{2}
Disc/ball						2^{1}		6		8^{3}
Biconical						1^{1}				1^{1}
Smooth fragment						2^{2}		7		9^{2}
Bowl fragment						1^{1}				1^{1}
Turtle shell ornament						1^{1}				1^{1}
Charmstones (Total)	6					17^{9}			4	21^{10}
A1a						1^{1}				1^{1}
A1b1						4^{3}			1	5^{4}
A2a1									1	1^{1}
A3b									1	1^{1}
A3c									1	1^{1}
B1a1						1^{1}				1^{1}
B1a3						2^{2}				2^{2}
B1b2	3					4^{2}				4^{2}
B1b3	3					3^{1}				3^{1}
B2						1^{1}				1^{1}
B4a						1^{1}				1^{1}
Point type 3b										1^{1}
Unclass. point type						3^{3}				3^{3}
Red ochre						2^{1}			1**	2^{1}
Mortar (rim frag.)						1^{1}				1^{1}
Pestle fragment						1^{1}				1^{1}
Slate pencil						1^{1}				1^{1}
Unworked pebbles							25			25^{1}
Total Artifacts Per Burial							25	13	4	

Superscript numbers in total column indicate number of grave occurrences.

* Scapula present in B25. ** Red ochre on charmstone.

TABLE 11 (continued)

DISTRIBUTION OF GRAVE GOODS FOR BURIALS OF THE WINDMILLER CULTURE (INCLUDING THREE CACHES), Site Sac-168B.

Trait	BURIALS																							
	4	5	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Baked clay objects					1		3					1									1	1			
Unshaped							1																		
Disc/ball												1										1			
Biconical					1																				
Smooth fragment							2																		
Bowl fragment																					1				
Turtle shell ornament												1													
Charmstones (Total)			1		2	1						1						1	3				1		1
A1a																									1
A1b1					2							1						1							
A2a1																									
A3b																									
A3c																									
B1a1																			1						
B1a3																			1				1		
B1b2			1																						
B1b3																									
B2																			1						
B4a						1																			
Point type 3b																					1				
Unclass. point tip							1			1														1	
Red ochre																			1				1**		
Mortar (rim frag.)																	1								
Pestle fragment				1																					
Slate pencil																	1								
Unworked pebbles																									
Total Artifacts Per Burial	1			1	1	11	4	1	1	3		3					2	1	4		2	1	2	1	1

* Scapula present in B25.

** Red ochre on charmstone.

TABLE 12

CHARMSTONE RAW MATERIAL FROM Sac-168B

Material	A1a	A1b1	A2a1	A2b	A3a	A3b	A3c	B1a1	B1a2	B1a3	B1b2	B1b3	B2	B4a	C1b	C1c	E1	E2	Total	Percent
Schist	1^{1}	11^{5}	9^{1}	1		1^{1}	2^{1}			1^{1}		1					1	2	30^{10}	61.2
(blue)	(1^{1})	(9^{4})	(9^{1})	(1)		(1^{1})	(1)										(1)	(1)	(24^{7})	(49.0)
(blue-black)		(2^{1})					(1^{1})											(1)	(4^{2})	(8.2)
(greenish-grey)										(1^{1})									(1^{1})	(2.0)
(blackish-grey)												(1)							(1)	(2.0)
Serpentine											4^{4}	3^{3}	1^{1}						8^{8}	16.3
Gabbro												3				1			4	8.2
Transluscent marble					1			1^{1}	1	1^{1}				1^{1}					5^{3}	10.2
Granite rock (Andesite ?)															2				2	4.1
TOTAL	1^{1}	11^{5}	9^{1}	1	1	1^{1}	2^{1}	1^{1}	1	2^{2}	4^{4}	7^{3}	1^{1}	1^{1}	2	1	1	2	49^{21}	100.0

Superscript entries indicate number of specimens found with 9 burials and 1 cache.

TABLE 13

SIZE RANGE IN mm. OF CHARMSTONES FROM Sac-168B

Type	Length		Maximum Width		Maximum Thickness		Total Number of Specimens
	Range	Average	Range	Average	Range	Average	
A1a	222		42		?		1
A1b1	230-298	267^{3}	25-30	27^{7}	15-19	17^{7}	11
A2a1	192-281	231^{5}	29-31	29.5^{6}	15-19	17^{5}	9
A2b	152		37		17		1
A3a	302		39		25		1
A3b	215		29		15		1
A3c	$136\text{-}145^{R}$	140.5^{2}	33-34	33.5^{2}	23	23^{2}	2
B1a1	165		31		38		1
B1a2	108		35		31		1
B1a3	163-172	167.5^{2}	37-33	35^{2}	25-20	22.5^{2}	2
B1b2	187-238	206^{4}	27-28	27.5^{4}	27-28	27.5^{4}	4
B1b3	$115^{R}\text{-}142$	130^{4}	28-33	31^{4}	28-34	31^{4}	7
B2	102		45		28		1
B4a	115		28		27		1
C1b	125		35		33		2
C1c	86		40		38		1
E1	188^{R}		25		21		1
E2	194^{R}		27 center 30 end		19		2
							49

Superscript entries indicate number of specimens measured.

R indicates reconstruction based on symmetry (4 specimens only).

TABLE 14

SIZE AND MATERIAL OF PROJECTILE POINTS FROM Sac-168B

Type	Length	Width	Thickness	Number	Obsidian	Slate	Chert	Basalt	Quartz Crystals
1 (NAa)	45-68	12-17	9	3	3				
2 (NAb1)	33-?45	24-29	5-11	2	2				
3a (NAb2)	60-68	26-30	7-9	3	1	1			1
3b (NAb3)	66	37	10	1^{1}	1				
5a (SAa)	39-96	18-36	6-10	6			1	4	1
5b (SAb)	43	23	4			1			
7a (SBa)	?60-?85	19-34	4-8	2		1		1	
7b (SCa1)	53	23	8	1			1		
7c (SCa2)	?	27	3	1		1			
7d (SCa3)	50	27	6	1	1				
Fragments				19^{1}	12	4	3		
Totals				41	20	8	5	5	2

Superscript = number of burials containing points.

TABLE 15

HORIZONTAL DISTRIBUTION OF VARIOUS BURIAL POSITIONS
UCAS EXCAVATIONS , SJo-68.

Trenches	Burial Position**									Total
	EVW	EVO	EDW	EDO	ESW	ESO	FlexW	FlexO	Dis-turbed	
A-E	8+2*	1	6	2	1	1	1	2	1	25
F-J	18+1*	1	14	2		1		2	6	45
K-O	18	5	4+1*					1	5	34
Provenience lost	10		1						1	12
Total	57	7	26	4	1	2	1	5	13	116*

TABLE 16

VERTICAL DISTRIBUTION OF VARIOUS BURIAL POSITIONS
UCAS EXCAVATIONS , SJo-68.

Depth	Burial Position**									Total
	EVW	EVO	EDW	EDO	ESW	ESO	FlexW	FlexO	Dis-turbed	
0-30"	43+3*	1	8	1		1		1	7	64
30-60"	11	6	17+1*	3	1	1	1	4	6	52
Total	57	7	26	4	1	2	1	5	13	116

* Includes 4 additional individuals from multiple burials (numbers 33, 62, and 106).

** EVW = extended ventrally west
EVO = extended ventrally in a direction other than west
EDW = extended dorsally west
EDO = extended dorsally in a direction other than west
ESW = extended side west
ESO = extended side in a direction other than west
FlexW = flexed west
FlexO = flexed in a direction other than west.

TABLE 17

DEPTH AND HORIZONTAL PROVENIENCE OF EXTENDED VENTRAL BURIALS
UCAS EXCAVATIONS, SJo-68.

Depth	Trenches				Total
	A-E	F-J	K-O	No Loc.	
0-30"	5+2*	15+1*	16	9	48
30-60"	5	4	6	1	16
Total	12	20	22	10	64

TABLE 18

DEPTH AND HORIZONTAL PROVENIENCE OF EXTENDED DORSAL BURIALS
UCAS EXCAVATIONS, SJo-68.

Depth	Trenches				Total
	A-E	F-J	K-O	No Loc.	
0-30"	3	4	1	1	9
30-60"	4	13	3+1*		21
Total	7	17	5	1	30

* Includes 4 additional individuals from multiple burials (numbers 33, 62, and 106).

TABLE 19a

HORIZONTAL DISTRIBUTION OF GRAVES

UCAS Excavations, SJo-68.

Trenches	Total Number of Burials	Burials With Artifacts		Burials Without Artifacts		Burials With Ochre Only	
		Percent	Number	Percent	Number	Percent	Number
A-E N1-2	20	50	10	40	8	10	2
A-E N3-4	1	100	1				
A-E S1-2	3	33	1	67	2		
F-J N1-2	16	50	8	44	7	6	1
F-J N3-4	19	79	15	16	3	5	1
F-J S1-2	10	33	3	50	5	17	2
K-O N1-2	13	77	10	23	3		
K-O N3-4	12	58	7	42	5		
K-O S1-2	7	29	2	71	5		
No Provenience	12	33	4	58	7	8	1
Totals	113	54	61	40	45	6	7

TABLE 19b

HORIZONTAL DISTRIBUTION OF BURIALS

Dawson Excavation, 1923, Site SJo-68

Horizontal Provenience of Burials	With Artifacts	Questionable Association	Without Artifacts
A-E N1-2	0	0	Not Recorded
A-E S1-2	1	0	
F-J N1-2	24	0	
F-J S1-2	2	1	
K-O N1-2	33	6	
K-O S1-2	12	1	

Charts 19a and 19b show the horizontal distribution of burials excavated from SJo-68. The UCAS excavators completely explored the undisturbed northwestern section of the mound. Burials from these excavations occur most frequently in the central and eastern section of the mound. Dawson's excavations add to the number of burials from the north-central and eastern sections.

TABLE 20

VERTICAL DISTRIBUTION OF GRAVES BY 12-INCH LEVELS, Site SJo-68.

University of California 1938-1947		Dawson 1923
0-11"	9	16
12-23"	30	39
24-35"	30	12
36-47"	33	0
48-60"	11	0
Unknown depth		8

TABLE 21

HORIZONTAL VERSUS VERTICAL DISTRIBUTION IN THE UNIVERSITY OF CALIFORNIA EXCAVATION, Site SJo-68

	AE/N1-2	AE/N3-4	AE/S1-2	FJ/N1-2	FJ/N3-4	FJ/S1-2	KO/N1-2	KO/N3-4	KO/S1-2	No Loc.
Shallow 0-30"	8	1	0	5	10	6	11	8	4	4
Deep 30-60"	12	0	3	11	9	4	2	4	3	0

TABLE 22

DISTRIBUTION OF BURIAL POSITIONS BY SEX*, SJo-68

Sex	Burial Position**									Total
	EVW	EVO	EDW	EDO	ESW	ESO	FlexW	FlexO	Dis-turbed	
Male	25	3	12	1	1	2		1	5	50
Female	20		8					4		32
Sex Unknown	13	2	8	1	1		1	1	21	48
Total	58	5	28	2	2	2	1	6	26	130

*The 24 individuals unaccounted for are too fragmentary to identify either sex or age and are without provenience.

**cf. Table 15.

TABLE 23

HORIZONTAL DISTRIBUTION BY SEX, SJo-68

Sex	Trenches				Total
	A-E	F-J	K-O	No Loc.	
Male	11	24	10	5	50
Female	12	7	8	5	32
Sex Unknown	10	19	14	5	48
Total	33	50	32	15	130

TABLE 24

VERTICAL DISTRIBUTION BY SEX, SJo-68

Sex	Depth	
	0-30"	30-60"
Male	25	25
Female	20	12
Sex Unknown	17	31
Total	62	68

TABLE 25

AGE GROUPINGS BY SEX, SJo-68
(Adapted from Brabender, 1963:7)

Sex	Foetus	0-1	1-18	19-20	21-34	35-54	+55	Unclassified	Total
Male					(4.5) 7	(12.3%) 19	(5.8%) 9	(1.9%) 3	(24.7%) 38
Female					(7.1%) 11	(12.9%) 20	(5.2%) 8	(0.6%) 1	(26.0%) 40
Sex Unknown	(1.3%) 2	(3.9%) 6	(19.5%) 30	(4.5%) 7	(1.3%) 2		(1.9%) 3	(16.9%) 26	(49.3%) 76
Total	(1.3%) 2	(3.9%) 6	(19.5%) 30	(4.5%) 7	(12.9%) 20	(25.2%) 39	(12.9%) 20	(19.5%) 30	(100%) 154

TABLE 26

GENERAL ARTHRITIC CHANGES IN SJo-68 AND Ala-328

	Age Groups			Unclassi-fied Adult	Adult Total	Percent Affected By Sex
	Young Adult 20-34	Middle-Aged Adult 35-54	Old Adult +55			
Male	1*(1)**	6 (8)	6 (5)	0 (2)	13 (16)	34.2% (24.2%)
Female	4 (7)	9 (5)	5 (2)	0 (3)	18 (17)	45.0% (21.7%)
Sex Unknown	1 (1)	0 (1)	0 (2)	3 (3)	4 (7)	12.9% (11.3%)
Total Number	6 (9)	15 (14)	11 (9)	3 (8)	35 (40)	

*SJo-68. **(Ala-328). (Brabender, 1963:9)

TABLE 27

Spondylitis Deformans (OSTEO-ARTHRITIS) IN SJo-68 AND Ala-328

	Age Groups			Unclassi-fied Adult	Adult Total	Percent Affected By Sex
	Young Adult 20-34	Middle-Aged Adult 35-54	Old Adult +55			
Male	2*(6)**	14 (15)	7 (5)	0 (8)	23 (35)	60.5% (53.0%)
Female	8 (11)	13 (13)	6 (6)	0 (11)	27 (41)	67.5% (52.5%)
Sex Unknown	0 (2)	0 (3)	1 (2)	3 (10)	4 (17)	12.9% (27.4%)
Total Number	10 (19)	27 (31)	14 (14)	3 (29)	54 (93)	

*SJo-68. **(Ala-328). (Brabender, 1963:9)

TABLE 28

AGE GROUPINGS BY SEX, SJo-68
(1966 Analysis by James Cadien)

Sex	0-6	6-12	12-21	21-45	50+	Unclassified	Total
Male			6(3.9%)	37(24.0%)	7(4.5%)		50 (32.5%)
Female			3(1.9%)	22(14.3%)	7(4.5%)		32 (20.0%)
Sex Unknown	16(10.4%)	9(5.8%)	5(3.2%)	15(9.7%)	3(1.9%)	24 (15.6%)	72 (46.7%)
Total	16(10.4%)	9(5.8%)	14(9.1%)	74(48.0%)	17(11.0%)	24 (15.6%)	154

TABLE 29

THE PERCENTAGE OF DEATHS BY AGE GROUP IN SJo-68, Ala-328, SAN JOAQUIN COUNTY, AND ALAMEDA COUNTY[1]

	Under 1 year	1-19 yrs.	20-34	35-54	55+yrs	Unclassified Adult
SJo-68	5.2%	24.0%	13.0%	25.3%	13.0%	19.5%
Ala-328	10.2%	31.4%	15.9%	15.3%	5.4%	21.8%
San Joaquin[*] County, 1959	5.5%	2.5%	3.0%	15.5%	73.5%	
Alameda[*] County, 1959	6.0%	2.5%	2.7%	13.8%	75.0%	

[*] Table 14 of the Public Health Statistical Report, 1959.

[1] From Brabender 1963.

TABLE 30

PERCENTAGE DISTRIBUTION OF DEATHS BY BROAD AGE GROUPS IN ABORIGINAL AND MODERN POPULATIONS

(Adapted from Cook, 1947:86-87)

Population[1]	0-19	20-50	50+	0-9	10-19	20-40	40+	Total Individuals
Aboriginal								
W. African Negro	19.0	70.8	10.1			60.8	20.1	189
Tasmanians	37.5	46.9	16.6	3.1	34.4	40.6	21.9	32
Madisonville, Ohio	38.8			35.1	3.7			521
Hamilton Co., Ohio	24.7	52.1	23.3	13.7	11.0			73
California	22.6	76.2	3.2	11.4	11.2	65.9	13.4	537
Swartz ruin, New Mexico	48.6			45.7	2.9			1,009
Pecos, New Mexico	15.0	47.5	37.5	6.1	8.9	24.2	60.8	587
Indians, Valley of Mexico	23.9	59.4	15.7					138
SJo-68, Calif. (2,500 B.C.)	25.0	39.0	12.0	16.0	9.0	48.0	12.0	154
Ala-328, Calif. (386 B.C. - 1700 A.D.)[2]	41.6	31.2	5.4			36.6		
Modern Groups								
California Missions ca. 1800 A.D.	35.9	24.6	39.8	18.3	17.6	19.1	45.3	1,378
Hupa Agency, Calif. 1887	56.2	11.9	31.8	30.0	20.2	2.5	41.2	460
Calif. Mission Agency, 1902	29.0	31.5	38.1			20.0	49.6	2,487
Carson Agency, Nevada, 1902	47.6	9.3	42.2	30.4	17.2	4.4	47.1	1,080
California, 1928	29.5	39.3	29.9	19.9	9.6	29.5	39.7	22,050

[1] Both men and women included in counts.

[2] Heizer, 1958:4.

TABLE 31

COMPARATIVE POPULATION BREAKDOWN OF SJo-68 AND AN EASTERN ARCHAIC SITE, INDIAN KNOLL

Age	0-9	10-19	20-44	45+
Indian Knoll**	303 35%	112 13%	443 51%	10 1%
Age	0-12	13-20	21-49	50+
SJo-68*	25 16%	14 9%	61 40%	18 12%

* Divided by 154, the number of skeletons in the collection. Unclassified skeletons are probably those of adults or old people.

** From Tables 1 and 2, Johnston and Snow, 1961:240-241. Divided by 873.

TABLE 32

VERTICAL DISTRIBUTION OF AGE GROUPS

	DEPTH					
	Total Burials		With Artifacts		TOTALS	
Age	Shallow Graves 0-30"	Deep Graves 30-60"	Shallow Graves 0-30"	Deep Graves 30-60"	With Artifacts	Burials
0-6 yrs.	14	2	9	2		
6-12 yrs.	3	3	0	3		
12-21 yrs.	7	7	7	3		
21-45 yrs.	32	28	20	16		
+50 yrs.	9	8	4	2		
Unknown*			1	0		
TOTALS	65	48	41	26	67	113

*Burial No. 12.

TABLE 33

DISTRIBUTION OF GRAVE GOODS WITH SKELETONS IN VARIOUS BURIAL POSITIONS
UCAS EXCAVATION OF SJo-68

Possession of Artifacts	Burial Positions									Total
	EVW	EVO	EDW	EDO	ESW	ESO	FlexW	FlexO	Dis-turbed	
With	37	2	18	2		1		1	6	67
Without	18	3	9		2	1	1	5	7	46

TABLE 34

ARTIFACT DISTRIBUTION IN GRAVES BY DEPTH
UCAS EXCAVATION OF SJo-68

Depth	Possession of Artifacts.		Total
	With	Without	
0-30"	42	23	65
30-60"	25	23	48
Total	67	46	
Transitional zone 31-35"	8	4	12

TABLE 35

HORIZONTAL DISTRIBUTION OF GRAVES
WITH AND WITHOUT ARTIFACTS
UCAS EXCAVATION OF SJo-68

Possession of Artifacts	Horizontal Provenience				Total
	A-E	F-J	K-O	No Loc.	
With	14	30	18	5	67
Without	10	18	12	6	46
With Ochre Alone	2	4		1	7

TABLE 36

ARTIFACTS DISTRIBUTION ACCORDING TO SEX OF INTERMENT
UCAS EXCAVATION OF SJo-68

Possession of Artifacts	Sex		
	Male	Female	Unknown
With	31	14	22
Without	14	16	16
With Ochre Only	2	0	5

TABLE 37a

ARTIFACT DISTRIBUTION ACCORDING TO AGE
UCAS EXCAVATION OF SJo-68

Possession of Artifacts	Age						Total
	?	0-6	6-12	12-21	21-50	50+	
With	1	10	4	10	37	5	67
Without	0	4	4	3	25	10	46
Total	1	14	8	13	62	15	113

TABLE 37b

BURIAL POSITION ACCORDING TO AGE OF INTERMENT
UCAS EXCAVATION OF SJo-68

Burial Position	Age						Total
	0-6	6-12	12-21	21-50	50+	Unknown	
EVW	6	2	4	38*	6		56
EVO		1	1	3			5
EDW	2	3	7	10	5		27
EDO	1			1			2
ESW				2			2
ESO			1	1			2
FlexW					1		1
FlexO				3	3		6
Disturbed	5	2		5		1#	13
Disturbed additional burials in graves	2	1		9	2		14
EVW additional burials in graves			1	2			3
Total	16	9	14	74	17	1	131

*Two adult interments in burial no. 106 are counted as separate interments. One is an EVW male and the other an EDW female; both contain mortuary goods, red ochre and a projectile point.

#Burial no. 12 not categorized.

TABLE 38

DISTRIBUTION OF CHARMSTONES IN SJo-68
Windmiller Phase

	Phase 1		Phase 2			Phase 3						Phase 4					Phase 5
Depth in Inches	36-54"		30-36"			24-30"						10-24"					0-10"
Burial Number	23	24	6+	67	75	62a*	66	79	87	D24	73	10	12	88	D15	D16	D34
D9																	1
B3															1		
B1b3										(?)					1	6	
D8													1				
B5b						1								1			
B4b)												1					
) may																	
B1a3) be							1										
B1b1											1						
C1b									2		1						
C1a								1	3								
C1c					1												
C1d				4													
C2c		3						2									
C2b	2	17	?	3				3									
C2a	1	3			1												
C3a	1	1		1													
C3b	2	7															
C3c		1															
C4a1	1																
A5	1																

* Burial Number 62a may be intrusive from Phase 4.

+ Artifacts from Burial Number 6 were lost in a fire which destroyed the field camp.

TABLE 39

CHARMSTONE MATERIAL IN SJo-68[a]

	A5	B1a3	B1b1	B1b3	B3	B4b	B5b	C1a	C1b	C1c	C1d	C2a	C2b	C2c	C3a	C3b	C3c	C4a1	D8	D9	Unclass.	Total
Transluscent marble		1				1^{1}	2^{2}				2^{2}	11^{2}		1^{1}	2^{1}							
Serpentine					1^{1}								1^{1}	1^{1}								
Gabbro				1^{1}									2^{1}			1^{1}						
Schist	1^{1}		1^{1}	5^{1}				1^{1}				1^{1}	1^{1}			1^{1}						
Sandstone																1^{1}		1^{1}			1	
Claystone				1^{1}									3^{1}	1^{1}	1^{1}	2^{2}						
Altered or burned material												2^{2}	1^{1}	2^{1}		1^{1}	1^{1}					
Igneous or metamorphic rock				1				1^{1}	3^{2}	1^{1}	2^{1}		4^{3}	1^{1}								
Porphoritic Igneous								2^{1}			2^{1}		1^{1}			1^{1}						
Crystal and grain quartz													1^{1}						1^{1}	1^{1}		
Unknown material													1^{1}									
TOTAL	1^{1}	1^{1}	1^{1}	7^{2} +1	1^{1}	1^{1}	2^{2}	4^{2}	3^{2}	1^{1}	4^{1}	5^{3}	25^{4}	5^{2}	3^{3}	9^{2}	1^{1}	1^{1}	1^{1}	1^{1}	+1	77^{15} +2

[a]Materials partially identified by Drs. Richard Hay and Howel Williams of the University of California, Berkeley, Department of Geology.

