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San Francisco Bay Archaeology: Sites Ala-328, Ala-13 and Ala-12

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SAN FRANCISCO BAY ARCHAEOLOGY:

Sites Ala-328, Ala-13 and Ala-12.

by

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PREFACE

This paper is a condensed and slightly revised version of my 1976 doctoral thesis, Toward a Prehistory of the San Francisco Bay Area: The Archaeology of Sites Ala-328, Ala-13, and Ala-12. The complete thesis, on file at Harvard University, is available in microfilm or xerox copy from University Microfilms, Ann Arbor, Michigan (dissertation number 77-8673). This version has been prepared for publication with the hope of reaching a wide audience of professional and avocational California archaeologists with the plea for an altered perspective on Bay area prehistory which is one of the messages of the thesis, and to provide for comparative purposes a descriptive body of material viewed from this perspective.

In this condensed version, Appendices 1-4 of the thesis, which list attributes of individual burials and recorded features, have been eliminated. Revisions include some updating of bibliographic citations, a change in the form of citations, and a few minor textual alterations. Neither the introductory review and evaluation of previous work nor the conclusions have been changed.

In returning to this work after 4 years, I was struck by its deficiencies in 2 areas which now routinely receive attention in Bay area archaeological investigations, the study of historical documents and attention to the present day knowledge of descendants of Native Californians. I make no effort to correct these deficiencies here, but in the discussion of ethnographic and historical information in Chapter 2 I have added references to examples of the fine and productive ethnohistorical research which has been accomplished in recent studies. It is more difficult to cite examples of the contributions of Native Californians to ongoing anthropological work in the Bay area, although a beginning is being made through the common practice of consultation with members of the local Native Californian community when archaeological investigations are undertaken (see, e.g., Winter 1978). It is time to discard the assumption that Bay area archaeology is the study of extinct peoples. Mission records clearly document the survival of individuals who surely left descendants (Milliken 1979: 4.41). A few of these people are active consultants or participants in current anthropological studies, but it is imperative that other potential contributors be sought out. Fulfillment of this mandate of ethics and simple courtesy can only benefit the work undertaken.

ACKNOWLEDGEMENTS.

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I am indebted to my academic advisor, Jeremy A. Sabloff, who tutored me in archaeology from my introduction to the subject through the completion of this work. Thanks also go to the other members of my committee, Gordon R. Willey and Stephen Williams.

In California, my greatest debts are to Bert A. Gerow and James Bennyhoff, who spent many hours with me examining archaeological collections and discussing California prehistory. David Fredrickson, Edward Helley, Kenneth Lajoie, and Thomas Jackson provided inspiration when my enthusiasm waned; the latter two along with Michael Moratto share the responsibility for my selection of the Alameda site collections as the focus of research.

The following people provided me access to various archaeological collections: James Dotta, Treganza Anthropology Museum; David Herod and Lawrence Dawson, Lowie Museum of Anthropology; Bert A. Gerow, Leland Stanford, Jr. Museum of Anthropology; Lowell Bean and Benjamin Ananian, California State University, Hayward; George Coles, Contra Costa College; Eldon Earnhardt and John Galloway, Canada College. Robert F. Heizer permitted me to make extensive use of the resources of the Archaeological Research Facility, UC-Berkeley.

Sheilagh Brooks and Robert Oliphant provided age and sex determination for some of the human skeletal material. Joe Darr and William Follett identified some faunal bone material. Charles Bickel and Stephen A. Kirsch identified rock types of some stone artifacts. Maps accompanying Chapters 1 and 2 were drafted by Charles Bickel, and that accompanying Chapter 3, by Thomas Jackson.

The revised text was typed by Suzanne Sundholm of the Archaeological Research Facility, University of California, Berkeley. Thanks go to the members of the board of the Facility, especially the chairman, John Graham, for making this publication possible.

Chapter 1. INTRODUCTION.

Historical review.

A brief review is offered here of previous archaeological work in the San Francisco Bay area, in order to illustrate the assumptions embodied in the isolation of that geographic region as a unit for archaeological study and to place this paper in the context of previous methodological and theoretical contributions toward a prehistory of the area. For more detail regarding method and theory, and for more attention to the wider archaeological unit of central California as a whole, see Fredrickson (1973, 1974) and Gerow with Force (1968) for recent historical reviews. Uhle (1907: 6-7) lists early references in the literature to central California shellmounds. Moratto (1974) provides a recent bibliography for the San Francisco Bay area which includes anthropological and historical sources relevant and contributory to knowledge of the prehistory of the area.

The San Francisco Bay area was first treated as an archaeological unit by N. C. Nelson, in the course of his survey of "evidences of prehistoric man" along the bayshore (1909: 310). The sites he recorded included both earth mounds and shell heaps, to use his terminology, but he separated the 2 site types and was willing to postulate some kind of cultural unity only for the latter. Regarding these, he observed that, "[e]nough is known to warrant the statement that a general similarity in culture obtains for the entire region; but the differences, if any, remain to be brought clearly" (1909: 327).

Nelson included in his Bay region the coastal strip between the northern and southern latitude boundaries of San Francisco Bay. The substantial dependence upon shellfish as a food, evidenced in the significant shell content of the seashore mounds, was the basis for assuming some relationship between the occupants of these sites and those on the bayshore. This illustrated well the element of environmental or, better, subsistence determinism inherent in the grouping together of shellmounds of the region. [1]

1 Some of that determinism remains, if involuntarily, in the present scheme. Although it is assumed that there were inhabitants of the immediate area interior to the bayshore extending to the foothills, there has been insufficient work done to define the relationships between local inland sites and nearby shellmound sites adjacent to the bayshore. Whether these represent seasonal or occasional occupations for the exploitation of different resources, or whether they represent alternate subsistence adaptations of populations distinct from those occupying shellmound sites is not clear as yet.

Nelson was working with limited information. Only 3 mounds in his sample had been carefully excavated (1909: 31).[1] Otherwise his data came from observations of the sites located in his survey, from information collected by his professor, John C. Merriam, and from collections and hearsay among residents of the bay region. The brevity of his conclusions, which extended little beyond the statement of general cultural similarity quoted above, may be attributed to the paucity of data. As will be noted below, Nelson did acknowledge the evidence of some cultural change over time within the region, which had been suggested previously by Uhle (1907); he also suggested the possible functional nature of some differences observed in the material culture of different sites, and granted that some differences might reflect occupation of different sites by groups with different cultural affiliations. However, he offered no site-by-site comparisons of differences with which to document his observations.

Nelson's map served to define the San Francisco region for some time. For example, Kroeber's (1925: 919-939) discussion of California prehistory employed the geographic category without explicitly delimiting the boundaries of the San Francisco Bay region, implying that it was a commonly known unit. Bay sites mentioned in text and tables were all bayshore locations; no inland sites were mentioned (probably because none had been well sampled), and a single coastal site was listed separately from bay sites. As will be mentioned below, Kroeber argued for general homogeneity, over both space and time, within the San Francisco Bay region.

Gifford (1940: 157, 159, 160) tentatively divided Nelson's Bay region into 2 areas. He separated the Sonoma-Napa-Solano County areas bounding northern San Francisco Bay, which are part of his Napa region, from the rest of the "/s/hores and nearer hinterland of San Francisco, San Pablo, and Suisun Bays" (p. 157), which made up his Bay region. Gifford's Bay region, like Nelson's, included some coastal and inland sites as well as bayshore sites. The tentative separation between Napa and Bay was based upon evident prevalence of cremation in the Napa region as opposed to inhumation in the Bay region. After Gifford's tabulations of California bone and shell artifact types (1940, 1947) failed to show the presence of types peculiar to the Napa region, he suggested (1947: 51) that it should be merged either with his Bay region or Delta region, both adjacent to the Napa region, and both sharing a high number of artifact types with the latter.

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1 The 3 referred to were Emeryville (Ala-309), excavated by Uhle, Ellis Landing (CCo-295), excavated by Nelson, and West Berkeley (Ala-307), excavated by Furlong and Peterson. The Emeryville and Ellis Landing studies were published (Uhle 1907; Nelson 1910); Furlong's and Peterson's reports remain in manuscript form on file at the Archaeological Research Facility, UC-Berkeley, but their work is incorporated in a report based on later excavations (Wallace and Lathrap 1975).

Following Nelson, Beardsley (1948, 1954) was the next to attempt to describe the archaeology of the San Francisco Bay region as a whole. His main effort was to show a sequence of cultural change in sites along the coast of Marin County, northwest of San Francisco Bay. He treated the Marin coast as a separate unit from the San Francisco Bay area. Aside from this deletion, Beardsley's San Francisco Bay area was the same as Nelson's, with the focus on bayshore sites, but with the inclusion of 2 inland sites with shell-rich middens suggesting a bay focus; a single ocean coastal site west of the bay was also included (1954: 87).

At a higher level of integration, Beardsley placed the Marin coastal sites and the San Francisco Bay area sites into a Littoral Zone. This category was not based on cultural similarities between Marin coast and San Francisco Bay sites, but rather on "cultural differences that consistently separate the salt water manifestations of culture in all periods from contemporary manifestations in the Great Valley of the interior. Dissimilar environments working on basically uniform traditions are the factors responsible for much, but not all, of this divergence" (1954: 7). Beardsley's view of culture formation and persistence contains a strong element of subsistence determinism. His view that basically uniform traditions characterized the Marin coast, San Francisco Bay and the Great Valley will be mentioned again below.

After Beardsley, aside from summaries (Meighan 1959, Heizer 1964) the next detailed treatment of the archaeology of the San Francisco Bay area as a unit was offered by Gerow, as part of a reexamination of the archaeology of central California (Gerow with Force 1968). As in previous studies mentioned above, the area was treated as a unit with no formal delimitation of boundaries made, and no explicit discussion of the kind of unity (geographical, cultural, or other) implied in treating the area as a unit for study. However, it is clear that Gerow's Bay region is essentially the same as Nelson's. Gerow's map of selected sites does not include any coastal sites, but the inland site CCo-259 is shown (Gerow with Force 1968: 139).

It is evident that 2 presumptions formed the basis for the early designation of the San Francisco Bay area as an archaeological unit, and they remain implicit in continued use of the unit. One is the notion that some continuity in culture can be expected among human groups which live adjacent to one another. The second is the notion that some continuity in culture can be expected among human groups which share a common subsistence pattern in the same or closely similar environmental situations. The nature of this continuity in culture is never specified, but these notions imply a definition of culture which includes elements of both a "normative" approach, which emphasizes shared ideas and consequent shared behaviors, and an "adaptive systemic" approach, which emphasizes common participation in a system by individuals who do not necessarily share ideas or behaviors (see Binford 1965). Both approaches have merit, but it will be important in future work to clarify what is implied when cultural continuity or similarity of one sort or another is suggested.

As they have been used so far, these notions allow a boundary to be drawn between the interior valley and the bayshore, but leave unresolved the degree and nature of cultural similarity to be postulated for adjacent groups which inhabited a similar environment but possibly practiced different subsistence strategies. Nelson, for example, felt safe generalizing about the inhabitants of shellmounds in the Bay region, but was uncertain that an equivalent degree of cultural similarity could be postulated for inhabitants of Bay region sites where shell was not prominent in the midden. Later analysts did not make this distinction explicitly, but the data for their syntheses came from shellmound sites, since it is predominantly these which have been excavated up to the present.[1]

This paper treats the San Francisco Bay area as an archaeological unit (see Map 1-1). Ocean coast sites are excluded.[2] The analysis focuses on bay-oriented sites, both bayshore locations and inland sites with shell-rich middens, for the time-honored reason that most available data come from these. This focus is recognized as a weakness, and the imperative need to sample inland sites and "earth mounds" is stressed. Without an understanding of the degree of sedentism represented in the large shellmounds, without a notion of what the inland sites represent in relation to the bayshore sites, we cannot adequately assess the extent and nature of cultural continuity within the area, nor can we understand the social mechanisms by which cultural information was transmitted. On the other hand, the data so far gathered have been sufficien to generate several models of the prehistory of the area, and from these can be extracted underlying hypotheses which may be tested. New schemes are not

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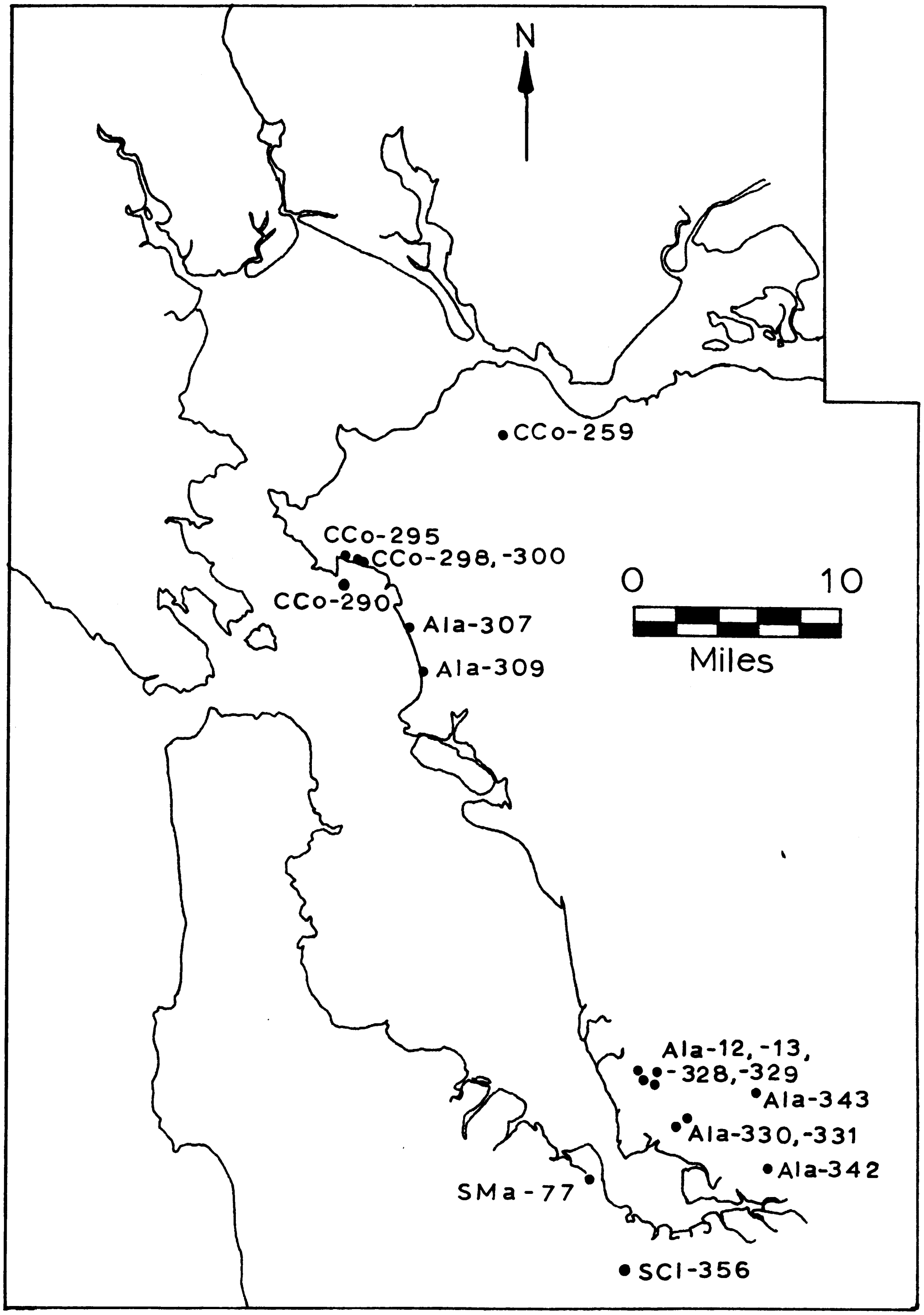
1 University Village (SMa-77) is the only major published site in the Bay area in which the midden contained less than about 15% of constituents other than soil (Gerow with Force 1968: 27-29). Since the site is also one of the earliest occupied Bay sites so far excavated, it would be of interest to have a larger sample of "earth mounds" with which to compare it. As it is now, the suggestion that a period of less intensive exploitation of local food resources, represented by SMa-77, was followed by a period of more intensive exploitation, as indicated by the higher shell and bone content in sites occupied later around the bay (Gerow with Force 1968: 124), is weakened because we are unsure whether the contrast between the early earth midden and the later shell middens represents temporal change or is a function of a limited sample skewed toward the more visible shellmounds.

2 Beardsley's work (1948, 1954) justifies provisional separation of the archaeological unit manifested in Marin coast sites from that manifested in San Francisco Bay-oriented sites in Marin County; ocean coast sites along the San



Map 1-1. San Francisco Bay Area. Location of sites mentioned in text.

the immediate requirement. The primary focus of continuing work toward a prehistory of the Bay area should be to test and modify the formulations already offered.

Early formulations were divided over the issue of the existence of notable cultural change over time or space within the area. In later formulations, change is acknowledged but there is disagreement over the nature of the change, particularly with reference to the question of how it was affected by cultural influences from outside the area.

In the first published systematic report of a San Francisco Bay shellmound (Uhle 1907), certain cultural changes were documented at Emeryville. Max Uhle, using stratigraphy for chronological control, reported change over time in burial customs, in the occurrence or frequency of occurrence of certain artifact forms, and in the relative proportions of oyster and clam shells in the midden. On the level of broad developmental stages, however, Uhle considered that all occupants of the site had led "a primitive as well as a simple life" with "implements... of the rudest kind," in "low types of dwelling places" with a gathering subsistence technique (1907: 31).

Nelson subsequently (1909) postulated a general similarity in culture among Bay area shellmounds. He acknowledged the likelihood that some differences might exist within and among sites, due either to change over time, or to cultural differences among occupants of different sites, or to differential suitability of particular sites for certain subsistence activities. However, the only specific difference cited in his survey report was differing frequencies of occurrence of stone "sinkers" at particular sites. Uhle (1907: 42) had already contrasted Emeryville and West Berkeley with regard to differing proportions of stone and bone tools at the 2 sites, which he linked to a presumed emphasis on fishing at the latter site.

Nelson's detailed report (1910) on excavations at Ellis Landing argued for essential cultural unity of all inhabitants of that site. Allusions to certain late additions to the artifact assemblage and to general progress towards perfection of manufacture (Nelson 1910: 402) implied the recognition of cultural change like that demonstrated by Uhle for Emeryville, but Nelson gave no listing of distributional differences or changes in form among artifacts, and the basis for his allusions cannot be found in the published data. The one change specified, from preponderance of mussel shell in lower levels to that of clam in upper levels, was interpreted as an involuntary response to environmental changes in the condition of the bay bottom.

Francisco peninsula are excluded because of the paucity of reported information. The relationships between the sea-coast sites and bay-oriented sites merit study, but they are not considered in this paper.

Nelson's work reinforced the notion that cultural change at the developmental level of stages was absent at Ellis Landing. Unfortunately, it also diverted attention from the existence of change over time at the smaller scale which Uhle had demonstrated for Emeryville. Nelson failed to apply Uhle's analytical techniques, and subsequent studies shared this defect.

For example, Loud (1924) interpreted differences between the 2 Stege mounds (CCo-298, CCo-300) in amount of living debris and in numbers of artifacts classed as "netsinkers" to reflect different subsistence modes of the occupants of the 2 sites, presumably reflecting cultural traditions of different times, but he confessed to see no way to control the temporal element. In this regard, Loud suggested that study of smaller sites would be useful, a suggestion later repeated by Kroeber (1936: 113) and still currently made (T. King 1974: 38-39), though it has not been followed in any systematic way.

Kroeber based an early summation of California prehistory (1925: 919-939) primarily on archaeological data from the San Francisco Bay area. The similarity in artifact types recovered from different sites and different depths impressed Kroeber, and he generalized from the Bay area for the state as a whole, postulating that "relatively little transformation and but slight succession of civilizations occurred in prehistoric California" (1925: 931). He acknowledged that some variation in frequency of occurrence of artifact types had been noted within and among San Francisco Bay area mounds, but dismissed the possibility that this might represent local cultural variation over space or time, attributing the variation to the vagaries of sampling large sites of irregular structure.

Schenck (1926), reporting on later excavations at Emeryville on the occasion of the leveling of that site, re-echoed previous conclusions of others regarding the absence of evidence indicating cultural development of an evolutionary nature in the archaeological remains of successive occupations of sites in the Bay area. Although his excavations and documentation of salvage work encompassed a much greater volume of midden than Uhle's had, Schenck had little to contribute with regard to smaller scale cultural changes at Emeryville. He was unable to perceive Uhle's strata, and did not summarize changes in occurrence or frequency of occurrence of particular artifact forms by depth units. Fortunately, his published report did include information regarding provenience by depth for many artifacts (unlike Nelson's Ellis Landing report) which permitted the demonstration of change over relative time by other analysts subsequently (e.g., Kroeber 1936; Beardsley 1948, 1954; Gerow with Force 1968).

By 1936 Kroeber had been influenced by the successful construction elsewhere of local and regional sequences of cultural change outside the context of a scheme of developmental stages, and he predicted that such sequences could be constructed in California, although he anticipated difficulty due to the absence of an item like pottery which provides a vehicle for fairly rapid change within a local tradition (and for archaeological detection of such change). From southern and central California data, Kroeber isolated an apparent trend in the decreasing frequency of occurrence of charmstones over time. He proposed the use of such a trend to correlate regional and local sequences throughout California wherever charmstones occurred archaeologically.

Kroeber's optimism that local sequences of culture change were to be found in California was based on work in southern and central California which was published during the late 20's and early 30's (Rogers 1929, Olson 1930, Lillard and Purves 1936). In 1939 there appeared the most detailed and best documented local sequence to be offered in California up to that time, the scheme of Lillard, Heizer and Fenenga (1939, hereafter LH&F 1939; Heizer and Fenenga 1939) which traced cultural change in the interior valley of central California. In addition to documentation of change per se, the methods used were an important feature of the study. They represent refinements and additions to the methods used by Uhle to show change at Emeryville by attending to variations in modes of disposal of the dead and to changing frequencies of occurrence of particular artifact types in midden.

Lillard, Heizer and Fenenga used variation in modes of disposal of the dead and also attended to changing frequencies of occurrence of different artifact types. They differed from Uhle by focusing upon gravelots as units of analysis. Depth provenience of graves and the patterned co-occurrence of certain artifact types as grave goods in certain relative frequencies were used to isolate groups of burials presumed to share cultural identity. These data were the basis for the formulation of 3 periods which could be defined according to a combination of traits including attributes of mortuary behavior such as position and mode of disposal and the number and identity of artifacts placed with the dead. Use of gravelots alleviated the difficulty of extracting regularities in changing use of artifacts from deposition units of irregular construction.

Although the scheme of 3 periods, or horizons, was defined on the basis of archaeological data from the interior valley of central California, it was of wider interest. Heizer and Fenenga (1939) in presenting it to a national audience, emphasized 2 aspects of the scheme. First, it was another demonstration, in addition to the work of Rogers and Olson in southern California, that cultural change characterized California prehistory. With these cases in hand, it was time to discard the entrenched notion of a homogeneous unchanging California prehistoric culture. Second, the Valley 3 period scheme appeared to be paralleled by cultural change patterns in the Bay area and in southern California; hence they felt that the succession of horizons which they had demonstrated for the Valley was an example of a general California phenomenon.

Heizer and Fenenga specifically indicated the applicability of the Valley sequence to the Bay area (1939: 396-397). Beardsley's work in the next decade was an attempt to present evidence for cultural succession along the San Francisco Bayshore and the Marin coast which would show those local sequences to be comparable and generally equivalent in content and order to the Valley horizons.

This kind of extension of one regional sequence to other areas occurs commonly in early efforts to establish chronological control over archaeological material in areas where the events of prehistory are yet to be discerned (Willey and Phillips 1958: 27; Rowe 1962: 42). The dangers of such an extension lie in untested assumptions that events and processes were the same outside the studied region as they were within it (an assumption clearly made by Kroeber and by Heizer and Fenenga as shown above). In the hope of getting something for nothing, as Rowe put it (1962: 43), a developmental scheme based on a local sequence may be extended beyond appropriate limits, at the risk of serious distortion.

A particular difficulty with extending the Valley shceme to the Bay area lies in the method of gravelot analysis by which the Valley periods were isolated and defined. Along the bay, graves accompanied by goods were the exception rather than the rule, and the quantity and variety of items recovered as grave goods was generally much smaller than that commonly found in gravelots in the Valley. Thus Beardsley was forced to use a very restricted data sample in order to match Bay area sites against Valley horizon criteria. For example, 119 of 705 burials from Emeryville were accompanied by artifacts; Beardsley used only 48 because of lack of depth data or "complacency of artifacts in terms of facies affiliation" (Beardsley 1954: 88). He considered that he had successfully matched the sequence of cultural change in the Bay area with that in the Valley in spite of such an obvious contrast between the 2 areas as that of frequency of placement of goods in graves.

While his matching might have been justified if simple correlation of phases were the aim, it should be recalled that Beardsley assumed a common tradition binding the 2 areas, and attributed differences in material culture to differences in environment. Another explanation offered for the absence or paucity of certain Valley traits in the Bay area was a characterization of Bay area cultures as marginal (Heizer 1949: 39).

An alternative to this approach which extends the Valley sequence to the Bay area and attributes differences to the environmental setting or to marginality of Bay area culture is an approach which considers the Bay area as a home for cultural traditions and developments which were different from, rather than marginal to, Valley traditions and developments. Such a model does not deny contact between the 2 areas nor negate the utility of some Valley diagnostics for cross-dating Bay and Valley phases. However, it makes no assumption of a common cultural tradition uniting the 2 areas, and focuses instead upon defining a sequence and tradition or traditions for the Bay area in terms of attributes which prove to be significant within the formal, temporal, and spatial parameters of archaeological manifestations within the Bay area itself. Such a task is difficult in that it requires doing for the Bay area what Lillard, Heizer and Fenenga did for the Valley -- discovering attributes which permit temporal and formal ordering of archaeological data from a number of sites within the region. The greater ease of focusing upon attributes and trends already isolated by someone else perhaps explains the widespread adoption of the Valley horizon scheme after it was proposed.

The alternative perspective was mentioned by Gerow as early as 1954 (see Gerow with Force 1968: 8-9), but reports on Bay area sites continued to consist of application of the taxonomy developed for the Valley to Bay area material (e.d., Davis and Treganza 1959, hereafter D&T 1959; Davis 1960), with the underlying assumption of common tradition unquestioned.

The reappraisal of central California archaeology included in the University Village report (Gerow with Force 1968) applied the new perspective to archaeological materials from University Village and other published Bay area sites in order to suggest characteristics of Bay area occupations at different time periods, and to isolate trends of change. Gerow used gravelot data where possible to make his formulation comparable to that derived for the Valley. He admitted that Beardsley had shown trait correspondences between Bay and Valley sites, but contended that a characterization of the archaeology of Bay sites was lacking in Beardsley's work.

On the basis of data from University Village and lower levels of West Berkeley, Gerow summarized the traits of local culture during an "Early Bay" period, cross-datable to some manifestations of the Valley "Early Horizon" by bead and ornament types, but contrasting with the Valley cultures of that time period in features such as subsistence strategy and mortuary behavior.

Study of the characteristics of Bay and Valley components attributable to the successive time periods of the Middle and Late Horizons in the Valley allowed Gerow to delineate trends of change in the 2 areas. An increase in trait correspondences between the 2 areas over time suggested to Gerow a model of convergence rather than the lineal model of parallel change which underlies extension of the Valley scheme to the Bay area.

A recent report (Wallace and Lathrap 1975) in which it is contended that West Berkeley can be "fit into" the Valley scheme and that the early component of that Bay site has generic affinities with Early Horizon manifestations in the Valley suggests that a model of parallel successive changes in Bay and Valley is still considered appropriate by some students of Bay area archaeology in spite of Gerow's presentation of an alternate model of convergence.

Examination of archaeological material from other Bay area sites in the light of both models is warranted as part of an effort to evaluate both schemes and to extract aspects of each which may be useful in continuing delineation and refinement of a Bay area prehistory.

Focus of this paper.

This paper provides description and analysis of material excavated from 3 shell midden sites near the southeast shore of San Francisco Bay in Alameda County, sites Ala-328, -13, and -12. These sites, together with a fourth, Ala-329, are all within a distance of a mile from one another. Radiocarbon determinations and artifactual similarities indicate that there was considerable overlap in the occupation of the 4 sites, with the initial occupation of Ala-328 occurring earliest and the final occupation at Ala-329 probably the latest. Analysis of the Ala-329 material is proceeding at Stanford University under the direction of Gerow.

The information to be derived from the archaeology of these 4 sites is particularly suited to the purpose of evaluation of the parallel and convergent models of change discussed above. Occupation of the group of sites spans a period which apparently began shortly after the abandonment of University Village and West Berkeley and ceased slightly prior to the historic period which began with Spanish contact. In his effort to characterize a Bay tradition and to illustrate the differences between Bay and Valley postulated in the convergence model, Gerow provided most detail for the earliest known phase, which pertains to his "Early Bay" period and to Wallace's "West Berkeley facies" of the interior Early Horizon (Wallace and Lathrap 1975: 57). Gerow's information derived from analysis of the University Village material which was under his supervision, and from the Wallace and Lathrap manuscript pertaining to West Berkeley which was published in 1975 after slight revision. Gerow's delineation of later periods, depending as it did primarily upon published materials, was less specific, focusing more on trends of change than on characterizations of particular components or phases. Analysis of the material from the 3 Alameda sites described herein, together with that from Ala-329, will permit characterization of later archaeological phases in the Bay area, and hence is appropriate to an effort to examine the validity of a model which emphasizes differences between Bay and Valley sites rather than similarities.

The possibility that a perspective from the southeast shore of San Francisco Bay gives an excessively localized view of Bay area prehistory is recognized. For this reason, some comparison with other Bay area materials is included as a necessary part of the description and analysis. However, a detailed re-examination of material from other sites (as well as location and excavation of site types and site loci not yet sampled) is required before a Bay-wide prehistory can adequately be formulated. That is beyond the scope of this paper, which works toward a prehistory of the Bay area, but which attains only a view from the 3 sites reported upon here.

Limitations of the data to be presented.

The parallel and convergent models are both integrative schemes at the descriptive level (Willey and Phillips 1958). The data and analysis offered in this paper also remain primarily at the level of descriptive rather than explanatory prehistory. In part this reflects a conviction that spatial-temporal integration of archaeological manifestations and delineations of an outline of prehistory are a necessary part of the operations which produce interpretations of prehistory at the explanatory level. In part the narrow focus of this paper reflects also the limits of existing information pertaining to Bay area prehistory.

As mentioned above, it is known that all Bay area sites are not shell middens, but historically the focus has been on these. The resulting lack of temporal, functional and probably spatial control over site variation inhibits interpretation of the archaeology of the predominant site type examined, shell middens, as well as leaving a gap in knowledge of other site types. For example, if some earth middens represent seasonal occupation sites or specialized activity sites used by people who occupied shell middens, the archaeology of the latter clearly does not give a complete picture of the subsistence activities of occupants of shell middens.

The problem might be less serious if intensive analyses of food remains and studies of general paleoecology were available for the shell middens which have been examined, but this is not the case. There are sampling difficulties with those midden constituent analyses which have been done, disparities in procedures of collection and analysis which make site by site comparisons of results difficult, as well as difficulties in interpreting midden composition data in cultural or behavioral terms. Reporting of floral remains is scanty, primarily because of poor preservation of macroscopic remains. Techniques such as flotation and pollen sampling for recovery of plant remains have not been used during the excavation of most Bay area sites. Analyses of faunal remains vary in extent and techniques used, making both intra- and inter-site comparisons difficult. Most frequently, only a listing of species present is offered. The net result of relative inattention to floral and faunal remains is that knowledge of diet of prehistoric occupants of the Bay area is incomplete, and is based on inference from qualitative observations.

Even the artifactual material from Bay area sites, which has been better studied than other factors pertaining to settlement and subsistence patterns, is not as well understood as it needs to be to adequately inform a Bay area prehistory. In this paper, artifacts are described primarily in terms of formal attributes. Few inferences regarding function are made, either concerning the use to which an item was put, or concerning the function it fulfilled in a systemic context. Function is not ignored because purely formal classifications are considered to have more value than those which attend to function. On the contrary, the intent is to admit and to emphasize the regrettable lack of knowledge regarding function of many archaeological artifact types commonly found in California, and in the Bay area in particular.

Organization of artifact descriptions according to putative activity spheres (e.g., hunting, ceremonial, dress) has been common in reports on California sites since Lillard, Heizer and Fenenga (1939) set the precedent. Yet, as mentioned above, very basic knowledge is still lacking regarding factors such as diet, community size and permanency which have direct bearing on the ways in which artifacts were used. It may be that functional and contextual categorizations of implements, however speculative, have lured students into complacency -- possibly, vital questions have remained unaddressed in research because people thought that the answers were known. This is surely an over-simplification, but the point seems valid. Undocumented assignments of function to particular artifact types may obscure rather than clarify knowledge.

Experimental archaeology (in attempts to replicate wear patterns on bone tools, e.g.) and continuing efforts in the area of ethnographic analogy may indicate the probable uses to which certain artifact types were put. Attention to the covariance of attribute changes on different artifact types, like that which informed Deetz's (1970) interpretation of selected aspects of the general archaeological sequence on the southern California coast, may be a key to systemic functions of particular artifact types or attributes. Chester King's (1974a) consideration of the varying economic and social functions of shell beads according to factors such as display area produced per unit of energy input into the manufacturing process is another study along this line. But bone wear pattern replication studies are few or nonexistent, an update on analogies in California awaits a re-examination of the accuracy of the ethnography (Heizer 1975) and, unfortunately, the rarity of studies like Deetz's and King's is what makes them so exciting. It is hoped that a side effect of the predominant use of formal rather than functional classifications here will be to emphasize what is not known about the functions of many artifact types, which may perhaps stimulate efforts to address this serious deficiency.

In the absence of basic understanding of such factors as settlement patterns, residential permanency, and subsistence procedures as reflected in diet, it is difficult to interpret the descriptive patterns of occurrence and change extracted from analyses of gravelots and artifact assemblages; hence the emphasis of this paper on description, rather than interpretation. The primary effort is to deal, within the limitations of the data, with the implications of the parallel and convergent models for cultural change in central California, to characterize the remains of prehistoric occupation on one shore of San Francisco Bay over a long time span, to examine any trends evident in the materials, and to evaluate the similarity or dissimilarity of the remains and trends with characterizations for the Bay area previously offered.

Chapter 2. SITES ALAMEDA-328, ALAMEDA-13, AND ALAMEDA-12.

Location.

Ala-328, -13, and -12 are situated near the eastern shore of San Francisco Bay, south of Alameda Creek and the Coyote Hills Slough, roughly between the cities of Newark to the southeast and Union City to the northeast (see Map 2-1). Together with adjacent site Ala-329, they are sometimes referred to jointly as the "Coyote Hills sites" because of their location near the eastern edge of those hills. [1] Other names previously applied to the sites include "Newark" and "Patterson", sometimes used to refer to both Ala-328 and -329, sometimes only to the former; and "Ryan", applied to Ala-329. (Newark is a nearby city, and Patterson and Ryan are names of families who owned and used the sites historically.)

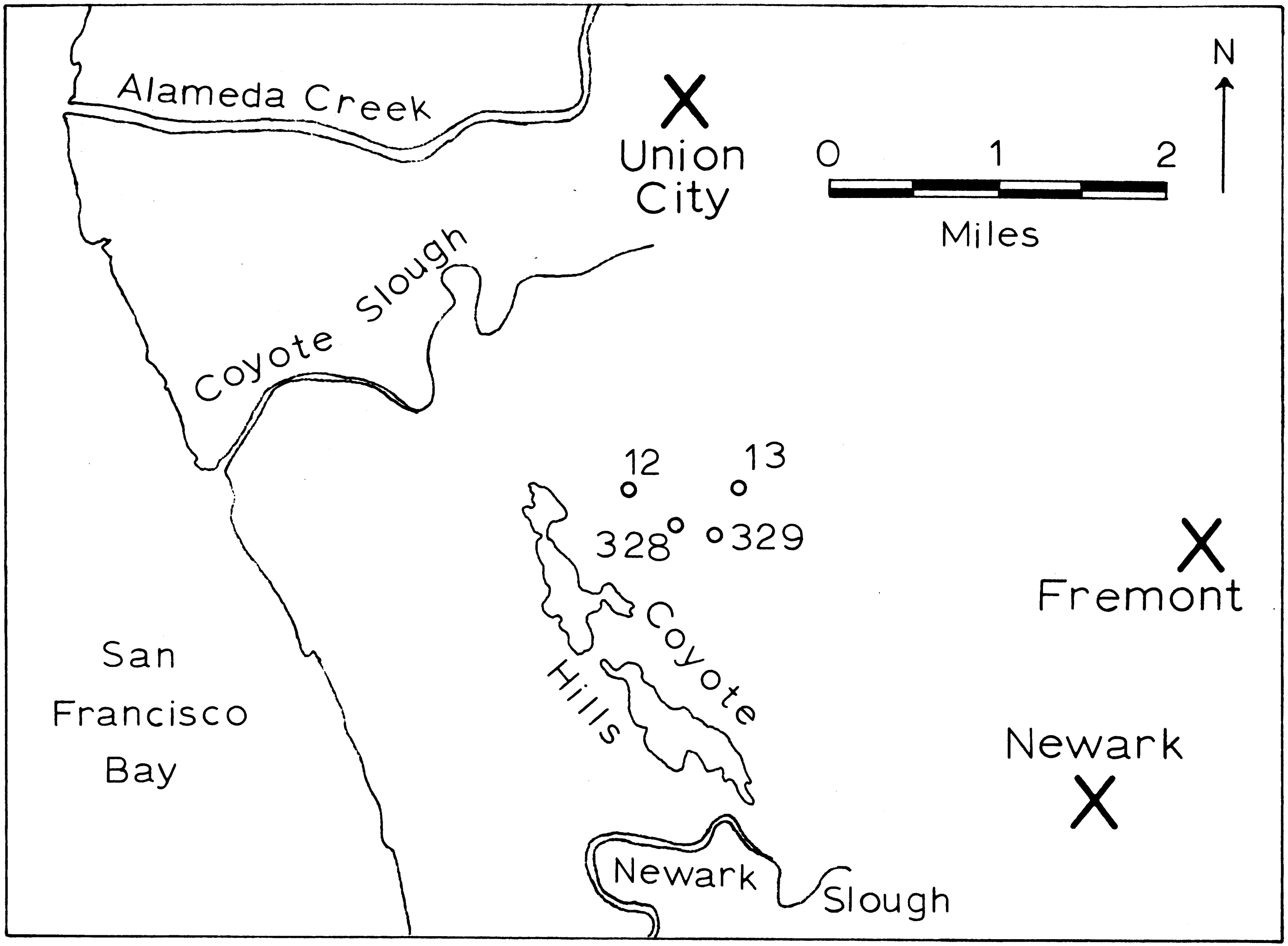
The 4 sites lie between approximately 4 and 6 feet above sea level upon an alluvial plain which slopes from about 100 feet above sea level at the base of the Diablo Range foothills about 10 miles to the east, to 5 feet above sea level at the east edge of the Coyote Hills, three tenths to seven tenths of a mile west of the sites.

There has been no systematic survey of the hills and immediate environs, as far as I was able to determine; hence these 4 sites should not be accepted as the only manifestation of aboriginal occupation in the area. Wedel (1935) reported a survey of the bayward side of the hills, on which no sites were found. Other sites in the vicinity but farther from the hills than these 3 are discussed later in this chapter.

Local environment.

There has been no systematic attempt at paleoenvironmental reconstruction of the area of the sites. Consideration of archaeological evidence for environmental conditions has been confined to inferences based upon examinations of the faunal components of midden constituents and species identification of artifactual bone (e.g., if deer were present, the local environment must have been such as to support deer, and so forth). Previous discussion of the environment of the sites (D&T 1959: 4-5) offered a brief delineation of present-day environment in the area, under the assumption that little significant environmental change has taken place since the sites were abandoned prehistorically.

[1] For want of a better term, the phrase "Coyote Hills sites" is used occasionally below to refer to the sites described in this paper without Ala-329; "the Alameda sites" is used similarly. Context should make the meaning clear in each case.



Map 2-1. Location of archaeological sites Ala-328, Ala-13, Ala-12, Ala-329.

That assumption is also made here, but the description of the Coyote Hills environment offered is set as far back in time as historical records permit and the effects of some known historic changes are considered as they pertain to reconstruction of the prehistoric environment. Extremely helpful in this regard were 2 recent studies, a map showing the extent of marshlands on San Francisco Bay in the mid-1800's (Nichols and Wright 1971), and a geographical consideration of landscape modification over time in the Coyote Hills area (Pressler 1973). These are the major sources of data for the sections on environmental factors below.

Climate. The Coyote Hills area falls into Grinnell's Upper Sonoran life zone, and experiences a Mediterranean climate (Kessli 1942: 477-478), 2 seasons differentiated by slight difference in average temperature and a notable difference in precipitation. Climatic information presented below comes from a U.S. Weather Bureau station at Fremont (Elford 1972, cited in Pressler 1973) to the southeast of the Coyote Hills area, and from Pressler (1973: 19-21).

Summer mean average daily temperature is 60° F.; winter mean average is 51°. September, the hottest summer month, has average maximum readings of 77°, with night temperatures dropping to the 50's; on the average, only 5 days annually have maximum temperatures of 90° or higher. January is the coldest month, with minimum temperature readings averaging 38°, and high afternoon readings around 58°; on the average, only 13 days annually have minimum temperatures below 32°.

Precipitation averages 15 inches per year. Less than 10% of the annual rain falls during the May to October summer period. Total precipitation may drop to about 8 inches once every 20 years, or rise to 23 inches equally rarely. Given this seasonal variation in rain, plants grown without irrigation are expected to become dormant in early June.

Sunshine is the general rule for weather, although in summer clouds tend to gather in the afternoon and remain until early the next day, while in winter clouds are brought in by the occasional storms which move through the area.

No wind measurements have been made in the area. Velocities are probably higher on the bay side of the hills than in the area of the sites. The assumption is made that this shelter from the wind was one reason which made habitation at these sites advantageous.

Soil. The soil of the alluvial plain on which the Coyote Hills sites lie is a member of the Dublin adobes. Three of the sites lie on a sterile soil base which is a yellowish clay comparable to the usual substratum found adjacent to Dublin adobes (D&T 1959: 7); Ala-12 lies on sand (Rackerby 1967, hereafter R 1967, p. 28). For agricultural purposes these alluvial soils exhibit poor drainage but are fertile if well-managed. Tree crops, which suffer from waterlogging, would not thrive in this area with its usually high water table, but forage, field and truck crops are suitable. The soils of the Coyote Hills themselves are well-drained but are agriculturally useless because of the steep slope and the consequent instability of the soil; however, they can sustain range grassland which has been used historically for grazing domesticated animals (Pressler 1973: 21-24).

Geology. The Coyote Hills rise 300 feet above sea level, an isolated upland unconnected with the hills on either side. The bedrock forming the hills is highly deformed. It includes weakly metamorphosed basalt, chert, graywacke sandstone, and minor amounts of shale, all rocks belonging to the Franciscan Formation (Pressler 1973: 9). The cherts and basalts, more resistant to erosion, form the hill tops, capping the sandstone and shale which make up the rocks of the lower slopes and the valleys. Some of this local rock, especially chert and sandstone, appears in the archaeological sites, in both modified and unmodified forms.

The flat lands on which the Coyote Hills sites lie are alluvial deposits containing material from the hills to the east and some deposition of bay sediment. Near the mouth of Alameda Creek to the northwest of the sites, bay mud interfingers with sand, silt and gravel carried to the bay by the stream (Schlocker 1968: 25, quoted in Nichols and Wright 1971: 5). The alluvium is estimated to be 1000 feet deep near the east edge of the Coyote Hills, decreasing in depth in an easterly direction (Pressler 1973: 18).

Relationship of sites to fresh water, marsh, and bay. The Coyote Hills carry no streams. Some springs, running today, surface on the hill slopes. In 1935 an archaeologist at Ala-328 was told by the landowner that there had been a good spring flowing about 50 years previously immediately east of the site in an old creek bed which in 1935 was overgrown with weeds and willows (Wedel 1935). More recently, Pressler learned -- perhaps from the same informant or a relative -- that a line of springs about one half mile east of the hills, and hence close to the archaeological sites, was flowing in the early 1900's, only to cease a few years after the 1906 earthquake (Pressler 1973: 18). The significance of that correlation is unknown. Since the city of Oakland was pumping water from wells in the area at that time, factors other than the earthquake may have contributed to cessation of the springs. The former presence of springs in the area suggests the possibility of their presence during the time when the Coyote Hills sites were occupied, but this remains to be proven (perhaps by study of pollen from the areas of the former springs).

Alameda Creek, probably the only perennial stream in the area when the sites were occupied, flowed along a main distributory channel about 3 miles to the north of the sites in the early 1900's before land reclamation and flood control efforts were begun; some of its meanders came closer to the area of the sites. It rises in the hills to the east, where at least 4 aquifers exist in the Niles Cone (Pressler 1973: 18).

The prehistoric distribution of tributary channels of Alameda Creek and of other ephemeral streams in the area is unknown. The situation is complicated by the fact that the southeastern bay shore was previously lined with marshes and sloughs, whose channels were not fixed. The research of Nichols and Wright (1971) and Pressler (1973) suggests that the inshore extension of marshland was much greater in the Coyote Hills area before land reclamation efforts and the construction of salt evaporation ponds were begun. It appears that each of the 4 archaeological sites was situated at or within 100 or 200 yards of the edge of a marshy area. [1] The marsh survives today in diminished form to the northwest as the Coyote Slough, which has been channelized.

Preliminary analysis by the U. S. Geological Survey of sediment cores taken at the north end of the Coyote Hills near the flood control channels suggests that the marshland presently in the area came into being no more than approximately 3000 years ago; previously the area was mudflats with no vegetation. Cores on bayshore marsh in the southwest bay show the same stratigraphy, a few feet of peat followed by mud (Atwater and Hedel 1976: 10-11). Thus the historic bayward extension of the marshes (i. e., that shown by Nichols and Wright 1971) probably reflects a relatively recent bayward advance of marshland which occurred in the last 3000 years (Bickel 1978a). More detailed analysis of cores in hand, and collection of cores further inland are required for adequate delineation and interpretation of the Holocene history of San Francisco Bay marshlands. The preliminary analysis of cores does support the assumption of marshland environment around the sites discussed herein, which are no older than roughly 2500 years. However, if further work can establish conditions previous to 3000 years ago, it may illuminate the poorly understood earlier human prehistory of the Bay area.

The first significant efforts at land reclamation and flood control in the Coyote Hills area did not take place until after 1916, so the picture gained

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1 Davis refers to the Whitney map of 1873, on which Ala-328 is "located at the edge of a marshy slough, of which the present Coyote Hills Slough is a remnant" (D&T 1959: 4). Nelson (1909) located Ala-328 and -329 within marshlands.

from earlier sources used by Nichols and Wright and Pressler may be close to the reality at the time of aboriginal occupation. Pressler's informants who lived in the area prior to the construction of levees reported that the hills could be reached only by boat at high tide, except from an access road situated on land slightly higher than the marshy areas, which approached from the southeast: "at high tide all the sloughs and creeks were full and the land between would be a salt marsh" (Pressler 1973: 58). During the winter periods of flooding when Alameda Creek overflowed its main channel in the Union City area as well as meanders to the southwest closer to the area of the Coyote Hills sites, the marshy area to the northeast of the hills and northwest of the sites was under as much as 8 feet of water, and the owner of the land rowed over his fields, fences and all (Pressler 1973: 61).

The normal high tide conditions and more extreme winter flooding conditions observed before flood control measures were undertaken suggest the possibility that prehistoric inhabitants of the Coyote Hills sites made trips to the bay or to the hills either by boat, probably tule constructions by analogy with historical observations and ethnographic examples (see Follett 1975a: 80-81 for a review of the evidence regarding tule balsas on San Francisco Bay), or on foot following the tide down paths through the marsh vegetation formed by emptying channels.

Lack of knowledge of the courses of sloughs and channels within the salt marshlands which were near the sites prehistorically is paralleled by uncertainty as to the extent of fresh water marsh and streams adjacent to the salt marsh. Several fresh water marshes are maintained artificially in the area today, but it is uncertain whether any were to be found in the area prior to construction of levees. Since fresh water marshes are customarily found wherever there is possibility for backup of fresh water meeting bay or ocean (Reid 1961: 80), and the gentle slope of the alluvial plain provides that possibility, the assumption of at least a fringe of fresh water marsh around the junctures of stream meanders with salt marsh seem justified.

Pressler (1973: 40) infers the existence of former streams near Ala-328 and -329 from a study of fossil stream channels revealed in aerial photographs. Davis (D&T 1959: 4) assumed the presence of willow and other species which line fresh water courses at Ala-328, but gave no evidence for the assumption. In recent history, Ala-12 and -13 were adjacent to a tributary channel of Alameda Creek. This led to their salvage excavation prior to flood control work on that channel. Whether the channel was full when the sites were occupied is unknown. The base of Ala-12 is sand, which has been interpreted to mean that the site was established on a beach (R 1967: 28), presumably adjacent to a stream.

Although the exact location and extent of fresh water sources for the inhabitants of the Coyote Hills sites in unknown, it is evident that there were active springs or streams in the area. The water table is high locally. Although the pumping of water from wells has lowered the water table historically, it was at or above sea level in 1973, according to Pressler (1973). As was mentioned above, tree crops are not grown in the flatlands adjacent to the Coyote Hills because of the combination of high water table and poorly drained soils. Gerow (with Force 1968: 26) has noted that archaeological sites in the southwest part of the Bay area are invariably situated near zero ground water level, regardless of land elevation or distance from the bay shore. The evidence is less conclusive for the Coyote Hills sites, but suggests that they conform to this pattern.

Plant communities. Among the present-day wildlife habitats in the Coyote Hills area, 2 are of interest because they are the result neither of agriculture nor of flood and tidal controls. These are the grasslands which cover the hills and the willow runs found on flatlands adjacent to the archaeological sites. Discussion below mentions only the prominent species in these plant communities, following Pressler (1973). An exhaustive list of plant and animal species in the area may be found in Ringer (1972).

Vegetation on the hills is primarily open grassland, consisting mainly of European introduced species. Some native bunch grasses still persist, including stipa and small-flowered stipa (both *Stipa sp.*), pine blue grass (*Poa sp.*), and California oat grass (*Danthonia californica*). Some native shrubs grow on the hills, notably California sagebrush (*Artemisia californica*). Some patches of trees are found on the hills, mostly of introduced species, but including 2 native species, California live oak (*Quercus agrifolia*) and California buckeye (*Aesculus californica*).

The expanse of grassland today is maintained by grazing, as it was when the Spaniards of Mission San Jose used the area to graze cattle. Pressler (1973: 44) assumes that prior to contact the native inhabitants burned the grasslands systematically to hold back the growth of bushes and trees and to control the small animal population which presumably was a food source. While there is good evidence for deliberate burning of grasslands by native Californians (Lewis 1973), it is known that purposes of burning varied, and in consequence, parts of particular local areas were burned at different times, or not burned at all. In the absence of any definite evidence for burning, we can only speculate about prehistoric land use and management practices in the Coyote Hills. Judging from present conditions, the hills could have offered a variety of resources from trees, shrubs, bulbs and grasses. Which species were present, whether some of these were encouraged at the expense of others, or whether a careful burning pattern resulted in some mix of varied resources, we cannot say. This is a question which palynological work might answer in the future. [1]

At present, we can only project back some unspecified combination of woodland-grassland covering the hills prehistorically, offering plant resources to humans and animals alike. Very few game animal and bird species in the area today are restricted entirely to the hills environment, but location adjacent to both salt and fresh-water habitats promotes considerable wildlife use of the area. For example, three quarters of the mammal species in the area frequent the hill grasslands, and almost half of the bird species are directly or closely dependent on grassland for food and nesting sites (Pressler 1973: 29-30).

On the flatland soils adjacent to the archaeological sites, willow runs are to be found today. Two species of willow (Salix sp.) predominate, interspersed with California box elder (Acer negundo californicum) and sycamore (Platanus racemosa). Rabbits, other rodents and a variety of birds find a haven in this plant community. If present prehistorically, a willow run around the sites would have been a rich source of food.

The presence of willow, sycamore and elder depends upon where the fresh-salt water boundary was in the prehistoric marshy situation of the sites. The latter 2 species are less salt tolerant than the willows, and their presence may only have been permitted by the desalinization of soil following water control efforts after 1916 which removed access of tidal water to areas adjacent to the sites. Even the willows may not have been present before this time. One obvious check would be the determination of the ages of trees now growing around the site, as well as queries to older residents of the area who might know whether willows grew around the sites before the first dikes were built. More conclusive results applicable to a longer time span might be obtained from analysis of sediment cores from around the sites which could show by pollen and microfaunal analysis what plant communities were present and where salt and fresh water boundaries were located in time and space.

If the present-day plant communities can be used as a basis for reconstruction of the prehistoric local environment of the archaeological sites,

[1] Lewis' work (1973) suggests such widespread effects of aboriginal burning practices in California (e.g., their possible direct contribution to the evolution of chaparral vegetation) that it leads one to speculate that the effects of human hunters-and-gatherers in some parts of the world might be as notable in the pollen record as those of agriculturalists in some places (e.g., in Denmark [Iverson 1956]). For the Coyote Hills area specifically, it would be interesting to see if one could define a pre-human occupation vegetation pattern(s), an aboriginal pattern(s), and a post-contact pattern(s). It would presumably be possible to work backward from the latter, which would show the effects of

the sites were probably situated near the juncture between willow runs and grasslands interspersed with expanses of trees and shrubs. There is notable correspondence between this situation and that characterizing sites in the southwest part of the San Francisco Bay area, where the majority of known sites straddle the border between a "Willow Composite Community", or meadowland, and an "Oak Forest" or parkland (Gerow with Force 1968: 23-24), although the oak component of the Coyote Hills vegetation porbably did not include the valley oak (Quercus lobata) which is found in the southwest Bay area parklands. [1]

Midden constituency and dietary inferences. In addition to the use of resources provided by the plant and animal communities around the archaeological sites, the shell and bone content of the archaeological middens suggests the exploitation of salt marsh, intertidal areas, and the waters of the bay itself, all of which have historically been displaced westwardly from the sites.

Detailed information regarding midden constituency is available only for Ala-328. Regarding Ala-13, Rackerby (1967: 1) states, "the composition of the mound appeared to be quite similar to other shellmounds in the area (Gifford, 1916). Ostrea lurida was the most frequently observed shell; it was found scattered throughout the midden and also concentrated in lenses." At Ala-12, a constituent analysis was evidently begun but there are no records of it. Rackerby (1967: 28) notes that "the greatest majority of the shell lenses and the shell fill in the features were shells of the oyster."

A constituent analysis was made of the midden at Ala-328, based on independent examination of 2 samples from each of the 18 6-inch levels of a 5 by 5 foot pit sunk to a depth of 9 feet. Each sample represented about 0.5% of the volume of a 6-inch level, or approximately 0.033 cubic feet. See Ringer (1972) for a discussion of procedures. The analysis is treated here as if it applies to the site as a whole, with frank admission of the inadequacy of both temporal and spatial representativeness of a sample coming from 1 locus in

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cattle grazing probably in increase in grasses, especially in introduction and spread of European species.

[1] Davis' (D&T 1959: 4) reconstruction of prehistoric environment ignores the Coyote Hills as a locus of tree resources, but presumes presence of valley oak (Quercus lobata) on the valley floor and of buckeye (Aesculus californica) and and 2 species of coastal live oak (Q. agrifolia and Q. wislizenii) in the foothills to the east.

Table 2-1. Average per cent incidence of mount constituents over all levels, Ala-328.

	Sample I	Sample II
Ostrea lurida	38.3	37.1
Macoma nasuta	.8	.6
Cancer sp.	.3	.2
Penitella gabbi	2.2	2.2
Balanus sp.	.7	.8
Cerithidea californica	2.6	2.6
Mytilus edulis	.3	.3
Unidentifiable shell	1.6	1.1
Mammal bone	.1	0
Fish bone	0	.1
Bird bone	0	0
Unidentifiable bone	.3	.3
Charcoal	.4	.3
Lithic	44.7	47.7
Baked clay	7.8	6.8

Table 2-2. Relative per cent incidence of different shell species, Ala-328.

	Sample I	Sample II
Ostrea lurida	81.8	82.7
Macoma nasuta	1.6	1.3
Cancer sp.	.6	.5
Penitella gabbi	4.7	5.0
Balanus sp.	1.6	1.7
Cerithidea californica	5.5	5.8
Mytilus edulis	.6	.7
Unidentified shell	3.3	2.5

Figures on both tables calculated from data in Ringer (1972). Zero values indicate percentages less than 0.1.

Table 2-3. Mammals identified for Ala-12. After Whelan (1970: 12, 17).

Genus	Max. # of individs.	Min. # of individs.	# of bones recovered.
Antilocapra americana			
antelope	4	2.5	5
Canis sp.			
canids	11	5	61
Cervus canadensis			
elk	5	3	80
Citellus beecheyi			
ground squirrel	2	1	2
Enhydra lutris			
sea otter	7	4.5	28
Mephitis mephitis			
striped skunk	1	1	1
Neotoma sp.			
woodrat	1	1	1
Odocoileus hemionus*			
deer	9	2.5	54
Phoca vitulina			
harbor seal	1	1	1
Procyon lotor			
raccoon	1	1	1
Sylvilagus sp.			
brush rabbit	4	1.5	9
Taxidea taxus			
badger	1	1	4
Thomomys bottae			
pocket gopher	10	7	21

* Black-tailed deer or mule deer or both may be represented (see Whelan 1970: 3-4).

such a large site. [1] Although there are competent critiques of constituent analysis, amply summarized by Ringer (1972: Chap. V), there are few studies which meet the requirements for adequate sampling. The extant constituent analyses pertinent to Bay area prehistory, especially Gifford (1916) and Greengo (1951), are certainly as vulnerable as Ringer's to criticisms of sampling inadequacy.

The averages of per cent incidence over all levels for mound constituents, calculated from Ringer's figures given for each level, are given in Table 2-1. Table 2-2 shows relative frequency of occurrence of different species within the shell component alone. Because of the weight of soil and unanalysed residue which passed through screens and was washed from sorted constituents is not included, the figures in Table 2-1 do not show the relatively low shell content of the mound previously noted by Cook and Heizer (1951: 304, Table 7), although percentage of shell is lower than Gifford's (1916: Table 1) percentages for the average San Francisco Bay mound in spite of the absence of a residue category in Ringer's analysis.

Notable is the predominance of oyster (Ostrea lurida) over other shellfish species. This trait, shared by Ala-13 and -12 as mentioned above, is characteristic of mounds in the southern part of the Bay area. Clams (Macoma nasuta) and mussels (Mytilus edulis) are a very minor part of the shell component of the midden, in contrast to sites further north along the bay shore (see Gifford 1916: Table 10). In some of the latter, clams are seen to increase in frequency of occurrence relative to oyster or to mussel over time (Greengo 1951: 5 ff., Table 3), but this trend is absent at the Coyote Hills sites. Explanation probably lies in factors which promoted growth of a sizable oyster population in the south bay at about 2500 BP (Story, Wessels and Wolfe 1966: 49-50) and also, presumably, in differences in availability of clam and mussel relative to oyster in the marsh and bayshore area frequented by inhabitants of the Coyote Hills sites.

Further investigation is needed to delineate the spatial and temporal parameters of the presence of Ostrea lurida in San Francisco Bay. Some oysters have grown whenever sea level caused filling of the bay over the past 200,000 years (Brian Atwater, U.S.G.S., Menlo Park, personal communication 1976); where and when they were populous may have direct bearing on archaeological manifestations along the bay shore. Understanding demographic

1 A further difficulty is the unknown location of Ringer's pit. He says (1972: 25) that it was located 50 feet due north of datum, but it is unclear what datum is his referent. If it is the original datum entered on the 1949 map, his pit probably went through an area of the site excavated and refilled by Wedel. Primarily for this reason, Ringer's postulated changes in shellfish exploitation over time are ignored here. They suffer from several methodological inadequacies as well.

trends of populations of M. nasuta and M. edulis is equally important for improved interpretation of San Francisco Bay area prehistory. Purely cultural explanations for evident human preference for particular shellfish species (e.g., Gifford 1916: 10) are not convincing unless good control over environmental variables permits the rejection of environmental explanations. Even Gerow's cautions assertion that cultural as well as natural factors may be involved (Gerow with Force 1968: 32), certainly correct in its general import, is questionable in its specifics. He suggests that more easily obtained species such as oysters and mussels will be harvested before buried species such as clams in an initial period of bayshore settlement. [1] This may be true, but changing (or unchanging) patterns of species preference over time are surely in part related to environmental determinants of species availability (Bickel 1978b).

The horn shell (Cerithidea californica) and a boring clam (Penitella gabbi) [2] are other prominent shellfish constituents of Ala-328, occurring with greater frequency than clam and mussel although much less significant than oyster. The horn shell is a salt marsh species which favors more brackish water than do the other shellfish midden constituents. It is smaller in size than oyster, clam and mussel. Its relative importance at Ala-328 suggests more exploitation of local salt marsh than occurred at sites further north along the bayshore; whether this was due to presence of relatively more extensive salt marsh or to lesser accessibility to the larger molluscan species is unclear.

It should be noted that all of the shellfish species identified in the constituent analysis are estuarine species (Desgrandchamp 1976). From a broad perspective, San Francisco Bay as a whole may be described as an estuary, for it is the meeting place of salt and fresh water, ocean salt water and fresh water supplied mostly from the Sacramento-San Joaquin drainage of the Sierra Nevadas (Pestrong 1972). A closer focus on estuaries within the bay where local streams exit is warranted in the study of San Francisco Bay prehistory, for most of the archaeological sites so far located and studied reveal a pattern of local estuarine exploitation (Desgrandchamp 1976).

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1 A similar explanation for patterns of shellfish exploitation on the northeast coast of the United States (Snow 1972) has been convincingly refuted by more adequate explanations based upon environmental rather than cultural variables (Braun 1974, Brennan 1976).

2 Another boring clam (Pholas pacifica) has been identified in other sites of the Bay area. Since Ringer's is the only report of Penitella gabbi and he does not report Pholas pacifica, it may be that he has made a different identification of a species identified elsewhere as Pholas pacifica.

The variations in shellfish constituents among sites in part reflect varying microenvironments, due to subtleties such as sedimentation patterns which differentially promote the growth of particular shellfish species. Crude classifications, such as those which assign oysters and mussels to rocky areas and clams to sandy areas (see, e.g., Ringer 1972) and crude causal explanations which assume a particular bay-wide consequence of a phenomenon such as sea level rise (see, e.g., Greengo 1951, criticised by Gerow with Force 1968: 31-32) do not serve an interpretive purpose. On the other hand, attention to the ranges of tolerance to varying conditions exhibited by different species and subsequent examination of probable local effects of postulated bay-wide changes (as well as more local changes) are precisely what is needed to assist the interpretation of the evidence provided by shellfish midden constituents.

Ringer's figures show that shell is a more prominent midden constituent than bone by a factor of 10. This does not necessarily mean that shellfish was more of a dietary staple than meat. Aside from factors such a differing flesh-to-refuse ratios of shellfish and mammals, differential preservation of shell and bone, and the possibility that many mammals were butchered off-site and perhaps consumed off-site as well, the unknown nature and degree of sedentism represented by the site precludes any reliable estimate of the various faunal components of the diet. In the case of shell, the overwhelming predominance of oyster permits inference that this was the most important food species; for bone, the evidence is more equivocal.

Information regarding Ala-13 and -12 comes from a faunal analysis of the mammal bones by Whelan (1967, 1970); fish bone and bird bone was not identified. Whelan (1970) also examined mammal material from Ala-328. Ringer (1972) identified all mammal bone recovered in his constituent unit at Ala-328, and presented the results of identification of all fish bone from the unit by W. I. Follett of the California Academy of Sciences. Bird bone was not treated by Ringer.

Identified mammal remains from Ala-12 are shown on Table 2-3. As the table indicates, canids, pocket gopher, deer, sea otter, antelope and brush rabbit are the most numerous mammals, whether a maximum or a minimum count is used; of these, all but the gopher were probably food animals. Because of the small sample size, no evaluation of the relative importance of one species over another nor any consideration of changes in frequencies of occurrence by depth are considered here.

Mammal remains from Ala-13, shown in Table 2-4, include all animals identified for Ala-12, plus wildcat. Most numerous are gopher, sea otter, deer, canids, raccoon and brush rabbit, according to both maximum and minimum counts of individuals represented. Considering the occurrence of bones identified, rather than individuals represented, Whelan (1970: Tables

Table 2-4. Mammals identified for Ala-13. After Whelan (1970: 28, 39).

Genus	Maximum number of individuals	Minimum number of individuals	Number of bones recovered
Antilocapra americana			
antelope	11	3	17
Canis sp.			
canids	35	10	265
Cervus canadensis			
elk	8	2	50
Citellus beecheyi			
ground squirrel	3	1	4
Enhydra lutris			
sea otter	39	16	313
Lynx rufus			
wilkcat	1	1	1
Mephitis mephitis			
striped skunk	8	2	32
Notoma sp.			
woodrat	6	3	13
Odocoileus hemionus*			
deer	35	12.5	547
Phoca vitulina			
harbor seal	1	1	1
Procyon lotor			
raccoon	15	4	24
Sylvilagus sp.			
brush rabbit	15	7	47
Taxidea taxus			
badger	4	3	31
Thomomys bottae			
pocket gopher	89	66	310

* Black-tailed deer or mule deer or both may be represented (see Whelan 1970: 3-4).

10, 11) sees a decrease in deer from greater to shallower depths, and a reverse trend for sea otter.

Identified mammal remains from Ala-328, shown in Table 2-5, include all genera recovered at Ala-12 and -13 as well as jack rabbit, spotted skunk, California sea lion, and porpoise. Most numerous animals are gopher, sea otter, canids, brush rabbit, and deer. Depth control over faunal remains is very crude, and is skewed by the fact that a majority of bones in the sample were recovered from the 0 to 5 foot level (2924, in contrast to 785 bones from the 5 to 10 foot level; other bones are provenienced to levels of smaller size). Nevertheless, considering numbers of bones rather than individuals, canids, deer and sea otter are the important genera over all depths, with canids predominating in the 5 to 10 foot level, and sea otter in the 0 to 5 foot level.

A small sample of fish bone, recovered from the only unit which was screened it its entirety, was examined by W.I. Follett of the California Academy of Sciences, who identified the following species (Ringer 1972: 23): white sturgeon (Acipenser transmontanus), green sturgeon (Acipenser medirostris), leopard shark (Triakis semifasciata), shark (species unknown), bat ray (Myliobatis californica), long-jawed goby (Gillichthys mirabilis), perch (species unknown), minnow (species unknown). These are all edible fish presently known to frequent San Francisco Bay.

As Ringer points out (1972: 23), the goby, perch and minnow are all represented by small bones or scales which pass through a quarter inch screen; hence they are frequently lost in the field. Sturgeon, shark and bat ray have few bony parts to be preserved. These factors have undoubtedly led to underestimation of the dietary contribution of fish to occupants of bayshore sites. Discussion of fish is usually confined to a few speculations regarding fishing techniques when artifacts attributable to fishing, such as "netsinkers" or "fishspear barbs", are described. Notable exceptions are Follett's analyses of fish remains (Follett 1975a, 1975b; the former includes a bibliography of earlier work), but he is usually given much less than a representative sample with which to work. Outside of the Bay area, attention to fish remains in archaeological sites is greater (e.g., see the work of Casteel, Fitch, Follett and Schulz referred to in Follett 1975a), but is a relatively recent phenomenon still hindered by excavation methods inadequate for recovery of fish remains.

The following points summarize the results of midden analyses at Ala-12, -13, and -328. There is no direct evidence of plant exploitation. Faunal exploitation is represented by large components of shell and relatively small amounts of bone at all 3 sites. Oyster is the predominant shellfish represented. The most common mammal food species at all 3 sites are canids, deer, otter, and rabbit. At Ala-13 and -328 there is some indication

Table 2-5. Mammals identified for Ala-328. After Whelan (1970: 50, 64).

Genus	Maximum number of individuals	Minimum number of individuals	Number of bones recovered
Antilocapra americana			
antelope	7	4	27
Canis sp.			
canids	74	47	955
Cervus canadensis			
elk	19	8	109
Citellus beecheyi			
ground squirrel	15	7	45
Enhydra lutris			
sea otter	97	63	1290
Lepus sp.			
jack rabbit	1	1	1
Lynx rufus			
wildcat	4	2	9
Mephitis mephitis			
striped skunk	15	6	44
Neotoma sp.			
woodrat	19	10	51
Odocoileus hemionus*			
deer	41	20	459
Phoca vitulina			
harbor seal	6	4	25
Procyon lotor			
raccoon	17	9	88
Spilogale sp.			
spotted skunk	1	1	2
Sylvilagus sp.			
brush rabbit	48	31	257
Taxidea taxus			
badger	14	7	98
Thomomys bottae			
pocket gopher	272	249	919
Zalophus californianus			
California sea lion	1	1	1
? ? ? ?			
porpoise	1	1	2

* Black-tailed deer or mule deer or both may be represented (see Whelan 1970: 3-4).

that deer decreases in occurrence over time, while sea otter increases. Eight fish have been identified at Ala-328, including sturgeon and leopard shark, which are large in size but have few bony parts which would leave archaeological evidence of their consumption. Bird bones were present at all 3 sites but have not been identified, an unfortunate circumstance because of their potential for indicating seasonality of occupation.

Ethnographic and historic information.

The aboriginal inhabitants of the Coyote Hills sites presumably belonged to a group of tribes classed as Costanoans, a term taken from the Spanish work Costanos, coastal peopel. The designation Costanoan is also applied to a language of the Penutian family (see Levy 1976 for a history of these linguistic classifications). Kroeber (1925: 463, 465) divided the Costanoan area geographically into 7 dialect areas on the basis of linguistic evidence in mission records and other historical sources. The northernmost of these, Kroeber's "Saklan", is now considered to pertain to Miwok-affiliated occupants, Bennyhoff's (1961) "Bay Miwok", rather than to Costanoans. The Coyote Hills area is well to the south of the Bay Miwok area and its classification as Costanoan is not in dispute.

There is no guarantee that Costanoan linguistic or cultural affiliations extended back into the earlier phases of occupation of the Coyote Hills sites or elsewhere in the Bay area. The central distribution of Penutian languages within a periphery of Hokan languages in California is commonly taken to mean to later arrival of Penutians in the state, who displaced or replaced Hokan speakers. It has been suggested that the presence of notable cultural and physical differences between comparably early occupants of San Francisco Bay area sites and sites in the interior Valley reflect the arrival of Penutian speakers in the interior which caused rapid and distinctive changes in that region which only came to affect Bay area populations later in time (Gerow with Force 1968: 97-98, 125-126).