+ = unassociated in the hardpan.

TABLE 40

PROJECTILE POINTS WITH GRAVE ASSOCIATION IN SJo-68

	Phase 5(?)						Phase 4																
Dawson's Grave Lot Number	35	29	12						25	43	8c	36	44	56	15			18	40		13	23	42a
UCAS Burial No.				73	17	19	22	82								39	103			58			
Depth	6-10"						10-24"																
Point Type 3a		1			1					1	2	1		1				1			1		
1	1								1						1						1		
2							1									1		1		1			
7d																							
7c						1																	
6c		1																					
6d																							
5c													1										
5d																							
3b	1		1		1																		
5a																		1					
7a				1																1			
9a																							1
frag.								1			2	1			2		1		2		1	1	
Totals																							
Dawson	2	2	1						1	1	4	2	1	1	3			3	2		3	1	1
UCAS				1	2	1	1	1								1	1			2			

TABLE 40 (continued)

PROJECTILE POINTS WITH GRAVE ASSOCIATIONS IN SJo-68

	Phase 4 (continued)								Phase 3										Phase 2				
Dawson's Grave Lot Number	9	30	45				17		28			6											
UCAS Burial No.				1	80	36		84		46	12		87	89	77	cr4	cr5	16	79	62a	42	105	33
Depth	10-24"								24-30"										30-36"				
Point Type 3a	1	1							1	1		2							1	2			
1					2		5			1		1	1	1						5	1		
2				1			1													2			
7d												1											
7c												1								2			
6c																	1			1			
6d	1																						
5c	1																						
5d												1											
3b																1	3					4	4
5a																	1						
7a					1									2			1	1		2			
9a																							
frag.			1			1		1		2	1	2			1	2	3		2	1			
Totals Dawson	3	1	1				6		1			8											
UCAS				1	3	1		1		4	1		1	3	1	3	9	1	3	15	1	4	4

TABLE 40 (continued)

PROJECTILE POINTS WITH GRAVE ASSOCIATION IN SJo-68

	Phase 2 (cont.)					Phase 1										No Provenience					
Dawson's Grave Lot Number	26						27									14		63	67	70	71
UCAS Burial No.		75	6	78	37	106		60	70	91	23	24	cr1	cr3	29		N/N2				
Depth	30-36"					36-53"										No depth					
Point Type																					
3a		1																			
1														1						1	
2										1							1				
7d																					
7c																					
6c												1						1			
6d																					
5c											2		3								
5d																					
3b	1	1		3		1					1	1	7			1					
5a							1	1	1			2	3		1				1		
7a											1	1			2						
9a																					
frag.					1						1		4		1						1
Totals																					
Dawson	1						1									1					
UCAS		1		3	1	1		1	1	1	5	5	17	1	4		1				

Dawson grave lot 73 = 42b original notes.
Dawson grave lot 42 = 42a original notes.
Dawson grave lots 74 and 75 = 42c original notes.

Circled numbers are not in the collection but are recorded in Dawson's original field notes. They are not included in the totals.

TABLE 41

DISTRIBUTION OF POINTS BY AGE AND SEX
IN THE UCAS BURIALS, SJo-68

Age	No.	% of Burials With Points**	Sex	No.	% of Burials With Points*
0-6 yrs.	2	5.9	Male	18	47.4
6-12 yrs.	1	2.9	Female	7	18.4
12-21 yrs.	5	14.8	Sex unknown	13*	34.2
21-49 yrs.	22	64.8	Total graves	38	
50+	4	11.8			

* Including four cremations

** Not including four cremations

TABLE 42

RAW MATERIAL OF TOTAL PROJECTILE POINTS FROM SJo-68

Types	1	2	3a	3b	4a	5a	5c	5d	6c	7a	7c	7d	7e	9a	9b	Misc.	Fragments
Obsidian	34	28	47	38	1	13	8	1	7	8	1	1	1	3		2	108
Chert	2	1	2				1		3	5	5				1		5
Schist	5		1			3			1	3						1	7
Quartzite	2	1							1								4
Basalt	1					1											2
Petrified Wood	2																

TABLE 43

VERTICAL DISTRIBUTION OF UNASSOCIATED POINTS FROM SJo-68

	0-6"	6-12"	12-18"	18-24"	24-30"	30-36"	36-42"	42-48"	48-64"	No Loc.	Total
3a	1	1	10	4	7	1				9	33
1	1	1	3	4	3	2	1		1	8	24
2	2	4	5	3	1		1	1		5	22
6c		2		1	1		1			2	7
7c			1							1	2
7d											0
5c										3	3
5d										2	2
3b		2	1		1					3	7
7a		2			1				1	1	5
5a		3			1					5	9
9b									1		1
9a						1				1	2
4a										1	1
Miscellaneous				1			1			1	3
Fragment	5	17	17	4	9	2	2	1	2	40	98

TABLE 44

HORIZONTAL DISTRIBUTION OF UNASSOCIATED POINTS FROM SJo-68

Types	1	2	3a	3b	4a	5a	5c	5d	6c	7a	7c	7d	9a	9b	Misc.	Fragments
A-E	7	12	15	3		3			3	3	2		1			38
F-J	7	4	10	1		2			3	2				1	2	33
K-O	4	2	1	1	1	1	1									8
No Loc.	6	4	7			3	2	2	1				1		1	20
Totals	24	22	33	5	1	9	3	2	7	5	2	0	2	1	3	99

TABLE 45

VERTICAL DISTRIBUTION OF OBSIDIAN AND NON-OBSIDIAN POINTS, SJo-68.

	Points in Graves		Unassociated Points	
	Obsidian	Non-obsidian	Obsidian	Non-obsidian
0-6	2		8	
6-12	6	1	31	1
12-18	16	5	34	4
18-24	13	6	24	3
24-30	21	19	21	4
30-36	18	12	4	2
36-42	7		4	1
42-48	25	1	2	1
48-54	4	1	1	1
54-60	1		2	1
Unknown	2		72	6

TABLE 46a

BONE TOOLS IN SJo-68 UCAS GRAVES

UCAS BURIAL NOS.	Antler Flaker	Teeth	Claws	Birdbone Tube	Bird Wishbone	Misc. Bone	Bone Awls	Antler Points	Gorge Hook	Bone Points	Beaver Mandible	Bone Fishhook	Antler Wand	Sweat Scraper	Canis Skull	Charmstones	Points	Ochre	Shell Beads	Shell Urns	Slate Rods	Quartz Crystals
Phase 5																						
22 (11")	1																1	X				
Phase 4																						
5 (19")							1															
86 (19")		6																				
88 (22")					1											1	4		3?	2		16
84 (23")			1														1			11		
Phase 3																						
73 (28")	1						1									2				36		11
62a# (32")			1		1	1	1									1	15		47 (H) 391 (O)	4	1	5
Phase 2																						
9 (35")		1									1											
67 (36")							1									8		X	97 (H) 123 (O)			5
6 (37")				1	1		1	6	1		2	1				1						
Phase 1																						
49 (44")											1		1					X	20? (H.1a)	8		
60 (44")							2										1	X	60 (H.1a)			
51 (46")														1					21 (H.b)	5		
38 (47")															1							
Cr1 (50")							1	6		1							18					
No. of Bur.	2	2	2	1	3	2	7	2	1	1	3	1	1	1	1	5	6	4	6	6	1	4
No. of Spec.	2	7	2	1	3	3	8	12	1	1	3	1	1	1	1							
	T	C	C	C	C	T	T	T	T	T	C	T	C	C	C							

T = Tool. C = Ceremonial object.

TABLE 46b

BONE TOOLS IN DAWSON'S GRAVE LOTS, SJo-68

DAWSON'S GRAVE LOTS		Bone Chisel Gouge	Turtle Shell	Antler Flaker	Teeth	Claws	Bird Wishbone	Miscellaneous Worked Bone	Awls	Birdbone Tubes	Bone Points	Beaver Mandible	Points									Quartz Crystals	Pencils	Shell Beads	Shell Ornaments
													1	2	3a	3b	5a	7d	7c	5c	Fragments				
8"	12		1													1							4		
10"	47		1																						
11"	11				1																			165 O. 2b 120 H. 1a 112 O. 1a	2
11"	20				20																				
12"	38						64																	239 O. 1a 125 H. 1a	20
12"	39						1	1																	
12"	53	1																							
12-24"	60				1																				
12"	62		1			1			1															7 H. 1a 350 O. 1a	5
16"	50	1																							
16"	40				5																2	1		1 O. 1a	
16"	18	2	1											1	1		1							3 O. 1a	
18"	61		1																					40 O. 1a 14 H. 1a	2
18"	57				2																				
18"	13											1	1	1							1			927 O. 1a	2

TABLE 46b (continued)

BONE TOOLS IN DAWSON'S GRAVE LOTS, SJo-68

DAWSON'S GRAVE LOTS		Bone Chisel Gouge	Turtle Shell	Antler Flaker	Teeth	Claws	Bird Wishbone	Miscellaneous Worked Bone	Awls	Birdbone Tubes	Bone Points	Beaver Mandible	Points									Quartz Crystals	Pencils	Shell Beads	Shell Ornaments
													1	2	3a	3b	5a	7d	7c	5c	Fragments				
18"	2									3												9			
18"	23							1																188 O. 1a 322 H. 1a	5
18-20"	17				1				1				5	1								21		1 H. 1a	
24"	28								1						1										
27"	6				11								1		2			1	1	1	2			510 O. 1a	32
36"	22					2																2		48 H. 1a	
42"	27				2												1								
?	66								1																
?	14								2	1						1								40 H. 1a	40
Total Burials		3	5	0	8	2	2	2	7	2	0	1	3	3	3	2	2	1	1	1	4	4	1	12	8
Total Specimens		4	5	0	43	3	65	2	8	4	0	1	7	3	4	2	2	1	1	1	6	3	4	3,207	108

TABLE 47

SHELL BEADS AND ASSOCIATED ORNAMENTS IN DAWSON GRAVE LOTS, SJo-68.

Depth	Dawson's Grave Lot Numbers	Beads: Olivella 1a medium	Beads: Olivella 1a small	Beads: Olivella 2b	Beads: Haliotis 2	Beads: Haliotis 1a	Ornaments: C.(2).a	B.1	C.(1)	C.(1).1	C.(2)	C.(2).a	M.F.3	M.E.2	M.E.1	C.(1).c	C.(1).a	C.1	C.3	C.1.n	C.(1).1.a	B.(2).1.1	Amorph. 2.a	B.1.a	B.(1).1	B.1.1	B.2	C.(1).2.a	H.2
Phase 5																													
6"	55				3	25	1																						
8"	32	1	23																										
10"	52		175					2	3	1	4	2	1		1														
10"	21		1						1	1																			
10"	8		136			42																							
11"	11			156		120					1																		
12"	31	3	12	1	3	1																							
12"	38	6	233			125				1	9	4							1										
12"	48			476																									
12"	62		350	1																1									
Phase 4																													
15"	15		187																										
16"	18	3																											
16"	33		322	564		7																							
16"	37		41								4	3																	
16"	40		1																										
18"	3			293		383																							
18"	9		10			230					2			1		1	1	1	1		1								
18"	10		10	10		3															3								
18"	13					927																							
18"	23		188			322			1		2	2																	

TABLE 47 (continued)

SHELL BEADS AND ASSOCIATED ORNAMENTS IN DAWSON GRAVE LOTS. SJo-68.

Depth	Dawson's Grave Lot Numbers	Beads					Ornaments																						
		Olivella 1a medium	Olivella 1a small	Olivella 2b	Haliotis 2	Haliotis 1a	C.(2).a	B.1	C.(1)	C.(1).1	C.(2)	C.(2).a	M.F.3	M.E.2	M.E.1	C.(1).c	C.(1).a	C.1	C.3	C.1.n	C.(1).1.a	B.(2).1.1	Amorph. 2.a	B.1.a	B.(1).1	B.1.1	B.2	C.(1).2.a	H.2
Phase 4 (con't.)																													
18"	30					1																							
18"	41			78		50					36	8																	
18"	49		336		21										1							2							
18"	51		614																										
18"	61		40			14					2																		
18-20"	17					1																							
24"	4					459																							
24"	5		71			647			3		6	7					1	1					1						
24"	7		62								6	7																	
24"	(42c) 74	965	2,407																										
Phase 3																													
24"	(42c) 75			5	1			111	1		4	6						1						1	31	3	1		
27"	6		510					1	2	1	13	9					2	2										1	
30"	24		1																										1
36"	22			48																									
?	14		112			42					2	2								1									

TABLE 48

SHELL BEADS AND OTHER ASSOCIATIONS IN DAWSON GRAVE LOTS, SJo-68.

Depth	Dawson's Grave Lot Numbers	Points									Charmstones Blbl and B3	Clay Pecan	Crystals	Ochre	Slate Rods	Ground Obsidian Awl	Mortar	Stone Disc	Mica Ornaments	Asbestos Splinters	Slate Pendant	Bone
		3a	1	2	7d	7c	6c	5c	5a	Fragment												
6"	55																					
8"	32															1						
10"	52																					
10"	21																					
10	8(a)																					
11"	11																					Teeth
12"	31												2									
12"	38																					64 Bird wishbones
12"	48																					
12"	62																					1 Turtleshell 1 Claw 1 Awl
15"	15		1								2	1										
16"	18	1		1					1													1 Bone chisel 1 Turtleshell 1 Awl
16"	33													1								
16"	37																					
16"	40												1									5 Teeth
18"	3																					
18"	9	1					1	1					6	1				1				

TABLE 48 (continued)

SHELL BEADS AND OTHER ASSOCIATIONS IN DAWSON GRAVE LOTS, SJo-68.

Depth	Dawson's Grave Lot Numbers	Points									Charmstones B1b1 and B3	Clay Pecan	Crystals	Ochre	Slate Rods	Ground Obsidian Awl	Mortar	Stone Disc	Mica Ornaments	Asbestos Splinters	Slate Pendant	Bone
		3a	1	2	7d	7c	6c	5c	5a	Fragment												
18"	10																					
18"	13	1	1							1		1					1	1				1 Beaver mandible
18"	23											1										1 Misc. bone
18"	30	1																				
18"	41																					
18"	49																					
18"	51																					
18"	61																					
18-20"	17												21									1 Tooth 1 Awl
24"	4											2										
24"	5																					
24"	7												1		16				5	6	1	
24"	74																					
24"	75																					
27"	6	2	1		1	1		1		2												11 Teeth
30"	24										2(?)		16									
36"	22												2									2 Claws
?	14	1										1										2 Awls 1 Birdbone tube

TABLE 49

SHELL BEADS AND OTHER ASSOCIATIONS IN U.C.A.S. GRAVES, SJo-68.

	Phase 5				Phase 4				Phase 3					Phase 2							Phase 1				
Depth - Inches UCAS Bur. No.	10" 19	12" 59	12" 82	13" 3	18" 45	18" 104	22" 88	23" 84	26" 10	27" 96	28" 111	28" 73	29" 16	30" 32	31" 79	32" 62a	33" 65	34" 92	36" 67	36" 75	40" 50	44" 49	44" 60	44" 71	46" 51
<u>Olivella</u> 1a small	125	13		1	147	13					1		1			46	35		29						1
<u>Olivella</u> 1a medium												1			4		30		68	1				96	
<u>Olivella</u> 2b	65								47							1									
<u>Haliotis</u> 3								4																	
<u>Haliotis</u> 2					1	2				2															
<u>Haliotis</u> 1a			2			80	3	1				35		89	60	391	31	84	123	2	100	20	60		21
POINTS																									
7c	1															1									
3a															1	2				2					
1																5									
2																2									
6c																1									
7a													1			2									
5a																								1	
Fragments			1					1							2	1									
CHARMSTONES																									
B5b							1									1									
B4b									1																
B1b1												1													
C1b												1													
C1a															1										
C1c																					1				

TABLE 49 (continued)

SHELL BEADS AND OTHER ASSOCIATIONS IN U.C.A.S. GRAVES, SJo-68.

	Phase 5				Phase 4				Phase 3					Phase 2							Phase 1				
Depth - Inches	10"	12"	12"	13"	18"	18"	22"	23"	26"	27"	28"	28"	29"	30"	31"	32"	33"	34"	36"	36"	40"	44"	44"	44"	46"
UCAS Bur. No.	19	59	82	3	45	104	88	84	10	96	111	73	16	32	79	62a	65	92	67	75	50	49	60	71	51
CHARMSTONES (continued)																									
C2c															1										
C2b															1				3						
C1d																			1						
C2a																				1					
C3a																			1						
Quartz crystal	2				32		16	11								5	1		10						
BONE																									
Bird wishbone							1									1									
Claws								1																	
Antler flaker												1													
Awl												1				1			1						
Teeth																1									
Beaver jaw																						1			
Antler "wand"																						1			
Sweat scraper																									1
Miscellaneous worked bone																1									
Ochre			X										X				X		X*			X	X		
SHELL ORNAMENTS																									
B.2	1							1									2								
C.(2).a	1				3					7												6			5
F.2	1																4								

TABLE 49 (continued)

SHELL BEADS AND OTHER ASSOCIATIONS IN U.C.A.S. GRAVES, SJo-68.

	Phase 5				Phase 4				Phase 3					Phase 2							Phase 1				
Depth - Inches	10"	12"	12"	13"	18"	18"	22"	23"	26"	27"	28"	28"	29"	30"	31"	32"	33"	34"	36"	36"	40"	44"	44"	44"	46"
UCAS Bur. No.	19	59	82	3	45	104	88	84	10	96	111	73	16	32	79	62a	65	92	67	75	50	49	50	71	51
SHELL ORNAMENTS (continued)																									
H.2	1																								
B.(1).1					1					2															
C.(2)					4	5	2	1		12						3									
C.(1)						2									1										
C.1						1																			
C.(1).1						1																			
M.E.(1).1						1																			
B.1								3																	
B.2.a								1																	
C.(1).a									1																
F.1																	1								
Segment C.(1).a																									1

*Two red bands painted across the back of the femora.

TABLE 50

HALIOTIS ORNAMENTS BY GRAVE, SJo-68.

Dawson's Grave Lot Numbers	U.C. Bur. Nos.	B.1	B.1.a	B.(1).1	B.1.1	B.2	B.2.a	B.1.1.1.1	B.2.(1).1	C.(1)	C.(1).a	C.(1).n	C.(1).c	C.1	C.(1).1	C.(1).1.a	C.(2)	C.(2).a	C.3	C.(2).1	C.(1).2.a	C.(1).n segment
Phase 5																						
6" 55																		1				
10" 8											1			1			2					
10" 21										1					1							
10" 52		2								3					1		4	2				
	10" 19					1												1				
Phase 4																						
11" 11																	1					
12" 31									1									1				
12" 38															1		9*	4	1			
12" 54										1				1			7	2				
12" 62												1										
	13" 97																5			1		

TABLE 50 (continued)

<u>HALIOTIS</u> ORNAMENTS BY GRAVE, SJo-68.

Dawson's Grave Lot Numbers	U.C. Bur. Nos.	B.1	B.1.a	B.(1).1	B.1.1	B.2	B.2.a	B.1.1.1.1	B.2.(1).1	C.(1)	C.(1).a	C.(1).n	C.(1).c	C.1	C.(1).1	C.(1).1.a	C.(2)	C.(2).a	C.3	C.(2).1	C.(1).2.a	C.(1).n segment
Phase 4 (cont.)																						
16" 37																	4	3				
	16" 48				7			1														
	16" 58																	2				
18" 9											1		1	1		1	2		1			
18" 10																3						
18" 23										1							2	2				
18" 41																	36	8				
18" 49									2													
18" 61(8b)																	2					
	18" 45			1													4	3				
	18" 104									2				1	1		5					
	22" 88																2					

TABLE 50 (continued)

<u>HALIOTIS</u> ORNAMENTS BY GRAVE, SJo-68.

Dawson's Grave Lot Numbers	U.C. Bur. Nos.	B.1	B.1.a	B.(1).1	B.1.1	B.2	B.2.a	B.1.1.1.1	B.2(1).1	C.(1)	C.(1).a	C.(1).n	C.(1).c	C.1	C.(1).1	C.(1).1.a	C.(2)	C.(2).a	C.3	C.(2).1	C.(1).2a	C.(1).n segment
Phase 3																						
	23" 84	3				1	1										1					
24" 5											1			1	3		6	7				
24" 7																	6	7				
24" 75		111	1	31	3	1				1							4	6				
	26" 10										1											
27" 6		1								2	2			2	1		13	9			1	
	27" 96			2													12	7				
Phase 2																						
30" 24																						
	31" 79									1												
	32" 62																3					
	33" 65					2																

TABLE 50 (continued)

<u>HALIOTIS</u> ORNAMENTS BY GRAVE, SJo-68.

Dawson's Grave Lot Numbers	U.C. Bur. Nos.	B.1	B.1.a	B.(1).1	B.1.1	B.2	B.2.a	B.1.1.1.1	B.2.(1).1	C.(1)	C.(1).a	C.(1).n	C.(1).c	C.1	C.(1).1	C.(1).1.a	C.(2)	C.(2).a	C.3	C.(2).1	C.(1).2.a	C.(1).n segment
Phase 1																						
	44" 49																	6				
	46" 51																	5				1
	18" 85	1		3						1		2		1	2							
No depth 14										1							2	2				
No depth 65															1							
	N/N2										1											

TABLE 50 (continued)

HALIOTIS ORNAMENTS BY GRAVE, SJo-68.

Dawson's Grave Lot Numbers	U.C. Bur. Nos.	F.1	F.2	F.2.a	M.F.(2)	M.F.3	M.F.2	H.2	H.3	M.E.1	M.E.(1).1	M.E.(2)	M.E.2	M.B.1	Amorph. 1	Amorph. 2.a
Phase 5																
6" 55																
10" 8																
10" 21																
10" 52						1				1						
	10" 19		1					1								
Phase 4																
11" 11																
12" 31																
12" 38																
12" 54																
12" 62																
	13" 97															

TABLE 50 (continued)

HALIOTIS ORNAMENTS BY GRAVE , SJo-68

Dawson's Grave Lot Numbers	U.C. Bur. Nos.	F.1	F.2	F.2.a	M.F.(2)	M.F.3	M.F.2	H.2	H.3	M.E.1	M.E.(1).1	M.E.(2)	M.E.2	M.B.1	Amorph. 1	Amorph. 2.a
Phase 4 (cont.)																
16" 37																
	16" 48								1							
	16" 58															
18" 9													1			
18" 10																
18" 23																
18" 41																
18" 49										1						
18" 61																
	18" 45															
	18" 104										1					
	22" 88															

TABLE 50 (continued)

HALIOTIS ORNAMENTS BY GRAVE, SJo-68.

Dawson's Grave Lot Numbers	U.C. Bur. Nos.	F.1	F.2	F.2.a	M.F.(2)	M.F.3	M.F.2	H.2	H.3	M.E.1	M.E.(1).1	M.E.(2)	M.E.2	M.B.1	Amorph. 1	Amorph. 2.a
Phase 3																
	23" 84															
24" 5																1
24" 7																
24" 75				2				1				1		1	1	
	26" 10															
27" 6																
	27" 96															
Phase 2																
30" 24								1								
	31" 79															
	32" 62															
	33" 65	1		4												

TABLE 50 (continued)

HALIOTIS ORNAMENTS BY GRAVE, SJo-68.

Dawson's Grave Lot Numbers	U.C. Bur. Nos.	F.1	F.2	F.2.a	M.F.(2)	M.F.3	M.F.2	H.2	H.3	M.E.1	M.E.(1).1	M.E.(2)	M.E.2	M.B.1	Amorph. 1	Amorph. 2.a
Phase 1																
	44" 49															
	46" 51															
	18" 85															
No depth 14																
No depth 65																
	N/N2															

* 1-55156 has a *Haliotis* 1a bead glued on edge.

TABLE 51

OTHER ASSOCIATIONS OF U.C.A.S. GRAVES WITH <u>HALIOTIS</u> ORNAMENTS.. SJo-68.

U.C. Burial Nos.	Depth in Inches	Sex			Burial Position			Age					Shell Beads	Charmstones					Points						Fragments	Quartz Crystals
		Male	Female	Unknown	EVW	EDW	Disturbed	0-6	6-12	12-21	21-50	50+		B5bc	B4b	C1a	C2c	C2b	7c	2	7a	3a	1	6c		
Phase 5																										
19	10"		X		X						X		X						1							2
Phase 4																										
97	13"	X				X					X															
48	16"	X			X							X														19
58	16"	X			X						X									1	1					1
45	18"	X			X						X		X													32
104	18"			X			X				?		X													
88	22"		?		X					X			X	1												16
Phase 3																										
84	23"	X			X						X		X		1										1	11
10	26"	X			X						X		X													
96	27"	X			X							X	X													
Phase 2																										
79	31"	X			X						X		X			1	1	1				1			2	
62a	32"	X			X						X		X	1					2	2	2	2	5	1	1	5
Phase 1																										
65	33"			X		X			X				X													1
49	44"	X				X					X		X													
51	46"	X			X						X		X													
85	48"	X			X						X															
N/N2	?			X			X																			

TABLE 52

QUARTZ CRYSTALS IN SJo-68 GRAVES

	Phase 5		Phase 4												Phase 3			Phase 2					
Dawson's Grave Lot Numbers	6" 34			12" 62(8c)	12" 1	12" 31	16" 33	16" 40			18" 9		18-20" 17			24" 7	24" 19	30" 24				36" 22	
U.C. Burial Numbers		10" 19	11" 11						16" 48	16" 58		18" 45		22" 88	23" 84				32" 66	32" 62a	33" 65		36" 67
Total Quartz Crystals	19	2	14	1	9	1	1+	1+	19	1	8	33	21	16	11	1	41	16	1	5	1	2	10
>30 mm long	9*	2	3?	.	2	1					2		4	3	3	1	4	2	1	5		1	
15-30 mm long	9		8?	1	6				19	1	4		17	13	8		35	13				1	5
0-14 mm long					1							33					2	1					5
Shell ornaments#		4		1					9	2	8	7		2	5	13		1		3	7		
Shell beadsØ		190		351			893	1		-	240	148	1	3	5	62		1		438	96	48	220
Charmstones																							
D9	1																						
B5b													1							1			
Bla3																			1				
Cld																							4
C2b																							3
C3a																							1
Points																							
7c		1																		2			
3a				2																2			
2										1										2			
7a										1										2			
1																				5			
6c																				1			
Fragments				2				2							1					1			
Worked bone								5					2	1	1					4			1

*One specimen 100 mm long and length unknown. #See Table 49. ØSee Table 47a.

TABLE 53

OCHRE IN SJo-68 GRAVES

	Phase 4						Phase 3		Phase 2				Phase 1										
Depth	11"	12"	13"	15"	16"	20"	27"	29"	32"	32"	33"	36"	37"	37"	44"	44"	44"	44"	45"	47"	47"	47"	53"
University of California Burial Nos.	22	82	14	39	58	43	21	16	52	66	65	67	37	63	107	49	60	70	13	23	24	25	29
Female	?	?						X[1]		X					X								?
Male				X	X		X		X			X	X			X	X	X		X	X		
Unknown or questionable			X			X		X[2]			?			X					X			X	
Age	19-24	50+	25-45	24-30	25-45	1 yr.	19-24	25-45 5-7[2]	25-45	25-45	6-12	25-45	40-50	12-16	25-45	25-45	25-45	21-30	15-18	18-21	21-25	18-21	21-25
Position																							
E.V.W.	X	X	X		X					X										X	X		X
E.D.W.				X				X[1]			X	X			X	X	X	X	X				
E.D.O.						X	X		X				X									X	
Disturbed								X[2]						X									
Ochre Dist.																							
On head		X							X				X	X			X		X		X		
On body			X	?			X	X[2]	X		X					X		X	X		X	?	?
Small amt. on limb	X				X					X					X			X		X			
Painted bands on femora												X											
Total points*	1	1		1	2			1					1				1	1		5	5		5
Charmstones*												8								15	32		
Shell ornaments*					X						X					X							
Qtz crystal*					1					1													
Beads		X						X			X	X				X	X						
Bone	1											1				2	3						

* For further breakdown into types see appropriate tables.

TABLE 54

HORIZONTAL AND VERTICAL DISTRIBUTION OF BAKED-CLAY OBJECTS. SJo-68.

	Clay Objects					
	Round	Cylin-drical	Biconical	Disc	Pecan	Pots
Depth						
No loc.	2	2	3	10	3	2
0-11"			2	1	1	
12-23"		1		5	4	
24-35"			1	1		
36-47"	2	1	1	3	2	
48-59"	2		2			
60+"				2		1
Horizontal Provenience						
A-E	2	1	4	16	7	2
F-J	4	1	2	4	1	1
K-O	1	2	2	2		
No loc.	1		1		2	

Items may have vertical provenience but no noted horizontal provenience. In that case, the item is included in the vertical distribution and is omitted from the horizontal distribution.

TABLE 55

HORIZONTAL AND VERTICAL DISTRIBUTION OF BAKED-CLAY FRAGMENTS, SJo-68.

Horizontal Provenience	Depth					No. Location and Surface
	6-11	12-23	24-35	36-47	48-70	
A-E		3	20		10	103
F-J		4	2	6	1	29
K-O		8	9	4	36	24
No loc.	1				1	32

TABLE 56

VERTICAL DISTRIBUTION OF SURFACE-IMPRESSED BAKED-CLAY FRAGMENTS, SJo-68.

Surface Impression	6-11	12-23	24-35	36-47	48-70	No location and surface
Basketry				3	4	19
Cord or Twine				1	1	6
Twigs or Matting					2	1
Fingernails		3	2	1	2	18
Finger Holes						10
Incised Lines			2			2
Smooth		12	43	3	39	133

TABLE 57

HORIZONTAL AND VERTICAL DISTRIBUTION OF MORTARS AND METATES, SJo-68.

Location	No Depth	DEPTH 0-12"	12-24"	24-36"	36-48"	48-60"
A-E	2		Feature (nos.6,7)/8			1
F-J	1		1	Feature (nos.10,12)/2		
K-O	1		2	4	1	Feature (no.22)/2
No loc.	12					

TABLE 58

HORIZONTAL AND VERTICAL DISTRIBUTION
OF MANOS AND PESTLES, SJo-68.

	A-E	F-J	K-O	No Location
0-12"	2			
12-24"	1	1 (burial no. 23)	1 (burial no. 80)	
24-36"	2	2 (burial nos. 62a and 73)		
36-48"				
48-60"	1 (cremation no. 1)		1	
no depth	1		3	

TABLE 59

HORIZONTAL AND VERTICAL DISTRIBUTION OF WASTE:
FLAKES, FLAKE FRAGMENTS, PEBBLES, SCRAPERS AND CHOPPERS, SJo-68.

	A-E				F-J				K-O				No Location			
	Flake	Pebbles	Scraper	Chopper	Flake	Pebbles	Scraper	Chopper	Flake	Pebbles	Scraper	Chopper	Flake	Pebbles	Scraper	Chopper
0-12				1	1						10					
12-24			1	1			3	1								
24-36	3					5		1	1		1					
36-48			1					1								
48-60			1													
60+												2				
No loc.	24	17	1	2	9	7	2		3	2		1	3	5	3 UCAS* 2 Dawson	1

* UCAS = University of California Archaeological Survey.
Dawson = Dawson SJo-68 Collections.

TABLE 60

WASTE RAW MATERIALS, SJo-68.

	Petrified Wood	Chert	Quartz	Basalt	Schist	Igneous	Obsidian	Questionable
Flakes		19		1	4	13	9	
Chunks		8			1	1		
Pebbles	1	6	11		3	16		1
Choppers		8		2		1		
Scraper		13		2	1	1	2	1
Cores		1					1	

TABLE 61

NUMBERS OF GRAVES IN EACH PHASE
Site SJo-68

Phase	UCAS Graves	Dawson Graves	Total Graves
5	9	12	21
4	30^{+1}	$58^{(?)}$	89
3	18^{+1}	2	21
2	15^{+3}	2	20
1	41	1	42
TOTAL	113^{+5}	75	188^{+5}

+ = Cremations

TABLE 62

ALL IDENTIFIABLE POINTS WITH DEFINITE PROVENIENCE
IN THE WINDMILLER CULTURE

Point Types	Sites						
	SJo-142	Sac-107C	SJo-68B*	Sac-168B	SJo-68A*	SJo-56	SJo-112
1	2		3	2	35	6	
2	3	8	3	2	22	3	3
3a	1	8	1	3	42	3	1
3b		6	27	1	7		
5a	8	11	8	6	5	19	4
5b				1	3		
5c			3				
5d			1	2			
5e	1			1	1	2	
6a	1	1					
6b	1						
6c	1		3		7	7	
7a	4	12	6	1	9	10	1
7b	2	1		1		4	
7c		1		1	5	9	
7d					1		
9a			1		1	1	
9b			1				
Totals	24	48	57	21	138	64	9

Note: The statistical method used refers to these numerous categories of variables for each site as "multinomial populations." SJo-112 is not included in the analysis because the site contains too few points.

*SJo-68A = hardpan(0-30", Phases 5, 4, and 3).
*SJo-68B = brown midden (30" - 60", Phases 2 and 1).

TABLE 63a

FREQUENCY OF MORTUARY GOODS IN GRAVES OF WINDMILLER COMPONENTS[1]

	SJo-68	SJo-68 Dawson's Records	Sac-107C	Sac-168B	SJo-56	SJo-142	SJo-112
Total Burials	113[2]	75	60	25	73	49	50 (?)
Graves w/artifacts	67	66	55	13	48	35	36
Graves w/out artifacts	46	9 (known)	5 (known)	12	25	14	14 (known)
Burial Position							
Extended ventrally	61		46	20	71	43	31
Extended dorsally	28		?	4		2	4
Extended on side	4			1			
Flexed	7		4				4
Disturbed	13		6	1	2	4	11
Orientation							
West/SW	80	75 (?)	46	22	72	46	39
Other than West	27		4	2		3	
Unknown	6		20	1	1		11
Cremations	5		1				
Isolated Skulls	2	25	1				3

[1] Multiple burials have been ignored in the above comparisons; therefore, some dorsal and disturbed burials have not been recorded, as well as many burials without artifacts. F. Dawson estimated that 50% of his graves did not contain artifacts.

[2] See Table 62 for breakdown into Phases.

TABLE 63b

DISTRIBUTION OF ARTIFACTS IN WINDMILLER CULTURE SITES
(Number of graves containing each type)

	SJo-68 Components				Sac-107C	SJo-168		SJo-56	SJo-142	SJo-112
	1	2	3	4/5		b_1	b_2			
Stone ball (ground)								3		
Perforated baked clay disc										
Baked clay "pecan"			4	12						
Baked clay pot	3#					1				
Stone beads					1				1	
Conical pipe									2	
Slate pendant				1				2		3
Slate rods	1		2	3	7		1			6
Quartz crystals			6	17	12			15	15	1
Unworked pebbles					1				7	
Zincblende fragments		1		1						
Mica ornament		1		2	2					2
Asbestos splinters				2	2					1
Obsidian bangles				1	3					
Stone atlatl spur										1
Pestle	X#	X#	X#	X#						
Mano	X#	X#	X#	X#					X#	
Mortar	X#	X#	2X#	X#			1			
Rectangular paint palette					1					
Ochre	11	4	2	8	5		2	5	6	3
Ground stone discs				2						
Bone or horn spatulas*	1			1*	3*			1		
Worked antler tines			1	1	4					2
Bone awls	2	2	2	4	7			4	2	3
Bird wishbones			1	3	2			1	1	1
Bird bone tubes				3	5			1	2	
Human fibula dagger								1		
Human skull recepticle				1#	1					

TABLE 63b (continued)

DISTRIBUTION OF ARTIFACTS IN WINDMILLER CULTURE SITES
(Number of graves containing each type)

	SJo-68 Components				Sac-107C	SJo-168		SJo-56	SJo-142	SJo-112
	1	2	3	4/5		b_1	b_2			
Bone beads									1	
Bone or horn chisel or gouge				3#						
Falcon skull									1	
Canis skull	1									
Beaver mandible	1	2		1				1		
Teeth (drilled*)										
Elk molars		1	2	7	2*			2		
Bear or falcon claws		1	1	2				1		
Antler "wand"	1									
Gorge hook		1			1			1		
Bone fishhook		1								
Bone or antler points	1	1								
Turtle shell pendants				5		1		1		
Miscellaneous bone tools			1	2	1	4				3
Beads					39	4		21	26	26
Olivella 1b								2		3
3e										1
3b					3				1	
2b		1	3	9	9	2		7	8	3
1a	2	5	5	27	16	2	2	8	10	11
Haliotis 3				1	4				2	4
2			1	6	4			3		7
La	4	7	1	22	27			14	20	25
Square bead mussel shell								2		

- occurs unassociated in the mound matrix.

TABLE 64

WINDMILLER CULTURE PROJECTILE POINTS FOUND IN GRAVES

	Equivalent to SJo-68 Components					SJo-68 2,4,5	SJo-68 5(?)	SJo-68 ? 3,4,5				SJo-68 4/5	SJo-68 5
	SJo-68							SJo-56					
	Early	--------------			Late			Early	---------		Late		
	1	2	3	4	5	Sac-107C	Sac-168	E	D	C	B	SJo-142	SJo-112
3a		1^{1}	7^{5}	9^{8}	2^{2}	2^{2}	Contains only one identifiable 3b point associated with a burial. The rest are fragments.		2^{1}			1	1
1	1^{1x}		10^{6}	9^{4}	2^{2}				1^{1}		1^{1}	2	1
2	1^{1x}		2^{1}	7^{6}	1^{1}	4^{4}			2^{1}			1	
7d			1^{1}									1	
7c			3^{2}		1^{1}				5^{1}		5^{2}		
7b											2^{1}	1	
6a												1	
6c	1^{1}		2^{2}		1^{1}	1^{1}			3^{2}		2^{1}	1	
6d				1^{1}									
5c	5^{2}			2^{2}				1^{1}					
5d			1^{1}					1^{1}				2	
5e					1						2^{2}	1#	
7a	4^{3}		6^{4}	2^{2}	1^{1}	5^{5}			5^{2}		2^{1}	3	
3b	9^{3}	10^{5}	4^{2}		$3^{3?}$								1
5a	9^{6}		(1^{1})	(1^{1})		8^{4}		1^{1}	(6^{2})		(10^{4})	(5)	1
9a				2^{2}									
Fragment	6^{3}	1^{1}	14^{8}	16^{11}	1^{1}	$?^{5}$			$?^{1}$			4	
Large ceremonial blade*						1^{1}							

Superscript = number of graves. x = probably intrusive. ( ) = may be 7a or need reclassifying.
# = much larger and cruder than the midden specimen from SJo-68. ? = may be new type.
* = one very large ceremonial blade in Sac-107C is unique.

TABLE 65

CHARMSTONES IN THE WINDMILLER SITES

	SJo-68 Components						SAC-168			SJo-56(1)					
	1	2	3	4/5	SAC-107C	Midden SAC-107C	Midden SAC-168	b2	b1	E	D	C	B - No Charmstones	SJo-142B	SJo-112
Phase 5															
#F1						+1									
#D5					$1^{\underline{1}}$										
#D4						+1									
#E3												$1^{\underline{1}}$			
E1					$1^{\underline{1}}$	+1	+1							+1	
Unclass.												+1			
E2					$2^{\underline{1}}$		+2								
#D6						+1									
#D3					$1^{\underline{1}}$										
#D2												$1^{\underline{1}}$			
D1b															$1^{\underline{1}}$
#D1a					$1^{\underline{1}}$										
*C5						+2									
#C4b						+1									
#C4a2					$1^{\underline{1}}$										
#B7															$3^{\underline{3}}$
*B6						-1									$3^{\underline{2}}$
#D9				$1^{\underline{1}}$											

TABLE 65 (continued)

CHARMSTONES IN THE WINDMILLER SITES

	SJo-68 Components						SAC-168			SJo-56					
	1	2	3	4/5	SAC-107C	Midden SAC-107C	Midden SAC-168	b2	b1	E	D	C	B - No Charmstones	SJo-142B	SJo-112
Phase 4															
*A1b2					$3^{\underline{3}}$										
A1b1					$1^{\underline{1}}$	-1	-4 +2		$5^{\underline{4}}$			$1^{\underline{1}}$			
B2					$9^{\underline{6}}$	+2									
B3				$1^{\underline{1}}$	$9^{\underline{2}}$	+1									
#D7											$1^{\underline{1}}$				
#D8				$1^{\underline{1}}$											
B4a					$1^{\underline{1}}$				$1^{\underline{1}}$					$1^{\underline{1}}$	
*B5a											$3^{\underline{1}}$				
B5b			$1^{\underline{1}}$	$1^{\underline{1}}$							-1				
B4b				$1^{\underline{1}}$							$1^{\underline{1}}$				
#A4b (2)					$1^{\underline{1}}$										
#A4a					$1^{\underline{1}}$										
*A3a							+1								
A3b					$4^{\underline{3}}$	-1	+1								
A3c					$3^{\underline{2}}$	+1	+1	$1^{\underline{1}}$							
A2b					$6^{\underline{3}}$		-1								
*A2a2					$3^{\underline{2}}$	+1									

TABLE 65 (continued)

CHARMSTONES IN THE WINDMILLER SITES

	SJo-68 Components						SAC-168			SJo-56					
	1	2	3	4/5	SAC-107C	Midden SAC-107C	Midden SAC-168	b2	b1	E	D	C	B - No Charmstones	SJo-142B	SJo-112
Phase 4 (continued) A2a1					5^{2}		+4 -4	1^{1}							
B1b3				7^{2}	10^{5}	+1 -1	+3 -1	3^{1}			1^{1}			2^{2}	
B1a1								1^{1}		5^{4}	1^{1}				
Phase 3 B1a2							-1			4^{2}					
*B1b2								4^{2}							
B1b1			1^{1}		1^{1}										
B1a3			1^{1}			+1		2^{2}		2^{1}					
A1a					7^{5}	+1		1^{1}							
*C1b			3^{2}				+1 -1								
C1a			4^{2}												
Phase 2 C1c		1^{1}			1^{1}	-1	+1								
*C1d		4^{1}													

TABLE 65 (continued)

CHARMSTONES IN THE WINDMILLER SITES

	SJo-68 Components				SAC-107C	Midden SAC-107C	SAC-168			SJo-56				SJo-142B	SJo-112
	1	2	3	4/5			Midden SAC-168	b2	b1	E	D	C	B - No Charmstones		
Phase 1															
*C2c	$3^{\underline{1}}$		$2^{\underline{1}}$												
C2b	$19^{\underline{2}(3)}$	$3^{\underline{1}}$	$3^{\underline{1}}$			+1									
C2a	$4^{\underline{2}}$	$1^{\underline{1}}$													
C3a	$2^{\underline{2}}$	$1^{\underline{1}}$			1^{1}	+1									
*C3b	$9^{\underline{2}}$														
C3c ✓	$1^{\underline{1}}$				2^{2}										
#C4a1	$1^{\underline{1}}$														
#A5 ✓	$1^{\underline{1}}$														

[1]SJo-56 phases were established by using the arrangement of burials by depth in Heizer's (1949) Table C and noting changes in points and Charmstones through the sequence: burial numbers 15, 9, 32, 8, 66, 43, 25, 63 in Phase E; burial numbers 44, 14, 45, 53, 12, 53, 45, 14, 44 in Phase D; burial numbers 19, 61, 1, 22, 51, 52, 31, 41, 54, 65, 21, 29 in Phase C; and burial numbers 7, 10, 18, 57, 2, 23, 40, 47, 49, 26, 27, 62, 5, 6, 20, 48 in Phase B. Phase A consists of two intrusive Consumnes Culture burials.

[2]The placement of the A Charmstones in time requires the depths of burials with particular types of charmstones in SAC-107C. This breakdown is not available in the literature.

[3]Including 5 fragments, possibly type C2b.

= unique specimen. + = located in midden w/depth and horizontal provenience.

Superscript = number of burials. - = no provenience. * = single site.