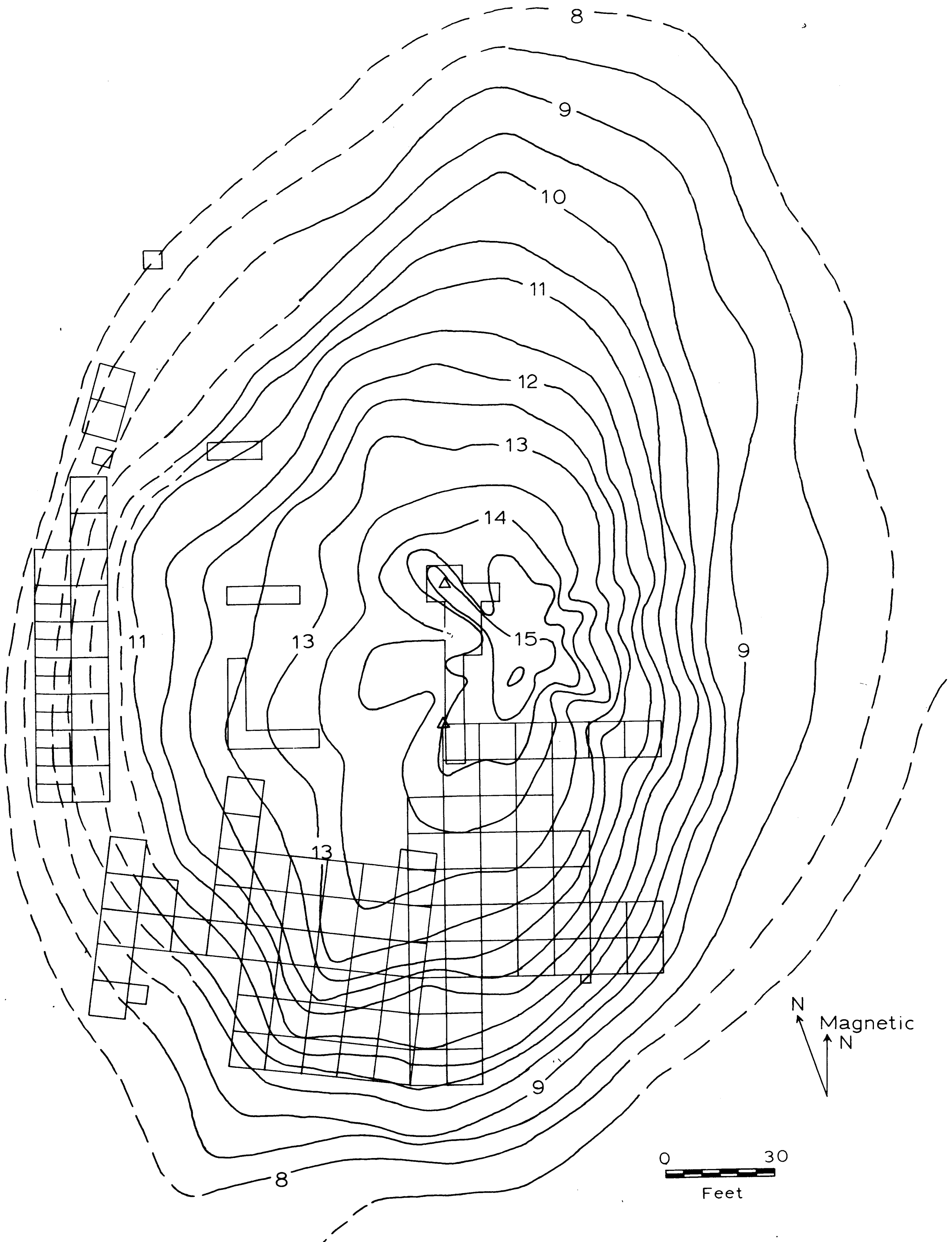
There is little ethnographic information pertinent to understanding Costanoan lifeways before contact. Heizer (1974) and Levy (1978) summarize what is known. These people of the littoral regions were the first and probably most drastically affected by the central California missions, which were situated in Costanoan territory in large part because of the adjacent navigable bays and coast. Native inhabitants who did not die from illness lived a different routine as neophytes in the missions, often with people from a variety of localities including some outside Costanoan territories with whom they might never have dealt, and surely never so intimately, in pre-contact times. Hence missionaries' accounts do not describe a situation unaffected by contact, even after obvious mission influences are stripped away. However, mission records can provide valuable ethnogeographic information as well as other ethnographic data. Recent analyses of mission records focused on other areas around San Francisco Bay illustrate the potential which such investigations would have for adding to the understanding of the late prehistoric and early historic situation in the area of interest here (C. King 1974b, 1977, 1978; Milliken 1978, 1979).

None of the early expeditions in search of mission sites passed close to the vicinity of the Coyote Hills sites, so eyewitness accounts of the environment and any native inhabitants are lacking for the early historic period. However, early maps and expedition accounts pertaining to surrounding areas may provide some geographic information applicable to the area (see, e.g., Mayfield 1978). The absence from the site collections of items such as trade beads indicative of contact with Europeans suggests that there was no post-contact phase of occupation at Ala-328, -13, or -12. Mission Santa Clara, established near the south end of San Francisco Bay in 1777, probably drew any inhabitants of the area into its influence. Mission San Jose was established about 10 miles to the east of the Coyote Hills area in 1797, and thereafter the hills and adjacent lands were used to graze the stock of the mission (Pressler 1973). After secularization, the area was not abandoned to permit a return of any surviving native inhabitants, but has been continually occupied by ranchers and farmers up to the present. Like most of the immediate environs of San Francisco Bay, this locality was sufficiently attractive to the Spanish and to later comers that the native inhabitants were given no opportinity to remain in the area.

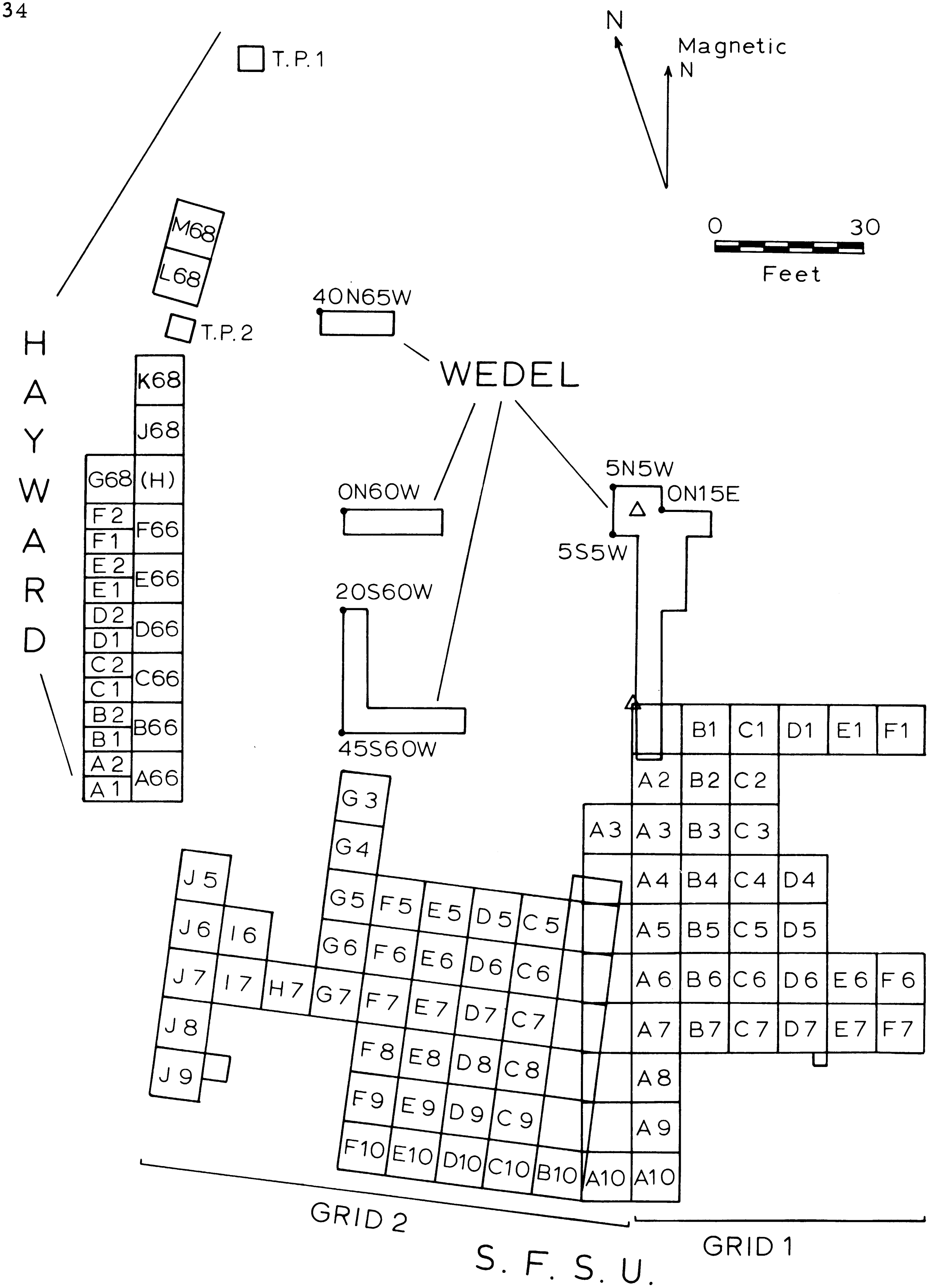
Excavations.

History. Ala-328 was recorded by Nelson (1909) during his early survey of San Francisco Bay shellmounds. Waldo Wedel visited the site in the spring of 1935, when he sunk a test pit near the summit of the mound. He returned in the fall with volunteer graduate student labor from the University of California, Berkeley (henceforth referred to as UC-Berkeley), to direct excavation of 4 or 5 pits to the north and west of the mound center (see Maps 2-2 and 2-3). Burial records and Wedel's field notes from the excavation are Numbers 43 and 67 of the manuscripts on file at the Archaeological Research Facility, UC-Berkeley; burials and artifacts recovered were deposited at the Lowie Museum of Anthropology, UC-Berkeley.

Beginning in the fall of 1949, on ongoing program of excavation was conducted at Ala-328 under the direction of Dr. A. E. Treganza, as part of an archaeological field course offered 1 or 2 semesters of each year by San Francisco State College (now San Francisco State University, henceforth



Map 2-2. Site Ala-328. Contour map showing location of excavated units. Drawn from original SFSU contour map, 1949.
Dashed lines show interpolations included on subsequent SFSU maps.
Contours in feet above sea level. Contour interval 0.5 feet.



Map 2-3. Site Ala-328. Units excavated.
Overlap of SFSU units indicates accumulated error in layout (see text).

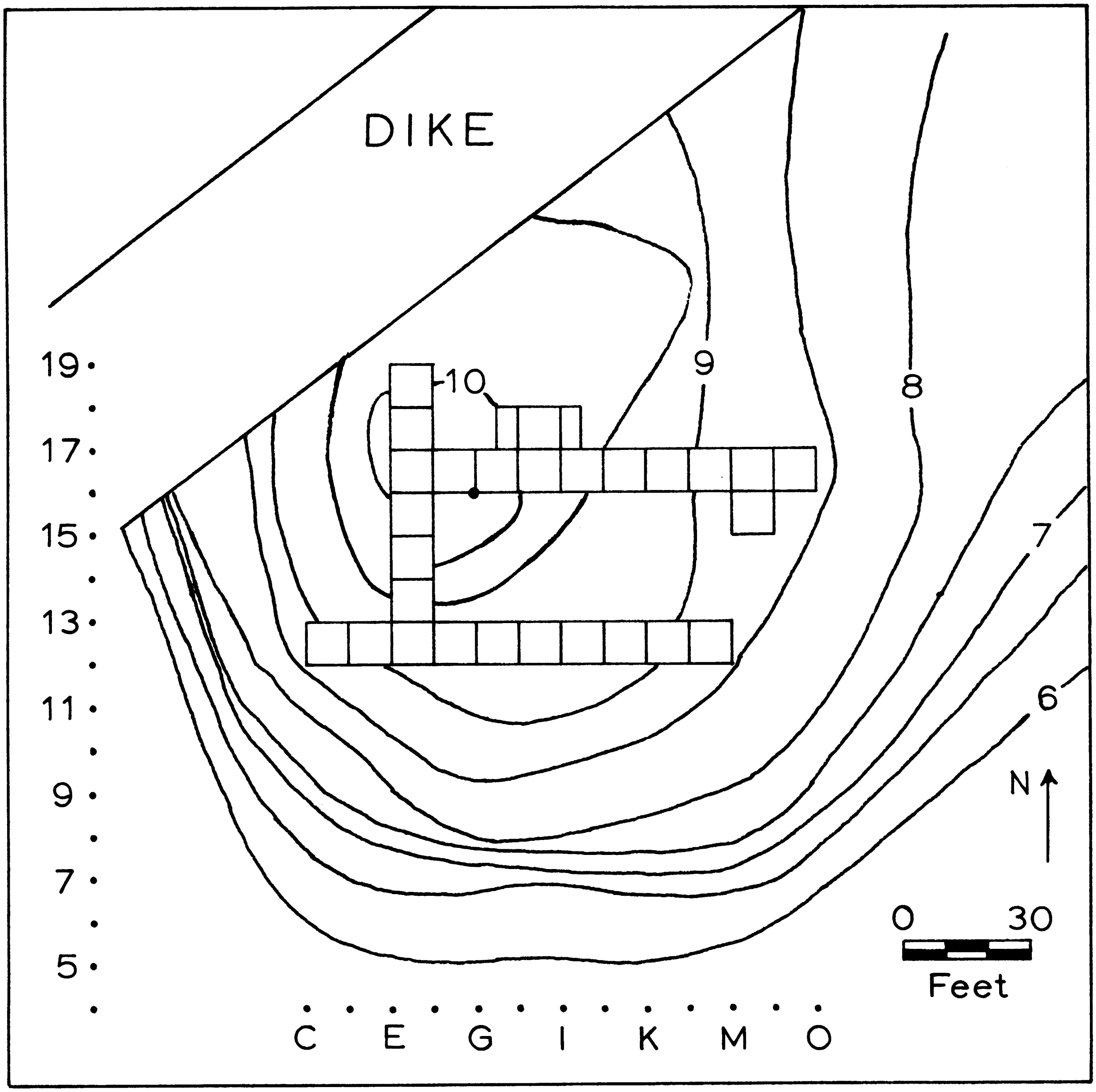
referred to as SFSU). Spring of 1968 was the last SFSU field season at the site, by which time much of the mound south of the summit had been excavated (see Maps 2-2 and 2-3). Field notes, sutdent notebooks, burial records, and artifacts from the excavations are stored at SFSU, under the care of the Treganza Anthropology Museum. The majority of the burials removed are in storage under the care of the Lowie Museum. A report on material excavated through 1953 has been published, written by Davis and Treganza (1959).

During the summers of 1966, 1967 and 1968, a crew of students from Hayward State College (now California State University, Hayward, henceforth referred to as Hayward) under the direction of C. E. Smith, excavated a series of pits to the west and north of those opened by SFSU (see Maps 2-2 and 2-3). Burials and artifacts from the excavations, as well as field notes, student notebooks and burial records are stored at Hayward, under the supervision of the Department of Anthropology.

Over half of Ala-328 remains unexcavated and evidently undisturbed except for plow zone mixing which occurred during the years when the site was farmed. It and adjacent site Ala-329 are presently under the protective supervision of the East Bay Regional Park District. They remain a resource which can be tapped when further excavation is warranted. It is to be hoped that one future priority will be collection and adequate microanalysis of floral and faunal remains.

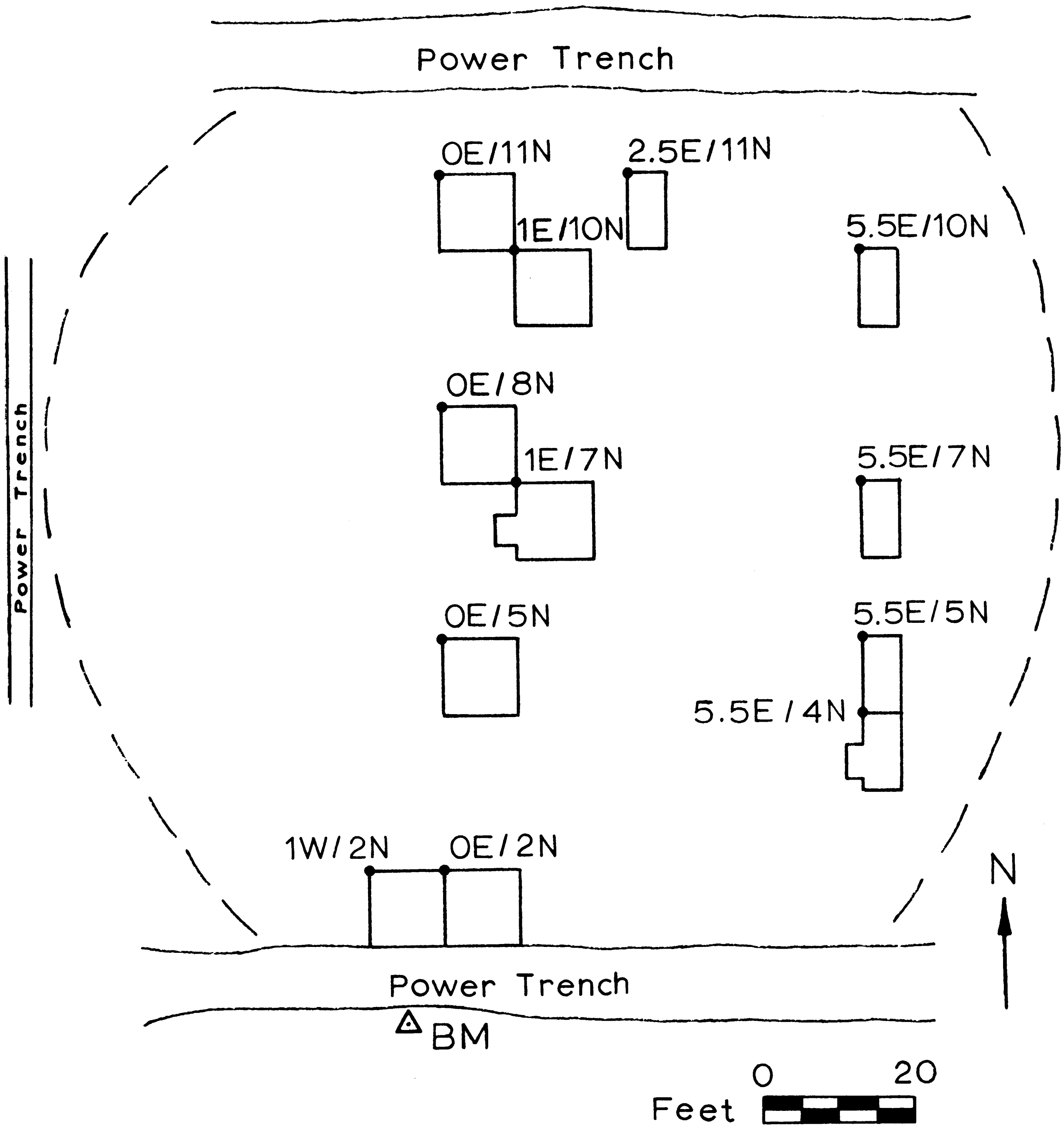
Ala-13 and -12 were not mentioned in Nelson's survey, but were entered into the site records of the University of California Archaeological Survey in 1949. The 2 sites were excavated as a salvage effort contracted by the National Park Service with the Department of Anthropology, SFSU. Work took place in the spring and early summer of 1965. About 60 to 80 working days were spent at the 2 sites, with a regular crew of 5 or 6 experienced students under the direction of F. Rackerby, then a graduate student at SFSU. During the spring, an undergraduate field class also participated in the excavation. Because Ala-12 was flooded until late spring, a much larger area of Ala-13 was excavated (see Maps 2-4, 2-5). Student notebooks, burial records, and artifacts from the excavations are in the care of the Treganza Museum, SFSU; burials have been stored at the Lowie Museum, UC-Berkeley. Rackerby's report on the 1965 excavations at Ala-13 and -12 has been published (R 1967).

In 1968, excavation at Ala-12 was continued, under the direction of R. Oliphant, then an advanced student at SFSU, as part of the activity of an archaeological field methods class (which was also digging at Ala-328). Since only half of the site had been destroyed by flood control work, an effort was made to add to the sample of material previously excavated from Ala-12. Artifacts, burial records and a manuscript report on the excavation are at SFSU, while the burials recovered were placed in the care of the Lowie



Map 2-4. Site Ala-13. Contour map showing location of excavated units.

Based on Rackerby (1967: Map 2).
Contours in feet above sea level.
Contour interval 0.5 feet.



Map 2-5. Site Ala-12. Location of excavated units. Based on Rackerby (1967: Map 3).

Museum, UC-Berkeley.

Much of sites Ala-13 and Ala-12 have been destroyed or disturbed by construction of flood control facilities. It is possible that enough midden remains undisturbed for some useful excavation to be done, although careful assessment of the effects of construction will have to be made. As recommended for Ala-328, adequate samples for microanalysis should be given priority in any future work at these sites.

Methods. Inference from field notes and burial records is largely the source of information regarding methods used in excavating the Alameda sites, since explicit statements regarding technique are lacking.

Wedel's report indicates that pick and shovel were used at Ala-328, with some screening indicated by mention in one burial record that the matrix had been carefully screened; screen size is not mentioned. Units are referred to in 5 by 5, 5 by 10, and 5 by 15 foot dimensions. A north-south line (oriented to magnetic north) and an east-west line run through the datum, which was set at the approximate center of the mound, provided the orientation for all pits opened. Evidently only burials and artifactual remains were collected, no faunal remains or mound constituency samples.

In 1949, SFSU surveyed the mound; their original map was used as the base for Maps 2-2 and 2-3. A grid aligned to magnetic north was staked out, and provided the basic pattern of 10 by 10 foot pits for all subsequent excavations. Over time, error accrued in the north-south and east-west lines, and by 1967 when the lines were resurveyed, errors ranging from 3° to 9° were noted. The displacement of much of Grid II shown on the maps is an approximation of the location of these pits in consideration of the error.[1] Excavation began in the A, B, and C trenches of Grid II in 1954, proceeding

[1] The specific errors recorded were: 0-line (east side A trench) N 3° E (Mag), A-line (west side A trench) N 3.5° E (Mag), F-line (east side G trench) N 9° E (Mag), 4-line (north side 5 trench) E 7° S. On Maps 2-2 and 2-3, an error of 7° is shown for both N-S and E-W lines of all of Grid II except trench A. This overemphasizes the overlap with trench A which occurred in the excavation of pits from trench B, and perhaps underestimates overlap between some pits in the A trenches of Grids I and II. Another approximation might have begun with a 3° error at the 0-line or A-line, then increased it gradually up to 9° at the F-line, thus showing progressive overlapping of adjacent pits in Grid II, rather than indicating massive overlap of trenches B and A, as Maps 2-2 and 2-3 do. Or the overlap might have been shown between Grids I and II along the A trenches. All of these schemes have some logical appeal, but the facts to support any one are lacking. The alternative chosen emphasizes the imprecision of our knowledge of their placement.

generally from south to north through 1968. Without knowledge of the magnitude and location of the errors which altered the grid layout during this period, a true mapping of the excavation units cannot be made.

Power earthmoving equipment was used to clear vegetation and top layers of soil from the mound surface before each season's dig, as well as to move backdirt. A serious error in depth provenience is a possible consequence of this practice. There was no datum plane established, and all depths were reported as depths below surface. Student notebooks indicate that excavators were usually instructed to add a certain number of inches to the measured depth provenience of artifacts to correct for topsoil removal, but it appears that their work was not checked with regard to this factor. Hence in any one season, some artifacts were probably recorded at depths below original surface, others at depths below scraped surface; the discrepancy between the 2 measures was of the order of 18 inches. Whether the zero "surface" to which all depths should have been related corresponded each year to the topography mapped in 1949 seems unlikely in view of the surface scraping which took place each season.

Commentary in student notebooks suggests that the "shovel-broadcast" method was used during most of the SFSU excavations at Ala-328. That is, dirt was removed from place by shovel and spread out for inspection, then shoveled a second time into a backdirt pile where it was again examined for artifactual content. The use of picks to break up soil was occasionally necessary.[1] Photographs indicate that trowels and brushes were used in exposure of burials. Screens were not used until the early 1960s, and thereafter apparently only for burial matrix; screen size is not mentioned. Digging proceeded in arbitrary levels except when burials or features such as pits or housefloors were encountered. The varying depth levels quoted in student notebooks suggest that no consistent level depth was used. As an illustration, Whelan (1970) was unable to control depth provenience of some faunal remains

[1] Only a few student notebooks over the years mention use of picks. Depths referred to are different, and do not support a widespread change in mound compactness at a particular level, like that at 68 inches referred to by Davis (D&T 1959: 8). Since student notebooks up to 1953 do not support his mound mass separation, it may be that continued absence of support in notebooks from later years reflects the nature of the documentation, not the nature of the site. Few notebooks give sidewall profiles, and those offered are often impressionistic. The two profiles presented by Davis (D&T 1959: Diagrams 1, 2) show the separation of upper and lower mound mass at different depths, one at 68 inches and one at 82 to 84 inches. As mentioned by Davis (D&T 1959: 8), Wedel noted a change from lesser to greater compactness between 42 and 48 inches in two pits. (A typographical error in Davis shows the range to be 22 to 48, but Wedel's notes specify 42 to 48 inches.)

more precisely than at 5-foot intervals. One pit, E-5 II, was excavated by natural levels, but work at the site ceased before the pit was deeper than 2 feet. It is not clear how much shell and faunal material was saved during the excavations, nor whether the procedures were consistent through the years. Consistency seems unlikely, since supervision was delegated to different teaching assistants over 20 years. A mound constituent sample was extracted by excavating a 5 by 5 foot pit to sterile and screening all midden therein. The analysis (Ringer 1972) was discussed above. Unfortunately the exact location of the pit cannot be determined, since it is keyed to a datum of uncertain location.

There is no explicit information on methods used in the Hayward excavations at Ala-328. Pits opened in 1966 and 1968 were 10 by 10 feet; those in 1967, 5 by 10; two 5 by 5 foot test pits were sunk in 1967. Screens of unspecified size were in use, but how much of the midden was screened is uncertain. Digging proceeded by 6-inch levels, whether by trowel or shovel is unclear. Unanalysed level bags containing faunal material are in storage at Hayward. Depths are reported sometimes with reference to datum plane, sometimes to surface; because there is no record of the elevation of the datum plane, it is not possible to translate from one depth referent to the other. Where specified, depths in the artifact catalog refer to surface, and I have presumed that this is so for all depths in the catalog. Burial depths refer either to datum plane or surface, and are so specified where cited in this paper. Where only datum plane depth is available for a burial, any associated artifacts are considered here to be of uncertain depth provenience.

Information regarding methods of excavation at Ala-12 and -13 comes from Rackerby (1967). At Ala-13, a grid of 10 by 10 foot units oriented to the cardinal directions was established (whether alignment was to magnetic north or true north is unclear), and the highest point on the site surface was selected as datum plane elevation. Burial depths are usually recorded with reference to both datum plane and surface. Artifact depths are rarely labeled as to referent, but Rackerby (1967: 2) implies that datum plane measurements were used, and cross-checking where possible (for burial associations) suggests that this is so. In this paper, it is presumed that reported artifact depths from Ala-13 refer to datum plane unless they are specifically labeled otherwise. Excavation began with power-stripping in Trench 13 which was "immediately abandoned" (R 1967: 2), although power machinery was regularly used to move backdirt and to open pits D through J in Trench 12 and pit H-11 after hand excavation had ceased. The same "shovel-broadcast" method described for Ala-328 was used at Ala-13, with occasional use of picks. Screens of one-half or one-quarter inch mesh were used to process matrix around features and burials. Faunal material and some lithic material was collected, segregated by pit and 12-inch level; part of the former was identified and analysed by Whelan (1967, 1970). Although column samples for microanalysis of mound constituency were collected (R 1967: 3), there is no record of their ultimate disposition.

Ala-12 was covered with alluvial overburden at the time of excavation in 1965, necessitating test borings to locate the midden surface by depth, and a power stripping operation to remove 26 inches of accumulated overburden from about half of the site surface. Deeper power trenches were opened around the west, south and north of the site to securely establish the limits of midden extent. A north-south baseline was established (whether alignment was to true north or to magnetic north is unclear) and several 10 by 10 foot and 5 by 5 foot units were opened. [1] According to Rackerby (1967: 30), "Excavations proceeded in the same manner as at Ala-13." Artifacts, burials and features were recorded to depth below surface. A datum plane was established, but was referred to only in burial records, where depth below surface were also cited. The site topography was not mapped. Faunal material and some lithic material was collected by 12-inch levels; some of the former has been analysed (Whelan 1967, 1970). Rackerby (1967: 30) reports that quarter inch screens were used for burial and feature matrix, although Oliphant's handout to students in 1968 states that no screening had been done at the site.

In 1968, Oliphant directed excavation of 2 10 by 5 foot pits at Ala-12, 2.5E/11N and 1E/10N. Digging was done with shovels, picks and trowels. All of the material from pit 2.5E/11N was passed through quarter inch screen. The shovel-broadcast method was used in pit 1E/10N, with screens used only for the material from feature 28. Excavation proceeded in 12-inch levels. Absolute depths below surface of artifacts, burials and features were recorded. Faunal material and some lithic material was saved by 12-inch levels; this was never analysed.

Sample recovered. Wedel (1935) estimated the size of Ala-328 to be 100 by 70 yards; his excavations showed maximum depth to be greater than 12 feet. Davis (D&T 1959: 1, Map 1) gives dimensions of 350 by 250 feet, with a known depth of 13 feet near center. Roughly 20% of the site surface has been opened by excavators, as Map 2-2 shows. Because records are incomplete, it is uncertain how many of the pits were excavated to sterile base, and precise calculation of the volume of material excavated is not possible. A minimal estimate is 75,947 cubic feet. This was calculated after a study of student notes and the deepest reports of artifacts and burials in each unit allowed

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[1] On Rackerby's Map 3, units are inconsistently labeled, some according to northeast corner, some according to northwest corner, and 2 pits have identical labels. Map 2-5 herein shows pits labeled according to grid coordinates of the northwest corner; locations in this paper refer to pit designations on this corrected map.

estimation of the final depth to which each pit was excavated. In equivocal instances (e.g., 3 artifacts at 96 inches, 1 at 120 inches) the conservative estimate (96 inches, in this case) was preferred. Table 2-6 summarizes the data used for this calculation, and indicates which pits were probably excavated to sterile. As with depth estimates, evidence that sterile was reached was evaluated conservatively. Approximately 517 burials were exposed and about 3500 items (not counting individual beads found together as lots) were catalogued as artifacts from Ala-328; this is equivalent to 0.007 burials and 0.046 artifacts per cubic foot removed. [1]

Ala-13 was a circular mound estimated to measure 300 feet in diameter before part of it was destroyed by construction of an earthen dike in the early part of this century (R 1967: 1). Rackerby implies a 6 foot depth of midden, but 55 to 60 inches seems a more accurate estimate. [2] There are no records showing the depth to which each pit was excavated. Rackerby (1967: 2) estimates that 26 pits were dug to an average of 55 inches depth, which would give 11,916 feet as the volume removed by excavators. Using the depths of the deepest burials or artifacts reported from each pit as indicators of maximum depth to which that pit was dug, I found that twenty five 10 by 10 foot pits and two 5 by 10 foot pits (which sum to give Rackerby's 26 pits) were excavated to an average depth of 47 inches. Calculation of volume removed from each pit gives 10,245 cubic feet as the volume removed by excavators. Table 2-7 summarizes the data used for this calculation, and indicates which pits were probably excavated to sterile base. Both estimates ignore the power stripping of pits 12D-j and 11H. Reported artifacts almost exclusively pertain to burials at sterile base in this area, suggesting that midden from shallower depths was not carefully examined for artifactual material; hence it seems incorrect to treat the power stripping as equivalent to hand excavation in calculating the volume of material excavated. As an estimate, I treat the power stripping as an 18 inch excavation of eight 10 by 10 foot pits, adding 1200 to the total volume excavated at Ala-13, to give 11,445 cubic feet. About 4% of the original site surface was sampled. [3] Approximately 425 putative artifacts

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1 The figures calculated separately for each excavation are: SFSU, .007 burials and .045 artifacts per cubic foot; Hayward, .005 burials and .067 artifacts per cubic foot; Wedel, .008 burials and .035 artifacts per cubic foot. It should be noted that a number of catalogued items did not appear to be artifacts when examined; hence these are maximal figures for artifact yield of the midden.

2 Burial 76, nearest to the datum point (reportedly the highest point of the mound), was in a submound pit at 50 inches below surface, 57 inches below datum plane (R 1967: 77).

3 Rackerby (1967: 2) mentions a ten per cent sample, but this refers to

(not counting individual beads found together as lots) and 108 burials were exposed or recovered at Ala-13; this is equivalent to 0.037 artifacts and 0.009 burials per cubic foot excavated.

Ala-12 was nearly circular, measuring 150 feet north-south by 140 feet east-west before flood control work destroyed part of the site; maximum midden depth was 56 to 60 inches (R 1967: 30). In the absence of records indicating the depth to which each pit was dug, an estimate was made, on the assumption that each pit was excavated to the depth of the deepest reported burials or artifacts. This procedure gives a total volume of 3650 cubic feet removed from the site, including both 1965 and 1968 excavations. Table 2-8 summarizes data used in this calculation, and indicates which pits were probably excavated to sterile. Approximately 6% of the site surface was sampled. Thirteen burials and about 450 putative artifacts (not counting individual beads found together as lots) were exposed or recovered at Ala-12; this is equivalent to 0.004 burials and 0.123 artifacts per cubic foot excavated. This is a higher artifact yield and slightly lower burial yield relative to dirt moved than was attained at Ala-13 and -328. It holds for the 1965 and 1968 excavations considered separately, and for the screened and unscreened pits of the 1968 excavations considered separately.

Previous analyses and reports.

Artifacts recovered from the Wedel excavations at Ala-328 were included in Gifford's (1940, 1947) compendia of Californian bone and shell artifacts. Beardsley (1954: 98-99) summarized the archaeology as revealed by the Wedel collection. On the basis of 7 graves with associated artifacts, he found 2 components, 1 pertaining to his Ellis Landing Facies, temporally equivalent to the Middle Horizon of the Valley, and 1 belonging to his Fernandez Facies, temporally equivalent to Phase 2 of the Late Horizon of the Valley. He noted the absence of evidence for a component of his Emeryville Facies, temporally intermediate between Ellis Landing and Fernandez Facies, equivalent to Phase 1 of the Late Horizon of the Valley, but mentioned evidence for a component pertaining to that facies ad adjacent site Ala-329. Beardsley's cultural break between Ellis Landing and Fernandez components occurs between 36 and 48 inches below surface, in the area of contrast between hard packed midden and less compact upper levels of the mound noted by Wedel at 42 to 48 inches depth. Burials without associations were found deeper than the deepest assignable to Ellis Landing Facies. Beardsley left open the question of their temporal and cultural implications, although he considered the presence

27,200 square feet "available for investigation" (this phrase is not explained further), rather than to the 70,686 square foot area of a circular site 300 feet in diameter, disregarding the effect of topography, which would increase this figure.

Table 2-6. Estimates by pit of depth and volume of excavations, Ala-328.

Pit		Dimensions (ft.)	Depth (in.)	Sterile	Volume (cu. ft.)
Wedel excavations					
0-5S	10-15E	5 x 5	96		200
0-5S	7-10E	3 x 5	120		150
0-5S	5-7E	2 x 5	96		80
W and S of datum [1]		radius of 8	12		200
40-50S	0-5E	5 x 10	120		500
40-55W	40-45S	5 x 15	40		250
30-40S	0-5E	5 x 10	48		200
0-5E	0-5S	5 x 5	48		100
0-5E	5-10S	5 x 5	72		150
0-5E	10-15S	5 x 5	84		175
5-6½E	12½-16½S [2]	1½ x 4	84		42
40-45S	35-40W	5 x 5	8		17
40-45S	55-60W	5 x 5	21		44
30-40S	55-60W	5 x 10	26		108
20-30S	55-60W	5 x 10	12		50
0-5S	40-50W	5 x 10	57		238
0-5S	50-60W	5 x 10	48		200
35-40N	50-65W	5 x 15	20		125
15-30S	0-5E	5 x 15	31		194
Hayward excavations					
A-66		10 x 10	49		408
B-66		10 x 10	48		400
C-66		10 x 10	66		550
D-66		10 x 10	66	x	550
E-66		10 x 10	54		450
F-66		10 x 10	39		325
G-68		10 x 10	38		317
J-68		10 x 10	43		358
K-68		10 x 10	48		400
L-68		10 x 10	60		500
M-68		10 x 10	16		133
Test Pit 1		5 x 5	60	x	125
Test Pit 2		5 x 5	36		75
A1-67		5 x 10	24		100
A2-67		5 x 10	18		75
B1-67		5 x 10	34		142
B2-67		5 x 10	54	x	225

Table 2-6 (continued)

Pit		Dimensions (ft.)	Depth (in.)	Sterile	Volume (cu. ft.)
Hayward excavations (continued)					
C1-67		5 x 10	48		200
C2-67		5 x 10	60	x	250
D1-67		5 x 10	37		154
D2-67		5 x 10	42	x	175
E1-67		5 x 10	48	x	200
E2-67		5 x 10	48	x	200
F1-67		5 x 10	48		200
F2-67		5 x 10	50	x	208
SFSU excavations					
A-1	I	10 x 10	146	x	1217
A-2	I	10 x 10	126	x	1050
A-3	I	10 x 10	96		800
A-4	I	10 x 10	108	x	900
A-5	I	10 x 10	108	x	900
A-6	I	10 x 10	114	x	950
A-7	I	10 x 10	111	x	925
A-8	I	10 x 10	84		700
A-9	I	10 x 10	72		600
A-10	I	10 x 10	24		200
B-1	I	10 x 10	120	x	1000
B-2	I	10 x 10	96		800
B-3	I	10 x 10	96	x	800
B-4	I	10 x 10	102		850
B-5	I	10 x 10	60		500
B-6	I	10 x 10	120	x	1000
B-7	I	10 x 10	78		650
C-1	I	10 x 10	124	x	1033
C-2	I	10 x 10	114	x	950
C-3	I	10 x 10	114	x	950
C-4	I	10 x 10	120	x	1000
C-5	I	10 x 10	96		800
C-6	I	10 x 10	96		800
C-7	I	10 x 10	96		800
D-1	I	10 x 10	124	x	1033
D-4	I	10 x 10	110	x	917
D-5	I	10 x 10	110	x	917
D-6	I	10 x 10	96	x	800

Table 2-6 (continued)

Pit		Dimensions (ft.)	Depth (in.)	Sterile	Volume (cu. ft.)
SFSU excavations (continued)					
D-7	I, north half	5 x 10	96		400
D-7	I, south half	5 x 10	60		250
E-1	I	10 x 10	124	x	1033
E-6	I	10 x 10	96		800
E-7	I	10 x 10	90	x	750
F-1	I	10 x 10	96	x	800
F-6	I	10 x 10	60		500
F-7	I	10 x 10	60	x	500
A-3	II	10 x 10	108	x	900
A-4	II	10 x 10	120	x	1000
A-5	II	10 x 10	108	x	900
A-6	II	10 x 10	96	x	800
A-7	II	10 x 10	96	x	800
A-8	II	10 x 10	96		800
A-9	II	10 x 10	108	x	900
A-10	II	10 x 10	96		800
B-4	II, south half	5 x 10	120	x	500
B-5	II	10 x 10	120	x	1000
B-6	II	10 x 10	96	x	800
B-7	II	10 x 10	120	x	1000
B-8	II	10 x 10	102	x	850
B-9	II	10 x 10	96		800
B-10	II	10 x 10	90	x	750
C-5	II	10 x 10	120	x	1000
C-6	II	10 x 10	108	x	900
C-7	II	10 x 10	96	x	800
C-8	II	10 x 10	96	x	800
C-9	II	10 x 10	100	x	833
C-10	II	10 x 10	72		600
D-5	II	10 x 10	108	x	900
D-6	II	10 x 10	108	x	900
D-7	II	10 x 10	108	x	900
D-8	II	10 x 10	96	x	800
D-9	II	10 x 10	120	x	1000
D-10	II	10 x 10	84	x	700
E-5	II	10 x 10	24		200
E-6	II	10 x 10	102	x	850
E-7	II	10 x 10	110	x	917
E-8	II	10 x 10	87	x	725

Table 2-6 (continued)

Pit		Dimensions (ft.)	Depth (in.)	Sterile	Volume (cu. ft.)
SFSU excavations (continued)					
E-9	II	10 x 10	84	x	700
E-10	II	10 x 10	60	x	500
F-5	II	10 x 10	100	x	833
F-6	II	10 x 10	96	x	800
F-7	II	10 x 10	120	x	1000
F-8	II	10 x 10	72	x	600
F-9	II	10 x 10	75		625
F-10	II	10 x 10	48		400
G-3	II	10 x 10	66		550
G-4	II	10 x 10	90	x	750
G-5	II	10 x 10	84	x	700
G-6	II	10 x 10	84	x	700
G-7	II	10 x 10	80	x	667
H-7	II	10 x 10	36		300
I-6	II	10 x 10	12		100
I-7	II	10 x 10	24		200
I-9	II, NW quarter	5 x 5	40	x	83
J-5	II	10 x 10	24		200
J-6	II	10 x 10	81	x	675
J-7	II	10 x 10	62	x	500
J-8	II	10 x 10	70	x	583
J-9	II	10 x 10	60	x	500

[1] Housefloor exposure detailed in Wedel notes (1935).

[2] Area of burials 15-17; Wedel notes mention clearing overburden to expose portions of burials outside established pit boundaries.

Table 2-7. Estimates by pit of depth and volume of excavations, Ala-13.

Pit	Depth (in.)	Sterile	Volume (cu. ft.)
C-13	44		367
D-13	51	x	425
E-13	58	x	483
F-13	53		442
G-13	50		417
H-13	55	x	458
I-13	46	x	383
J-13	43	x	358
E-14	64	x	533
E-15	55	x	458
E-16	47		392
M-16	32		267
E-17	55	x	458
F-17	53	x	442
G-17	62		517
H-17	40	x	333
I-17	48	x	400
J-17	48		400
K-17	45	x	375
L-17	37	x	308
M-17	42	x	350
N-17	36	x	300
E-18	67		558
G-18*	17		71*
H-18	20		167
I-18*	26		108*
E-19	57		475

* Five by ten foot pit; all others were ten by ten feet.

Table 2-8. Estimates by pit of depth and volume of excavations, Ala-12.

Pit	Dimensions (ft.)	Depth (in.)	Sterile	Vol. (cu. ft.)
2.5E/11N	5 x 10	54	x	225
1E/10N	5 x 10	60	x	250
0E/11N	10 x 10	54	x	450
5.5E/10N	5 x 10	36		150
0E/8N	10 x 10	60	x	500
1E/7N	10 x 10	60	x	500
0E/7N*	3 x 4	60	x	60
5.5E/7N	5 x 10	36		150
0E/5N	10 x 10	60	x	500
5.5E/5N	5 x 10	30		125
5.5E/4N**	5 x 10 + 3 x 2	30		140
1W/2N	10 x 10	48		400
0E/2N	10 x 10	24	x	200

* Unit partially excavated only in southeast quadrant (see Map 2-5).

** Unit expanded west into what should have been 5E/4N (see Map 2-5), but artifacts credited to 5.5E/5N.

of 1 ventrally extended burial to be possible evidence for Early Horizon occupation on the bay shore.

Davis reported upon material gathered in the first 5 seasons of SFSU excavations at Ala-328 in a masters thesis for UC-Berkeley which was subsequently published (D&T 1959). Joint authorship with A. E. Treganza reflected the role of the latter as excavation director, but the analysis and interpretation offered is Davis' (D&T 1959: iv), hence he is referred to alone as the author throughout this paper. Davis suggested the presence of 3 cultural components at the site, characterized by differing frequencies of occurrence of particular artifact types and burial complex attributes. Change between components was gradual and exhibited continuity. The distribution of artifacts recovered without association as well as those found as grave goods was considered in Davis' formulation. As he anticipated (D&T 1959: 62) material from subsequent excavations necessitates some alterations in his scheme, and these will be discussed in Chapter 5. Specific revisions or comments regarding his descriptions of artifact types and mortuary complex are included in Chapters 3 and 4 where appropriate.

In addition to characterizing 3 components at Ala-328, Davis attempted to evaluate the affinities of the site to other central California sites by comparing frequencies of occurrence at other sites of selected artifact types from Ala-328. This permitted him to note that certain artifact types, such as serrate bone and bone wedges, are found primarily in bay and coastal sites, rarely in sites of the interior Valley. From this he concluded that "culture differences did exist between the two regions in prehistoric time" (D&T 1959: 67). It is unclear whether he interpreted this difference to reflect anything other than environmental demands on a tradition essentially the same as that found in the interior, as Beardsley had previously asserted. However, Davis' use of Ala-328 traits rather than traits drawn from the 3-horizon Valley scheme as a basis for comparison provided the reader with more of a delineation of Bay area culture than had Beardsley's approach.

Rackerby's (1967) report on the 1965 excavations at Ala-13 and Ala-12 compares poorly with Davis' work. There is no discussion of the goals of the excavation or analysis, perhaps a reflection of the salvage nature of the work. The report briefly discusses mortuary patterns and describes the artifacts in terms of their significance as time markers according to the Valley horizon scheme. Rackerby did not personally examine all of the artifactual material. His report was prepared while he was in residence as a graduate student in Illinois. This perhaps explains why Ala-13 and Ala-12 artifacts were not compared with the Ala-328 collections, a procedure which would have benefited the study. For example, Rackerby claims to have isolated a previously unreported bone awl type at Ala-12, but numerous specimens of the type are present in the Ala-328 collection. A number of errors in identification of shell species, bone type and rock type are present in the report, as well as inaccurate descriptions of some artifacts and incorrect typological identification of some shell beads. These errors are corrected in Chapter 3 below.

Several masters theses at SFSU treat material from 1 or more of the sites. These include a constituent analysis of midden from Ala-328 (Ringer 1972), an analysis of mammal remains from Ala-328, -13 and -12 (Whelan 1970), and a study of the paleopathology of human skeletal remains from Ala-328 (Ryan 1972). Desgrandchamp (1976) uses data from Ringer (1972) to compare estuarine exploitation in the San Francisco Bay area and the Santa Barbara region of southern California. Results of Ringer's constituent analysis and Whelan's faunal analyses have been presented above. Ryan's work is referred to in Chapter 4 below.

It should be noted that Ryan's study is the only work to date which treats a large proportion of skeletal material from any of the sites. Dr. Sheilagh Brooks of the University of Nevada, Las Vegas, made some anthropometric measurements on Ala-328 material excavated through 1957 (personal communication 1973). Her only published study to date regarding this material (Brooks and Hohenthal 1963) discusses 2 individuals from Ala-328 which were found to have cleft palates. Dr. Judy Suchey of California State University, Northridge, recorded nonmetric traits of the crania of 39 individuals from Ala-328 as part of a study of biological distance among central California populations (Suchey 1975). In addition to these efforts, there are unpublished determinations of age and sex of some of the Ala-328 material, discussed in Chapter 4.

Thus, although excavation at Ala-328, -13 and -12 led to the recovery of skeletal remains of more than 600 individuals, we cannot at present describe the physical characteristics of the occupants of these sites. This deficiency limits the present study to a characterization of Bay area inhabitants solely in cultural terms, and prevents any assessment of the implications of the parallel and convergent models of change with regard to genetic interactions of populations in central California.

Radiocarbon determinations.

Radiocarbon determinations have been made on 2 samples from Ala-328. The first, C-690, was a charcoal sample collected from pit A-5 I at a depth of 132 inches at the base of cultural deposits. This provenience information comes from the correspondence of Dr. Robert F. Heizer, under whose auspices the determination was made, and who was kind enough to let me examine copies of the cover letter sent with the sample and that in which Libby reported his results. A photographic slide of the latter exists at SFSU, in which it is clearly specified that the sample came from pit A-5; for this reason, it is not possible to explain why D. Clark (1964: 166) was given pit C-1, 136 inches, as provenience of the sample. Burial records indicate that sterile matrix was reached in pit A-5 I at about 100 inches; a number of burials recovered from 100 to 116 inches in the pit were reportedly in submound matrix. Davis' field notebook indicates that the southern 3 feet of the pit were excavated to 114 inches but gives no information regarding the northern portion. Davis' Diagram 1 (D&T 1959) is ambiguous, but permits the interpretation that the pit was excavated to 132 inches below surface. However, the presence of charcoal in an otherwise sterile layer remains unexplained.

Libby, using the solid carbon method, obtained the following results for the sample (1954: 138): 2588 ± 200, 2090 ± 220, and an average 2339 ± 150 radiocarbon years, or 389 BC ± 150 years.

Because of confusion regarding provenience of sample C-690, concern that it may have been a composite sample of charcoal pieces scattered through the pit, questions regarding the accuracy of the solid-carbon method, and the desireability of multiple samples when making age estimates, another determination was made for the basal level of Ala-328. In the spring of 1974 I collected a sample of non-artifactual shell, mostly oyster, from the northwest corner of pit D-5 II at an approximate depth of 100 inches below surface, calculated with reference to a housefloor left <u>in situ</u> which had been reported at 90 inches depth. The sample came from the area of contact between midden and submound clay. It was submitted to Teledyne Isotopes as their sample number I-8085, which gave a determination of 2330 ± 90 years (- Δ C^{14} 252 ± 8), or 380 BC ± 90 years.

The overlap between determinations for the 2 samples is striking. Since shell radiocarbon dates tend to be "old" in the few comparative tests which have been made between shell and charcoal samples in California, these determinations should be considered a maximum age for initial occupation of the portions of the site from which they were recovered.

A radiocarbon determination was made on a single sample from Ala-13. The data which follow are taken from Rackerby (1967: 6, 49). The sample, a section of burned limb from hearth feature 8 in pit E-14 at 55 inches below surface (69 inches below datum plane), was submitted to Geochron Laboratories in 1967 as their sample GX1049. Using the gas method, they reported a determination of 1685 ± 85, or AD 265 ± 85 years (incorrectly calculated to be AD 375 by Rackerby).

Rackerby (1967: 49) reports that a charcoal sample submitted from Ala-12 did not yield sufficient gas for a determination to be made.

Nearby sites.

As already mentioned, a fourth site is closely associated with the 3 sites to which this pâper is devoted. Ala-329, located about 300 years southeast of Ala-328, has been partially excavated by crews from Stanford University and San Jose State College. Material is presently being analysed at Stanford. A preliminary report on 3 seasons of work by Stanford has been published (Coberly 1973).

Four other sites in the vicinity have been sampled. About 2 miles to the southeast of the Coyote Hills sites lie Ala-330 and -331, which were probably once shell middens similar in size and composition to Ala-328. Manuscript number 296 at the Archaeological Research Facility, UC-Berkeley, pertains to excavations at Ala-330 by a UC-Berkeley field class in the late 1950's. Phebus (1973) reports on salvage excavations conducted at the site in 1960 and 1961. I inspected the site in 1974; it has been sufficiently disturbed by grading and construction that further excavations would probably not be informative.

Ala-331, a few hundred yards to the southwest of Ala-300, was sampled by students from Hayward. Field notes, artifacts and a burial removed in the excavations have been deposited at Hayward. Breck Parkman, one of the excavators and presently a graduate student at Hayward, estimated that the site measures about 350 by 200 feet, with a maximum depth of 60 inches near the center. Artifacts recovered include Haliotis "banjo" ornaments which fall into Gifford's type N4 (1947: 22, 83). The site should be protected from disturbance and eventually sampled more extensively.

Further southeast along the bayshore and slightly inland, tucked into hills about 2 miles south of Mission San Jose, is site Ala-342, excavated in 1968. Artifacts from the site indicate that it was in use after contact with Europeans. It has been interpreted as an activity site devoted to the roasting of vegetal foods (C. King 1968). Its presence suggests that future research into subsistence practices in the Bay area should include a search for other such activity sites.

The fourth site, further removed from the bay than the others, is Ala-343, located about 6 miles almost due east of the Coyote Hills sites within the town of Fremont. Some artifacts from the site and a very brief report describing work in 1968 have been deposited at SFSU (Wildesen 1968). A few details are included in Wildesen (1969). I examined construction test trenches put through the locality in 1974. They suggested that a very deeply buried component may be present, as well as the shallower one sampled by Wildesen. It appears that Ala-343 is probably several occupation sites spread over a large area adjacent to the now-extinct Stuiver's Lagoon. This would be a valuable place to sample extensively as part of research into exploitation of inland resources and the nature of inland occupation sites in the Bay area.

Chapter 3. ARTIFACTS.

Introduction.

Artifact descriptions below are ordered according to 2 factors: the relative frequency of occurrence of particular artifact types as burial associations, and the raw material of which they are made. The rationale for ordering by frequency of occurrence in graves stems from the goal of this paper to characterize the archaeology of 3 Bay area sites in a manner which will permit evaluation of the parallel and convergent models of cultural development for central California discussed in Chapter 1. Since Lillard, Heizer and Fenenga's innovation of the approach in 1939, archaeological sites in central California have generally been characterized according to traits revealed in gravelot analysis. In the interests of comparability, the artifactual data from Ala-328, -13, and -12 are presented in a manner which emphasizes their place in the mortuary complex or complexes at the sites.

Any ordering scheme has its drawbacks. The emphasis here on burial associations may be criticized because absence rather than presence of grave goods is more characteristic of burials from 2 of the sites discussed. Artifacts accompanied one third of the burials at Ala-328, less than one half of those at Ala-13, and about three quarters of those at Ala-12, where the burial sample is small; see Chapter 4.) In fact, because of the relatively now occurrence of artifactual accompaniments with burials at these sites, an ordering based solely on grave associations is inadequate. For this reason, raw material of artifacts is also used as a basis for arranging type descriptions below. Although groups based on raw material are primarily descriptive, inferred trends over time in changing degrees of interest in bone, stone and shell have been used previously to show cultural development in central California (see Beardsley 1949: Fig. 2). Hence attention to raw material here also obeys the criterion of comparability used to justify emphasis on burial associations in the presentation of artifact descriptions.

Other ordering schemes were considered and rejected. An assemdage might be characterized by its numerically predominant artifact types, but ordering artifacts according to absolute numbers of specimens recovered raises issues of equivalency (e.g., is 1 shell bead equal to 1 stone mortar?). Functional or contextual groupings such as have been commonly used in central California site reports (e.g., LH&F 1939; D&T 1959) assume knowledge which is lacking and may create illusions of fact in areas which in reality beg investigation. It will be noted, however, that although function is not a basis for the ordering of the artifact descriptions below, assumptions regarding function to underlie some of the categories employed (e.g., chipped stone blades and scrapers, fish-spear prongs). Furthermore, discussions of presumed use are included in the descriptions of artifact types for which inferences of function have commonly been made, or for which there is contextual evidence suggestive of use. There is no attempt to ignore function, but rather to be clear about the state of knowledge regarding function in each case.

It is hoped that the criterion of comparability mentioned above justifies the selection of grave occurrence and raw material as factors which determine the ordering of artifact descriptions here. The data are presented in what is intended to be sufficient detail to permit their reorganization for purposes other than the site characterizations and limited inter-site comparisons attempted in this paper.

For each artifact type, descriptions of the samples from Ala-328, Ala-13 and Ala-12 are presented one after the other. This encourages item-by-item comparision of the assemblages from the 3 sites. The overall ordering, from pigment to shell to bone to stone artifacts, and the ordering within these classes generally follows the frequency of occurrence of particular artifact types as grave goods at Ala-328, with some consideration of the absolute numbers of specimens recovered (see Table 3-1). [1] Departure from strict adherence to order by grave occurrence permits the joint consideration of items such as various forms of pointed bone or chipped stone which may profitably be described together in spite of their differing frequencies of occurrence as grave goods.

Identification of raw materials.

Shell was identified according to species on the basis of knowledge gained informally in working with identified archaeological specimens at SFSU and at the Lowie Museum, and in consultation with James Dotta of the Treganza Museum and James Bennyhoff of California State College, Sonoma. Doubtful identifications are mentioned in the text where appropriate.

Relatively little of the modified bone has been identified by genus or species. Comparions with type collections at the California Academy of Science by SFSU student Joe Darr resulted in identification of ulnae of canids and racoon (Canis sp. and Procyon lotor), bacula of sea otter (Enhydra lutris), parasphenoids of sturgeon (Acipenser sp.), and incisors of canids and bear (Canis sp. and Ursus sp.). W.I. Follett of the Academy assisted in the evaluation of sting ray spine artifacts by showing the author unmodified caudal

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1 Some differences in grave good frequency between the 3 sites are ignored in this ordering (cf. Tables 3-1, 3-2, 3-3), but these are dealt with in the text descriptions and in discussion of similarities and differences between the 3 sites in Chapters 4 and 5.

spines of Myliobatis californica. Comparison with figures in Olsen (1964, 1968) and with incomplete type skeletons at SFSU by the author permitted separation of bird and mammal bone. Bird bone was not classified further, but some modified mammal bone was identified as cervid. Size was the basis for identifying particular specimens as elk, deer, or antelope. Whelan (1970) identified the following cervid species among unmodified bone recovered at the 3 Alameda sites: Antilocapra americanus (antelope), Odocoileus hemionus (mule deer or blacktailed deer), Cervus canadensis (elk). It is presumed that the modified cervid bone from these sites also consists of these species.

Charles Bickel, a specialist in metamorphic rocks, and Stephen Kirsch, a mineralogist, both professors in the Department of Geology, SFSU, assisted in identification of stone material in the collections. Bickel worked primarily with charmstones, and Kirsch with chipped stone artifacts and miscellaneous mineral and rock specimens. Their methods and conclusions are discussed in the sections devoted to charmstones and chipped stone artifacts below. Without examining every specimen, both geologists confirmed the author's identification of most pecked and ground stone artifacts as sandstones, and agreed with the conclusion that few specimens of granite and none of basalt are present in the artifactual material. No attempt was made to identify pigment specimens either by geological or chemical methods.

Pigment -- Ala-328

Pigment was the most frequent burial accompaniment at Ala-328. It was a definite association with 53 graves, and a possible association with 3 others. [1] The 57 individuals in these 56 graves include 9 individuals below 21 years of age (1 female, others not sexed) and 31 adults 21 and over (16 males, 8 females, 7 of undetermined sex) among those for whom age and sex was determined.

"Ocher", the usual label for pigment in the records, was the sole accompaniment of 15 or 16 of the 53 burials with which it was definitely associated, and 2 of the 3 graves where ocher was a possible accompaniment lacked other associations. Twenty three of the 53 graves with ocher lay in the basal cemetery. Two others, and 1 of the possible associations were on

1 The total of 53 includes 4 burials for which Davis' tabulation (D&T 1959: 13, 14) is the only evidence of pigment as one of the grave goods. In all other cases, a catalogued artifact or a reference in burial record or student notes was the basis for concluding that pigment was a grave accompaniment. An occurrence reported as a possible association in the burial record for W18 is recorded as a definite association by Davis, but considered a possible association here.

Table 3-1. Grave goods at Ala-328: incidence, frequency of occurrence.

Artifact type	# spec.	# w/burs.	% w/burs.	# burs. w/type	% burs. w/type
pigment [2]	-	-	-	53	30
shell beads	(55)*	(50)*	@100	50	29
whole	(35)*	(34)*	@100	34	20
cut	(33)*	(29)*	@100	23	13
shell ornaments	87+**	82+	94	27	16
bone tubes	261	156	60	25	14
antler wedges	171	26	15	19	11
bone whistles	128	33***	26	16	9
serrate bone	223	15	7	14	8
mortar	124	14	11	14	8
whole	13	10	77	10	6
fragments	111	4	4	4	2
quartz crystals	32	16	50	11	6
pestle	127	13	10	9	5
whole	28	10	36	6	3
fragments	99	3	3	3	2
blunt pointed antler tools	110	8	7	8	5
chipping hammers	204	7	3	6	3
quartz cobbles	29	13	45	6	3
pebble grave goods [2]	28	28	100	6	3
pointed bone, angular tip	68	6	9	5	3
sidebladed rib art.	60	8	13	5	3
obsidian blades	58	5	9	5	3
charmstones	53	13	25	5	3
modified non-obsidian lacking use-wear	43	6	14	5	3
perf. mammal teeth	35	23	66	5	3
modified obsidian lacking use-wear	23	8	24	5	3
pointed bone, nippled tip	211	4	2	4	2
pointed bone, narrow smooth conical tip	32	4	13	4	2
sting ray spine	12	6	50	4	2
non-obsidian flake scraper	29	3	10	3	2
pointed cervid ulnae	13	4	31	3	2
pointed bone, flat tip	27	2	7	2	1
obsidian bifacially chipped scraper	26	2	8	2	1

Table 3-1 (continued)

Artifact type	# spec.	# w/burs.	% w/burs.	# burs. w/type	% burs. w/type [1]
dull pointed fishspear prongs	22	2	9	2	1
serpentine clusters	21	21	100	2	1
antler rack art.	13	4	31	2	1
unpointed perf. bone	9	3	33	2	1
small polished bone and antler objects	5	2	40	2	1
grooved and notched stone	18	3	17	2	1
unperf. mammal teeth	4	3	75	2	1
phyllite pieces	2	2	100	2	1
misc. pecked stone	2	2	100	2	1
shell pendants (?)	2	2	100	2	1
miniature mortars	20	1	5	1	1
abraded rubbing and pecking stones	31	1	3	1	1
hammerstones	13	1	8	1	1
bird talons	12	5	42	1	1
mod. ant., no use	7	1	14	1	1
mica ornaments	(1)*	1	100	1	1
pointed perf. bone	4	1	25	1	1
bipointed bone	11	3	27	1	1
antler sockets	11	1	9	1	1
pointed bird bone, hollowbacked tip	42	1	2	1	1
stone bead	1	1	100	1	1
shell scraper	1	1	100	1	1

Documented specimens missing from the collection are tabulated in specimen counts and as burial associations if appropriate.
Possible associations not tabulated as burial associations.
Associations with multiple graves counted as associations with 1 individual.

1 Based on total number burials with artifact or ocher association: 174.

2 Only burial associations tabulated.

* Figure in parentheses is number of occurrences; see text for discussion of number of specimens represented.

** Minimal figure; counts all documented lost specimens, subtracts 4 unprovenienced specimens, assuming they are 4 lost specimens.

*** Minimal figure; 14 unbroken specimens, 19 lots of broken specimens which probably represent more than 19 unbroken whistles.

Table 3-2. Grave goods at Ala-13: incidence, frequency of occurrence.

Artifact type	# spec.	# w/burs.	% w/burs.	# burs. w/type	% burs. w/burs.[1]
shell beads	1527+	1458+	95	16	32
whole	299	234	78	7	14
cut	1228+	1224+	@100	12	24
shell ornaments	78+	63+	81	9	18
pigment	9(13)*	8(9)*	89(69)*	8(9)*	16(18)*
obsidian blades	11	6	55	5	10
mortars	9	5	56	5	10
whole	6	5	83	5	10
fragments	3	0	0	0	0
bone whistles	15	10	67	4	8
modified obsidian lacking use-wear	30	7	23	4	8
serrate bone	30	3	10	3	6
whole Haliotis	4	2	50	2	4
pointed bone, flat tip	4	2	50	2	4
chipping hammers	16	1	6	1	2
pointed bone, angular tip	14	1	7	1	2
bone tubes	13	2	15	1	2
pointed deer splint	9	1	11	1	2
non-obsidan flake scraper	4	1	25	1	2
non-obsidian blades	3	1	33	1	2
antler "peg"	2	1	50	1	2
serrate shell	1	1	100	1	2
shell pendant (?)	1	1	100	1	2

Possible associations not tabulated as burial associations.
Associations with multiple graves counted as associations with 1 individual.

1 Based on total number burials with artifact or ocher association: 50.

2 Figures in parentheses take into account 4 questionable occurrences of pigment; see text.

Table 3-3. Grave goods at Ala-12; incidence, frequency of occurrence.

Artifact type	# spec.	# w/burs.	% w/burs.	# burs. w/type	% burs. w/type [1]
pigment	4	4	100	4	44
obsidian blades	8	3	38	3	33
chipping hammers	22	3	14	3	33
shell beads	16+	16+	100	2	22
whole	15+	15+	100	1	11
cut	1	1	100	1	11
mortar	27	9	33	2	22
whole	2	2	100	1	11
fragments	25	7	28	1	11
pointed bone, angular tip	5	2	40	2	22
unperf. mam. teeth	23	23	100	2	22
pestle	26	7	27	1	11
whole	1	0	0	0	0
fragments	25	7	28	1	11
modified obsidian lacking use-wear	8	1	13	1	11
blunt pointed antler tools	7	1	14	1	11
pointed thick spatulate bone	3	3	100	1	11
bone whistles	2	1	50	1	11
cut <u>Haliotis</u> orn. (?)	2	1	50	1	11
antler rack art.	1	1	100	1	11
bipointed bone	1	1	100	1	11
bone bead	1	1	100	1	11
quartz crystal	1	1	100	1	11

Possible associations not tabulated as burial associations.
Associations with multiple graves counted as associations with 1 individual.

[1] Based on total number burials with artifact or ocher association: 9.

or near the site base, though outside the cemetery area. In 6 cases, ocher was found in graves within 24 inches of the mound surface; all 6 were cremations. A seventh grave above 24 inches was possibly accompanied by ocher; this was an inhumation. Table 3-4 lists burials found with ocher and shows their location and depth within the site.

Pigment was noted as a powdery deposit in graves or as a stain on bone, soil, or artifacts. Generally it was concentrated in one area of the grave. In a few instances it formed a bed under the skeleton or thoroughly stained almost all bones, but such generous use as that suggested by Uhle (1907: 24) for Ala-309 was never observed at Ala-328, nor at the other Alameda sites reported on here. Occasionally pigment occurred in discrete red lumps which were recovered as artifacts. One instance of "yellow ocher" was recorded as a grave deposit. Pigment color was red in all other cases, which were usually described as "red ocher". "Limonite pigment" and "cinnabar" were each reported once. A "hematite paint-rock" and "2 pieces limonite" were 2 of the 3 pigment occurrences reported as possible burial associations; neither is present as a catalogued specimen.

None of the recovered pigment lumps has been analysed to determine specific composition. As reported in D&T (1959: 18), several of the latter were recovered outside of graves. They are soft to the touch, and presumably would not require grinding before use. A chipping hammer recovered from B-7I at 116" below surface was reportedly stained with red ocher when found, although it is not presently stained. None of the mortars, large or miniature, show traces of pigment. Several pestles are stained, but no stain was noted in the original catalog, and because it is known that several pestles were used in classroom demonstrations of pigment grinding, aboriginal staining cannot be safely inferred. Thus, the reported single occurrences of hematite and limonite chunks, one stained grinding implement, and the existence of small mortars conprise the equivocal evidence for pigment preparation by heating and grinding at Ala-328.

Pigment -- Ala-13

Pigment was a more frequent grave association than any artifact type except shell beads and shell ornaments at Ala-13. It was recovered with 8 or 9 burials: 7, 9, 29, 46, 47, 61, 63, 74, and possibly 77. Three infants and 6 adults occupied these graves.

Six of the graves in which pigment was found were dug into the sub-mound; 3 of these lacked associations other than pigment. The 3 shallower graves in midden, burials 9, 61, and 63, also lacked other grave goods.

Table 3-4. Provenience of burials with pigment associations, Ala-328.

Burials with pigment definitely associated: W6, W21, 67-11, 66-13, 4, 8, 18, 26, 29, 35, 38, 40, 41, 42, 50, 54, 55, 57, 58, 64, 65, 80, 90, 91, 92, 100, 106, 107, 108, 119, 120, 121, 126, 129, 130, 131, 132, 179, 205, 219, 222, 314, 353, 378, 379-383, 391, 406, 409, 410, 413, 417, 439, 441.

Burials with pigment possibly associated: W18, 223, 431.

SFSU Grid I	SFSU Grid II	Hayward Excavations
A-3: 42, 53	A-4: 100, 103, 106	A-66: 39
A-4: 96, 100, 105, 106, 108	A-5: 90	Test Pit 1: unknown d.
A-4/5: 102, 102	A-5/6: 88	
A-5: 100, 100, 100, 100, 101, 108, 116	A-9 (into Grid I): 84	
A-5/6: 79, 112, 116	B-4: 110	Wedel Excavations
B-3: 36	B-9: 72	
A/B-4: 120	B-10: 62	10-15'E 0-5'S: 66
C-5/6: 12	C-5: 50	40-50'W 0-5'S: 38
C-6: 8, 12	D-8: 24	50-60'W 0-5'S: 26
C-7: 17, 60	E-6: 70	
D-4: 78	E-7: 92	
D-7: 24, 30	E-9: 47	Two SFSU burials omitted because of unknown location.
D-8: 22	F-6: 37	
F-1: 96	F/G-6: 57	
	J-7: 54	
	J/K-5/6: 46	Depths in inches below surface.

Pigment was reported as "red ochre" (sic), a red stain or powder on the bones, in 8 cases; and as a discrete lump of "hematite" in 1 case, burial 77 (R 1967: 64-77). Four other lumps of what is described as "hematite" were reportedly recovered unassociated in the midden (R 1967: 11). None of the pigment was examined for this report; it has apparently been discarded from the collection. Because the "hematite ore" reported from Ala-12 was incorrectly classified as such (see footnote below), the identity of the reported "hematite" at Ala-13 must be questioned.

Three miniature mortars recovered from the site could have been used for pigment preparation, but none is stained, nor are any other stone artifacts.

Pigment -- Ala-12

Pigment was the most common grave association at Ala-12, accompanying 4 burials: 2, 7, 8, and 11. Individuals in these graves include 1 youth and 3 adults. Other grave goods in addition to pigment accompanied 3 of the graves; the unmodified stone and bone recovered with burial 8 may or may not represent deliberate accompaniments.

Burials 2, 7, and 8 lay in graves dug into submound. Burial 11 lay in a mixed matrix of midden and sand immediately above submound, and was considered to be "at the bottom of the site" (Oliphant 1968: 10).

Pigment was reported as a red powder in all 4 cases [1], staining the buried bones. Burial 2 was exceptional in that ocher lined the pit, and the body was stained from ribs to feet on top and below (R 1967: 83); stains were apparently not found on the undersides of the other burials.

One fragment of a miniature mortar was recovered at Ala-12; it shows no stain indicative of use in pigment preparation, nor were any other artifacts recovered at the site so stained.

Shell Beads -- Introduction.

The assemblages from the 3 Alameda sites include about 7500 classifiable small (maximum dimension less than 3 cm) perforated shell artifacts

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1 Rackerby (1967: 34, 41, 84) mentions 6 lumps of "hematite ore". Only 3 were catalogued, those recovered with burial 5. They are unmodified pieces of local chert and sandstone with no evidence of hematite present. Two of the specimens (6847, 6846) appear in Rackerby's Appendix B listed as lithic fragments of sandstone and basalt, respectively.

usually described as beads or sequins. Most specimens are Olivella shell; a few lots of Haliotis and Saxidomus beads were also recovered.

Shell beads from central California have commonly been classified according to two distinctive typologies, those of Gifford (1947) and Lillard, Heizer and Fenenga (LH&F 1939). A number of attributes (e.g., size, shape, species of shell) are considered in both typologies, although with different emphases. The chief differences between the two are due to the use of a different unit of analysis in each case. For Gifford, this was the individual bead; for LH&F, the gravelot. Gifford types are based on form of individual beads; LH&F types are based on variations in form which appeared to have significance with regard to gravelot seriation and stratigraphy (Bennyhoff and Heizer 1958: 78).

One revision of the LH&F typology has been made, by Bennyhoff and Heizer (1958, henceforth B&H 1958), and another is in preparation, by Bennyhoff and Fredrickson; a working version of the latter exists (Bennyhoff and Fredrickson 1967, henceforth B&F 1967). The revisions contain new types and subtypes which have been isolated from material unavailable or not studied at the time of the original formulation. Some subtypes have been eliminated because it has been demonstrated that they lack significance in terms of seriation analysis of gravelots.

Gerow has presented a typology for a particular site (Gerow with Force 1968: 51 ff.) and has isolated some general categories of form (Gerow with Force 1968: 55, 56; Gerow 1974: 30, 50) which are modifications of Gifford's scheme in that they emphasize mode of manufacture as well as gross form of the beads. In the two studies just cited, Gerow was able to show, using the gravelot as the unit of analysis, some general trends in the appearance of different classes of shell beads in southern California, the lower Sacramento Valley, and the San Francisco Bay region, trends which are contrary to previous notions of parallel cultural development in the 3 areas.