TABLE 66

ABSOLUTE DATES ON BONE AND CHARCOAL FROM THE WINDMILLER CULTURE

Windmiller Component	Ind. Site Phase	Windmiller Phase	Burial Catalog Number	Burial Number	Char-coal	Bone	B.P.	B.C.	Laboratory Sample No.	Sample Submitted	Published References
SJo-56	D	3	12-7016	53		X	2855±115	905	I-2751	1967	Heizer 1949:pl 3
SJo-142		5?	12-5679	18		X	2495±120	545	I-2750a	1967	
SJo-142		5?	12-5676	15		X	2585±100	635	I-2750b	1967	
SJo-142		5?	12-5677	16		X	3445±110	1495	GX-0660	1966	
SJo-68	4/5	4	12-7570	22		X	2980±110	1030	I-3038*	1967	
Sac-107C		?	12-5616	22		X	3075±105	1125	I-2748	1967	
Sac-107C		?	12-5588	8		X	2675±135	725	6X-0659	1966	
Sac-168	B	3?	12-9556	17		X	3070±170	1120	I-3037*	1967	
SJo-68	1	1	12-7571	24		X	3585±110	1635	I-2749a	1967	
SJo-68	1	1	12-7572	23		X	3775±160	1825	I-2749b*	1967	
SJo-68	?	Screened		---	X		4052±160	2102	C-440/522	1956	Heizer 1958
SJo-68	?	Screened		---	X		4100±250	2150	M-645	1957	Heizer 1958
SJo-68	1?		12-7674	Cremation Number 1		X	3080±300	1130	M-646	1957	Heizer 1958
SJo-68	3-1?		12-7676	Cremation Number 3		X	4350±250	2400	M-647	1957	Heizer 1958

*Using 2N NaOH solution to remove humic acids.

Dating was financed by a Graduate Research Council grant 1965-66 and by The University of California Archaeological Research Facility.

The dating of collagen in bone results in dates approximately 500 years younger than the mixed charcoal sample from SJo-68.

Geochron Laboratory cleaned its samples with HCl and recovered collagen in a cold dilute solution of HCl. They did not use NaOH in the cleaning process.

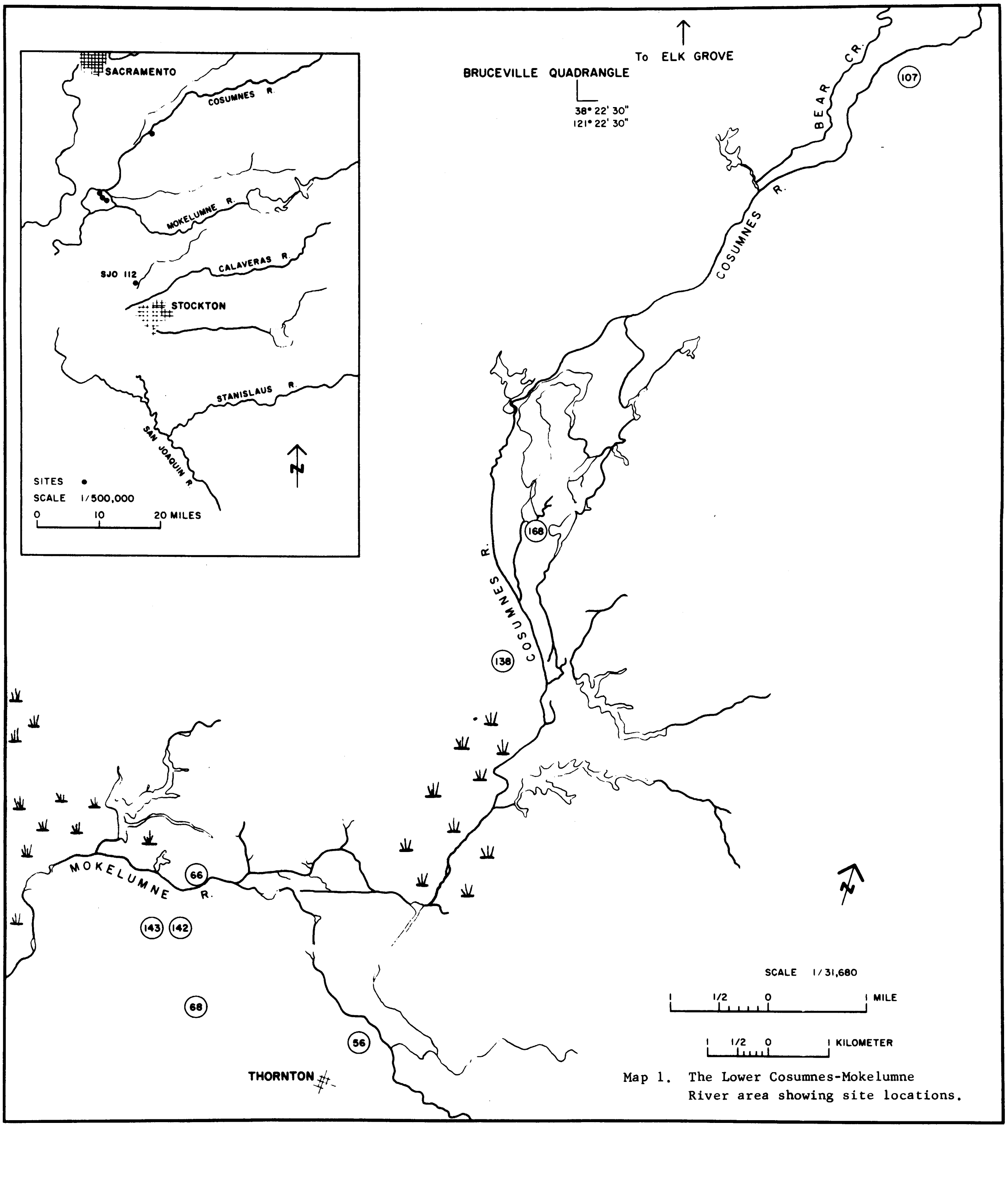
TABLE 67 (continued)

Rabbit Island I								
Burial Number	Surface Depth	Position	Orientation	Deposition	Dimensions	Sex	Age	Associations and Remarks
7-52	3.0	Extended	NE	Supine	L. 2.9, W. 0.8		Inf.	14 clam shell fragments, 7 mussel shell fragments (4 with cut edges), 52 perforated shell disc beads
10-52	2.9	Extended	NE	Prone	L. 5.5, W. 1.3	F	Adult	2 pestles, 1 Rabbit Island stemmed point imbedded in first lumbar vertebra -- red Ocher -- possible fronto-lamboidal skull deformation
12-52	2.8	Extended	NE	Supine	L. 5.3, W. 1.3, Th. x		Adult	None
13-52	3.7	Extended	NE	Supine	L. 2.9, W. 0.9, Th. x		1 yr	1,216 small shell disc beads - perforated

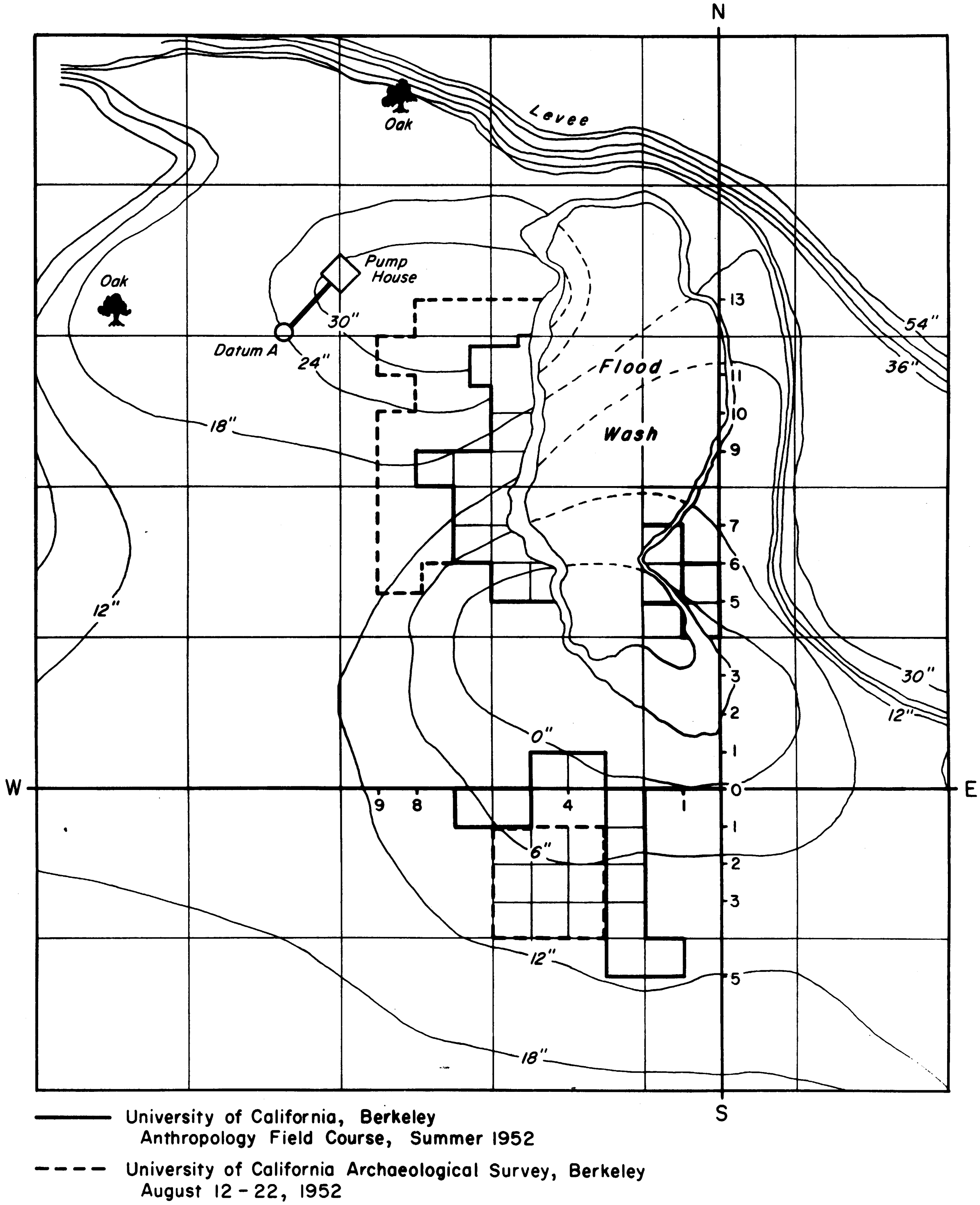
TABLE 67.

Burial Information from Rabbit Island I (From Crabtree, 1957: 13-15, Table 67)

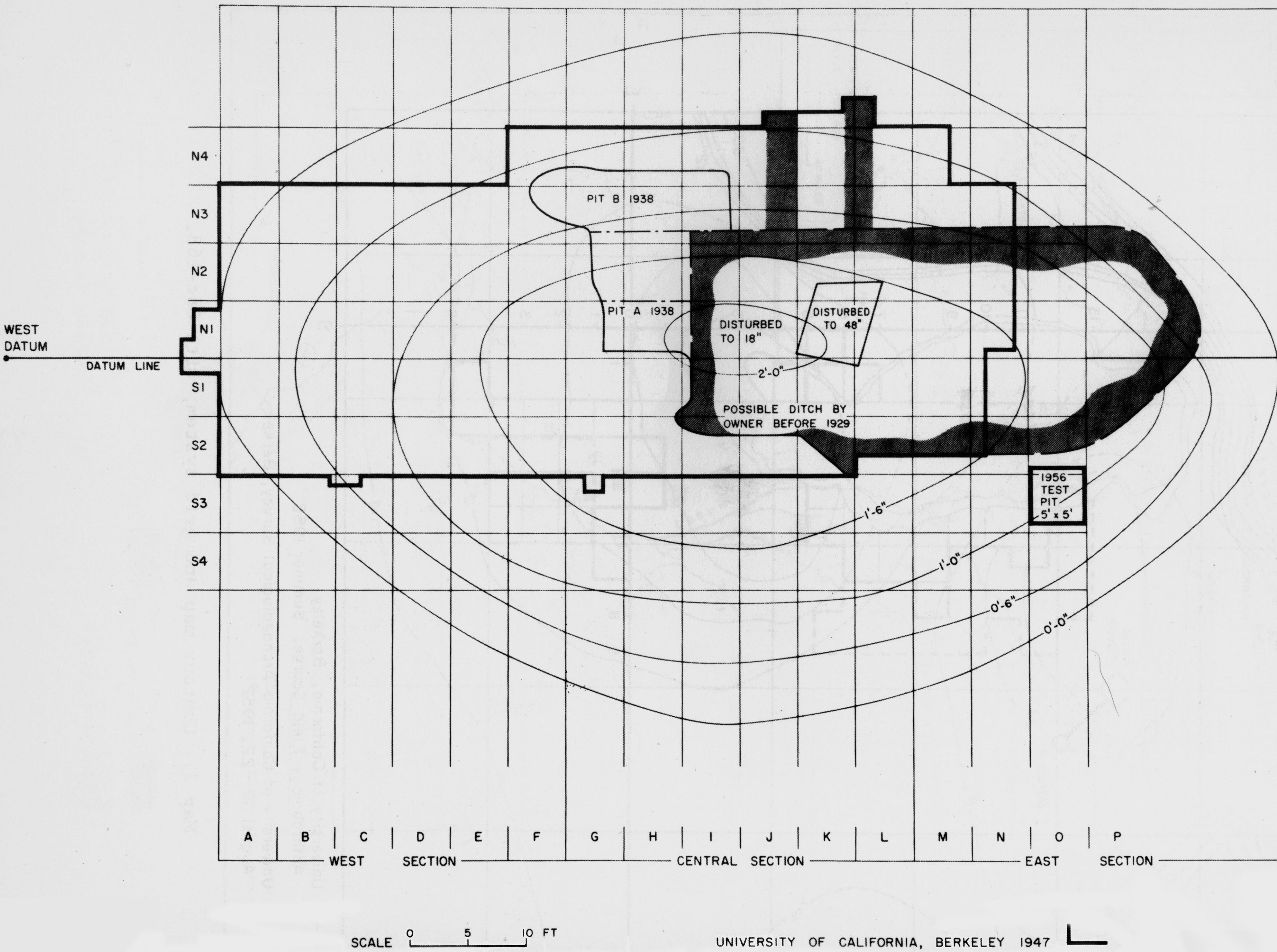
Rabbit Island I								
Burial Number	Surface Depth	Position	Orientation	Deposition	Dimensions	Sex	Age	Associations and Remarks
6-51	1.8	Extended	NE	Supine	L. 5.6, W. 1.4, Th. 0.2	M	MA	3 Rabbit Island stemmed points
8-51	4.0	Extended	NE	Supine	L. 4.0, W. 1.3, Th. x		Child	26 points (12 Rabbit Island stemmed, 13 modified triangular, 1 broken), 1 bone point or awl
9-51	2.8	Extended	NE	Supine	L. 5.8, W. 1.7, Th. x	M	MA	12 unworked flakes, 1 pebble, 2 flake blades, 2 Rabbit Island stemmed points, 1 small point or drill, 1 chopper, 1 rectangular slate object, 3 antler wedges, 3 antler fragments
10-51	3.0	Extended	NE	Supine	L. 5.4, W. 1.1, Th. x		13-17	1 pestle, 1 Rabbit Island stemmed point --- common burial with B11-51
11-51	3.0	Extended	NE	Supine	L. 5.9, W. 1.3, Th. x	F	Adult	8 points (6 Rabbit Island stemmed, 1 square based round shoulders, 1 broken), 34 shell disc beads, 1 bone comb
4-52	3.6	Extended	NNE	Supine	L. 5.8, W. 1.6	M	Adult	27 shell disc bead fragments (11 with perforation), red ocher, 9 cobbles covering the skull
6-52	3.0	Extended	NE	Supine	L. 5.4, W. 1.1	M	Adult	1 perforated shell disc bead, 1 fragment of clam shell, common burial with B7-52



Map 1. The Lower Cosumnes-Mokelumne River area showing site locations.



Map 2. Contour map and grid system, site Sac-168.



Map 3. Contour map, grid plan and excavated areas, site SJo-68.

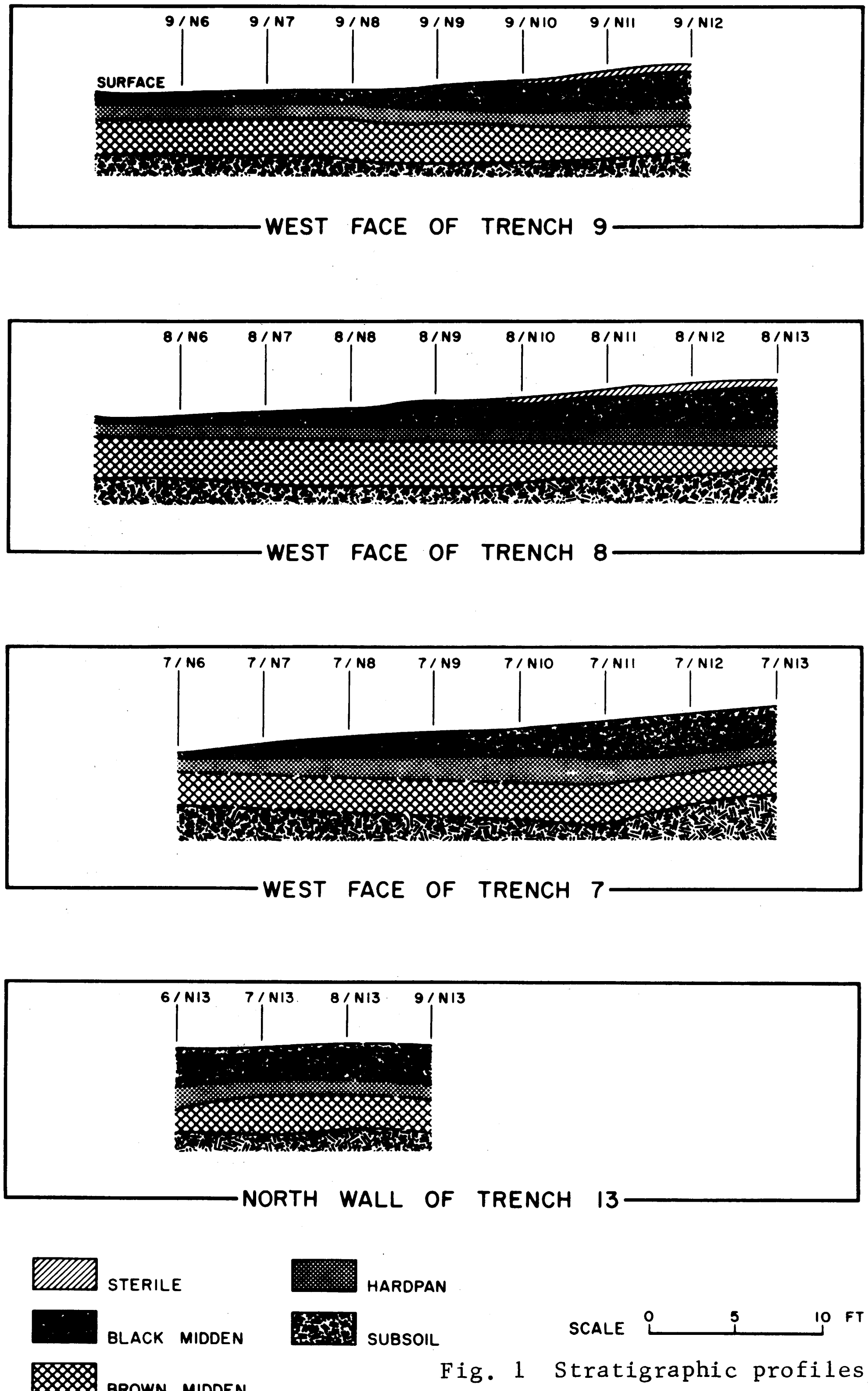


Fig. 1 Stratigraphic profiles, site Sac-168.

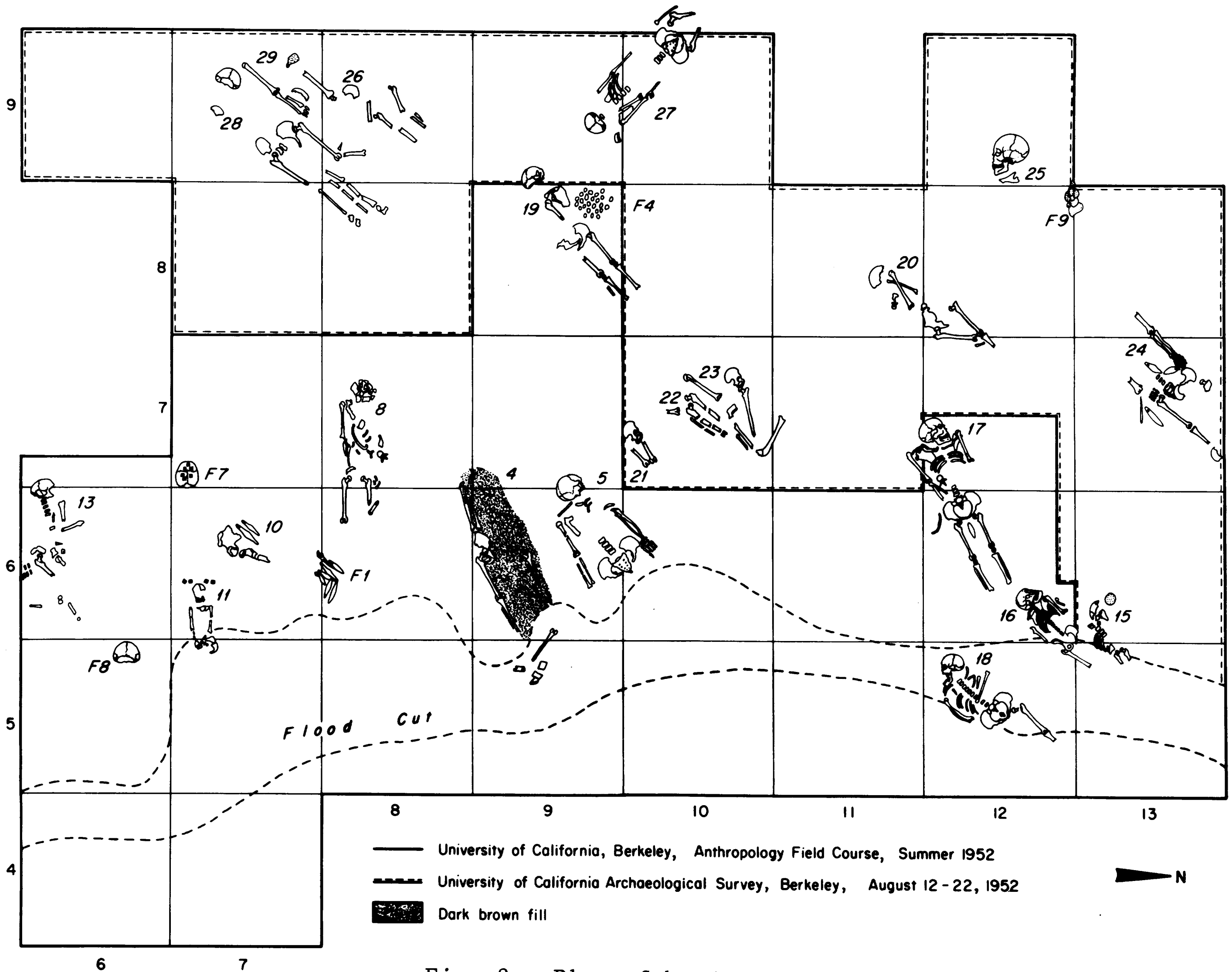


Fig. 2. Plan of hardpan and brown midden north, site Sac-168B.

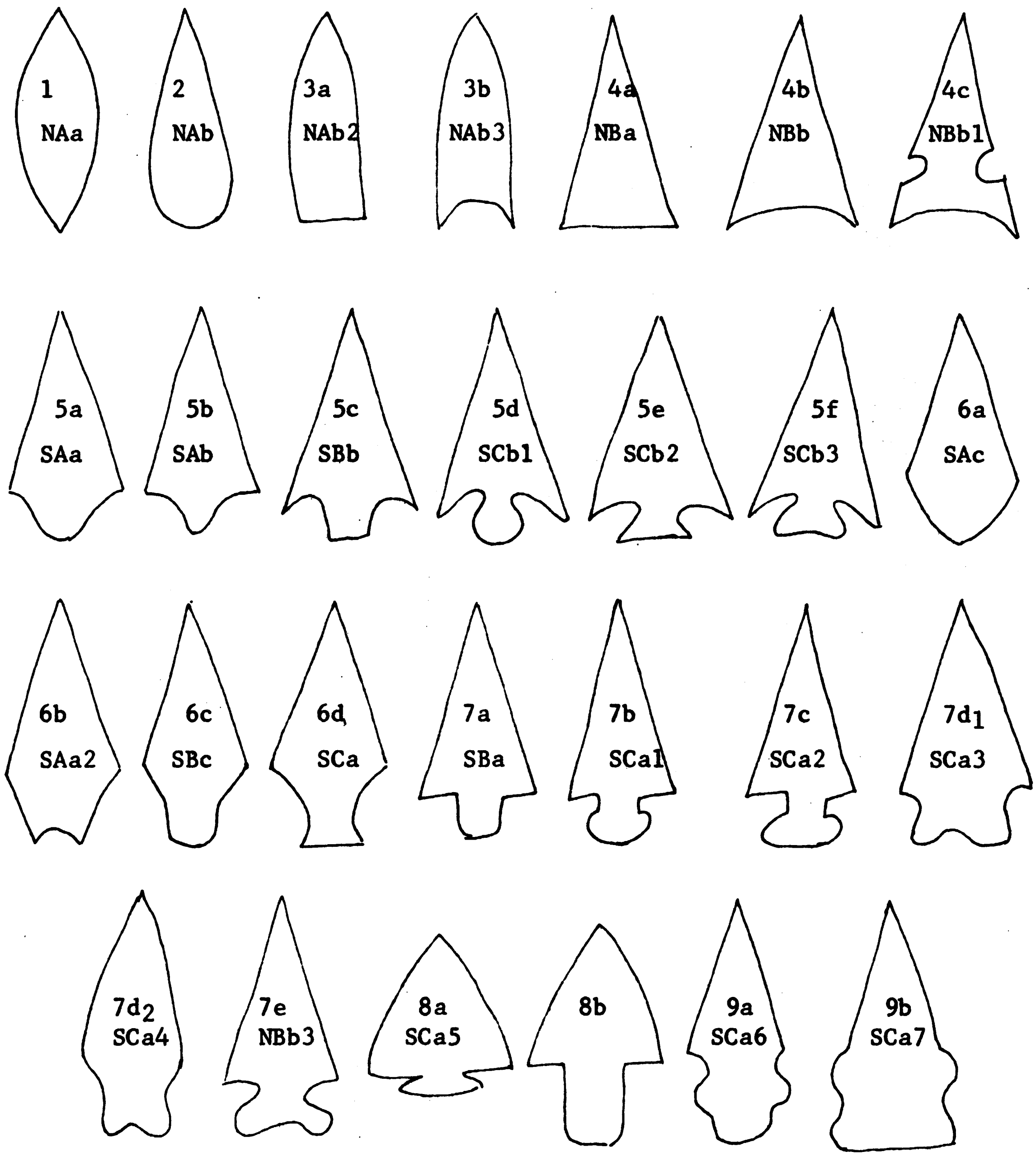


Fig. 3. Windmiller Culture Projectile Point Typology

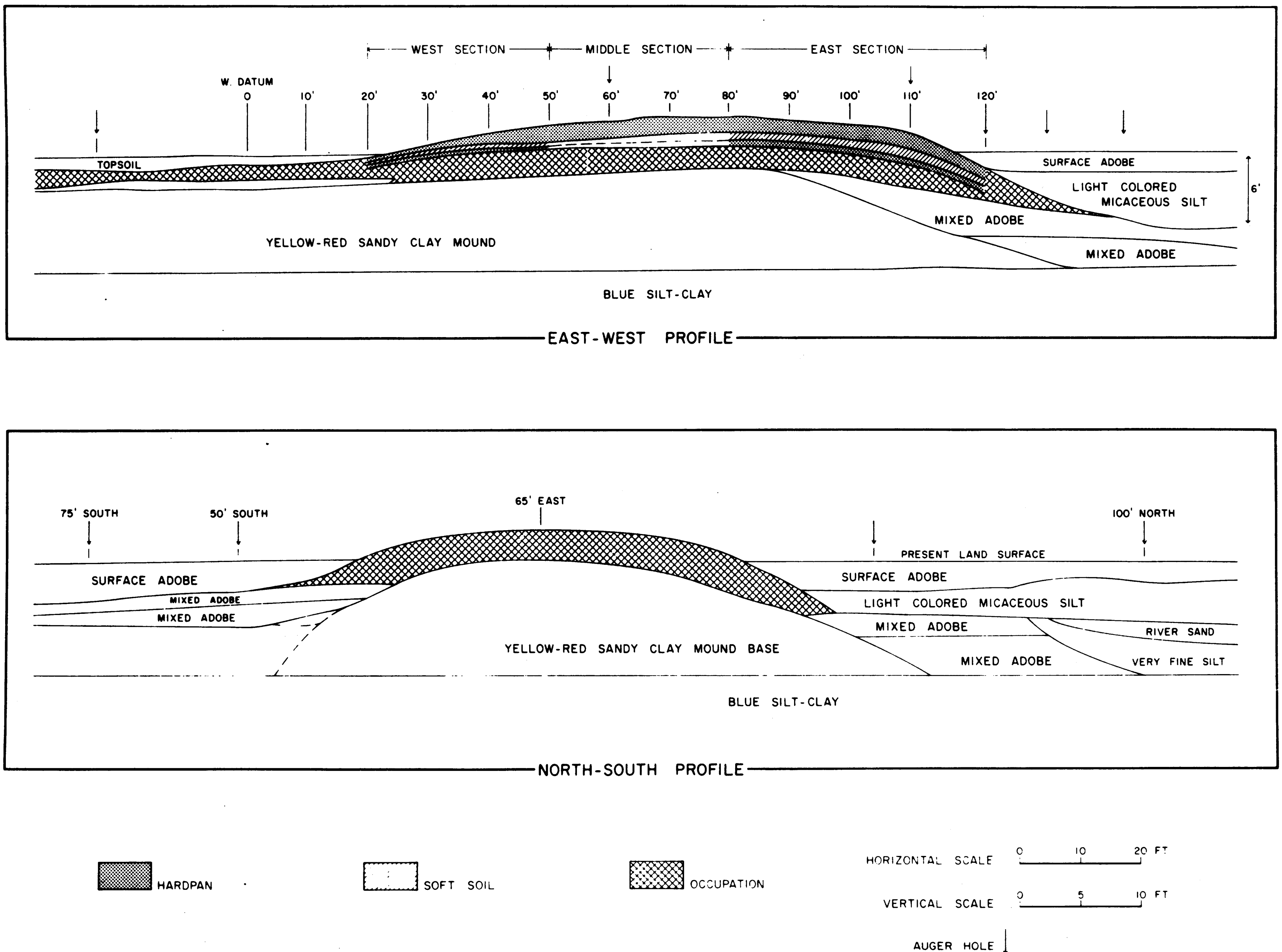


Fig. 4. North-south and east-west profiles of site SJo-68.

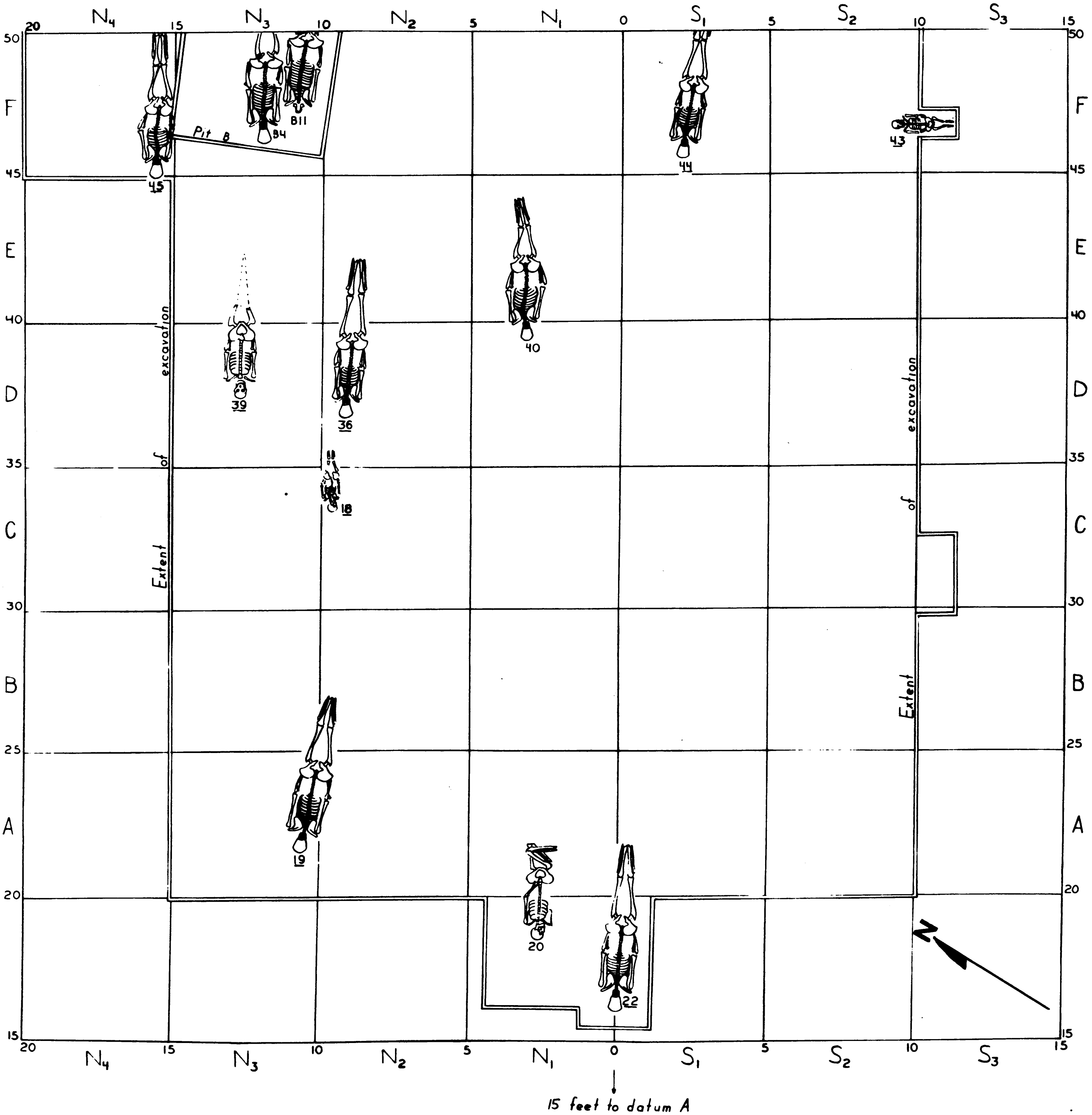


Fig. 5. Burial plan, SJo-68; Trenches A-F, at a depth of 0-24".

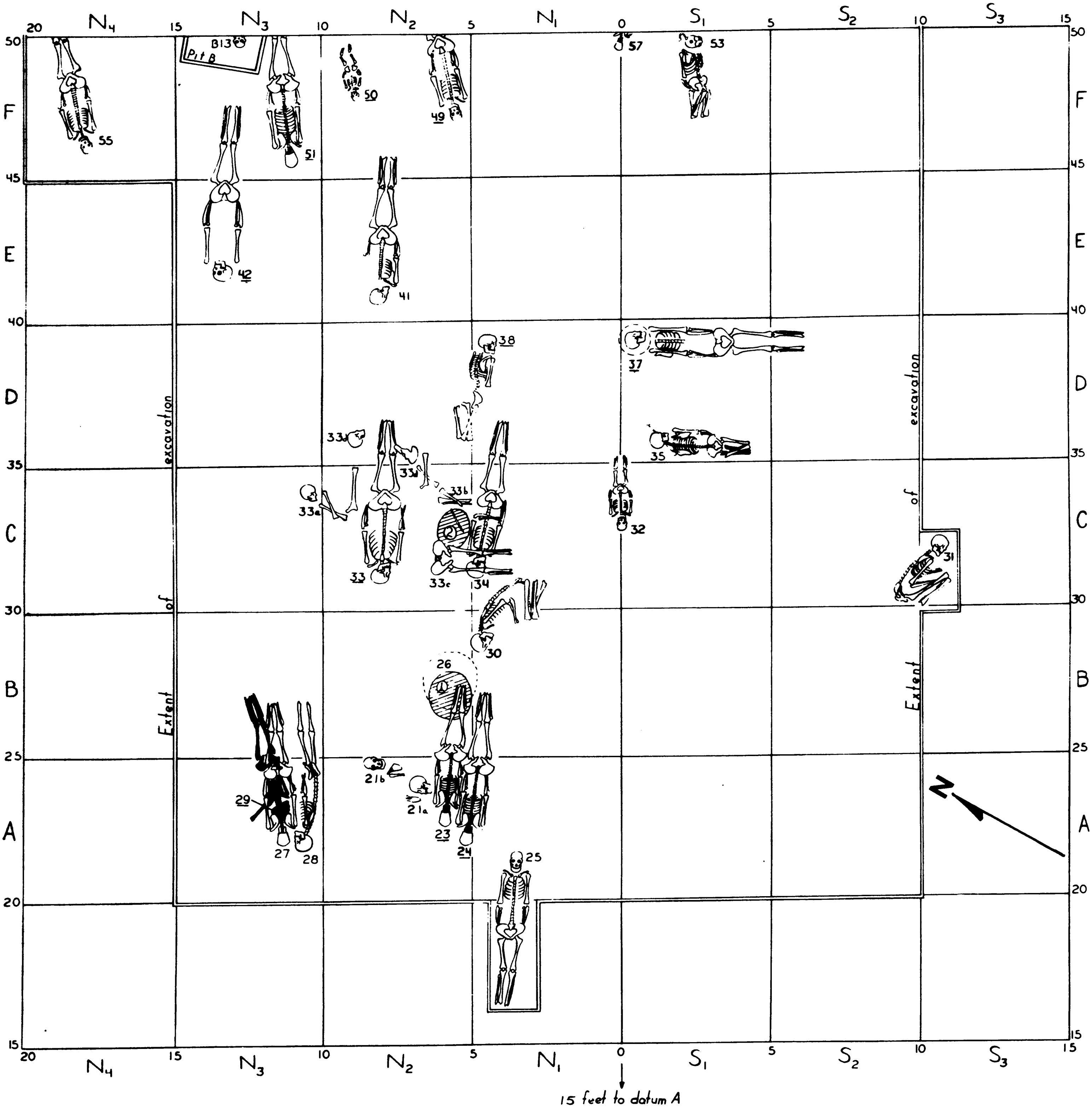


Fig. 6. Burial plan, SJo-68; Trenches A-F, at a depth of 24-60". Cremations indicated by hachured lines. Disturbed burials indicated by dashed lines.

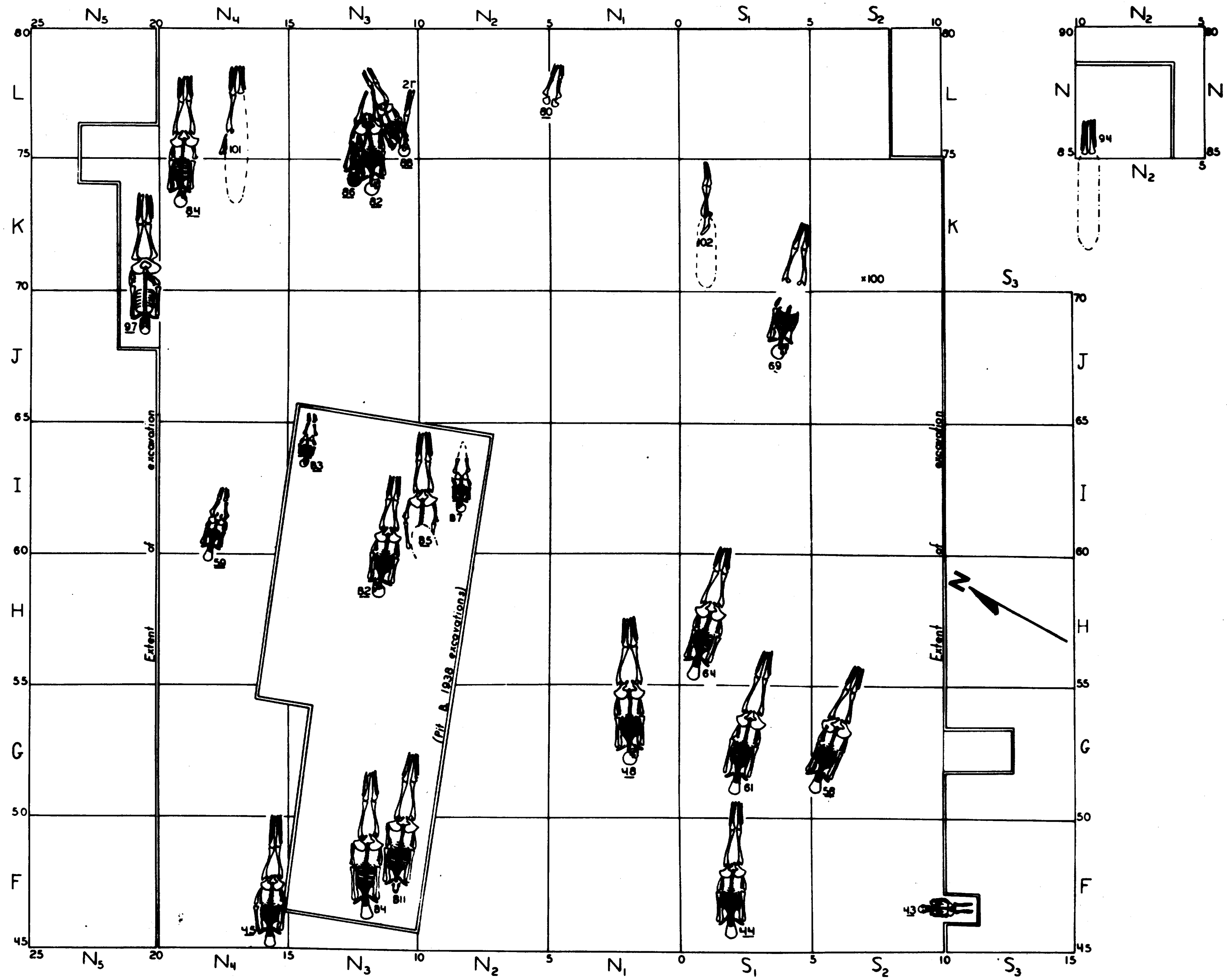


Fig. 7. Burial plan, SJo-68. Trenches F-N, at a depth of 0-24".

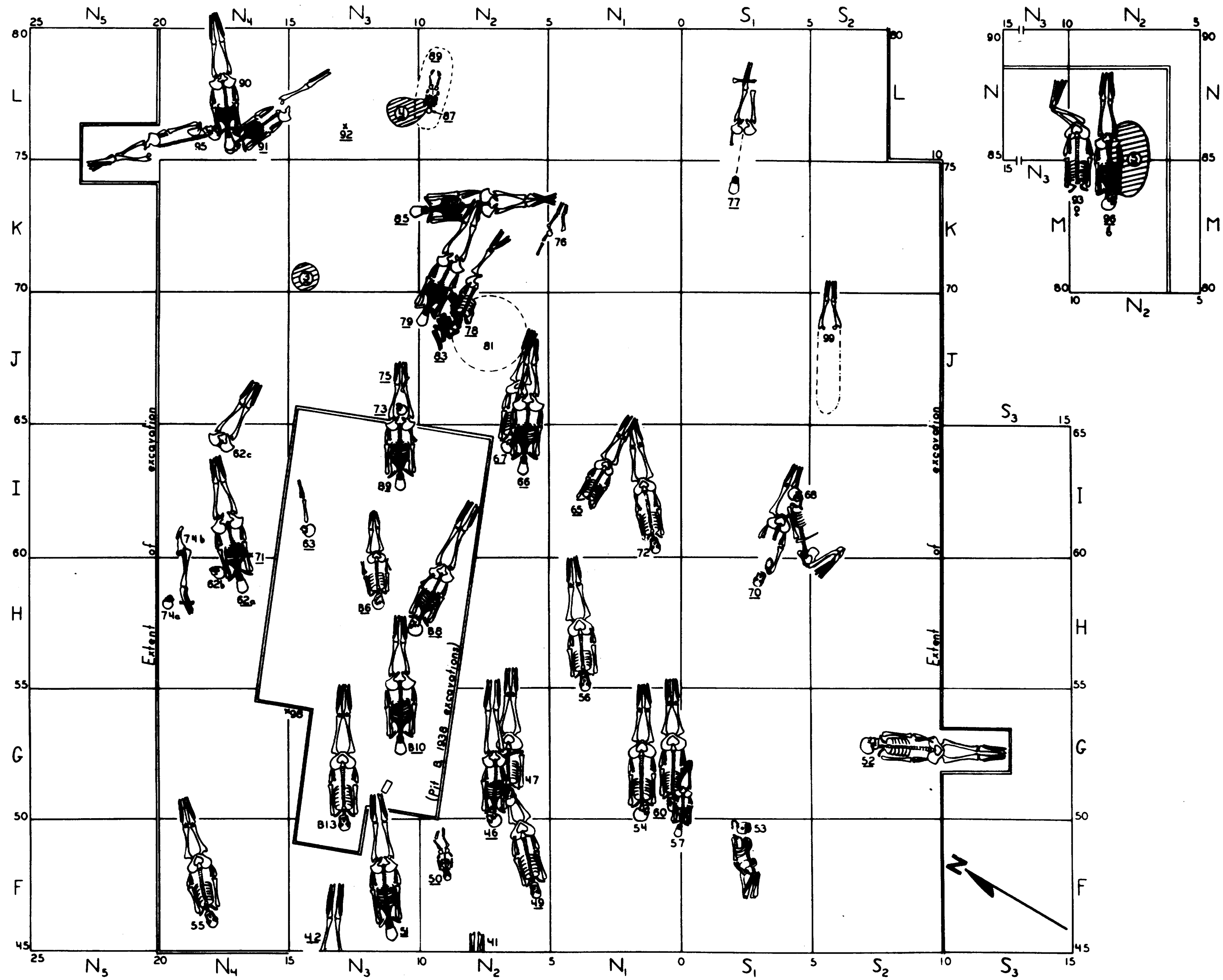


Fig. 8. Burial plan, SJo-68; Trenches F-N, at a depth of 24-60". Cremations indicated by hachured lines; disturbed burials, by dashed lines.