In this paper, beads are classified and described according to categories from both the working revision of the LH&F typology (B&F 1967) and from Gerow's modification of the Gifford typology as presented in Gerow 1974, with an added modification of my own. The unit of analysis is the lot of beads collected with some presumed cultural coherence, usually shared association with 1 grave. Unassociated beads are described, but their classification is not to be considered as reliable or useful as that accorded to beads recovered in mortuary context.

Bead lots are first grouped according to whether they are whole-shell beads modified only by percussion or abrasion, or beads made from segments cut or broken from the whole shell and perforated by drill or punch. This division into whole and cut shell beads recognizes Gerow's "fundamental technological contrast between whole univalve shells perforated by percussion or abrasion with natural siphonal openings and centrally drilled discoidal or tubular fractions of univalves and bivalves" (Gerow with Force 1968: 56).

The cut bead category is subdivided into 3 gross form categories: circular, oval, and rectangular. This is a purposeful refinement of Gerow's "oval-discoidal" and "quadrilateral" categories which permits recognition of some trends obscured when only 2 shape categories are used. The circular and oval groupings can easily be lumped if a return to Gerow's categories is desired.

Cut beads are further subdivided into more specific types taken from the B&F revision of the LH&F typology. Specific typing is accompanied by a detailed description of form and size of specimens in each lot. All cut beads bear a single, central perforation. The only exception, a Haliotis rectangular specimen with two perforations from Ala-12, is described in detail in the section devoted to beads from that site. The occasional presence of beads with slightly off-center perforations is noted in descriptions of those lots in which they are found.

With regard to both form and size, the lot is characterized according to its modal pattern, but extremes and variations are mentioned. Reported measurements include minimal, maximal and modal lengths, widths, diameters, and thicknesses (where applicable). Every bead was not measured, except in the very small lots; rather, a search was made for the largest, the smallest, and for several which represented the mode of each lot. Measurements were made on these with calipers graded to 0. 1 mm. Reported measurements have been rounded to the nearest 0. 5 mm. All measurements are maximum measurements (e. g., the largest diameter of an off-circular bead). Length and width measurements are always given in the form "length by width", with length first. This is significant for Olivella beads, where length refers to the dimension along the axis run from aperture to spire, and width refers to the dimension perpendicular to length. For Haliotis and Saxidomus specimens, "length" on the bead cannot be related to a particular orientation of the shell itself.

The numerical count of each lot is given. Reference to the "reported count" is included in cases where a discrepancy exists between the number of beads in the lot as examined for this study, and the number reported in previous studies. Discrepancy between actual and reported counts in most cases is probably attributable to handling incidents which occurred in cataloging, recataloging, and study use of the collections.

It should be noted that in the case of lots containing very few beads, assignment to a particular type may be equivocal for several reason. There is some overlap in form and measurements between different types as defined. Some transitional forms must be expected since the seriational analysis postulates the stylistic emergence of 1 type from another over time, at least in some cases. Furthermore, where only a few beads remain from what was a larger lot, it cannot be assumed that those recovered archaeologically represent the mode of the lot of which they were a part prehistorically.

The technological categories, whole and cut shell beads, and the gross form characterizations, circular, oval, and rectangular, require no more explanation. Since the typology (B&F 1967) which will be used for finer subdivisions is unpublished, a descriptive summary is offered here for the particular types found at the Alameda sites.

Olivella spire-lopped beads. This is the only member of the whole shell bead category. These are whole, uncut shells, modified only by removal of the spire end, presumably by grinding against rock. Some specimens may have been spire-lopped by natural agents, but the assumption is that human manufacture created most of the tip perforations. As a group, they fall into Gifford' (1947) type F5b, Gerow's (Gerow with Force 1968) type IA, LH&F's (1939) and B&H's (1958) type 1, and B&F's (1967) type A1, all of which are mutually inclusive.

The majority of specimens are Olivella biplicata. Cursory examination of Ala-12 and Ala-328 specimens revealed no O. pycna or O. baetica specimens. Four specimens from Ala-13 were tentatively identified as O. baetica by Bennyhoff after a brief look at the collection. Re-examination of the spire-lopped beads from all 3 sites would be warranted if the species differences should come to be shown to have more than descriptive significance in central California archaeology.

Generally there is little variation in form among the Olivella spire-lopped beads recovered at the 3 sites discussed here. The few variant beads, all from Ala-13, are described in that section. The general uniformity eleminates the need for description of each occurrence of beads of this type. All necessary descriptive details are presented in tabular form for Ala-328 and Ala-13; the single lot found at Ala-12 is described in the text for that site.

The Olivella spire-lopped beads from the 3 sites do vary in size. Maximum diameter is the dimension used here as an index to size variation because it is the diagnostic attribute for "large" and "small" subtypes in the B&H typology (1958), and is retained in the working revision of that typology (B&F 1967). In the latter, the size division is three fold: small (Ala), maximum diameter 4 to 6 mm; medium (Alb), maximum diameter 7 to 9 mm;

large (A1c), maximum diameter 10 to 14 mm. Examples of the 3 types are shown in Plate 1A, B, C. The same size divisions are made for O. baetica beads, which are distinguished from O. biplicata by the labels A1d, A1e, and A1f, respectively. Only one lot of O. baetica, 4 A1d beads, was recovered from the Alameda sites; 2 of these are shown in Plate 1D.

None of the recovered lots of Olivella spire-lopped beads fall into the undefined millimeter intervals between subtypes, but clearly the definitions in the B&F typology should be refined to include those intervals. Nevertheless, it should be remembered that the typology is supposed to reflect aboriginal size selection based on less uniform and replicable measurements than those afforded by scaled rulers and calipers.

In the tabular presentations of spire-lopped bead occurrences, modal maximum diameter is used to place each lot in a subtype. The range of maximum diameters is shown. In cases where more than 10 beads cluster around a different diameter from the predominant mode, a breakdown of the groupings is given in lines immediately below the general characterization of the lot. Where just a few beads are responsible for great variance around the mode, details are not given.

In the tabled counts of individual lots, a plus sign (+) indicates the presence of fragments. Erosion and breakage were evident in most lots. In a few cases (notably 1-2814 and 1-2809 from Ala-328), several beads showed irregular side perforations, apparently due to erosion.

Circular Olivella beads. These all fall into Gifford's (1947) type X3bI, which does not differentiate among circular beads by size. In the B&H (1958) typology, they belong to type 3; in the B&F (1967) typology, to class G. The class is divided into types according to size of perforation. Beads with small perforations are "saucers"; beads with larger perforations are "rings". Saucers and rings, in turn, are subdivided according to size of outside diameter.

Round saucer Olivella beads. Type G1. Outside diameter: 2 to less than 5 mm. Perforation: small, 1 to 2 mm in diameter. Equivalent to type 3d (LH&F 1939; B&H 1958). Plate 1E.

Small saucer Olivella beads. Type G2a. Outside diameter: 5 to 7 mm. Perforation: small, 1 to 2 mm. Part of type 3c (LH&F 1939; B&H 1958). Plate 1F.

Large saucer Olivella beads. Type G2b. Outside diameter: 7 to 10 mm. Perforation: small, 1 to 2 mm; 3 mm may occur rarely.

Also part of type 3c (LH&F 1939; B&H 1958). Plate 1M.

Large ring Olivella beads. Type G3b. Outside diameter: 7 to 10 mm. Perforation: large, 3 to 4 mm. Also part of type 3c (LH&F 1939; B&H 1958). Plate 1L.

Circular Haliotis beads. On the Alameda specimens, the epidermis has been ground away to leave a nacrous surface exposed; no species identification is possible. These beads fall into Gifford's (1947) type J2a, which does not distinguish by size among circular Haliotis forms. They correspond to Haliotis bead type 3 in the LH&F (1939) and B&H (1958) typologies, which distinguish larger "ornaments" from smaller "beads", but which do not subdivide the beads by size. They fall into type H3a, small disk Haliotis bead, in the B&F (1967) typology; the type is subdivided by size.

Small disk Haliotis bead. Type H3a1. Diameter: 4 to 6 mm. Perforation: 2 to 3 mm. Plate 1K.

Type H3a2. Diameter: 7 to 10 mm. Perforation: 2 to 3 mm. Plate 1J.

Circular clamshell beads. It is presumed that all of the clamshell specimens discussed herein were manufactured from Saxidomus shell. For this study, no formal identification of the specimens was made by an authority on shell species. Gifford isolated 5 specimens of S. nuttalli and 13 of S. giganteus from the lot recovered during the Wedel excavations at Ala-328 (Gifford 1947: 32-33), and beads from other lots appear to be made from the same shell type. Circular clamshell beads fall into Gifford's types V1aII and V1aIII. They are designated type 1 clam shell disk beads in the LH&F (1939) typology, and are described simply as Saxidomus clam disks in B&H (1958). In the B&F (1967) typology they fall into type A1, small clam shell disk bead, which is subdivided by diameter size and thickness. Only two subtypes are present among the beads recovered at the 3 Alameda sites.

Small clam shell disk bead. Type A1c. Diameter: 7 to 11 mm. Thickness: 2 to 6 mm. Average size: 9 by 3 mm. Plate 1I.

Medium-size clam shell disk bead. Type A2a. Diameter:

8 to 13 mm. Thickness: 2 to 6 mm. Average size: 11 by 3 mm.

Oval Olivella beads. These fall into a variety of types in the various bead classification schemes. Four classes of oval beads from the B&F (1967) typology occur at the Alameda sites: split, drilled; punched; lipped; and saddle beads.

Split, drilled Olivella beads, Class C; Type C2, split, shelved Olivella beads. Most beads in lots of this type retain a shelf-like remnant of the inner whorl, although some unshelved specimens do occur. Beads may range in size from half shells to smaller segments. Type C2 beads differ from other split, drilled beads in their small perforation size. The type falls into parts of types X1b, X2b, and X3bI of Gifford's (1947) typology, and is included in type 3b1 of B&H's (1958) typology. Plate 1H.

Punched Olivella beads, Class D; Type D1, split, punched Olivella bead. Edges may or may not be ground smooth on beads of this type. They may vary in size from half-shells to smaller segments. Shelf remnants are usually present. The irregularity of the perforation shows that it was not drilled. This type corresponds to type X1a and parts of X2a in Gifford's (1947) typology, and is the same as type 3a2 in B&H's (1958) typology. Plate 1G.

Lipped Olivella beads, Class E. This class is the same as Gifford's type X3bII, which is well illustrated in his report (1947: 97). It corresponds to type 3a1 in the B&H (1958) typology. The beads are characterized by the presence of a portion of the aperture whorl or "lip" on the concave part of the bead along one edge. Evidence of lipping varies in degree, from a mere thickening on one side of the bead, to the presence of internal folding over of the aperture whorl, to preservation of the aperture itself at the end of the bead. The amount of lipping varies with size, and the two traits are used by Bennyhoff and Fredrickson to define several types of lipped beads. Two types are present among the beads reported upon herein.

Full-lipped Olivella bead. Type E2. These are oval beads with enough aperture whorl present so that the internal folding of the lip is commonly seen. They differ from thin-lipped beads, type E1, not found at the sites being reported here, in greater size and degree of lipping, and an oval rather than circular shape. Plate 1N.

Large-lipped Olivella bead. Type E3. These beads are larger and more concave than full-lipped beads, often almost entire half-shells. They commonly retain the aperture, and frequently a shelf-like remnant of the interior whorl as well.

Saddle Olivella beads, Class F. Several types of saddle beads are represented in the 3 Alameda site collections. General characteristics of the saddle class include an oval shape which often gives an impression of angularity because opposite sides are frequently more linear and parallel to one another than is the case among other oval bead types. Saddles always have rounded corners, however, which distinguish even the most straight-sided specimens from rectangles. On saddle beads, width is equal to or greater than length. The relatively great width often gives the bead more curvature or concavity than is found on non-saddle beads of comparable size. Most saddle types exhibit "diagonal cutting"; that is, they were cut from the shell body at an angle to the vertical and horizontal axes of the shell. Diagonal cutting can be observed if the bead is oriented vertically using the growth lines on the convex surface as a guide; the top and bottom of a diagonally cut bead will not be perpendicular to the vertical axis thus established.

Oval saddle Olivella beads. Type F1. This is the one saddle type which is not always characterized by diagonal cutting. Important attributes are a large perforation diameter (about 3 mm) and width greater than length. Oval saddle beads would be typed as 3b in the B&H (1958) typology, and would fit type X3bI and possibly X3c in Gifford's (1947) typology. Plate 1, o.

Full saddle Olivella beads. Type F2a. Beads are characterized by diagonal cutting, a small perforation diameter (about 1.5 mm or less), and width greater than length. Generally, full saddle beads are larger in width and length than are beads of the saddle types described below. Full saddle Olivella beads correspond to part of type 3b in B&H (1958). They would be assigned to type X3bI, and possibly X3c, in the Gifford (1947) typology.

Round saddle Olivella beads. Type F2b. This is a new type, previously lumped with other saddle beads, type 3b, by B&H (1958). Round saddle beads share with full saddles the traits of diagonal cut and small perforation size, but are not as wide or long as full saddles. They would be placed in types X3bI and X3c in Gifford's (1947) typology. Plate 1Q.

Square saddle Olivella beads. Type F3a. These beads are diagonally cut, with a small perforation diameter like full and round saddle beads. They are more square in outline than other saddle types, with length and width approximately equal in size; rounded corners distinguish them from rectangular Olivella beads. Square saddles were described as "modified saddles", type 3b2, in the B&H (1958) typology. They fit type X3c, and possibly X3aI also, in the Gifford (1947) typology. Plate 1R.

Rectangular Olivella beads. The few specimens of this shape fall into a single type in all 3 typologies considered here. They fit type 2a1 of the B&H (1958) typology, and type X3aI of the Gifford (1947) typology.

Plain, centrally perforated thin rectangular Olivella bead. Type M1a. Specimens of this type have a small perforation diameter (about 1 mm) placed centrally in a bead which is a "plain" rectangle in outline; that is, not unusually wide nor departing from right angles at its corners. They usually lack any remnant of the interior whorl on the concave surface. Other types and subtypes in the B&F (1967) typology treat beads which differ from these in perforation size or placement, overall size, presence of interior whorl remnant, or outline shape. Plate 1S.

Rectangular Haliotis beads. The 3 specimens recovered fall into 2 types because 1 is doubly perforated. All of them lack epidermis, so species identification is not possible.

Square Haliotis beads. Type H1. The specimens recovered are rectangular, each with a single central perforation. In spite of the possibly misleading label for type H1, rectangular specimens are included in the type (B&F 1967: 31). The type is part of Gifford's (1947) S5aIV, and equivalent to Haliotis type 1 in the B&H (1958) typology. Plate 1T.

Mulitperforated Haliotis bead. Type H2. Again, the type is described as typically square, but rectangular specimens are included. The single specimen recovered would be described as S6aIII in the Gifford (1947) typology, and as Haliotis type 2 in the B&H (1958) typology. Plate 1U.

Shell Beads -- Ala-328 (5752+ specimens) [1].

Because a number of bead lots have been lost, it is not possible to make a precise estimate of the number of specimens recovered from the site. The artifact collection includes about 6000 beads of known provenience. Evidence from burial records, catalog, student notes, and Davis' Tables 2, 3 and 4 (D&T 1959) documents 9 occurrences which are not represented in the collection. There are reported counts for 6 of these totalling nearly 1000 specimens. Adding these counts and adjusting disparities between reported and actual counts of lots in the collection yields a total count of 7142 specimens; this ignores 3 lots for which occurrence is well documented but no counts were reported.

Altogether, these represent 55 separate occurrences of beads, of which 50 were associated with different graves. The 5 unassociated occurrences account for only 5 specimens of the total number recovered. Beads were second only to pigment as burial accompaniments at Ala-328.

More than 55 lots of beads are described below, because occasionally beads of several types occurred together as grave goods. There were 35 documented occurrences of whole shell beads, and 33 documented occurrences of cut shell beads; in absolute numbers, there were about twice as many whole shell beads recovered as cut shell beads. In the collection, there are 3897 whole shell beads and 1855 cut shell beads; the corrected estimate includes 4810 whole shell beads and 2332 cut shell beads, and ignores 2 whole shell lots and 1 cut shell lot for which no counts are available.

It will be noted that in several cases the present specimen count differs significantly from the original reported count. Furthermore, the artifact collection includes hundreds of additional specimens for which provenience information has been lost. These facts, and the minimal use of screens during excavations should be kept in mind when evaluating the specimen counts and occurrence information pertaining to shell beads from Ala-328.

Olivella spire-lopped beads. (3897 specimens).

Table 3-5 gives descriptive data and provenience information for all *Olivella* spire-lopped beads from Ala-328.

[1] Specimen counts refer only to specimens in the collection; the occurrence of other specimens now lost is mentioned in text and/or tables. A plus sign (+) refers to presence of fragments.

Table 3-5. Provenience and descriptive information for Olivella spire-lopped beads, Ala-328.

Cat. No.	Pit	Grid	Depth ("bs)	Bur.	Pres. Count	Reported Count	Size Range (mm)	Mode (mm)	Type	Other Grave Goods
1-2817	F-5	II	3	-	1	-	-	7	Alb	-
1-690	C-5/6	I	12	130	1	1	-	7	Alb	yes
1-1574,	A-3	II	12	272	96	-	4.0-13.0	10	Alc	yes
1-2800,					56		9.5-13.0	10-11	Alc	
1-2801					24		4.0-6.5	6	Ala	
					16		7.0-9.5	8	Alb	
1-332	E-7	I	18	47	132	138	5.0-9.0	7	Alb	yes
1-160	D-8	I	22	40	12+	17	7.0-9.0	-	Alb	yes
1-2904	D-6	II	24	373	8	-	8.5-10.0	9	Alb	yes
1-37442,	18"E	34'6"S	48	W3	123	30*	6.5-12.5	10.5	Alc	no
1-37443					93		8.6-12.5	10.5	Alc	
					30		6.5-8.5	8	Alb	
1-37436	12"E	15'0" S	50	W2	34	34	9.5-14.5	13	Alc	no
1-2730	A-5/6	II	88	379-383	17	-	6.5-9.5	8.5	Alb	yes
1-2816	A-5	II	90	378	138	-	4.0-6.0	5	Ala	yes
1-2791	A-6	II	93	360	10	-	9.0-9.5	-	Alb	yes
1-2814,	A-6	II	93	361	62+	-	5.0-6.0	5	Ala	yes
1-2809										
1-2903	B-6	II	93	376-	674	652	4.5-8.5	6	Ala	yes
				376a	442		4.5-6.5	6	Ala	
					232		6.6-8.5	7.5	Alb	
1-490	A-5	I	100	54	369	327	4.0-7.5	5	Ala	yes
1-201973,	A-4	I	102	108	203	229	5.5-8.0	7	Alb	yes
1-201974,										
(590: lost)										
1-585	A-4	I	102	107	108	140	5.5-8.5	7	Alb	yes

Table 3-5 (continued)

Cat. No.	Pit	Grid	Depth ("bs)	Bur.	Pres. Count	Reported Count	Size Range (mm)	Mode (mm)	Type	Other Grave Goods
1-2819	B-5	II	102	420	89	-	5.5-7.0	6	A1a	no
4375	A-4	II	103	408	136	-	6.0-8.5	7	A1b	no
1-2822	C/D-5	II	105	445	202	-	5.5-9.0	8	A1b	yes
1-628	A-4	I	105	119	218	141	4.0-10.0	6	A1a	yes
1-638	A-4	I	106	120	610	626	5.5-8.5	7	A1b	yes
1-2823	A-4	II	106	406	122	-	5.0-8.5	6	A1a	yes
1-495	A-5	I	106	55	119	119	5.0-11.0	6.5	A1a	yes
					108		5.0-7.0	6.5	A1a	
					11		9.5-11.0	-	A1c	
1-753	A-4	I	108	126	25	26	6.0-7.5	7	A1b	yes
1-2821	B-4	II	110	441	42	-	7.0-9.0	8	A1b	yes
1-228	A-5/6	I	112	42	240	261	5.5-7.5	6	A1a	yes
1-497	A-5	I	116	50	100	100	4.5-7.0	5.5-6	A1a	yes
1-37496	60'W 49'S		?	W24	6	-	10.5-13.0	-	A1c	?
(3178 - lost)	E/F-6	II	39	384	0	4	-	-	-	yes
(no # - lost)	A-5	II	92	380	0	-	-	-	-	yes
(no # - lost)	B-6	II	95	377	0	-	-	-	-	no
(no # - lost)1	A-4	I	96	121	0	94	-	-	1a**	yes
(527 - lost)	A-4/5	I	100	92	0	133	-	-	1a**	yes
(no # - lost)	A-4	II	103	409	0	561	-	-	-	yes
(548 - lost)	A-5	I	108	80	0	156	-	-	1a**	yes

* Discrepancy between actual and reported counts implies that Davis did not examine one of the boxes of specimens attributed to that burial.

** B&H (1958) type as reported in D&T (1959: 14).

There were 35 occurrences of Olivella spire-lopped beads at Ala-328; they were the most numerous bead type recovered. One single bead was found unassociated; the other beads accompanied graves. Spire-lopped beads were the sole accompaniment of 4 graves, and possibly of a fifth (burial W24) for which a burial record is lacking. In 29 cases spire-lopped beads co-occurred with other grave goods.

Spire-lopped beads occurred from 3" below surface to submound. However, only 10 of the 35 lots were recovered at depths above submound. This suggests much greater popularity of this bead type as a grave good during the early period of site occupation than was the case later. This pattern has been noted in the early components of other Bay sites (Gerow with Force 1968: 55) and will be referred to in later discussion following the descriptions of cut shell beads at Ala-328.

Size preferences evidently changed with time as well. All 10 lots of the small subtype, A1a, were found with submound burials. Three lots of the large subtype, A1c, were found in graves from 12 to 50" below surface; a fourth came from unknown depth in a pit which was not excavated to submound. It will be noted that 1 A1c lot (1-2800, etc.) includes 24 beads of A1a size, but larger beads predominate; similarly, 1 A1a lot (1-495) includes 11 beads of A1c size, but smaller beads predominate. Beads in the middle size range, A1b, occur from 3" below surface to submound. The more frequent occurrence in central California of smaller spire-lopped beads in earlier archaeological contexts and larger ones in later contexts has been frequently noted (e.g., LH&F 1939: 74, 80; Beardsley 1954: 66, 78; D&T 1959: 29).

Circular Olivella beads.

Round saucer Olivella beads. Type G1. (106 specimens). Plate 1E.

Of 111 cut beads reportedly recovered with burial 119, 106 remain (1-629). They are circular in shape; some are not precisely round, due either to original manufacture or erosion. Diameter ranges from 3.0 to 5.0 mm, with mode at 4.0 mm. Perforation diameter is 1 mm or less on all specimens. Davis (D&T 1959: 14, 29, 31) reported that the small disk beads with burial 119 were overlaid on bird bone tubes, but neither burial record nor catalog mentions bone in association with the burial. The beads show no trace of an adhesive.

This lot recovered with burial 119 is the only occurrence of round saucer Olivella beads in significant numbers, although 2 beads of comparable size can be isolated from a lot of larger specimens accompanying burial 58 and 1 round saucer bead occurs in a lot of saddle beads found with burial 138. Davis (D&T 1959: 14, 29, 31) refers to an occurrence of small Olivella disk beads with burial 80. The specimens are missing but burial record and catalog both refer to the beads in question as Haliotis, which suggests that Davis' reference is incorrect.

Small saucer Olivella beads. Type G2a. (410 specimens). Plate 1F.

Among the beads recovered with burial 58 is a group of 406 specimens which are basically circular in shape (1.519, 1-520, 1-521). Davis reports only 399 of this type for burial 58. Two tiny specimens are 3.0 and 4.0 mm in diameter with perforations less than 1 mm. Aside from these, diameters range from 5.0 to 7.5 mm, with mode at 6.0 mm. Perforation diameters are 1.5 to 2.5 mm, with mode at 2.0 mm. Eight specimens are shelved or bear a shelf scar. Ten specimens have a squarish appearance, but rounded corners. About 10 are somewhat ring-like, small in outside diameter and large in perforation diameter, but fall within the ranges cited above.

Approximately 30 beads retain a black adhesive substance and 20 more are stained brown and red; a few are still overlaid on 2 bone tubes (see Plate 1F). It is unclear whether all the beads were originally overlay, or whether some were found apart from the tubes.

A single small disk Haliotis found with burial 58 corresponds in size and shape to the Olivella beads in this lot.

Four beads remain from a lot (1-515) which overlaid a pair of bird ulna whistles found with burial 75. The whistles have traces of black over a large surface area, implying that many more beads were once present. Davis gives no count for the lot; presumably he, too, was able to examine only these 4 specimens. All are circular in shape, with diameters of 6.0 mm, and perforation diameters between 1.5 and 2.0 mm.

Small or large saucer Olivella beads. Type G2a or G2b. (56 specimens).

Burial 14 was found with 54 beads, of which 52 remain. The beads (1-334) are uniformly circular with diameters ranging from 6.0 to 8.0 mm, mode at 7.0 mm; this makes them intermediate between the small and large subtypes in the B&F (1967) typology. Perforation diameters range from 2.0 to 2.5 mm, mode at 2.0 mm. Three specimens are shelved; 3 others show a shelf scar. Two specimens are thicker than the others; possibly they include some of the callus portion of the shell, but they are too eroded to permit detection of it.

Beads of this lot are the most evenly circular of all recovered specimens which are classified as circular in outline.

Four beads attributed to burial 7 remain (1-246), of 452 reported in Davis. All are circular in shape. Two are 7.0 mm in diameter with a perforation diameter of 2.0 mm; 1 is 8.0 mm in diameter with a perforation of 2.0 mm; 1 measures 8.5 by 9.0 mm with a perforation diameter of 3.0 mm. One specimen is shelved; another shows a shelf scar. The circular shape of these beads and Davis' characterization of the larger lot as type 3c disc beads (D&T 1959: 14, 31) supports classification of these beads as saucers. As a lot of 4, these fall on and above the boundary between small and large saucers, but the mode of the larger lot may not have agreed.

Large saucer Olivella beads. Type G2b. (31 specimens).

Eighteen specimens (1-1188) were recovered with burial 222. Six are circular, ranging from 8.0 to 9.0 mm in diameter, 2.0 to 2.5 mm in perforation diameter. Seven or 8 specimens are slightly oval, averaging 9.0 by 8.5 mm in size with perforations of 2.0 to 2.5 mm. Four or 5 specimens are amorphous. Their irregular shape may be due to erosion, or they may represent unfinished beads.

Sixteen beads accompanied burial 4, according to Davis. Of these, 13 remain (1-73). All have perforation diameters close to 2.0 mm. Four are essentially circular, with maximum diameters ranging from 7.0 to 8.0 mm. Five are out-of-round or slightly oval, and slightly larger, with maximum diameters ranging from 8.0 to 9.0 mm. Four in the same size range are broken or eroded; 1 of these bears a shelf remnant. Taking the lot as a whole, the form may be characterized as poorly circular.

Large ring Olivella beads. Type G3b. (166+ specimens).

A total of 166 beads and 4 broken pieces comprise the lots credited to burial 142 (1-795, 1-796), although Davis reports only 163 beads with that burial. Most beads are circular; about 15 are slightly oval. Diameter ranges from 6.0 to 12.0 mm, with mode at 10.0 mm. Perforation diameter ranges from 2.0 to 3.0 mm, with mode between 2.5 and 3.0 mm. Seven specimens are shelved. These 7 and 5 beads among the 12 with perforations of 2.0 mm comprise a group of out-of-round amorphous specimens which suggest possibly unfinished beads.

Although Davis (D&T 1959: 13, 31) assigned 7 specimens from this group to type 3b, none of the beads appear to meet his stated criteria (D&T 1959: 28) for beads of that type. The lot as a whole conforms in shape and degree and kind of variation to other lots described here as circular. Because of the larger modal perforation diameter, the beads with burial 142 belong to a different subtype (large rings) than the other lots (small and large saucers) described above.

Untypable circular Olivella beads. (209 specimens).

A group of 193 specimens (1-37441) was recovered with burial W3. Five others are broken and 15 were in use elsewhere when the specimens were examined. The lot can best be described as poorly circular in shape. On most specimens length and width differ by about 0 5mm. The difference rarely exceeds 1 mm however which makes the beads better described as circular than oval.

Ninety seven beads are irregular in outline. Many of them appear to be broken or perhaps unfinished bead blanks. Perforation diameter on all is about 2. 0 mm, but they fall into 2 groups by size and curvature. Twenty four larger specimens, ranging from 9. 0 by 8. 0 mm to 10. 0 by 9. 5 mm, are flat; 9 of them are shelved or show the scar of the whorl remnant. The remainder, slightly smaller in size, show some curvature across the width. Twenty beads range from 6. 5 by 6. 5 mm to 8. 5 by 7. 0 mm; 1 is shelved, and 6 show a scar of the whorl remnant. Fifty three are slightly wider than long, ranging from 6. 5 by 7. 0 to 8. 0 by 9. 0 mm; 4 show a scar of the whorl remnant. In spite of the curvature and the many beads with greater width than length, the irregularity of outline distinguishes these specimens from saddle types.

About 45 beads of more regular outline also show some saddle attributes. Fourteen beads show the characteristic curvature and would fit into a larger lot of round or square saddle, but the length of most of these is too great with respect to the width to fit the definition of saddle beads being used here (B&F 1967: 18). These 14 all have a centered perforation about 2. 0 mm in diameter, and range from 8. 5 by 8. 0 mm to 6. 5 by 7. 0 mm in dimensions, with mode around 7. 5 by 7. 0 mm.

Thirty slightly larger and more circular beads also have a saddle-like curvature, and 10 to 15 were cut diagonally from the shell wall. However, all but 2 are longer than wide. They range from 8. 5 by 9. 0 mm to 11. 5 by 11. 0 mm in size, with mode at 11. 0 by 10. 5 mm. Perforation diameters range from 2. 0 to slightly more than 3. 0 mm, with mode at 3. 0 mm; perforations are slightly off-center on about 5 beads. Many specimens in this group show unground edges, reflecting erosion or incomplete manufacture.

A single shelved oval bead, 9. 0 by 8. 5 mm in size with a 2. 5 mm perforation, does not fit well into any of the groupings discussed above.

If the lot is accepted as finished beads, some sort of a stylistic transition phase between flat circular and more curved and oval saddle beads is perhaps indicated.

Three specimens (no catalog number) remain of 9 cut beads reportedly recovered with burial 226 (see Plate 3A). Four specimens were overlaid on a thick pointed spatulate bone artifact accompanying the burial, and 5 were found loose in the grave area. One bead is oval in outline, measuring 10. 0 by 8. 0 mm with a perforation of 2. 0 mm in diameter. The other 2 are irregular in shape, although edge-ground. One measures 8. 5 by 8. 0 mm, with an off-center perforation of 2. 0 mm. The other measures 7. 5 by 7. 5 mm, but is not circular; perforation diameter is about 1. 5 mm. None of the specimens is shelved.

A small but heterogeneous group of 13 beads (1-37464) was recovered with burial W6. None are shelved. Five are circular in shape. Two of these are ring-like, with 9. 0 mm diameters and perforations of 3. 0 mm. Three, with 2. 0 mm perforations and diameters near 6. 0 mm, are saucer-like. Among the other beads, 4 have unground edges and are presumably broken. Two of the remainder are irregular flat ovals, with length and width near 7. 5 mm and perforations of 2. 0 mm. Two other beads are ovals with scoop-like curvatures, measuring 8. 0 by 6. 5 mm, with perforations of 2. 0 mm. Such diversity throws into question Davis' (D&T 1959: 13, 31) classification of the entire lot as 3c, but certainly when taken as a whole the lot is more circular than anything else.

Circular Haliotis beads.

A single Haliotis disk bead found with burial 119 was catalogued; it is missing from the collection. Davis' reference (D&T 1959: 29) to Haliotis disk beads occurring in necklace form with this burial is contradicted by his Tables 4 and 9, and appears to be a transposition of his reference to a necklace of Olivella disk beads in the immediately preceding paragraph.

Both burial record and the original catalog specify that Haliotis disk beads formed the overlay on bone tubes found with burial 80, not Olivella disks as Davis claims (D&T 1959: 14, 29, 31). The specimens are missing, and evidently were when Davis made his study, since he gives no count in tables or text; hence certain resolution of the discrepancy is not possible.

Small disk Haliotis bead. Type H3a1. (2 specimens). Plate 1K.

A single specimen (1-2805), roughly circular in shape, was recovered with burial 58. It measures slightly over 6 mm in diameter, with a 2.0 mm perforation.

One fragment (1-2807) remains from a lot catalogued as 2 Haliotis beads and a fragment, collected from burial 361. The fragment is about half of a circular bead approximately 5 mm in diameter.

Small disk Haliotis bead. Type H3a2. (64 specimens). Plate 1J.

A lot (1-322) of 64 circular specimens, each with a single central perforation, was recovered with burial 54. Diameter ranges from 6.5 to 9.0 mm, with mode at 9.0 mm. Perforation diameter ranges from 1.5 to 2.0 mm with mode at 2.0 mm. Some specimens bear traces of a black substance, either remnant epidermis or possibly an adhesive agent. Davis reported (D&T 1959: 14, 29, 31) that the beads were overlaid on bird bone tubes when recovered, but neither burial record nor catalog refer to bone items associated with the grave. The burial record indicates that the Haliotis disks came from the neck area of the burial.

Circular clamshell beads.

Small clam shell disk bead. Type A1c. (67+ specimens). Plate 1I.

Three clam disk beads (1-691) showing traces of fire were recovered with cremation burial 130. Two are naturally grooved on one surface and one is smooth, but all have probably split in response to heat, so the difference should not be taken to reflect variation in finishing techniques or species difference within the lot. One bead is 11.0 mm in diameter with a perforation of 3.0 mm, and 2 are 7.0 mm in diameter with perforations close to 2.5 mm. Thicknesses of all 3 are 3.0 mm or less, but the strong possibility of splitting means that original thicknesses may have been greater.

Forty five specimens and 7 fragments found with cremation burial 272 (1-1574, 1-2798; see Plate 1, I) have been burned and probably split, so the total count may be inflated. Twenty nine specimens show grooves on one surface; the others may have lost these due to splitting or erosion. Outside diameters range from 6.0 to 9.0 mm, with mode at 7.0 mm; all of the specimens are circular in outline. Perforations are 2.0 to 3.0 mm in diameter. Thickness ranges from less than 2.0 to 3.0 mm, but the evidence of many split specimens argues against the assumption that present thicknesses equal the original measurements.

The 18 clam disk beads which accompanied burial W9 (1-37466) show no signs of burning. Five show grooves on one surface, and 13 show no grooves. Gifford (1947: 23-33) refers to 5 beads of Saxidomus nuttali and 13 of S. giganteus at Ala-328; presumably he attributed the grooved beads to the former species and the ungrooved beads to the latter. Both grooved and ungrooved specimens fall into the same size range, from 7.0 to 9.0 mm in diameter with mode at 7.8 mm; thickness from 2.4 to 5.6 mm with mode at 3 mm; and perforation diameter of 2.5 to 3.3 mm with mode under 3.0 mm.

A single clam disk bead (1-2818) was recovered unassociated in midden in pit J-4 II at 4" below surface. It is grooved, and measures 7.5 mm in diameter, 2.5 mm in thickness.

Medium-size clam shell disk bead. Type A2a. (1 specimen).

A single clam disk bead was recovered from pit J-5 II at 12" below surface. It is grooved, and measures 12.0 mm in diameter, 3.0 mm in thickness.

Oval Olivella beads.

Split, shelved Olivella beads. Type C2. (14 specimens). Plate 1H.

A small lot of oval beads with drilled central perforations (1-2804) accompanied burial 58. Davis reported 14 ovals. Of 13 which remain in the collection, 2 are broken, leaving 11 to characterize the lot. Ten are shelved, and 1 bears a shelf scar. Maximum dimensions range from 15.5 by 13.0 mm to 10.0 by 9.0 mm. All perforations are near 1.5 mm in diameter except that on the largest specimen, which is 2.0 mm.

A single specimen (1-2815) recovered from the backdirt of pit C-4 II is a shelved oval measuring 11.0 by 10.5 mm, with a perforation diameter less than 2.0 mm. It is shown on Plate 1H.

Full-lipped Olivella beads. Type E2. (24+ specimens). Plate 1N.

Ten beads (1-45) were recovered with burial 2. Perforations are 2.0 to 2.5 mm in diameter. The beads range in size from 9.0 by 8.0 to 11.0 by 9.0 mm, clustering around 10.0 by 8.0 mm. The beginnings of a fold of the lip are visible on 1 edge of all but the smallest specimen. Two of the beads are shown in Plate 1N.

Two classifiable beads plus fragments (1-195) remain of the 5 cut beads reportedly recovered with cremation burial 65. One specimen measures 7.0 by 6.0 mm, with a perforation diameter of 2.5 mm. The other is 13.0 by 10.0 mm in size, with a 3.0 mm perforation. On the latter, the beginning of a fold of the lip is visible on 1 edge; a portion of the lip is present, but not folded over, on the former. The larger bead has been split by burning.

One lipped bead (1-332) was recovered with cremation burial 47. It measures 10.5 by 9.0 mm with a perforation diameter of 2.5 mm, and shows the beginnings of a fold of the lip. It bears no sign of burning.

Three full-lipped beads (1-685) were among the grave goods accompanying burial 129, a cremation. All are black and show some splitting. The beginnings of a fold of the lip can be seen on 2; the callus and lip portion has split away from a third. Perforation diameter is 2.5 mm on all 3 specimens. They measure 13.5 by 10.0 mm in size. Perforation diameter is about 2.0 mm on all specimens.

Of 4 beads found with burial 131, 3 classifiable specimens remain, plus fragments (1-696). All are full-lipped beads which are burned and split. One, with a 3.0 mm perforation diameter, measures 11.0 by 9.5 mm. Two with perforations of 2.5 mm measure 13.0 by 9.0 mm and 12.5 by 9.0 mm. On all 3 the beginnings of a fold of the lip is evident.

Large-lipped Olivella beads. Type E3. (411 specimens).

A group of 411 lipped beads (1-37465) was collected from the upper body area of burial W9. A large portion of the shell, almost half in some cases, was used in the manufacture of these beads. As a consequence, they are scoop-like in shape, with a greater concavity than the other lipped beads from the site. All have been ground along the edges. On all but 10 specimens, the aperture whorl has been ground away to the base, so no fold of the lip can be seen. None of the specimens are shelved. All have small perforations, about 2.0 mm in diameter. The lot ranges from 6.5 by 6.0 mm to 14.5 by 11.5 mm, with mode at 13.0 by 10.5 mm.

Oval saddle Olivella beads. Type F1. (1 specimen). Plate 1, 0.

A single bead (1-646) was found unassociated in pit B-1 I at 94'' below surface. Its diagonal cut and curvature across the width are saddle-like traits, although it is slightly longer than wide, measuring 15.0 by 14.5 mm. It has a perforation diameter of 3.0 mm. On the convex surface, it has been ground to a flat bevel between the perforation and bottom edge. On the concave surface, a shelf scar is visible.

Round saddle Olivella beads. Type F2b. (40 specimens).

Burial 201 was accompanied by 40 beads (1-1121) which are lineal ovals in outline. Sides are parallel and straight rather than curved, but rounded corners distinguish these beads from rectangles. Width is greater than length on all but 1 specimen, where the 2 dimensions are equal. Curvature across the width is evident on all beads. All specimens were diagonally cut. Perforation diameter is about 1.5 mm on all. For 12 measured beads, width range is 9.0 to 11.5 mm, with modal clusters at 9.5 and 10.0 mm. Lengths are evenly distributed in the range 8.0 to 9.5 mm. The difference between width and length varies from 0 to 2.5 mm, falling between 1.0 and 2.0 mm on most specimens.

Round or square saddle Olivella beads. Type F2b or F3a. (254 specimens).

Davis reports (D&T 1959: 13) that 283 beads were recovered with burial 138. A total of 254 were found strung together on display at the Oakland Museum, catalogued as 772 (now 1-772), the number given to beads from that burial. The museum agreed to return the beads to the SFSU collection since Davis' classification of them as 1 of 2 occurrences of type 3b saddle beads at the site made them of especial interest for study.

The lot exhibits variation in attributes of size, perforation diameter, shape and shelving. A single tiny circular bead, 4 mm in diameter with a perforation less than 1 mm in diameter falls into the type G1. Eighteen broken beads are unclassifiable. The other beads may be grouped into 5 catagories: saucer-like beads which are more circular than oval, shelved beads, beads similar to the full saddle type, and beads similar to the round or square saddle types, which are divided into 2 subgroups of different sizes.

Forty five beads are more circular than oval in outline, although they are not really round. They lack the curvature to make them look like saddle beads, but many appear to have been diagonally cut. Modal perforation diameter is 2.0 mm, with none as small as 1.5 mm, nor any as large as 2.5 mm. Modal bead size is 11.0 by 10.0 mm, with range from 9.0 by 9.0 to 11.0 by 11.0+ mm. Only 2 specimens have the latter measurements, which technically meet the definition of saddle beads, but they lack the curvature associated with that type designation.

Twenty six beads are shelved, although they retain less of a remnant than do the beads described above as type C2 shelved ovals. The shelved specimens comprise about one-tenth of the lot and their shelving probably represents incidental rather than deliberate variation since in shape they conform to unshelved specimens. They are in between circular and oval in outline, not really round, but with little difference between length and width dimensions. Some specimens show diagonal cutting and the curvature associated with saddle beads, but are too round to be classified as saddle beads. Perforation size is about 2.0 mm on all specimens, with a range of less than 0.5 mm around this mode. This perforation size also distinguishes them from established round or square saddle types, which usually have perforation diameters of 1.5 mm or less. The largest shelved bead measures 12.0 by 11.0 mm, the smallest, 10.0 by 9.0 mm; mode is 10.0 by 10.0 mm.

Eighteen beads are oval in outline, and show the curvature and diagonal cut of saddle beads. Width is greater than length on all specimens, although sometimes by very little. Largest specimens measure 12.0 by 13.0 mm, the smallest, 10.0 by 10.0+ mm, with an even spread in sizes in between. Except for 1 specimen with a perforation of 1.5 mm, perforations are all close to 2.0 mm in diameter, too large for the full saddle type as defined in the B&F (1967) typology; however, by the other criteria of outline, cut, and shape these beads fall into that type.

One hundred and forty six beads are round in outline, with evident diagonal cut and deep curvature which make them more appropriately classed as saddle beads than as saucers. Outline and width and length measurements make them intermediate between round and square saddle types. Perforation diameters fall between 1.5 mm and 2.5 mm, with mode at 2.0 mm; this makes them larger than the diameter sizes specified in the type definitions (B&F 1967: 18). The beads vary in overall size, and may be divided into 2 groups. One hundred and fifteen beads are relatively small, with modal size of 11.0 by 10.0 mm; the smallest specimen is 10.0 by 8.0 mm; specimens larger than mode were placed in the other subgroup. Thirty one specimens are relatively large, with mode at 12.0 by 11.0 mm, within a range from 11.0 by 11.0 mm to 13.0 by 13.0 mm. Among these specimens, the relative similarity between length and width dimensions suggests their classification as square saddle beads, but the size of both subgroups is larger than would be expected for this type, and suggests the round saddle type.

As a whole, the lot recovered with burial 138 falls between the square and round saddle types, except that perforation size on almost all specimens is too large for any defined saddle type except oval saddles, which are not represented in the lot by shape. The full saddle specimens, the shelved specimens and the more circular specimens all fall close to the modal size and perforation diameter size of the specimens grouped as round or square saucers. They convey a sense that the lot may represent a stylistic transition between more circular, flat beads and more oval, curved beads. In this regard the lot is similar to beads recovered with burial W3, described above as untypable circular Olivella beads. The latter also have a modal perforation diameter of 2.0 mm, but are smaller in overall size, which perhaps contributes to their more circular appearance than this lot.

Discussion.

Table 3-6 shows the occurrences of shell beads at Ala-328, arranged by depth. It is clear that whole-shell beads occurred more frequently than cut-shell beads at submound depths, and that the reverse is true for depths above submound.

Among cut beads, circular forms appear to have been popular before oval forms. More specifically, a sequence is indicated in which both shell genus and bead shape figure. Haliotis disk beads and round saucer Olivella beads accompanied submound burials, followed by mostly circular Olivella forms at intermediate depths. Oval Olivella forms next appear, and with the subsequent shift from saddle to lipped oval Olivella forms, circular clamshell forms enter the sequence.

It should be noted that acceptance of the apparent trend from circular to oval Olivella forms at the site ignores the single occurrence of oval split, drilled Olivella specimens with the deepest burial above submound among those accompanied by beads. Information from other sites is necessary to clarify the temporal relationship between circular and oval split, drilled Olivella forms.

Shell Beads -- Ala-13 (1527+ specimens).

The artifact collection includes about 1500 shell beads. These represent 30 separate occurrences, of which 19 were associated with 16 different graves. The isolated occurrences were single beads in 8 cases; a lot of 45 beads was recovered with feature 2, an artifact cluster, and 2 lots of 12 and 4 specimens, respectively, came from Trench 12. Several burials from Trench 12 were accompanied by shell beads, and it seems likely that the unassociated lots from the trench represents grave goods which were moved from original context as a consequence of bulldozer use in excavation of that trench.

The assemblage of shell beads includes a single specimen of cut Haliotis sp. shell, which reportedly occurred with a second specimen, now apparently lost. All other beads are Olivella sp. Of these, about 1250 are cut beads, and about 300 are whole-shell beads modified by grinding.

Olivella spire-lopped beads. (299 specimens).

Table 3-7 gives descriptive data and provenience information for all Olivella spire-lopped beads from Ala-13. The majority of specimens are Olivella biplicata. Four beads were tentatively identified as O. baetica.

Spire-lopped beads were recovered in 17 separate occurrences. Seven lots were associated with burials and one with feature 2. A lot of 12 beads bulldozed from Trench 12 may have been a grave association removed from context in the process of excavation.

There is little variation in form among beads of this type. All of the specimens have been chipped or ground at the spire end, by natural or human agent. In most cases the opening at the spire end is 1 to 3 mm in diameter. Ten beads (in lot 30-62) have 4 mm openings, and 4 others in the same lot reach 5 and 6 mm in diameter.

About 20 beads show some grinding of the outermost edge. On most specimens, including 2 with unusually large spire openings described above, the ground edge is irregular; probably the grinding was done to smooth broken edges. One bead (in lot 30-76) was apparently deliberately bevelled with aperture end down and body held at an acute angle; much of the outermost edge is gone, the opening is very wide and the lips have been polished smooth.

Circular Olivella beads.

Small and large saucer Olivella beads. Types G2a and G2b. (166 specimens). Plate 1M.

A group of 166 beads (30-57) accompanied burial 94. Fifty five beads are circular or slightly oval in shape. They range from 6.0 to 9.0 mm in diameter, but may be separated into 2 size groups to accord with categories of the B&F (1967) typology.

Twenty nine beads are large saucers; 2 are shown in Plate 1M. Modal diameter among these is 7.5 mm, range 7.0 to 9.0 mm; modal perforation diameter is 2.0 mm, range 1.5 to 3.0 mm. The 3 beads with perforations of 3.0 mm or greater are 8.0 mm in diameter, and technically are rings (G3b) rather than saucers.

Twenty six beads are small saucers. Among these, modal diameter is 6.5, range 6.0 to 7.0 mm; modal perforation diameter is 2.0 mm, range 2.0 to 2.5 mm.

Fifteen beads are oval variants, within the size range of the saucers but showing noticeably greater length than width; modal dimensions are 7.5 to 7.0 mm, modal perforation diameter 2.0 mm.

Thirty two beads are amorphous in shape, most irregularly oval or subtrapezoidal in outline. In size they fall within the saucer range. Modal perforation diameter is 2.0 mm; perforations are usually centered.

Table 3-6. Occurrences of shell beads at Ala-328, arranged by depth.

Burial	Pit	Grid	Depth ("bs)	Bead Types	Whole	Circ.	Oval
-	F-5	II	3	Alb	x		
-	J-4	II	4	clam Alc		x	
129	C-6	I	8	E2			x
2	E-1	I	11	E2			x
130	C-5/6	I	12	Alb, clam Alc, E2	x	x	x
131	C-6	I	12	E2			x
272	A-3	II	12	Alc, clam Alc	x	x	
-	J-5	II	12	clam A2a		x	
47	E-7	I	18	Alb, E2	x		x
W9	57'W 44'S		21	clam Alc, E3		x	x
40	D-8	I	22	Alb	x		
65	D-7	I	24	E2			x
373	D-6	II	24	Alb	x		
201	A-9	II	28	F2b			x
14	A-1	I	32	G2a or G2b		x	
138	C-6	I	36	F2b or F3a			x
384	E/F-6	II	39	Al_(lost)	x		
226	D-8	II	40	untypable		x	
4	A-3	I	42	G2b		x	
W3	18"E 34'6"S		48	Alc, untypable	x	x	
W2	12"E 15'S		50	Alc	x		
75	D-7	I	50	G2a		x	
7	A-2	I	53	G2a or G2b		x	
142	B-2	I	60	G3b		x	
W6	10'9"E 1'6"S		66	untypable		x	
222	B-9	II	72	G2b		x	
58	A-5/6	I	79	G2a, H3al, C2		x, x	x
379-383	A-5/6	I	88	Alb	x		
378	A-5	II	90	Ala	x		
380	A-5	II	92	Al_(lost)	x		
360	A-6	II	93	Alb	x		
361	A-6	II	93	Ala, H3al	x	x	
376-76a	B-6	II	93	Ala	x		
-	B-1	I	94	Fl			x
377	B-6	II	95	Al_(lost)	x		
121	A-4	I	96	Al_(lost)	x		
54	A-5	I	100	Ala, H3a2	x	x	
92	A-4/5	I	100	Al_(lost)	x		
108	A-4	I	102	Alb	x		
107	A-4	I	102	Alb	x		

Table 3-6 (continued)

Burial	Pit	Grid	Depth ("bs)	Bead Types	Whole	Circ.	Oval
420	B-5	II	102	Ala	x		
408	A-4	II	103	Alb	x		
409	A-4	II	103	Al (lost)	x		
445	C. D-5	II	105	Alb	x		
119	A-4	I	105	Ala, Gl, H3a_ (lost)	x	x, x	
120	A-4	I	106	Alb	x		
406	A-4	II	106	Ala	x		
55	A-5	I	106	Ala	x		
126	A-4	I	108	Alb	x		
80	A-5	I	108	Al_, H3a_ (lost)	x	x	
441	B-4	II	110	Alb	x		
42	A-5/6	I	112	Ala	x		
50	A-5	I	116	Ala	x		
W24	60'W 40'S		?	Alc	x		
-	C-4	II	?	C2			x

Table 3-7. Provenience and descriptive information for Olivella spire-lopped beads, Ala-13.

Cat. No.	Pit	Depth*	Bur.	Present Count	Reported Count	Size Range (mm)	Mode (mm)	Type	Other Grave Goods
30-65	E-19	6-12	-	1	-	-	11.0	A1c	-
30-49	I-17	25	51	1	1	-	7.0	A1b	yes
30-59	F-14	25	75	4	-	5.0-6.0	-	A1d	other beads only
30-52	E-19	26	-	1	-	-	12.0	A1c	-
30-44	C/D-13	30	4	3	3	all 6.0	6.0	A1a	no
30-76	E-13	33	13	51	44	10.0-14.0	12.0	A1c	other beads only
30-67	E-13	36	-	1	-	-	12.0	A1c	-
30-50	C-13	36	12	73	-	5.0-10.5	8.5	A1b	no
				19		5.0-6.5	5.5	A1a	
				35		6.6-9.5	8.5	A1b	
				19		9.6-10.5	9.0	A1c	
30-75	C-13	39	15	90	112	7.0-14.0	13.0	A1c	no
				16		7.0-9.5	9.0	A1b	
				74		9.6-14.0	13.0	A1c	
30-51	F/G-13	44	8	12	12	5.0-10.0	6.0	A1a	no
30-55	F-13	45	-	1	-	-	14.0	A1c	-
30-62	C-13	56	F.2	45	45	9.0-14.0	13.0	A1c	yes
30-68	D-13	58	-	1	-	-	13.0	A1c	-
30-70	D-13	59	-	1	-	-	13.0	A1c	-
30-66	J-17	60	-	1	-	-	12.0	A1c	-
30-54	D-13	63	-	1	-	-	10.0	A1c	-
30-45	Tr. 12	?	-	12	-	6.0-10.0	10.0	A1c	-

* Depths in inches presumed below datum plane.

Twenty beads are too broken or eroded to be classified by shape. Forty four others remain stuck together in clumps of 4 to 6 beads, implying that they had been strung when placed in the grave. I did not attempt to measure and classify them.

Large ring Olivella beads. Type G3b. (224+ specimens). Plate 1L.

A lot of 224 specimens and 2 fragments (30-72) is attributed to burial 35. The reported count was 673 beads. One of 3 boxes belonging to lot 30-72 is missing, presumably with the rest of the beads. [1] The specimens are predominantly circular in shape. Diameters range from 8.0 to 12.5 mm, with mode at about 11.0 mm; perforation diameters range from 3.0 to 4.5 mm, most falling close to 4.0 mm. Most of the beads are good examples of large rings.

Thirty beads are under 9.5 mm in diameter. Sixteen of these have perforation diameters less than 3.0 mm, and are technically large saucer beads (G2b). The remaining 14 are 3.0 mm or greater in perforation diameter, and may be grouped with the other large rings in the lot.

It should be noted that both mode and maximum range of the large rings in this lot exceed the value of 10 mm specified in the B&F type description.

Nine beads in the lot are irregular in shape and have small perforation diameters of 2.0 mm or less. Sixteen other specimens are irregular in shape due to breakage or erosion.

Large saucer and large ring Olivella beads. Types G2b and G3b. (563+ specimens).

A group of 563 unbroken beads and 20 to 30 fragments (30-71, 30-73) were found with burial 54 [2]. The reported count was 565 beads. The specimens

1 Lots 30-71, 30-72, and 30-73, recovered with burials 35 and 54, were apparently stored for a time in unlabeled boxes. When the boxes were labeled, there was uncertainty as to which lots were to be attributed to which burial. The attribution of lot 30-72 to burial 35 is based on the claim that "some asphaltum adhered to the beads" (R 1967: 70). The beads in what is now labeled lot 30-72 do show some black staining, in contrast to the appearance of the beads in lots 30-71 and 30-73.

2 See footnote 1.

are divisible into two groups according to perforation diameter, one centering around 2. 0 mm, and one around 3. 0 mm.

In the group of 296 beads with modal perforation diameter of 2, all perforations are larger than 1. 0 mm and smaller than 3. 0 mm. Outside diameter ranges from 7. 0 to 10. 0 mm, with mode around 8. 0 mm. Twenty beads look finished and regular in shape, which is basically circular, although none are entirely round. They range from 7. 0 to 8. 0 mm in diameter, and may be classed as poor examples of large saucer beads. About 120 specimens which are irregular in shape may be unfinished bead blanks; 20 of them show a scar or a whorl remnant on the interior wall. Another 156 specimens appear to be broken or eroded at their edges, although some of these might also be blanks.

In the group of 257 beads with modal perforation diameter of 3. 0 mm, the range extends from 2. 0 to 4. 0 mm. Outside diameter ranges from 7. 0 to 11. 0 mm, with mode at 10. 0 mm. One hundred thirty three beads are basically circular in outline, although not really round, and may be classed as poor examples of large rings. Their shape is suggestive of modified saddle beads, especially in the case of about 20 specimens with greater width than length; but no diagonal cut is evident. This group might represent an early transitional phase from circular to more oval forms, perhaps a ring-to-saddle transition, but such developmental sequence has yet to be demonstrated.

The other beads with the larger perforation size are broken or eroded at the edges or otherwise so irregular in outline that they do not fall into a recognizable category; like the irregular specimens of smaller perforation size, some of these may be blanks.

Untypable circular Olivella beads. (9 specimens).

The 6 beads (30-60) recovered with burial 96 are too few and variable to be classed reliably. Two specimens are circular, with diameters of 7. 0 and 7. 5 mm, perforations of 2. 0 mm in diameter. Two beads of irregular off-oval shape measure 8. 5 by 8. 0 mm and 1. 1 by 1. 0 mm, with perforations of 2. 0 and 2. 5 mm, respectively. Two specimens with unground or eroded edges measure 9. 5 by 9. 0 mm and 8. 5 by 7. 5 mm, with perforation diameters close to 2. 0 mm.

With 4 slightly oval or irregular beads to 2 circular specimens, the lot could be classed as poor saucers. It might represent a transitional phase in stylistic change to more oval forms. After cursory examination, Bennyhoff said the lot might fall into a saucer-to-round-saddle transitional phase, if the emergence of saddles from saucers can be shown elsewhere with better evidence. By itself, the lot cannot be used to document such a developmental scheme.

Two broken beads and 3 intact specimens (30-64) were found with burial 93. Perforations are small, just over 1.5 mm in diameter. One specimen 9.5 mm in diameter shows diagonal cutting, and could be classed as a round or square saddle bead (F2b or F3a). Another, measuring 7.5 mm in diameter, was evidently not diagonally cut; it is best labeled a large saucer bead (G2b), although the small perforation is unusual for that class. The third specimen has weathered or unground edges; it measures 8.5 mm in diameter, and might be placed in either the round saddle or large saucer group. Like lot 30-60, these specimens could be interpreted as transitional forms between saucers and round saddles if such a developmental scheme should be demonstrated on the basis of better evidence.

Oval Olivella beads.

Split, punched Olivella beads. Type D1. (219+ specimens). Plate 1G.

A lot of 218 beads and 7 fragments (30-74) was associated with burial 51. A single bead (30-47), credited to nearby feature 6, conforms in shape and size to the other specimens, and is here considered to be a part of that grave association. The beads are oval in shape with marked concavity; each represents slightly less than half a shell, severed lengthwise. Most specimens have been ground smooth at the edges; a few have rough irregular edges where trimming from half shell to smaller size was not completed.

Perforations are approximately centered on all specimens; they were punched rather than drilled, and so are irregular in outline. All unbroken specimens retain a portion of the interior whorl except 6 to 10 which show the whorl scar. Beads range in size from 22.0 by 15.0 mm with perforation of 5.0 mm to 14.0 by 10.0 mm with a perforation of 4.0 by 2.0 mm. Modal size is 18.0 by 13.0 mm with perforation of 4.0 mm. Perforation diameters as small as 3.0 mm and as large as 6.0 mm occur rarely.

Six specimens have unusual attributes. Two show some grinding on the external surface in the area of the perforation; both have larger perforations as a result (5.0 by 6.0 mm and 9.0 by 6.0 mm). They also share less concavity and a more nearly circular shape (length and width differing by 3.0 mm or less) than most beads in the lot. Two other specimens are nearly circular in shape, due to more extensive cutting and grinding at the edges than is characteristic of the lot; they show no exterior surface grinding, however. Two beads show a sharp angularity, almost right angles, at the aperture end where the whorl portion has been ground away.

Full or round saddle Olivella bead. Type F2a or F2b. (1 specimen). Plate 1P.

One bead (30-63) was found in the vicinity of burials 22 and 23, possibly a cultural association with the graves. Like other specimens classified as saddle beads, the specimen is oval in shape with an angular appearance but rounded corners, and was diagonally cut. It measures 11.0 by 12.5 mm, with a perforation diameter of 1.0 mm. The bead is intermediate in form and dimensions between full saddle and round saddle types in the B&F (1967) typology.

Round or square saddle Olivella beads. Type F2b or F3a. (4 specimens). Plate 1Q, R.

Four beads (30-46) were recovered from Trench 12 at unrecorded depth, apparently unassociated with a grave. Bulldozer excavation may have obscured associations, however. The beads are ovals with an angular appearance; rounded corners distinguish them from rectangles. Diagonal cut is evident on all 4 specimens. Two intact specimens measure 7.5 by 8.0 mm and nearly 8.0 by 8.0 mm, both with perforation diameters near 1.0 mm. The former is a round saddle bead, the latter a square saddle bead, as those types are defined by B&F (1967). The other 2 specimens are broken. Perforation diameters are 2.0 and 1.5 mm, and present dimensions are 8.0 by 8.0 and 9.0 by 7.5 mm, respectively. Their present shapes indicate that both beads were similar in form to the 2 intact specimens.

Square saddle Olivella bead. Type F3a. (1 specimen). Plate 1R.

The single bead (30-69) found with burial 13 is diagonally cut, oval in shape with an angular appearance in spite of rounded corners. It measures 6.5 by just over 6.5 mm, and has a slightly off-center perforation 1.5 mm in diameter.

Untypable oval Olivella bead. (1 specimen).

A single bead (30-61) found with burial 53 has round edges due to erosion or absence of grinding. It is irregularly oval in outline, presently measuring 8.5 by 6.5 mm, with a perforation diameter of 2.0 mm. No interior whorl remnant or scar is evident.

Rectangular Olivella beads.

Plain, centrally perforated, thin rectangles. Type M1a. (2 specimens). Plate 1S.

Two beads (30-53) recovered with burial 57 are rectangular in shape, with no remnant or scar of the interior whorl present. Perforation diameters are about 1.0 mm on both beads. One is centrally perforated, measuring 7.5 by 5.5 mm. The other is perforated slightly off center, but closer to center than to end, and measures 6.5 by 4.5 mm.

Untypable rectangular beads. (36 specimens).

The 36 cut shell pieces (30-59) associated with burial 75 appear to be cut blanks for beads, all with drilled central or slightly off-center perforations close to 2.0 mm in diameter. No diagonal cut is evident, and length exceeds width on all specimens, which range from 8.0 by 7.0 mm to 12.0 by 10.0 mm in size. A single specimen retains part of the interior whorl.

The shape of the blanks suggests that rectangles were the intended end product, although most specimens would require more grinding and shaping before a rectangular shape were achieved; several have more curvature than is usually found on rectangular beads, and some lack straight edges.

Four beads are sufficiently finished and defined in shape to be called rectangles. They measure 10.5 by 9.0 mm, 9.5 by 7.5 mm, and 2 9.5 by 8.0 mm, and may be classed as plain, centrally perforated, thin rectangles (M1a).

Rectangular Haliotis beads.

Square Haliotis beads. Type H1. (1 specimen). Plate 1T.

Rackerby (1967: 16) reports the occurrence of 2 "small (10 mm.) square *Haliotis sp.* beads" with burial 75. One *Haliotis* specimen is present in the collection in lot 30-59, credited to burial 75. It is presumably one of the specimens referred to by Rackerby. The bead is a poor rectangle with rounded corners and sides, measuring 12.0 by 9.0 mm, with a drilled central perforation 2.0 mm in diameter. Erosion and breakage may be responsible for some of the rounding of the specimen.

Discussion.

Table 3-8 shows the occurrence of shell beads at Ala-13, arranged by depth. It illustrates the fact that whole-shell beads were not recovered at submound depths [1], while all circular cut beads came from graves dug into submound. Oval cut beads were recovered above submound with the exception of a single untypable specimen. Rectangular beads and the lot of oval split, punched beads occurred at the shallowest depths from which beads were recovered. Thus a sequence is suggested beginning with circular cut beads at submound; whole-shell beads then appear and occur through the rest of the sequence; oval cut beads follow circular cut beads in the sequence, with saddle types giving way to split punched beads at shallow depths where rectangular cut beads also appear.

Shell Beads -- Ala-12 (16+ specimens).

The artifact collection includes only 16 beads plus some fragments.

Olivella spire-lopped beads. (15+ specimens).

Twenty eight whole shell beads of Olivella biplicata were reportedly associated with burial 6, in pit 1W/2N at 44" below surface. Lots 29-150 and 29-151, credited to burial 6, contain 15 countable beads and numerous fragments. The few measurable beads are 6.0 to 7.0 mm in diameter; the lot may be considered Ala.

Rectangular Haliotis bead.

Multiperforated Haliotis bead. Type H2. (1 specimen). Plate 1U.

When a vertebra of burial 2 was removed from contact with a canid tooth associated with the burial, a piece of what appears to be Haliotis sp. shell was split open horizontally. From the halves, which adhere to tooth and vertebra, it can be seen that the piece was a rectangle about 12.0 by 9.0 mm with 2 perforations spaced evenly from edges and center. Rackerby's (1967: 41) description of a circular Haliotis bead with burial 2 must be incorrect. No other perforated or bead-size Haliotis artifact is in the collection, nor was

1 The unassociated specimens in D-13 must have been close to the contact with sterile clay below midden, since burial 35 in that pit at 67" below datum plane was reportedly "dug into submound clay" (R 1967: 67).

Table 3-8. Occurrences of shell beads at Ala-13, arranged by depth.

Burial	Pit	Depth*	Bead Types	Whole	Circ.	Oval	Rect.
-	E-19	6-12	A1c	x			
57	G-17	12	M1a				x
75	F-14	25	A1d, H1, untypable	x			x, x
51	I-17	25	A1b, D1	x		x	
-	E-19	26	A1c	x			
4	C/D-13	30	A1a	x			
13	E-13	33	A1c, F3a	x		x	
12	C-13	36	A1b	x			
-	E-13	36	A1c	x			
15	C-13	39	A1c	x			
8	F/G-13	44	A1a	a			
-	F-13	45	A1c	x			
22-23	G-13	55	F2a or F2b			x	
-	C-13	56	A1c	x			
-	D-13	58	A1c	x			
-	D-13	59	A1c	x			
-	J-17	60	A1c	x			
-	D-13	63	A1c	x			
93	H-12	66	untypable		x		
35	D-13	67	G3b		x		
54	E-13	68	G2b and G3b		x		
53	E-13	70	untypable			x	
94	H-12	71	G2 a and G2b		x		
96	I-12	71	untypable		x		
-	Tr. 12	?	F2b or F3a			x	
-	Tr. 12	?	A1c	x			

* Depths in inches presumed below datum plane; for burials, it is certain that depths refer to datum plane; for unassociated specimens, the reference point for depths is uncertain.

Note that deep burials 93, 35, 54, 53, 94, and 96 were all dug into submound. Other burials with which beads were found were not submound burials.

any mentioned in the catalog. Burial 2 was excavated from a submound grave in pit 0E/8N at 60" below surface.

Shell Ornaments -- Introduction

The assemblages from the 3 Alameda sites include about 150 cut shell artifacts usually described as ornaments. All specimens discussed in this section are Haliotis shell. For descriptive purposes, the ornaments have been divided into groups based on outline shape. Characteristics of each group are discussed below, in sections devoted to the ornament collection from each site. Descriptive information provided for individual specimens includes classification of each according to the Gifford (1947) typology.

The ornament typology of Beardsley (1954: 117-119; Figs. 7a, 7b) modified from LH&F (1939) is not used here because it provides less descriptive detail than does the Gifford typology. The concordance in Beardsley (1954: 118, 119) may be referred to. Correspondences between the general shape categories used here and Beardsley types are: tabular (MB, B or E), broad subrectangular (MB or B), circular (C), ring (RC), split disc (MC and MB), oval (C), pointed end (ME), miscellaneous (A, AP, B or MB, C, D, MC or MB). The shield form unique to Ala-328 has no corresponding type in either the Beardsley or Gifford typology. The written descriptions below and in the Gifford types shown in Tables 3-9 and 3-10 together provide sufficient detail for the interested reader to assign appropriate Beardsley types to particular specimens. Examples from each of the shape categories used in this paper are illustrated in Plate 2.

Shell Ornaments -- Ala-328

There are 71 specimens plus fragments in the collection. Evidence from burial records, catalog, student notes, and D&T (1959: Tables 2, 3, 4) documents the recovery of 16 additional specimens which are not in the collection. All but 5 of the total of 87 specimens plus fragments recovered were grave associations; ornaments were found with 27 different burials at Ala-328.

The Haliotis ornaments recovered at the site may be divided into 6 groups based on outline shape: tabular, circular, split disc, shield, ring, and miscellaneous. A general description of the specimens in each group is provided here. Mention is made of any unusual attributes which characterize particular specimens. Table 3-9 provides details regarding shape, Gifford type, measurements, species, and provenience of individual specimens. Documented occurrences of specimens now missing from the collection are noted in the descriptive text, but are not included in the table or in specimen

Table 3-9. Provenience and descriptive information, shell ornaments, Ala-328.

Cat. No.	Pit	Grid	D. ("bs)	Bur.	Gifford Type	Sp.	Max. Dimens. (cm)
Tabular							
1-335	A-1	I	32	14	U or Z2aIII or Q2aIV	u	3.1B x 1.3
1-336	"	"	"	"	S or Z2aIII	u	2.3B x 1.3
1-337	"	"	"	"	(S2aII)	r	2.0B x 1.0
1-338	"	"	"	"	S2aIII	u	2.8B? x 1.0
1-339	"	"	"	"	U or Z2aIII or Q2aIV	u	4.7 x 1.2
1-340	"	"	"	"	U or Z2aIII or Q2aIV	u	3.6B x 1.2
1-341	"	"	"	"	O1aIII or M1aII	u	2.2B x 1.8
1-489	"	"	"	"	fragments	c	fragments
1-877	/	/	17	/	K2aIII	u	3.5 x 2.1
1-1120	A-9	II	28	201	Z2aI	c	2.6 x 1.4
"	"	"	"	"	U, Z or Q2aI	c	3.0 x 1.5
"	"	"	"	"	U, Z or Q2aI	c	3.3 x 1.6
"	"	"	"	"	Z2aIII	u	3.3 x 1.3
1-1250	A-8	II	54	246	AA2aI	c	4.2 x 2.2
1-1561	A-3	II	12	272	K2aI	c	2.0B x 1.3
1-37461a	5-10E	5-10S	72	W1	Z2aIII	u	5.0B x 2.0
1-37497	60W	40S	/	W24	Z2aI*	c	3.5 c 1.3
1-37498	"	"	/	"	Z2aI*	c	2.2 x 1.0
1-37498	"	"	/	"	Z2aIII*	u	3.9 x 1.6
Circular							
1-489	A-1	I	32	14	fragment	c	B
1187?	B-9	II	72	222	K1aI	c	4.3 x 5.2
"	"	"	"	"	K2aI	c	4.3
1247	A-8	II	54	246	K2aI	c	3.7
1-1249	"	"	"	"	K2aI	c	2.7
1-1253	"	"	"	"	(K2aI)	c	B
1-1255	"	"	"	"	K2aII (Plate 2D)	r	4.3
1-1256	"	"	"	"	K2aI	c	3.3
1-1257	"	"	"	"	K2aI (Plate 2J)	c	3.7
1246? **	"	"	"	"	K1aI or K2aI**	c	**
3135**	B-6	II	93	376	K1aI or K2aI**	c	**
Split disc							
1-1248	A-8	II	54	246	AB2 (Plate 2K)	u	5.9 x 3.9
1-1252	"	"	"	"	(AB2)	c	B x 3.1
1-489	A-1	I	32	14	fragments	c, u	B

Table 3-9 (continued)

Cat. No.	Pit	Grid	D.	Bur.	Gifford Type		Sp.	Max. Dimens.	
Shield									
1-384	A-5, 6	I	112	42	-		c	3.5 x 2.6	
1-385	"	"	"	"	-		c	5.3 x 4.8	
1-496	A-5	I	116	50	-		c	8.5 x 8.7	
1-524	A-4, 5	I	100	92	- (Plate 2A)		c	6.2 x 5.8	
1-588	A-4	I	102	107	-		c	fragments	
1-591	A-4	I	102	108	-		c	B	
1-630	A-4	I	105-119		-		u	6.3 x 4.7	
1-635	A-4	I	106	120	-		r	6.7 x 6.8	
1-636	"	"	"	"	-		c	6.4 x 6.2	
2912	A-6	II	93	360	-		c	/	
2897	A-6	II	93	361	-		c	7.2 x 6.6	
1-1900	A-4	II	106	406	-		c	8.1 x 6.2	
1-1901	"	"	"	"	-		c	6.8 x 6.0	
1-2689	"	"	"	"	- (Plate 2E)		r	6.4 x 4.8	
1-2691	C, D-5	II	114	445	-		c	6.0 x 5.5	
1-2692	"	"	"	"	-		r	5.1 x 5.2	
1-2694	"	"	"	"	-		c	5.6B x 6.3	
/	/	/	/	/	-		c	B	
/	/	/	/	/	-		c	6.6 x B	
/	/	/	/	/	-		c	fragments	
/	/	/	/	/	-		c	7.9 x 7.3	
/	/	/	/	/	-		r	B x 5.4	
Ring						Est. # Spec.		Estimated Diam.	Width
1-321	A-5	I	100	54	J2aI	2-3	c	3-4cm	4-6mm
1-511	A-5, 6	I	112	42	J2aI	1	c	> 5cm	6mm
1-586	A-4	I	102	107	J2aI (Plate 2F)	1	c	2cm	4mm
1-587	"	"	"	"	J2aI "	1	c	4cm	5mm
1-2806	A-6	II	93	361	J2aI	1	c	1cm	2mm
1-2808	"	"	"	"	J2aI, IV	2	c, u	3cm	4mm
1-2811	"	"	"	"	J2aIV	<1	u	-	4mm
1-2812	"	"	"	"	"	<1	u	-	4mm
1-2813	"	"	"	"	J2aIII?, IV	1/2	r?, u	3.5cm	5mm
Miscellaneous								Max. Dimens.	
1-1873	G-5	II	60	-	Z1a, no perf.		u	5.8B x 1.6	
1-1251	A-8	I	54	246	-		u	4.9 x 2.2	
1-44	E-1	I	11	2	M2		u	11.0 x 7.0	

Table 3-9 (continued)

Cat. No.	Pit	Grid	D.	Bur.	Gifford Type	Sp.	Max. Dimens.
<u>Miscellaneous (continued)</u>							
1-842	A-4	I	45	-	AP2a	c	B
1-1874	E-6	II	42	389	-	c	fragments
1-2695	D-6	II	44	-	(AP1)	c	B
1-198	C-7	I	17	38	(AP1)	c	B
1-843	B-?	I	54	?	(AP1b)	u	B

u = <u>Haliotis sp.</u>, r = <u>H. rufescens</u>, c = <u>H. cracherodii</u>
B = broken.
() - probable type, inferred from broken specimen.
/ = missing information

* Gifford (1947: 25, 31, 36) shows 1 each of types U2aIII, Q2aI and Z2aIII from Ala-328. He probably refers to these 3 specimens, and evidently disagrees with my typing of 2 of the 3. The fourth ornament from the Wedel collection was omitted from Gifford's study, presumably because it is broken and incomplete.