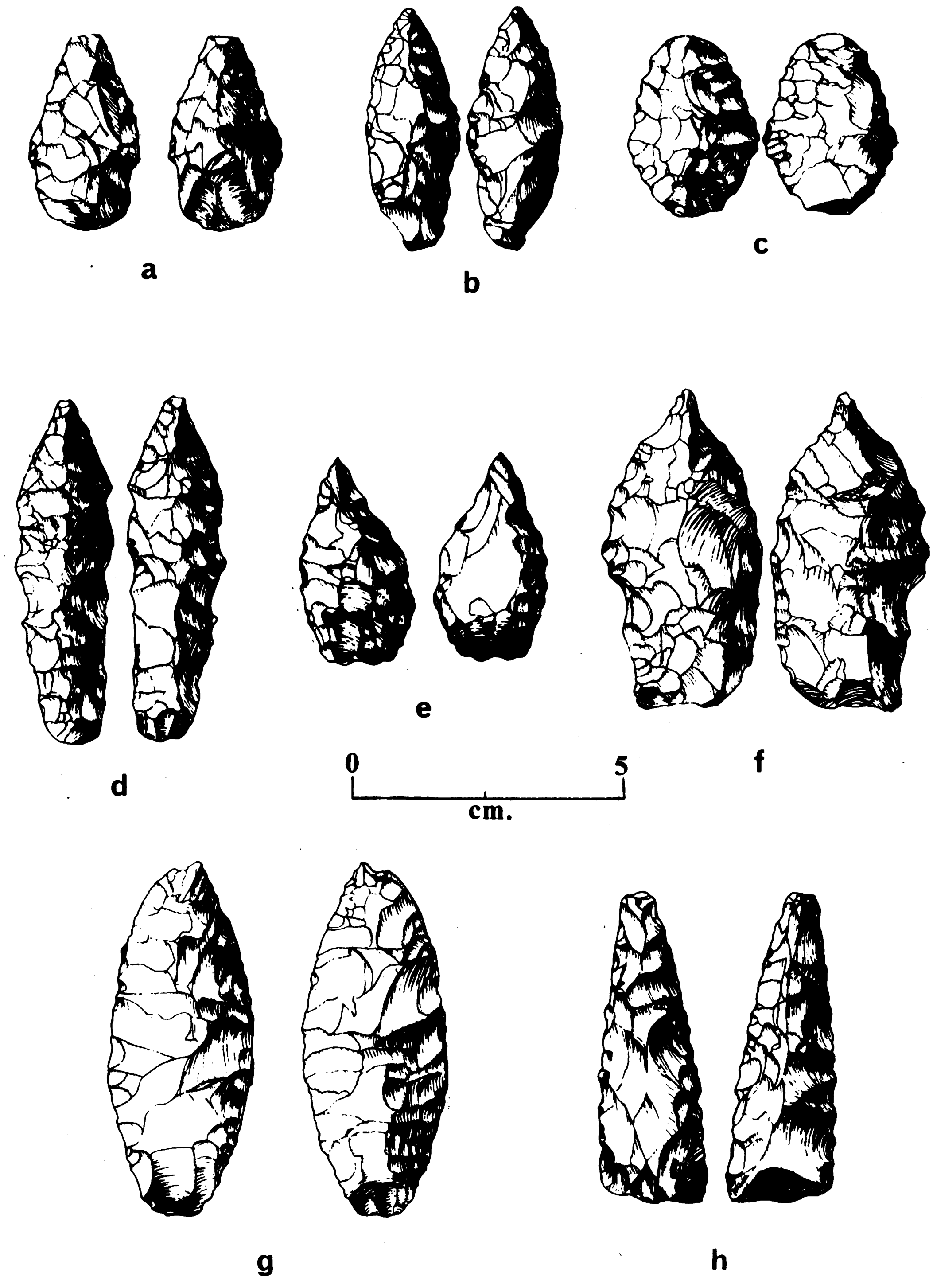
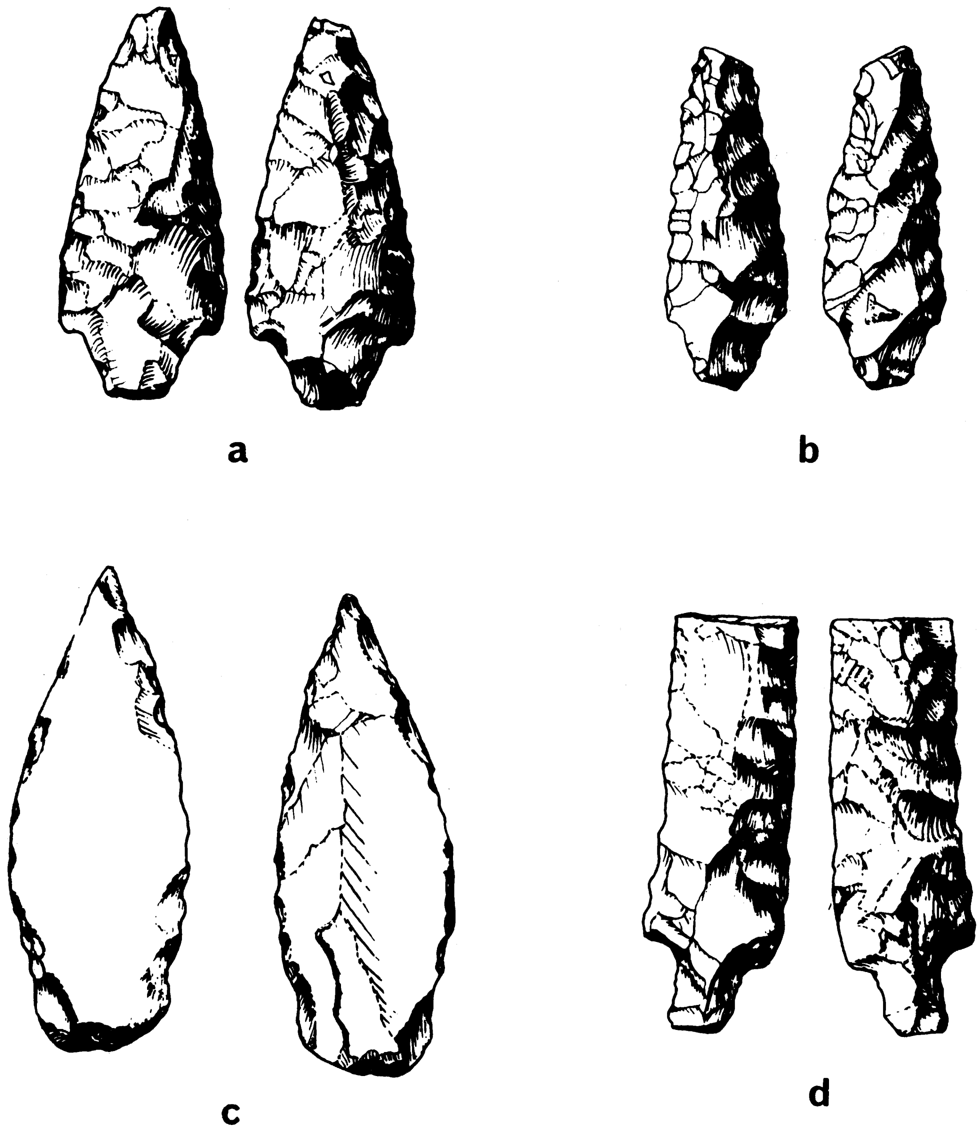


Fig. 9. Projectile Points, site Sac-168.

a. 1-133978 slate type 5a, no location.
b. 1-134013 obsidian type 1, no location.
c. 1-134025 obsidian type 3a, no location.
d. 1-134009 obsidian Hotchkiss Culture knife (?), square 3-S2, 10"d.
e. 1-134010 obsidian type 3a, square 6-N8, -29"d.
f. 1-134016 obsidian type 8b (?shouldered knife), square 6-N11, 13"d.
g. 1-165100 quartz crystal, type 3a, square 8-N12, -23"d.
h. 1-165099 slate point fragment, square 7-N12, surface.



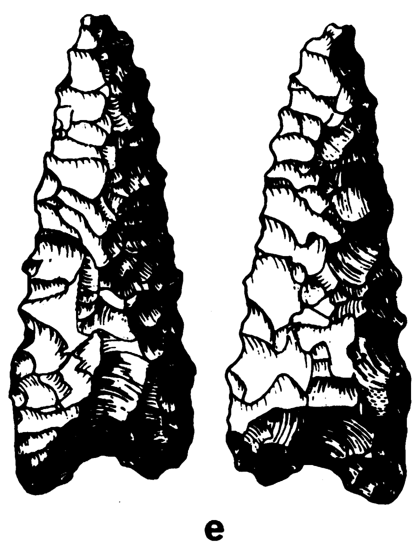


Fig. 10. Projectile Points, site Sac-168
(Illustrated actual size)

a. 1-133981 slate type 5a, square 7-N7, -36"d.

b. 1-133971 obsidian type 7c, square 3-S6, -6"d.

c. 1-133973 slate type 7a, no location.

d. 1-165102 slate type 3a, square 9-N8, -9"d.

e. 1-165093 obsidian type 3b, square 9-N7, -33"d.

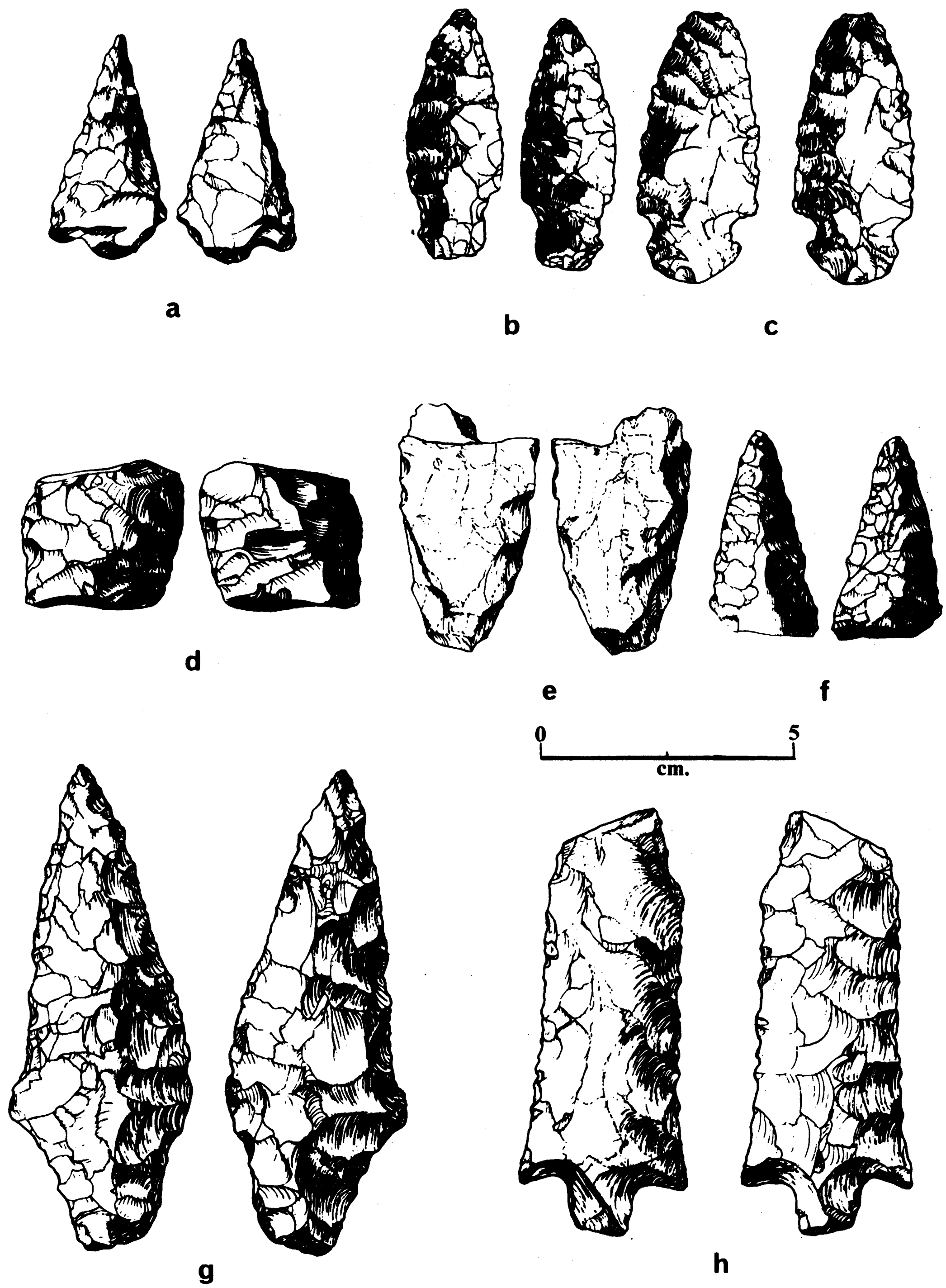


Fig. 11. Projectile Points, site Sac-168

a. 1-165098 slate type 5a, square 6-N13, surface, b. 1-133994 quartz type 7a, no location, c. 1-133983 obsidian type 7b, square 5-S1, -10"d., d. 1-165094 obsidian fragment, square 9-N10, -25"d., e. 1-165101 slate type 2, no location, f. 1-134008 obsidian fragment, square 3-S2, 6"d., g. 1-133988 chert type 5a, no location, h. 1-133974 slate type 7a, square 7-N8, -35"d.

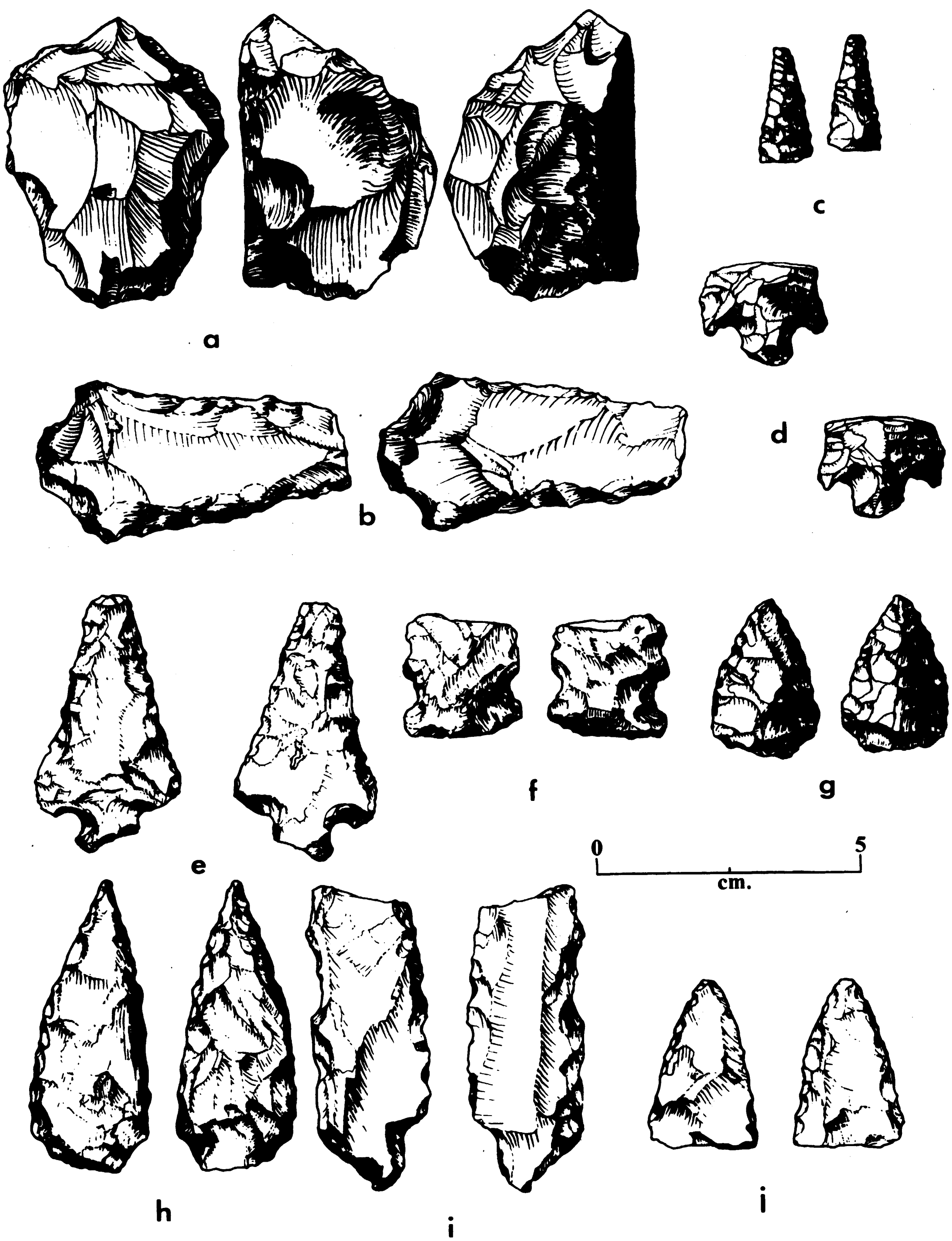


Fig. 12. Chipped Stone Artifacts, site Sac-168

a. 1-133948 chert core scraper (top and side view), no location. b. 1-133980 slate type 5a, no location, c. 1-133982 yellow chert fragment, no location, d. 1-133983 obsidian type 5a, square 5-S1, -10"d., e. 1-133972 slate type 7d, square 1-S4, surface, f. 1-133971 slate type 5a, square 3-S6, 6"d., g. 1-133984 chert type 1, square 7-N8, -23"d., h. 1-133975 slate fragment, no location, i. 1-133976 slate knife fragment, burial No. 7, j. 1-133977 obsidian fragment, square 6-N12, +22"d.

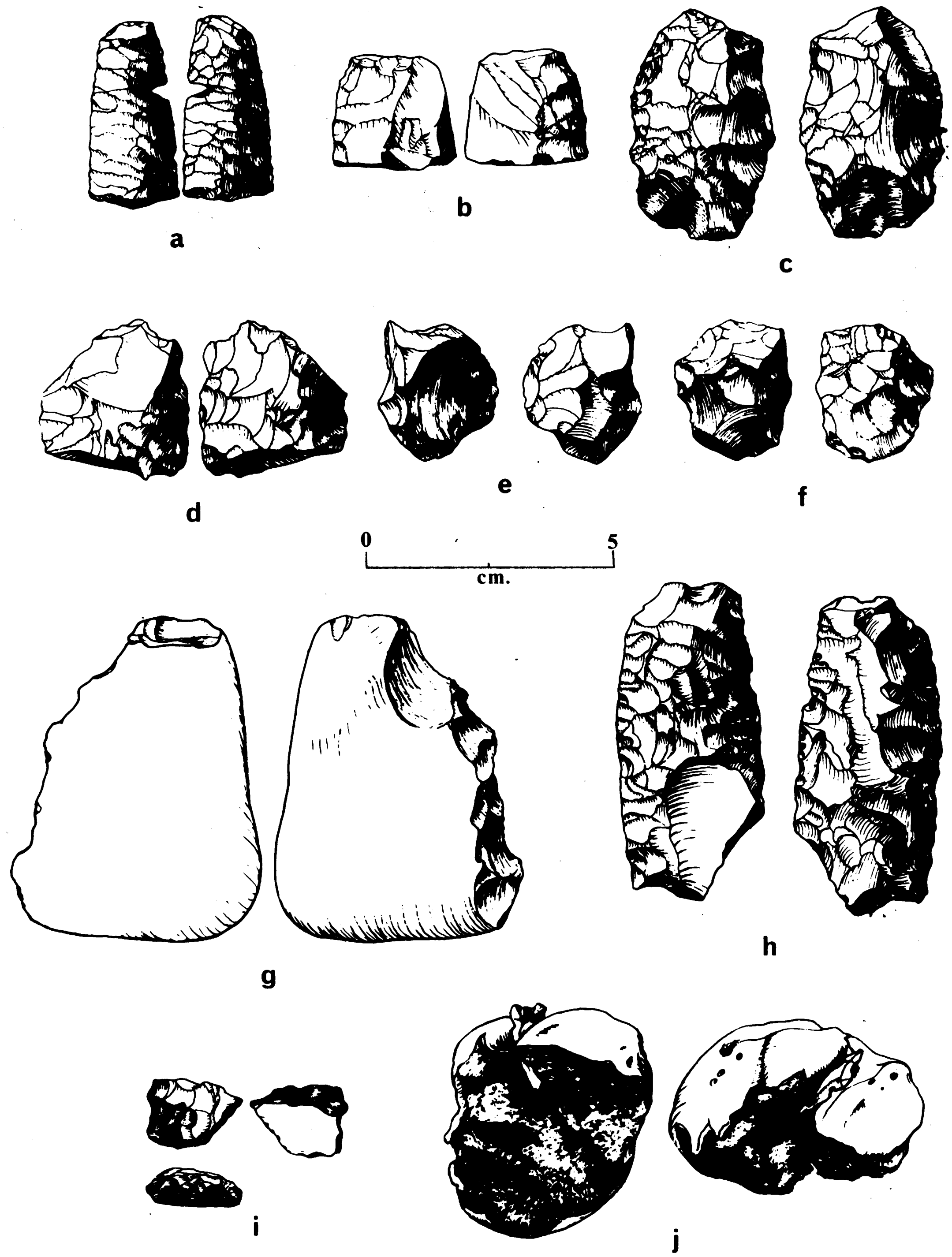


Fig. 13. Chipped Stone Artifacts, site Sac-168

a. 1-134011 obsidian fragment, square 4-S2, -9"d., b. 1-165097 obsidian fragment, square 7-N13, -12"d., c. 1-165095 obsidian fragment, square 7-N10, -45"d., d. 1-165107 obsidian fragment, no location, e. 1-165106 obsidian fragment, no location, f. 1-165105 obsidian scraper, no location, g. 1-165112 chert pebble scraper, square 7-N10, -63"d., h. 1-165096 obsidian fragment, square 9-N9, -42"d., i. 1-165108 obsidian, thumbnail scraper, no location, j. 1-133950 obsidian type Cla point embedded in left humerus, surface.