** At Oakland Museum; catalog number not visible; not measurable; see text describing circular specimens.

Table 3-10. Provenience and descriptive information, shell ornaments, Ala-13.

Cat. No.	Pit	D (in)*	Bur.	Gifford Type**	Edge Orn.	Sp.	Max. Dimens.	Remarks
Tabular								
30-367	G-17	19	57	Z4 or AB5	no	c	4.3 x 2.0	R 1967: Fig. 3d; 2 perfs.
30-363	D-13	18	1	Z2bI or U2bI	i	r	5.0 x 2.1	R 1967: Fig. 3c; 1 long edge incised.
30-368	E-12	65	89	Z2aIII or S2aIII	no	u	3.0B x 1.6B?	With 2 other ornaments.
30-370	M-17	35	6	-	-	u	B	
30-352	E-12	65	87	U2aII or Q2aIII	no	r	5.1 x 1.8	
"	"	"	"	" " "	no	r	4.4 x 1.8	
"	"	"	"	U2bI or Q2bI	s	r	3.5 x 1.5	2 serrats.; Plate 2N.
"	"	"	"	U2aII or Q2aIII	no	r	3.3 x 1.3B	
"	"	"	"	U2aI or Q2aI	no	c	3.3 x 1.2	
"	"	"	"	" " "	no	c	3.8 x 2.0	Part of siphon hole on 1 edge.
"	"	"	"	" " "	no	c	3.3 x 1.5	
"	"	"	"	" " "	no	c	3.5 x 1.6	
"	"	"	"	" " "	no	c	2.9B x 1.7	
"	"	"	"	" " "	no	c	2.6B x 1.1	
"	"	"	"	Z2aII	no	r	4.4 x 1.6	R 1967: Fig. 3h.
"	"	"	"	Z2aI	no	c	4.1 x 1.3	½ perf. in upper edge.
"	"	"	"	Z2b_	i	c	2.2B? x 0.7	Long edges incised.
"	"	"	"	Z2aI	no	c	3.0 x 1.1	Plate 2M.
"	"	"	"	Z2aIII	no	u	3.6 x 1.0	
"	"	"	"	Z2aIII	no	u	3.1B x 1.0	
"	"	"	"	Z2aI or Z2b_	s?	c	3.0 x 1.3	½ perf. in upper edge; poss. 1 serrat. in lower edge.
30-352	E12	65	87	Z2aI	no	c	2.9 x 1.4	
"	"	"	"	"	no	c	3.5B x 1.4	
"	"	"	"	Z2aIII	no	u	2.4 x 1.1	
"	"	"	"	"	no	u	2.5 x 1.3	

(Table continued next page)

Table 3-10 (continued).

Cat. No.	Pit.	D (in)*	Bur.	Gifford Type**	Edge Orn.	Sp.	Max. Dimens. (cm)	Remarks
Tabular (continued)								
30-352	E-12	65	87	S2bII	s	u	3.6 B x 1.5	5 serrats. in rounded bottom.
"	"	"	"	Q2b_	s	c	3.0B x 1.5	2 serrats. in rounded bottom; perf. in narrow end.
30-378	C-13	57 bs	-	S2bII	i	u	4.3 x 1.3	Long edges V- or line-incised; poss. groove across face.
Broad subrectangular								
30-380	E-19	36 bs	-	S5aV	no	u	4.6 x 3.6	Central perf., 5 mm diam.; Plate 2C.
30-368	E-12	65	89	Q1aIV or AA2aIV	no	u	4.9 x 3.3	Edge perf., 3 mm diam., Plate 2B.
Circular								
30-353	H-11	71	99	K4bI	s	c	6.7	2 perfs.; serrated.
"	"	"	"	"	s	c	6.7	2 perfs.; serrated.
30-371	H-12	66	93	K	s	c	3.5 to 4.5	Frags. of 2 to 4.
30-381	H-18	17 bs	-	L1a	no	c	7.1	No perf.
Ring								
30-379	E-19	8 bs	-	J2b_	i	c	3.9 outer; 0.9 wide	R 1967: Fig. 3b; serrat. on both edges.
Split disc								
30-352	E-12	65	87	AB1b_	s	c	3.8B x 1.7	Split circle, end perf; Plate 2L.
"	"	"	"	"	s	c	3.2B x 1.3	Split circle, end perf.
"	"	"	"	"	s	c	3.8 x 1.7	" " " "

(Table continued next page)

Table 3-10 (continued).

Cat. No.	Pit	D (in)	Bur.	Gifford Type**	Edge Orn.	Sp.	Max. Dimens.	Remarks
Split disc (continued)								
30-352	E-12	65	87	AB1b	s	u	3.1B x 1.6B	Split circle, end perf.
"	"	"	"	"	s	u	3.6B x 1.5B	" " " "
"	"	"	"	AB	s	c	-	5 fragments
30-364	D-13	18 bs	-	AB2_	i or s	u	6.5 x 2.4B	Split subrect., str. edge perf.; other edges serrat. or incised.
30-362	C-13	24 bs	-	AB2b	i	r	4.0B x 2.7	Split circle, str. edge perf.; all edges incised.
30-361	D-13	18	1	AB3b_	i	u	5.7B x 2.3B	Split circle, curved edge perf.; str. edge incised.
30-366	D/E/F-13	18-24	1?	AB3bII	i	r	4.2B x 2.2	Split circle, curved edge perf.; str. edge incised.
30-373	G-17	12-24	57	AB2_ or Z_	i	u	5.2 x 1.4	Split oval, str. edge perf.; 2 long edges incised; R 1967: Fig. 3e.
Oval								
30-369	C-13	56	-	K2aI	no	c	5.5 x 4.4	Siphon holes present; Plate 2P.
30-352	E-12	65	87	K2aI	no	c	2.3 x 1.5	Egg-shaped.
"	"	"	"	"	no	c	3.2 x 2.2B	Plate 2, O.
"	"	"	"	K5aII	no	u	2.0B x 1.6	2 perfs.
Pointed end								
30-352	E-12	65	87	AF5aI	no	c	3.9 x 1.9	R 1967: Fig. 3g; symmetrical.
"	"	"	"	"	no	c	3.9 x 2.3	5 mm perf.; symmetrical; Plate 2I.
"	"	"	"	"	no	c	3.5 x 1.3	Symmetrical.

(Table continued next page)

Table 3-10 (continued).

Cat. No.	Pit	D (in)	Bur.	Gifford Type**	Edge Orn.	Sp.	Max. Dimens.	Remarks
Pointed end (continued)								
30-352	E-12	65	87	AF5aI	no	c	3.4 x 1.8B	Symmetrical.
"	"	"	"	"	no	c	3.1B x 1.5	"
"	"	"	"	AF5aIV	no	u	3.5B x 1.5	"
"	"	"	"	"	no	u	2.9 x 1.3	"
"	"	"	"	AF5aI or AE4_	no	c	4.0 x 1.3	Asymmetrical; 1 edge str., 1 convex.
"	"	"	"	" " "	no	c	3.3B x 1.2	Asymmetrical; 1 edge str., 1 convex.
"	"	"	"	" " "	no	c	2.7 x 1.3	Asymmetrical; 1 edge str., 1 convex.
"	"	"	"	" " "	no	c	3.5 x 1.6	Asymmetrical; 1 edge str., 1 convex.
"	"	"	"	AF5aII or AE4a	no	r	3.3 x 1.3	Asymmetrical; 1 edge str., 1 convex. Plate 2G.
"	"	"	"	AF5aI or AC3	no	c	2.5 x 1.6	Asymmetrical; 1 edge str., 1 irregular.
"	"	"	"	" " "	no	c	2.7B x 1.2	Asymmetrical; 1 edge str., 1 irregular.
"	"	"	"	" " "	no	c	3.8 x 1.9	Asymmetrical; 2 irregular convex sites; Plate 2H.
"	"	"	"	AF5aII or AC3	no	r	2.6B x 1.9	Asymmetrical; 2 irregular convex sides.
"	"	"	"	" " "	no	r	2.3 x 1.3	Asymmetrical; 2 irregular convex sides.
"	"	"	"	AF5aIV or AC3	no	u	2.9 x 1.6	Asymmetrical; 2 irregular convex sides.
Miscellaneous								
30-375	I-17	60 bs? -		AP1b	no	u	3.0 x 0.6 x 0.3	No perf.; rim segment.

(Table continued next page)

Table 3-10 (continued).

Cat. No.	Pit	D (in)	Bur.	Gifford Type**	Edge Orn.	Sp.	Max. Dimens.	Remarks
Miscellaneous (continued)								
30-354	K-17	56 bs?	-	APlb	no	u	5.1 x 1.0 x 0.4	R 1967: Fig. 3i; rim segment, no perf.
30-365	M-16	39 bs	-	-	no	c	4.8 x 1.6	No perf; unfinished?
30-355	E-19	27 bs	-	AA	no	u	7.0 x 4.4	No perf.
30-368	E-12	65	89	AE3a	no	r	3.5 x 2.6	Edge perf.
Fragments								
30-376	D-14	20-24	70-71	-	no	u	3.7B x 0.9B	End perf.; long, narrow.
30-366	D/E/F-13	18-24	1?	-	i	u	-	2 frags., no perf.
30-377	E-19	4 bs	-	-	i	u	-	No perf.
30-374	C-13	48 bs	-	-	no	u	-	Perf.
30-352	E-12	65	87	-	no	23c, 1r, 20u	-	Each frag. perforated.
"	"	"	"	-	no	27c, 2r, 22u	-	None perforated.

i = incised
s = serrated
c = H. cracherodii
r = H. rufescens
u = Haliotis sp.
B = broken

*Depths below datum plane unless specified bs (below surface).

**Underlined blank (__) indicates that no defined Gifford type exactly describes the specimen.

counts shown after each group heading.

Tabular ornaments (18+ specimens).

These specimens are elongate in form, with a suggestion of angularity, although really sharp corners are rare. Each item bears a single perforation at one narrow end. Most specimens are rounded variations of a basic quadrilateral form. Five appear more triangular, tapering to a very narrow edge opposite the perforated end, like the "dagger" specimens illustrated in Plate 46c of Schenck (1926). Tabular ornaments as described here include those in Davis' Type I (D&T 1959: 32).

Maximum lengths range from 2.6 to greater than 5.0 cm, and maximum widths, from 1.0 to 2.2 cm. Among specimens identifiable by species, 1 is H. rufescens and 7 are H. cracherodii; there are several fragments of H. cracherodii as well.

The ornaments were found in 7 occurrences. Five are well documented burial associations: single specimens with burials W1, 272, and 246, 4 with burial 201, and 7 ornaments plus several fragments with burial 14. Three specimens are attributed to burial W24, for which there is no burial record. The seventh occurrence, a single specimen, may have come from burial 38, but disagreement between catalog information and burial records prevents a definite conclusion that this was so.

Student notes regarding burial 384 contain tracings of 10 ornaments which are tabular in shape. One specimen is serrated on both long edges. Two ornaments appear "dagger"-shaped, perhaps with ends sufficiently pointed to fit a special pointed end type such as that defined from some Ala-13 specimens below. Measurements recorded for intact specimens place them within the range of other tabular specimens recovered at Ala-328. No species identification is offered. All of the ornaments bear a single perforation at one end.

Four ornaments recovered with burial 99 were lost. Davis (D&T 1959: 12) classifies them as Type I ornaments, so presumably they were tabular in shape. No tracings, measurements, or species identifications are available for them.

Circular ornaments (11 specimens).

These items share a generally circular shape, and are perforated near the edge or about midway between the edge and center. Maximum diameters range from 2.7 to 5.2 cm; perforations are commonly 5.0 mm in diameter. One specimen is H. rufescens, the others are H. cracherodii. The ornaments were found in 4 occurrences, each associated with a burial.

Seven specimens were recovered with burial 246, part of a group of 12 ornaments and fragments; the non-circular specimens include 2 split discs, a tabular ornament, a unique curved bar, and fragments of circular or oval ornaments. The only H. rufescens circular specimen (1-1249) is among those found with burial 246. It has an unusually large perforation, about 10 mm in diameter; there is no clear evidence to show whether or not the perforation was drilled. Two of the circular specimens found with burial 246 are shown in Plate 2D, J.

Catalog numbers on 2 specimens in a permanent display mount at the Oakland Museum cannot be seen. One is circular and centrally perforated; the other is slightly oval and perforated near one edge. One was probably associated with burial 246, one probably with burial 376. (Because another specimen loaned to the museum has been lost, identification of these items is uncertain.)

Among 12 ornament fragments associated with burial 14 were 2 which showed serrated edges in a circular outline, apparently fragments of 1 or more circular ornaments. These were presumably among those in Davis' Type IA (D&T 1959: 32).

Two specimens, 1 circular and 1 slightly oval, were found in an open box labeled with the catalog number pertaining to 6 ornaments reportedly associated with burial 222. No record of the shape of the ornaments exists, and there is no indication that any other specimens in the collection were found with burial 222. Because the specimens themselves are unlabeled, attribution to burial 222 must remain uncertain.

Split disc ornaments (2+ specimens).

These items are semicircular in shape, and convey the impression that they might have been manufactured by severing circular ornaments; hence the name, split disc. There were 2 occurrences of split discs, both burial associations. Two specimens found with burial 246 have plain edges all around, with a single perforation on each near the center of the straight edge. One specimen is H. cracherodii; the other is unidentifiable by species. The latter is shown in Plate 2K. Fragments of H. cracherodii found with burial 14 are serrated along curved edges; they may represent 2 or 3 split discs; none of the fragments is perforated. They were presumably among those in Davis' Type IA (D&T 1959: 32).

Shield ornaments (22 specimens).

Figure 2 in D&T (1959) and Plate 2A, E herein illustrate the form of these artifacts better than verbal description can. Side edges are invariably convex. The top edge, so defined because a single perforation lies adjacent to the midpoint of this edge on all intact specimens, is concave on all but the smallest specimen, where it is convex. The bottom edge is concave on all but 1 specimen, where it is straight. On 1 specimen, both concave edges are perforated; since 1 perforation is broken through the edge, it seems likely that the other perforation was added as a repair, rather than as a stylistic innovation. Each of the 3 unusual specimens just described co-occurred with one or more shields of modal form.

The "shield" form is found in smaller objects of stone recovered at sit Ala-307. In size and material, however, the Ala-328 shields are unique.

The smallest specimen measures 3.5 cm from top to bottom edge, and 2.6 cm in width. On other measurable specimens, lengths range from 5.1 to 8.5 cm, widths from 4.8 to 8.7 cm. Widths and lengths never differ by as much as 2 cm. Perforations are close to 5.0 mm in most cases.

Three shields are H. rufescens, one is unidentifiable by species, and the remainder are H. cracherodii. In at least 2 cases, shields of H. rufescens and H. cracherodii co-occur with the same burial; provenience information is missing for 1 H. rufescens specimen and 4 H. cracherodii specimens.

Shields were found only as grave goods, with burials in the basal cemetery. Olivella spire-lopped beads accompanied all burials with which shields were found. Seventeen specimens in the collection accompanied 11 burials. Four missing specimens documented as shields bring the total to 12 graves accompanied by these unique artifacts. Three shields apiece were found with burials 120, 406, and 445; 2 shields apiece with burials 42, 92, and 121; a single shield apiece with burials 50, 107, 108, 119, 360 and 361.

Haliotis ornaments of unspecified form credited to submound burials 378 and 379 were probably shields. One or more of them may now be among the 5 shields in the collection for which provenience information is lacking. This seems likely because rings and shields are the only cut Haliotis forms recovered elsewhere in the site at submound [1]. The burial record for 379 notes, "lower left corner missing," a remark more appropriate to the shield form than to rings. No certain conclusion can be drawn, however.

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[1] Burial 376, in the basal cemetery, may have been accompanied by a circular specimen, but this is uncertain. See third paragraph of section describing circular ornaments, above.

Ring ornaments (fragments of approximately 10 specimens).

These pieces are distinguished from circular ornaments by the size of the central opening, which is always at least 3 times larger in diameter than the width of the ring itself as measured from the outside to inside edge. Rings were evidently cut from the body of the shell, perhaps only in rough outline. Edges have been ground smooth, and some grinding of the epidermis is evident, although these items are relatively thick. Except for shields, most of the other ornament forms retain much less epidermis than do rings; some of the latter lack epidermis, but this is due to erosional peeling rather than deliberate grinding. No incising or serration of edges occurs on rings from Ala-328.

None of these fragile pieces is unbroken but some are sufficiently large to provide estimates of diameter size. Outside diameters ranged from about 1.0 greater than 5.0 cm, with most probably falling near 3.0 cm. Ring widths range from 0.2 to 0.6 cm, with mode near 0.4 cm. Most of the fragments are H. cracherodii; a few may be H. rufescens, but cannot be so identified with certainty; on some, the epidermis has peeled away to leave them identifiable.

There were 6 occurrences of rings, all recovered with graves in the submound cemetery area. Olivella spire-lopped beads co-occurred with rings as grave goods in every instance. Rings were found in the cervical region of 3 burials, and in the pelvic region of 1; position was unrecorded for 2 occurrences. The 2 rings recovered with burials 92 and 406 are missing from the collection, but their occurrence is well documented. Tracings of the fragments found with burial 406 indicate a diameter near 2 cm. Only 1 fragment remains of the rings found with burial 42, the largest one in the collection, suggesting an original outer diameter greater than 5 cm. An unlabeled box of fragments of 2 or 3 rings of large diameter may pertain to either burial 42 or 92. The fragments found with burial 361 belong to 1 small ring, about 1 cm in diameter, and 3 or 4 rings of diameters of 3 cm or greater. Burial 107 was accompanied by 1 ring near 2 cm in diameter, and 1 near 3.5 cm in diameter (see Plate 2F). The 20 fragments found with burial 54 probably made up 2 or 3 rings of large diameter, near 4 cm, although it is difficult to estimate size from such small fragments.

Miscellaneous ornaments (8 specimens).

The form of each specimen is described here. Catalog numbers are included to permit easy location of particular specimens on Table 3-9.
1-44. One specimen, illustrated in Figure 3d of D&T (1959), is lemon-shaped in outline, with two projecting spurs at each end and a small perforation in the middle of one side near the edge. The specimen is very thin and fragile,

lacking any epidermis, and hence unidentifiable by species. It was recovered with burial 2. It is the sole example of Davis' Type II (D&T 1959: 32).

1-1873. This piece is tabular in form but differs from the other tabular ornaments in its greater length and absence of a perforation, although breakage at one end prevents certainty that a perforation was not present on the unbroken item. The epidermis is completely ground away, preventing species identification. The specimen has a single deep groove across its width about one third of the distance from the intact end to the broken end. It was not a grave good.

1-1251. A unique specimen is shaped as if it had been cut from a thick ring of Haliotis sp. It represents about one third of a full circumference, and is perforated at one end. It is one of numerous ornaments recovered with burial 246.

1-842. One specimen is a "crescent" in Gifford's terminology, a narrow curved piece cut from the rim of a H. cracherodii shell, with a drilled hollow at one end, presumably an incipient perforation. It was not a grave good.

1-2695, 1-198, 1-843. Three narrow rim fragments were recovered, each broken at both ends but ground smooth along the edges and with evidence of grinding on the epidermis. One rim fragment, of H. cracherodii, was found with burial 38. The 2 others, one H. cracherodii and one Haliotis sp., were not grave associations.

1-1874. Only H. cracherodii fragments remain of an ornament recovered with burial 389. Evidently 2 such artifacts were found, but 1 is missing from the collection. The items are described as "discs" in the burial record, and were found lying on either side of the skull. None of the fragments are perforated; they appear to have come from a small whole shell, which was cut along the edges, in one area bisecting the siphonal openings. A photographic slide of burial 389 shows one "disc", a round or slightly oval piece about the size of a human palm, lying concave side up in the area of the right shoulder, adjacent to the articulated mandible.

Discussion.

Most of the ornaments identifiable by species are H. cracherodii (46 specimens plus fragments). The sample of ornaments of H. rufescens is too small (6 specimens plus 1 identified as possibly H. rufescens) to permit inference of any changing preference for that species over time, although it may be noted that only 2 H. rufescens specimens were recovered above submound depths.

Rings and shields were the only ornament types found at the base of the mound, with the possible exception of an uncertainly identified association of burial 376 discussed in the section devoted to circular specimens. A possible hiatus in the use of ornaments as grave goods is suggested by the absence of specimens from depths between 72 inches below surface and the 88 to 116 inch depths of the interments in the basal cemetery. The fact that new forms mark the reappearance of ornaments at 72 inches and above supports the notion of a cultural break of some kind between the component represented by the basal cemetery and later components. The extent and nature of this break remains to be explored in the evidence regarding distribution of other artifact types.

Shell Ornaments -- Ala-13

There are 78 specimens plus fragments in the collection. All but 15 of the specimens plus fragments recovered were grave associations; ornaments were found with 9 different burials at Ala-13.

The Haliotis ornaments recovered at the site may be divided into 9 groups based on general outline shape: tabular, broad subrectangular, circular, ring, split disc, oval, pointed end, miscellaneous, and fragments. A general description of the specimens in each group is provided here. Mention is made of any unusual attributes which characterize particular specimens. Table 3-10 provides details regarding shape, Gifford types, measurements, species, and provenience of individual specimens.

Tabular ornaments (28 specimens).

Like tabular pieces from Ala-328, these are elongate and subrectangular in form, some with a suggestion of angularity, but no really sharp corners. Slight rounding of sides, especially the narrow ends of specimens, occurs generally. On 10 specimens, the long sides converge from a greater width at the perforated end to a relatively narrow end opposite; difference in width at the 2 ends ranges from 4 to 8 mm. These are like the specimens at Ala-328 compared above to Schenk's "dagger"-like specimens from Emeryville (1926: Plate 46c). All of the "dagger"-like specimens at Ala-13 were among the ornaments accompanying burial 87.

All but 1 of the tabular specimens bear a single perforation at 1 narrow end. The exception, 1 of the wider specimens, has 2 perforations at its narrowest end. Perforation diameters range from 2.0 to 5.0 mm, with most falling around 3 mm. Lengths range from 2.4 to 5.1 cm; maximum widths from 1.7 to 2.1 cm. Parallel-line edge incising occurs on the long edges of 2 specimens. A third specimen may have been incised with open V's or parallel lines on the long edges; its present condition prevents certain identification of the form of edge ornamentation. It possibly was grooved across one face, as well, but laboratory repair work makes this difficult to ascertain. Three specimens show a few serrations along 1 narrow edge, and a fourth may have a single serration along 1 narrow edge.

Fourteen tabular specimens were identifiable as H. cracherodii and 6 as H. rufescens; the remainder lacked sufficient epidermis to be identified.

All but 1 of the tabular ornaments were recovered as grave goods, 1 each with burials 1, 6, 57, and 89, and 23 with burial 87; 2 of the latter are shown in Plate 2M, N. Burials 87 and 89 were accompanied by Haliotis ornaments of other shapes in addition to the tabular specimens.

Broad subrectangular ornaments (2 specimens).

These artifacts are notably wider than the tabular ornaments, but share their subrectangular outline. One specimen (Plate 1B), singly perforated near its short straight end, tapers slightly outward along straight sides to a rounded bottom. The other specimen (Plate 1C) is centrally perforated; all 4 sides are slightly convex. Neither of the broad subrectangular specimens is identifiable by species.

The end-perforated specimen accompanied 2 other Haliotis ornaments found with burial 89. The centrally perforated specimen was found unassociated.

Circular ornaments (5 to 7 specimens).

There were 3 occurrences of ornaments with a circular outline, disregarding the ring ornament described in the next section. All are H. cracherodii.

Two ornaments lay on the left innominate of burial 99. Evidently paired, they are uniform in size. Both are doubly perforated, at center and near the edge. Both are serrated around the circumference. Rackerby figures one (R 1967: Fig. 3A).

A group of fragments recovered with burial 93 are the remains of 2 to 4 smaller circular ornaments, also with edge serration. Three pieces are broken across a perforation near the edge. It is impossible to determine if there were 1 or more perforations on the original ornaments. All of the fragments are H. cracherodii.

A roughly circular disc of H. cracherodii with neither perforation nor edge ornamentation was found unassociated in midden. It is probably similar to the unperforated disc, now in fragments, recovered at Ala-328, although the siphonal openings do not appear on this specimen.

Ring ornament (1 specimen).

One H. cracherodii ring, a circular ornament with a large cut center opening, was recovered unassociated at shallow depth. The specimen is incised with parallel straight lines on both inner and outer edges on the nacrous side. This ornamentation differentiates it from rings recovered at Ala-328, as does a slightly greater width.

Split disc ornament (10+ specimens.

On all of these specimens, there is 1 straight edge so situated as to suggest that it was the center line of a larger piece which was bisected in the process of manufacture of the ornament. All but 2 specimens have the outline shape of a half or lesser portion of a circle. The exceptions appear to be halves of elongated subrectangular and oval forms.

All of the specimens are ornamented on 1 or more edges. Five are serrated on the curved edge; 1 of these is shown in Plate 2L. In 1 case, erosion makes it unclear whether the ornamentation was serration or incising. The remainder of the specimens show parallel-line incising.

The split discs are all singly perforated. Placement varies from end to middle of straight edge to middle of curved edge.

Two specimens are H. rufescens, 3 and 5 fragments are H. cracherodii, and 5 were unidentifiable by species.

A single split disc was recovered with burial 1 and 1 with burial 57. Five whole specimens and 5 fragments were among the many Haliotis forms found with burial 87. Three of the split disc ornaments were not evident grave goods, although 1 of them may have been associated with burial 1 before power equipment disturbed that grave.

Oval ornaments (4 specimens).

These four items share a more oval than circular outline and edge perforations. They were found in 2 lots.

An unusual specimen, shown in Plate 2P, was made from an immature H. cracherodii shell which was trimmed just below the rim all the way around.

This gives a heart shaped outline with a row of siphonal openings along 1 edge, the 2 most distal still intact. A perforation was drilled below the curved indentation adjacent to the severed spire portion of the shell, almost directly opposite the most distal siphonal opening. The piece was recovered as part of feature 2.

There were 3 oval specimens among those associated with burial 87. Two, of H. cracherodii, are singly perforated; 1 is egg-shaped in outline and 1, shown in Plate 2, 0, is subrectangular. The third has 2 perforations, at opposite ends of the specimen; it cannot be identified by species.

Pointed end ornaments (18 specimens).

These items were all among the Haliotis ornaments associated with burial 87. All taper to a pointed end opposite the perforated edge. The convergence is sharper than that on the "dagger"-like specimens typed as tabular forms.

Seven specimens with pointed ends are symmetrical about the long axis, with convex sides (see Plate 2I). Five others are asymmetrical, with 1 straight edge and 1 convex edge (see Plate 2G); they have some affinity with the split disc type. On the remaining specimens, one or both sides are irregular in outline (see Plate 2H).

Among the 18 pointed end ornaments, 12 are H. cracherodii, 3 are H. rufescens, and 3 are not identifiable.

Miscellaneous ornaments (5 specimens).

The form of each specimen is described here; catalog numbers are used to permit easy location of particular specimens on Table 3-10.
30-375. This is a small, narrow segment cut from the rim portion of the shell. It tapers along its length, and in outline is reminiscent of a bird talon. It lacks a perforation. All cut surfaces are smooth to the touch, as if they had been finished by grinding.
30-354. This is also a rim segment, larger than 30-375 and symmetrical along its length. It is a narrow curved bar in outline (R 1967: Fig. 3i). The cut ends and outer edge show grinding or polishing marks, but some irregularities remain along the outer edge. The specimen is not perforated.
30-365. This is a piece cut along the outer edge of the shell where there is no rim present. It is biconvex in outline, with a break near 1 narrow end and some possible traces of incising (or natural boring) at the other end. The epidermis shows grinding. The item perhaps represents a manufacturing discard.

30-355. This specimen is almost rectilinear on 3 sides and corners, with 1 long side convex in outline. It is not perforated, nor does it show any edge ornamentation. A black substance adheres to portions of the exterior surface (from which all epidermis has been ground away), and also lies in a half ring along the long straight edge on the interior surface. This suggests that the item may have been overlaid, or perhaps served as an overlay itself. Unfortunately, there are no recorded comments concerning the circumstances of its recovery which might explain the presence of the adhesive.
30-368. This specimen shares some attributes of the split disc and broad subrectangular types. It shares the outline shape and relative width of the latter, and has one straight edge and the suggestive asymmetry of the former. The fact that its basal edge also is relatively straight, in contrast to the rounded perforated end and 1 rounded long side, gives the specimen the appearance of a "quarter-disc", split first one way and then perpendicularly again.

Fragments (5 occurrences).

These are specimens which are too eroded or broken to permit determination of their original form. Where fragments can be matched to classifiable specimens, such as several nacrous layers which had peeled from specimen 30-355, they are not treated as a separate occurrence, and are not counted here.

Table 3-10 provides provenience data and some descriptive information for the fragments.

Ornament cluster.

A cluster of *Haliotis* pendants (all catalogued as 30-353) was found in pelvic region of burial 87. Rackerby (1967: 13, 15) refers to 70 typed specimens (54 lanceolate, 12 rectangular, 4 round) and 93 fragments. I found 54 typable specimens in the collection (23 tubular, 18 pointed end, 3 oval, 5 split disc and 5 split disc fragments) and 90 untypable fragments. Records show that 7 to 9 "diamond-shaped" specimens were loaned to the Oakland Museum; they are lost.

Rackerby's analysis proposed that the cluster is divided about evenly between specimens of *H. cracherodii* and *H. rufescens,* that all specimens of *H. rufescens* are larger than specimens of *H. cracherodii,* and that the specimens were originally arranged in pairs, with 1 ornament of each species in a pair, *H. cracherodii* overlaid on *H. rufescens.* He suggests that the ornaments were attached to the edge of a basket.

My analysis shows a great predominance of H. cracherodii specimens (30 vs. 8 H. rufescens and 11 unidentifiable among whole ornaments, 55 vs. 3 H. rufescens and 42 unidentifiable among fragments).[1] Four H. rufescens specimens are longer than H. cracherodii specimens, but 4 fall within the range of the H. cracherodii specimens. Furthermore, all of the specimens are larger in size than those commonly used ethnographically in California for basketry overlay. Attachment to a garment seems more likely. It should be noted that 10 ornaments of similar shape and size were recovered with a burial at Ala-328.

Discussion.

Most of the ornaments identifiable by species are H. cracherodii (39 specimens among whole ornaments, compared to 12 of H. rufescens). The contrast is diminished if specimens from the cluster accompanying burial 87 are withdrawn from the comparison, leaving 9 ornaments of H. cracherodii, 4 of H. rufescens, and 10 of Haliotis sp. Ornaments of both species were recovered from submound to near surface depths.

Among the 9 graves in which ornaments were found, 4 were dug into submound clay and 5 were above submound. There is a 30 inch gap in depths below datum plane between the shallowest submound burial and the deepest midden burial with ornament accompaniment. It seems unwise to suggest a cultural interpretation for the depth gap because the sample size is small and information is lacking which would permit accurate translation of depth below datum plane into elevation above submound. No stylistic contrast is evident, across the gap or otherwise. The one ring ornament recovered lay at a shallow depth, the ovals and pointed end ornaments were at or near submound depths, but other forms occurred at all depths.

Shell Ornaments -- Ala-12

There were only 2 occurrences of cut Haliotis artifacts interpretable as ornaments at Ala-12.

A thick piece of H. rufescens (29-195) appears to have been ground smooth along 2 edges and on portions of the epidermis; it is not perforated.

[1] Clearly, Rackerby and I disagree in our species identifications. E.g., on his Fig. 3, specimens d, e, and i are identified as H. rufescens. After examining those specimens, I concluded that they are H. cracherodii, Haliotis sp. and Haliotis sp., respectively. Hence the disparity in analyses of the cluster cannot be attributed solely to the likelihood that 16 specimens are missing.

The specimen, found unassociated in pit 1E/7N at 46 inches below surface, measures 6.0 by 4.2 cm, and may or may not be a complete artifact in its present state.

Beneath the skull of burial 12, in pit 2.5E/11N at 40 inches below surface, were 1 or more artifacts (15255) of H. cracherodii which fragmented upon exposure. Among the fragments can be seen a straight edge which was ground smooth; portions of ground epidermis are also visible. There are enough fragments to have made up an ornament like the shield forms found at Ala-328, but no perforation or curved edge suggestive of that shape is evident. In its present state, the artifact(s) can be described as a disc of uncertain shape, akin to those recovered at Ala-309 by Schenck (1926: 235), and to one of the miscellaneous specimens from Ala-328 described above.

Other Shell Artifacts -- Ala-328

Possible shell scraper.

Davis (D&T 1959: 57) describes a modified sea mussel valve (491) which may have been used as a scraper. The specimen is not presently in the collection. It was found as a grave good with burial 54.

Possible shell pendants (2 specimens).

A single oyster valve (1-2693) and a freshwater mussel valve (1-779), each with a punched perforation, are possibly human artifacts. The former came from 118 inches below surface in pit B-4 II, and the latter was recovered with burial 139.

Unmodified whole Haliotis shells.

Burials 14 and 66-13 were reportedly accompanied by unbroken, unmodified Haliotis shells. Neither specimen was catalogued. The burial record specifies H. cracherodii for the shell found with burial 66-13. No other mention of whole Haliotis shell is made in site records.

Shell concentrations in graves.

Concentrations of shell were noted in 4 graves, Cerithidea in 2 instances (with burials 9 and 54), Ostrea in 1 (burial 445), and a mixture of

Cerithidea, *Ostrea*, *Mytilus*, and *Macoma* in 1 (burial 316). These were inferred to be deliberate burial accompaniments. Shell from 2 of these occurrences was collected and saved, although in 1 case it was discarded after weighing. The other occurrences were reported in burial records. Since the quality of burial records varies greatly, it would be unsafe to assume that shell concentrations were observed in only 4 of the graves excavated.

Other Shell Artifacts -- Ala-13

Serrate shell (1 specimen).

A fragment of mussel shell (30-48; probably *Mytilus edulis*) with 2 angular serrations like those on serrate bone artifacts was recovered in association with burial 51.

Possible shell pendant (1 specimen).

One valve of *Macoma nasuta* (30-356) bears an irregular perforation 3 to 4 mm in diameter at the narrow end. It is not clear whether the perforation was created by human agency; the shell shows no other signs of possible modification. It was recovered in association with burial 59.

Unmodified whole Haliotis shells (4 specimens).

Two *H. rufescens* shells were recovered unassociated, 1 from Trench 12 at unspecified depth and 1 from pit E-19 at 57 inches depth (presumably below surface). The former measures 10.5 by 8.0 cm; the latter is broken across the long dimension, and measures 7.6 cm in width. Two shells of *H. cracherodii* were recovered as grave goods, with infant burials 10 and 40. Rackerby (1967: 15) states that the siphon holes on both were plugged with asphaltum; no trace of asphaltum remains in the holes now. The specimen found with burial 10 measures 12.9 by 10.9 cm; about half of the epidermis is broken away. The other shell is broken across the long dimension, and measures 8.9 cm in width; it, too, lacks some epidermis.

Bone Tubes -- Ala-328

Tubes were the bone artifact type most frequently found in graves at Ala-328. They were in definite association with 25 different burials. Of a total inventory of 254 tubes and fragments presently in the collection, 150 were definite grave accompaniments. An additional 6 specimens missing from the collection are well documented as burial associations, and the occurrence of a seventh found unassociated is well documented. These bring the totals to 261 specimens recovered, of which 156 were grave goods. Documentation of 2 occurrences of paired tubes and 2 occurrences of beads, all reportedly burial associations, is insufficient to include them in totals, although their reported occurrence is discussed in the text below.

Like the shell artifacts and ocher which were even more frequent grave associations, these artifacts are usually considered to be primarily ornamental rather than directly utilitarian in function (see, for example, most tables in LH&F 1939; a recent specific statement may be found in Gerow 1974: 31). That interpretation applies to a majority of these specimens, although a few of the larger items were probably used as containers, sucking tubes, or gaming dice, rather than for ornament. An indirect social or economic function as currency or wealth or status symbols, analogous to that suggested by Chester King (1974) for shell beads, might be ascribed to these ornamental artifacts. However, most of them were not tools. Like other items which head the list of frequent grave associations, bone tubes were presumably not utilitarian necessities.

For purposes of description, the specimens have been placed in categories of undecorated bird bone tubes, decorated bird bone tubes, mammal bone tubes, and drilled uncut bone. Among undecorated tubes an arbitrary size division at 5 cm separates "tubes" from "beads".

<u>Undecorated bird bone tubes and beads</u> (202+ specimens). Plate 3G, P, Q, R, S.

Many of the longer classifiable specimens are broken across one end. "Fragment" is used here to designate specimens which are broken at both ends or are split lengthwise. There are 39+ fragments in the collection; the "+" encompasses very small pieces. Some fragments and broken specimens are probably pieces of whistles. They are grouped with tubes because they lack evidence of a transverse perforation.

Unbroken specimens range from 1.0 to 12.5 cm in length. Three broken tubes measuring 14.5, 16.0 and 21.0 cm are longer than any complete specimen. Most specimens fall below 5 cm in length; they are designated "beads" hereafter (see Plate 3Q, R, S). There are 179 beads in the collection, and 23 tubes. Among the 39+ bead and tube fragments recovered, 28 measure over 5.0 cm in length in their present broken condition. Average diameter of beads ranges from 0.3 to 1.1 cm (mode 0.7 cm). The range is 0.5 to 1.6 cm (mode 0.7 cm) for tubes. Twenty siz beads are shimmed (Gifford's type EE1e);

see Plate 3S. Evenly cut edges are found less frequently than edges apparently created by scoring and snapping, especially among beads. The severed ends of most specimens were not smoothed by manufacture or use, although some well-finished beads and tubes were found. Most specimens showed some surface polish, although relatively few are highly lustrous. Shallow longitudinal striations are visible on many specimens. Scratches in the area of papillae (the nodes for feather attachment) are frequent, and most evident on many tube-length specimens, although they occur on beads as well.

In only one instance was a large number of specimens found together. This was a burial association of 101 beads (81 plain beads between 1.0 and 3.0 cm in length, plus 20 shimmed beads 2.0 to 4.0 cm in length) and numerous split fragments (the "+" in the total of 39+ fragments).

The following burials were accompanied by beads (multiple specimens shown in parentheses): 68(8), 90(5), 161 (81 + 20 chimmed), 215, 290, 350, 373-373a-373b(2), 398. A single bead was reported to be in "questionable association" with burial W18. Bird bone beads are reported in the burial records for burials 369 (no count) and 425(20), but no catalogued beads are attributed to the burials. Undecorated bird bone tubes were found with the following burials: 37, 55, 219, 246, 353(2), 443(2). Bird bone bead or tube fragments accompanied the following burials: 42(3), 58, 120, 130, 142(2), 161, 244(2), 246, 353(3+), 261, 433-434. Since burials 42, 130, 142, 246, 353 and 361 were also accompanied by broken whistles, it is likely that some of the tube fragments recovered with these burials are pieces of whistles.

Table 3-11 gives provenience for all undecorated bird bone tubes and beads, and Table 3-12 summarizes their occurrence by depth.

Decorated bird bone tubes (3 specimens).

The few decorated bird bone tubes from Ala-328 were described by Davis (D&T 1959: 33) as an incised tube possibly associated with burial W4 (1-37454), and 2 sets of paired tubes with shell bead overlay accompanying burials 54 and 58. The beads from those burials are discussed with cut shell beads above. Other than Davis' text and tables, there is no record of tubes associated with burial 54. The tubes found with burial 58 do exist, but are now in fragments (1-520, 1-521; see Plate 1F). The incised tube is present among the artifacts deposited at Berkeley by Wedel; its design is described by Davis (D&T 1959: 33). Davis' Table 14 indicated that paired bone tubes with shell overlay accompanied burials 80 and 119. The record for burial 80 refers to "heavy bird femora" overlaid with shell disk beads, but grave goods from burial 80 were lost before cataloguing. Neither the catalog nor burial record refers to bone tubes accompanying burial 119.

Table 3-11. Provenience of undecorated bird and mammal bone tubes, Ala-328.

Depths in inches below surface.
m = mammal bone tube or bead.
b = bird bone bead
t = bird bone tube
f = bead-length fragment

(#) = multiple specimens, count(depth).
* = grave association.
*? = possible grave association.
+ = present, no specimen count.
f-t = tube-length fragment.

Wedel Excavations

0-5S	10-15E	b: 20
10-15S	0-5E	b: 33
0-5S	0-5E	b: 39
5-10S	0-5E	f-t: 74
10-15S	0-5E	t: 74
0-5E	40-50W	b: 38*?

Hayward Excavations

A-66	b: surface
B-66	t: 0-12
C-66	t: 10
J-68	b: 20, 37
K-68	b: 18

SFSU Grid I

A-4	m: 108*
	f-t: 106*
A-5	m: 2(79*)
	t: 100*
	f: 79*
A-6	b: 100
	f-t: 3(116*)
A-8	b: 30, 68, 68
	t: 54*
	f-t: 45*, 54*
	f: 45*
A-9	t: 84*
B-1	b: 111
	t: 110
B-2	f-t: 2(60*)
B-3	b: 101(84*), 84
	f: +(84*)
B-6	b: 90, 120
	t: 120
B-7	b: 43, 50
	f-t: 65
C-1	b: 67
C-5	b: 72
	f-t: 12*
C-7	b: 8(54*), 5(60*)
D-5	m: 85
E-7	t: 30*

SFSU Grid II

A-6	f-t: 93*
A-9	t: 84
B-4	t: 36
B-5	b: 46, 60, 60, 66
	t: 36
B-7	t: 48
B-8	t: 55
	f: 44
B-10	f: 22
C-5	b: 46, 60-68, 60-72 64, 64, 72-84
	f-t: 56*, 98
C-6	b: 13, 30, 48*, 53, 60
C-7	b: 78
	f-t: 48
D-5	t: 2(77*)
D-6	b: 2(24*), 37
D-7	b: 65*
	f-t: 90
D-8	b: 12*, 3(72)
	t: 42
	f-t: 36
E-5	f-t: 22
E-9	b: 80
E-10	f-t: 36
	f: 36
F-6	t: 2(57*)
	f-t: 2(57*)
	f: 57*
F-7	b: 64
	f-t: 60
F-9	t: 0-60
G-4	b: 42*, 46
G-5	b: 24
	t: 24
	f: 43
G-6	f-t: 13
G-7	f: 48
I-7	f-t: 14
J-6	b: 33, 33
J-7	b: 28, 60

Only specimens present in collection included.

17 specimens omitted because of missing depth or location.

Table 3-12. *Summary of occurrence of undecorated bone tubes by depth, Ala-328.*

Depth (inches below surface)	Beads		Tubes		Tube-length fragments		Bead-length fragments		Grand Total	Total Bur. Assoc.
	Total	Bur. Assoc.	Total	Bur. Assoc.	Total	Bur. Assoc.	Total	Bur. Assoc.		
0-12	1	(1)	0	(0)	1	(1)	0	(0)	2	(2)
13-24	4	(2)	1	(0)	3	(0)	1	(0)	9	(2)
25-36	5	(0)	3	(1)	2	(0)	1	(0)	11	(1)
37-48	7	(2)	2	(0)	2	(1)	4	(1)	15	(4)
49-60	19	(13)	4	(3)	7	(6)	2	(1)	32	(23)
61-72	14	(1)	0	(0)	1	(0)	0	(0)	15	(1)
73-84	105	(101)	4	(3)	0	(0)	1+	(1+)	110+	(105+)
85-96	1	(0)	0	(0)	2	(1)	0	(0)	3	(1)
97-108	1	(0)	1	(1)	2	(1)	0	(0)	7	(3)
	159	(120)	17	(8)	23	(13)	9+	(3+)	208+	(144+)
omitted	18	(poss. 1)	8	(0)	4	(0)	3	(0)	33	(poss. 1)

Omitted specimens: all from Hayward and Wedel excavations; also 21 SFSU specimens with imprecise provenience information.

Mammal bone tubes (5 specimens).

Two matched tubes (1-345, 1-346) of large diameter (3.2 to 4.0 cm) and short length (5.5 cm) were recovered with burial 58, 1 lying on each side of the skull. The specimens are described and illustrated by Davis (D&T 1959: Pl. 2Ba, c), where they are identified as elk tibia bone.

A specimen (1-754) associated with burial 126 is 2.7 cm long, with cut and polished ends. Diameter is 1.5 cm at the narrow end, 2.3 cm at the broad end. Inner tissue remains along the walls of the tube. The relatively great and variable diameter over such short length reflects the selection of bone near a joint end rather than midshaft for this specimen. This unusual feature suggests that the tube had a different use from other short bone tubes.

Two cut mammal bone tubes were found without association. One (1-668) is 2.7 cm in length and 1.0 cm in average diameter. The other (1-475) is 6.5 cm long and was probably about 1.5 cm in average diameter; splitting permits measurement only near one end, where diameter is 1.6 cm.

A few of the tubes and beads grouped with undecorated bird bone tubes may be mammal bone. The collection was not examined by a specialist. Because papillae are evident on most tubes considered to be bird bone, it is unlikely that a serious error of omission in the count of mammal bone tubes was made.

Provenience information for mammal bone tubes is included in Table 3-11.

Drilled uncut bone (5 specimens).

Three Canis sp. tibiae in the collection and a fourth described by Davis have been drilled longitudinally through a joint end and through the epiphysis on into the shaft. One specimen (1-37451), broken across the distal shaft, with a perforation 1.0 by 1.1 cm entering the proximal head and a minimum shaft diameter of 1.1 cm, was recovered from Wedel pit 30-40S, 0-5E, at 48 inches below surface. For the other 2 specimens, a left-right pair with initial drilled perforations of 0.5 cm diameter at the proximal heads, provenience information is lacking. Davis (D&T 1959: 60) reported a specimen 17 cm long, with a drilled perforation 1 cm in diameter at the distal epiphysis. It was recovered at 85 inches depth from an unspecified location.

Four bird bones were reportedly treated in a manner similar to the canid tibiae. Davis (D&T 1959: 23) described 4 California condor femora which were longitudinally drilled at ends and through the epiphysis. The sole unbroken specimen remaining when he studied the artifacts was 13.0 cm in length with a midpoint diameter of 1.8 cm and drilled perforations 6 mm in diameter at each end. The specimens, catalogued as lot 1-499 (which I was unable to locate), accompanied burial 42. Davis speculates that they might have been strung or used as sucking tubes.

A single rodent left femur (1-1057), unidentified as to species, has a perforation 6 mm in diameter drilled transversely through the joint end below the medial tuberosity (see Plate 3M). It was associated with burial 188. A right femur, evidently of the same species and drilled in the same way, was found unassociated in the upper 60 inches of pit C-9 II.

Discussion.

There is no evident clustering in distribution for undecorated bird bone tubes or beads or fragments. Tubes were recovered from sterile soil as grave goods and just above it as unassociated artifacts. Beads were not recovered below the mound base, but lay just above sterile soil in several parts of the excavation. Although tubes were not recovered above 30 inches below surface, tube-length fragments were recovered from depths as shallow as 12 inches, equal to the shallowest depths from which beads were recovered. Beads and tube-length fragments were each found both as grave goods and unassociated at these shallow depths.

The many beads recovered with burial 161 were found in the neck area in positions suggesting that they had been worn strung as a necklace. Since these comprised one lot which included a majority of all beads recovered at the site, relatively infrequent use of beads in this manner is indicated, at least in mortuary context. In this connection, it is interesting that 2 of 5 burials accompanied by perforated canid teeth had bone beads among their grave goods; possibly teeth and bone beads were strung together in these cases.

Although the sample of decorated bone tubes is small, even including poorly documented reported occurrences, it is notable that all examples with bead overlay were reported or recovered from depths within 2 feet of sterile base or deeper. Mammal bone tubes, also few in number, share this depth distribution.

Continuing use of bird bone tubes throughout much of the site occupation, as suggested by their occurrence at all depths, receives support from the fact that bone beads and tubes co-occur as grave goods with all shell bead types except saddles (if the decorative overlays are counted as co-occurrences). The paucity of saddle occurrences is a sufficient explanation for the absence of co-occurrences there.

Bone Tubes -- Ala-13

Compared to the sample from Ala-328, very few bone tubes were recovered at Ala-13. Only 1 burial was accompanied by tubes. All specimens from Ala-13 are undecorated bird bone tubes.

Undecorated bird bone tubes (3 specimens).

A well made tube, probably a humerus, was found unassociated in pit F-17 at 21 inches depth. It is 11.9 cm long, with an average diameter of 2.0 cm. It is illustrated in Rackerby (1967: Fig. 6c).

One ulna tube and a tube-length fragment accompanied burial 72 in pits D, E-14 at 81 inches below datum plane. Rackerby classified both specimens as whistles (1967: 22), but they lack evidence of a medial hole. The intact tube is 21.0 cm long, with an average diameter of 0.9 cm.

Ten tube segments, each with an intact cut end, came from a drawer filled with uncatalogued bird bone recovered from feature 14, according to labels on the drawer and on some specimen boxes therein. They are presumably the 10 cut bone tubes referred to in Rackerby's description (1967: 10) of the feature, which lay in pit G-12 at 67 inches below datum plane. Five are proximal ulnae, 2 right and 3 left. All are broken within a few centimeters of the end, and it is likely that at least some of the proximal and distal segments were originally parts of the same whole tubes.

Rackerby (1967: 23) reports a single bird bone bead from Ala-13, recovered in the matrix of burials 54 and 55. The specimen (30-131) is a burned medial fragment of bird bone which shows no sign of human modification. No other short bone tubes were recovered from the site.

Bone Tubes -- Ala-12

A single bird bone bead, 3.2 cm long with irregular but smoothed ends, was recovered in the neck region of burial 5, in pit 5.5E/4N at 23 inches below surface. No other bone tubes were reported from the site.

Antler Wedges -- Ala-328 (171 specimens).

This group corresponds to Gifford's type HH (1940: 166, 182, 231). Representative specimens are well described and illustrated by Davis (D&T 1959: 47, 49, Pl IA1-h); 2 wedges are shown in Plate 6A, B here. Tools vary in form. Some are made from split antler segments. Others are unsplit except for the angular cut, or bevel, which creates the wedge shape. A few have an unsplit shaft area but are thinned by removal of large chips at the distal base (for hafting?). These variations were equally widely distributed among burials and throughout the midden, and no temporal or social significance is attached to particular styles. On the basis of ethnographic analogy, antler wedges are commonly inferred to have been used as wedges and chisels in woodworking (see, e.g., Gifford 1940: 182; Bennyhoff 1953: 272).

Length of complete wedges ranges from 5.0 to 17.5 cm, with several broken specimens as long as 22.0 cm; most specimens fall between 8.5 and 14.0 cm in length. Width measured at the distal end of the cut wedge portion ranges from 1.0 to 5.0 cm, with most specimens falling between 2.0 and 4.0 cm. The smaller range of measurements reported here compared to that given by Davis (D&T 1959: 49) probably reflects lost specimens and perhaps differing definitions of the measurements.

Five specimens of smallest width (1.0 cm) intergrade in form with artifacts grouped as "blunt pointed antler tools." Since they show no flaker-like wear and have wedge-shaped tips, they are grouped here with wedges.

A comparison of the text in Davis (D&T 1959) on page 49 with the information in his Tables 2, 3, 4 and 15 reveals inconsistencies in the reporting of antler wedges associated with burials. The information given here and in Table 3-13 incorporates corrections. Antler wedges were associated with at least 19 burials (multiple specimen counts in parentheses): W1, 11, 12, 29, 37, 74, 102, 108, 126(3), 139(3), 195, 209, 218(2), 229, 315, 317, 380-381, 393, 409(3). The burial records refer to wedges with burials 172 and 328, but no wedges are catalogued for either burial.

Table 3-13 gives provenience information for all antler wedges from Ala-328, and Table 3-14 summarizes their occurrence by depth. No vertical or horizontal clustering is evident.

Antler Wedges -- Ala-13 (25 specimens).

Antler wedges from Ala-13 demonstrate the same variety of form as those recovered at Ala-328, and fall within the size range cited for the Ala-328 specimens. None of the wedges from Ala-13 were feature or burial associations. Of the recovered specimens, 10 were complete and 15 broken. Table 3-15 lists provenience data for all wedges from Ala-13.

Table 3-13. Provenience of antler wedges, Ala-328.

Depths in inches below surface. + = deeper than cited depth.
* = burial association. #(#) = multiple specimens, count(depth).

SFSU Grid I

A-2	0-18, 50, 53
A-3	18-25
A-4	63, 72, 3(108*), 108*
A-5	60, 60, 96, 110
A-7	35*, 65, 80
A-9	0-18, 29
B-1	74
B-2	24, 62, 3(94*)
B-3	72, 96+
B-4	40
B-5	18, 24
C-1	66
C-2	76, 84
C-3	78
C-5	70, 72
C-6	0-12
C-7	36, 36, 60, 60
D-1	84
D-4	21, 80, 80, 96
D-5	30, 96
D-6	12, 90
D-7	49, 59
D-8	19
E-1	60, 98, 122
E-5	12
E-6	24, 36*
E-7	24*
F-1	48, 69, 96*
F-6	43, 48, 60
F-7	48*

SFSU Grid II

A-3	36, 64
A-4	90, 3(103*)
A-5	85*
A-7	54
A-8	24, 54
A-9	30, 31*, 32, 36*, 112
A-10	27, 62, 63, 71, 92
B-4	34
B-5	66, 78
B-8	3, 26, 62, 93
B-9	60
C-5	45, 48, 66
C-6	21, 46*, 47, 52
C-7	55*
C-8	93
C-9	12, 0-60
D-5	76
D-6	18, 62, 70
D-7	18, 64
D-8	18*, 28*
D-9	74
D-10	54
E-6	48, 49, 54
E-7	95*
E-8	40
E-10	36*
F-9	43
G-3	38, 44, 66
G-4	30
G-5	24
G-6	42, 45, 64*, 84
H-7	18
I-6	6
J-3	24
J-7	54

Wedel Excavations

0-5S	40-50W	48
0-5S	10-15E	98
5-10S	5-10E	72*
10-15S	0-5E	48

Hayward Excavations

B2-67	24-30
C-66	6-12
E1-67	12-18
E2-67	12-18, 30-36
F-66	0
K-68	36
L-68	5, 23
Test Pit 2	18-24

Omitted: 19 SFSU and 2 Hayward specimens for which depth or location data are imprecise or missing.

Table 3-14. Occurrence of antler wedges by depth, Ala-328.

Depths in inches below surface.
W = Wedel excavations.
H = Hayward excavations.

Depth	Number of Specimens
0-12	6 (+3H)
13-24	15 (+4H)
25-36	17 (+3H)
37-48	16 (+1H, +2W)
49-60	19
61-72	21 (+1W)
73-84	12
85-96	14
97-108	8 (+1W)
109-120	2
121-132	1
	131 (+11H, +4W)

24 SFSU and 1 Hayward specimen omitted because of missing or imprecise provenience information.

Table 3-15. Provenience of antler artifacts, Ala-13.

Depths in inches presumed below datum plane.
w = wedge.
b = blunt pointed antler tool.
s = socket.
m = modified antler lacking use-wear.

Pit	Depth
C-13	w: 32
D-13	w: 24
E-15	w: 60
	m: 72
E-16	w: 24, 35, 57, 58
	m: 46
E-17	w: 48, 48
	m: 36-48
E-18	w: 70
	m: 65
E-19	w: 24
	s: 14
	m: 57
F-13	b: 36
F-17	b: 34, 54
G-13	b: 40
G-17	w: 14
	s: 55
H-13	w: 60
	s: 64
H-17	w: 24
I-12	b: 73
I-17	w: 23
	b: 56
J-13	b: 64
J-17	w: 31
K-17	w: 44
L-13	w: 41
L-17	w: 42, 44
M-16	b: 53
N-17	w: 43

Omitted: 2 wedges and 4 blunt pointed antler tools, because of missing provenience data.

Antler Wedges -- Ala-12 (14 specimens).

Only 1 specimen, found on the periphery of pit feature 3, was unbroken. It is 8.4 cm long and 1.5 cm wide at the working end. An antler wedge fragment was possibly associated with vandalized burials 11, 12, and 13. Another was excavated from pit feature 28. Provenience of all recovered wedges from Ala-12 is shown in Table 3-16.

Bone Whistles -- Ala-328 (125 specimens). Plate 3H, N, O.

Whistles were definite accompaniments of 16 different burials. Fourteen unbroken specimens and 19 lots of broken specimens, comprising a minimum of 33 whistles, were grave goods; thus, over one fourth of all whistles recovered were burial associations.

By analogy with reported and observed uses of whistles among Native Californians (e.g., Kroeber 1925: 96; scenes in the ethnographic film "Pomo Shaman", UC-Extension Media Center 1963) it is inferred that artifacts of this type were used in recreational and ceremonial contexts.

The whistles at Ala-328 are cut mammal or bird bone tubes bearing a single cut or drilled transverse perforation into the shaft. They correspond to Gifford's types FF1a and FF2 (1940: 165, 181, 230), single-holed whistles of mammal and bird bone with no incised decoration.

A total of 52 unbroken whistles were recovered, including 3 which have been lost. These were recovered with cremation burial 40, and comprise the entire inventory of Davis' "Type I whistles" (D&T 1959: 20-21). Davis' types are evaluated below. Two of the lost specimens were illustrated (D&T 1959: Pl. 2Ar, s).

Each of the 76 broken pieces or lots of fragments shows at least part of a transverse perforation into the shaft, evidence that it came from a whistle. The fragments grouped with bone tubes lack this evidence.

Five specimens are probably mammal bone; they conform to the other whistles in size and shape. Their occurrence is not confined to a particular depth or area. The remainder of the specimens are bird bone. Almost all bear evident papillae, the nodes for feather attachment which are found on bird wing bones. Ulnae predominate among the bird bones; a few whistles are made of humerus or tibiotarsus bones. No species identification of bones has been made. Davis (D&T 1959: 21) states that species of duck, crane or heron, and condor are represented. Many of the bird bones show scratches around the papillae, especially the nodes in the vicinity of the hole;

Table 3-16. Provenience of antler wedges and blunt pointed antler tools, Ala-12.

Depths in inches below surface.
* = burial association.
poss = possible.
w = wedge.
b = blunt pointed antler tool.

Pit	Depth
1W/2N	b: 4
0E/2N	w: 0-12, 0-12
0E/5N	w: 43, 48
0E/8N	b: 12-24, 24, 42
0E/10N	w: 56-62
	b: 40-48
0E/11N	w: 18, 34, 34
1E/7N	w: 20, 24
	b: 60*
2.5E/11N	w: 42poss*
5.5E/5N	w: 26, 27
5.5E/10N	b: 14

Omitted: 1 wedge, location imprecise.

presumably the scratches reflect attempts to reduce these protrusions. Shafts (both mammal and bird bone) often show faint logitudinal striations and some surface polish.

The complete specimens range in length from 6.5 to 23.5 cm, with modal length falling between 9.0 and 13.0 cm, median at 11.5 cm. Average diameter ranges from 0.4 to 1.3 cm, with mode between 0.6 and 0.7 cm. Table 3-17 summarizes the vertical distribution of whistles by length; no clustering is evident.

Hole placement was measured on 42 complete specimens. On the majority of these, the hole is cut either approximately midway between the 2 ends (19 specimens) or roughly one third of the distance from one end to the other (19 specimens). Table 3-17 shows the vertical distribution of whistles by hole placement; no clustering is evident. A few holes are irregular in shape, but most are roughly elliptical or circular in outline, with maximum diameter ranging from 0.2 to 1.1 cm, and mode between 0.3 and 0.5 cm.

On about half of the unbroken specimens, both ends are cut and smoothed; about a quarter have one finished end; other specimens show both ends unfinished. Contrary to the suggestion by Davis (D&T 1959: 20-21), there is no correlation in this collection of whistles between hole placement and degree of finish of individual specimens. Number of finished ends, position of hole in relation to ends, and placement of hole with regard to bone surface are attributes which show no apparent covariance with one another. The two whistle types defined by Davis are not valid because they are based on patterned combinations of the attributes just mentioned, and no such patterning is evident in the collection from Ala-328.

Few whistles retain evidence of decoration. None have been ornamentally incised. A shell bead overlay remained on paired whistles found with burial 75. The beads are described with other cut Olivella beads above. Asphaltum traces (from bindings or overlay?) remain on whistles found with burial 361. Asphaltum plugs, presumably utilitarian rather than ornamental in function, remain in ends or holes of a few specimens.

The following burials were accompanied by one or more whistles (multiple specimen counts shown in parentheses): 40(3), 42(7), 68(2), 75(2), 103, 130, 142, 219, 246, 273, 298(2), 302-302a, 353(5?), 361(2), 413(2?), 443(4?). Queries refer to cases where several broken pieces were recovered and the number of individual whistles represented is uncertain. Burial 66-13, a cremation feature at 35 inches below surface in Hayward pit A-66, was accompanied by 12 whistles, according to the feature record. A single Olivella disk bead was reportedly overlaid on 1 whistle. However, the artifacts in

Table 3-17. Length and hole placement of unbroken bone whistles, grouped by depth, Ala-328.

Depth (inches below surface)	Length (cm)	Hole Placement: midpoint	1/3 length	other	?	Total
0-12	6.5		1			1
13-24	3(7.5)	3				
	8.5	1				
	2(10.5)	1			1	8
	2(12.5)	1	1			
25-36	10.5	1				
	11.5		1			
	13		1			5
	15		1			
	18		1			
37-48	7.5		1			
	8		1			
	9	1				
	10	1				
	10.5	1				8
	11			1		
	11.5		1			
	13		1			
49-60	7.5	1				
	11			1		
	11.5		1			
	2(12)		2			
	12.5		1			8
	21.5			1		
	22			1		
61-72	9	1				
	11		1			3
	13		1			
73-84	9	1				
	13	1				
	2(15)				2	
	15.5			1		7
	17		1			
	19		1			
85-96	7.5				1	
	12	1				
	21	1				5
	23			1		
	23.5		1			
97-108						0
109-120	16	1				1

question were not catalogued, are not now in the collection, and have not been tabulated in the specimen count.

Table 3-18 gives provenience data for all whistle specimens from Ala-328, and Table 3-19 summarizes occurrences by depth. No significant vertical or horizontal clustering of whistle occurrence is evident, especially when adjustments in vertical spread are made with respect to burial occurrences. For example, the apparent clustering between 49 and 60 inches is dissipated when the burial associations from that level are shifted up by 24 or 36 inches to the levels which presumably represent the living surface of the site at the time when they were interred.

With regard to the cultural features and artifact types which have possible chronological significance at the site or in a wider context, whistles likewise show no evident clustering. They are grave goods both in the basal cemetery and in the shallow cremation area apparently pertaining to a late component in the site. Whistles co-occur with _Olivella_ spire-lopped, small saucer, large ring, and lipped bead types, and with _Saxidomus_ disk beads. It should be noted that the decorated whistles with burial 75 and the possibly decorated whistles with burial 361 lay within 2 ft. or less of sterile base. They share this depth distribution with decorated bone tubes. Occurrences of both artifact types are few, however.

Bone Whistles -- Ala-13 (15 specimens).

Whistles were the bone artifact type most frequently found in association with burials. Ten whistles, or two thirds of those recovered, were grave goods, found with 4 different burials.

One whistle is mammal bone; the remainder are bird ulnae. All shafts bear longitudinal striations; the papillae have been reduced on most of the bird bones.

Position of the medial hole can be measured on 6 intact or nearly complete specimens. On 5 whistles, the hole lies about one third of the distance between the ends; on 1, it is midway between the ends. The latter specimen was recovered at shallower depth than any of the former specimens (see Table 3-20).

Lengths of the 5 unbroken specimens range from 9.4 to 21.0 cm. Average diameter, measurable on 13 specimens, ranges from 0.7 to 1.3 cm, falling below 1.0 cm on most whistles. The mammal bone specimen has the largest diameter, but it is more similar to the bird bone specimens in size and shape than it is to the large flaring mammal bone whistles recovered at Ala-12.

Table 3-18. Provenience of bone whistles, Ala-328.

Depths in inches below surface.
* = burial association.
#(#) = multiple specimens: count(depth).
? = estimated count of whole specimens represented by broken pieces.

SFSU Grid I

A-2	84
A-4	54, 65, 76, 85
A-5	87*, 7(116*)
A-8	54*, 66
A-9	84*
B-2	60*
B-4	45
B-5	31
B-6	120, 120
C-1	78, 120, 126
C-2	42-62, 96-106
C-4	60
C-5	12*, 96
C-6	32
C-7	2(54*)
D-1	108
D-4	53, 78, 88, 96
D-7	2(50*), 56
D-8	3(22*)
E-1	87
F-6	60
F-7	48, 48

Hayward Excavation

J-68	35

SFSU Grid II

A-4	22
A-5	21, 96
A-6	44*, 2(93*)
A-7	40
A-8	42, 48
A-9	28
B-5	0-60, 57
B-6	12-24, 30, 40, 40, 58, 66, 76
B-7	50, 64
B-10	15
C-5	24, 60-72, 72-84
C-6	0-60, 0-60, 80
C-8	41, 44, 51
C-9	0-60
D-5	36-48, 54, 73-84, 4? (77*), 80
D-6	0-12, 42, 60, 67
D-8	12, 72
E-5	34
E-6	57, 2(70*)
E-9	42, 72
F-5	41, 46, 85
F-6	40, 52, 5? (57*)
F-7	2(60*), 60*
G-4	22, 70
G-5	42, 40-48
G-6	70
J-7	37

Omitted: 2 Hayward and 8 SFSU specimens with imprecise provenience information.

Table 3-19. Summary of depth occurrence, bone whistles, Ala-328.

Depth	Whole	Bur. Assoc.	Broken	Bur. Assoc.	Total	Total Bur. Assoc.
0-12	1	(0)	2	(1)	3	(1)
13-24	8	(3)	1	(0)	9	(3)
25-36	5	(0)	1	(0)	6	(0)
37-48	8	(0)	11	(1)	19	(1)
49-60	8	(4)	19	(10)	27	(14)
61-72	3	(1)	9	(1)	12	(2)
73-84	7	(4)	7	(1)	14	(5)
85-96	5	(2)	6	(1)	11	(3)
97-108	0	(0)	2	(0)	2	(0)
109-120	1	(1)	9	(6)	10	(7)
121-132	0	(0)	1	(0)	1	(0)
	46	(15)	68	(21)	114	(36)

Omitted: 3 unbroken Hayward specimens, 3 unbroken SFSU specimens, and 8 broken SFSU specimens because of imprecise depth information; none were burial associations.

Table 3-20. Provenience, length, and hole placement of bone whistles, Ala-13.

Pit	Depth[1]	Burial	No. Specimens	Length (cm)	Hole Placement[2]
D, E-14	81	72	7	21.0, 6(?)[3]	1/3, 1/3, 5(?)
E-15	69	73	1	?	?
E-15	71	74	1	13.0	1/3
G-13	60-72	-	1	9.9	1/3
H-12	71	94	1	?	?
H-17	23	-	1	?	?
H-18	29	F. 2	1	10.5	1/2
K-17	24-30	-	1	?	?
M-16	52	-	1	9.4	1/3

1 Depths in inches presumed below datum plane.

2 1/3 means medial hole lies one third of distance between whistle ends. 1/2 means medial hole lies one half of distance between whistle ends.

3 Question marks refer to broken specimens for which information is unobtainable.

Two uncatalogued specimens in the collection are omitted; they may derive from feature 14, pit G-12, 67 inches below datum plane.

One specimen ends in a hollowbacked point, with the bevel extending 1.8 cm back from the tip; the other end is straight and smoothed, as are intact ends on other specimens.

Seven bird bone whistles accompanied burial 72. A bird bone tube and a tube fragment accompanying that burial were interpreted as whistles by Rackerby (1967: 22); since each lacks evidence of a medial hole, they have been grouped with bird bone tubes in this paper. Burials 73, 74 and 94 were each accompanied by a single bird bone whistle. All 4 burials with which whistles were found were interments into submound clay. A whistle was found on housefloor feature 6.

Provenience information for catalogued specimens is presented in Table 3-20. Length and hole position are included there for measurable specimens.

Two intact whistles and fragments of 2 broken whistles which lacked catalog numbers were in a drawer filled with uncatalogued bird bone apparently recovered from feature 14. The unbroken whistles are ulnae of about the same size and apparently from the same bird species as the 8 unmodified ulnae found in feature 14 in pit G-12 at 67 inches below datum plane. Rackerby (1967: 10) denies presence of whistles in feature 14, but perhaps these were overlooked. Their lengths, each 28.5 cm, make them longer than any other whistle recovered from Ala-13, -328, or -12. The medial hole falls two fifths of the distance between the ends on these whistles. One of the fragments retains a cut end, and appears to be of the same size, bone type and species as the unbroken whistles.

Bone Whistles -- Ala-12 (1 specimen).

One whistle (6652), described and illustrated in Rackerby (1967: 46, Fig. 12c), is now missing from the collection; hence it is not included in the total above. A specimen very similar to it (29-370) is present; see Plate 3I. Both are single-hole whistles of heavy mammal bone, tapering from a broad to a narrower end, with a perforation near center. A black substance bearing cord impressions covers the circumference in the vicinity of the perforation on both; a second band is found around the narrow end on 6652. Measurements for 6652 and 29-370, respectively, are: 17.5 and 18.0 cm long, 2.6 and 2.7 cm medial width. The species and kind of bone from which each whistle was made has not been identified. Rackerby suggests that 6652 was made from human tibia. Specimen 29-370 appears to be non-human tibia.

Both whistles were recovered from pits which intruded into the sterile sand at the base of the site. Specimen 6652 accompanied burial 7 in pit 1E/7N at 56 inches below surface. Specimen 29-370 was found at 56 inches below surface associated with feature 26, a pit in unit 1E/10N.

The absence of bird bone whistles at this site is noteworthy, since bird bone predominates among whistles recovered at Ala-328 and -13.

Serrate Bone -- Ala-328 (221 specimens). Plate 3C, D, E, F, J, K, L.

Artifacts assigned to this group are characterized by 1 or more notched or sinuous edges showing use-polish. Gifford's type H (1940: 162, 172, 213) encompasses these, although his subtypes are too few to deal with the variety of bones used, which include: mammal scapulae, pelves, ulnae, ribs; fish parasphenoids; and several unidentified fragments.

Fifteen specimens of serrate bone were grave goods, found with 14 different burials; these are enumerated below, following the descriptions of different kinds of serrate bone recovered. Table 3-21 gives provenience information for all specimens of serrate bone; Table 3-22 summarizes occurrences by depth. Neither the group as a whole nor any of the subgroups was confined to particular depths or areas within the site.

Serrate Scapulae (179 specimens). Two specimens from the Wedel excavations were not examined and are not included in the total count; they are missing from the collection at Berkeley. All of the artifacts examined appear to be cervid scapulae. Most are deer, but some elk bone is present, and possibly some antelope. Seventeen specimens of elk are present, and 7 other specimens may be deer or elk; 6 diminutive specimens are deer or antelope.

Deliberate notching can be seen on 124 specimens. The others are broken or weathered so that the working edge is visible for only a short length, if at all. On a few specimens, weathering and lack of polish make it impossible to be sure that they were used. The impression conveyed is that deliberate notching was the rule for scapula blade tools used at Ala-328. This was evidently so throughout most of the Bay area [1] and the Napa region although, as Bennyhoff (1953) notes, it appears that specimens often continued to be used after breakage of some of the serrations. The emphasis on notching in most Bay area sites contrasts with the absence of serrations on used scapula tools recovered at SMa-77 (Gerow with Force 1968: 85).

The majority of the specimens (158) share the form predominant

[1] I personally examined the serrate scapulae from Ala-307, Ala-309, and CCo-290 to confirm this.

Table 3-21. Provenience of serrate bone, Ala-328.

Depths in inches below surface.
* = burial association.
\+ = deeper than cited depth.

#(#) = multiple specimens: count(depth).

SFSU Grid I

A-1	60
A-2	33, 40, 42, 50, 84, 84, 84, 113
A-3	25, 50, 114
A-4	0-18, 106*
A-5	0-18, 0-18
A-6	79*, 96, 108, 108
A-7	0-18, 18-24
A-8	20, 24, 53
A-9	24
B-1	38, 111
B-2	36, 30-36, 60, 60*
B-3	96, 96
B-5	24, 48
B-6	56, 60, 120
B-7	12, 36
C-1	0-18
C-2	58
C-4	10
C-6	12
C-7	17, 47, 60, 96
D-1	94
D-4	84, 96
D-5	28, 86, 95, 97
D-7	25, 47, 48
E-1	51, 64, 112
E-6	44*
F-1	48
F-7	9*, 12, 30, 40, 40

SFSU Grid II

A-5	24*, 42, 62
A-6	41, 48, 90
A-9	4, 107
A-10	40, 42, 55
B-4	73
B-5	12, 48, 60, 82, 84-96
B-6	30, 60, 61, 63, 84
B-8	10, 20, 20, 60-120, 77, 80, 97
B-9	37, 48*, 72, 102
B-10	13, 85
C-5	15, 0-59, 72-84
C-6	0-5, 44, 68, 70
C-9	19, 67, 72
D-5	8, 52, 53, 76
D-6	13, 60+
D-7	18, 64*, 66, 77, 84, 90
D-8	41 2(82*)
D-9	lower 60
E-5	0-12
E-6	0-12, 24, 34, 42
E-7	41, 43, 54*
E-8	53
E-9	72
E-10	48
F-5	0-60, 34, 55, 62
F-6	12, 16
F-9	0-60, 0-60, 40
F-10	24, 32, 34, 41
G-3	21, 27, 54
G-4	12
G-5	45, 58, 94
G-6	42
G-7	30
H-7	23
J-5	12-24
J-6	39
J-8	2(33)
J-9	12-24, 37-43

Hayward Excavations

A-66	0, 30-36, 30-36
B-66	42-48
C, D-67	36
D1-67	6-12
E-66	30-36, 46
E2-67	36-42
F1-67	16
F2-67	0, 0
G-68	33
J-68	35
K-68	30

Wedel Excavations

0-5E	10-15S	53
45-50W	0-5S	38
lost specimens:		
50-65W	35-40N	12
"	"	10*

Omitted: 30 SFSU specimens lacking complete provenience information.

Table 3-22. Summary of depth occurrence, serrate bone, Ala-328.

Depths in inches below surface.
W = Wedel excavations.
H = Hayward excavation.

Depth	Number of Specimens
0-12	14 (+2W, +4H)
13-24	23 (+1H)
25-36	17 (+7H)
37-48	31 (+1W, +2H)
49-60	21 (+1W)
61-72	15
73-84	16
85-96	13
97-108	7
109-120	5
	162 (+4W, +14H)

42 SFSU and 1 Hayward specimen omitted due to incomplete or imprecise depth information.

Table 3-23. Provenience of serrate bone, Ala-13.

Depths in inches presumed below datum plane.
* = burial association.

Pit	Depth
C-13	56, 56
D-14	34*
E-13	34, 67
E-14	59
E-15	41
E-16	35
E-17	16
E-18	15, 23
E-19	0
F-17	22
G-12	74, 74
H-17	0-24
H-18	24
I-13	64*
I-17	31, 50
J-13	12-24, 44
J-17	54, 54
K-17	37
L-17	41
M-17	35*

Omitted: 3 specimens lacking proveninece data.

among serrate scapulae recovered in the Bay area (Bennyhoff 1953: 268). On these artifacts the axillary border has been removed and the remaining thin blade axillary to the spine has been notched. The spine is trimmed on all specimens to varying degrees, but some spine remains on all serrate scapulae of this form. In contrast to these specimens, on serrate scapulae from the Napa region, the coracoid border, supraspinous fossa and spine have been cut or broken away, leaving the axillary border and ridge as backing for serrations on the infraspinous fossa (Bennyhoff 1953: 268). Twenty specimens from Ala-328 are scapula pieces comprised of portions of the axillary border and ridge; their similarities to the Napa form just described will be considered below. One specimen is a socket deliberately severed from the rest of the scapula. The descriptive terms "spined" and "de-spined" are used below to refer to Bennyhoff's "Bay" and "Napa" forms, respectively.

Spined specimens. Plate 3K. Davis also illustrated several spined specimens from Ala-328 (D&T 1959: Pl. IAi, k, m, n, o). Unfortunately the view, with spines away from the camera, does not clearly show that it is the axillary border which has been removed, but this is the case. One illustrated specimen has a hole cut in the blade, a unique feature among serrate scapulae from the site.

Among the spined scapulae are 8 specimens of elk and 5 which may be deer or elk; the remainder are deer, except for two possible antelope specimens. None of the elk specimens and only 1 of those which may be deer or elk retain the socket end (glenoid fossa and coracoid process) as a "handle". Only 3 specimens without any breaks were recovered. These, all of deer, measure 13.5, 16.5, and 18.0 cm in maximum length; a broken specimen of elk, presently 25.5 cm long, increases the length range for serrate scapulae. The maximum extent of serration is 11.5 cm, on a broken specimen of deer bone.

About equal numbers of right and left scapulae are present in the sample of spined specimens: 39 right and 48 left, among specimens which could be assigned handedness with certainty. Sixty two reasonably complete specimens have a single working edge; 10 are serrated along the coracoid border as well as the axillary blade edge. Use-polish is evident at the working edge(s) and back from it on one or both sides of the blade. Among specimens on which judgment can be made, 16 exhibit significant use-polish on both sides extending back from the working edge(s). They include 7 double-edged specimens (4 right and 3 left) and 9 single-edged specimens (5 right and 4 left). Sixteen other scapulae (13 left and 3 right, all single-edged) are polished primarily on the side opposite the spine, and 2 (both left, single-edged) are polished mostly on the spine side.

Bennyhoff (1953: 268) found that in the Bay area, right scapulae were used spine up, and left, spine down. In this sample, it appears that single-edged specimens were most often used with spine up, regardless of handedness; and most double-edged specimens and some with a single working edge were used with spine up and spine down.

Among spined scapula specimens, 46 are fragments without serrations; 17 of these are blade or neck fragments, and 29 consist of the socket end (coracoid process and glenoid fossa), evidently broken "handles"; see Plate 3J. Because these fragments show spine trimming or use-polish common to specimens on which serrations remain, they are grouped with serrate scapulae.

De-spined specimens. Plate 3E, F. Twenty scapula specimens are pieces of axillary border (12 right, 6 left, 2 indeterminable). Eight specimens are elk, 2 are deer or elk, 6 are definitely deer, and 4 are deer or antelope. Eleven axillary fragments are definitely notched along the severed inner edge, including 5 of elk, 1 of deer or elk, 2 of deer, and 3 of deer or antelope. Some of the others (including 2 associated with burials) show use-polish although the probable working edge is obscured by breakage or weathering. Two elk specimens lack polish and may not have been used.

None of the axillary specimens retains the coracoid process and glenoid fossa as a handle. The absence of this feature on the deer specimens differentiates them from the de-spined deer scapulae reported from Napa sites, from SMa-77 and from 4 Ala-307 specimens examined by me, which do have handles. The absence of the glenoid fossa and coracoid process on the elk axillary specimens accords with the absence of those parts on all elk spined specimens from Ala-328. Of the 5 deer or elk spined scapulae, 4 are neck fragments (by definition lacking the fossa and process) and 1 specimen includes blade and handle.

Discussion. The great majority of the serrate scapulae from Ala-328 are spined specimens which match the "Bay" form described by Bennyhoff. The axillary specimens include none with a handle present; in this respect they differ from the de-spined "Napa" form, and are probably best interpreted as remnants of the manufacture of spined saws which were put to use (see Bennyhoff 1953). The elk specimens cannot be judged in this way, because elk serrate scapulae at Ala-328 invariably lack the socket portion. [1] In this regard it is of interest that a single elk scapula socket was recovered, in addition to the axillary pieces and spined serrate scapulae described above.

1 This holds true also for Ala-309, where the only 3 unbroken elk specimens, 1-25733, 1-26073, and 1-26069, lack sockets. 1-25733 is de-spined; the other 2 are spined, as is the only elk fragment, 1-26464. There are no certain elk specimens in the Ala-307 collection; there are also no intact serrate scapulae lacking a socket area.

It has been deliberately severed immediately behind the glenoid cavity; none of the lateral border or neck portion of the scapula blade is present.

Roughly equal numbers of spined and de-spined elk specimens were recovered, in contrast to the preponderance of the spined forms among deer specimens. Perhaps their large size encouraged the manufacture of 2 serrate tools from each elk scapula, an option rarely considered with the smaller deer scapula. However, such speculation is groundless without knowledge of the uses to which the tool form was put (which would determine the desireable size parameters, e.g.), and that knowledge is lacking. Bennyhoff (1953: 268-269) discusses a variety of possible uses.

Although the distributional segregation which Bennyhoff observed between spined and de-spined forms of serrate scapulae is confirmed by absence of the latter at Ala-328, it appears that a simply geographical scheme does not adequately describe the distribution of the two styles. All modified cervid scapulae from SMa-77 share the de-spined form predominant among specimens recovered in the Napa region, as Gerow points out (Gerow with Force 1968: 85). One quarter of the serrate scapulae from Ala-307 are of the de-spined form, according to my observations of specimens in the Lowie Museum. [1] These two sites are the earliest known occupation sites in the Bay area, judged both by artifactual complexes and radiocarbon determinations (Gerow with Force 1968; Wallace and Lathrap 1975). De-spined serrate deer scapulae are also reported from the deep component at inland site CCo-308 (Fredrickson 1966), to the north of the Alameda sites in the area intervening between them and the Napa region. According to radiocarbon determinations, this component is probably older than either SMa-77 or Ala-307 (see Wright 1971, where determinations for all 3 sites are shown).

It appears that the unusual presence of de-spined deer scapula tools at Ala-307 and SMa-77 may be a symptom of cultural affiliations or influences which differed during earlier phases of occupation in the Bay area from those in force later. Re-examination of serrate scapulae from Bay area sites with the temporal parameter in mind clarify the interpretation; for this paper,

[1] Wallace and Lathrap (1975: 32) list 15 specimens; I found 18. Four intact specimens (1-6963, 1-121912, 1-123752, 1-123764) are handled, de-spined serrate scapulae. A distal fragment (1-123741) probably represents a de-spined specimen, but this is uncertain. Two specimens lack provenience, 1 came from pit B-3 at 0-12'' depth, and 1 from G-7 at 108'' depth; the fragment was found in pit E-4 at 108-120''. Spined specimens occur at greater depths in the vicinity of the 2 deep specimens; the specimen from B-3 has the shallowest depth of recovery of any serrate scapula from the site.

only Ala-307 and Ala-309[1] collections were inspected, in addition to Ala-328, -13 and -12.

Serrate Pelves (13 specimens). Plate 3D. One specimen, illustrated in Davis (D&T 1959: Pl. IAp), is deer bone. It is serrated for 9.0 cm along the outer edge of the ilium-ischium, with the border of the ilium broken away and the pubis severed from the acetabulum. It is presently 20.0 cm long, but shows breakage at one end. Davis reports 2 deer pelves (D&T 1959: 50), but I located only this one. Possibly his identification of one of the other serrate pelves differed from mine, or perhaps he successfully identified one of the serrate fragments presently considered unidentifiable.

Twelve smaller pelves (10 probably sea otter, 2 unidentified) are notched on the inner edge of the ischium within 2.0 cm or less of the arch of the obturator foramen. The pubis is broken away on all specimens, and on many the area of curvature around the lower ischium is also broken. Apparently the ilium served as a handle on these tools. Eleven of the 12 specimens are left pelves. All are broken; their present lengths range from 5.0 to 17.5 cm; the longest serrated edge is 6.0 cm.

Serrate Fish Parasphenoids (15 specimens). Plate 3C. These artifacts are all sturgeon parasphenoids which are notched along a single edge. An example is illustrated in Davis (D&T 1959: Pl. IA1). Most specimens are broken; a possibly complete specimen is 16.0 cm long, with serrations extending 7.3 cm along an edge. No pattern of placement of the working edge is evident among different specimens.

Serrate Bone Fragments (9 specimens). Two ribs (probably cervid) and 7 other pieces of identifiable bone show a notched edge in spite of their broken condition. Two pieces have 2 serrated working edges.

Serrate Ulnae and Split Bone (5 specimens). Plate 3L. These artifacts show higher and more extensive polish than any other specimens of serrate bone recovered from the site. The illustrated specimen is a deer or antelope ulna lacking only the proximal epiphysis; it is 10.5 cm long. Two are broken cervid ulna blades, 6.7 and 7.5 cm long. One is a split cannonbone measuring 9.5 cm in length, and one is a split radius which is 13.0 cm long.

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[1] The only de-spined deer scapula from Ala-309, aside from 2 fragments, is problematical. The specimen, illustrated by Uhle (1907: Pl. 9, 17), lacks the socket area but shows careful trimming and preparation of a handle area along the neck and shaft, like that commonly seen on de-spined elk specimens; however it is clearly deer bone, and not especially large compared to other deer specimens. It was recovered from the 8th stratum, relatively deep in the site.

The complete ulna thins to a knife edge near the tip. One broken ulna blade has a narrow conical tip, like those on artifacts interpreted as possible basketry awls. The other ulna blade and the split cannon bone bear flat points like those on specimens grouped as pointed bone with flat tip, described below. The split radius is broken at the tip.

Each of these specimens bears from 1 to 7 rounded grooves on one edge. The grooves are fewer and shallower than the notches on the serrate bone described above.

The grooves, blade shape and high polish give these artifacts a form akin to that of some ethnographic specimens catalogued as "eel-splitters" in the collection of the Lowie Museum. An artifact of this type (1-6949) was recovered from Ala-309.

Serrate Bone in Graves. Serrate bone accompanied 14 burials: W11, 23, 36, 38, 58, 85, 120, 127, 142, 203, 238, 270, 275, 290; and possibly 326 and W8. The catalog attributes 1 of the specimens to 326, but none is mentioned in the burial record. Davis (D&T 1959: 12) attributes a notched scapula to W8, but neither catalog, burial record nor Wedel's notes mention the association. The burials include 4 adult females, 4 adult males, 1 adult probably male, a juvenile, an infant, and 5 individuals of undetermined age and sex; 1 of the latter was identified as a female adult in the field.

The artifact found with burial 142 is an unserrated axillary scapula fragment; Davis labels it a "scapula scraper" (D&T 1959: 13). A serrate pelvis and an unserrated axillary scapula fragment accompanied burial 238. A serrate pelvis was found with burial 275, and a serrate fish parasphenoid with burial 23. All other associated specimens are spined serrate scapulae, except an unidentifiable fragment with burial 290 which may be a mammal pubis.

Serrate Bone -- Ala-13 (30 specimens).

The bone artifacts from Ala-13 characterized by 1 or more serrated edges include a fishbone piece, 2 antler specimens, and 27 made from mammal scapulae.

Among the scapulae, which are all probably of deer, 15 are definite spined saws (see the discussion of this form in the Ala-328 section above). One (30-142/6560) is an axillary fragment which was used with the socket area and the proximal axillary border broken away; hence it differs from "Napa" form de-spined scapulae described in the Ala-328 section. It was incorrectly identified as a pelvis fragment in Rackerby (1967: 22). The remaining 11 scapula artifacts include a piece of axillary border and socket and blade fragments, all of which have been modified, but which lack working edges in their present state.

There are 12 left and 7 right scapulae among specimens which can be assigned handedness. Two specimens have double working edges. Among 7 specimens which can be judged, 5 (including a double-edged specimen) show greater use-polish on the non-spine side, and 2 are more polished on the spine side. The serrated axillary fragment has a higher sheen on the side of the protruding axillary ridge than on the other side. Polish is light or obliterated by weathering on the other specimens.

The only completely reconstructible serrated scapula (30-152), illustrated in Rackerby (1967: Fig. 5C) is 21.0 cm long, with serrations along 10.7 cm of its length.

The fishbone piece is a serrated fragment of sturgeon parasphenoid, like those from Ala-328; it is broken along its length.

One antler serrate is an antler wedge fragment 6.5 cm long, notched along 1 edge for 4.0 cm. The other piece (30-146), illustrated in Rackerby (Fig. 5D), is a flat fragment of antler outer tissue notched along one edge; it is broken through the serrated areas. Rackerby (1967: 22) refers to 3 antler saws; artifact 30-203, probably considered a saw by him, is described elsewhere in this report as an antler "peg".

A serrated scapula saw was associated with each of 3 burials, 6, 19, and 71. Four serrate scapulae were reportedly a part of feature 2, an artifact cluster in pit C-13 at 56 inches below datum plane. I found 2 specimens attributed to the feature (30-144/6315, 30-38/6316) as well as specimen 30-139/6313 which is not attributed to feature 2 in the catalog, although it is so listed in Rackerby (1967: 9). I was unable to locate specimen 30-1/6314, which Rackerby lists with feature 2; it is not tabulated in the count of serrate scapulae given above. Provenience for all serrate bone is given in Table 3-23.

Serrate Bone -- Ala-12 (9 specimens).

Artifacts with serrations include a piece of broad flat rib (29-308) serrated on both edges, illustrated in Rackerby (1967: Fig. 10A), and 2 scapula blade fragments serrated on one edge, 1 (29-311) illustrated in Rackerby (Fig. 10B). In addition, the socket portions of 3 scapulae which show striations and polish, and 3 pieces of scapula blade with trimmed spines are presumed to be fragments of serrate scapulae.

All of the scapula blade fragments, serrated and unserrated, are spined. The socket fragments could have broken from either spined or despined pieces.

None of the serrate bone artifacts were grave goods. Specimens were recovered from 1W/2N at 12 inches below surface (12" b. s.); 0E/8N at 36 and 65"b. s.; 1E/7N at 24, 27 and 29"b. s.; 2.5E/11N at 24 to 36"b. s.; 5.5E/4N at 24 to 36"b. s.; and 5.5E/7N at 31"b. s.

Blunt Pointed Antler Tools -- Ala-328 (110 specimens). Plate 6G.

This group consists of artifacts made from distal ends of antler spikes, which as a result are less massive than specimens described as antler wedges. Point form differs as well. These specimens have rounded or flat tips at the working end, which is roughly circular or elliptical in cross section. Sometimes the end is just a blunted tine tip; at other times it is modified by beveling or trimming. Tip wear varies. Some specimens have rough pits and cuts on the end and shaft in the immediate vicinity. Others are smooth on end and shaft and show a lustrous use-polish. A few specimens are broken or weathered so that wear at the tip end is obscured.

Sixty one specimens were probably or possibly used a flakers in the manufacture of stone items. Many show cuts and pits comparable to ethnographic specimens in the Lowie Museum collection which were reportedly used as flakers. Others show less wear, but are not inconsistent with the pattern found among the ethnographic examples. Forty five specimens lacked any evidence of possible use as flakers; the high luster on many suggests use as rubbing tools.

Over one half the specimens have been severed at the proximal end by deliberate cutting. Probably some of the specimens with uncut ends were used at their present lengths, while others are broken objects. Lengths range from 2.7 to 19.0 cm among cut specimens, from 2.5 to 17.5 cm among broken specimens. Only 8 cut and 4 broken artifacts are longer than 10 cm, with other specimens evenly distributed among shorter lengths. As Davis noted in his discussion of antler flakers (D&T 1959: 52), such short length implies that the artifacts were hafted for use. Such a practice is documented among ethnographic specimens at the Lowie Museum. The longer specimens grouped here probably include 3 artifacts which Davis described as "digging tools" (D&T 1959: 55).

Blunt pointed antler tools accompanied at least 8 burials: 42, 206, 265, 276, 405, 409, 67-5, and 67-9. A specimen associated with burial 210 was lost to vandals, and is not tabulated in the total count for this group. Two specimens are catalogued as grave goods for burials 19 and 361, but burial records and notes provide no corroboration. Table 3-24 gives provenience information for blunt pointed antler tools: Table 3-25 summarizes their occurrence by depth.

Blunt Pointed Antler Tools -- Ala-13 (12 specimens). Plate 6F.

Like equivalent artifacts at Ala-328, these items vary in point form and nature of use-wear. Bluntness, gouges and scratches near the tip, and similar evidence of rough wear suggest that 8 of the Ala-13 specimens could possibly have been used as flakers in the manufacture of stone items. Four of the antler tine tools lack any evidence of rough use; they must have served in some capacity other than as flakers.

Length ranges from 4.7 to 11.1 cm among specimens with cut proximal ends, and from 5.4 to 14.0 cm among pieces broken at the proximal end; only 1 cut specimen and 2 broken ones exceed 10 cm in length.

None of the blunt pointed antler tools accompanied a feature or burial at Ala-13. Provenience data for these specimens are included in Table 3-25.

Blunt Pointed Antler Tools -- Ala-12 (7 specimens).

The modified antler tines from Ala-12 are similar to those recovered at Ala-328, except that none have been beveled or trimmed at the tip. Four specimens with flat tips could possibly have been used as flakers, although none have cuts or pits below the tip. A possible flaker (29-329) is illustrated in Rackerby (1967: Fig. 11F). Three specimens with rounded tips could not have been used as flakers. The 3 vary from high to low in degree of use-polish. One, described by Rackerby as an "antler tine perforator" is illustrated in his Figure 11E. Five blunt pointed antler tools with cut ends range in length from 4.5 cm to 10.0 cm; 2 specimens are broken. One possible flaker was associated with burial 7. Provenience information for blunt pointed antler tools is included in Table 3-26.

Sidebladed Rib Artifacts -- Ala-328 (60 specimens). Plate 5Q, R.

Artifacts in this group fit Gifford's types E and F (1940: 172), but Gifford's types are more inclusive than this category. Sidebladed rib artifacts share a long thin narrow form which results in fragility. There are only 4 complete specimens in the collection, and apparently only 2 of these were recovered unbroken.

Table 3-24. Provenience of blunt pointed antler tools, Ala-328.

Depths in inches below surface.
* = burial association.

SFSU Grid I

A-4	108
A-5	76, 112*
A-6	89
A-7	38, 72
A-8	28, 39
A-9	34
B-1	108
B-2	62
B-5	24
B-7	12
C-1	77
C-2	48
C-3	64
C-7	54
D-1	112
D-4	50
D-5	26
D-6	80
E-6	51
E-7	30
F-1	48
F-6	48

SFSU Grid II

A-3	0-60, 0-60, 45
A-4	50, 84, 103*, 108*
A-5	98, 100
A-6	48, 54, 93
A-9	33
B-5	24, 48
B-6	12*, 18
B-10	2
C-5	100
C-6	24, 24, 65
C-7	47
C-8	24
C-9	18
C-10	72
D-6	42, 56
D-7	44*
D-8	0-60, 36, 38
E-9	8
F-5	41, 42, 51, 56
F-6	45
F-7	24*, 39
F-9	69
F-10	30, 52
G-3	62
G-4	28
G-5	48
G-6	24, 66, 68, 70
G-7	67
I-6	12
J-9	12-24

Wedel Excavations

5-10S	0-5E	74
10-15S	5-10E	24
35-40N	50-60W	12
15-20S	5-10E	24
10-15S	0-5E	24
40-45S	40-50W	12

Hayward Excavations

A-66	0-6, 6-12
B1-67	6-12
C1-67	39
D-66	12-18
D1-67	37
D2-67	36-42
E-66	0-6
E2-67	24-30*
F1-67	6-12, 29*, 48
F2-67	40
J-68	17, 39
K-68	24
L-68	16-27
M-68	14
Test Pit 1	24-30

Omitted: 5 SFSU and 2 Wedel specimens lacking complete provenience information.

Table 3-25. Summary of depth occurrence, blunt pointed antler tools, Ala-328.

Depths in inches below surface.
W = Wedel excavations.
H = Hayward excavations.

Depth	Number of Specimens
0-12	5 (+2W, +5H)
13-24	10 (+3W, +4H)
25-36	8 (+3H)
37-48	17(+6H)
49-60	9
61-72	12
73-84	3
85-96	2
97-108	7
109-120	2
	75 (+6 W, +18H)

Omitted, 8 SFSU, 2W, 1H specimen; imprecise depth information.

Table 3-26. Provenience of sidebladed rib artifacts, Ala-328.

Depths in inches below surface.
* = burial association.
# (#) = multiple specimens; count(depth).

SFSU Grid I

A-3	42
A-9	42
B-2	85, 4(94*)
C-1	71, 120
C-7	60*
D-1	114
E-1	80, 99
E-6	25

Wedel Excavations

0-5S	50-60W	48
0-5S	5-10E	102

SFSU Grid II

A-4	24, 54, 64
A-6	72-84
A-7	43, 55
A-8	42
A-9	28, 3(48), 84*
B-5	36
B-6	41
B-9	90
C-5	37, 66-72
C-6	55, 96
C-7	54, 60
D-5	84-96
D-7	66*
D-9	62

Table 3-26 (continued).

SFSU Grid II

E-9	20*
F-5	81
F-6	35
G-4	2(50), 72, 77
G-5	58
G-6	78
G-7	48
J-5	12-24

Omitted: 7 SFSU and 2 Hayward specimens lacking complete provenience data.

Table 3-27. Summary of depth occurrence, sidebladed rib artifacts, Ala-328.

Depths in inches below surface.
W = Wedel excavations.

Depth	Number of Specimens
0-12	0
13-24	3
25-36	4
37-48	10 (+1W)
49-60	9
61-72	6
73-84	6
85-96	8
97-108	1 (+ 1W)
109-120	2
	49 (+ 2W)

Omitted: 7 SFSU and 2 Hayward specimens lacking complete provenience data.

On all specimens from Ala-328 which show this narrow form and thin blade-like side edges, the rib has been split and ground down or otherwise smoothed. (The few unsplit rib artifacts recovered have been placed in other groups because of differing shaft and edge thickness and point form.) These specimens show inner tissue on one side and longitudinal striations on the other side, presumably as a result of manufacturing processes. Bone used for these artifacts has not been identified by species; cervid ribs are surely represented, and possibly also sea mammal and canid ribs.

Pointed ends are V-shaped or slightly rounded; unpointed finished ends are straight or rounded. None of the complete specimens is bi-pointed.

This group is characterized by a high use-polish overall, which suggests that contact with edges and surfaces as well as tip was involved in use of the artifacts (hence Gifford's /1940: 172/ speculation that the artifacts might have functioned as sweat-scrapers).

About 60 specimens or lots of fragments fall into this group. Four are complete, 23 are pointed fragments, 15 are fragments with an unpointed but complete end, and the rest are medial fragments. Average widths range from 0.6 to 1.5 cm (mode 0.8 to 0.9 cm). Most specimens are thin; thickness ranges from 0.2 to 0.5 cm (mode 0.2 to 0.3 cm). Lengths of complete specimens are 14.0, 20.5, 23, and 24 cm. These specimens and many fragments are bowed in shape due to the natural curvature of the raw material. The 2 specimens pictured by Davis (D&T 1959: Pl. 2Am, n) illustrate this attribute.

Burials 90, 180, 219, and 312 were each accompanied by 1 or more fragments of sidebladed rib collected as a lot. Burial 139 was accompanied by 4 lots of fragments which represent at least 2 whole specimens. The single end fragment found with burial 180 is exceptional. It is broken lengthwise, leaving only the straight end and a single finished edge, along which 4 shallow grooves may be seen, beginning about 0.5 cm below the end and extending for 1.5 cm. A sidebladed rib artifact was reportedly associated with burial 226, but artifacts from that burial were not catalogued.

Table 3-26 gives provenience information for all specimens of sidebladed rib artifacts in the collections. Table 3-27 summarizes occurrence by depth. It should be noted that the artifact group is not restricted to depths below 55 inches, which was the case for the smaller sample described by Davis (D&T 1959: 53).

Sidebladed Rib Artifacts -- Ala-13 (5 specimens).

The specimens include 2 pointed end fragments, 2 straight end fragments, and 1 medial fragment. These are all probably cervid bone. All have been split and show a high polish. None were grave associations. They were recovered at the following locations (depths in inches presumed below datum plane): M-17, 18-24; I-13, 44; C-13, 62; F-13, 64; E-13, 60.

Sidebladed Rib Artifacts -- Ala-12 (1 specimen).

A segment of unsplit rib 12.7 cm long and 1.4 cm at maximum width has an irregular end and a rounded end, neither of which were evidently working ends. The rib surface is highly polished over longitudinal striations, comparable in this respect (and presumably in function) to sidebladed rib artifacts found at Ala-328 and Ala-13 which are made of split rib bone. The artifact was found unassociated in pit 0E/8N at 62 inches below surface.

Rackerby (1967: 44) classified 10 polished pieces of rib as strigils. I found no other polished rib segment, split or unsplit, sufficiently complete to be classed with the artifact just described. Among the untypable bone fragments were 8 specimens of polished spatulate bone, some of rib. One, from feature 28, was excavated after Rackerby's analysis; perhaps the other 7 were among the specimens which he classified as strigils.

Pointed Bone Tools -- Introduction.

Pointed bone artifacts from the 3 sites include a large number (about 550 specimens) which best fit type A, "awls", in Gifford's typology (1940: 168-170, 199-204). Gifford hypothesized that archaeological specimens in this type, like the ethnographic specimens in the type for which functions had been reported, were used in the manufacture of coiled basketry, for perforating skins for sewing, and for slitting lamprey eels for drying.

Because the term "awl" connotes basketry alone to many people, it should be emphasized that most of the pointed bone artifacts classified here would not be suitable for such use. This became evident when a sample of the archaeological specimens was compared with ethnographic specimens in the Lowie Museum of Anthropology which reportedly had been used as basketry awls (some of the same specimens examined by Gifford). Most of the specimens from Ala-328, -13 and -12 lack the smooth conical point evident on ethnographic basketry awls. Of those which are conically pointed, most are thicker at the tip than the ethnographic specimens. Thus, the majority of the pointed bone artifacts from the 3 sites are items whose function is unknown, and their presence should not be taken as evidence of the manufacture of basketry at the sites. No further speculation regarding use of the pointed bone artifacts is added here.[1]

The classification of pointed bone artifacts adopted here is similar to Gifford's. It differs primarily in emphasis on point form rather than bone type and degree of head modification, as the basis for defining most groups. As a result, specimens which belong to a single Gifford type are divided here between several different groups. It will be noted that a few of the groups used are closely equivalent to Gifford types. In these cases, the natural shape of a particular kind of bone dominates that artifact shape, including point form.

The groups of pointed bone to be described in this section are: pointed bone with angular tip, pointed bone with nippled tip, pointed bone with narrow smooth conical tip, sting ray spines, pointed ulnae with sharp tips, pointed bone with flat tip, pointed bird bone with hollowbacked tip, pointed bone with dull rounded tip, pointed bone with broad smooth conical tip, pointed deer splints. Examples from these groups are shown on Plate 1Y, 5P, and all of Plate 4.

Several hundred pieces of modified bone were recovered from the sites in such poor condition that their original form cannot be judged. These are labeled as "modified bone, untypable" in the tables of burial associations (Appendices 1, 2, 3 of Bickel 1976). They are not considered elsewhere.

Gifford's type A provided a detailed breakdown of bone type and degree of head modification in its subdivisions. In the descriptions which follow, A subtypes are used as abbreviations to summarize bone types used and degree of head modification on specimens of each group of pointed bone for which these attributes are variable. Subtypes of type A are used even for relatively blunt-tipped groups which might fall into Gifford's B and C types because they better describe bone type and modification than do B and C types. The text fully describes point form; the Gifford abbreviations are offered to provide details of shaft form. Gifford's definitions, included here for ease of reference, are (after Gifford 1940: 161):

[1] Four specimens, of the narrow conical, broad conical, and angular tipped typed, were examined in 1976 by a Pomo basketmaker, Mabel McKay. None were suitable for use in manufacture of the tightly weaved coiled basketry she makes, but she suggested that they could have been used for the manufacture of more open basketry, such as that used for fish traps. From conversation with Lawrence Dawson of the Lowie Museum I learned that Pomo fish traps are twined baskets. Dawson has seen pointed bone tools, particularly cervid ulnae, being used in the manufacture of twined basketry by contemporary Native Californians.

A1. Mammal leg bone.

- A1a. Head of bone intact to serve as handle.
  - A1aI. Cannon bone (distal end).
  - A1aII. Ulna.
  - A1aIII. Fibula.
  - A1aIV. Tibia.
  - A1aV. Radius.
- A1b. Head unworked except by original splitting.
  - A1bI. Cannon bone (distal end as head).
  - A1bII. Cannon bone (proximal end as head).
  - A1bIII. Tibia.
  - A1bIV. Radius.
- A1c. Head partly worked down.
  - A1cI. Cannon bone (distal end as handle).
  - A1cII. Cannon bone (proximal end as handle).
  - A1cIII. Tibia.
  - A1cIV. Radius.
- A1d. Head entirely removed.
- A1e. Splinter.
  - A1eI. Cannon bone.
  - A1eII. Tibia.
  - A1eIII. Radius.
- A1f. Awl with covered handle.
- A1g. Sharpened deer splint (vestigial outer metatarsal).

A2. Mammal rib.

A3. Mammal penis bone.

A4. Bird bone.

- A4a. Head of bone intact.
  - A4aI. Radius.
  - A4aII. Ulna.
  - A4aIII. Humerus.
- A4b. Cut-off bone.
  - A4bI. Radius.
  - A4bII. Ulna.
  - A4bIII. Humerus.
- A4c. Split bone.
  - A4cI. Ulna.
  - A4cII. Humerus.

A5. Fishbone.

- A5a. Sting-ray spine.
- A5b. Polished fishbone.

Pointed Bone with Angular Tip -- Ala-328 (68 specimens). Plate 4A, B.

Specimens assigned to this group have tips formed by the convergence of 2 or more planar or curved surfaces across the angular boundaries between them. This results in a tri- or multi-anguloid cross section at the tip, in contrast to the circular and elliptical cross sections of conical and flat tipped pointed bone artifacts. The Ala-328 specimen illustrated in Gifford (1940: 199, right hand AlaIV specimen) shows the angularity created by converging planes which characterizes specimens in this group. Tip shape is too angular and/or broad for use in the manufacture of coiled basketry.

The shape is never as flattened across 1 plane as that on the artifacts described below as pointed bone with flat tip. The 2 groups probably embrace tools used for different purposes. It seems likely that specimens with angular tips served multiple and varied uses, since they share point morphology with one another only grossly. Most specimens show very light to medium use-polish; a few show high polish at the tip.

Among some of the specimens made from splinters of bone, it is difficult to judge whether the proximal end is intact or broken. Of 25 specimens which are definitely complete, length ranges from 5.0 to 14.5 cm, with the mode in the 8 to 9 cm interval. Eleven specimens consist only of tip fragments with the characteristic shape. The group also includes 10 specimens broken at the extreme distal end, but sufficiently complete so that the form of their tips is adequately defined to permit their assignment to this group.

Two specimens of tibia, 2 of ulna, and 1 cannon bone were identified. All are probably cervid except 1 ulna.

Unbroken specimens include: 1 A1aII, 2 A1aIV, 4 A1b, 1 A1bIc, 14 A1e, 3 A5b. Broken specimens include: 6 A1b, 36 A1e, 1 A4.

Artifacts of pointed bone with angular tip were found with the following burials: 12, 14, 139 (2 specimens), 287, 358. The specimen which accompanied burial 287 (1-1587; Plate 4A) is unique. It is broken across the shaft at 6 cm length, with a rough groove cut around the circumference just below the break. It may have been an angular bi-point akin to a gorge hook, grooved around the middle for suspension. The specimen shows high polish overall except at the break.

Table 3-28 gives provenience for all specimens of pointed bone with angular tips. Table 3-29 summarizes occurrence by depth.

Table 3-28. Provenience of pointed bone, angular tip, Ala-328.

Depths in inches below surface.
t = tip fragment.
b = broken at extreme end.
* = burial association.

SFSU Grid I

A-1	32*
A-7	35*
B-1	84t
B-2	94*, 94t*
B-4	101
B-5	20b
B-6	120t
B-7	41t
C-3	54, 64b
C-4	7
C-7	96
D-5	85

Hayward Excavation

B1-67	6-12
C-66	30-36
C2-67	6-12
D-66	50
F1-67	33, 34
G-68	24,36
J-68	32

Wedel Excavation

0-5S	10-15E	70, 87
10-15S	0-5E	47
35-40N	50-60W	17

SFSU Grid II

A-4	24, 102*
A-5	90
A-6	48
A-7	66
A-9	88b
B-6	36b
B-7	27, 67t
B-9	92
C-5	84-96
C-6	104
C-10	48
D-5	91, 84-96
D-6	44b
D-7	44b
D-8	44, 72
D-9	32
D-10	34t
E-6	38b
E-7	35
E-9	48b
F-5	85
F-7	60*, 60t
F-9	69t
G-3	36
G-4	52, 72, 77
I-7	17
J-5	12-24t
J-7	35b
J-8	31t

Omitted: 5 SFSU specimens lacking complete provenience information.

Table 3-29. Summary of depth occurrence, pointed bone, angular tip, Ala-328.

Depth in inches below surface.
H = Hayward excavations.
W - Wedel excavations.

Depth	Number of Specimens
0-12	1 (+2H)
13-24	4 (+ 1H, 1W)
25-36	10 (+5H)
37-48	8 (+1W)
49-60	4 (+1H)
61-72	6 (+1W)
73-84	2
85-96	11 (+ 1W)
97-108	3
109-120	1
	50 (+9H, 4W)

Omitted: 5 SFSU specimens with missing or imprecise depth information.

Table 3-30. Provenience of pointed bone artifacts, Ala-13.

Depths in inches presumed below datum plane.

* = burial association	ds = deer splint
/ = missing information	u = ulna with sharp tip
ns = narrow smooth conical tip	h = bird bone with hollowbacked tip
b = broad smooth conical tip	n = nippled tip
a = angular tip	d = dull rounded tip
f = flat tip	

Pit	Depth	Pit	Depth
C-13	a: 48-60	G-17	ds: 67
	d: 18		n: 12-24
E-12	h: 71		d: 51
E-13	a: 67	H-12	f: 71*
E-14	b: 64	H-13	a: 47, 59
	ds: 45		d: 42
E-16	a: 34	H-18	a: 19
	d: 32, 36		n: 32
E-17	ds: 36-48	I-12	h: 73
	n: 20	I-13	a: 39
	d: /	I-17	b: 48-60
E-18	f: /		f: 67*
	d: 12-14		ds: 48-60
E-18, 19	ds: /	J-17	a: 34
E-19	a: 64		ds: 31
	u: 54		d: 39
F-13	ds: 56	K-17	f: 56
	d: 43	L-13	d: 43
F-17	a: 12	L-17	d: 53
	n: 34	M-17	a: 18, 31
G-12	a: 69*	N-17	ns: 61
G-13	ds: 48-60, 71*	Tr. 12	b: /
	d: 36-48		a: /

Pointed Bone with Angular Tip -- Ala-12 (5 specimens).

This is the bone artifact type found most frequently in mortuary context at Ala-12. One specimen is cannon bone, AlbII, and measures 12.7 cm in length. The 4 others are broken splinters of unidentified bone, Ale, in their present form. A single specimen was associated with burial 6, and 1 was found with mixed burials 11 and 12. Another came from the matrix of burials 7 and 8, and may have been a grave good. One of the artifacts on the periphery of pit feature 3 was a pointed bone with angular tip. Table 3-31 shows provenience of the specimens.

Pointed Bone with Nippled Tip -- Ala-328 (211 specimens). Plate 4M, N.

Specimens assigned to this group have blunt points with a distinctive tip form and a characteristic wear pattern in the tip area. Each tip has a small rounded knob or nipple on the end, formed by slight indentations on one or more sides, often marked by short transverse scratches. In the tip area and below, a concentration of erratic short scratches is found, especially on the convex bone surface of split-bone tools, presumably a result of tool use rather than manufacture.

Both the erratic scratch pattern and the nippled end are present on each artifact placed in this group. Broken-tipped specimens with the characteristic wear pattern are included only when the remaining tip form and the nature of the break strongly suggest the former presence of an end knob. Similarly, nipple-tipped specimens lacking the scratched wear pattern are included only if overall surface weathering is the evident reason that no striations are visible on the bone.

This group of pointed bone with nippled tip surely includes many of the specimens described by Davis as "fiber-strippers" (D&T 1959: 53-55, Pl. 2Cj-1). These are nowhere listed by catalog number, and so can not be identified with certainty. The text description suggests that Davis' "fiber-stripper" category is more inclusive than this group of nipple-tipped bone, in that presence of both tip form and wear pattern on each specimen is not an explicit trait of all "fiber-strippers". About 40 specimens in the nipple-tipped group discussed here came from Grid I. Davis, reporting only on Grid I material, found 48 "fiber-strippers". The discrepancy is not great. There are 15 artifacts from Grid I placed in the group of pointed bone with dull rounded tip yet to be described. Several of these show the erratic scratch wear pattern characteristic of nipple-tipped specimens, and these are probably some of the missing "fiber-strippers".

The attributes for the group of pointed bone with nippled tip have been

Table 3-31. Provenience of pointed bone artifacts, Ala-12.

Depths in inches below surface.
* = burial association
ns = narrow smooth conical tip
b = broad smooth conical tip
d = dull rounded tip
a = angular tip
f = flat tip
u = ulna with sharp tip
n = nippled tip

Pit	Depth
1W/2N	ns: 17 a: 44* f: 14 n: 0-4 d: 8, 20
0E/2N	n: 22
0E/5N	a: 40 f: 32 n: 19, 28, 36, 41 d: 30
0E/8N	b: 47 a: 57 n: 12, 25, 31, 32, 24-36, 46, 59 d: 24-36, 38
0E/11N	f: 36-42, 44 n: 28, 28, 32, 32, 32, 32, 35, 24-36, 42, 47 d: 17, 30
1E/7N	b: 36-38 a: 50-60 n: 18, 39 d: 18
0E/7N	n: 50
1E/10N	f: 60 u: 48-54 n: 36, 40-48
2.5E/11N	b: 43 a: 36-48* n: 24, 24-36, 36-48 d: 24-36
5.5E/4N	n: 26
5.5E/5N	n: 24-31
5.5E/7N	b: 12 n: 24-36 d: 31, 24-36

Provenience information is lacking for one nippled tip specimen.

defined as specifically as possible because the group comprises one of the few artifact types with a large inventory which appeared in Davis' analysis to be restricted to certain levels of the site (D&T 1959: 53, 55). Distribution of the specimens is discussed later in this section. No further speculation is added here to Davis' comments on the possible function of these tools (D&T 1959: 54).

Among the 211 specimens of pointed bone with nippled tip are 15 of rib, 14 of cannon bone, 6 of antler, 5 of tibia, 4 of ulna, 3 of scapula, 3 of probable radius, and 1 of rodent mandible. Some of the ribs are probably sea otter; the rest of the bone is land mammal, most probably cervid. In addition, 1 specimen of sea otter baculum has been identified, and 1 of what is presumably whale bone. One sturgeon parasphenoid was modified into a pointed bone with nippled tip, and 1 specimen is definitely bird bone; several other specimens are probably bird bone, but identification is uncertain.

Unbroken specimens include: 4 A1a, 7 A1aI, 4 A1aII; 15 A1b, 5 A1bI, 2 A1bII, 5 A1bIII, 3 probably A1bIV; 124 A1e; 14 A2; 1 A3; 1 A4; 1A5b. Unbroken specimens for which there is no appropriate Gifford type include: 4 of antler, 3 of scapula, 1 of rodent mandible, and 1 of probable whale bone. Broken specimens include 13 A1e, 1 A2 and 2 of antler. The relatively small percentage of broken specimens (8%) is evidence of the sturdiness of the type.

Length of complete specimens ranges from 3.5 to 19.0 cm, with mode in the interval between 6 and 7 cm, median between 7 and 8 cm. Only 19 specimens are longer than 10 cm. The short length of the artifacts surely contributed to their sturdiness.

Twenty eight specimens have working tips at both ends. Fourteen of these are nipple-tipped and erratically scratched at both ends. On 10 other specimens the second tip has a different form from that on the other end. The 4 remaining double-ended specimens are broken at one tip.

Tip shape was ascertained by placing specimens with convex or outer bone surface up, holding tip end distal and shaft end proximal to observer, and comparing the slope or angle at which the side edges converged to form the point. If slopes were about equal, the tip was classified "symmetrical". If the left edge sloped more steeply than the right edge (i.e., formed a more acute angle with the shaft axis), the tip was classified "asymmetrical-left"; and vice versa.

There were 75 symmetrical tips, plus 9 of the second tips on double-ended tools; 85 asymmetrical-left tips, plus 3 on double-ended tools; 31 asymmetrical-right tips, plus 2 on double-ended tools. Both tips of double-ended specimens shared the same symmetry classification in 5 cases, and differed in 9 cases. Twenty specimens were not classifiable because of splitting near the tip.

Perhaps handedness of the tool-user is related in some way to the preponderance of asymmetrical-left tips. Davis mentioned this differential tip wear on "fiber-strippers", and suggested that it might relate to handedness (D&T 1959: 53), although he did not report the pattern of asymmetry for the group of specimens he described.

Aside from the characteristic erratic scratches near the tip, relatively few surface striations are present on nipple-tipped bone artifacts. Nine specimens show some longitudinal striations; 15 have areas of transverse cuts and scratches; another 10 show a variety of cuts and scratches. Shouldering on one or both sides of the tip is common, as Davis noted; in 10 cases multiple concavities or grooves, usually 2, lie along one edge behind the point.

Most specimens show shouldering or chipping or beveling at the working end which has produced a point area thinner than the rest of the shaft. In a few cases, the point has been thinned to a knife-like edge. Nine specimens are noticeably broad and planar at the tip, hence less pointed in shape than others. Tips of 27 specimens, plus 3 of the second tips on double-ended tools, are thick and quite blunt in comparison to most specimens.

In Davis' sample of 48, all "fiber-strippers" were reportedly mineralized, and none were associated with burials (D&T 1959: 53). The enlarged sample embraced in this group of pointed bone with nippled tip contains only a minority of mineralized specimens. One artifact of this group was associated with each of burials 433-434, 435, 437, and 445. These include 4 adults, 1 female, 1 probable female, 1 probable male, and 1 of undertermined sex; neither age nor sex was determined for 1 individual. A pointed bone with nippled tip was reported as a possible association of burial 67-6, and another as a doubtful association of burial W4. The record for burial 189 reports a specimen from this group as a grave good; however, the catalogued location of the artifact is imprecise and does not mention association with a grave.

Table 3-32 shows provenience of specimens of pointed bone with nippled tip recovered from Ala-328. It includes estimates of the depth at which sterile base lay in each pit, so that depths can be related to the mound base as well as to mound surface. Table 3-33 summarizes the distribution of nippled tip specimens according to distance above submound. Table 3-34 summarizes occurrences of the artifact type by depths below surface. The data suggest a trend from greater use of nippled tip artifacts during the period when the first 4 feet of midden accumulated to relatively little use during the period of deposition of the upper 4 feet of midden.

Davis notes that "fiber-strippers" were recovered at Ala-307, Ala-309, Ala-329 in the Bay area and at coastal site Sma-22 (D&T 1959: 55, 75). I located 7 specimens of pointed bone with nippled tip in the Ala-307 collection [1]; 4 were recovered at depths from 92 to 179 inches, 1 from 27 inches, and 2 lacked provenience. In the Ala-309 collection I found 5 specimens of the type [2]; 4 came from Uhle's strata 8, 9 and 10, and 1 lacked provenience. Thus there is some support from these sites for the changing frequency of occurrence with time evidenced at Ala-328. On the other hand, Gerow has stated in conversation that tools of this form occur at all depths at Ala-329, and Coberly's report on some of the Ala-329 material suggests that the artifacts (called "shell pries" in that report) increased in frequency in shallow depths of the site (Coberly 1973: 67). It will be interesting to see if this is confirmed in analysis of a larger sample of material from the site now underway at Stanford.

Pointed Bone with Nippled Tip -- Ala-13 (4 specimens).

Three specimens are symmetrical at the tip; 1 is asymmetrical-right. A specimen made of an antler prong is 8.7 cm long. Two unidentified bone splinters, A1e, measure 2.8 and 10.9 cm in length. The remaining specimen, made of mammal rib, A2, is broken.

None were grave goods; 1 was recovered on housefloor feature 6. Table 3-30 gives provenience information; specimens came from shallow to intermediate depths at the site, as best it can be judged from the reported depths below datum plane. The relative paucity of specimens of pointed bone with nippled tip at Ala-13 compared to their abundance at Ala-328 may indicate that occupation of Ala-13 occurred at a period contemporary with shallower levels of Ala-328, where the artifact type was scarce relative to deeper levels.

Pointed Bone with Nippled Tip -- Ala-12 (36 specimens).

The few specimens identifiable as to bone type include 2 of cannon bone, 1 ulna, 1 rib, and 1 of antler; all of these are probably cervid bone. In addition, 1 specimen of sturgeon parasphenoid was recovered. Unbroken specimens include: 1 A1a, 1 A1aI, 1 A1aII, 5 A1b, 1 A1bI, 1 A1e, 1 A5b, and the antler piece for which there is no appropriate Gifford type. Broken

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1 Specimen nos. 1-123737, 1-123967, 1-123968, 1-123973, 1-123972, 1-123989, 1-123961. Six other specimens were possibly too broad and lacked distinct nippling: 1-121948, 1-122684, 1-123005, 1-123898, 1-123895, 1-123892.

2 Specimen nos. 1-4999, 1-9068, 1-9067, 1-8982, 1-8919. A sixth specimen, 1-8979, may belong to the type.

specimens include: 1 A1d, 14 A1e, 1 A2.

Length range of complete specimens is 5.4 cm to 14.0 cm. Three specimens are double-ended, 2 with a second nippled tip, 1 with a flat tip. Among intact tips, 19 are symmetrical, 7 are asymmetrical-left, and 1 asymmetrical-right. This includes the double-tipped specimens, 1 left/right, the other left/symmetrical.

Rackerby's "shouldered awl" category (1967: 42, Fig. 10C, D, E) segregates the nippled tip specimens with pronounced shouldering. Specimens with only slight nippling, or worn specimens with evidence of former nippling apparently fall into Rackerby's "fiber-stripper" category (1967: 44, Fig. 10A, B), which he does not define formally. It appears that Rackerby used 2 attributes, shouldering and erratic scratching in tip area, to define 2 artifact groups. He ignored the frequent co-occurrence of the 2 attributes. His claim that "shouldered awls" are unique to Ala-12 (1967: 42) shows a lack of awareness that Ala-328 contained artifacts with pronounced shouldering among the "fiber-strippers."

Although Rackerby does not list the individual specimens in each class, it appears that all of his "shouldered awls" and some of his "fiber-strippers" are among the specimens classified herein as pointed bone with dull rounded tip. The ulna, rib and antler specimens grouped here with other nipple-tipped bone artifacts are discussed separately by Rackerby (1967: 44, Fig. 11D).

One specimen of pointed bone with nippled tip was a possible association of vandalized burials 11, 12 and 13. Another was found in pit feature 9. Table 3-31 includes provenience of all specimens of pointed bone with nippled tip from Ala-12. They occurred from surface to 50 inches depth below surface. The relatively large number of specimens compared to the sample from Ala-13 suggests that Ala-12 is more similar to the deeper levels of Ala-328 than is Ala-13; i.e., that Ala-12 is older than Ala-13 if these 2 sites shared in the trend of decreasing use of tools of pointed bone with nippled tip indicated by the Ala-328 data.

Pointed Bone with Narrow Smooth Conical Tip -- Ala-328 (32 specimens). Plate 4E, F.

Specimens assigned to this group have smooth conical tips narrow enough to permit inference of possible use in manufacture of coiled basketry. Probably a few specimens too thick for coiling are included here, since an effort was made to place every possible coiling awl in this group.

Specimens show medium to high use-polish overall, with higher polish

Table 3-32. Provenience of pointed bone, nippled tip, Ala-328.

Depths in inches below surface.
* = burial association.
? = missing information.

> = greater than.
< = less than.
≤ = less than or equal to.

Submound Depth	Pit	Specimen Depth
SFSU Grid I		
?	A-3	88, 96
≤ 96	A-4	78, 90, 90, 92
≤ 100	A-5	87, 90, 96, 102, 102, 102, 108
108	A-6	86, 95, 108, 108, 108
105	A-7	102
?	A-8	120
124	B-1	93, 108, 116
> 94	B-2	72, 96
96-108	B-3	72, 96, 96
90-100	B-6	120
?	B-7	76
124	C-1	60-72
108	C-2	94, 94-106
?	C-4	108
?	C-6	86
> 88	C-7	62
≤ 124	D-1	100, 102
> 109	D-4	72, 105
> 100	D-5	75, 86
> 88	D-7	60, 132
≤ 124	E-1	122
SFSU Grid II		
109	A-3	93, 60-120
96	A-4	66, 84, 84, 84
85-112	A-5	76
93	A-6	92
96	A-7	94, 96
> 88	A-8	60, 82, 89, 103, 120
≤ 103	A-9	96, 96

(Table continued on next page)

Submound Depth	Pit	Specimen Depth
SFSU Grid II		
?	A-10	59, 69, 70
84-90	B-5	76
93-96	B-6	76, 84, 85, 85, 90,
≤ 103	B-8	56, 71, 85, 85, 87, 102
?	B-9	102
108	C-5	60*, 68*, 60-68, 60-72, 86, 84-96, 100, 108*
92-101	C-6	80, 80, 108, 109
96	C-7	72, 76, 102
79	C-8	70
> 90	C-9	0-60
< 105	D-5	55, 24-72, 74, 90, 90, 94, 94, 84-96, 96-108
96-108	D-6	60+, 82, 95
105-110	D-7	68, 84
90	D-8	54, 59, lower 60, 66, 72-84
103-120	D-9	lower 60, 89
72	D-10	54, 61
85-90	E-6	42, 67, 68, 69, 107
95-105	E-7	90, 91
63-75	E-8	60
72-84	E-9	47, 66, 72
> 88	F-5	67, 68, 68, 70, 71, 81, 87
92-94	F-6	37, 58, 84, 84
> 72	F-8	72
?	F-9	60, 70
85-90	G-4	60, 70, 72, 72
84	G-5	55, 55, 58, 60, 60, 63

Table 3-32. (continued)

Submound Depth	Pit	Specimen Depth
	SFSU Grid II	
84	G-6	48, 61, 70
80	G-7	60-72
53-66	J-6	40, 56, 55-60*, 60
54	J-7	31
69-70	J-8	7
54-60	J-9	36
	Hayward Excavations	
?	A-66	47
?	A1-67	6-12
?	B-66	38
54	B2-67	6-12
?	C-66	0-12, 0-12, 63
?	C1-67	24-30
≤66	D-66	42
48	E1-67	18-24
41	E2-67	24-30, 30-36
?	F1-67	1
50	F2-67	6-12, 12-18
?	G-68	17, 34
?	J-68	7
?	K-68	12, 18, 30, 30
?	L-68	13, 18, 23, 60
	Wedel Excavations	
? 35-40N	60-65W	20
? 0-5S	40-50W	16

Omitted: 12 SFSU and 3 Hayward specimens lacking location and/or depth data; plus 4 SFSU specimens lacking location, at 72, 96, 98, 106 inches below surface.

Table 3-33. Summary of distance above submound, pointed bone, nippled tip, Ala-328.

Distance in inches above submound.
H = Hayward excavations.
W = Wedel excavations.

Distance	Number of Specimens
at or in submound	18
1-12	27 (+1H)
13-24	37 (+1H)
25-36	13 (+1H)
37-48	5 (+2H)
49-60	1
61-72	1
	102 (+ 5H)

Omitted: 78 SFSU, 24H, 2W specimens because of missing or imprecise provenience data or unreported depth of submound for some pits. 16 of the omitted specimens were possibly recovered farther than 36 inches above submound. (Specimens with no reported depth not subject to speculation.)

Table 3-34. Summary of depth occurrence, pointed bone, nippled tip, Ala-328.

Depths in inches below surface.
H = Hayward excavations.
W = Wedel excavations.

Depth	Number of Specimens
0-12	1 (+8H)
13-24	0 (+7H, +2W)
25-36	2 (+6H)
37-48	5 (+3H)
49-60	21 (+1H)
61-72	35 (+1H)
73-84	21
84-96	42
97-108	24
109-120	5
121-132	2
	158 (+26H, +2W)

Omitted: 22 SFSU and 3 Hayward specimens with imprecise depth or no depth reported.

on tip in cases where degree of polish varies over the piece. About half the specimens retain striations parallel to the length of the shaft, perhaps the result of a shaping, smoothing or sharpening process. Few show these within 2 cm of the tip, where they were presumably worn away by use. In a few cases, transverse scratches, cuts or slight grooves across portions of the shaft are visible.

Length among 15 unbroken specimens ranges evenly from 7.5 to 15.0 cm. The group includes 4 fragments consisting only of tips with the characteristic shape. In addition, there are 3 specimens with tips which are narrow enough for coiling, but slightly flat or angular rather than smoothly conical in shape.

Nine specimens of cannon bone, 2 of radius, and 1 baculum were identified. Of these, the latter is sea otter, one radius is canid, and the cannon bones are probably deer or antelope.

Unbroken specimens include: 1 AlaV; 1 Alb, 1 AlbI, 4 AlbIIb, 1 AlbIIc; 1 Alc, 1 AlcII, 1 AlcIV; 2 Ale; and 1 A3. All 17 broken specimens are splinters (Ale) in their present form.

Burials 38, 58, 139, and 328 were each accompanied by a single specimen of pointed bone with narrow smooth conical tip. These include 3 adults, 2 male and 1 female; 1 individual was not aged or sexed. Table 3-35 given provenience information for all specimens of this group; Table 3-36 summarizes their occurrence by depth.

The recovery of so few awls suitable for coiling suggests that coiled basketry was not manufactured at the site. It may simply reflect the fragility of such awls, which cannot be accurately typed by the archaeologist when recovered after tip breakage. No basketry impressions were discernible on baked clay pieces recovered from the site.

Pointed Bone with Narrow Smooth Conical Tip -- Ala-12 (1 specimen).

The artifact is radius bone, AlbIV, measuring 11.7 cm in length. Its provenience is shown on Table 3-31.

Sting Ray Spines -- Ala-328 (12 specimens). Plate 1Y.

These are caudal spines, or "stings" of the bat ray, Myliobatis californica (see Follett 1975a: 73-75). This group is more inclusive than Gifford's type A5a, which is apparently confined to sting ray spines with barbs

Table 3-35. Provenience of pointed bone, narrow smooth conical tip, Ala-328.

Depths in inches below surface.
* = burial association.
t = tip fragment.
? = slightly angular or flat.

SFSU Grid I

A-2	42
A-5	79*
B-2	94? *
C-1	90, 102
C-7	17t*, 60?
D-4	84

Wedel Excavations

0-5S	0-5E	60
0-5S	50-60W	45

SFSU Grid II

A-4	52
A-5	46
A-7	24
A-8	54
B-8	76t
B-10	54, 60
C-7	17t
D-5	44
D-6	0-12
D-8	82*
D-9	40, 79
E-6	42, 50?
F-5	61
G-3	48
G-4	40, 42
G-5	84

Omitted: 2 SFSU specimens with incomplete provenience data.

Table 3-36. Summary of depth occurrence, pointed bone, narrow smooth conical tip, Ala-328.

Depths in inches below surface.
W = Wedel excavations.

Depth	Number of Specimens
0-12	1
13-24	3
25-36	0
37-48	8 (+1W)
49-60	7 (+1W)
61-72	1
73-84	6
85-96	2
97-108	1
109-120	0
	29 (+2W)

Omitted: 1 SFSU specimen with unrecorded depth.

ground off (1940: 170). As Gifford notes, unworked spines are not unusual in Bay area shellmounds. Since it is difficult to judge whether most specimens from Ala-328 were deliberately modified or not, all sting ray spines recovered at the site are considered together in this group.

Examination of unmodified spines of Myliobatis californica at the California Academy of Sciences, with the assistance of W. I. Follett, established the basis for judging the nature and extent of modification of the archaeological specimens.

Four spines show a definite cut or groove in the proximal end, analogous to the nock in an arrowshaft. Four others which are less certainly notched may be unmodified. Perhaps this end notching played a part in a hafting process. All specimens show reduction of marginal teeth at the distal end, but this is a natural feature, as is a flattened surface on 1 side of the proximal end, which marks the point of attachment of the spine to the ray body. Four specimens show some removal or wear of marginal teeth along the shaft, but only in 1 case does this occur for several centimeters near the tip as if a sharp narrow point were the goal. None is modified to the extent of Ala-309 specimen 1-8636, which has no barbs for the distal 3. 5 cm and has been ground smooth over that area. Length of unbroken specimens ranges from 5. 5 to 7. 0 cm; a broken specimen increases the range to 7. 5 cm.

Use of these artifacts in conjectural. Follett has suggested (1975a: 75) that they might serve as punches if marginal teeth are trimmed. In Australia they are reportedly used as spear points (Sharp 1952: 19), but this is far afield for safe use of ethnographic analogy.

Sting ray spines were associated with the following burials: 139 (3 specimens), 188, 224, and 272. A sting ray spine was reportedly associated with burial 226. Artifacts from that burial were not catalogued; while some can be identified in the burial photograph, it is not surprising that so small an item as a sting ray spine is not visible, and its occurrence cannot be confirmed.

By pit and depth below surface, specimens came from: B-2 I, 94" (3 specimens); D-7 I, 46"; F-7 I, 48"; A-3 II, 12"; B-9 II, 82"; D-8 II, 20"; F-10 II, 26". Location is unknown for 1 specimen recovered at 0 to 6 inches depth, and 1 from 74 inches below surface. Depth is unreported for a specimen found in pit F-8 II.

Sting Ray Spines -- Ala-13.

Rackerby (1967: 23) reports that 38 "sting ray barbs" were collected from feature 2. I was unable to locate artifact lot 6309, which should be these barbs, but they are visible in a photograph of artifacts collected from the feature. The artifact (30-127) associated with burial 55, which Rackerby (1967: 23) describes as a sting ray barb is unmodified fish bone. The bone has not been identified as to type or species, but it is definitely not a sting ray spine.

No sting ray spines were recovered at Ala-12.

Pointed Ulnae with Sharp Tips -- Introduction.

Bone type is one of the diagnostic criteria of these groups because of the unique combination of natural handle and narrowed shaft offered by ulnae (see Bennyhoff 1953: 269). The shaft lends itself to particular tip forms, which differ for cervid and non-cervid ulnae; hence the two are treated as separate groups. Some pointed ulna artifacts were recovered which do not share the typical point forms described for these groups. These artifacts have been placed in other groups according to their tip form. Ulna specimens occur among artifacts of pointed bone with angular tips, nippled tips, dull rounded tips, and broad smooth conical tips. Some of them are probably reworked specimens which once had the point forms described for these groups.

Pointed Cervid Ulnae with Sharp Tips -- Ala-328 (13 specimens). Plate 4L.

Specimens in this group were manufactured from elk, deer and possibly antelope ulnae. Tips are elliptical in cross section, as are the shafts on which they are made. Point form overlaps with the flat V-shaped tip characteristic of the group of pointed bone with flat tip described below. The difference lies in generally sharper tips and narrower shafts of unsplit bone on the ulnae. Flatness of tip varies, with a few tips approaching a conical cross section. (One ulna on which the tip is conical has been placed in the general group of pointed bone with broad smooth conical tip.) All tips are more broad and less round than tips of ethnographic basketry awls, though more sharply pointed than specimens of Gifford's type C (1940: 170-171, 207-209). For this reason, they do not fit Bennyhoff's classification of blunt ulnae (1953: 270). Use-polish varies from light to high on different specimens. Some specimens, especially those with high polish, may have been coiling awls which were reused for a different task after breakage of the fine tip. As mentioned above, cervid ulnae have been observed in use in the manufacture of twined basketry.

Pointed cervid ulnae include 2 of elk, 10 of deer, and 1 of deer or antelope. The 2 elk ulnae and 8 other specimens are right limbs; 2 are left limbs. Seven artifacts show modification of the radial notch epiphysis. Length below radial notch is 11.5 and 12.0 cm for elk specimens, 3.0 to 14.5 cm for others (mode 5.0 cm). Total length ranges evenly from 6.5 to 18.5 cm (no mode; median 11.5 cm). On 3 specimens the proximal head is complete; 4 lack epiphyses; 2 (1 elk) were severed above the radial notch, and 2 (1 elk) above or within the semilunar notch. Eight specimens show longitudinal striations on the shaft.

Burial 409 was accompanied by 2 cervid ulnae with sharp tips. Burials 365 and 437 were each found with a single specimen of this group. Table 3-37 gives provenience information for cervid ulnae with sharp tips; Table 3-38 summarizes their occurrence by depth.

There are no specimens of pointed cervid ulnae with sharp tips in the collections from Ala-13 and Ala-12.

Pointed Non-cervid Ulnae with Sharp Tips -- Ala-328 (5 specimens). Plate 4K.

Specimens in this group were manufactured from raccoon and canid ulnae. Tips are flat or semi-conical, formed by an angular cut or bevel across the shaft, with inner tissue usually revealed. Point form is identical to that of specimens of pointed bird bone with hollow-backed tip, described below. The mammal ulnae are sturdier artifacts than the latter, and are further set apart by their naturally broadened proximal ends.

Specimens include 1 canid ulna, 3 of raccoon, and 1 unidentified ulna broken below the head. Three specimens show high use-polish, 2 light. Three are left limbs, 1 right, and the broken specimen is indeterminate. Lengths are 8.9, 12.1, 12.3, 12.5, and 6.8 cm, the latter measurement pertaining to the broken specimen.

None of these artifacts were associated with burials. Table 3-37 includes provenience information for pointed non-cervid ulnae with sharp tips; Table 3-38 summarizes their occurrence by depth.

Pointed Non-cervid Ulnae with Sharp Tips -- Ala-13 (1 specimen).

The artifact is canid or raccoon ulna; it measures 15.0 cm in length. Provenience is shown in Table 3-30.

Table 3-37. Provenience of pointed ulnae, sharp tips, Ala-328.

Depths in inches below surface.
* = burial association.
n = non-cervid.
# (#) = multiple specimens: count (depth).

SFSU Grid I

A-6	68n
A-8	28n
B-6	60-120n
D-5	60n

Grid II

A-4	2(103*)
C-9	16n
C-10	29
D-5	90-95
D-9	62
F-5	66, 87, 92
F-7	116
F-8	72
G-6	65*
I-7	12-24
J-6	62*

Table 3-38. Summary of depth occurrence, pointed ulnae, sharp tips, Ala-328.

Depths in inches below surface.

Depth	Number of Specimens	
	Cervid	Non-cervid
0-12	0	0
13-14	1	1
25-36	1	1
37-48	0	0
49-60	0	1
61-72	5	1
73-84	0	0
85-96	3	0
97-108	2	0
109-120	1	0
	13	4

1 non-cervid specimen omitted, imprecise depth.

Table 3-39. Provenience of pointed bone, flat tip, Ala-328.

Depth in inches below surface.
* = burial association.
t = tip fragment
b = broken at extreme end.

SFSU Grid I

A-3	78t
A-5	64
A-7	35
B-1	84
B-2	60*
B-5	40
B-7	66
C-1	48-54b
C-6	8
D-7	48
E-7	42*
F-7	30

SFSU Grid II

A-8	68, 82
B-5	18
C-5	67b
C-6	40
D-6	77
D-9	52
F-5	47t
F-8	60
G-3	8, 16, 37
J-8	20
J-9	58t

Omitted: 1 specimen lacking depth information.

Pointed Bone with Flat Tip -- Ala-328 (27 specimens). Plate 4G, H.

Specimens assigned to this group have V-shaped points. In cross section, the tips are flatly elliptical. Most of the shafts are split bone; all are relatively flat in comparison to shafts of other groups except sting ray spines and deer splints. Artifacts in this group contrast with the latter 2 types in larger size and lesser fragility. The group is closest to B1 and B2 among Gifford types (1940: 170).

Longitudinal striations and apparently erratic scratches are visible on shafts of most specimens. Most specimens show some use-luster. Tips are often highly polished when overall polish is lighter. Two specimens curve upward at the tip when laid flat, due to natural curvature. A breakage pattern of slight chipping at the tip is noticeable (found on 7 specimens, several probably reused after breakage).

Four specimens of cannon bone and 2 of rib were identified. All are probably cervid. The cannon bone specimens resemble ethnographic implements of split cannon bone catalogued as "eel splitters" in the Lowie Museum collection. The ethnographic specimens have a knife-like thinness of shaft at the working end, which is found only on some of the specimens of this group.

Unbroken specimens include: 5 Alb, 2 AlbI, 1 AlbII, and 7 Ale. Broken specimens include: 1 AlbIIa, 9 Ale, 2 A2.

For 15 intact specimens, length ranges from 6.5 to 18.0 cm, with the mode in the 10 to 11 cm interval. Three specimens consist only of tips with the characteristic shape. Two other specimens are broken at the tip, but are sufficiently complete to allow them to be placed in this group.

Burials 87 and 142 were each accompanied by a single artifact of pointed bone with flat tip. Table 3-39 gives provenience information for all specimens in the group. Table 3-40 summarizes occurrence by depth.

Pointed Bone with Flat Tip -- Ala-13 (4 specimens).

One specimen is unsplit rib, A2; 3 are splinters of bone, Ale, 1 identifiable as cannon bone. The rib is 21.0 cm long, and the splinters measure 8.9, 10.9 and 13.2 cm in length. A flat tipped pointed bone lay between the skulls of burials 82 and 83, and another was associated with burial 94. Provenience of all specimens is included in Table 3-30.

Pointed Bone with Flat Tip -- Ala-12 (5 specimens).