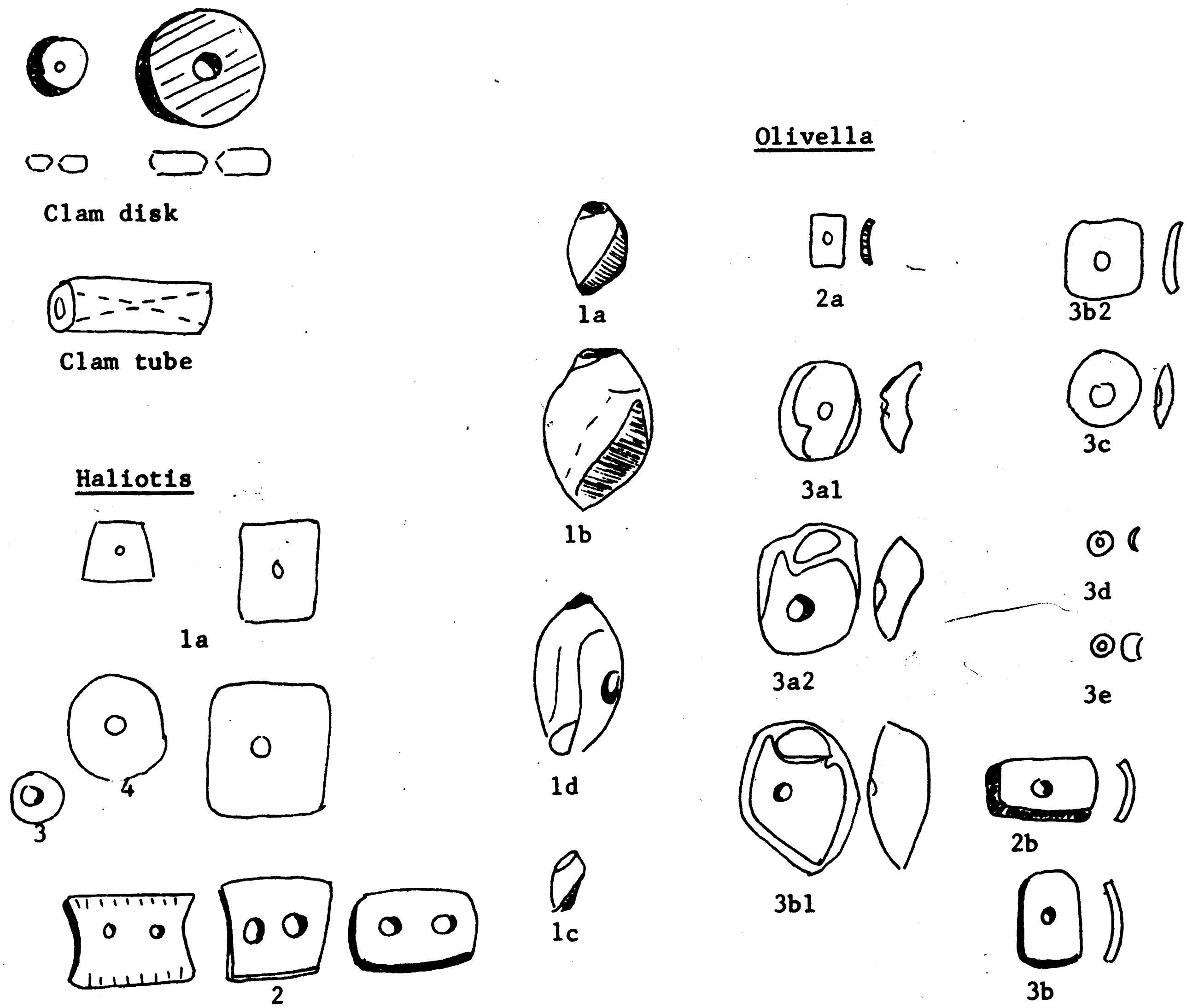
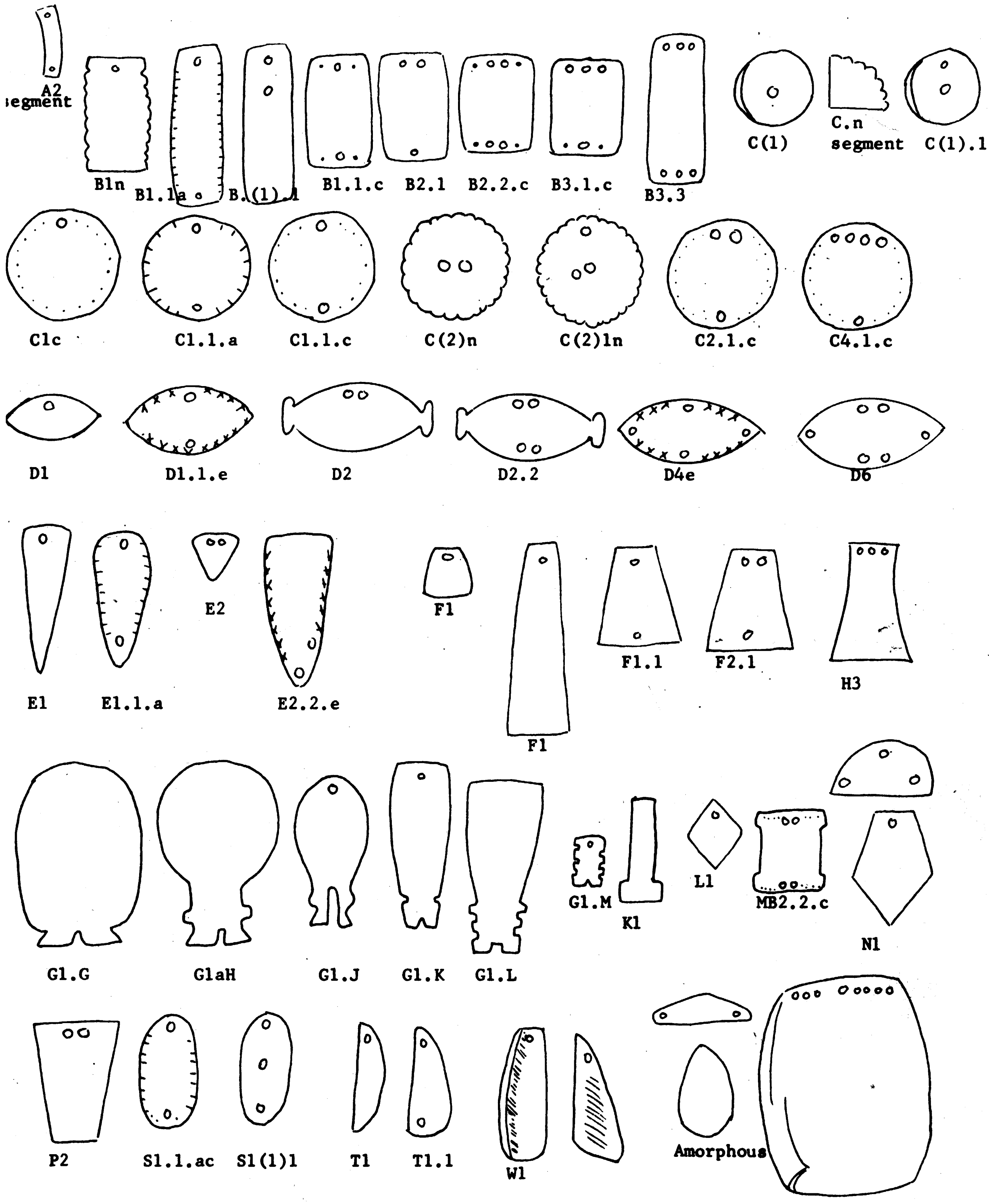


Fig. 14. Shell Bead Typology



Decoration: a = edge incising; c = edge puctation; e = edge v-incising
n = edge nicking.

Fig. 15. Haliotis Ornament Typology.

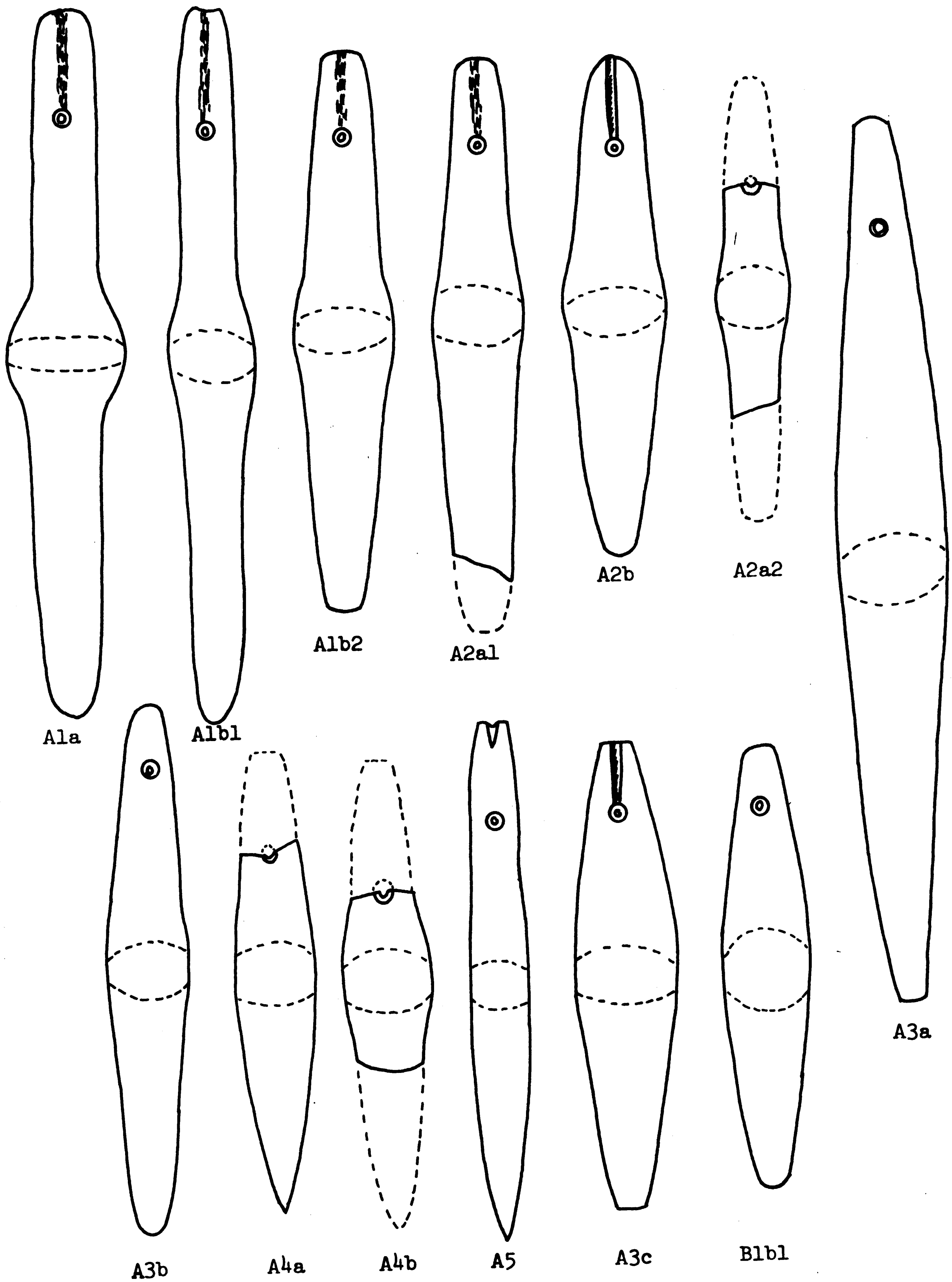


Fig. 16. Charmstone Typology.

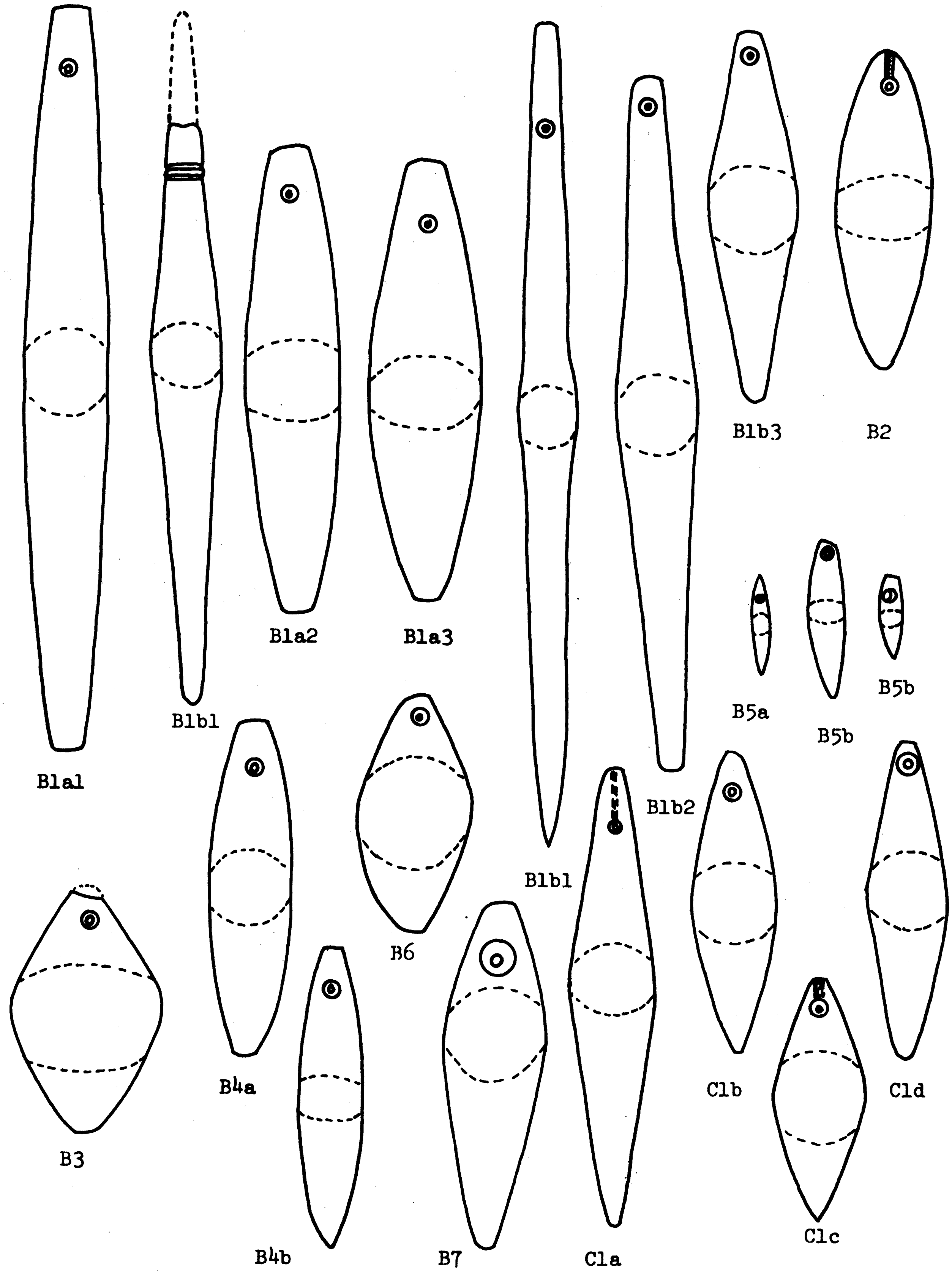


Fig. 17. Charmstone Typology (cont.)

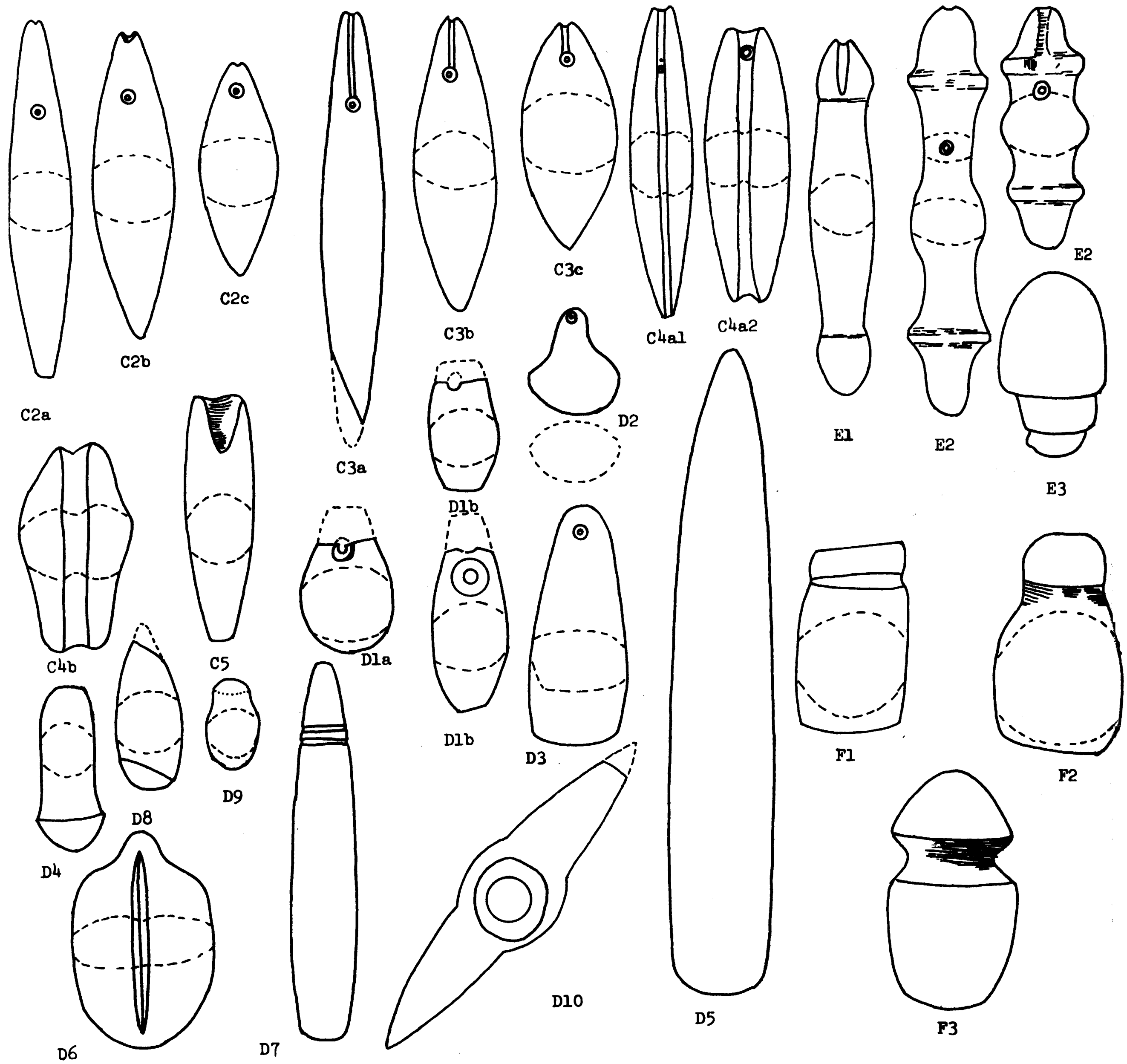


Fig. 18. Charmstone Typology (cont.)

Charmstones, sites Sac-168, SJo-68

(Not to scale)

Plate 1

a. 1-33724 (A1b1)

b. 1-33927 (A2a1)

c. 1-33919 (A3a)

d. 1-33925 (A3b)

e. 1-73408 (A5)

f. 1-73452 (B1a3)

g. 1-33923 (B1b2)

h. 1-33930 (B1b2)

i. 1-33929 (B1b2)

j. 1-33942 (C1b)

Plate 1.

Charmstones, sites Sac-168, SJo-68

(Not to scale)

Plate 2

a. 1-55326 (B1b3)

b. 1-33945 (B4a)

c. 1-49063 (B4b)

d. 1-73464 (C1a)

e. 1-73458 (C1a)

f. 1-73432 (C2a)

g. 1-73430 (C2a)

h. 1-73431 (C3a)

i. 1-73402 (C2b)

j. 1-73459 (C2b)

k. 1-73404 (C3b)

l. 1-73460 (C2b)

m. 1-33932 (E2)

n. 1-73457 (E2c)

o. 1-33937 (E2)

Plate 2.

Obsidian projectile points, site SJo-68

Plate 3

a. 1-55275 Type 1, Dawson grave lot 15, d. 15 in., l. 6.0 cm.

b. 1-73377 Type 1, Burial 80, d. 18 in., l. 6.0 cm.

c. 1-73376 Type 1, Burial 80, d. 18 in., l. 7.0 cm.

d. 1-73189 Type 1, Square A/S1, d. 21 in., l. 6.0 cm.

e. 1-73328 Type 1, Square I/N1, d. 30 in., l. 8.5 cm.

f. 1-73298 Type 1, Burial 42, d. 33 in., l. 8.0 cm.

g. 1-73269 Type 2, Square D/S2, d. 40 in., l. 9.0 cm.

h. 1-55281 Type 2, Dawson grave lot 17, d. 20 in., l. 5.0 cm.

i. 1-86437 Type 2, d. 42 in., l. 4.5 cm.

j. 1-55290 Type 3a, Dawson grave lot 28, d. 14 in., l. 5.5 cm.

k. 1-55260 Type 3a, Dawson grave lot 62, d. 12 in., l. 4.0 cm.

l. 1-55235 Type 5c, no location, l. 9.0 cm.

m. 1-55294 Type 3b, Dawson grave lot 5, d. 6 in., l. 4.5 cm.

n. 1-55273 Type 3b (?), Dawson grave lot 14, l. 5.0 cm.

o. 1-55288 Type 3b, Dawson grave lot 26, d. 36 in., l. 5.5 cm.

p. 1-73230 Type 3b, Burial 23, d. 47 in., l. 5.5 cm.

q. 1-73292 Type 3b, Square F/N1, d. 20 in.

r. 1-73245 Type 3b, Burial 24, d. 47 in., l. 5.5 cm.

s. 1-86448a. Type 3b, Burial 105, d. 33 in., l. 5.0 cm.

t. 1-86448c. Type 3b, Burial 105, d. 33 in., l. 6.5 cm.

u. 1-86448d. Type 3b, Burial 105, d. 33 in., l. 5.5 cm.

v. 1-73380 Type 3b, Burial 78, d. 37 in., l. 7.0 cm.