Specimen 29-245 is illustrated in Rackerby (1967: Fig. 10H). It is made of unidentified bone, and is 20.0 cm long. Two broken specimens are made of the same bone type. All 3 are A1d. Another broken specimen is a splinter of unidentified bone, A1e, in its present form. The fifth artifact of this type is intact, a cannon bone, A1bI, measuring 16.5 cm in length. One artifact of pointed bone with flat tip was recovered from feature 28. None were grave goods. Table 3-31 shows provenience of all specimens.

Pointed Bird Bone with Hollowbacked Tip -- Ala-328 (42 specimens). Plate 4I, J.

This group corresponds to Gifford's type A4 (1940: 169), although not all of the subtypes are represented among the pointed bird bone from Ala-328. Specimens in the group have rounded or V-shaped tips formed by cutting or grinding at a low angle across the hollow shaft. Length of the cut is usually between 1 and 2 cm in extent. All of the pointed bird bone artifacts from the site were treated in this way. (Two were further modified to produce an angular and a nippled tip, respectively; these are tabulated with the appropriate groups of bone.) The only mammal bone specimens with similar points are the non-cervid ulnae with sharp tips.

Use-polish varies from light to high, but most specimens show relatively little polish. Striations along the shaft generally occur only in the immediate vicinity of the tip, probably the result of the manufacturing process rather than use. All identifiable specimens were manufactured from radii; only 1 specimen was made of split bone rather than an intact shaft.

Shaft diameters range from 0.2 to 0.8 cm (mode 0.4 cm). Twelve specimens with head intact and 6 specimens severed immediately below the proximal joint are definitely unbroken. Among these, length ranges from 8.0 to 19.0 cm (mode 12.5 cm).

A single pointed bird bone with hollowbacked tip accompanied burial 139. Table 3-41 gives provenience information for all specimens in this group. Table 3-42 summarizes their occurrence by depth.

Pointed Bird Bone with Hollowbacked Tip -- Ala-12 (2 specimens).

The 2 catalogued specimens are both tip fragments which were not associated with a burial or feature. Their provenience is given in Table 3-30.

Table 3-40. Summary of depth occurrence, pointed bone, flat tip, Ala-328.

Depth in inches below surface.

Depth	Number of Specimens
0-12	2
13-24	3
25-36	2
37-48	6
49-60	5
61-72	4
73-84	4
	26

1 specimen omitted; no recorded depth.

Table 3-41. Provenience of pointed bird bone, hollowbacked tip, Ala-328.

Depth in inches below surface.
* = burial association.

SFSU Grid I

A-4	64, 65
A-6	68, 84
A-8	74
B-2	26, 94*
B-3	108
B-4	72
B-6	62, 84
C-2	21, 60
C-4	120
C-7	42
D-1	114

SFSU Grid II

A-8	72
A-9	28, 43
B-4	34, 101

Table 3-41. (continued)

SFSU Grid II

B-8	46
C-5	60-72
C-6	49
C-9	0-60
D-5	36-48
D-7	70
D-8	0-60
D-9	48
D-10	59
E-8	83
G-3	40
G-5	24, 54
G-7	0-60

Omitted: 7 SFSU specimens lacking complete provenience information.

Table 3-42. Summary of depth occurrence, pointed bird bone, hollowbacked tip, Ala-328.

Depth in inches below surface.

Depth	Number of Specimens
0-12	0
13-24	2
25-36	3
37-48	6
49-60	4
61-72	8
73-84	4
85-96	1
97-108	2
109-120	2
	32

10 specimens omitted; imprecise location or depth data.

In addition to these, 10 uncatalogued specimens, all large radii, came from a drawer in which bird bone from feature 14 was stored. Eight specimens, 4 right and 4 left, are pointed with long beveled cuts at the distal end; proximal heads are intact. Present length ranges from 26.5 to 29.0 cm. All appear to be of the same species as 2 unmodified radii also recovered from feature 14. Two other specimens, 1 right and 1 left, bear similar points at the proximal ends, and distal heads are intact. Both are 25 cm in length. They may be of a different species than the other pointed radii recovered from feature 14. Although Rackerby mentions only 9 pointed bones from feature 14 (1967: 10), these 10 appear to be matched in pairs, and probably all were recovered from the feature. The uncatalogued specimens are not included in Table 3-30.

No artifacts of pointed bird bone with hollowbacked tip were recovered from Ala-12.

Pointed Bone with Dull Rounded Tip -- Ala-328 (70 specimens). Plate 4 O, P.

Specimens of this group are the least pointed of all artifacts describable as pointed bone. Tips are dull, rounded in shape, broad in width and often thick in breadth. The group is equivalent to Gifford's type C (1940: 171-172).

Some tips have been smoothed and polished by use; others bear deep scratches, like those on bone tools used ethnographically as flakers. Several specimens show the erratic scratch pattern characteristic of nipple-tipped bone artifacts, and perhaps were reused in a different manner after breakage of the original tip.

Nineteen specimens of ulna, 3 of baculum, 3 of cannon bone, 3 of rib and 1 humerus are identifiable by bone type. Fourteen of the ulnae are non-cervid (canid and raccoon), and 5 are deer or antelope bone. The cannon bones, ribs and humerus are all cervid, probably deer, and the bacula are sea otter.

Among unbroken specimens, there are 3 A1a (C), 3 A1aI (C1); 6 A1b (C); 19 A1aII (C2); 32 A1e (C); 1 A2 (C5); 3 A3 (C6). Appropriate C subtypes designations have been included here in parentheses.

Modal length of unbroken specimens is 7.5 cm; lengths range from 3.5 to 17.0 cm. Among ulnae, total length ranges from 7.2 to 9.6 cm, and they measure 4.0 to 6.0 cm in length below radial notch. In dull point form and length they correspond to Bennyhoff's class C2c of blunt ulna tools (1953: 270). The Ala-328 specimens are slightly longer below the radial notch than the Napa artifacts for which the class was defined.

None of the artifacts of pointed bone with dull rounded tip were recovered as grave goods. Table 3-43 gives provenience information for all specimens; Table 3-44 summarizes their occurrence by depth. The tables indicate some clustering of SFSU specimens in depths below 60 inches. To incorporate the Hayward specimens in a meaningful way, depths were examined in regard to distance above submound (using estimates from Tables 3-32 and 2-6). Thirty one specimens lay within 36 inches of the mound base (27 of these within 24 inches of submound), and 11 were further than 36 inches from the base. Because depth to base is unknown or imprecise for many pits, position with regard to submound cannot be calculated for 28 specimens. It seems likely that the clustering near submound reflects presence of a number of blunted formerly nippled tip specimens in this group, while the spread at shallower depths reflects other kinds of dull pointed tools lumped here.

Pointed Bone with Dull Rounded Tip -- Ala-13 (12 specimens).

Among identifiable broken specimens are a cervid ulna, an unidentified mammal tibia, a sea otter baculum, and 2 antler pieces, 1 a tine and 1 a flat piece of outer tissue. One broken specimen is a bird ulna. The unbroken specimens include 1 AlaII, 1 AlaIV, 1 A3, 3 Ale, and 2 of antler. Length range of unbroken specimens is 4.9 to 14.5 cm. Broken specimens include 3 Ale and 1 A4cI. Provenience of all specimens is given on Table 3-30. None were burial associations.

Pointed Bone with Dull Rounded Tip -- Ala-12 (11 specimens).

One specimen is made of non-cervid ulna; the others are unidentifiable as to bone type. Unbroken specimens include 1 AlaII, 1 Alb, 4Ale. The remainder of the specimens are Ale; 2 are definitely broken, 3 less certainly so. Unbroken specimens range in length from 3.9 to 7.7 cm; 1 of the possibly broken specimens is 12.6 cm long in its present state. On 2 specimens, both ends have been used; there are dull rounded tips at each end of both artifacts. The "fiber-stripper" illustrated in Rackerby (1967) as Figure 10B is a pointed bone with dull rounded tip. Table 3-31 includes provenience of all specimens. None were grave goods.

Pointed Bone with Broad Smooth Conical Tip -- Ala-328 (52 specimens).

Specimens placed in this group have smooth conical tips too broad to have been used in manufacture of coiled basketry. They show medium to high

Table 3-43. Provenience of pointed bone, dull rounded tip, Ala-328.

Depths in inches below surface.

SFSU Grid I

A-1	120, 120
A-2	38, 120
A-4	120
A-5	96
A-5, 6	109
A-6	97, 108
B-2	72
B-3	84-96, 96, 96
C-2	94-106
E-7	41

SFSU Grid II

A-4	84
A-5	80
A-8	84
B-6	34, 92
B-8	85
B-9	94
B-10	75
C-7	6, 30, 96
D-5	72-84, 90
D-7	0-18, 66
D-8	84
E-5	0-12, 6
E-6	68, 75, 91
E-7	41
F-5	52, 63, 84
F-9	56
G-3	9
G-4	50
G-6	66, 66

Hayward Excavations

B1-67	6-12
C-66	0-12, 48-54, 63
D-66	24-30
D2-67	24-30, 30-36
E2-67	30-36
F1-67	19
F2-67	40
G-68	19, 38, 31
J-68	36
K-68	36
L-68	25

Omitted: 9 SFSU specimens lacking complete provenience information.

Table 3-44. Summary of depth occurrence, pointed bone, dull rounded tip, Ala-328.

Depths in inches below surface.
H = Hayward excavations.

Depth	Number of Specimens
0-12	4 (+2H)
13-24	0 (+2H)
25-36	2 (+9H)
37-48	3 (+1H)
49-60	3 (+1H)
61-72	6 (+1H)
73-84	8
85-96	10
97-108	2
109-120	5
	43 (+ 16H)

11 SFSU specimens omitted because of imprecise or incomplete provenience data.

polish overall. About one third of the specimens retain longitudinal striations like those found on pointed bone artifacts with narrow smooth conical tips, described above; likewise, some bear transverse scratches.

Among the 29 unbroken specimens, length ranges from 5.5 to 16.5 cm, with mode in the interval between 10 and 11 cm. The group includes 5 fragments consisting only of tips with the characteristic shape. In addition, there are 5 specimens broken at the extreme distal end, but sufficiently complete so that the form of their tips is adequately defined to permit their assignment to this group.

Ten specimens of cannon bone, 5 of rib, 2 of radius, 1 humerus, 1 ulna, and 1 baculum were identified. Of these, the latter is sea otter; the ulna, most ribs and the cannon bones are probably deer or antelope.

Unbroken specimens include: 1 Ala humerus, 1 AlaII, 1 AlaV; 5 Alb, 2 AlbI, 1 AlbIa, 3 AlbII, 3 AlbIIb, 1 AlbIV; 1 Ald; 7 Ale, 1 AleI; 1 A2; 1 A3. Broken specimens include: 1 Alb, 18 A13, and 4 A2.

No specimen of pointed bone with broad smooth conical tip was recovered as a grave good. Table 3-45 gives provenience information for all specimens of this group; Table 3-46 summarizes their occurrence by depth.

Pointed Bone with Broad Smooth Conical Tip -- Ala-13 (3 specimens).

A bisected biconical perforation, with the break now well-polished, lies on the proximal end of 30-126, which is a flat split segment of cannon bone, A13, measuring 9.9 cm in length. Another splinter of cannon bone, Ale, is broken. The other specimen is sea otter baculum, A3, 13.0 cm long. None of the specimens accompanied burials. Their provenience is shown on Table 3-30.

Pointed Bone with Broad Smooth Conical Tip -- Ala-12 (4 specimens).

Two specimens are fragments of unidentified bone. One of them was recovered in the vicinity of vandalized burial 13, and may have been associated with the grave. The unbroken specimens include 1 of unidentified bone, Alb, and 1 radius, AlbIV, measuring 7.7 and 11.6 cm in length, respectively. Provenience of all specimens is given in Table 3-31.

Table 3-45. Provenience of pointed bone, broad smooth conical tip, Ala-328.

Depths in inches below surface.
t - tip fragment.
b = broken at extreme end.

SFSU Grid I

A-2	110
A-6	84
B-6	60
C-1	90
C-2	78
C-5	72
C-7	60
D-5	86, 92
E-1	65, 60

Hayward Excavations

A-66	48
E-66	30-36
F1-67	46

SFSU Grid II

B-6	36-48, 54
B-7	48
B-8	63
B-9	49
C-6	100
C-7	58t
C-8	49
C-9	36, 50t, 0-60
D-5	12-24b
D-7	47
D-9	24
E-6	0-12
E-8	44, 55b
E-10	45
F-5	74t
F-6	41
F-7	87b
F-9	58, 58
G-4	20t, 34, 37
G-5	50, 60b
G-7	60
J-8	24

Omitted: 1 Wedel and 7 SFSU specimens lacking complete provenience information.

Table 3-46. Summary of depth occurrence, pointed bone, broad smooth conical tip, Ala-Ala-328.

Depths in inches below surface.
H= Hayward excavations.

Depth	Number of Specimens
0-12	1
13-24	4
25-36	2 (+1H)
37-48	8 (+2H)
49-60	15
61-72	5
73-84	3
85-96	4
97-108	1
109-120	1
	44 (+3H)

1 Wedel and 4 SFSU specimens omitted because of imprecise or missing depth data.

Pointed Deer Splints -- Ala-328 (5 specimens). Plate 5P.

This group is the same as Gifford's type Alg. "sharpened deer splint (vestigial outer metatarsal)" (1940: 169). Two specimens are illustrated by Davis (D&T 1959: Pl IBr, s).

On all 5 specimens, the distal end has been narrowed to a sharp V-shaped point. Longitudinal striations, presumably from the sharpening process, can be seen on 4 of the artifacts. Use-polish on shaft and edges extends back 2 to 3 cm from the tip on all specimens. Total lengths are between 5 and 6 cm.

SFSU excavations yielded specimens from: B-3 I, 60"; B-8 I, 42"; C-5 I, 60"; G-6 II, 70"; (all depths below surface). A specimen was found in Wedel excavations at 20 inches below surface in pit 0-5S 0-5E. None of the recovered pointed deer splints were grave goods.

Pointed Deer Splints -- Ala-13 (9 specimens).

Shafts on all 9 splints have been narrowed to a sharp V-shaped point. Longitudinal striations are visible on all but 1. Two specimens lack the proximal epiphysis; presumably they came from immature deer. Length among unbroken specimens ranges from 3.9 to 7.5 cm. Burial 44 was accompanied by a modified deer splint. Provenience of all specimens is shown on Table 3-30.

There are no pointed deer splints in the collection from Ala-12.

Perforated Mammal Teeth -- Ala-328 (29+ specimens). Plate 1X.

These artifacts are all canid incisors (upper, lower, and indeterminate; all of Canis sp.) with biconical perforations through the roots. They fit Gifford type UU4 (1940: 185). The specimen illustrated by Gifford (1940: 234) is from Ala-328, one of two teeth found in possible association with burial W1.

Perforated teeth were definite accompaniments of burials 18 (7 specimens and a fragment in collection; 13 reported), 68 (7 specimens), 90, 315 (2 specimens), and 433-434. One specimen is catalogued as an association of burial 353, but it is not listed among grave goods in the burial record.

Table 3-47 gives provenience information for perforated teeth. Only 1 specimen, in F-7 II at 72 inches depth, was possibly within 36 inches of the

Table 3-47. Provenience of perforated mammal teeth, Ala-328.

Depths in inches below surface.
* = burial association.
# (#) = multiple specimens: count(depth).

SFSU Grid I

A-9	7+(37*)
B-2	62
C-5	72
C-7	7(54*), 60*
E-6	3

SFSU Grid II

C-5	55-60*
C-7	2(55*)
D-8	44
F-7	72
G-6	40
I-6	0-12

Hayward Excavations

A-66	6-12

Wedel Excavations

5-10S 5-10E 2(74)

Omitted: 1 SFSU specimen at unreported depth.

Table 3-48. Provenience of dull pointed fishspear prongs, Ala-328.

Depths in inches below surface.
* = burial association.
a = MM2a specimen
b = bipointed specimen.
f = flat specimen.

SFSU Grid I

A-2	53*
A-3	42, 108b
C-3	79f
C-4	79a
C-6	30-36, 36, 36b

SFSU Grid II

A-5	84b
A-6	24
B-6	42
B-10	14
C-5	58*
C-8	53
F-5	44
G-7	24

Omitted: 6 SFSU specimens lacking complete provenience information.

mound base (depth to base varied from 96 to 120 inches in that pit). It appears that perforated canid incisors were not in use during the earlier phases of occupation at Ala-328. The relatively small number of teeth recovered and the fact that most midden was not screened are factors which necessitate a tentative conclusion in that regard. It should be noted that an unperforated incisor of bear (Ursus sp.) accompanied a burial in the basal cemetery. However, other occurrences of unperforated mammal teeth, all canid, were well above submound. The unperforated mammal teeth are described below, in a separate section.

Perforated mammal teeth were not found at either Ala-13 or Ala-12.

Pointed Thick Spatulate Bone -- Ala-328 (7 specimens).

Four heavy spatulate bone (elk tibia?) artifacts with the swordlike form and rounded-V point shape illustrated for Gifford's type M (1940: 215-216) fall into this group; see Plate 3A. Two other specimens have the same blade and point form, but each ends proximally in a large ring formed by hollowing out the split distal joint of the elk cannon bone from which the artifact is made; see Plate 3B. These are equivalent to the "ringed daggers" excavated from a coastal site in Marin County (Beardsley 1954: 42).

Two of the presumed tibia specimens lack the proximal end. The other 2 are indented, like those illustrated by Gifford, and each has a single perforation, 0.4 and 0.6 cm below the end, and 0.2 and 0.5 cm in diameter, respectively. One had 2 Olivella disc beads attached to each of the "ears" when excavated, and 2 parallel lines of punctations cross the convex surface immediately below the area of attachment of the beads. The other specimen has no punctate design or beads, but the presence of a black substance (asphaltum?) over much of the first 3.5 cm of the proximal convex surface suggests that an overlay was present at one time.

Both cannon bone and tibia specimens curve upward to a distance of 1.0 to 1.5 cm from the horizontal at the distal end when laid flat with the concave surface down; the curvature may be a result of human modification. The complete tibia specimen measures 35.5 cm in length, average width 3.5 cm. The complete cannon bone specimen is 30.5 cm in length, average width 3.0 cm.

The 2 cannon bone specimens and the tibia specimen with bead overlay and punctate design lay in the right shoulder area of burial 226 in pit D-8 II at 40" below surface (b. s.). Another tibia spatulate was found in the lap area along the tibiae of burial 391, in pit F-6 II, 37" b. s. A third specimen was part of feature 68-33, which was interpreted to be a portion of an incompletely exposed burial, in pit J-9 II at 39" b. s. The fourth spatulate tibia artifact came from pit C-9 II at 48" b. s., and was not associated with a burial or feature.

In addition to the specimens just described, a spatulate object of what is presumed to be whalebone is included here. It is illustrated and discussed by Davis (D&T 1959: 23-24, Pl. 2A, b). It is flat, and lenticular in cross section, contrasting in this regard with the land mammal bone artifacts, which are concavo-convex. Maximum width and thickness, 4.0 and 1.0 cm, occur at the straight, squared proximal end. From this end, the object tapers along its 26.5 cm length to a rounded V-shaped point. It was associated with burial 129, a cremation, in pit C-6 I, at 8" b. s. (incorrectly reported as 94" b. s. by Davis [D&T 1959: 23]).

Pointed Thick Spatulate Bone -- Ala-13 (1 specimen).

A broken medial fragment (30-122) of thick split bone conforms to the outline of elk tibia wands found at Ala-328 and Ala-12. It measures 23.5 cm in length. It was recovered without association in the 48 to 60 inch level (presumable below datum plane) of pit G-13.

Pointed Thick Spatulate Bone -- Ala-12 (3 specimens).

Burial 11 was uncovered with fragments of 3 large spatulate bone artifacts lying in the head and chest region. The proximal end of 1 wand lay in the mouth. Four broken pieces were recovered by excavators before the burial was vandalized. They show that the 3 artifacts were similar in size and form to the mammal bone specimens from Ala-328 described above.

Two eared proximal ends were recovered; neither is perforated. No bead overlay is evident, but 1 fragment is stained with a black substance which may have once served as an adhesive for an overlay. The bone appears to be the same as that used for the Ala-328 specimens, which is presumed to be elk tibia. The proximal fragments, largest of those recovered, measure 31 and 22 cm in length, 3.5 and 3.7 cm in maximum width.

Discussion.

While not abundant at any of the sites, it may be significant that similar specimens of pointed thick spatulate bone were recovered at all three. Artifacts of this form seem to be characteristic of bay and coastal sites in central California, and were absent from the collections of interior sites examined by Gifford, although present in some southern coastal site assemblages.

From Ala-307, in addition to the illustrated "curved antler blades" (Wallace and Lathrap 1975: Pl. 5k, l) which are close in form and may have been functionally analogous to the bone specimens described above, there are several bone fragments [1] which appear to correspond to the type. At Ala-309, there are 2 specimens mentioned by Gifford, one shown in Uhle (1907: Pl. 8, 5) which is short in comparison to specimens described above; both have a large perforation in the shaft not found on Ala-328, -13 and -12 specimens. In addition, there are several fragments[2] which fit the type, 3 of which are also illustrated in Uhle (Pl. 8, 6; Pl. 7, 14 and 15). Since Gifford did not include the latter in his type (probably because they are fragments), a re-examination of collections from the interior sites should be made to establish whether any fragments attributable to items of pointed thick spatulate bone are present there. A more thorough look at Bay collections is also warranted, both to establish an inventory for the sites and to consider possible temporal limits on the occurrence of the type. [3]

Dull Pointed Fishspear Prongs -- Ala-328 (22 specimens).

Artifacts assigned to this group include 1 which fits Gifford's type MM2a (see Plate 5E), 10 unbroken specimens of Gifford's type MM2b (see Plate 5D), and 7 probable MM2b fragments (Gifford 1940: 183). Bennyhoff (1950: 296-298, 308-309) gives a detailed analysis of occurrences and possible functions of these forms; he suggests that they were hafted in pairs to make bident fishspears. All are short, sturdy objects with somewhat rounded cross sections and dull, rounded tips. One is illustrated by Davis (D&T 1959: Pl. 2Ca). The group also includes 3 small bipointed artifacts more conically pointed than the MM2 specimens, which would fall into subgroups of Gifford's type T (1940: 176-177). Two of them are illustrated by Davis (Pl. 2Cc, d) and the third is shown here in Plate 5G. In addition, there is a single-pointed specimen cut straight across at the proximal end of a shaft much flatter in cross section than other artifacts in the group (see Plate 5F). Its short length, cut end, and dull point differentiate it from specimens grouped as pointed bone

[1] 1-123990 to 1-123998 inclusive.

[2] 1-8778, 1-8781, 1-8788, 1-8920, 1-8987.

[3] With regard to sterile base, specimens occur at middle depths at Ala-328, close to sterile at Ala-13 and -12. The specimens enumerated from Ala-309 came from Uhle's strata 7 to 9. The bone fragments from Ala-307 came from 35 to 60 inches depth; I did not record depths of the "curved antler blades."

with flat tip.

Most of the artifacts appear to be made of antler; the bipoints and flat point may be mammal bone. Striations and cutting scars are found on all specimens, presumably a result of shaping efforts. Polish ranges from light to very high among specimens, with the smooth tip ends usually more highly polished than the body of individual artifacts.

Length of complete MM2b specimens ranges from 4.0 to 8.0 cm. The MM2a specimen is 4.5 cm long. The bipoints measure 4.5, 5.8, and 6.5 cm in length. The flat point is 4.2 cm long, and widens to 1.2 cm from its dull pointed end.

Whether the bipoints and flat point functioned as fishspear prongs or other fishing tackle is uncertain. Traces of asphaltum over half of one bipoint support the notion that it was hafted. The flat specimen shares size and a dull tip form with the MM2 specimens, but there is no evidence which suggests its function.

Provenience information for dull pointed fishspear prongs is given in Table 3-48. One MM2b specimen and a fragment, plus a bipointed artifact from this group, all came from the same depth of pit C-6 I. Location of each artifact within the pit was not recorded, so it is not known if they were associated with one another. A single MM2b specimen was found with burial 7 and another with mixed burials 433-434.

All MM2b specimens and fragments were recovered in the upper 5 feet of the site. The MM2a specimen was deeper than any of the MM2b specimens, as were 2 of the bipoints and the flat point. The relatively shallow MM2b distribution may support Bennyhoff's inference (1950: 308) that the type developed in the interior Valley and appeared relatively late in the Valley Middle Horizon. The overall paucity of fishspear prongs at Ala-328, also noted in other Bay area sites (Bennyhoff 1950: 308) suggests that these were not the predominant fishing implements at the site. [1]

Dull Pointed Fishspear Prongs -- Ala-13 (3 specimens).

One complete specimen, illustrated both in Rackerby (1967: Fig. 6A)

1 It can be argued that occupation sites might not produce tools for such an activity, but they do so in greater numbers in Valley sites; whether this reflects different fishing methods or on-site fishing in the Valley sites and off-site fishing in the Bay area remains to be determined, but the former interpretation seems more likely.

and in Plate 5C here, is a barbed prong of Bennyhoff's type 001 (1950: 297-298, 308). It was recovered from pit H-13 at 18 inches below datum plane.

A proximal end fragment from the upper 12 inches below datum plane of pit E-17 has a sharp shoulder angle like that on 30-114, and so might pertain to type 001. Another proximal end fragment, from pit M-17 at 18 inches depth below datum plane, shows only a slight angle, and is comparable in this respect to the unbarbed MM2b prongs recovered at Ala-328.

According to Bennyhoff (1950: 308), type 001 appears archaeologically later than type MM2b, perhaps developing from the latter. At the time of his study, only four specimens of type 001 had been found in the Bay area, from sites Ala-309, -329, and SCl- 356, mostly in contexts cross-dated to the Valley Middle Horizon. One of the two specimens at SCl-356 occurred in the component assigned to Beardsley's Emeryville Facies, equivalent in his scheme to Phase 1 of the Late Horizon in the Valley. The occurrence of a type 001 fishspear at Ala-13 and the absence of the type at Ala-328 agrees with other indications, such as the submound location of circular shell beads at Ala-13 and their shallower provenience at Ala-328, that occupation at Ala-13 began relatively late in the occupation span at Ala-328. It is also consistent with the appearance of some Valley Phase 1 Late diagnostics, such as rectangular shell beads, at the former site and the absence of any at the latter.

No dull pointed fishspear prongs were recovered at Ala-12.

Antler Rack Artifacts -- Ala-328 (13 specimens). Plate 6K.

These artifacts are made from antler segments which include forks, the junctions at which a central shaft and 2 side prongs meet. "Rack" is used in this limited sense, for lack of a better term.

On 4 racks, 1 prong has been broken or cut away near the fork but the other shows use. There are broken tips on 2 specimens. The intact specimens end in a broad conical tip and a wedge tip, neither showing rough wear. The wedge-tipped specimen was evidently used without hammering, the fork and shaft serving as a handle.

Six specimens are racks with 2 tines in each case showing use. One 1 set, working ends are blunt, smooth, and polished. On the 5 others, cuts and pits indicate possible use as flakers. Two of these might have been digging tools, as suggested by Davis (D&T 1959: 55), but the length of the other 2 (3.7 and 8.0 cm in comparison to 14.5 and 19.0 cm) probably precludes use in the manner speculated.

One of the double-tined possible flakers or digging tools was associated with burial 90. In addition to the specimens described above, 2 rack fragments and 1 broken piece with intact flaker-like working end were found with burial 409; unbroken antler wedges and flakers were among other goods in this grave. Table 3-49 gives provenience for antler rack artifacts.

There were no antler rack artifacts recovered from Ala-13.

Antler Rack Artifacts -- Ala-12 (1 specimen).

Burial 6 was accompanied by a large piece of antler which may be either a finished tool or manufacturing debris. The main shaft has been cut on a bevel, like a wedge, at the proximal end. At the fork, the large prong has been cut away; a small prong remains, with a flat broken tip like those on blunt pointed antler tools. It is unclear which end, if either, was a working end.

Unpointed Perforated Bone -- Ala-328 (9 specimens). Plate 5I, J.

These artifacts are grouped because they are perforated and do not have pointed ends, but they are not homogeneous in form. Gifford's type Q (1940: 163, 175, 218-221) would embrace these artifacts, although none fit his subgroups exactly. All are made of split mammal bone, and all are broken in some way. Most specimens exhibit a high luster.

One specimen which lacked a perforation in its present fragmentary state is included. It could instead be treated as a piece of an artifact like those grouped as pointed thick spatulate bone, although it is thinner than any of the latter. It was considered to be a fragment of a probable bone pendant by Davis (D&T 1959: 35-36), as was another specimen grouped here which is not perforated, but shows a conical indentation with scars around it, evidently an incipient perforation.

Three specimens bear portions of punctate design on one surface. The concave surface of the unperforated specimen is punctate; the convex surface of 2 other specimens bears the design. Patterns are: 2 sets of parallel lines crossing at a diagonal to form an X, 3 parallel lines, and a single line (see Plate 5I).

The punctate specimens and 2 others are relatively thin (0.2 to 0.3 cm) and broad (1.5 to 2.8 cm). Two specimens are made of thicker (0.5 to 0.7 cm), heavier bone. One is evidently a narrow (0.8 cm) split rib section

Table 3-49. Provenience of antler rack artifacts and modified antler lacking use-wear, Ala-328.

Depths in inches below surface.
* = burial association.
n = no use (modified antler lacking use-wear).
# (#) = multiple specimens: count (depth).

SFSU Grid I

A-4	120
C-2	70n
C-6	24n
C-7	60*
D-5	40

SFSU Grid II

A-4	3(103*), 108n
A-6	36
A-7	39n
A-9	41
B-8	103
F-10	28
G-6	69n
G-7	65

Omitted: 2 SFSU rack artifacts, 1 SFSU specimen lacking use-wear; 1 Wedel specimen lacking use-wear. Provenience information is incomplete for these specimens.

Table 3-50. Provenience and maximum dimensions of small polished bone and antler objects, Ala-328.

Depths in inches below surface.
Dimensional measurements in centimeters.
? = missing information.
* = burial association.

Pit	Grid	Depth	Length	Width	Plate
B-5	I	44	4.0	1.3	5M
C-4	I	54	2.5	0.9	5N
D-7	II	44*	2.0	0.9	5O
E-8	II	55*	4.8	1.7	
?-2	I	68	3.6	1.3	

Table 3-51. Provenience of antler sockets and blanks, Ala-328.

Depths in inches below surface.
* = burial association.
? - missing information.
b = socket blank.

SFSU Grid I

C-7	60

SFSU Grid II

A-5	18-36
A-8	39
C-5	46, 64
C-8	18, 39b
F-6	43
G-4	46
?-9	30-42
?-?	30b

which might have been grouped with sidebladed rib artifacts were it not perforated. Its perforation diameter is close to 0.4 cm; the perforations on other specimens are 0.2 cm or less. Perforation is biconical on all but 2 of the perforated specimens. Most proximal ends are broken edges; the 3 complete ends are slightly rounded and well-polished.

Two artifacts of this group accompanied burial 219 in pit A-9 II at 84 inches depth. One was found lying against the thoracic vertebrae of burial 413, at 70 inches depth in pit E-6 II. Other unpointed perforated bone artifacts came from the following pits and depths below surface, all in SFSU Grid II: A-9, 43"; B-4, 64"; C-6, 24"; C-9, 51"; D-5, 64-70". The location of 1 specimen from 44 inches depth is unrecorded.

Unpointed Perforated Bone -- Ala-13 (1 specimen).

A fragment of split polished cannon bone (30-82) is biconically perforated at 1 end near its maximum width of 0.8 cm. Perforation diameter is 0.2 cm. It is broken across the shaft, and might have been pointed when intact. The specimen is illustrated by Rackerby (1967: Fig. 4C). It was recovered from pit D-13 at 51 inches below datum plane.

Unpointed Perforated Bone -- Ala-12 (2 specimens).

An unidentified fish bone was found in feature 3, in pit 0E/5N at 44 inches below surface. Rackerby (1967: 34) refers to it as sturgeon bone; it is not a parasphenoid, the most common sturgeon bone recovered at adjacent Ala-13 and -328. The specimen is unmodified except for a clean circular hole about 0.3 cm in diameter which is not biconical, and which may be natural.

A flat bone fragment (29-235) described and illustrated in Rackerby's Figure 12E bears 1 intact biconical perforation 0.4 cm in diameter, and is split through an adjacent perforation. The specimen lacks high polish and punctate design. In these respects and in the large perforation size, it is dissimilar from unpointed perforated bone recovered at Ala-328. It was recovered without association in pit 1W/2N at 24 inches below surface.

Small Polished Bone and Antler Objects -- Ala-328 (5 specimens).

These artifacts possibly functioned as atlatl hooks. Two are described and illustrated by Davis (D&T 1959: 40, 60, Pl. 2Cf, g), who labels 1 an atlatl hook, 1 a "conical-headed bone object". The former is also illustrated here (Plate 5M); the latter, on display at the Oakland Museum, is inaccessible for photographing. The form difference between these 2 is probably due to different modes of attachment, rather than different functions. The base and projecting spur were probably areas of attachment for the antler specimen (Plate 5M; Davis' Pl. 2Cf). The groove was the probable area of attachment for the bone specimen.

Three other specimens, similar to the latter in form, were found in later excavations; 2 were illustrated here (Plate 5N, O); a third is on display at the Oakland Museum. All 4 of the non-spurred specimens are slightly concave on 1 surface, presumably the surface which faced the atlatl body, and flat or rounded on others. All come to a rounded point and a flat end, as does the upper portion of the spurred specimen. The non-spurred specimens all have a transverse groove or indentation around three quarters of their circumference in approximately the middle of the object; 1 specimen has a second groove behind the first. Longitudinal and transverse scratches from the shaping process are evident under the high polish of all 5 specimens.

Maximum lengths and widths of the 5 small polished bone and antler objects are given in Table 3-50, which also shows their provenience. Burials 236 and 276 were accompanied by artifacts of this group. Davis (D&T 1959: 60) attributes a specimen to burial 139, but information in the burial record and artifact catalog contradict this.

Beardsley (1954: 88) describes "a notched antler tine tip (atlatl hook?)" specimen recovered at a depth of 12 feet from Ellis Landing with a burial also accompanied by shell beads of saucer and modified saddle types. The depth of recovery of the small polished bone and antler objects from Ala-328 is consistent with the provenience of similar bead forms from the latter site.

No bone or antler artifacts similar to these were recovered at Ala-13 or Ala-12.

Unperforated Mammal Teeth -- Ala-328 (4 specimens).

A bear tooth (upper incisor of Ursus sp.) was associated with burial 106, in pits A-5 I, II at 100 inches depth. It is 9.1 cm long and 2.5 cm in maximum width. Cut marks along the convex curve of the root suggest that an effort was made to thin that portion. The tooth is not otherwise modified. It is shown in Plate 5K.

A tooth tentatively identified as an incisor of Canis sp. (too worn or broken for definite identification) was found unassociated in pit C-5 II at 60 to 72 inches depth. It is not perforated, but shows pits and adjacent scratches on opposite sides of the root portion, as if perforation was underway when it was lost or discarded; see Plate 5L.

Two canid teeth (incisors of Canis sp.) accompanied burial 180, in pit E-9 II at 20 inches depth. Neither showed any signs of human modification.

No unperforated mammal teeth were recovered at Ala-13.

Unperforated Mammal Teeth -- Ala-12 (23 specimens).

A group of 22 canid incisors were associated with burial 2, in a submound gravepit. None are perforated, but a black substance, presumably asphaltum, coats the root area on most of the teeth. Linear impressions in the adhesive suggest that the teeth were bound together. Half of a rectangular Haliotis bead adheres to 1 tooth (see Plate 1 U). Two of the specimens, removed in a block *in situ*, lie with roots together, enamelled ends apart, over a scapula of burial 2.

An unmodified carnivore tooth, a canine or incisor, was found in the grave of burial 5, which lay about 1 foot above submound. It has not been identified by species or jaw position, but has a shorter area of enamel and a bulkier root portion than the canid incisors associated with burial 2. Contrary to Rackerby's description (1967: 46), the proximal end has not been ground flat.

Bird Talons -- Ala-328 (12 specimens). Plate 5A.

Eight occurrences of raptorial bird talons are recorded. The specimens have not been identified by genus and species. They are extremely similar to one another in appearance, and probably all derive from birds of the same species. None are perforated or otherwise modified.

A group of 5 talons was associated with burial 42 in pits A-5, 6 I at 112 inches depth. Talons were found unassociated in pit B-6 II at 70 inches and in Ringer's constituent unit at 42 to 48, 54 to 60, 96 to 102 (3 specimens), and 102 to 108 inches. The fact that all material from the constituent unit was screened probably best explains the recovery of so many talons from that pit.

No bird talons were recovered at Ala-13 or Ala-12.

Bipointed Bone -- Ala-328 (11 specimens).

Each of these artifacts is long and narrow, circular or oval in cross section, and tapers to fine points or broken tips at both ends from a maximum diameter near mid-length. The group is closest to Gifford type T1a (1940: 164, 176, 221).

Three specimens were found with burial 42, in pits A-5, 6 I at 112 inches depth. The artifacts measure 21.0, 17.0 and 14.0 cm in length. Two are illustrated by Davis (D&T 1959: Pl. 2Ak, 1).

Another specimen came from pit D-5 I at 92 inches depth. It is heavier than the other bipointed artifacts, and its intact point is similar to those on specimens of broad conically tipped bone, but the taper on the bipoint is more gradual, producing a more symmetrical form overall.

A lot of 7 specimens of bipointed bone was found unassociated in pit D-8 II at 18 inches below surface. Most have been broken. All are smaller in diameter and apparently were shorter than the artifacts described above. The single complete specimen in the lot is 11.9 cm long, with maximum diameter less than 0.3 cm (see Plate 5B).

The short length of the lot recovered at shallow depth is interesting in the light of Davis' assertion, following Beardsley (1954), that an artifact of this kind, "but somewhat shorter type occurs in the /Lower Sacramento/ Valley in Late /Horizon/ times" (D&T 1959: 37).

There are no specimens of bipointed bone in the collection from Ala-13.

Bipointed Bone -- Ala-12 (1 specimen).

Associated with 1 or more of burials 11, 12 and 13 was a bipointed bone artifact found in pit 2.5E/11N at 46 inches below surface. It is circular in cross section, although slightly flattened at midlength. It tapers from the center to narrow ends. Each tip is broken, but the present length of 11.0 cm is close to original length; maximum diameter is 0.4 cm.

Antler Sockets -- Ala-328 (11 specimens). Plate 6C.

Nine artifacts, which fall into Gifford's type JJ (1940: 166, 183, 232), are antler basal segments with the interior hollowed out. The hollows range from 0.8 to 3.5 cm in maximum diameter, and approximate depth ranges from

2.5 to 7.0 cm. External length ranges from 4.7 to 7.9 cm. Cut marks are evident around the open shaft ends, and in some cases on the basal surface as well; bases lacking cut marks presumably were shed naturally. On a few specimens, scars remains where the rough knobs on the outer surface of the shaft have been cut away.

One of the antler sockets is illustrated by Davis (D&T 1959: Pl. 2Bb). He refers (D&T 1959: 55-56) to another specimen which was a hollowed distal segment of antler; I was unable to locate the specimen.

Two antler base artifacts are like the sockets in form and length, but have not been hollowed out. Both have been cut to length, and on 1 the knobby surface has been smoothed. These are interpreted to be unfinished sockets.

One socket was associated with burial 350; another, found near mixed burials 433-434, was considered to be a possible association. Table 3-51 shows provenience of sockets and blanks. None were found in the deeper portions of the mound.

Gifford (1940: 183) reports the occurrence of sockets at only 1 site, Ala-309. This shared artifact form is one of many similarities in material culture between the 2 sites.

Antler Sockets -- Ala-13 (3 specimens).

These artifacts are comparable to those recovered from Ala-328 in form and dimensions. None were feature or burial associations. Provenience data are included in Table 3-15.

No antler sockets were recovered at Ala-12.

Modified Antler Lacking Use-Wear -- Ala-328 (7 specimens).

In addition to the 13 antler rack artifacts described above, 7 pieces were recovered on which prongs had been severed and no working surface was evident. These are probably remnants of manufacture of other tools. One was associated with burial 405. Provenience data for these specimens is included on Table 3-49.

In view of the large number of antler wedges and blunt pointed antler tools found at the site, the paucity of manufacturing debris is notable. It seems likely that antler pieces lacking working edges were discarded in most cases by excavators as nonartifactual material.

Modified Antler Lacking Use-Wear -- Ala-13 (5 specimens). Plate 6D.

Four of these artifacts are rack fragments which show scars where segments or prongs were cut away, but which lack evident working surfaces. Like similar specimens recovered at Ala-328, these are probably best interpreted as remnants of manufacture of other tools.

None of these modified antler pieces were burial or feature associations. Their provenience is shown in Table 3-15.

Modified Antler Lacking Use-Wear -- Ala-12 (1 specimen).

A modified antler fork was found unassociated in pit 0E/2N at 7 inches below surface. It is severed at the prongs and across the shaft and must be manufacturing debris.

Pointed Perforated Bone -- Ala-328 (4 specimens).

These specimens are grouped because all are pointed and perforated, but they are diverse in size and form.

Two specimens share the conical tip of Gifford's type P3a (1940: 163, 174-175, 217), but differ greatly from one another in size (cf. Plates 2A f and j in D&T /1959/). The longer specimen, 15.3 cm in length, was found in pit C-6 I at 24 inches depth. The shorter item, 3.5 cm in length, came from pit B-4 I at 44 inches depth. The 2 artifacts surely served different purposes.

One specimen of pointed perforated bone accompanied burial 219 in pit A-9 II at 84 inches depth. It is similar in size and form to an artifact illustrated by Davis (D&T 1959: Pl. 2Ah) which was recovered in pit A-5 I at 104 inches depth. The 2 specimens measure 12.0 and 9.6 cm in length and could be placed in Gifford's type P4 (1940: 163, 175, 218), characterized by flat cross section and flat, rather than conical, point.

Pointed Perforated Bone -- Ala-13 (1 specimen). Plate 5H.

An unsplit rib artifact is biconically perforated at 1 wide end and tapers to a pointed end at the other. Maximum width of 1.3 cm occurs at the perforated end; perforation diameter is 0.5 cm. The bone surface near the pointed tip is weathered and nibbled, so it is uncertain whether the artifact is complete at its present length of 11.5 cm. The specimen was found in pit C-12 at unknown depth. It should be noted that a fragment described above as unpointed perforated bone might have pertained to this group in its unbroken form.

There are no artifacts of pointed perforated bone in the Ala-12 collection.

Straight Ended Thick Spatulate Bone -- Ala-328 (5 specimens).

All specimens in this group share a thick, flat straight ended form, contrasting in all 3 attributes with artifacts grouped as pointed thick spatulate bone. They are thicker and more blunt than all specimens in the latter group, and lack the marked concavity across the width found on the land mammal specimens in the latter group. The group is closest to Gifford's type D6 (1940: 162, 171, 211). Use is conjectural. Certainly the artifacts are sturdy enough to have withstood much strain if used as pry bars or wedges, as suggested by Gifford.

Two specimens are made of porous sea mammal bone. One, shown in Plate 6J, is slightly rounded at one end, and is thinned somewhat (for hafting?) at its straight end; it measures 7.0 by 2.7 by 0.6 cm. The other specimen shows no evident working edge and no indication that it was hafted; it presently measures 13.0 by 3.0 by 1.3 cm, but is broken across its length.

Three specimens are made of split nonporous land mammal bone. All show longitudinal striations on both concave and convex surfaces and edges. One evidently complete specimen, shown in Plate 6I, has no edge or surface differentiated as a working portion of the tool; it measures 14.5 by 2.0 by 0.5 cm. The other 2 specimens are broken. One, almost 3 cm wide at the break, has edges which are rough to the touch for 6.5 cm below the finished end, as if they had been used for pounding, although they show a polish. Thickness of the latter 2 specimens is 0.4 and 0.7 cm.

None of the specimens were recovered in association with burials. They came from the following locations and depths below surface: B-9 II, 33"; C-5 II, 40"; D-7 II, 73"; G-4 II, 60"; and C, D-66, 18".

There are no artifacts of straight ended thick spatulate bone in the Ala-13 collection.

Straight Ended Thick Spatulate Bone -- Ala-12 (2 specimens).

Both specimens are broken, but each has one unbroken end which is straight ended with rounded corners. One fragment (29-349), illustrated in Rackerby (1967: Fig. 11A) is thicker and wider than the pointed spatulate artifacts found with burial 11, and less smoothly polished over the scratches and striations left by manufacture. It came from pit 1E. 7N at 42 inches depth. A second fragment is lighter and thinner than the pointed spatulate grave goods. Although it is presently straight ended, nothing in its size and shape excludes the possibility that it was originally a pointed artifact similar to the latter. The Ala-12 and -328 pointed spatulates are of heavier bone, but a similar artifact from Ala-307 is made of material as thin and light as that of this straight ended fragment from Ala-12. The latter was found unassociated in pit 0E/8N at unknown depth.

Antler Fork Juncture with Cut Hole -- Ala-328 (2 specimens).

These artifacts fit Gifford's type LL, "shaft wrenches" (1940: 166, 183, 232). One specimen, found in pit F-5 II at 74 inches depth, has an oval hole measuring 4. 1 by 2. 4 cm. The specimen is split through the inner tissue, so that only half of the tool is present; it is 1.5 cm thick in this condition. The second specimen, from pit A-5 II at 94 inches depth, measures 3. 5 by 2. 4 cm across the hole, and is 2. 5 cm thick; it is shown in Plate 6H. Both specimens are broken across the main shaft and a portion of the hole. Cut marks on both specimens where prongs were severed, and pitting on the edge of the hole of 1 specimen are remnants of the manufacturing process. The interior walls of the holes are polished smooth on both specimens.

There were no antler fork junctures with cut holes recovered at either Ala-13 or Ala-12.

Flaked Bone -- Ala-328 (11 specimens). Plate 5S, T.

Five pieces of split bone were flaked to achieve a flat or jagged point, or a knife-like edge; the other 6 are too incomplete to determine the original form. These 11 artifacts comprise the flaked bone inventory for the site. Davis (D&T 1959: 59) refers to 6 pressure-flaked specimens which lay between 75 and 102 inches below surface. Only 3 of the 11 specimens discussed here come from these depths; whether the other specimens mentioned by Davis are lost or typed differently by me is uncertain.

Flaked bone was recovered from the following locations and depths below surface: A-5 I, 78"; A-6 I, 102"; C-3 I, 9"; D-5 I, 98"; D-7 I, 48"; A-6 II, 48"; A-7 II, 40"; D-5 II, 70"; E-9 II, 8"; F-8 II, ?; F-9 II, 70".

Flaked bone is relatively scarce at Ala-328 in comparison to Ala-307, where 44 specimens were recovered from about 14,000 cubic feet of midden (Wallace and Lathrap 1975: 8, 33). At both sites, flaked bone artifacts have a wide horizontal and vertical distribution.

There are no flaked bone artifacts in the collections from Ala-13 and Ala-12.

Incised Split Bone -- Ala-13 (1 specimen). Plate 1V.

One fragment of split bone, with 1 finished straight end and a splintered break at 5.2 cm length, has been ground down to create several planar surfaces over the length of the convex surface. A different design element is incised on each plane; the design elements are criss-crossed lines or groups of 3 parallel diagonal lines. Two stained areas are visible, which may be remains of an overlay. The specimen, 1.6 cm wide at the break, came from pit I-18 with no recorded depth.

One incised bone tube was recovered at Ala-328; it is discussed with other decorated bone tubes from that site.

No specimens of incised bone were recovered at Ala-12.

Worked Scapula Object -- Ala-13 (1 specimen).

A large distal blade fragment of probable elk scapula shows longitudinal striations on both faces. Its size (9.9 cm maximum width, 14.5 cm maximum length in its present broken form) and the striations, as well as an absence of high luster, are characteristics which distinguish it from serrated scapula artifacts. The specimen was a surface find on the site.

There are no comparable specimens in the collections from Ala-328 or Ala-12.

Bone "Peg" -- Ala-328 (1 specimen).

This was dismissed as an untypable fragment until its similarity to the Ala-13 specimens described below was recognized. It measures 9 cm in length, about 2 cm in maximum width, with an outline resembling a single-shouldered straight stemmed projectile point. The "stem" area has been trimmed to a cylindrical projection 0.6 cm in width, extending about 2 cm; the "tip" area is broken. The piece is porous bone, too thick and rounded to have served any penetrating function suggested by the comparison with a projectile point outline. It was recovered unassociated in pit G-4 at 12 inches depth.

Antler "Pegs" -- Ala-13 (2 specimens).

A piece of antler 11 cm long with a maximum width of 1.6 cm was cut to a diameter of 0.8 cm at both ends, as if 2 pegs or tangs were desired. The artifact (30-125) was found with burial 3, in pits C, D-13 at 42 inches below datum plane. It is illustrated in Rackerby (1967: Fig. 6D).

Another antler object of about the same size was cut as if a peg were desired at 1 end, while the other is not narrowed down (see Plate 6E). One lateral edge has a number of parallel grooves, which caused Rackerby to classify the specimen as an antler saw (1967: 22). However, the piece is thicker than other serrate bone specimens and the grooves are so shallow and ill-defined that the artifact does not seem equivalent in form to the other serrates. It was recovered from pit H-13 at 48 inches below datum plane.

No artifacts comparable to the bone and antler pegs described above were recovered at Ala-12.

Mortars -- Ala-328 (122 specimens; 11 whole, 111 fragments).

The items discussed in this section are large stone basins commonly assumed to have been used for grinding foods, especially hard seeds and nuts. Small specimens (less than 12 cm in diameter) are described in a separate section devoted to miniature mortars; the separation emphasizes an inferred difference in function between the 2 artifact types and their differing frequencies of occurrence as grave goods.

Among artifacts manufactured of stone, large mortars were the item most frequently recovered in burial association at Ala-328. Whole mortars accompanied 10 different graves, and mortar fragments were found in 4 other graves.

Two bowl mortars documented in catalogs and burial records are missing, and are not included in the total count following the section heading above. One accompanied burial 67-6, and 1 was found with mixed burials 380-381. At least 7 of the 11 complete or nearly complete specimens which remain were grave goods. They were recovered with burials W1, 76, 329, 365, 403, 429, and 433-434. One mortar, broken in 4 pieces (D&T 1959: 42), was found without associations; only 2 of the pieces (1-365, 1-408) remain in the collection. The provenience of 3 specimens is not recorded. One of them matches the description and measurements given in the burial record for burials 169 and 170, and is presumed here to be the mortar found with that grave.

One hundred and eleven mortar fragments were also recovered, 67 including a portion of rim. A single wall fragment was associated with each of burials 358, 67-4, 67-9, and 68-1B. Several wall and rim fragments of 2 different mortars were a part of SFSU feature 1. Single rim fragments were found with SFSU features 67-9 and 68-35.

On all whole mortars, the maximum diameter of the inner cavity is at rim height; these are not "bowls" with expanding inner cavities like one found at SMa-77 (Gerow with Force 1968: 68-69) and several from SMa-125 which I have examined.

Rims are flat or rounded in shape. Following Beardsley's typology (1954: 9), the "rounded" rims would be labeled "sharp", but the former term is more accurate descriptively of rim shapes in this assemblage. About two thirds of the rim fragments have rounded rims.

Some of the flat rims on whole mortars, and on fragments of adequate size for judgment, slant downward slightly toward the outside. On 2 whole mortars, 1 round-rimmed and 1 flat-rimmed, a polished flat shoulder about 1 cm in width slants steeply toward the inside. This shouldering pattern is evident on a number of rim fragments, both flat and rounded. It presumably results from contact with a pestle shaft, perhaps from a grinding motion in which the distal pestle end remained relatively still while the proximal end was moved in a circle or half-circle, with pestle shaft resting against the rim during the motion.

Three of the whole mortars are broken along the rim, either from use-wear or intentional breakage. Several large fragments, walls lacking a base, or broken basal portions, may have come from mortars which were intentionally broken. In 1 case, matching wall and base fragments were found together. None of these possibly "killed" fragments were found in association with burials.

One large fragment is unusual in shape. It appears to be about half of a troughlike mortar, an elongate oval in outline and interior cavity shape, U-shaped in vertical cross section. The base is rounded, and the rim is flat. The piece is dressed overall, and the intact end is pecked and rounded so that it resembles a pestle end. On this fragment, height is 11 cm, depth 6 cm, and shorter diameter 12 cm; the specimen is broken across the longer diameter, which was probably greater than 20 cm.

All of the intact mortars were made of indurated sandstone. Among the fragments, about a third were of soft sandstone, the remainder of indurated sandstone. Basalt and granite evidently were not mortar raw materials at this site.

Table 3-52 gives provenience, measurements, descriptive information and Beardsley types for the 11 eleven complete mortars. Table 3-53 gives provenience of mortar fragments, and Table 3-54 summarizes their occurrence by depth.

There were 13 individuals in the 10 graves definitely accompanied by mortars. Eight were adults, aged 20 to 35 years; 3 females, 2 probable females, 1 male, 1 probable male, and 1 of undetermined sex. Two individuals were younger, 1 probable female 15 to 18 years old, and 1 child 5 to 6 years old. Age and sex were not determined for 3 individuals. A tendency for mortars to be buried with females of childbearing age is suggested by these data, although the sample is small.

All but 1 of the complete mortars were recovered well above the base of the mound. Many fragments were recovered at or near the base, 1 as a burial association. The evidence does not support an argument for increased use of mortars in the later occupations of the site, but does indicate a change in the use of mortars as a grave good. The depths shown in Table 3-52 indicate that mortars were placed in graves mostly during a period well after the initial occupation of the site which ended, however, before the accumulation of at least the last 1 to 2 feet of midden at the site.

The relative paucity of mortars at the site, and the high incidence of burial association of unbroken specimens suggests that food processing in large stone mortars was not a common activity at the site. The possibility that a food processing area remains unsampled by excavations must be admitted, of course. If this is ignored, and if acorn was a staple for the people who inhabited the site during its 2 millenia of existence (a longtime assumption in central California archaeology; see, e.g., LH&F 1939 and Fredrickson 1973), the implication is that acorn processing was done elsewhere, or else it was done in perishable mortars. Given the relatively small inventory of pestles at the site (28 whole specimens, 99 fragments), the implication of off-site processing seems most reasonable. Either seasonal residence changes or short forays away from a base settlement may be indicated. The presence

Table 3-52. Provenience, measurements, and descriptive information for mortars, Ala-328.

Cat. No.	Pit	Grid	Bur.	Depth	Shaping	Sides	Rim	Base	Int. Cavity	Height	Depth	Top Diam.	Base Diam.	Type*
1-1797	G-6, 7	II	329	40	all	round	flat	flat	circ.	17	13	14	26	A2a
1-1804	J-7	II	429	46	all	str.	flat	flat	circ.	27	19	34	27	A1a
1-522	C-7	I	76	54	part /all/	round	flat+ round	round	oval	22 /18/	14 /15/	23x25 /23x26/	16x19	B2 /A2b/
1-1801	C-5	II	433-34	56	part	round	flat	flat	circ.	25	18	30	26x15	B1
1-408, 1-365**	F-7	I	-	60	all	round	round	flat	/	/	/	/	/	/A2b/
1-1803	D-6	II	403	62	all	round	round	flat	circ.	19	14	24	22	A2b
1-1800	G-6	II	365	65	all	str. + round	flat+ round	flat	circ.	19	13	16	20	A1a-A2a
1-37457	5-10E, 5-10S		W1	72	/all/	/str./	/flat/	/flat/	/oval/	/23/	/17/	/30x33/	/	/A2a/
1-1805	(B-10	II	169-170	60)	all	str.	flat	flat	circ.	28	21	38	27	A1a
1-1807	/	/	/	/	part	round	round	broken	circ.	25	19?	25	20?	A2b-B1
1-1808	/	/	/	/	part	round	round	flat	circ.	28	16	35	15	B1
lost	A-5	II	380-81	92	described as "cobble mortar" in burial record									
lost	67-C1***		67-6	36	all	round		flat						A2a

Depths in inches below surface.
Dimensions in centimeters.
/ / = observations recorded in Davis (D&T 1959: 42).
/ = missing information.
( ) = presumed provenience; specimen matches description and measurements in burial record.
? = estimated measurement of specimen broken at base.

* Beardsley (1954: 9, Fig. 3).
** 2 fragments missing; no measurements possible.
*** Description and typing tentative; based on photograph in burial record which shows specimen *in situ* with burial.

Table 3-53. Provenience of mortar fragments, Ala-328.

Depths in inches below surface.
* = burial association.
# (#) = multiple specimens: count (depth)

SFSU Grid I

A-2	118, 118
A-3	74, 108
A-4	41, 48
A-5	98, 112
A-6	86
B-1	49, 54-60, 91, 120
B-4	30
B-5	36
C-1	104
D-1	140
D-5	72
E-1	2(156)
E-7	76
F-6	60

SFSU Grid II

A-4	102*
A-5	6
A-7	20
A-8	90
A-9	96
B-4	0-12
B-5	114
B-7	68
B-8	26, 85
C-5	88, 96-108, 120
C-6	0-14, 30, 40, 80, 104
C-7	92, 92, 92, 96, 96
C-8	94, 95
D-5	48-60, 54, 72-84, 84, 90
D-6	78, 98
D-7	42
D-10	84
E-5	9, 12-18
E-6	8

SFSU Grid II

E-8	88
E-9	66
F-5	88
F-7	98
F-8	96
F-10	34
G-4	60, 72, 75, 77
G-5	3
G-6	84
G-7	2(72)
I-7	9-10
I-9	0-12, 12-24
J-5	12
J-6	36, 53, 53
J-7	46, 52, 60
J-8	50
J-9	26, 48-60

Hayward Excavations

A2-67	0-6
B2-67	45*
D1-67	6-12, 20
D2-67	30-36, 30-36, 30-36
E1-67	12-18, 18-24
E2-67	48, 48
F1-67	26*
K-68	17
Test Pit 1	36-42, 36-42*

Wedel Excavations

0-5E 40-50S	12

Omitted: 8 SFSU and 1 Hayward specimens, imprecise provenience.

Table 3-54. Summary of depth occurrence, mortar fragments, Ala-328.

Depths in inches below surface.
H = Hayward excavations.
W = Wedel excavations.

Depth	No. Specimens
0-12	8 (+2H, +1W)
13-24	3 (+4H)
25-36	9 (+4H)
37-48	5 (+5H)
49-60	12
61-72	6
73-84	10
85-96	17
97-108	8
109-120	6
121-132	0
133-144	1
145-156	2
	87 (+15H, +1W)

Omitted: 1 Hayward and 7 SFSU specimens lacking precise provenience information.

of one site (Ala-324) interpreted as a food-processing station (C. King 1968, cited in T. King 1974) in the foothills inland from Ala-328 lends scanty support to the idea of short forays for food gathering and processing. Several patterns of movement may have been involved, varying with the food exploited (which was bulbs, not acorns, in the site referred to above).

Mortars -- Ala-13 (9 specimens; 6 whole, 3 fragments).

Mortars share with obsidian blades the position of most frequent burial association among artifacts made of stone at Ala-13; each accompanied 5 different graves at the site.

Five unbroken or reconstructible bowl mortars were recovered, and sufficient fragments of a sixth to permit observations of its form and dimensions. Five of the 6 were associated with adult individuals buried in submound pits, burials 35, 53, 72, 77, and 94. Sex of the individuals has not been determined. A sixth mortar reportedly came from the 36 to 48 inch level in Trench 11. Since Rackerby's report (1967) does not clarify the recovery situation of artifacts from Trench 11, it is unknown whether the specimen was a burial association. Table 3-55 gives provenience, descriptive information, measurements, and Beardsley types for the complete mortars.

The 3 mortar fragments in the collection were all found unassociated (see Table 3-56 for provenience). These include only 1 specimen (30-27/6448) identified as a mortar fragment in Rackerby (1967: 54). Lot 30-421/6562, reportedly mortar fragments, is apparently missing from the collection. The 2 fragments 30-5 and 30-269/6328 comprise a broken but reconstructible mortar described with the 5 complete specimens. Rim mortar fragment 30-6/6445 is misclassified as a pestle fragment in Rackerby (1967: 53), and wall fragment 20-18/6496 is not listed in Rackerby's report.

All mortars and fragments are indurated sandstone. The mortars described as basalt by Rackerby (1967: 53-54) were incorrectly identified. The fragments of missing lot 6562 are among those described as basalt. Excepting that lot, no mortars or fragments recovered from Ala-328, -12, or -13 were basalt. However, mortars and fragments of vesicular basalt have been recovered at nearby Ala-329. Until the forms and provenience of basalt specimens from the latter site are reported, the significance of the apparent contrast will be unknown.

Considering the volume of the excavations at the 2 sites, the sample of whole mortars from Ala-13 is equivalent to about 3 times the number uncovered at Ala-328, but the number of mortar fragments corresponds to about one twelfth of that recovered at Ala-328. The meaning of this variation is unclear.

Table 3-55. Provenience, measurements, and descriptive information for mortars, Ala-13.

Cat. No.	Pit	Bur.	Depth	Shaping	Sides	Rim	Base	Int. Cavity	Height	Depth	Outer Diam.	Inner Diam.	Type
30-422	Tr. 11	no	36-48	all	round	round	round	oval	/	12.5	47x39	28x25	A2b
30-418	D-17	77	65	all	round	round	round	circ.	21	11.5	38	21	A2b
30-5, 30-269	D-13	35	67	all	round	round	round	?	13	7.5	17	?	A2b
30-419	E-13	53	70	all	round	sharp+ round	round	circ.	18	11	39x30	20x19	A2b
30-420	H-12	94	71	all	str.	flat	flat	circ.	25	22	32	27	Ala
30-417	D-14	72	81	all	round	sharp+ round	round	circ.	20	12	39x31	22x20	A2b

Depths in inches below datum plane for burial associations; presumed to be below datum plane for Tr. 11 specimen.
Dimensions in centimeters.
/ = missing information.
? = observation unobtainable; partially reconstructed specimen.

* Beardsley (1954: 9, Fig. 3).

The majority of whole mortars recovered at Ala-13 were grave goods, as at Ala-328. All of the mortars in burial association were at submound depths. This suggests that the initial period of occupancy at Ala-13 correlates with a period in the middle of the occupation sequence at Ala-328, if the practice of interring mortars with the dead was contemporary at the 2 sites.

One of the unbroken specimens from Ala-13 is a straight sided, flat rimmed, flat bottomed dress mortar of the type reported by Beardsley (1954: 85) to first appear in Bay area sites in his Emeryville Facies, postulated as a temporal-cultural equivalent to Phase 1 of Late Horizon in the Valley sequence. The other 5 are well-made boulder mortars with rounded sides, rims and bottoms. Mortars of both types were recovered at Ala-328, but not from submound graves; hence it is not as convincing to suggest contemporaneity of the 2 types at Ala-328 as it is at Ala-13.

In comparison to the mortars recovered at Ala-328, the Ala-13 assemblage is better made. The finished forms are more symmetrical, and all dressed surfaces have been ground or polished smooth over pecking scars. Four of the boulder mortars are slightly elliptical in outline, all 5 have a slight inner bevel along the rim, and all have very steep inner sides. The assemblage reflects more consistent and better quality workmanship than that from Ala-328.

Mortars -- Ala-12 (27 specimens; 2 whole; 25 fragments).

One complete mortar covered the skull of burial 4, in pit 5.5E/4N at 24 inches below surface. The other rested on the left shoulder of the same burial, an adult of undetermined sex. Both mortars are indurated sandstone cobbles which show pecked shaping on the ends and bottoms, but which have not been dressed overall; on 1 specimen the pecking has not been ground smooth. Each mortar has oval cavities formed by steep straight inner sides which end in a rounded bottom. The bases are flat, but show only slight pecked shaping. Rims are sharp in some areas, rounded in others. On both specimens the rim slants inward, but only one shows a discrete bevel. Both are B2 mortars in Beardsley's typology (1954: 9, Fig. 3). They are approximately equal in size. Measurements for the 2 follow.

	Maximum outer diameter	Inner depth	Height
29-385	22 x 16 cm	8.5 cm	12 cm
29-386	23 x 15 cm	10 cm	13 cm

Eleven rim fragments and 14 wall fragments of mortars are about evenly divided between soft and indurated sandstone as their raw material.

Table 3-56. Provenience of mortar and pestle fragments, Ala-13.

Depths in inches presumed below datum plane.
/ = missing information.
m = mortar fragment.
p = pestle fragment.

Pit	Depth
D-15	m: /
E-18	p: 0, 3, 4
F-13	p: 72
F-17	m: 60
	p: 56
H-18	p: 30
I-17	p: 18
I-18	m: 18

Table 3-57. Provenience of mortar and pestle fragments, Ala-12.

Depths in inches below surface.
* = burial association.
/ = missing information.
# (#) = multiple specimens: count(depth).
m = mortar fragment.
p = pestle fragment.

Pit	Depth
1W/2N	p: 15, 21
0E/2N	p: 7
0E/5N	m: 24, 30
	p: 26, 35, 41, 41, 62
0E/8N	m: 31
	p: 48
0E/11N	m: 33, 34, 36, 44
	p: 19, 24-36, 32, 40
1E/7N	m: 29, 33, 35, 24-36, 42, 55, 58, /
	p: 45, 72
1E/10N	p: 62
2.5E/11N	m: 30-54

(continued above)

Table 3-57. (continued)

Pit	Depth
5.5E/4N	m: 7(24-28*)
	p: 7(22-30*), 25
5.5E/5N	m: 16
	p: 11
5.5E/10N	m: 24

Table 3-58. Provenience of quartz crystals, Ala-328.

Depths in inches below surface.
* = burial association.
# (#) = multiple specimens: count(depth)

SFSU Grid I	
A-4	100*
C-1	80*
C-6	8*, 24
SFSu Grid II	
A-5	2(53*)
A-6	60
A-9	75*
B-10	60*
C-9	36
D-6	2(28*)
D-7	58*
D-8	36*
E-6	2(70*), 78
F-7	3(66*)
J-9	3(38-40)
Hayward Excavations	
E-66	24-30

Omitted: 10 SFSU specimens lacking provenience information.

One fragment has a flat rim, but is not large enough to indicate the shape of the mortar sides. Four rim fragments and 3 wall fragments from 2 or more mortars were part of the bed of stone artifacts underlying burial 5, which was associated with burial 4, accompanied by 2 unbroken mortars, as noted above. A wall fragment recovered in the vicinity of vandalized burials 11, 12 and 13 may have been a grave association. Table 3-57 gives provenience of mortar fragments.

If excavation volumes are considered, equivalent numbers of whole mortars were recovered at Ala-12 as at Ala-13, both sites yielding proportionately more mortars than Ala-328. Relatively more mortar fragments came from Ala-12 than from Ala-328, and many more than from Ala-13. Both whole mortars from Ala-12 were grave goods, which accords with the pattern at Ala-328 and -13. The presence of 2 mortars in one grave is unique to Ala-12 among the 3 sites, although 2 mortars of this type were found with a burial at Ala-309 (Schenck 1926: 246).

Because the mortars recovered at Ala-13 are dressed overall and those from Ala-12 show only partial shaping, the latter are more similar to the mortar sample from Ala-328, which contains both partly and wholly shaped mortars. Temporal inferences are eschewed because of small sample size and also because partly dressed mortars like those from Ala-12 appear throughout the temporal span of occupation of various Bay area sites (e.g., they were found in both cone and trenches at Ala-309; cobble mortars with no external shaping were recovered at early site SMa-77).

Quartz Crystals -- Ala-328 (28 specimens). Plate 1W.

Intact crystals and quartz fragments retaining a portion of a crystal face fall into this group. Unbroken crystals range from 0.6 to 3.4 cm in maximum diameter. A number of specimens are cracked within the crystal and a few are chipped at one or both ends. Internal cracking and breakage of this sort may be observed on quartz crystals in their natural setting, hence it is uncertain if the crystals were battered in use, as Davis suggests (D&T 1959: 16).

Twelve crystals and fragments in the collection were associated with the following burials (multiple counts in parentheses): 32, 129, 215, 257, 274, 298(3), 369(2), 413(2). Burial records and catalog document the occurrence of quartz crystals as grave goods with burials 92, 170, and 316(2), but the specimens are missing; similarly, 2 of 3 quartz crystals documented as associations of feature 68-33 are missing. Eleven quartz crystals were reportedly associated with burial 226; none were catalogued and none are visible in the burial photo, so their occurrence cannot be confirmed. Table 3-58 gives provenience information for quartz crystals in the collection and for 4 well-documented specimens which are missing. No distributional clustering is evident.

Speculations regarding the uses to which quartz crystals were put vary in their emphases on utilitarian, social, or ceremonial functions of the items (cf. D&T 1959: 16, Gerow with Force 1968: 81-82, Wallace and Lathrap 1975: 27). The fact that half of the quartz crystals from Ala-328 were recovered as grave goods suggests a social or ceremonial function; whole mortars were the only obviously utilitarian artifact type with a comparable incidence of occurrence in graves.

Quartz crystals were not recovered at Ala-13.

Quartz crystals -- Ala-12 (1 specimen).

A quartz fragment retaining several crystal facets was in association with burial 6.

Pestles -- Ala-328 (127 specimens; 28 whole, 99 fragments). Plate 7A, B, C, G.

Pestles are distinguished as a group from other pecked and ground roughly cylindrical elongate forms by extensive pecked shaping over most or all side surfaces. Other artifacts of similar shape may show scattered pecking, which often appears to be a result of use rather than a shaping process. Such specimens are considered to be multiple-use tools, which are categorized in this report as chipping hammers or hammerstones.

Twenty eight whole or nearly intact pestles were recovered. Two were associated with what was reported to be a cobble mortar, a specimen since lost; this was the only recorded co-occurrence of mortar and pestle. These 2 pestles and 8 others were associated with 6 graves, in which 7 individuals lay: 49, 129, 131, 360, 380-381, 409. The 6 individuals for which age and sex have been determined were all adults, 3 male, 2 female, and 1 possible male. The burial record lists a pestle grave good with burial 328, but no catalogued artifact is attributed to the burial. Three of the burials with which pestles were found were cremations located in the shallow cremation cemetery; the other 3 graves, containing inhumed individuals, were in the basal cemetery (see Chapter 4 for discussion of cemetery). No information regarding placement of pestles within any of the 6 graves was recorded. A single pestle was associated with SFSU feature 1. Provenience information for unbroken pestles is given in Table 3-59. A summary of their distribution by depth is included in Table 3-61. It is curious that whole pestles

Table 3-59. Provenience and measurements of intact pestles, Ala-328.

Depths in inches below surface.
b = breakage on specimens; original measurement was slightly greater.
/ = missing information.
H = Hayward excavations.

Form	Pit	Grid	Depth	Burial	Length	Max. Diam.	Cat. No.
Flanged	C-6	I	8	129	31.0	6.8	1-744
	C-6	I	12	131	57.5	7.0	1-701
Round-	A-7	I	0-18	-	23.9	7.3b	1-14
ended	C-7	I	82	-	25.0	7.1	1-541
	D-5	II	116	-	24.0b	8.5	1-2493
Cylind-	B-4	I	47	-	21.5	6.6	1-748
rical	C-6	I	8	129	19.4	6.6	1-712
	C-6	I	8	129	26.0	6.8	1-743
	D-7	I	25	49	25.0	6.5	1-528
	E-1	I	156	-	15.0	6.7	1-534
	E-6	I	96	-	17.3	6.1	1-562
	/-9	I	35	-	18.5	8.0	1-48
	A-4	II	103	409	16.0	7.5	1-2513
	A-5	II	83	380-381	38.5	5.7	1-2494
	A-5	II	83	380-381	21.8	6.1	1-2489
	A-5	II	93	-	17.0	8.0	1-2508
	A-6	II	93	360	23.5	5.9	1-2488
	A-6	II	93	360	20.9	6.2	1-2490
	C-10	II	48	-	11.5	5.6	1-953
	D-7	II	47	-	15.0	6.7	1-1536
	D-8	II	48	-	20.9	6.4	1-1474
	E-8	II	54	-	14.9	6.7	1-1421
	F-5	II	80	-	14.5	6.9	1-2492
	F-7	II	84	-	30.0	5.8	1-2495
	/-9	II	36	-	20.7	6.4	1-1417
	C1-67	H	27	-	13.0	6.3	1-09-68
	J-68	H	41	-	13.3	6.5	1-236-68
	C-66	H	60-66	-	14.5	4.1	1-319-68

were recovered only in very shallow graves or with submound burials; this contrasts with the recovery of mortars in graves at middle depths.

Broken pestles were recovered in the form of 65 end fragments and 34 medial fragments. Burials 11, 131, and 68-1B were each accompanied by a pestle fragment. Davis (D&T 1959: 12, 13) reports pestle fragments associated with burials 74 and 98 as well; the specimens have been lost, and are not included in the counts above. Table 3-60 gives provenience of pestle fragments, and Table 3-61 summarizes their occurrence by depth.

Almost all pestles and fragments are indurated sandstone; 6 fragments of soft sandstone were recovered. Length of complete specimens range from 57.5 to 11.5 cm, averaging 21,8 cm. Maximum diameter ranges from 8.5 to 5.6 cm, averaging 6.6 cm. Dimensions of individual specimens are included in Table 3-59. It should be noted that the shorter specimens (15 cm or less in length) were probably unsuited for use in a bowl mortar.

Variation among pestles occurs in shape of ends, presence and location of used pits or natural flat surfaces on the shaft, amount and nature of apparent use-wear on ends. A single specimen (1-48) shows mano-like flat grinding use along 1 side of the shaft, as well as possible end use. The artifacts classified as manos by Davis (D&T 1959: 44) fall into the anvil hammerstone and abraded pecking stone groups described elsewhere. For descriptive purposes, the intact pestles may be placed into 3 groups, flanged, round-ended, and cylindrical pestles.

Flanged pestles (2 specimens). These pestles are tapering cylinders with flanged handles; that is, they show a sudden expansion of diameter at the proximal end, somewhat like that on a baseball bat handle. Beardsley's type IIB4 (1954: 10, Fig. 4) includes the flanged ends of these specimens, but he specifies flattened working ends, and these are slightly rounded at the distal end. The longest and the third longest pestle from the assemblage fall into this group. The longer specimen shows no use-wear on either end; the shorter specimen may have been used slightly. Both examples accompanied cremations which lay very near the surface of the site. The longer specimen was broken when excavated, although all pieces were present. Breakage may have been deliberate or due to fire damage. Well-finished flanged pestles such as these are characteristic of late prehistoric components in sites around San Francisco Bay and in the lower Sacramento Valley. It is interesting, therefore, to note that the one pestle end fragment which shows a flange and dressed finish was recovered in pit B-7 I at 64 inches below surface; it was not a burial association.

Round-ended pestles (3 specimens). These pestles have end areas which extend further back toward the shaft area than do the end portions of other pestles in the assemblage. The ends are more rounded than those on other pestles,

Table 3-60. Provenience of pestle fragments, Ala-328.

Depths in inches below surface.
* = burial association.

SFSU Grid I

A-1	0-18
A-2	33, 111
A-3	96
A-5	48
B-1	49
B-2	61
B-7	64
C-1	80, 90, 117
C-3	108
C-6	0-12*, 24
C-7	72, 81, 96
D-4	84, 84
D-6	2
E-1	28*, 113, 122

SFSU Grid II

A-5	80
A-6	33, 88
B-4	50, 96-108
B-6	50, 76, 76
B-7	68, 84
B-9	15, 64
C-5	14, 70-72
C-6	0-12, 0-14, 6, 94
D-6	90
D-7	90
D-10	24, 41
E-6	15, 30, 92
E-7	90
E-8	27, 55
F-5	19
F-6	54
F-9	85
F-10	24
G-3	66
G-4	72
G-6	74
G-7	0-60

SFSU Grid II

H-7	26, 34
I-6	6
J-3	9
J-8	49
J-9	12-24

Hayward Excavations

A1-67	18-24
B1-67	18-24, 24-30
B2-67	6-12, 40, 54
C1-67	30
C2-67	0-6, 30-36
D1-67	0-6
D2-67	12-18
E1-67	30-36
E2-67	0-6, 30-36
F1-67	28, 35
F2-67	43
G-68	10

Wedel Excavations

5-10E	5-10S	54
60-65W	35-40N	14

Omitted: 7 SFSU, 4 Hayward, 3 Wedel specimens lacking complete provenience information.

Table 3-61. Depth occurrence of pestles and pestle fragments, Ala-328.

Depths in inches below surface.
H = Hayward specimen.
W = Wedel specimen.

Depth	No. of Specimens
0-12	10 (+5H)
13-24	8 (+3H, +1W)
25-36	11 (+8H)
37-48	7 (+3H)
49-60	8 (+1H, +1W)
61-72	9 (+1H)
73-84	14
85-96	14
97-108	3
109-120	4
121-132	1
133-144	0
145-156	1
	90 (+21H, +2W)

Omitted: 11 SFSU specimens, 3 H specimens, and 3 W specimens, all lacking precise depth information.

approaching a rounded conical shape on the most extreme specimen. The ends are smooth surfaced and show no evidence of pounding or grinding against stone. The depth of the end portions and their polish suggest possible use against wooden mortars. However, they are not conical or chisel-pointed like other specimens interpreted as wooden-mortar pestles (LH&F 1939: 10, 11). These pestles have the largest diameters of the assemblage. Two are bun-shaped, rounded over a roughly semicircular cross section except at 1 end where a flattened side causes a taper over one third of the length.

Cylindrical pestles (23 specimens). These pestles are predominantly cylindrical with slight to moderate tapering; the difference between proximal and distal end diameters ranges from 0.3 to 4.0 cm. On 8 specimens, the taper is caused by 1 or 2 naturally flat surfaces which angle in towards one end. Ends are flat or slightly rounded. Various specimens in this group approximate types IIA1, IIA2, IIB1b in Beardsley's (1954) typology, types A1, B1, and C1 in the typology of Lillard, Heizer and Fenenga (1939), and types II, III and IV in Gerow's typology (Gerow with Force 1968: 66).

Seven specimens show definite use of both ends. Of 9 pestles which show definite use at the wider end, the narrow end shows possible use in 4 cases. Two specimens were used only at the narrow end. Three specimens show no evidence of pounding against stone; perhaps coincidentally, all 3 are less than 15 cm in length. Wear on 2 specimens was obscured by exfoliation of the rock at the pestle ends. These judgments concerning use-wear are based on visual examination conducted without magnification.

On several cylindrical pestles, naturally flat surfaces were left unpecked on portions of the shaft. None shows use-wear on these shaft areas except 1 specimen (1-48) mentioned above. One specimen has a single man-made pit on the shaft; another has 2 pits on opposite sides, each measuring about 5 by 3 cm in outline, 0.3 cm in depth. The pits have pecked surfaces, and may have served as anvils, like the pits on artifacts grouped as anvil hammerstones, described elsewhere. Four pestle end fragments are pitted in the same manner as the 2 unbroken pestles. Uhle illustrates a comparable pitted pestle from Emeryville (1907: Fig. 13), and 1 is shown in Plate 7B here.

Pestles -- Ala-13 (7 specimens; all fragments).

One complete pestle (30-409/6528) was reportedly recovered from pit G-12 at 71 inches depth (R 1967: 53); I was unable to locate the specimen. Five pestle ends and 2 medial fragments were found. None were grave associations; 1 was associated with feature 6, 1 with feature 7. The 7 include the 4 definite pestle fragments and 3 of the possible pestle fragments listed in Rackerby (1967: 53). A proximal fragment is flanged, with a concave finished end; it was recovered at 18 inches depth below datum plane in pit I-17. Another fragment is a tapering cylinder in form. Hence at least 2 of the 3 pestle types found at Ala-328 occurred also at Ala-13. All of the fragments appear to be indurated sandstone, contrary to the classification of some as granites and basalt in Rackerby. Table 3-56 gives provenience of the pestle fragments. Three pestle ends were recovered on or near the surface in pit E-18, but not in apparent association with one another.

The small number of pestles recovered, both absolutely and relative to the samples from Ala-328 and Ala-12, is noteworthy.

Pestles -- Ala-12 (26 specimens; 1 whole, 25 fragments).

Only 1 unbroken elongate ground stone artifact from the Ala-12 collection showed peck-shaping sufficient to be classified as a pestle. In spite of scattered pecking overall, planar and angular surfaces still dominate, so the specimen could be called a cobble pestle. It is roughly cylindrical, with a slight taper. Cross section is roughly circular at the large end, elliptical at the smaller end. The 2 ends and adjacent shoulders at each end show use. The larger end is slightly rounded, the smaller end flat. Maximum diameter is 6.3 cm, and length is 18.5 cm. The specimen, made of indurated sandstone, was found unassociated in pit 0E/5N at 20 inches below surface.

Fragments include 17 pestle ends and 8 medial sections. Four of these are soft sandstone and the remainder, indurated sandstone. None of the ends are flanged. Two taper in diameter along their length. One has a flat surface suggesting mano-like use along the shaft below an unused end. On another specimen the working end is a smooth surface oriented at an angle to the shaft axis, as if the tool was held obliquely rather than vertically and was used for rubbing rather than pounding. Four pestle ends and 3 medial sections were among the broken stone artifacts associated with burial 5. A pestle fragment was found in each of 3 pit features: 11, 22, and 28. Table 3-57 includes provenience information for pestle fragments.

Chipping Hammers -- Ala-328 (204 specimens). Plate 12D, E.

As the name implies, these artifacts were presumably used for light pounding tasks; "pecking stone" would be an acceptable alternative designation for the type. The complete specimens are mostly elongate cobbles of indurated sandstone, shaped only by weathering or as a consequence of use. Cross sections may be roughly circular or elliptical or somewhat angular. In size, chipping hammers range from short, relatively narrow items which could have been controlled by finger pressure, to longer, heavier specimens which were probably gripped in the fist and used either like a modern hammer or like a pestle. Fourteen specimens are pebble hammers, small ovals in shape. Two of these are schists, the only chipping hammers not made of sandstone.

These multiuse tools show percussion spalls or pecked usage on end(s) and/or shoulder(s). By "shoulder" is meant the facial surfaces immediately adjacent to the ends. Degree of wear varies from light to heavy. Among complete elongate specimens, 40 show end wear, 19 show shoulder wear, and 25 specimens are worn on both end and shoulder. Among fragments, 40 show end wear, 33 are worn on both end and shoulder, and 33 show shoulder use solely. Five pebble hammers show end use; 3, shoulder use; 3, end and shoulder use. Three other pebble hammers show usage in the center of one or both sides; this usage would place them with hammerstones but for their small size.

Table 3-64 summarizes maximum dimensions of the unbroken tools, grouped by position of used surfaces. Table 3-62 gives provenience information for all chipping hammers and fragments recovered, and Table 3-63 summarizes their occurrence by depth.

Burial 139 was accompanied by an intact chipping hammer and a fragment, and burials 290 and W1 each had an associated unbroken chipping hammer. One unbroken specimen was in possible association with burials 67-9. Burials 432, 67-3, and 67-6 were each accompanied by a fragment. Complete chipping hammers were associated with 3 features: SFSU feature X, SFSU feature 1, and Hayward feature 68-1. A chipping hammer fragment was part of SFSU feature 67-9.

Among the unmodified stone items saved by excavators, approximately 40 have the elongate form characteristic of chipping hammers and fall within the size range, although there is no evidence to justify calling them blanks for chipping stones. Four such items accompanied burials 170, 188, 432, and W1.

Chipping Hammers -- Ala-13 (16 specimens).

Chipping hammers from Ala-13 are similar in shape, dimensions and nature of wear to those described from Ala-328. One pebble hammer, 9 elongate hammers and 6 fragments were recovered from Ala-13. The pebble hammer measures 6.2 by 6.1 by 4.0 cm. Among the unbroken elongate hammers. length ranges from 7.7 to 25.0 cm, width from 3.1 to 8.2 cm, and thickness from 1.9 to 4.8 cm. The pebble hammer is a soft sandstone; all other specimens are indurated sandstone. The pebble hammer shows end wear; 7 elongate hammers show end and shoulder wear, while 2 show wear on shoulders only; half of the fragments are shoulder-worn, half end-worn. One chipping hammer was associated with burial 29; a fragment was part of feature

Table 3-62. Provenience of chipping hammers, Ala-328.

Depths in inches below surface. # (#) = multiple specimens: count(depth).
* = burial association.

SFSU Grid I

A-2	0-18
A-4	56, 56, 89
A-5	110
A-6	18, 24
A-7	27
A-10	30
B-2	61, 72, 2(94*), 96
B-3	48
B-4	40
B-5	20
B-6	9, 90
B-7	116
C-1	18-24, 76, 104, 115, 122
C-6	24
C-7	19, 96
D-1	114
D-5	100
D-7	18, 32
E-1	156
E-6	12, 16
E-7	58
F-6	57
G-1	96

Wedel Excavations

40-55W	40-45S	12
5-6½	12½-16½S	81
5-10E	5-10S	75

SFSU Grid II

A-1	10
A-5	93, 108
A-7	18, 80
A-9	103
B-4	15, 36, 73, 96-108
B-5	60, 85, 114
B-7	63, 63, 78
B-9	90
C-5	15, 60-72, 108, 119
	31, 62-66,
C-6	100, 106
	60
C-7	94, 102
C-9	48-60, 48-60
D-5	75, 80
D-7	19
E-5	84, 89, 92
E-6	39
E-8	36
E-10	35, 75, 96
F-5	54
F-6	40
F-10	66, 66
G-3	75, 75, 77,
G-4	77, 85
	37
G-5	60, 77
G-7	0-12
I-6	24
I-9	40, 40, 57, 81
J-6	2, 27
J-7	19
J-8	48-60
J-9	

Hayward Excavations

A1-67	18-24
B2-67	39, 45
C1-67	42-48
C2-67	6-12, 12-18, 30-36
D1-67	0-6, 6-12, 12-18, 36, 36
D2-67	12-18, 18-24, 24-30, 24-30, 24-30, 24-30, 24-30, 30-36
E1-67	18-24, 30-36, 30-36, 30-36, 36-42, 36-42, 40, 42
E2-67	12-18, 36-42
F1-67	6, 26, 27, 33, 42, 44
F2-67	24, 34, 44, 48, 50
G-68	18, 30. 31, 34, 38
J-68	32, 36, 36, 36, 39, 43
K-68	6, 18, 18, 30, 36-42, 42-48
L-68	17, 21
M-68	16, 31

Omitted: 14 SFSU, 22 Hayward specimens lacking complete provenience information.

Table 3-63. Summary of depth occurrence, chipping hammers, Ala-328.

Depths in inches below surface. W = Wedel excavations.
H = Hayward excavations.

Depth	Number of Specimens
0-12	5 (+6H, +1W)
13-24	14 (+15H)
25-36	8 (+29H)
37-48	7 (+23H)
49-60	12 (+7H)
61-72	8
73-84	14 (+2W)
85-96	15
97-108	9
109-120	6
121-132	1
133-144	0
145-156	1
	100 (+80H, +3W)

Omitted: 16 SFSU and 5 H specimens lacking precise depth information.

Table 3-64. Measurements of chipping hammers, Ala-328.

Wear Position	No. Spec. Measured	Length (cm) Min.	Max.	Av.	Width (cm) Min.	Max.	Av.	Thickness (cm) Min.	Max.	Av.
end	15*	9.0	14.0	11.5	2.4	6.5	3.9	1.5	5.2	2.6
shoulder	15	9.0	16.5	13.2	3.4	8.0	4.5	2.0	6.4	3.6
end and shoulder	20	7.6	20.5	13.8	2.9	6.9	4.9	2.4	6.4	3.9
pebble hammers	14**	4.3	7.0	5.7	2.6	5.5	3.9	1.9	3.2	2.5

* 14 measured for thickness.
** 13 measured for length.

7, a rock cluster possibly associated with burial 75. Table 3-65 gives provenience for all chipping hammers.

Chipping Hammers -- Ala-12 (22 specimens).

Chipping hammers accompanied 3 burials at Ala-12. They share with obsidian blades the most frequent occurrence in graves among stone artifacts, and are second only to pigment in this respect among all artifact types recovered, irrespective of raw material.

All chipping hammers recovered are indurated sandstone. No pebble hammers were found at Ala-12; otherwise the size range is comparable to the Ala-328 sample. Five unbroken elongate hammers show end wear; 2 show end and shoulder use. Shoulder wear can be seen on a medial fragment. Five end fragments show end wear; 9 others are worn on both end and shoulder.

A chipping hammer was associated with each of burials 3, 5, and 7, and features 11 and 22, both pits. Table 3-66 gives provenience of all chipping hammers and fragments recovered.

Quartz Cobbles and Fragments -- Ala-328 (29 specimens). Plate 11J.

None of these quartz pieces show a crystal face, nor do any show evidence of human modification or use-wear. About half of the pieces saved by excavators were grave goods. They were associated with burials 28, 219 (2 specimens), 272, 298 (7 specimens), 409, and 413, which are widespread vertically and horizontally within the site. Catalogued specimens are attributed to burials 216 and 432 as well, but burial records do not confirm this. Three specimens which accompanied burials 28, 219 and 413 are small rounded cobbles. They measure 3.5 by 3.4 by 2.7 cm, 5.8 by 4.9 by 3.6 cm, and 3.9 by 2.7 by 1.4 cm, respectively. The other specimens found with graves and most of those lacking association are small angular fragments.

Quartz Fragments -- Ala-13 (3 specimens).

None of these small quartz pieces show a crystal face, nor do any show evidence of human modification or use-wear. Two fragments were recovered near burial 55, but are not a certain association. A third piece was found unassociated in pit E-14 at 69 inches depth. No quartz crystals were recovered at Ala-13.

Table 3-65. Provenience of chipping hammers and hammerstones, Ala-13.

Depths in inches presumed below datum plane.
* = burial association.
c = chipping hammer.
h = hammerstone.

Pit	Depth
C-13	c· 52
	h: 56
E-14	c: 37, 52
E-19	c: 12-15, 54
	h: 6
F-12	c: 69, 79
F-17	c: 10
H-13	c: 14
H-18	h: 18
J-11	c: 56
J-17	c: 33
L-17	c: 35, 51*, 54
M-17	h: 50

Omitted: 2 chipping hammers and 3 hammerstones lacking complete provenience information.

Table 3-66. Provenience of chipping hammers, Ala-12.

Depths in inches below surface.
* = burial association.

Pit	Depth
0E/5N	16, 41, 48*, 54, 66
0E/8N	28, 58, 60, 60
0E/11N	26, 40
1E/7N	29, 46, 56, 59, 59*
5.5E/4N	23*
5.5E/5N	12-25, 24, 30
5.5E/10N	37
1W/2N	12

Quartz Cobbles and Fragments -- Ala-12 (10 specimens).

None of these specimens shows a crystal face. Three were recovered in the vicinity of vandalized burials 11, 12 and 13, and may be grave associations. A piece of quartz was found among the modified and unmodified stone artifacts which lay beneath burial 5. A quartz fragment associated with hearth feature 13 is described as a scraper by Rackerby (1967: 33), but it lacks use-wear or evident human modification.

Pebble Grave Goods -- Ala-328 (24 specimens).

Small pebbles of varying shapes accompanied 6 burials: W11, 42, 173, 432, 445, 67-9. A feature consisting of 26 pebbles was reported to be adjacent to burial 68-1B; none of the pebbles were catalogued, however, so this occurrence is not included in the total above or on Table 3-1. These burials include 3 at or in submound, and 4 within 30 inches of the surface of the site.

The 20 specimens found with burial 42 were varied in shape (spherical ovoid, disk, elongate, naturally grooved) and in rock type (a glaucophane schist, a porphyritic volcanic rock, a variety of sedimentary rocks including sandstones and cherts). Two smooth oval pebbles of what is probably a fine-grained sandstone accompanied burial 173. A single smooth elongate sandstone pebble was found with burial 432. A pebble of probable finegrained sandstone which has a few angular irregularities but is stream-polished was associated with burial 445. Four "small, smooth stones" were reportedly associated with burial 67-9; the specimens are lost. Aside from some of the colored specimens with burial 42, most of the associated pebbles are unremarkable in appearance.

Pebble Grave Goods -- Ala-13 (5 specimens).

Although not mentioned in Rackerby (1967), these pebbles bear the same catalog number (30-415) as 2 quartz fragments which were possibly associated with burial 55. The specimens include 3 pebbles of chert, and 2 of jasper. One is smooth surfaced, probably stream-polished, while the others are angular sheared chunks like those presently eroding from outcrops on the Coyote Hills. Probably these were recovered when the matrix around burial 55 was screened, and their association with the burial is fortuitous.

No pebble grave goods were reported from Ala-12.

Chipped Stone Artifacts -- Introduction.

The chipped stone artifacts have been divided into 2 categories according to raw material, obsidian and non-obsidian. For sorting specimens descriptively, the classification used by Fredrickson (1968: 57 ff.) was applied to the collections.

Rock types of non-obsidian specimens were determined in consultation with Prof. S. A. Kirsch, a mineralogist from the Department of Geology at SFSU. His identifications were based solely on examination of specimens with a hand lens. The explanations which follow are my renderings of his comments concerning the rock names he used. "Flint" as used here is a gray or black opaque rock often described as Monterey chert; it may be speckled rather than homogeneous in color, and may contain obvious inclusions. "Chert" is used here for less opaque, more translucent rocks, usually green, brown or creamy white among these specimens. "Silicified chert" shows greater translucence than chert; specimens are green or white. "Chalcedony" is the most translucent of the chert series; specimens are white or yellow in color. "Jasper" is more opaque than chert, and usually red or reddish brown in color. "Jasperoid quartz or chert" is banded green, white and red rock, with textural and optical properties intermediate among the 3 rock types for which it is named. These definitions apply throughout this paper wherever these terms are used.

Raw material for some of the non-obsidian specimens could have been collected from outcrops on the Coyote Hills, especially for those of chert, silicified chert, chalcedony, jasper, and jasperoid quartz or chert. The flint, a white chalcedony used for one small finely made point, and some of the cherts with good flaking characteristics were probably collected or traded in from elsewhere. Most of the rock which can be collected today from the hills shows the effects of shearing in the past, which makes it difficult to work with in a flaking process.

Obsidian was not available locally. X-ray fluorescence analysis of seventy specimens by Jackson (1974) indicates that the predominant sources were 2 flows in the Napa area to the northwest, and 4 flows on the east side of the Sierras (see Tables 3-67, 3-68, 3-69, and Map 3-1). As Table 3-67 shows, the majority of the specimens at Ala-328 from eastern sources were recovered at relatively great depths. This supports a trend noted by Jackson (1974: 70) from appreciable amounts of eastern obsidian in earlier components of eastern and southern Bay area sites to overwhelming predominance of Napa obsidian in later components. The evidence for change in source with depth is not clear at Ala-13 and Ala-12, partly because of use of datum plane depths at the former site, and the small sample size at the latter. The fact that Ala-13 contains relatively few specimens from eastern sources, and Ala-12 relatively

Table 3-67. Sources of artifactual obsidian from Ala-328.

Source data from Jackson (1974: Table 18).
Depths in inches below surface.
* = burial association.

Cat. No.	Pit	Grid	Depth	Source	Artifact Type
1-1244	? -9	II	8	Napa	blade
1-46	E-1	I	11*	Napa	blade fragment
1-2839	J-5	II	0-12	Napa	blade
1-2796	A-3	II	12*	Bodie Hills	bifacially chipped scraper
1-2757	I-6	II	17	Napa	blade
1-1125	A-9	II	18	Napa	blade fragment
1-2759	J-7	II	21	Napa	blade fragment
1-2485	I-7	II	12-24	Napa	blade
1-2466	E-6	II	24	Mono Ctr/Mt.	blade fragment
1-2760	J-7	II	40	Napa	blade
1-975	E-9	II	41*	Napa	blade
1-1105	B-9	II	42*	Napa	modified, lacking use-wear
1-1241	E-8	II	51*	Napa	blade
1-2765	B-4	II	53	Napa	bifacially chipped scraper
1-2748	A-6	II	56	Napa	blade
1-2751	G-4	II	56	Napa	blade fragment
1-1524	D-7	II	58	Bodie Hills	blade
1-1627	F/G-7	II	60*	Napa	bifacially chipped scraper
1-1080	A-1	II	62	Napa	reamer
1-1480	B-8	II	70	Casa Diablo	blade
1-898	C-5	I	72	Anadel	blade fragment
1-387	A-4	I	76	Bodie Hills	blade
1-1479	B-8	II	76	Napa	reamer
1-2471	G-7	II	76	Casa Diablo	blade
1-1469	? -8	II	78	Napa	blade
1-2470	A-5	II	80	Bodie Hills	blade
1-2455	D-7	II	86	Bodie Hills	blade fragment
1-681	B-1	I	86	Hapa	blade fragment
1-594	C-7	I	88*	Napa	blade
1-2483	A-5	II	90*	Napa	blade
1-783	B-2	I	94*	Napa	flake scraper
1-1481	C-6	II	94	Mt. Hicks	blade
1-1472	?	II	94	Napa	blade fragment
1-2460	C-5	II	96	Napa	blade
1-2461	E-6	II	104	Napa	bifacially chipped scraper
1-596	C-1	I	118	Napa	blade
1-2456	no location		?	Mt. Hicks	blade fragment
1-2789	no location		?	Napa	blade
1-2459	no location		?	Napa	blade
1-2788	no location		?	Napa	blade

Table 3-68. Sources of artifactual obsidian from Ala-13.

Source data from Jackson (1974: Table 17).
Depths in inches presumed below datum plane.
* = burial association.

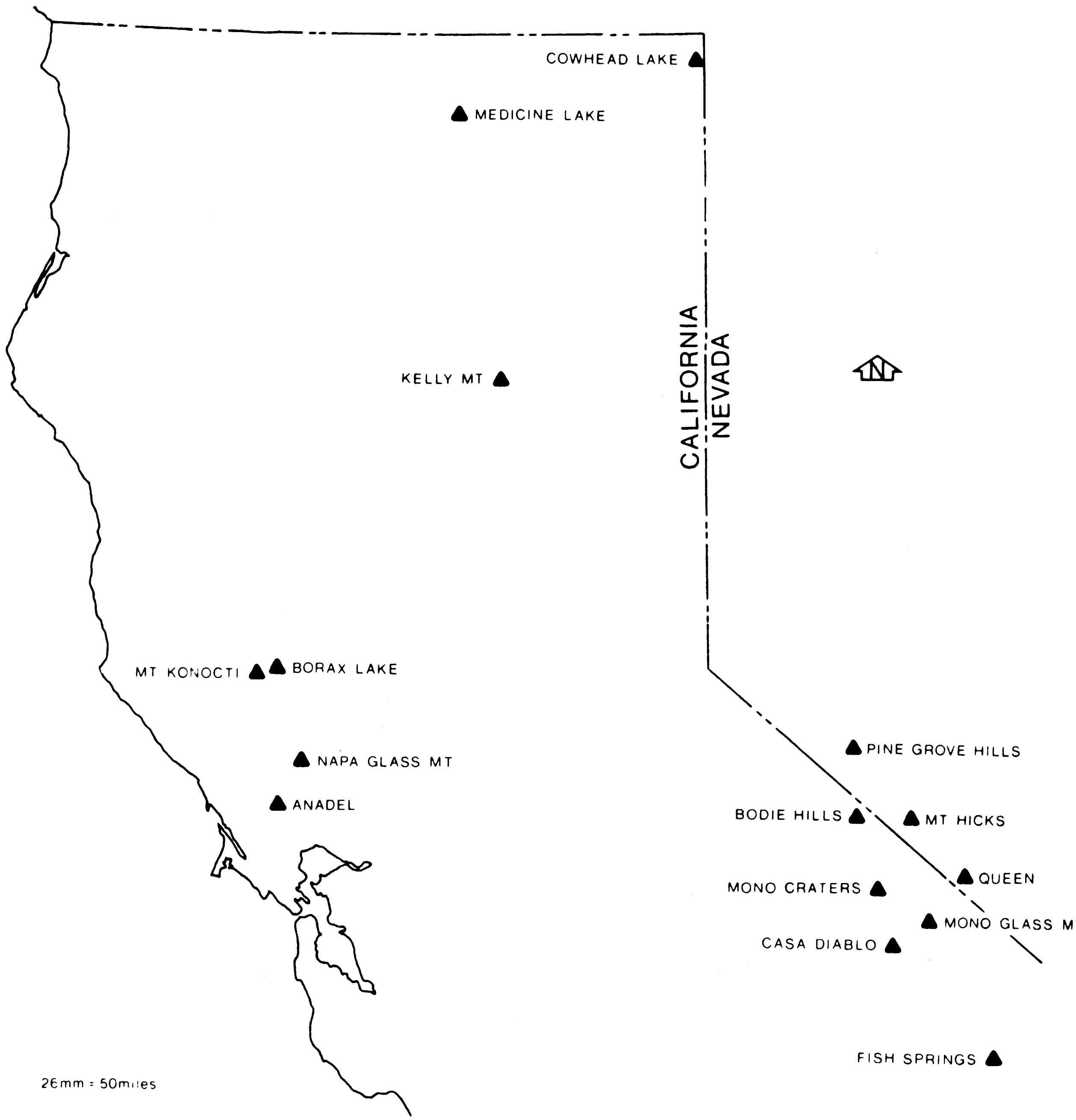
Cat. No.	Pit	Depth	Source	Artifact Type
30-296	M-17	12-18	Napa	modified, lacking use-wear
30-299	I-17	18	Napa?	modified, lacking use-wear
30-298	M-17	18-24	Napa	flake scraper
30-289	J-17	24	Napa	blade fragment
30-287	M-17	26	Napa	blade fragment
30-292	M-17	31	Napa	modified, lacking use-wear
30-280	M-17	33	Napa	modified, lacking use-wear
30-297	N-17	40	Napa	modified, lacking use-wear
30-300	E-13	42	Napa	flake scraper
30-277	E-14	44	Napa	flake scraper
30-278	M-17	45	Casa Diablo	modified, lacking use-wear
30-286	I-13	49	Casa Diablo	blade
30-304	E-15	55	Anadel	modified, lacking use-wear
30-281	I-13	62*	Napa	blade
30-282	J-13	63*	Napa	blade
30-283	I-13	66*	Napa	blade fragment
30-303	E-13	66	Napa	modified, lacking use-wear
30-279	H-12	71*	Napa	blade
30-284	H-12	71*	Casa Diablo	blade
30-295	?	surface	Napa	blade

Table 3-69. Sources of artifactual obsidian from Ala-12.

Source data from Jackson (1974: Table 16).
Depths in inches below surface.
* = burial association.

Cat. No.	Pit	Depth	Source	Artifact Type
29-164	1W/2N	15*	Anadel	blade
29-159	5.5E/10N	17	Anadel	modified, lacking use-wear
29-173	5.5E/10N	17	Napa	blade fragment
29-166	0E/2N	21	Napa	blade
29-167	0E/2N	22	Bodie Hills	blade
29-165	5.5E/4N	27*	Napa	blade
29-174	0E/8N	36-48	Anadel	modified, lacking use-wear
29-181	0E/5N	48-66	Casa Diablo	blade fragment
29-169**	1E/7N	68*	Mono Ctr/Mt.	blade
29-199	1E/10N	?	Bodie Hills	bifacially chipped scraper

** Typographical error in Jackson mislabeled this 29-129.



MAP 3-1: OBSIDIAN SOURCES

many, might indicate greater age for the latter site.

The assemblages from the 3 sites vary in proportions of obsidian and non-obsidian specimens. The Ala-12 assemblage is evenly divided between the 2 classes of raw material, and there is no evidence for a change in frequency of 1 class relative to the other with depth (cf. Tables 3-83 and 3-84). At Ala-328 a slight preference for obsidian over non-obsidian, especially for the manufacture of blades, may be indicated by the difference in total numbers of specimens recovered in the whole chipped stone assemblage and in the blade category (see the counts below). However, obsidian and non-obsidian artifacts do not differ in relative frequency of occurrence by depth (see Tables 3-70 through 3-78). At Ala-13, there is a preponderance of obsidian in the chipped stone assemblage and some evidence for the absence of non-obsidian artifacts from shallower depths, although interpretation is difficult because only datum plane depths are available (see Tables 3-80, 3-81, and 3-82). Ala-12 and -13 clearly differ from one another with regard to usage of the different rock types, but this does not permit a temporal inference like that made above on the basis of obsidian source differences, since the intermediate assemblage at Ala-328 does not provide evidence for a change in relative frequencies of obsidian and non-obsidian over time.

Chipped Stone Artifacts -- Ala-328 (242 specimens).

There are 137 artifacts of obsidian and 105 non-obsidian artifacts, mostly cherts of local origin. The obsidian tools include 26 blades (inferred to be knives or points) and 32 blade fragments, 1 drill, 4 reamers, 26 bifacially chipped scrapers, 12 flake scrapers and 2 scraper planes. In addition, 34 specimens which probably represent chipping debris and broken tools show signs of human modification, but no usage is evident. The non-obsidian tools include 13 blades and 6 blade fragments, 29 flake scrapers, 10 scraper planes, 1 bifacially chipped scrapers, and 2 small choppers. In addition, there are 43 specimens which include flakes, cores and amorphous pieces with signs of human modification but no usage evident.

Chipped stone artifact types varied in frequency of occurrence as grave goods. Obsidian blades, specimens of modified obsidian lacking use-wear, and specimens of modified non-obsidian lacking use-wear were each found in 5 graves. Non-obsidian flake scrapers accompanied 3 burials, and obsidian bifacially flaked scrapers and obsidian flake scrapers were each recovered in 2 graves. None of the other chipped stone artifact types occurred as grave goods.

Table 3-70. Provenience, dimensions, and descriptive attributes of obsidian blades, Ala-328.

Depths in inches below surface.
Dimensions in centimeters.
b = broken.
b? = possibly broken.

Dist. Base-MW = distance from base to area of maximum width; range given where sides are parallel in area of max. width.

H = Hayward excavations.
/ = missing information.
* = burial association.
D = Davis (D&T 1959).

Pit	Grid	Depth	Max. Length	Max. Width	Max. Thick	Dist. Base-MW	Weight (gm)	Shape	Blade	Stem Marker	Plate	Cat. No.
E-5	II	6	2.6b?	3.0	1.3	0.4-0.8	1.5b?	tri	long	yes	8C	1-2767
/-9	II	8	5.4b?	2.2	0.9	0	11.0b?	leaf	long	no	8U	1-1244
J-5	II	0-12	2.7	1.8b	0.4	0.8	1.0b	tri	long	yes	8D	1-2839
A-66	H	0-14	7.1	3.4	1.1	2.6	/	leaf	long	no		1-62-66
I-6	II	17	2.5b	1.6	0.4	1.2	2.0	tri	long	yes	8E	1-2757
D-6	II	21	4.8	2.3	0.7	2.1	6.0	tri	long	yes	8P	1-2554
I-7	II	12-24	2.9b	1.2	0.5	0.3	2.0	tri	long	yes	8F	1-2485
J-7	II	40	4.0	2.2	1.1	1.4	9.0	leaf	long	yes	8H	1-2760
E-9	II	41*	4.0	2.0	0.9	1.0-1.7	7.5	leaf	long	no	8Y	1-975
E-8	II	51*	6.2	1.9	0.8	1.6-2.1	10.0	leaf	long	no	8O	1-1241
A-6	II	56	6.8	2.5	1.2	6.8	20.5	leaf?	long?	no?	8T	1-2748
D-7	II	58	5.9	2.3	1.1	2.7	13.0	leaf	long	yes	8X	1-1524
B-8	II	70	6.0	2.0	0.9	1.6	/	leaf	long	no	8W	1-1480
B-7	II	74	3.9	2.5	0.8	1.3	6.5	leaf	long	yes	8R	1-2468
A-4	I	76	4.6	1.7	0.9	0	7.0	leaf	long	no	8V	1-387
G-7	II	76	2.6	2.3	0.8	0	3.5	tri	long	yes	8I	1-2471
/-8	II	78	5.8b	2.2	0.8	1.6	10.5	leaf	long	yes	8B	1-1469
A-5	II	80	3.0b?	1.7	0.6	0.7-1.7	3.0b?	leaf	short	no	8G	1-2470
C-7	I	88*	13.1	2.3	0.6	1.9-4.4	20.5	leaf	long	no	D.3s, 8L	1-594
A-5	II	90*	9.2	2.9	1.0	2.2-4.2	24.0	leaf	long	no	8M	1-2483
C-6	II	94	3.5	2.4	0.8	0.4	3.5	tri	long	yes	8J	1-1481
C-5	II	96	4.8b?	1.9	0.9	2.0	8.5b?	leaf	long	no	8Q	1-2460
C-1	I	118	4.1	1.6	1.0	1.7	6.5	leaf	long	no	8K	1-596
/-/	I	/	9.2b?	2.1	0.7	4.2	14.0b?	leaf	long	no	D.3t, 8S	1-2459
/-/	I	/	8.9b?	2.4	0.9	4.1	19.0b?	leaf	long	no	D.3u, 8N	1-2789
/-/	II	/	6.9	2.0	0.8	2.4	10.0	leaf	long	no	8A	1-2788

Obsidian blades and fragments. (26 unbroken specimens, 32 fragments).

The obsidian blades and points range from relatively long, heavy bi-pointed and leaf-shaped forms through small triangular serrated side-notched forms. Because so few examples of any particular form were found, the majority of the sample of unbroken blades is illustrated, in Plate 8; one specimen stored at Hayward is not shown.

Workmanship varies from piece to piece. A blade (1-594) and 2 fragments show the fine oblique "ribbon" flaking referred to by Davis (D&T 1959: 40). A variety of edge finishing techinques are evident. Some pieces have straight, finely retouched edges which may be linear, finely dentate, or serrated; others are sinuoüs, and show only crude retouch. Three blades with fine retouch along most edge surfaces show crude percussion retouch along 1 edge. This suggests unskilled resharpening of an edge previously shaped by pressure flaking, possibly an indicator that the well made pieces were not manufactured by their users, but were received in trade as finished items. Absence of notable debitage at the site might support this interpretation, but it is equally well explained by the excavation techniques.

Two thirds of the blades at most could have been used as points. The others may represent manufacturing failures intended as points, broken points re-used as knives or scrapers, or blades originally intended to be knives.

Gifford and Schenck's typology (1926), as modified by Strong (1935), has been commonly applied to blade assemblages from central California (e.g., LH&F 1939, D&T 1959). Comparative work generally stresses contrasts in primary attributes isolated by the typology, rather than detailed consideration of differing frequencies of occurrences of specific types. For this reason the points from Ala-328 have not been assigned to specific types, but particular attributes have been recorded for each specimen. Primary attributes coded in the Gifford and Schenck typology and its variants are presence or absence of stem, or better, stem markers (Gerow with Force 1968: 64), and leaf-shaped versus triangular outline. Another variable of probable cultural and temporal significance in the Bay area is relative blade length (see Gerow with Force 1968: 60-65), calculated by treating position of maximum width as the boundary between stem and blade.

Provenience, measurements and descriptive data regarding the attributes just mentioned are given in Table 3-70 for unbroken blades, and provenience of blade fragments is shown in Table 3-71.

As indicated in Table 3-70, the obsidian blades from Ala-328 are predominantly leaf-shaped, lacking in stem markers, and long-bladed; all of the triangular blades have stem markers, while most of the leaf-shaped specimens do not.

Table 3-71. Provenience of obsidian blade fragments, Ala-328.

Depths in inches below surface.
* = burial association.

SFSU Grid I

B-1	86, 96
C-5	72
E-1	11*
E-7	48

SFSU Grid II

A-9	18, 40
A-10	55
B-5	56
B-8	90
D-6	81
D-7	86, 88
E-6	24
E-7	82
G-4	56
I-6	12
I-7	27
J-7	21

Omitted: 6 SFSU specimens lacking complete provenience information.

Table 3-73. Provenience of obsidian bifacially chipped scrapers, Ala-328.

Depth in inches below surface.
* = burial association.
# (#) = multiple specimens: count(depth)

SFSU Grid I

A-3	86

SFSU Grid II

A-3	12*
A-6	2(56)
B-1	90
B-4	53
B-7	42
C-5	82
C-8	66
C-10	54
D-7	48, 88
E-6	49, 104, 105
F-7	60*
I-7	12-24
J-7	3

Hayward Excavations

A-66	32
B1-67	12-18
B2-67	6-12, 12-18
G-68	27
M-68	15

Omitted: 2 SFSU specimens lacking complete provenience information.

The 4 specimens weighing 2. 0 gr or less were all recovered from depths of 24 inches or less below surface. This is the case also for a fragment of the same sort of point. These are light triangular points with rounded convex bases and two shallow rounded notches or serrations on each side of the proximal end of the blade; some are side-notched at an interval below the serrations; on others, the lowest serration is stem marker. Points like these were found at adjacent site Ala-329 (Coberly 1973: Fig. 8b, c, f, g), as well as other Bay area sites (e. g., CCo-259 /_ Davis 1960: Pl. 1rr_/, CCo-295 /_ Nelson 1910: Pl. 44, 9/).

An obsidian blade was found with each of burials 115, 200, 237 or 237a, and 378, and a fragment of a small lightweight point was associated with burial 2. An obsidian point was reportedly associated with burial 82, but was lost before being examined by Davis (D&T 1959: 38); it is disregarded here. Davis (D&T 1959: 38, 40) speculates that the blade found with burial 115 was the cause of death. It was not embedded in any bone, and at first impression the large size of the point and the ribbon flaking on its faces suggest ceremonial rather than utilitarian function. However, a blade of comparable size was embedded in a vertebra of a burial at Ala-13, so Davis' speculation cannot be ruled out. None of the other associated blades or the fragment was embedded in bone; it is not possible to determine whether any of them might have caused the death of the individual concerned. Burials 2, 115 and 237 were determined to be females, and the other burials with which blades were found were males; no sexual preference for blades as a grave good (or murder weapon) can be inferred.

Non-obsidian blades and fragments. (13 unbroken specimens, 6 fragments).

None of the non-obsidian blades or fragments was a grave good. A chert point was reportedly found with burial 82, but was lost before being examined by Davis (D&T 1959: 38); it is disregarded here.

The non-obsidian blades range from large leaf-shaped forms to small triangular sidenotched points. One leaf-shaped specimen with thick unworked ends must have been used as a knife; the others could all have functioned as points. Most specimens appear somewhat crude, with irregular profiles or edges, but this is probably due to the nature of the raw material rather than to unskilled manufacturing. Two lanceolate blades of chert and a small side-notched point of chalcedony are just as well made as most of the obsidian blades. The entire sample of blades is illustrated in Plates 9 and 10, excluding 4 specimens at Lowie Museum, the Oakland Museum and Hayward. Several specimens illustrated by Davis (D&T 1959: Pl. 3w, x, aa, bb) are missing from the collection; the specimen shown in Davis' Plate 3z is probably one of those at the Oakland Museum.

Provenience, measurements, rock type and descriptive data regarding forms are given in Table 3-72; provenience and rock type of blade fragments are included in the table. There are 9 leaf-shaped and 4 triangular blades; 3 of the triangular blades show stem markers, compared to 2 leaf-shaped specimens; only 2 short bladed specimens are present, both leaf-shape One specimen (1-1856) recovered at shallow depth is of special interest, being a well made light weight Desert Sidenotched point (see Hester and Heizer 1973 for a recent review of the type). The specimen does not exactly fit any of the subtypes defined by Baumhoff and Byrne (1959) because it is straight-based. It can be interpreted as a variant of either the Delta or General subtypes. Points of the Delta subtype were recovered at adjacent site Ala-329 (Coberly 1973: Fig. 9a, p. 53) and at CCo-259 to the north (Davis 1960: 35). With the exception of a point from the Marin coast noted by Baumhoff and Byrne, these represent the westernmost reported occurrences of the Desert Sidenotched point in central California to my knowledge, and the only occurrences of the type at San Francisco Bayshore sites.

Discussion.

Taken as a whole, the point assemblage from Ala-328 is characterized by an emphasis on leaf-shaped rather than triangular forms, by an absence of stem markers, and by long blades. The first 2 characteristics are shared among other Bay area sites, in contrast to sites of the interior of central California. The third characteristic is widely shared in both Bay and interior regions, but it contrasts with the preponderance of short-bladed specimens found at early bayshore site SMa-77 (Gerow with Force 1968). If the evidence from the latter site indicates a temporal change in emphasis from short to long blades in the Bay area or a wider region (and this remains to be investigated), then the Ala-328 assemblage clearly post-dates the change.

Other temporal indicators in the assemblage include the technique of ribbon flaking, possibly edge dentation [1], the small triangular serrated obsidian points, and the Desert Sidenotched point. Ribbon flaking on large obsidian blades is a diagnostic trait of Middle Horizon components in the interior of central California (LH&F 1939: 77). A blade (1-594) found with burial 115

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1 Dentate edging on points is considered a possible time marker of a subphase of the Middle Horizon in the Cosumnes District in Bennyhoff's work in progress regarding phases of central California prehistory. Since the work is unpublished and inaccessible, it will not be discussed here, although relevant information is presented. This consists of the occurrence of 5 tip fragments of blades (1-1008, 1-1560, 1-898, 1-2486, 1-2751), all with thick cross sections and finely dentate edges, recovered from the following pits and depths below surface: A-10 II 55", C-5 I 72", G-4 II 56", I-7 II 27", F-7 II ? ".

Table 3-72. Provenience, dimensions, and descriptive attributes of non-obsidian blades, Ala-328.

Depths in inches below surface. Dimensions in centimeters. b = broken. b? = possibly broken.

Dist. Base-MW = distance from base to area of maximum width; range given where sides are parallel in area of max. width.

H = Hayward excavations. / = missing information. ( ) = estimated dimensions. D = Davis (D&T 1959).

Pit	Grid	Depth	Max. Length	Max. Width	Max. Thick.	Dist. Base-MW	Weight (gm)	Shape	Blade	Stem Marker	Rock Type	Plate	Cat. No.
/-/	II	2	4.8	2.2	0.8	1.9	7.5	leaf	long	no	flint	10B	1-2772
J-5	II	8	2.6	1.5	0.4	0	1.0	tri	long	yes	chalcedony	10E	1-1846
A-/	H	21	5.3	3.3	1.4	/	/	tri	long	no	flint		1-121-68
G-5	II	27	(7.0)	(2.4)	/	/	/	(leaf)	?	(no)	chert		2777
B-5	II	30	7.0	2.1	1.1	4.0	16.0	leaf	short	no	chert	10J	1-1041
E-7	I	48	4.5	1.8	/	/	/	leaf	long	no	chert	D. 3z	864
E-7	I	72	7.5	3.3	1.1	3.2-4.3	25.0	leaf	? *	? *	flint	9C	1-140
A-4	I	84	6.7	2.7	1.1	3.8	17.0	leaf	short	yes	flint	9D	1-715
F-5	II	87	2.8	1.7	0.6	0.5	1.0	tri	long	yes	flint	10F	1-2762
B-3	I	96	5.6	2.2	0.7	/	/	leaf	long	no	chert		1-142633
C-1	I	104	2.9b	1.7	0.8	/	3.5b	tri	long	yes	jasper	D. 3y, 10H	1-575
D-7	II	/	5.9b	2.9	1.5	1.8	22.0b?	leaf	long	no	flint	9P	1-2743
/-/	I	/	7.7	3.0	1.0	1.4	22.5	leaf	long	no	flint	D. 3v, 9E	1-1852
Fragments													
A-4	I	0-18									flint		1-152
A-3	I	78									flint		1-199
A-4	II	80									flint		1-2472
A-6	I	102									flint		1-231
C-5	II	108									chalcedony		1-2848
Const. Unit I		83-84									jasper		1-1756

* Both ends thick and dull; probably used sidebladed as a knife.

and 2 fragments (1-2456, 15060) lacking provenience data show ribbon flaking, a poor sample for making temporal inferences.

The small triangular serrated obsidian points found at shallow depths have formal affinities to the "delicate side-notched serrate-edged obsidian projectile points" (LH&F 1939: 80) which characterize sites of the Late Horizon in the interior, although they are less delicate and show fewer serrations than many of those specimens. A fragment (1-2759) was recovered from pit J-7 at 21 inches below surface; provenience of the points (1-2485, 1-2839, 1-2767, 1-2757) is shown in Table 3-70. All come from the western portion of the SFSU excavations, which suggests horizontal stratigraphy, although it may simply reflect increased use of screens in this area of the site, which was excavated later than areas to the east.

If the Desert Sidenotched point can be safely used as a horizon marker, it cross dates with a range in time beginning with the late part of the period designated Phase 1 of the Late Horizon in the delta area of central California, extending through Phase 2 and into historic times (Baumhoff and Byrne 1959: 51-54, 60-61). Baumhoff and Byrne suggest that Desert Sidenotched points of the General and Delta subtypes were introduced in the delta locality about 1450 and 1500 AD, respectively, based on the assumption that Phase 2 of Late Horizon begins about 1500 AD in the delta. Although a considerable number of radiocarbon determinations have been made on pertinent delta sites in the interim, no reanalysis has yet been offered which requires changing the 1500 AD date. Bennyhoff, cited in Baumhoff and Byrne as the source for the original estimate, is using the new information, but has not yet completed a reworking of the delta phasing.

A rough dating of the Desert Sidenotched point from 1500 AD to sometime in the 1700's is sufficient for the purposes of this study. The specimen, found unassociated at shallow depth in the plow zone can not be easily assigned to an isolable component of the site although, like the small triangular obsidian points, it came from the western portion of the SFSU excavations. A time marker of limited significance in this context, it may be more informative as an indicator of trade networks to the east or northeast. The chalcedony of which it is made was probably not available in the local hills or in the Mt. Diablo range to the east. Baumhoff and Byrne (1959: 54-55) present evidence which suggests that non-obsidian Desert Sidenotched points in Sacramento and San Joaquin County sites (the delta region) were traded in as finished points, from some unknown source to the east. The Ala-328 specimen probably represents a delta trade contact through which material from further east passed.

Obsidian drills. (1 specimen).

The specimen is a broad flake, 2.1 by 2.1 by 0.8 cm, with 2 large flake scars on 1 face isolating a drill tip between them. It corresponds to Meighan's (1955: 16) "expanded-head drill". The specimen was found in pit C2-67, at 54 to 60 inches below surface.

Obsidian reamers. (4 specimens). Plate 10K.

These are long, narrow, pointed blades with straight cutting or scraping edges. They are differentiated from other blades by cross sections thickened in the center on 1 or both sides near the point, which must have contributed great strength to the tip ends in their presumed use as drills or reamers. Similar items are interpreted as drills or reamers by Davis (1960: 44, Pl. 1gg) and Meighan (1955: 16-17; Pl. 4, 12-15). Some of the blade tip fragments with triangular cross sections probably came from tools of this sort. Two complete reamers measure 5.9 by 1.7 by 1.1 cm and 3.6 by 1.7 by 0.9 cm. Reamers were found in pits A-1 II at 62 inches, B-8 II at 76 inches, E-66 at 18 to 24 inches, and Test Pit 1 at 24 to 30 inches (all depths below surface).

Obsidian bifacially chipped scrapers. (26 specimens). Plate 10P, Q.

These are pieces which show bifacial flaking and use-wear along 1 or 2 straight or convex edges. On some examples flaking extends over much of the body. The presence of irregular shatter scars on several specimens implies that some tools in this category may have been pieces which were originally discarded in the process of manufacturing blades, because of a defect in the material or a mistake on the part of the knapper; others may be re-worked fragments of broken tools. Measurements for bifacially chipped scrapers are summarized in Table 3-79. Provenience data are included in Table 3-73. Burials 272 and 298 were each accompanied by 1 artifact of this form. An obsidian bifacially chipped scraper was in possible association with burial 66-5.

Non-obsidian bifacially chipped scrapers. (2 specimens; 1 silicified chert, 1 jasper).

One small cobble of silicified chert, bifacially flaked to produce a thin convex edge which has been unifacially retouched, shows use along the edge. Over half of the cobble remains unmodified, forming a grip or backing for the working edge. The specimen was recovered from pit C-1 II at 126 inches below surface, at or just below the base of the mound in that area of the site. The tool measures 5.3 by 2.3 cm, and weighs 60.5 gm. It is illustrated in Plate 10 O.

An angular chunk of jasper has 1 used straight edge which was thinned by crude bifacial flaking. Opposite the thin edge is a flat breakage plane which could have acted as a finger rest or backing when the tool was used for cutting or scraping. The specimen measures 5.5 by 3.3 by 1.2 cm. It was recovered from the shallow disturbed zone in Hayward pit D-?.

Obsidian flake scrapers. (12 specimens). Plate 10M.

These are flakes which show unifacial chipping along 1 or more edges. It is presumed that they were random flakes which served as tools briefly when their natural cutting edge was useful, and were then abandoned. About half the specimens show wear on a thick vertical edge, as if they had been briefly used as scraper planes; the others show wear on thin edges. Provenience for obsidian flake scrapers is given in Table 3-74. Measurements are summarized in Table 3-79. Flake scrapers were reportedly associated with burials 139 and 67-14. Whether they were grave fill or grave goods is uncertain.

Non-obsidian flake scrapers. (29 specimens; 5 silicified chert, 5 flint, 6 jasper, 8 chert, 2 chalcedony, 2 jasperoid quartz or chert, 1 unidentified rock).

Like obsidian flake scrapers, these tools show only slight unifacial chipping, and are presumed to represent random flakes which were used when a thin sharp edge was needed, but which were not deliberately manufactured with such usage in mind. Nine show use-wear on a thick vertical edge, 16 on a thin edge. Five other specimens fit Fredrickson's (1968: 81) classification of "thin edge flake knife", large flakes with a thin cutting edge, often with a "finger rest" on the thick edge opposite formed by a natural flat surface or created by removal of a flake. Two non-obsidian flake scrapers are shown on Plate 10L, N; the former is a "thin edge flake knife". Measurements of flake scrapers are summarized in Table 3-79. Burials 406, 432 and 67-3 were each accompanied by a non-obsidian flake scraper. Table 3-75 shows provenience of all specimens recovered.

Obsidian scraper planes. (2 specimens).

These 2 specimens show slight retouch and use-wear along 1 or 2 steep edges. One specimen, recovered from pit B-7 I at 64 inches below surface, measuring 4.4 by 3.0 by 1.1 cm, appears to be a broken blade blank with evident hydration over most surfaces except for the steep used edge and the break area. The other scraper plane, from pit B-9 II at 84 inches below surface, measuring 3.6 by 1.5 by 1.0 cm, is a flake with a triangular cross section, showing retouch and use along the 2 parallel sides. It is shown in Plate 10 V.

Non-obsidian scraper planes. (10 specimens; 5 silicified chert, 2 chalcedony, 2 chert, 1 flint).

These artifacts show use-wear on 1 or more vertical edges of a planar surface. In all cases, the used edge has been prepared by unifacial flaking, usually with little secondary retouch evident. One specimen (see Plate 10W) is a large fist-sized chert cobble with an edge prepared by 2 large percussion flakes at one end. The others are smaller, and would be gripped in fingers rather than fist for use. Measurements for scraper planes are summarized in Table 3-79. Provenience information is included in Table 3-76.

Non-obsidian small choppers. (2 specimens; 2 silicified chert).

One cobble, found in pit J-9 at 12 inches below surface, measures 6.0 by 3.3 by 3.2 cm. It is battered at 1 end which is an angular corner, probably a thick point before usage dulled it. Adjacent to the battered corner, a steep edge shows slight nicks implying additional usage of the tool as a scraper plane. The specimen is shown in Plate 10R.

The second chopper, found in pit F-7 II at 60 inches below surface, is a relatively flat piece measuring 6.2 by 2.7 by 1.0 cm, a crude backed knife in form. It is shown in Plate 10S. The knife edge is unifacially chipped and so thick that it would have been ineffective for cutting or scraping; it shows breaks as if it had been pounded against something.

Modified obsidian lacking use-wear. (34 specimens).

This category consists mostly of small flakes or larger pieces with flake scars, none of which show areas nicked or dulled by use, in spite of evident human modification. The specimens are smaller in size than most of the deliberately shaped artifacts; they do not represent raw material for chipping. Some pieces are fragments of other tools, untypable in present form. Two specimens, narrow bladelets apparently struck from a flat platform, resemble burin spalls. Eight examples of modified obsidian lacking use-wear

Table 3-74. Provenience of obsidian flake scrapers, Ala-328.

Depths in inches below surface.
* = burial association.

SFSU Grid I

B-1	88
B-2	94*

SFSU Grid II

A-6	56
C-5	60-72
E-6	33
I-6	0-12
I-7	12-24

Hayward Excavations

B-66	24-30
D1-67	6-12*
E-66	6, 30
K-68	30

Table 3-75. Provenience of non-obsidian flake scrapers, Ala-328.

Depths in inches below surface.
* = burial association.

SFSU Grid I

A-2	119

SFSU Grid II

A-4	106*
C-5	60-72, 60-72, 72, 99, 104
D-10	69
G-3	66
I-6	0-12, 0-12
I-9	12-24, 12-24, 24-26*

Table 3-75. (continued)

Hayward Excavations

A1-67	18-24
D1-67	6-12, 6-12, 6-12
D2-67	24-30*
B-66	36
D-66	42
E-66	48
F-66	38, 39
J-68	18, 33, 38

Omitted: 2 SFSU specimens lacking complete provenience information.

Table 3-76. Provenience of non-obsidian scraper planes, Ala-328.

Depths in inches below surface.

SFSU Grid I

B-7	32
E-1	120

SFSU Grid II

B-8	6
I-7	38-32
J-7	62
J-9	0-12

Hayward Excavations

D2-67	24-30
A-66	21
D-66	24

Omitted: 1 SFSU specimen lacking complete provenience information.

Table 3-77. Provenience of modified obsidian lacking use-wear, Ala-328.

Depths in inches below surface.
* = burial association.
# (#) = multiple specimens: count(depth)

SFSU Grid I

A-5	81
A-6	89
B-1	85
E-6	16

SFSU Grid II

A-6	72-84
B-4	52
B-9	42*
C-5	60-72, 69, 106*
D-5	53, 72-84
D-7	48
E-5	12-18, 22
E-6	2(42*), 42
E-9	42
F-7	2(60*)
I-6	0-12
I-9	0-12*, 24-26*
J-5	12-14

Hayward Excavations

D-66	30-36
G-68	22
K-68	36

Omitted: 5 SFSU specimens and 1 Wedel specimen lacking complete provenience information.

Table 3-78. Provenience of modified non-obsidian lacking use-wear, Ala-328.

Depths in inches below surface.
* = burial association.
# (#) = multiple specimens: count(depth).

SFSU Grid I

A-1	46
A-3	78
A-5	90, 100*

SFSU Grid II

A-6	93*, 93*
B-4	68
B-9	82*
C-5	60-72, 96-108, 96-108, 115
C-7	90
D-5	72-84, 84-96
E-5	12-18
F-6	88
F-10	24
G-5	70
H-7	12-24
I-6	8, 0-12
I-7	12-24
I-9	0-12, 12-24, 2(24-26*)

Hayward Excavations

A1-67	6-12
B2-67	6-12
E2-67	24-30
F1-67	24-30
J-68	33, 36

Omitted: 9 SFSU specimens and 1 Wedel specimen lacking complete provenience information.

Table 3-79. Dimensions and weights of chipped stone artifacts, Ala-328.

Tool Type	No. Spec. Measured	Length (cm)			Width (cm)			Thickness (cm)			No. Spec. Weighed	Weight (gm)		
		Min	Max	Av	Min	Max	Av	Min	Max	Av		Min	Max	Av
Obsidian bifacially chipped scrapers	25	1.9	3.9	2.9	1.1	2.9	1.7	0.6	1.9	1.0	12	2.0	8.5	4.1
Obsidian flake scrapers	12	1.3	4.5	2.9	1.0	2.1	1.4	0.2	1.0	0.6	6	0.5	3.5	2.3
Non-obsidian flake scrapers	29	1.9	7.3	3.6	1.5	5.9	2.7	0.4	2.0	1.0	16	1.0	31.0	9.2
Non-obsidian scraper planes	10	2.8	8.7	5.0	2.0	6.3	3.4	1.1	4.8	1.9	7	12.0	92.0	31.9

were associated with 5 burials, single specimens with burials 203 and 445, and 2 specimens apiece with burials 298, 389, and 432. Provenience information for this group is included in Table 3-77.

Modified non-obsidian lacking use-wear. (43 specimens; 20 chert, 9 flint, 5 silicified chert, 3 jasper, 3 jasperoid quartz or chert, 1 sandstone, 1 quartz, 1 chalcedony).

Specimens in this group show flake scars, but no areas with use-nicks or dulling. Forms include flakes, irregular chunks which are "cores" in the sense that they are scarred from removal of large flakes, and chopper-like chunks. Artifacts of this type were found with burials 57, 224, 360, 361, and 432 (2 specimens); 1 was a possible association of burial 68-1J. A piece was reported from burial 226, one of many artifacts found with that burial which were never catalogued; it is not included in the tabulation of specimens in this group because it could not be examined. Table 3-78 shows provenience of all specimens of modified non-obsidian lacking use-wear which were recovered.

In addition to the 43 pieces of apparent chipping debris and cores, a number of unworked cobbles of chert, jasperoid quartz or chert, silicified chert, and jasper were collected by excavators. They may represent stock intended for eventual use. Their presence is a reminder of the local abundance of a variety of non-obsidian rock which was used in the manufacture of some chipped stone objects. Two unworked specimens were found with burials 67-6 and 68-1B.

Chipped Stone Artifacts -- Ala-13 (59 specimens).

The chipped stone artifacts recovered from Ala-13 include 49 obsidian pieces and 10 items of other rock types, mostly cherts of local origin. The obsidian tools include 6 blades (inferred to be knives or points) and 5 blade fragments, a single bifacially chipped scraper and 10 flake scrapers. Table 3-80 gives provenience data for these artifacts, and includes measurements for unbroken specimens. Twenty seven additional specimens show signs of human modification, but lack evident use-wear; they probably represent broken tools, chipping debris or rejected manufacturing efforts. Table 3-81 gives provenience information for modified obsidian lacking use-wear. The non-obsidian tools include 3 blades, 1 scraper plane, and 4 flake scrapers. Two other specimens show scars where flakes were removed, but lack evident use-wear. Table 3-82 gives provenience and rock type for all non-obsidian chipped stone artifacts, and includes measurements for unbroken specimens.

Obsidian blades and fragments were found in 5 graves; along with

Table 3-80. Provenience and dimensions of obsidian chipped stone artifacts, Ala-13.

Form	Pit	Depth	Max. Length	Max. Width	Max. Thick	Dist. Base-MW	Weight (gm)	Plate	Cat. No.
Blades	H-12	71*	4.4	2.5	1.1	1.5	12	9R	30-279
	H-12	71*	5.5	3.0	1.1	0	16	9G	30-284
	I-13	49	4.4	2.3	0.9	1.2	9	9M	30-286
	I-13	62*	13.5	3.1	1.1	3.5	49	9A	30-281
	J-13	63*	10.6	3.2	1.1	2.1	33	9F	30-282
	/	surface	7.0	1.9	0.7	1.8	7	9H	30-295
Blade fragments	I-13	66*							30-283
	J-17	24							30-289
	L-17	38							30-291
	L, M-17	57*							30-313a
	M-17	26							30-287
Scrapers	E-13	42	2.3	1.6	0.9				30-300
	E-13	48-60							30-310
	E-14	44	5.0	2.3	1.0				30-277
	E-20	surface							30-325b
	J-13	37	2.3	1.6	0.8				30-290
	L-17	34							30-311
	L-17	36	2.5	1.1	0.9				30-293
	M-16	30-36	1.9	0.7	0.3				30-294
	M-17	12-18							30-321
	M-17	18-24	1.8	1.8	0.7				30-298
	M-17	24-30							30-306

Depths in inches presumed below datum plane.
Dimensions in centimeters; not included for broken specimens.
* = burial association.
/ = missing information.
Dist. Base-MW = distance from base to point of maximum width.

Table 3-81. Provenience of modified obsidian lacking use-wear, Ala-13.

Depths in inches presumed below datum plane.
* = burial association.
# (#) = multiple specimens: count(depth).

Pit	Depth
D-13	75
E-13	52, 56, 66, 74*
E-15	55
E-20	0, 0
F-17	12
G-17	41
H-18	2(27*)
I-17	18
J-17	13
L-17	32, 40*
L, M-17	57*
M-17	12-18, 12-18, 12-18, 24-30 24-30, 31, 33, 45, 3(61*)
N-17	39, 40

Table 3-82. Provenience, rock type, and dimensions of non-obsidian chipped stone artifacts, Ala-13.

Form	Pit	Depth	Rock Type	Max. Length	Max. Width	Max. Thick.	Dist. Base-MW	Weight (gm)	Plate	Cat. No.
Blades	K-17	38	flint	7.0	2.5	0.7	0	14	9K	30-285
	D-13	70	phyllite	8.9	2.2	1.0	4.3	22	9J	30-288
	D-13	73*	chert	5.1	2.1	0.9	1.9	7	9N	30-275
Scraper plane	E-19	54	chert	7.5	6.4	2.3				30-268
Flake scrapers	F-17	38	jasper	4.2	2.6	0.8				30-270
	L-17	49	flint	2.3	2.0	1.1				30-302
	G-13	58	jasper	3.8	2.8	1.2				30-274
	E-13	70*	chert	2.7	2.4	1.4				30-272
Modified, lacking use-wear	E-13	72	silic. chert							30-266
	E-18	53	chert							30-267

Depths in inches presumed below datum plane.
Dimensions in centimeters.
* = burial association.
Dist. Base-MW = distance from base to point of maximum width.

mortars, they are the stone artifact type most frequently found in burial association at Ala-13. Specimens of modified obsidian lacking use-wear were found in 4 graves. A non-obsidian blade and a non-obsidian flake scraper were each found in association with 1 burial. None of the other chipped stone artifact types occurred as grave goods.

Obsidian blades. (6 unbroken specimens, 5 fragments).

The unbroken blades are illustrated in Plate 9 (A, F, G, H, M, R). All are leaf-shaped, long-bladed, and without stem markers, although there is great diversity of form within these parameters. All of the blades are relatively large and heavy, and there is no suggestion of small lightweight points among fragments or other obsidian artifacts recovered at the site.

Single blades found with burials 18 and 34 and a blade fragment with burial 33 probably had wounded the individuals in those graves. A blade fragment near burials 29, 30 and 38 and 2 blades accompanying burial 94 may have been placed in these graves with less hostile intent.

Non-obsidian blades. (3 specimens; 1 chert, 1 flint, 1 phyllite).

The 3 non-obsidian blades are illustrated in Plate 9 (J, K, N). They include 2 leaf-shaped points without stem markers and a triangular straight-stemmed point; all are long-bladed. The triangular chert blade (30-275) is the best made, most surely complete of the 3 blades. Its position in the grave of burial 35 does not clarify whether it was a wound agent or a grave good. The base of the flint blade (30-285/6216) is a diagonal flake scar which could be a result of breakage; in Rackerby's report (1967: 57) the specimen is interpreted to be a fragment. The phyllite blade (30-288) is very crude in form, not certainly modified by man. Like the obsidian blades, these are relatively large and heavy, and there is no suggestion of light weight points among other non-obsidian pieces recovered at Ala-13.

Obsidian scrapers. (11 specimens).

Specimens include 1 bifacially chipped scraper and 10 flake scrappers; they fit the scraper types described for Ala-328 specimens above. Among the flake scrapers, 3 show use on a thick vertical edge, and 7 on a thin edge. No obsidian scrapers were associated with graves or features.

<u>Non-obsidian flake scrapers</u>. (4 specimens; 2 jasper, 1 chert, 1 flint).

One flake scraper was used along a thin irregular edge. The other 3 show use-wear on a thick vertical edge. The largest of the 3 shows unifacial flaking along a non-used edge, to no evident purpose; perhaps this is a manufacturing reject ultimately used as a flake scraper. A single flake scraper was a grave association, found with burial 53.

<u>Non-obsidian scraper plane.</u> (1 specimen; chert).

A thick vertical edge on this fist-size flake was prepared by unifacial percussion flaking, and shows use-wear along its juncture with the planar base.

<u>Modified obsidian lacking use-wear.</u> (30 specimens).

None of the specimens in this group are large enough to be cores or blanks representing raw material for chipping. The absence of unworked obsidian and the small number of obsidian artifacts lacking use-wear suggests that objects in this latter category do not represent primary manufacturing debris, but more probably were produced by accidental breakage or as chipping debris when broken specimens were reworked. Several pieces, catalogued as 2 lots (30-305c-g and 30-312), were associated with burial 38, and were interpreted by excavators to be fragments of a projectile point. Modified obsidian lacking use-wear was also found with burials 29, 55 and 62; in the latter grave, 2 pieces were found.

<u>Modified non-obsidian lacking use-wear.</u> (2 specimens; 1 chert, 1 silicified chert).

Unlike the obsidian artifacts which are modified but lack use-wear these 2 fist-size cobbles are large enough to have provided raw material for finished items such as small blades or scrapers. Each shows scars where large flakes have been removed; hence these specimens may be considered cores.

Chipped Stone Artifacts -- Ala-12 (46 specimens).

There are 23 artifacts of flaked obsidian and 23 non-obsidian chipped stone artifacts in the Ala-12 collection. The obsidian tools include 6 blades and 2 blade fragments, a single bifacially chipped scraper, and 5 flake scraper.

There are 9 additional specimens which show signs of human modification but lack any evidently used edges or surfaces. These presumably are broken tools or chipping debris; none is large enough to be raw material for initial manufacture of a tool. No unmodified obsidian was recovered from the site. Table 3-83 gives provenience for all flaked obsidian artifacts, and includes measurements for unbroken specimens. The non-obsidian tools include 4 blades, 9 flake scrapers, and 2 scraper planes. An additional 8 specimens include flakes, cores and amorphous pieces which apparently have been modified, but which show no use-wear. A variety of unmodified pieces of rock of the types found among the non-obsidian tools were recovered or noted at the site; these may have been raw material for manufacture. Table 3-84 gives provenience and rock type for all non-obsidian chipped stone artifacts, and includes measurements for unbroken specimens.

Obsidian blades were found with 3 burials; they share with chipping hammers the highest frequency of occurrence as grave goods among stone artifact types, and in fact among all artifact types; only pigment occurred with more burials. One specimen of modified obsidian lacking use-wear was associated with a grave. None of the other chipped stone artifact types accompanied burials.

Obsidian blades. (6 unbroken specimens, 2 fragments).

All 6 blades are illustrated on Plates 9 (B, I, L, O, Q) and 10A. There are 4 leaf-shaped points lacking stem markers, and 2 triangular stemmed pointes; 1 of the latter is about equally long in blade and stem, while the others are long-bladed. The specimen (29-192) which shows the finest flaking, suggestive of ribbon flaking, also bears an eccentric spokeshave-like notch in 1 side, and evidence of breakage at the base. All of the blades are of a size and weight which suggests use on darts or spears rather than arrows; 1 fragment may have come from a light weight point. Burials 4, 6 and 7, and pit feature 3 each had an obsidian blade in association. Those found with burials 4 and 7 may have caused the deaths of the individuals involved (R 1967: 31).

Non-obsidian blades. (4 specimens; 3 flint, 1 chert).

All 4 blades are shown on Plate 10 (C, D, G, I). There are 3 long-bladed leaf-shaped points lacking stem markers, and 1 triangular stemmed point with blade and stem roughly equal in length. The leaf-shaped points appear crude and unfinished compared to the triangular point. Like the obsidian blades, these specimens are too heavy to have been used as arrow points. None were found as grave goods.

<u>Obsidian scrapers</u>. (6 specimens).

One specimen is bifacially chipped scraper which appears to be a discard from blade manufacture; it bears flake scars from an apparent thinning effort which was unsatisfactory for a blade. All of the 5 flake scrapers show use-wear on a thin edge. A single flake scraper was among a number of rocks and broken stone artifacts underlying burial 5.

<u>Non-obsidian flake scrapers.</u> (9 specimens; 5 flint, 3 chert, 1 silicified chert).