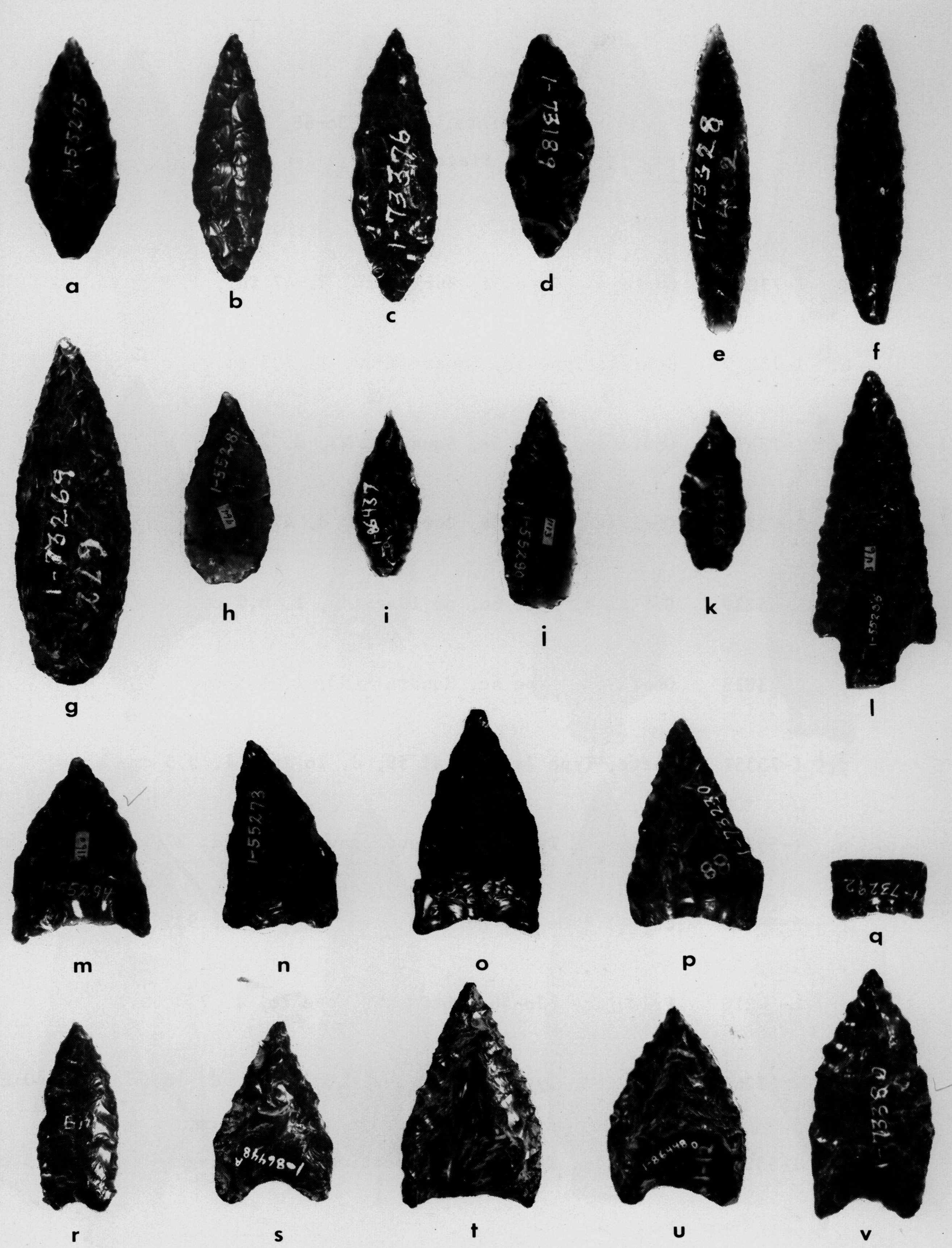


Plate 3

Projectile points, sites SJo-68, SJo-56

Plate 4

a.	1-73260	Obsidian, Type 5a, Burial 24, d. 47 in., l. 6.0 cm.
b.	1-73215	Schist, Type 5c, Square K/S2, l. 7.5 cm.
c.	1-73373	Obsidian, Type 5a, Square K/N3, d. 24 in., l. 7.5 cm.
d.	1-73246	Obsidian, Type 5a, Burial 24, d. 47 in., l. 5.5 cm.
e.	1-55239	Obsidian, Type 6c, no location, l. 6.0 cm.
f.	1-73219	Obsidian, Type 6c, Square H/N3, l. 5.5 cm.
g.	1-73357	Slate, Type 7a, Burial 58, d. 16 in., l. 5.5 cm.
h.	1-55257	Obsidian, Type 7d, Dawson grave lot 6, d. 27 in., l. 6.5 cm.
i.	1-73378	Chert, Type 7a, Burial 80, d. 18 in., l. 9.5 cm.
j.	L-19210	From site SJo-56, Obsidian, Type 7b, l. 7.0 cm.
k.	1-55266	Obsidian, Type 6d, Dawson grave lot 9, d. 18 in., l. 8.0 cm.
l.	1-55297	Obsidian, Type 9a, no location, l. of fragment shown 4.5 cm.

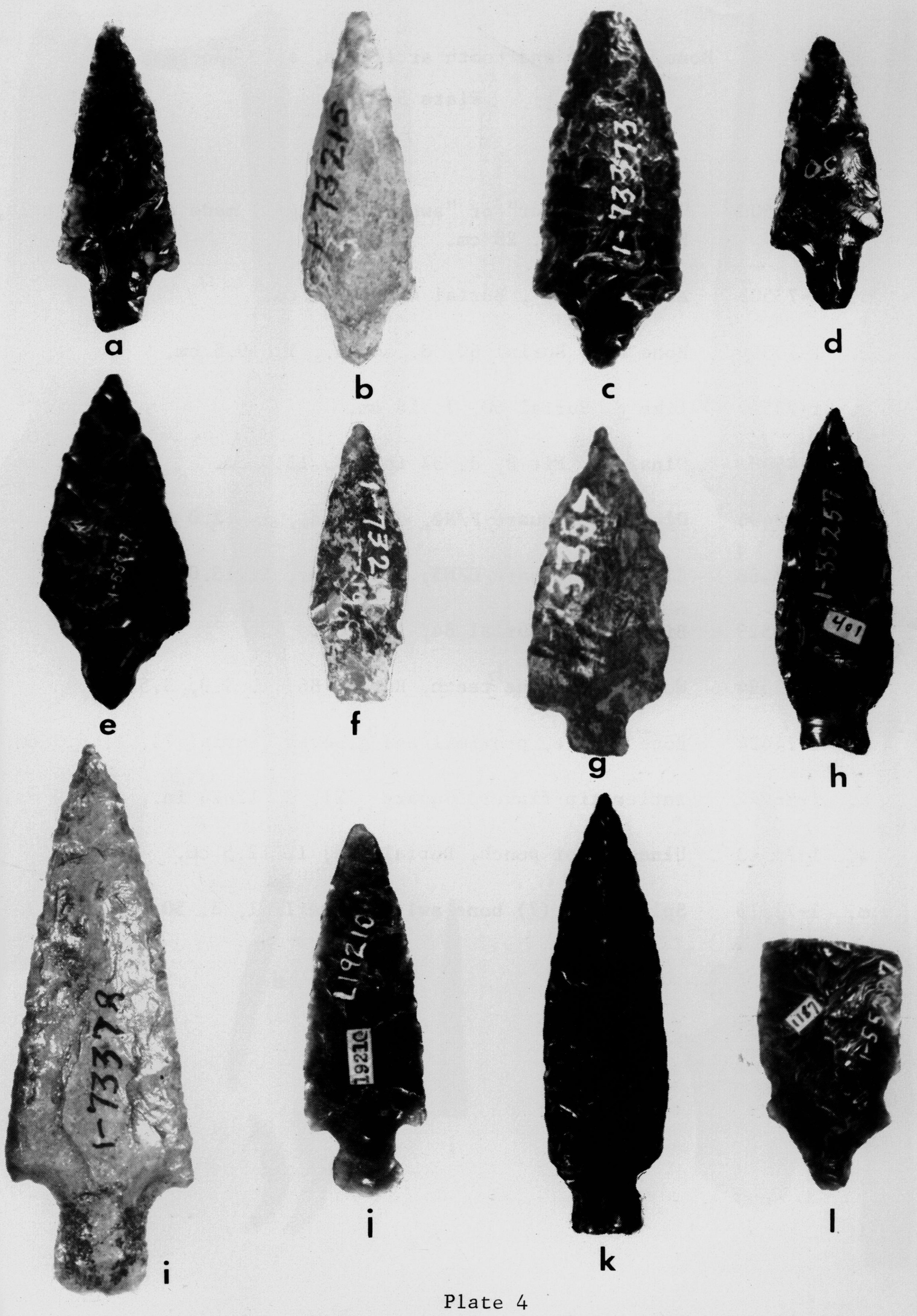


Plate 4

Bone, antler and tooth artifacts, site SJo-68

Plate 5

a.	1-73500	"Sweat scraper" or "sword" (strigil) made of elk scapula, Burial 51, l. 28 cm.
b.	1-73503	Antler "wand", Burial 49, l. 69 cm.
c.	1-73509	Bone awl, Burial 60, d. 44 in., l. 19.5 cm.
d.	1-73510	Like c, Burial 60, l. 18 cm.
e.	1-49087	Ulna awl, Pit B, d. 37 in., l. 13.5 cm.
f.	1-73496	Ulna awl, Square F/N2, d. 32 in., l. 12.0 cm.
g.	1-73488	Ulna awl, Square C/N3, d. 15 in., l. 15.0 cm.
h.	1-73529	Bird talon, Burial 84, l. 4 cm.
i.	1-73524	Wolf (?) canine teeth, Burial 86, l. 3.0, 3.5 cm.
j.	1-74424	Bone needle, proximal end grooved, Burial 73, l. 6.0 cm.
k.	1-86442	Antler tip flaker, Square _/S1, d. 12-24 in., l. 8.5 cm.
l.	1-73513	Ulna awl or punch, Burial 62a, l. 12.5 cm.
m.	1-73515	Split bird (?) bone awl, Square I/N1, d. 50 in., l. 13.5 cm.

Plate 5

Baked clay, shell objects and quartz crystal, site SJo-68

Plate 6

a. 1-73628 Baked clay pot wall, Square J/N4, d. 61 in., h. 8.0 cm.

b. 1-73822 Baked clay pot wall, Square A/N1, h. 4.5 cm.

c. 1-73615 Baked clay ball with basketry impression, Square B/S2, max. dia. 6.0 cm.

d. 1-55355 Perforated clay disc, Dawson grave lot 9, dia. 3.5 cm.

e. 1-55348 Like d , Dawson grave lot 33, dia. 3.5 cm.

f. 1-73482 Quartz crystal, Burial 66, l. 7.0 cm.

g. 1-73633 Baked clay "pecan", Burial 86, l. 2.5 cm.

h. 1-73577 Haliotis ornament type c(2), Burial 84, dia. 5.5 cm.

i. 1-73578 Haliotis pendant, type F.2,a, Burial 84, l. 3.5 cm.

j. 1-19068 Haliotis pendant type H.2.n, Burial 41, l. 5.0 cm.

k. 1-19205 Turtle carapace with Haliotis type 1a bead appliqué, Burial 6, l. 4.5 cm.

l. 1-19204 Like k, Burial 6, l. 4.0 cm.

m. 1-49064 Olivella rectangular beads type 2b, Burial 10, bead l. 1.0 cm.

n. 1-73579 Haliotis circular beads type 3, Burial 84, dia. 1.0 cm.

o. 1-73537 Olivella beads type 1a, Burial 19, bead l. 1.0 cm.

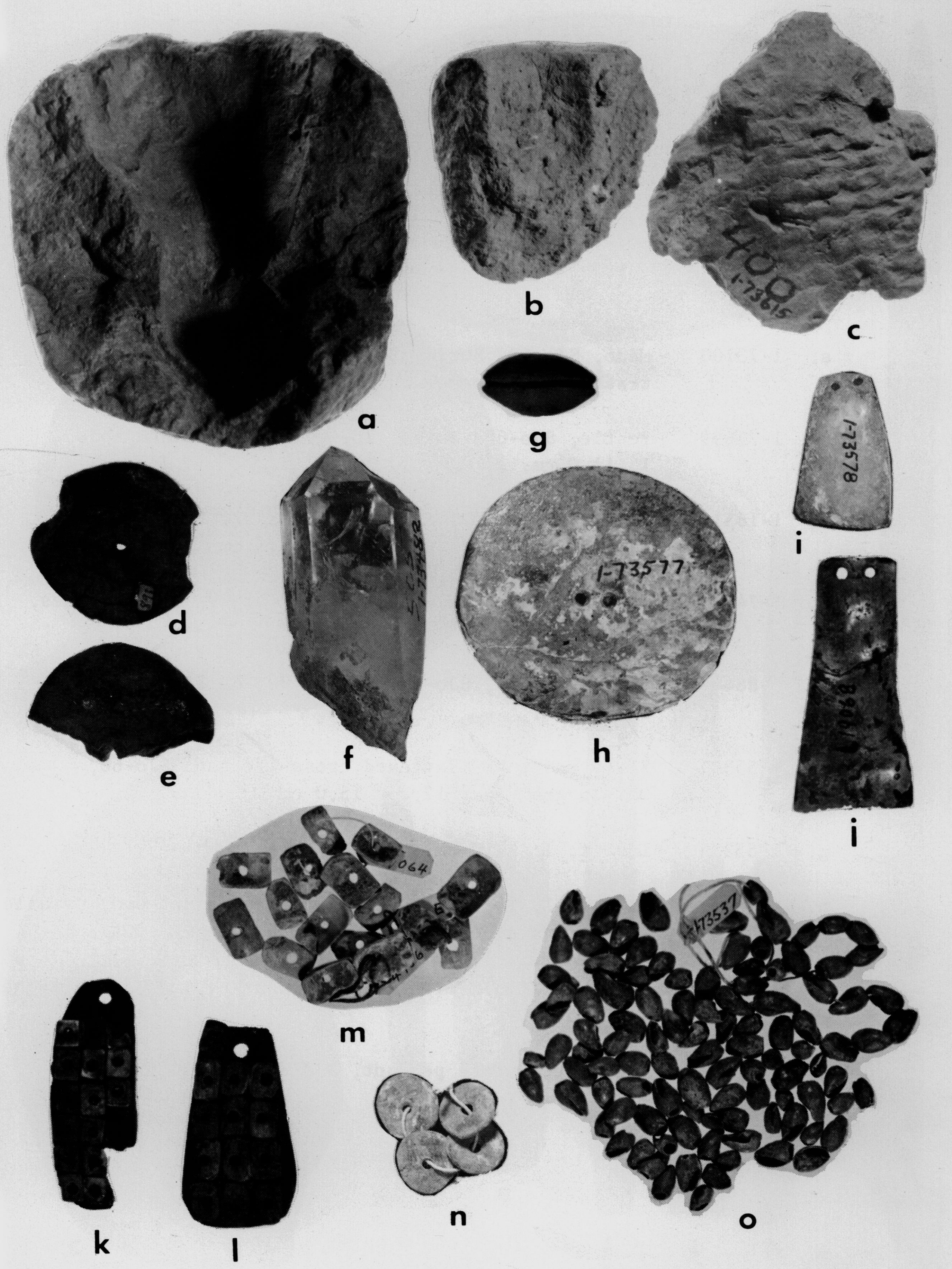


Plate 6

Ground stone and slate, sites Sac-168, SJo-68

Plate 7

a.	1-73700	Mano, SJo-68, Burial 80, unifacial grinding with traces of red ocher on one end, dia. 9.5 cm.
b.	1-73699	Pestle, SJo-68, Burial 80, grinding on both ends, l. 11.0 cm.
c.	1-165127	Mortar, Sac-168B, Square 8/N9, d. 26 inches, stained with red ocher, dia. 14.5 cm.
d.	1-74419	Green slate pencil, SJo-68, Burial 29, d. 53 inches, l. 6.5 cm.
e.	1-86447	Slate pendant, SJo-68, Burial 80, d. 18 inches, l. 9.5 cm.
f.	1-55331	Slate rod with flattened cross-section, SJo-68, Dawson grave lot 12, l. 15.0 cm.
g.	1-55334	Like _f_, l. 13.0 cm.
h.	1-55332	Like _f_, l. 14.5 cm., with groove at blunt end, parallel striations around middle.
i.	1-73451	Cylindrical slate rod, SJo-68, Burial 62a, d. 32 inches, l. 18.5 cm.
j.	1-55321	Perforated slate pendant, SJo-68, Dawson grave lot 7, l. 3.5 cm.

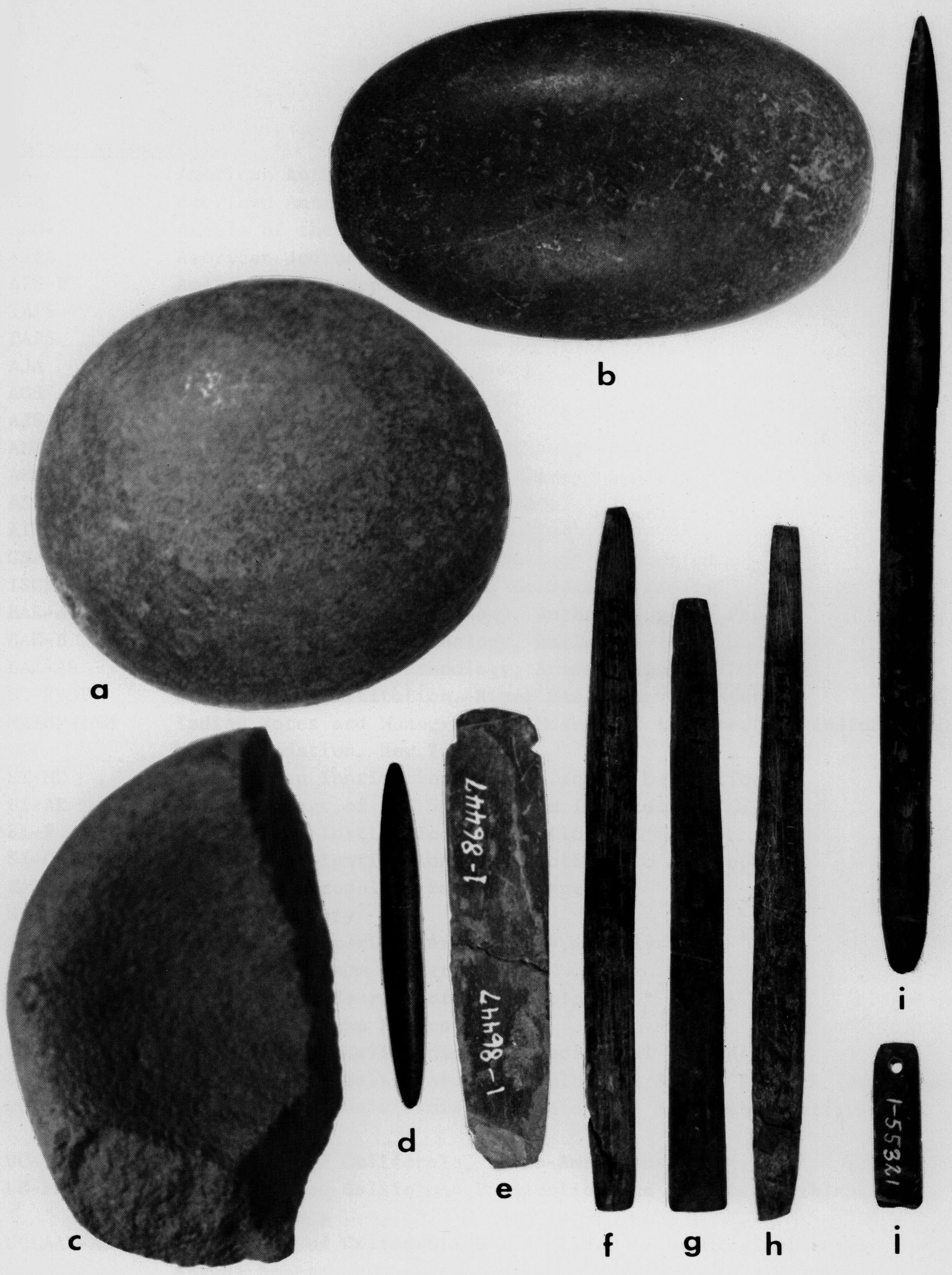


Plate 7

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Abbreviations:

AA	American Anthropologist
AAn	American Antiquity
AAG-A	Annals of the Association of American Geographers
AJPA	American Journal of Physical Anthropology
APS-Y	American Philosophical Society, Yearbook
TAPS	Transactions of The American Philosophical Society
PAPS	Proceedings of The American Philosophical Society
AJA	American Journal of Archaeology
AGS	American Geographical Society
AJS	American Journal of Science
AMNH-B	American Museum of Natural History, Bulletin
AMNH-AH	American Museum of Natural History, Anthropological Handbook
ABC	Anthropology in British Columbia
AINA	Arctic Institute of North America
GSA-B	Bulletin of The Geological Society of America
ISCM-OP	Idaho State College Museum, Occasional Papers
BAE-AP	Bureau of American Ethnology, Anthropological Papers
BAE-B	Bureau of American Ethnology, Bulletin
BAE-AR	Bureau of American Ethnology, Annual Report
SI-RBSP	Smithsonian Institution, River Basin Survey Papers
MAIHF-INM	Indian Notes and Monographs. Museum of the American Indian, Heye Foundation, New York
SI-MC	Smithsonian Institution, Miscellaneous Collections
SI-AR	Annual Report of the Smithsonian Institution
SI-P	Smithsonian Institution Publication
SI-CA	Smithsonian Institution Contributions to Anthropology
KAS-P	Kroeber Anthropology Society, Papers
NH	Natural History
SAA-M	Society for American Archaeology, Memoirs
SWM-M	Southwest Museum Masterkey
SWJA	Southwestern Journal of Anthropology
SWMP	Southwest Museum Papers
UC-AR	University of California Anthropological Records
UCAS-R	University of California Archaeological Survey Reports (Berkeley)
UCARF-Ms	University of California Archaeological Research Facility, Manuscript
UC-IA	University of California, Ibero-Americana
UC-PAAE	University of California Publications in American Archaeology and Ethnology
UCLAAS-AR	University of California Los Angeles, Archaeological Survey, Annual Report
UC-PA	University of California, Publications in Anthropology

UK-RA	University of Kentucky, Reports in Anthropology
UU-B	University of Utah, Bulletin
UU-AP	University of Utah, Anthropological Papers
USNM-R	Reports of the U.S. National Museum
VP-PA	Viking Fund Publications in Anthropology
UOM-SA	University of Oregon Monographs, Studies in Anthropology
CIW-Y	Carnegie Institution of Washington, Yearbook
CIW-P	Carnegie Institution of Washington, Publications

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