Six scrapers show use on a thin edge, 2 on a thick vertical edge; 1 fits Fredrickson's "thin edge flake knife" category (1968: 81), described in the section devoted to scrapers from Ala-328, above. One flake scraper came from the vicinity of vandalized burials 11, 12 and 13, and may have been a grave association. Two flake scrapers were among the fill in pit feature 28.

<u>Non-obsidian scraper planes.</u> (2 specimens; 2 chert).

Both specimens show unifacial retouch along the prepared working edge. One was found in the fill of pit feature 28.

<u>Modified obsidian lacking use-wear.</u> (9 specimens).

An obsidian flake was associated with feature 5, interpreted as a hearth (R 1967: 34). Another flake was part of the matrix excavated from pit feature 4.

<u>Modified non-obsidian lacking use-wear.</u> (8 specimens; 4 chert, 3 flint, 1 jasper).

One piece of modified chert was found in association with burial 4; it is described as a "flake blade" by Rackerby (1967: 84).

Charmstones -- Introduction

These artifacts have counterparts from many archaeological sites throughout the United States; outside of California, they are commonly called "plummets". Use is conjectural; ethnographic analogy gives rise to their interpretation as charm stones and sling stones and other suggested uses are as

Table 3-83. *Provenience and dimensions of obsidian chipped stone artifacts, Ala-12.*

Form	Pit	Depth	Max. Length	Max. Width	Max. Thick.	Dist. Base-MW	Weight (gm)	Shape	Stem Marker	Blade	Plate	Cat. No.
Blades	1W/2N	15*	5.1	1.8	0.9	2.2	8.0	leaf	no	long	9Q	29-164
	0E/2N	21	5.4	2.5	0.9	1.4	10.0	tri	yes	long	9L	29-166
	0E/2N	22	3.5	2.2	0.9	1.7	7.0	tri	yes	equal	10A	29-167
	5.5E/4N	27*	6.4	2.1	0.8	2.4	10.0	leaf	no	long	9O	29-165
	0E/5N	43	7.4	2.7	0.6	2.8	12.0	leaf	?	long	9I	29-192
	1E/7N	68*	8.7	2.5	1.4	3.6	29.0	leaf	no	long	9B	29-169
Blade fragments	0E/5N	48-66										29-181
	5.5E/10N	17										19-173
Scrapers	1E/10N	/	3.6	3.2	0.7							29-199
	1W/2N	18	2.2	1.3	0.5							29-156
	0E/5N	40	2.3	1.3	0.5							29-155
	2.5E/11N	41	2.4	1.4	0.4							29-205
	5.5E/4N	28*	1.5	1.4	0.4							29-191
	5.5E/7N	20	1.5	1.0	0.4							29-154
Modified, lacking use-wear	0E/5N	30										
	0E/8N	36-48, 36-48, 60										
	1E/11N	0-12										
	1E/7N	60										
	2.5E/11N	42										
	5.5E/10N	17, 27										

Depths in inches below surface.
Dimensions in centimeters.
* = burial association.
/ = missing information.
Dist. Base-MW = distance from base to area of maximum width.

Table 3-84. Provenience, rock type, and dimensions of non-obsidian chipped stone artifacts, Ala-12.

Form	Pit	Depth	Max. Length	Max. Width	Max. Thick.	Dist. Base-MW	Weight (gm)	Rock Type	Shape	Stem Marker	Blade	Plate	Cat. No.
Blades	0E. 7N	5	4.4	2.7	0.8	2.2	11.0	f	leaf	no	long	10C	29-168
	5.5E/4N	22-28	3.3	2.3	0.7	1.5	5.0	f	tri	yes	long	10G	29-170
	5.5E/4N	31	3.8	1.6	1.0	1.6	8.0	f	leaf	yes?	long	10D	29-172
	5.5E/5N	24-31	3.5	1.6	0.8	1.1	4.0	c	leaf	no	long	10I	29-171
Flake scrapers	0E/5N	41	3.7	2.8	0.9			c					29-176
	0E/5N	47	4.7	4.6	1.8			c					29-131
	0E/7N	0-10	4.2	3.3	1.9			f					29-136
	0E/8N	48-60	2.7	2.5	0.5			f					29-180
	1E/10N	56-62	2.3	1.7	0.7			sc					29-210
	1E/10N	60	3.2	2.8	0.7			f					29-211
	2.5E/11N	12-24	4.4	3.6	2.0			c					29-197
	2.5E/11N	30-54	2.0	1.2	0.5			f					29-209
	5.5E/4N	22	3.3	2.3	0.5			f					29-157
Scraper planes	0E/5N	52	2.7	2.4	0.9			c					29-184
	1E/10N	56-62	3.7	2.3	0.8			c					29-198
Modified, lacking use-wear	0E/5N	41-45						c					
	0E/8N	48-60						c					
	1E/7N	21, 57						c, f					
	1E/10N	40						j					
	5.5E/4N	25*						f					
	/	/, /						c, f					

Depths in inches below surface.
Dimensions in centimeters.
/ = missing information.
Dist. Base-MW = distance from base to area of maximum width.

f = flint.
c = chert.
j = jasper.
sc = silicified chert

throwing stones and net sinkers (Elsasser 1955; Gerow with Force 1968: 77).

The charmstone or plummet artifact commonly appears to be designed for suspension at one end. Specimens often show careful workmanship which suggests a non-utilitarian function, but equally often show battered wear which suggests the opposite. As Gerow points out (Gerow with Force 1968: 77), a utilitarian function does not require that no social or religious attributes inhered in the artifacts; hence battering on a well made specimen is not necessarily paradoxical (particularly since cultural boundaries between non-utilitarian and utilitarian or sacred and profane may not be sharply defined).

The charmstones from Ala-328, -13 and -12 share the traits just listed, a form conducive to suspension, careful workmanship on most specimens, and breakage or battered wear on 1 or both ends or on the body of the majority of specimens as if they had been put to hard use. Interestingly, only 4 of 13 specimens recovered in mortuary context were broken or battered.

In addition to these widely-shared attributes, the charmstone assemblages from the Coyote Hills sites evidence several features characteristic of charmstones from other Bay area sites. These pertain to a primary division within the assemblages between perforated and unperforated specimens. Perforated specimens precede unperforated specimens in time. Furthermore, perforated and unperforated forms differ in raw material. These differences were noted by Davis (D&T 1959: 15-16) in his study of the early collection of charmstones from Ala-328, and are substantiated below in the descriptions and tabled information regarding charmstones from Ala-328, -13 and -12. The difference in raw material and temporal occurrence of perforated and unperforated charmstones has also been noted for Bay area sites Ala-309 (Schenck 1926: 259-260), CCo-259 (Davis 1960: 20), and SMa-77 (Gerow with Force 1968: 68 ff.); only perforated forms were found at the latter site. Outside the Bay area, a change over time from perforated to unperforated charmstones has been suggested for central California as a whole (Heizer and Fenenga 1939: 385-386).

Of particular interest here is the change in raw material, since it probably involved a change in trading relationships. The charmstones were identified as to rock type by Charles Bickel of the Department of Geology, SFSU. Examination with hand lens and binocular scope was sufficient to effect a primary division between specimens of sandstone and "greenstone", which correlated almost perfectly with division according to presence or absence of perforation; all but 3 of the unperforated charmstones are sandstone, and all of the perforated specimens are "greenstone".

The sandstone specimens are made of graywacke so strongly indurated that it can only have come from the Franciscan Formation. Since the

Franciscan Formation is widely exposed throughout western California, and strongly indurated graywacke is the most common lithology of the formation, source identification of particular specimens was judged impossible. Bickel proceeded no further with classification of the sandstones, although he noted that a variety of sandstones are present among the charmstones.

After petrographic examination of thin sections cut from a number of "greenstone" specimens, he concluded that all of them are made from strongly metamorphosed mafic rocks which can only have come from the Franciscan Formation. Contrary to previous identifications of most specimens as steatite (D&T 1959: 16; R 1967: 55), a metamorphic rock composed almost wholly of talc, Bickel found no talc in any specimen, hence none can be designated as steatite. The perforated charmstones are made of 4 general types of rock: I, chlorite "schist"; II, glaucophane schist group; III, rocks rich in calcic amiphibole; and IV, serpentinite. Specimens of type I rock are more fine-grained than a schist is expected to be and some lack the pronounced orientation characteristic of a schist [1]; for this reason Bickel qualifies the name "schist". The types have been subdivided, but further division is not necessary for this discussion.

All 4 types of rock share a small grain size and lack of pronounced orientation which contributes to their slippery feel, ability to take a polish, and general textural qualities recognizable by archaeologists and prehistoric Native Californians alike. In text below, the word schist (without quotation marks) is used to designate rocks with those general qualities. Bickel's identifications by type number are used in tables where possible; for specimens he did not examine, the word schist again is used to designate these general qualities.

In an effort to locate a source for the "greenstone", Bickel sampled boulders and bedrock from the mouth of Wildcat Canyon, Richmond, a source area suggested by Loud (1924) for "greenstone" from the Stege Mounds, CCo-298 and CCo-300. Bedrock and some stream boulders from lower Wildcat Creek are identical in petrographic thin section to type I chlorite "schist". Outcroppings of chlorite "schist" are not abundant in the region east of San Francisco Bay, and Bickel's identification suggests that "greenstone" from Wildcat Creek was traded as far south as the Coyote Hills sites. This is not conclusive since other potential sources of "greenstone" may have gone unrecognized in historic times (Heizer and Treganza /1944/ cite Loud's source, but no others in central California). Raw material for charmstones of rock types II, III, and IV could also have come from boulders in Wildcat Creek, according to Bickel's analysis, but those rock types also occur at numerous

1 In this regard they are similar to schists used for charmstones at Sma-77 which "lack a clearly defined schistose structure" (Gerow with Force 1968: 77).

other localities in the region, and hence are not as suggestively linked to the Wildcat Creek locality as is rock type I.

Type I specimens outnumber all the other types by 3 to 1 (see Tables 3-85, 3-86, 3-87, 3-88). In the light of Bickel's identification of a likely source area for type I chlorite "schist", what is implied by the temporal change from perforated schist charmstones to unperforated sandstone charmstones in the Coyote Hills sites is not only a stylistic change, but also a shift away from a raw material of restricted availability to one more widely accessible. The political and social implications of such a shift merit further study, particularly if other changes (perhaps the shift from eastern to northern obsidian sources?) are found to correlate with this one.

Charmstones -- Ala-328 (35 classifiable specimens, 18 fragments).

Charmstones were recovered with 5 burials at Ala-328; with obsidian blades they share sixth place among stone artifacts in frequency of grave association. Fifteen other artifact types were more frequent burial accompaniments than charmstones, considering types of bone and shell as well as stone.

The classifiable specimens are almost evenly divided among perforated and unperforated charmstones; 17 perforated specimens and 18 unperforated specimens were recovered. Further subdivisions according to shape are described below. Perforations are biconical, always nearer one end than the other; the perforated end is assumed to be the proximal end. Most perforated specimens have been modified by a notch across the proximal end, or a groove around the end and shaft from one side of the perforation to the other; in 1 case a channel extends longitudinally around the entire stone. Notches, grooves and channel presumably aided in attachment of cordage to the specimens, although there is no direct evidence such as the aphaltum and binding impressions found on charmstones from SMa-77 (Gerow with Force 1968: 76). Unperforated specimens have at least 1 narrow end (presumed to be proximal) to which cordage might have been attached; roughening, slight indentation, or black stains on this portion of a few specimens substantiate this possibility.

Perforated specimens are invariably made of schist. A dark green chlorite "schist", Bickel's type I, predominates in the collection. Light green, gray, black, and white-colored schists are also present, with mica as a prominent component of the rock in several cases. Most unperforated specimens are indurated sandstone. A unique cupshaped specimen is made of type I schist, as is 1 of the unperforated squat plummet-shaped charmstones. One fragment of unusual form which probably broke from an unperforated charmstone is schist.

Sandstones were used for the manufacture of many artifact types other than charmstones. In contrast, schists were used almost exclusively for charmstones. Only 4 stone artifacts of schist were recovered that are not charmstones. One (1-265) is a fragment too incomplete to be typed. Of classifiable specimens, 1 is a pebble chipping hammer, and 1 is a miniature mortar, both discussed with other artifacts of those forms elsewhere in this report. The other is a flat oval piece of serpentinite polished overall, with 2 parallel planar surfaces on opposite sides. The specimen (1-2897) measures 7.2 by 4.6 by 2.1 cm. It was recovered at the mound base in pit J-7 II at 63 inches below surface. One unworked chunk of type I chlorite "schist" (1-535) was recovered from the site, measuring 9.2 by 7.0 by 5.8 cm. Unfortunately, provenience for the specimen was not recorded. Its presence suggests that schist charmstones were manufactured locally, although the raw material was probably obtained in trade.

All but 4 perforated charmstones exhibit bipolar symmetry; that is, they taper symmetrically to both ends from a maximum diameter at midlength. In contrast, all but 4 unperforated specimens lack bipolar symmetry, and reach maximum width at a point distal to midlength.

Nine of the perforated specimens were grave goods. Only 1 unperforated charmstone was associated with a grave, and it is unique in shape and unusual among unperforated specimens in its rock type, a schist. Three charmstone fragments were grave goods. One is perforated and 1 probably broke from a perforated charmstone; both are schists. The other fragment is sandstone, and probably was unperforated.

Six of the perforated charmstones, the 2 fragments of perforated charmstones and the unusual unperforated specimen were all found with burial 42. [1] Burials 66, 100 and 252 were each accompanied by a perforated charmstone; the sandstone fragment was recovered with burial 432. Sex and age determinations are lacking for 2 of the individuals buried with charmstones; the other 3 were adults, 1 female, 1 male, and 1 probable male.

Tables 3-85, 3-86, and 3-87 give descriptive information, provenience data and measurements of perforated charmstones, unperforated charmstones, and charmstone fragments, respectively.

The specimens have been divided into the following descriptive classes: phallic charmstones, perforated biconical charmstones, perforated cigar-

1 Davis evidently interprets a worked piece of micaceous schist (1-265) as a charmstone fragment, resulting in a total of 10 charmstones and fragments associated with burial 42 (D&T 1959: 27). The specimen is considered to be a modified untypable stone artifact in this report.

Table 3-85. Descriptive data, dimensions, and provenience of perforated charmstones, Ala-328.

Depths in inches below surface.
Dimensions in centimeters.
/ = missing information.
* = breakage has diminished length slightly.
i = irregular.
b = broken specimen, measured at present length.
- = not determinable.

? = probable original form of broken pieces.
H = Hayward excavations.
( ) = estimate of original length.
** = not examined in thin section; conclusive identification not possible.
N = notch across end.
G = groove around end to perforation.
C = channel around body to end.

Form	Bipolar Symmetry	Cross Sec.	End Mod.	Rock Type	Max. Diam.	Max. Length	Pit	Grid	Burial	Depth	Plate	Cat. No.
Phallic, squat	no	/	N	schist	4.8	8.5*	A-5, 6	I	42	112		1-254
" "	no	oval[i]	N	I	4.8x3.5	8.0*	A-5	I	no	92	11E	1-423
Phallic, long	yes	circ	N	schist	3.9	10.6	A-5, 6	I	42	112		1-253
" "	yes	circ	N	I	3.5	12.3	A-5, 6	I	42	112		1-257
" "	yes	circ	N	I or IV**	4.1	9.3	A-5	I	100	101	11F	1-421
Phallic, long?	-	circ	-	I	3.3	8.8b	E-1	I	no	103		1-165
" "	-	circ	-	schist	4.1	8.0b	F1-67	H	no	40		1-60-68
Biconical,	yes	oval	N	IV	3.7x3.2	(17.0)	D-8	II	no	72		1-1443
angular	no	circ	G	I	3.0	15.0	E, F-8	II	252	72	11G	1-1444
" " ?	-	oval	G	I	3.9x3.3	11.0b	C-4	I	no	35		1-895
Biconical,	yes	oval	G	I	4.5x3.3	8.5	E2-67	H	no	41		1-47-68
rounded	yes	oval	G	schist	5.2x2.5	9.4	E-66	H	no	54		1-261-68
Cigar	yes	circ[i]	C	III	3.1	8.1	A-5, 6	I	42	112		1-259
"	yes	oval[i]	no	II	3.6x3.2	8.0	G-68	H	no	14		1-124-68
Cigar?	-	circ	N	I	3.4	9.1b	C-7	I	66	43		1-327
Misc, globular	yes	circ	no	III	3.7	6.5	A-5, 6	I	42	112		1-255
" egg-shaped	no	/	no	schist	/	/	A-5, 6	I	42	112		1-256

Table 3-86. Descriptive data, dimensions, and provenience of unperforated charmstones, Ala-328.

Depths in inches below surface.
Dimensions in centimeters.
b = broken specimen, measured at present length.
? = probable original form of broken specimen.
/ = missing information.

H = Hayward excavations.
W = Wedel excavation.
dist = disturbed zone near surface.
i = irregular
* = breakage has diminished length slightly.

Form	Bipolar Symmetry	Cross Sec.	Rock Type	Max. Diam.	Max. Length	Pit	Grid	Burial	Depth	Plate	Cat. No.
Squat plummet	yes	oval	I	4.4x3.6	8.2*	A-4	I	no	0-18		1-17
" "	yes	/	sand.	/	/	B-66	H	no	dist		1-11-66
" "	yes	/	sand.	/	/	C-66	H	no	dist		1-14-66
" ", incipient	yes	oval^{i}	sand.	4.0b	6.4b	J-7	II	no	40		1-2896
" " "	yes	circ	sand.	4.3	6.2	J-68	H	no	18		1-53-68
Longnecked tear-shaped	no	circ	sand.	3.3	10.3b	A-3	I	no	18		1-128
" " pointed?	no	circ	sand.	4.1x3.5	7.5b	/	/	/	/		1-2900
" " "	no	circ	sand.	2.8	12.6b	D-5	II	no	/		1-2898
" " "	no	oval	sand.	3.5x2.8	9.5b	/	/	/	/		1-2908
Longnecked tear-shaped knobbed	no	circ	sand.	3.2	12.5b	50-60W, 0-5S	W	no	12		1-37437
" " "	no	circ	sand.	3.4	8.3b	/	/	no	0	11B	1-1620
" knobbed?	no	circ	sand.	3.9	7.5b	A-4	II	no	24		1-1452
" " "	no	oval	sand.	4.5x3.2	b	/	/	no	/		1-37505
Longnecked tear-shaped,	no	circ	sand.	3.2	10.9b	/	/	/	23	11H	1-847
" " rounded	no	oval	sand.	3.2x2.8	10.0b	F-66	H	no	12		1-39-66
" " ", incipient	no	oval	sand.	2.2x1.9	6.6	E-7	I	no	0		1-328
" ", rounded?	no	/	/	/	11.4b	A-7	I	no	18-24		1-22
Miscellaneous, cuplike	no	circ	I	3.0	3.0	A-5, 6	I	42	112		1-258

Table 3-87. Descriptive data, dimensions, and provenience of charmstone fragments, Ala-328.

Depths in inches below surface.
Dimensions in centimeters.
- = information unobtainable.
* = shallow drilled holes on opposite sides; incomplete perforation.
b = broken specimen, measured across break.

/ = missing information.
o = measurement omitted; fragment too small to provide useful measurements.
i = irregular.
W = Wedel excavation.
H = Hayward excavation.
dist = disturbed zone near surface.

Probable Form	Perf.	Cross Section	Rock Type	Max. Diam.	Max. Length	Pit	Grid	Burial	Depth	Cat. No.
Misc., cylinder	yes	circ	I	2.5b	9.0b	A-5, 6	I	42	112	1-261
Cigar or squat phallic	-	oval	I	4.0x2.8	6.6b	A-5	I	no	60	1-127
" " " "	yes	oval	I	4.9x3.2	6.9b	A-9	II	no	42	1-1106
Phallic, long	yes*	circ	I	3.4	7.9b	D-9	II	no	40	1-1291
" "	yes*	circ	I	3.1	7.4	D-1	I	no	94	1-358
" "	yes	circ	IV	3.2	10.5	D-6	II	no	98	1-2895
" "	-	-	I	o	o	A-5, 6	I	42	112	1-260
" "	-	-	I	o	o	C-2	I	no	64	1-1036
Longnecked tearshaped	-	-	sand.	o	o	/	II	/	/	1-1613
" "	-	circ	sand.	3.5	8.0b	B-5	I	no	18	1-111
" "	-	-	sand.	o	o	D-66	H	no	dist	1-17-66
" "	-	-	sand.	3.7	o	45-50W, 0-5S	W	no	6	1-37453
" "	-	concavo-convex	schist	o	o	F2-67	H	no	0-6	1-150-67
Cigar or tearshaped	-	oval[i]	sand.	3.5x2.8	9.5b	I-9	II	432	0-12	1-2899
Narrow rounded biconical	no	circ	/	2.6	12.2	M-68	H	no	12	1-195-68
Cigar	-	circ	sand.	3.2	b	J-68	H	no	19	1-72-68
Angular biconical	-	/	sand.	/	/	C2-67	H	no	dist	1-34-67
Incipient	-	tear	sand.	o	o	/-9	II	no	72	1-1471
"	-	circ	sand.	4.9b	7.7b	/	/	/	/	1-1872

shaped charmstones, unperforated longnecked tear-shaped charmstones, unperforated squat plummet charmstones, miscellaneous charmstones, charmstone fragments.

Perforated Phallic Charmstones. (7 specimens).

All phallic charmstones recovered from Ala-328 are made of green-colored schist. The distinctive feature of this group is the conformation of the proximal (perforated) end, which is phallic in appearance on all specimens. As Davis points out (D&T 1959: 16), the phallic form of these specimens differs from that of specimens collected from lower Sacramento Valley Early Horizon sites (compare Heizer 1949: Fig. 10, or Ragir 1972: Pl. 2m, o, with Plate 11E, F herein); but the label "phallic" is still descriptively appropriate. The proximal end is notched across the top on all intact specimens; the notch does not extend down the shaft to the perforation. Among these phallic charmstones there are two subgroups, differing in shaft form and shape of distal end.

Squat phallic charmstones. (2 specimens). These charmstones are short and wide, with oval cross sections, greatest width below midlength (no bipolar symmetry), and each ends distally in a button-like knob. In Davis' typology, (D&T 1959: 15) this subgroup is designated Ib1d: perforated, piled, plummet-shaped, one end "phallic", opposite end with button-like pile. One specimen is broken at the extreme proximal end, and the other shows some pecked wear on the distal end. The squat charmstones were found in the basal cemetery area; 1 accompanied burial 42 and the other lacked association. The former is illustrated by Davis (his Plate 3k); the latter is shown in Plate 11E herein. Two fragments (1-127, 1-1106) might have been squat phallic charmstones before breakage, but they are presently too incomplete for accurate typing.

Long phallic charmstones. (5 specimens). These charmstones are longer and narrower than squat phallic specimens, with circular cross sections and bipolar symmetry. They are phallic at distal as well as proximal ends. The distal ends lack the transverse grooves found proximally, however. In Davis typology, this subgroup is designated IB2a: perforated, piled, symmetric spindle-shaped, both ends "phallic", perforated end grooved longitudinally. Three unbroken long phallic charmstones were recovered, all from graves in the basal cemetery area; 1 was found with burial 100, and 2 with burial 42. The former is illustrated in Plate 11F herein, and one of the latter is shown in Davis (his Plate 31). Two specimens broken at the proximal end also fall into this group; they were not grave goods, and were recovered outside the cemetery area. Other broken specimens which may have been long phallic charmstones in their original form are discussed with charmstone fragments, below.

Perforated Biconical Charmstones (5 specimens).

Specimens in this group taper noticeably from the area of maximum circumference to the ends, which are blunt or slightly rounded with no secondary curvature. They may be divided into 2 subgroups on the basis of size and relative curvature of sides. All were recovered subsequent to Davis' analysis of the Ala-328 collection, and his typology does not have category which describes them.

Angular biconical charmstones. (3 specimens). These charmstones are long and narrow, circular or slightly oval in cross section, with flat ends, straight sides and an effect of angularity as the sides converge at the point of maximum circumference. One intact specimen with a beveled proximal groove was found with burial 252; it is shown in Plate 11G. A specimen (1-1443) with a shallow scratched proximal notch is battered at the distal end to the extent that about 4 cm of length have been lost. A third specimen (1-895) may be a reworked charmstone of the angular biconical subgroup. It is straight sided and shows angularity at the point of maximum circumference, which lies midway between 2 broken ends. A beveled groove extends upward on both sides of the perforation, which is located unusually far from the end in comparison with all other perforated charmstones recovered from the site. This placement may reflect individual preference or stylistic change. The specimen came from shallower depths than did the other charmstones in this subgroup.

Rounded biconical charmstones. (2 specimens). These charmstones are short and wide, pronouncedly oval in cross section, with rounded ends and with curved sides which do not give an angular effect at their convergence at the maximum circumference. Both of the rounded biconical charmstones recovered show bipolar symmetry. Each is grooved proximally. On one specimen (1-47-68), the shaft groove is a distinct beveled groove like the notch across the top; on the other (1-261-68), 2 parallel shallow scratches connect the top groove to the perforation on each side of the shaft.

Perforated Cigar-Shaped Charmstones (3 specimens).

Charmstones in this group have convex sides which taper gradually from a maximum diameter at midlength to blunt or rounded ends with no secondary curvature. They differ from biconical charmstones in a less marked taper to relatively broader ends. A specimen of this type from Ala-13 is shown in Plate 11K.

One specimen (1-259), recovered with burial 42, is crudely channeled, bearing an indentation of irregular depth and width from end to end around both sides. The channeling, and grinding of adjacent surfaces, has resulted in a flattened and deformed circular cross section. The specimen is illustrated by Davis (his Plate 3g). In his typology it is IA3a: perforated, not piled, symmetrical spindle shape, perforated end squared off and grooved longitudinally, opposite end curved, with blunt tip.

Another cigar-shaped charmstone (1-327), found with burial 66, is also illustrated in Davis (his Plate 3e). It lacks bipolar symmetry in its present condition but presumably was symmetrical before battering caused breakage at the distal end. The intact end, which has a shallow scratched notch, is the narrowest among cigar-shaped specimens, approaching the width found on biconical charmstones. Davis (D&T 1959: 91) types the charmstone as IA2b: perforated, not piled, asymmetrical spindle shape, end of greatest diameter curved, tip blunt. His description fits the specimen in its present broken form. Its probable original form is the basis for its placement herein with symmetrical cigar-shaped charmstones.

A third cigar-shaped specimen (1-124-68), found unassociated, differs from the other 2 in the absence of any notching in its proximal end. Two fragments (1-127, 1-1106) might have been perforated cigar-shaped charmstones before breakage, but they are presently too incomplete for accurate typing.

<u>Unperforated Longnecked Tear-Shaped Charmstones</u> (11 specimens).

These charmstones are tear-shaped in outline, circular or oval in cross section. Each ends proximally in a narrow long neck. Breakage at the extreme proximal end is common. Binding was probably attached to this portion on many specimens. Black stains, slight indentation, and roughening at the extreme proximal end on some unbroken charmstones support this assertion.

Longnecked tear-shaped charmstones may be placed in subgroups according to the conformation of the distal end, which may be pointed, rounded, or knobbed. These all fit group IIB1 in Davis' typology, but none correspond exactly with his finer subdivisions. None of them shows bipolar symmetry. Pointed specimens reach maximum diameter somewhere between two thirds and three quarters of the distance from proximal to distal end. On rounded and knobbed specimens, maximum diameter lies even nearer to the distal end of the charmstone.

Pointed longnecked tear-shaped charmstones. (4 specimens). Pointed specimens taper smoothly along straight sides from the area of maximum diameter and show no secondary curvature as they converge to a blunt point at the distal end. No unbroken pointed specimens were recovered from Ala-328, but 4 longnecked tear-shaped charmstones from the site clearly fit the pattern, although the distal point of each is broken away. A specimen of the type from Ala-13 is shown in Plate 11A.

Rounded longnecked tear-shaped charmstones. (4 specimens). On these charmstones, the tapering sides curve inward more sharply than on pointed specimens, at a point closer to the area of maximum diameter. Two of the specimens (1-847, 1-22), both illustrated by Davis (his Plate 3a, b) and the former shown here in Plate 11H, show breakage at the very distal end; they may once have been knobbed distally. Another specimen (1-39-66) is intact across the bottom, but broken at the proximal end, as is specimen 1-847. One specimen (1-328) is noticeably smaller than the others (see Table 3-86); it is still roughly pecked overall; apparently it is an incipient charmstone lost or discarded before manufacture was complete.

Knobbed longnecked tear-shaped charmstones. (4 specimens). These charmstones taper sharply and rapidly inward at the distal end like rounded specimens. There is secondary curvature at the most distal portion creating appendages which vary in size among different specimens; some are slight bumps, others are comparable to distal knobs on phallic charmstones Two specimens show slight breakage on the distal knob; all 4 are broken at the proximal end. One is shown in Plate 11B.

Unperforated Squat Plummet Charmstones (5 specimens).

These are short stones with globular bodies ending proximally in short, relatively narrow, almost parallel-sided necks, and distally in rounded knobs. All specimens exhibit bipolar symmetry. Cross sections vary in shape. In Davis' typology this group is type IIB1a: unperforated, plummet-shaped, both ends piled.

One plummet charmstone (1-17) bears a black stain on the neck, probably a remnant of adhesive applied to secure a binding to that end. The specimen is illustrated in Davis' Plate 3d. It is unusual among unperforated specimens in its raw material, type I chlorite "schist". Plate 11D here shows a charmstone of the squat plummet type from Ala-13. Three of the 5 squat plummets show breakage at each end. One of these and an unbroken specimen are pecked over much of their surfaces. They were evidently not ground smooth after being shaped, and might be considered incipient charmstones, discarded or lost while in the process of manufacture.

Miscellaneous Charmstones (3 specimens).

These charmstones, all found with burial 42, are unmatched by any other specimens. One (1-258) is a small cup-shaped item, open at 1 end and knobbed at the other. The maximum diameter is at the open end. The specimen is illustrated by Davis (his Plate 3n). Its unusual shape implies that it might have served a different purpose from specimens with solid shafts and more elongate forms. Its placement here with charmstones is arbitrary.

The other 2 unmatched charmstones are more orthodox in shape. Both are perforated. One (1-256), illustrated in Davis' Plate 3m, is egg-shaped, with maximum diameter proximal to the midpoint, and perforation placed very near the rounded, ungrooved end. In Davis' typology this charmstone is designated IA1a: perforated, not piled, egg-shaped, end of greatest diameter shouldered, more or less pointed. The other unmatched charmstone (1-255), also illustrated by Davis (Plate 3j), has a short globular shaft and circular cross section, with broad knobs at both ends. It is not fully perforated, but bears 2 incipient perforations, shallow pits opposite one another on the shaft just below the point where secondary curvature begins. In Davis' typolog the charmstone is designated IB1c: perforated, piled, one end piled, one end knobbed.

Charmstone Fragments (18 specimens).

These broken charmstones are not sufficiently complete to be assigned with certainty to particular subgroups. The probable type of each specimen is indicated in Table 3-87, which also gives some descriptive information and provenience for each fragments. Noteworthy fragments are discussed in the paragraphs below. Three specimens were grave goods, 2 with burial 42 and 1 with burial 432.

One specimen (1-261), made of a micaceous schist, is unlike any other recovered. It is cylindrical in form, notched at the perforated unbroken end, with straight sides diverging slightly from the proximal end to a maximum diameter of 2.5 cm where it is broken across the shaft at 9.0 cm length. The specimen was found with burial 42. It is figured by Davis (his Plate 3c).

Five specimens, all made of green-colored schist, appear to be fragments of long phallic charmstones. Two (1-260, 1-1036) are knobbed distal end pieces; 1 of these accompanied burial 42. Three (1-1291, 1-358, 1-2895) evidently had been or were being reworked after breakage into non-phallic forms different from one another and unlike any other recovered charmstones. The fact that they were re-worked suggests that the raw material was highly valued or scarce.

One medial fragment (1-150-67) of what was probably a longnecked tear-shaped charmstone is unusual in form and raw material. It bears a mortar-like pit 1.6 cm deep in one side of the body, giving it a concavo - convex cross section. It is made of schist, while all other fragments conforming to unperforated charmstone types are sandstones.

Burial 432 was accompanied by a polished sandstone fragment (1-2899) which might have been cigar-shaped or tear-shaped in its original form. Another cigar-shaped fragment (1-72-68), an angular biconical one (1-34-67), and a long narrow rounded biconical specimen (1-195-68) are all broken pieces which are closer to perforated charmstone forms than to the plummet and tear shapes characterizing intact unperforated charmstones from the site. They presumably are forms which are unrepresented among unbroken specimens due to inadequacy of the sample. A long necked biconical specimen from Ala-13 (30-424, shown on Plate 11A) is complete and unperforated. It is probably representative of the unbroken form of the 2 biconical fragments, suggesting that they were pointed tear-shaped specimens. No unbroken, unperforated cigar-shaped charmstone is present in the collections from either Ala-328 or Ala-13. Lack of perforation is not proven for the fragments, since the 3 specimens are each broken at one or both ends. However, they are sandstone artifacts, and no perforated charmstones of sandstone have been recovered from Ala-328. Only one such occurrence is recorded for a Bay area site, a broken specimen from Ala-309 (Uhle 1907: 55; Pl. 12, 7) which is unlike any Ala-328 charmstones or fragments in form.

Two sandstone fragments (1-1471, 1-1872) have areas of pecking which appear to be shaping efforts not yet ground smooth. Breakage at the ends of both of these incipient charmstones may have led to their discard before completion.

Charmstones -- Ala-13 (10 classifiable specimens, 12 fragments).

Among classifiable specimens, there are 3 perforated and 7 unperforated charmstones. Fragments include 4 broken pieces and 8 "incipient" charmstones, i.e., specimens in various stages of manufacture showing rough peck-shaped surfaces. One perforated charmstone fragment of schist was recovered. The other 11 incipient charmstones and fragments probably pertain to unperforated forms; all are made of sandstone, a raw material rarely used in central California for artifacts which are drilled. As is the case for Ala-328 charmstones, perforated specimens each have a notch or groove across the proximal end; unperforated specimens each have at least 1 narrow end to which cordage might have been attached, and several specimens show slight indentation, roughening or traces of asphaltum at this end.

The 3 perforated charmstones and the only perforated fragment are schists. All other specimens, unperforated, incipient and fragments, are made of indurated sandstones.

None of the charmstones recovered were burial associations; 1 (30-253) was associated with feature 6. None were found at or below the mound base. Table 3-88 gives provenience and rock type for all specimens, as well as descriptive information and measurements for classifiable specimens.

The collection includes 3 perforated cigar-shaped charmstones (1 shown in Plate 11K), 2 unperforated squat plummets (1 shown in Plate 11D), 4 pointed longnecked tear-shaped specimens (1 shown in Plate 11A), and 1 knobbed longnecked tear-shaped charmstone. All fragments pertain to these forms except the perforated schist piece, which shows the beginning of a proximal curvature like those on phallic charmstones. Descriptions of these charmstone groups may be found in the Ala-328 section, above. Breakage is common. Among classifiable specimens, 5 are so broken that a useful length estimate cannot be made, a sixth shows distal battering, although overall length has not been affected.

The Ala-13 charmstone assemblage differs from that recovered at Ala-328 in content and distribution. Perforated forms are fewer in number and variety relative to unperforated forms than is the case at Ala-328. The absence of charmstones among grave goods at Ala-13 is another contrast. A temporal difference in initial occupation of the 2 sites may explain the disparity.

Charmstones -- Ala-12 (1 specimen).

The specimen (12182), shown in Plate 11C, is evidently a proximal end fragment of a long phallic charmstone. It is biconically perforated, and remains of a notch are visible across the phallic curvature at the end. The fragment is a green type I chlorite "schist". It was recovered from pit feature 28 at 60 inches below surface, just above the mound base in unit 1E/10N.

A piece of apparently unmodified stone (29-49, 6690) possibly a chipping hammer fragment, previously described as a charmstone fragment

Table 3-88. *Descriptive data, dimensions, and provenience of charmstones, Ala-13.*

Depths in inches presumed below datum plane.
Dimensions in centimeters.
G = groove around end to perforation.
N = notch across end.
- = information unobtainable.

* = breakage has diminished length slightly.
b = broken specimen, measured at present.
? = probable original form of broken pieces.
indeterm. = intended form not determinable.
/ = inapplicable.

Form	Bipolar Symmetry	Perf.	Cross Sec.	End Mod.	Rock Type	Max. Diam.	Max. Length	Pit	Depth	Plate	Cat. No.
Cigar	yes	yes	circ	G	I	2.9	12.3	I-17	19		30-245
"	yes	yes	circ	G	G	3.3	10.1*	M-16	33		30-248
"	yes	yes	circ	N	II	3.4	7.6	E-17	45		30-416
Squat plummet	yes	no	circ	/	sand.	4.6	7.2b	I-17	18	11D	30-244
" "	yes	no	oval	/	sand.	4.9	6.4b	H-17	31		30-253
Longnecked tearshaped,	no	no	circ	/	sand.	3.3	17.0	F-17	33	11A	30-424
" " pointed	no	no	circ	/	sand.	3.8	10.2	G-13	36		30-323
" " pointed?	no	no	circ	/	sand.	3.6	8.1b	G-18	17		30-252
" " "	no	no	circ	/	sand.	3.1	11.1b	-	surf		30-249
" " knobbed	no	no	circ	/	sand.	3.4	11.6b	H-18	20		30-246
Incipient longnecked	no	-	-	-	sand.	-	-	-	surf		30-243
" "	-	-	-	-	sand.	-	-	E-18	17		30-250
" "	-	-	-	-	sand.	-	-	H-13	24		30-257
Incipient plummet	-	-	-	-	sand.	-	-	N-17	43		30-251
Incipient indeterm.	-	-	-	-	sand.	-	-	E-18	42		30-254
" "	-	-	-	-	sand.	-	-	G-17	1-12		30-242
" "	-	-	-	-	sand.	-	-	I-17	42		30-327
" "	-	-	-	-	sand.	-	-	G-17	11		30-240
Fragment, longnecked	-	-	-	-	sand.	-	-	H-17	20		30-271
" "	-	-	-	-	sand.	-	-	E-18, 19	-		30-241
Fragment, cigar	yes	-	-	-	sand.	-	-	K-17	32		30-256
Fragment, phallic?	-	yes	oval	-	I	-	-	M-17	43		30-247

(R 1967: 61), is not interpreted as such here.

Serpentinite Clusters -- Ala-328 (21 specimens).

These artifacts are pieces of serpentinite in which the serpentine probably replaced actinolite (identification by C. Bickel). Technically, the needle-like structure of the rock is too coarse and insufficiently fibrous to be appropriately called chrysotile, but these artifacts are similar to "chrysotile splinters" reported from other archaeological sites. Gerow (Gerow with Force 1968: 80-81) lists the reported occurrences of artifacts of this type in central California.

The Ala-328 specimens appear to be unmodified. They show no grinding or polishing like that on chrysotile asbestos rods from SMa-77 (Gerow with Force 1968: 80) or on specimens 1-122990 and 1-123845 from Ala-307, which I examined at the Lowie Museum.

A single piece 4.4 cm long accompanied burial 298, in pits F, G-7 II at 60 inches depth. Twenty pieces, the largest measuring 5.5 by 1.1 by 1.4 cm, were found with burial 219 in pits A-9 I, II at 84 inches depth; 2 of the pieces are shown in Plate 1Z.

No serpentinite clusters were found at Ala-13 or Ala-12.

Grooved and Notched Stones -- Ala-328 (18 specimens).

Provenience data for these artifacts are given in Table 3-89. They fall into 3 groups which differ notably in form.

Abraded grooved stones. (6 specimens). Plate 7F.

These artifacts are all made of soft sandstone. Three broken cobbles each have a single abraded U-shaped groove like those on specimens which Fredrickson (1968: 92) describes as whetstones. The smallest groove is 0.5 cm wide, 0.3 cm deep, 2.8 cm long; the other 2 measure 1.0 by 0.7 by 3.8 cm and 0.9 by 0.4 by 2.6 cm. The larger grooves might have been used for shaft straightening. A fourth cobble is similar to these, but has a narrower, V-shaped groove, measuring 0.2 by 0.2 by 2.8 cm.

Another cobble fragment has 2 areas measuring 2.5 by 1.2 cm and 2.5 by 4.5 cm covered with erratic shallow grooves best termed scratches, again suggesting a whetstone function, perhaps for sharpening bone tools.

The most unusual specimen in this group is an irregular chunk with a narrow V-shaped groove on 1 face. On another face, a circular hole about 0.9 cm in diameter enters perpendicular to the surface and extends about 1.7 cm into the stone. Remnants of another hole which was aligned differently lie on the adjacent weathered surface about 1 cm away.

Pecked grooved stones. (9 specimens). Plate 7E.

Nine broken stone artifacts show pecked grooves ranging in width from 1.7 to 2.6 cm and in depth from 0.2 to 0.7 cm on specimens sufficiently complete to measure. All but 2 specimens are broken in the groove area; the exceptions are split longitudinally. In 3 cases, 2 parallel grooves are present, separated by 2.5, 4.0 and 5.2 cm. Groove extent cannot be determined on the split specimens. On the others, grooves cover a full circumference except on 1 of the double grooved specimens, where 1 groove extends across the maximum diameter on 1 side but is not continued around. This is the deepest measurable groove (0.7 cm) and perhaps its depth obviated the need for a full circumferential span of the cobble. The remnant of the second groove on this specimen is insufficient to show whether it covers full circumference or not.

Although all specimens are fragments, it appears that both globular and elongate cobbles are represented, the latter especially in the case of double grooved specimens. Weights of the larger fragments are 422, 643, and 672 gm; the artifacts were probably close to double these weights in their unbroken state. Maximum diameters on 4 measurable specimens range from 8.1 to 9.7 cm. Three grooved stones are soft sandstone. Six are indurated sandstone. Two pecked grooved stones were associated with burial 11.

Artifacts of this form are commonly interpreted as netsinkers or anchors; certainly the broken condition of the specimens does not argue against such a function.

Pecked edge-notched stones. (3 specimens).

Three stones of different shapes are edge-notched. One is a naturally flat piece of soft sandstone, oval in outline, measuring 17.0 by 13.0 by 4.0 cm, with 1 end spalled, the other rounded. One face is pecked slightly from use and in 1 area shows a few long scratches, probably fortuitous scars on this soft rock. The 2 edges are notched slightly to 1 side of midlength, with notches 4.6 and 3.7 cm wide, 0.7 and 0.8 cm deep. The stone weighs 1147 gm. It was

Table 3-89. Provenience of grooved and notched stones, Ala-328.

Depths in inches below surface.
/ = missing information.
* = burial association.
#(#) = multiple specimens: count(depth).
a = abraded grooved stone.
g = pecked grooved stone.
n = pecked edge-notched stone.

Omitted: 2 g specimens, 1 SFSU and 1 Wedel lacking depth information.

SFSU Grid I	
A-/	g: 42-48
A-2	g: 18
B-1	g: 30
B-2	a: 76
D-7	a: 60
E-1	g: 2(28*)
SFSU Grid II	
A-5	n: 104*
B-6	g: 56
B-7	n: 72
J-5	a: 12-24
SFSU Constituent Unit I	
	g: 27
	n: 106
Hayward Excavations	
C1-67	a: 27, 30
E-66	a: 52

Table 3-90. Provenience and measurements of grooved and notched stones, Ala-13.

Cat. No.	Pit	Depth	Maximum Dimensions	Notch Dimensions	Weight (gm)
30-261	Tr. 12	-	12.9/5.4/1.8	1.3/0.4 4.3/0.3	176
30-262	-	-	10.1/4.0/3.4	2.3/0.2	258
30-396	J-17	surf	b /3.9/4.7	1.8/0.1	b
30-15	I-13	50	b /4.9/4.2	3.4/0.7*	b

Depths in inches presumed below datum plane.
Dimensions in centimeters.
Notch dimensions given as width / depth.
- = missing information. b = broken.

* Length and width of shallow irregular groove.

Table 3-91. Provenience of miniature mortars, Ala-328.

Depths in inches below surface.
* = burial association.

SFSU Grid I		SFSU Grid II	
A-3	50	B-6	24
B-2	6	B-8	94
B-6	55-60	B-10	90
C-4	120	E-7	68*
D-4	53	F-5	88
D-5	32	F-8	90
D-7	30	G-4	70
E-6	60	J-6	57

Omitted: 4 SFSU specimens lacking complete provenience information.

associated with burial 394 in the basal cemetery. It is shown in Plate 7D.

A smaller piece of soft sandstone, presently oval in outline with a maximum width of 6.7 cm, is broken across a notch which is 2.0 cm deep and 1.5 cm wide at the break. The specimen is split so that the opposite edge is missing; hence presence of a matching edge notch can not be confirmed. Slight notching is evident at the end, perpendicular to the deeper edge notch. A flat abraded surface 5.0 by 1.5 cm in extent covers the edge adjacent to the notch.

A flat piece of indurated sandstone, broken so that it has a half-disc shape (9.7 cm maximum diameter, 7.4 cm from edge to break, 2.1 cm thick at break) is broken across a notch which is 2.2 cm wide at the break, and probably 1 cm deep. Because of the break, presence of a matching edge notch cannot be confirmed. One surface of the disc is deeply pecked or spalled in 2 areas, but this may not be due to human modification.

Function of these pieces is unknown; they are more broad and flat than artifacts commonly considered to be netsinkers. The 3 notched specimens were recovered at relatively great depths compared to grooved stones, but the sample is too small and heterogeneous to give any meaning to such a distribution.

Grooved and Notched Stones -- Ala-13 (4 specimens).

Four artifacts have been pecked along one or more edges to create crude notches. Like the disparate edge-notched and grooved stones from Ala-328, these specimens may not all represent the same form or function. In 1 case (30-396), 2 opposing edge notches across the width of the specimen are well defined. On another stone (30-261), a narrow notch lies opposite a longer pecked and smoothed indentation. A third artifact (20-262) has a pecked notch across from a natural indentation on the opposite edge. Specific notch areas are difficult to see on the fourth specimen (30-15), but a discontinuous groove extends almost the full circumference. Soft sandstone is the raw material of this vaguely grooved stone; the other notched stones are indurated sandstone. Table 3-90 gives provenience data and dimensions of the artifacts. As the measurements show, 2 complete specimens and 1 broken only at 1 end are elongate; the smaller fragment presumably had the same shape.

Grooved and Notched Stones -- Ala-12 (5 specimens.

Abraded grooved stones. (2 specimens).

One soft sandstone chunk has 5 U-shaped abraded grooves on different surfaces, the largest measuring 6. 1 by 1. 4 by 0. 9 cm. Another soft sandstone cobble bears a shallow abraded indented area measuring 7. 0 by 1. 8 cm which, like the grooves on the specimen just described, presumably reflects whetstone use, perhaps for sharpening bone tools. The multi-grooved stone came from pit 0E/2N at 9 inches below surface; the other possible whetstone was recovered from pit 0E/7N at 24 inches depth.

Pecked edge-notched stones. (3 specimens).

All 3 artifacts are flat, broad, smooth surfaced indurated sandstone cobbles. Each has pecked notches on opposite edges at or near the maximum width.

The largest specimen, from pit 0E/2N at 48 inches below surface, measures 13. 5 by 10. 8 by 3. 5 cm, and weighs 601 gm; notches are 1. 7 cm wide by 0. 5 cm deep and 2. 0 by 0. 7 cm. A notched stone from pit 1W/2N at 10 inches depth measures 6. 9 by 6. 5 by 1. 9 cm and weighs 128 gm; notches are 1. 1 by 0. 2 cm and 0. 9 by 0. 2 cm. A third notched stone was recovered from pit 1W/2N at 21 inches below surface. It is missing a large spall from one side, beginning at the notch. In size it is roughly intermediate between the 2 unbroken specimens, and its intact notch is comparable to theirs.

Phyllite Pieces -- Ala-328 (2 specimens).

A thin flat fragment of phyllite was found with burial 42, and a slightly longer flat piece of the same material, measuring 8. 7 by 2. 2 by 0. 4 cm, accompanied burial 213. Neither shows any obvious human modification. The latter is shown in Plate 10 U.

There were no phyllite pieces in the collections from Ala-13 and Ala-12.

Miscellaneous Pecked Stone Artifacts -- Ala-328 (2 specimens).

An elongate soft sandstone cobble, subrectangular in cross section, was found associated with burial 394, in the basal cemetery. It has the form of a short cylindrical pestle, but shows only slight pecking on 1 shaft surface, and no end use. It is made of a material presumably more suited to use as an abrading tool than a pounding tool, but it shows use-surfaces of neither sort. It is pictured in Plate 12L.

A smooth stone sphere was associated with burial 170, in pit B-10 II, at 60 inches below surface. The sphere is 5.1 cm in diameter. It is shown in Plate 11 I. It was presumably pecked and ground to shape, but retains no evidence of such manufacture. According to S. A. Kirsch, the rock may be either a fine grained sedimentary concretion, in which case the spherical shape could be natural, or it is an igneous rock, a fine grained schist; if so, the spherical shape is probably man made.

No artifacts comparable to these specimens of miscellaneous pecked stone were recovered from Ala-13 or Ala-12.

Miniature Mortars -- Ala-328 (20 specimens; 7 whole, 13 fragments). Plate 12C.

A group of small pitted stones are interpreted to be miniature mortars. They differ from the pitted hammerstones classed as anvils described below in generally smaller overall size, larger and deeper pits. Like anvil hammerstones, however, several specimens bear pecked or spalled ends and bottoms showing their use as instruments of percussion. Some of the shallower mortars may have in fact served the same sort of anvil use as the hammerstone.

Measurements were made on 7 complete specimens, all of which fit easily into the palm. Maximum outside diameters range from 4.9 to 8.2 cm, averaging 6.5 cm. Maximum pit diameters average 4.2 cm, ranging from 2.6 to 6.2 cm. Pit depth ranges from 0.4 to 1.5 cm, averaging 0.9 cm. A fragment increases these ranges, measuring 9.7 cm outside, 6.5 cm in pit diameter, and 2.5 cm deep.

One small mortar was manufactured from a green schist like that used for perforated charmstones at the site; unfortunately, the depth of recovery in pit F-8 II was not recorded. Two specimens are made of soft sandstone, and 9 of indurated sandstone. Table 3-91 provides provenience data for miniature mortars. One intact specimen was found with burial 286. A fragment was possibly associated with burial 252; artifact catalog and burial record disagree on this point.

Miniature Mortars -- Ala-13 (3 specimens).

All 3 miniature mortars recovered from Ala-13 are indurated sandstone cobbles. The illustrated specimen (Plate 12B), from pit L-17 at 53 inches below datum plane, has a maximum outside diameter of 7.7 cm; maximum pit diameter is 4.9 cm, and pit depth is 1.5 cm. A pecked area on the underside suggests hammerstone use. A second miniature is also pecked on the bottom, from use or possibly as the result of a shaping effort to flatten the bottom for stability if used on the ground rather than in the hand. The artifact is 11.0 cm in outside diameter, with a pit diameter of 7.4 cm and pit depth 3.0 cm. It was a surface find 10 feet north of pit C 13. The third miniature mortar shows no exterior wear. It measures 7.2 cm in maximum outside diameter and 4.5 cm across the pit, which is 1.6 cm deep. It was recovered at 48 inches below datum plane from pit H-13.

Miniature Mortar -- Ala-12 (1 specimen).

A fragment of indurated sandstone found unassociated in pit 0E/5N at 48 inches below surface appears to be half of a miniature cobble mortar with a rounded rim. Some pecked shaping is visible around the side and bottom. The natural angular shape of the cobble prevents it from standing upright; when used it must have been hand-held or placed in a hole in the ground. Inner diameter of the mortar is 6.8 cm at the break, and depth is 3.8 cm; maximum outside length to the break is 6.5 cm.

Abraded Rubbing Stones and Pecking Stones -- Ala-328 (31 specimens).

The majority of these artifacts are made of indurated sandstone; 7 specimens are soft sandstone. Table 3-92 gives provenience data for the artifacts described in this section. In addition to these specimens of abraded stone, 6 abraded grooved stones are discussed above, in the section devoted to grooved and notched stones. Specimens described here fall into 3 subgroups.

Abraded rubbing stones. (2 specimens).

Two flat oblong disc-shaped artifacts may have been used as abraders. Both have 1 or 2 pecked areas on each flat face, possibly anvil areas, or gripping areas for the user's fingers. On a specimen of soft sandstone, which measures 8.0 by 6.0 by 1.9 cm, 2 abraded surfaces on each face are separated by a slight shoulder, as if in different episodes of use the stone was in different positions and orientations. One broad surface of the indurated sandstone specimen, which measures 7.3 by 6.4 by 2.2 cm, may have been used for rubbing as an abrader, although wear is not as easy to detect as on the soft sandstone specimen. The specimen of indurated sandstone is shown in Plate 12K.

Abraded pecking stones. (11 unbroken specimens, 7 fragments). Plate 12 I.

The unbroken specimens are ovate in shape, roughly elliptical or subtriangular in cross section, and bear abraded flat surfaces along two parallel long edges. Abraded area dimensions range from 3.0 to 11.5 cm in length and 1.0 to 3.0 cm in width, with areas ranging from 3.5 to 30.0 cm^2, median at 12.0 cm^2. Pecked or ground evidence of usage of 1 or both ends is present on all specimens. Four show pecked areas on shoulders; 1 of these is also pecked in the center of a face, and another is pecked over 1 entire face, perhaps as a shaping effort rather than by use. Another specimen has an abraded flat surface across a face, covering a broader area than the edge grinding.

Seven fragments share the pattern of ground flat surfaces along the 2 long edges; remnants of pecking on 5 fragments suggest that pecking preceded abrasion in these cases, and perhaps in others. The fragments share the relatively flat, somewhat elongated shape of the unbroken specimens, and many show pecking on end, face or shoulder which may have derived from use or manufacture. In several cases, the end wear appears to be a continuation of the edge pecking and grinding; perhaps the entire circumference was ground.

Among both unbroken specimens and fragments, some size variation is evident. Probably these are multi-use tools which shared 1 or more functions to which their abraded edges were suited, but differed according to other uses to which they were put.

One unbroken stone with paired abraded surfaces was associated with burial 67-14.

Miscellaneous abraded stones. (5 unbroken specimens, 6 fragments).

Each of these artifacts bears a single flat abraded surface which does not fit the pattern of artifacts described above. Size of specimens and placement of abrasion varies. All except 1 fragment were probably elongate cobbles, differing from one another in size and cross section; the exception suggests a thick, flattened spherical shape like that found among many of the anvil hammerstones described below. Most specimens are indurated sandstone.

There were no artifacts comparable to the abraded rubbing stones and pecking stones just described in the collections from Ala-13 and Ala-12.

Hammerstones -- Ala-328 (13 specimens).

These are generally larger than specimens classed as chipping

Table 3-92. Provenience of abraded rubbing stones and pecking stones, Ala-328.

Depths in inches below surface.
* = burial association.
r = rubbing stone, abraded faces.
p = pecking stone, parallel abraded surfaces.
m = miscellaneous abraded stones.

SFSU Grid I

A-1	p: 72
A-5, 6	p: 78
B-6	p: 72
C-1	p: 121
C-7	r: 44
D-5	p: 57-64

Omitted: 3 SFSU specimens, 2 p, 1 m, lacking depth information.

SFSU Grid II

A-6	p: 60
A-7	p: 80
	m: 80
B-4	p: 101
B-7	p: 78
	m: 62
B-9	p: 48
C-5	m: 68
D-7	p: 46
E-6	p: 30
G-4	p: 12
	m: 77
G-5	m: 10
G-6	m: 53
I-6	r: 7
J-8	m: 31

Hayward Excavations

B2-67	m: 42
D1-67	p: 12-18*
F1-67	p: 38, 45
	m: 42
B, C-66	m: 28

Table 3-93. Provenience of hammerstones, Ala-328.

Depths in inches below surface.
* = burial association.

SFSU Grid I

A-4	108*
A-7	28
B-5	30
D-4	72
D-7	32
E-1	156

SFSU Grid II

A-7	lower 60
C-6	49
D-9	93
E-5	19
F-5	29

Wedel Excavations

0-5E	30-35S	24

Omitted: 1 SFSU specimen lacking complete provenience information.

hammers, and are wider and thicker and less elongate in shape. Predominant wear is on broad faces rather than ends or shoulders as on chipping hammers. Hammerstones range in length from 8.5 to 16.0 cm, averaging 13.4 cm. Average width is 8.7 cm, ranging from 6.4 to 9.9 cm. Thickness varies from 4.7 to 7.5 cm, with 5.9 cm the average. Provenience information for hammerstones is given in Table 3-93. They fall into 2 descriptive categories, anvils and cobble choppers.

Anvils. (11 specimens). Plate 12G.

These hammerstones appear to have been used as anvils. Three are pecked over much of both of their broad, relatively flat surfaces, and their ends show pounding use as well. Eight specimens are pitted, bearing a shallow depression in the center of a flat face; 2 of the 8 bear a second pit on the face directly opposite. Pits are circular or elliptical in outline, ranging from 3 to 6 cm in diameter, and are shallow, ranging from less than 2 to 5 mm in depth (much shallower than pits on miniature mortars). All of the specimens show other pecked or spalled usage areas on ends, shoulders, edges or faces apart from the pitted area. The 2 bipitted hammerstones each have flat abraded areas along the side edges, like those on abraded pecking stones described above. Both show pecked or ground use at the ends as well. Thus they each have 6 worked or working surfaces of 2 or 3 different kinds. Uhle (1907: 49-50), discussing a bipitted hammerstone from Ala-309, suggests that the pits resulted from use of the tools for pounding stakes. He offers the same suggestion for a pestle with a pitted shaft (1907: 47). Two pestles and 4 pestle fragments at Ala-328 were similarly pitted.

Burial 126 was accompanied by an anvil hammerstone, described as a "wedge maul" in Davis Table 4 (D&T 1959). Anvil hammerstones were in association with SFSU features 68-18 and 1. The anvil with feature 1 must be either the "crude maul-like stone" or the "core chopper" mentioned by Davis (D&T 1959: 57).

Cobble choppers. (2 specimens)

These artifacts are more spherical in shape than the other hammerstones. One, a fistsize granite or pegmatite cobble illustrated in Plate 12F, shows pecked usage around its maximum circumferential edge and in the center of 1 face. A larger sandstone cobble is heavily spalled at 2 ends, pecked on shoulders below 1 end, and shows some pecking on 1 face, as well as a ground flat surface along 1 edge.

Hammerstones -- Ala-13 (7 specimens).

Like the Ala-328 specimens classified as hammerstones, these are generally larger and less elongate in shape than chipping hammers, with major use-wear on broad faces rather than ends or shoulders. Maximum length ranges from 8.3 to 14.0 cm, maximum diameter from 5.6 to 9.8 cm, and maximum thickness from 2.5 to 6.7 cm. All hammerstones from Ala-13 are indurated sandstone. The total of 7 includes 2 specimens classed as "hammerstones", 3 as "pitted stones" and 2 not described by Rackerby (1967). Each hammerstone shows anvil use on at least 1 broad face. All but 1 broken specimen show other usage areas apart from the pecked anvil area(s). On the 4 larger specimens, pecking is shallow and not confined to 1 area of a face. The 3 smaller hammerstones, approximately fistsize, are pitted, bearing a shallow pecked depression in the center of a flat face. Two bear a second pit on the face directly opposite. Pit dimensions fall within the range described for Ala-328 specimens. One of the bipitted stones (30-20), shown in Plate 12A, was part of feature 2, an artifact cluster. No other hammerstone was a feature or burial association. Provenience data for hammerstones are included in Table 3-65.

Hammerstones -- Ala-12 (2 specimens).

On each hammerstone, a shallow pitted area on 1 face suggests that it was used as an anvil. Pecked or spalled shoulder areas on each show that they were used for pounding as well. Both specimens are broken across the largest dimension. One is indurated sandstone, 1 soft sandstone. The latter was found on the edge of pit feature 3, in unit 0E/5N at 42 inches below surface. The other hammerstone also came from pit 0E/5N, at 17 inches depth; it lacked associations.

Mica Ornaments -- Ala-328 (1 occurrence).

Numerous fragments of thin sheets of clear mica were found with burial 369, in pit D-6 II at 28 inches below surface. They are interpreted as remains of ornaments, although no evidence of perforations or other modifications may be discerned upon them in their present condition. Some of the pieces are shown in Plate 10T.

Mica in this form was not recovered at either Ala-13 or Ala-12.

Stone Bead -- Ala-328 (1 specimen).

There is a single stone bead in the Ala-328 collection, recovered with burial 130, a partial cremation. The bead measures 3.5 mm in diameter, 1.5 mm in thickness; its perforation diameter is 1.5 mm. The tiny size of the bead precludes certain identification of the raw material without damage to the specimen, but it is probably steatite, according to S. A. Kirsch. The specimen is smaller than stone beads found in contexts attributed to Phase 2 of the Late Horizon in interior sites, but it co-occurs with Olivella lipped beads and clamshell disk beads with burial 130, both considered diagnostic of the Phase 2 Late Horizon when found in interior sites.

Davis (D&T 1959: 36, Pl 3i) describes and illustrates an hour-glass shaped stone tube which is no longer present in the collection. He identifies it as steatite, but his incorrect identification of charmstone material as steatite should be recalled. The specimen, of unknown function (bead? , earplug?), was reportedly 3 cm long, with end diameters of 1.7 cm and a constricted mid-section diameter of 1.4 cm. It was recovered with burial 42, in the basal cemetery.

There are no stone beads in the collections from Ala-13 and Ala-12.

Miscellaneous Grinding Tools -- Ala-328 (2 specimens).

A flat slab of indurated sandstone, measuring 15 by 23 by 4.5 cm, was recovered from pit F-8 II at unknown depth. On 1 side, a shallow depression covers about 11 by 8.5 cm of the surface. There is scattered pecking in the depression and just outside, but grinding rather than pounding use is indicated by the relatively smooth surface, although there is no polish evident. On the opposite side of the slab there is no depression, but there is pecking in an oval outline a few centimeters in from the edge, and at 1 end the pecking covers an area about 10.5 by 6.5 cm. This pecking may be the result of use of the stone as an anvil, or perhaps was a shaping effort to provide a stable flat bottom for the grinding face.

A slab of indurated sandstone found in pit L-68 at 5 inches below surface contains a shallow mortar pit 10.5 cm in diameter, 1.6 cm deep. The slab is broken across the pit, and the slab bottom and other end are also rough broken edges. The specimen presently measures 16 by 20 by 8 cm. It perhaps functioned as a hopper mortar. No trace of adhesive is evident around the pit, however.

A flat stone piece from the Wedel excavations was catalogued as a "possible stone polishing slab", but shows no evident human modification.

Miscellaneous Grinding Tools -- Ala 13 (3 specimens). Plate 12H.

Unlike the Ala-328 grinding tools just described, these specimens were grinding agents rather than bases for grinding action. No typical manos were recovered from any of the Coyote Hills sites, but 3 stone artifacts from Ala-13 appear to have been used for rubbing or grinding. A broken soft sandstone specimen, once oval in outline, has 2 flat smooth-surfaced faces on opposite sides. The edges are rounded, showing some pecked shaping. There is no steep shouldering between faces and edges; hence a circular grinding motion is implied rather than back-and-forth motion. The specimen was recovered at 62 inches depth from pit E-13.

Two other stones each have one flat face inferred to be a grinding or rubbing surface, while the opposing face in each case is rounded and shows pecked areas from hammer or anvil use. One specimen, measuring 12.5 by 8.5 by 6.1 cm, came from unknown depth in pit D-15. The other, measuring 12.1 by 7.1 by 4.3 cm, was recovered from Trench 11; its depth was not recorded.

Miscellaneous Grinding Tools -- Ala-12 (1 specimen). Plate 12J.

A broken flat disc of indurated sandstone shows pecking in the center of its flat face, as if it had been used as an anvil. It lacks evidence of pounding use like that found on anvil hammerstones. The specimen, presently measuring 5.6 (to break) by 7.8 by 1.9 cm, was recovered from the area of feature 3, in pit 0E/5N at 42 inches depth.

Stone pendant -- Ala-328 (1 specimen).

A fragment of a narrow piece of polished stone which is grooved at one end was found near the surface of pit A-3 I. It is described and illustrated by Davis (D&T 1959: 36, Pl. 3, o). The rock is not steatite, as reported by Davis, but is serpentinite in which the serpentine has replaced a fibrous mineral.

There are no comparable specimens in collections from Ala-13 or Ala-12.

Pipes -- Ala-328 (3 specimens).

Davis (D&T 1959: 18, 20, Pl 3p-r) describes and illustrates 3 artifacts which were probably smoking pipes. All were recovered without associations at depths of less than 12 inches below surface in disturbed levels of the site. The 3 specimens are on loan to the Oakland Museum, and could not be examined closely for this study. No similar artifacts were discovered in subsequent excavations.

Davis identifies 1 specimen as baked clay and 2 as steatite. His misidentification of charmstone raw material as steatite should be recalled. The baked clay specimen and 1 "steatite" specimen are conical. The other is a tubular pipe, flanged near the narrower end. Schist or steatite pipes of the latter form first appear in interior sites in contexts attributed to Phase I of the Late Horizon (Beardsley 1954: 78). Because these specimens were found in disturbed context, they are of little interpretive significance.

No pipes were recovered at Ala-13 or Ala-12.

Chapter 4. BURIALS AND FEATURES.

The burial sample -- Ala-328.

Approximately 517 burials were uncovered at Ala-328. The figure is approximate, first, because about 30 individuals described as infants were in such poor condition when exposed that they were not removed from the site. The number of individuals in those graves and the field determinations of their age could not be checked subsequently.

In addition to this factor, there were 23 cases in which one burial number was assigned to a grave which, upon later study in the laboratory, was found to contain the remains of multiple individuals. Additions to the total burial count were made by me for 17 of these cases, of which 11 were infants accompanying adult burials. In these cases, the burial record contained evidence of the presence of extra bones in the grave, and such confirmation of the laboratory discovery of multiple individuals in a particular lot was sufficient to convince me to add to the total burial count in such instances. I counted only 1 individual in the other 6 cases (burials 264, 265, 281, 298, 301, and 376) because it was uncertain whether each lot of multiple individuals analysed in the lab corresponded to the particular SFSU burial number to which it had been attributed by the workers doing laboratory analysis. [1]

It was frequently impossible to decide after the fact whether a multiple interment had gone unnoticed in the removal of what was interpreted to be a single occupancy grave, or whether the extra bones were included in the gravelot because of disturbance of some sort, prehistoric or recent. In the tabled burial lot information (Appendix 1 of Bickel 1976), question marks identify equivocal cases, and the evidence is summarized under the entry for each one.

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1 Most of the burials excavated from Ala-328 were deposited at the Lowie Musuem. There, they were assigned catalog numbers which did not correspond to the numbering scheme used on burial record forms from the excavations. In many cases, it is not possible to match the skeletal specimen to burial excavation data with certainty. This uncertainty also attaches to age and sex data for individuals included in Appendix I of Bickel (1976). Age and sex were reported by Lowie Museum catalog numbers, which were then matched with SFSU burial numbers by comparing provenience information, date of excavation, and field age and sex determinations. In many cases there are insufficient data to permit a match; in other cases I disagreed with Brooks' or Oliphant's match.

Age and sex distribution. For the 517 burials included in the sample, information concerning age and sex varies in quality. Age and sex determinations were not recorded for 38 individuals. For 106 other individuals, field records contain age and sex determinations, but there was no subsequent confirmation of these determinations in a laboratory context; since it is not possible to determine the qualifications of the person who made the determinations in each case, they must be treated as uncertain data. The remaining 373 individuals were examined in a laboratory setting; none of the Hayward burials were included.

Age and sex determinations used here were made by Dr. Sheilagh Brooks while she was a postdoctoral research associate at UC-Berkeley, and by Robert Oliphant while he was a candidate for the masters degree at SFSU. Brooks and Oliphant examined 162 of the same individuals at different times, and Brooks examined 18 individuals which Oliphant did not, while Oliphant examined 194 individuals which Brooks did not. Age and sex determinations made by both Brooks and Oliphant are reported for each individual in Appendix I of Bickel (1976). In the summary below, and in Table 4-1, Brook's determinations are used for the skeletal material which was examined by both.

According to the laboratory determinations, the sample of burials from Ala-328 includes 106 males, 20 individuals sexed as probably male, 74 females and 19 individuals sexed as probably female; sex was not determined for 154 individuals. Considering only the 219 individuals for which sex was determined in the lab, 48% are males, 34% are females, 9% are probable males, and 9% are probable females.

Individuals which were assigned a numerical age by Brooks and Oliphant may be grouped into 9 age categories. The sample includes 52 infants (birth to 3 years), 31 children (4 to 8), 14 pre-adolescents (9 to 12), 37 adolescents (13 to 17), 15 subadults (18 to 20), 91 young adults (21 to 35), 71 middle-aged adults (36 to 55), 2 old-aged adults (56 and older). Some individuals were not aged in years. These include 56 "adults", 1 "juvenile", and 1 "child". Age was not determined for 2 of the individuals examined in the lab. Considering the 371 individuals for which age was determined, 14% are infants, 8% children, 4% pre-adolescents, 10% adolescents, 4% subadults, 25% young adults, 19% middle-aged adults, less than 1% old adults, 15% adults of unspecified age, and less than 1% juveniles and children of unspecified age. Combining these figures shows a ratio of about 3 adults to 2 individuals below adulthood among the population for which age was determined.

Table 4-1 summarizes the age and sex determinations made in laboratory examinations and shows the contribution of the Wedel sample to the whole distribution. Table 4-2 summarizes the age and sex determinations made in the field for those burials not re-examined in the lab, and shows the contribution of the Hayward and Wedel sample to the whole distribution. The table is included to show that no marked difference exists between the sample of burials examined in the lab, and those for which there are only field determinations.

Because the 517 individuals exposed at Ala-328 represent disposals of the dead made over a period of close to 2000 years, it would be inappropriate to treat them as representative of the living population occupying the site at any one time. Hence no mortality curves or hypothetical population structures are offered here. [1] The age and sex patterning of total sample may be used as a base against which to compare the composition of the few cemeteries or grouping of possibly contemporary burials which have been isolated within the site. The evidence for these will be presented below, after further discussion of the attributes of the mortuary sample as a whole.

The burial sample -- Ala-13.

A total of 108 burials were recovered from Ala-13; 99 were excavated by hand and 9 were noted during bulldozing of the site. Laboratory age and sex determinations of the burials are not available. According to field determinations of age, there were 12 infants, 16 youths and 70 adults in the sample excavated. Estimates of age were not made for 1 of the excavated burials, nor for the bulldozed burials. Year equivalencies for the age categories used were not specified; the "youth" category above includes burials aged as "adolescent" and "child" as well as "youth". The field determinations indicate that about twice as many adults were recovered as were individuals of lesser age. No sex determinations were made in the field. Tabled burial lot information (Appendix 2 of Bickel 1976) gives the age data for individual burials.

The burial sample -- Ala-12.

Thirteen burials were exposed during excavations at Ala-12. Laboratory age and sex determinations of the burials are not available. According to field determinations of age, there were 9 adults, 2 youths and 2 foetuses in the sample excavated. Year equivalencies for the age categories used were

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1 They are offered by Ryan (1972· Chap. II, pp. 8-10, and Tables I, II, III, p. 64), based on a sample of 451. He found that most deaths occurred either from birth to 2 years of age or from 41 to 50 years of age. There was no significant difference in mortality for males and females at any age, even during the reproductively important years (19 to 30 in Ryan's scheme).

Table 4-1. Laboratory age and sex determinations, Ala-328 burial sample.

Age	Male	Male?	Female	Female?	Sex unknown	Total
Infant (birth-3)	0	0	0	0	52(4)*	52(4)
Child (4-8)	0	0	0	0	31(4)	31(4)
Pre-adolescent (9-12)	0	1	1	0	12	14
Adolescent (13-17)	9(1)	1	5	5	17	37(1)
Subadult (18-20)	7	2	3(1)	0	3	15(1)
Young adult (21-35)	51(2)	5	25(3)	5	5	91(5)
Middle-aged adult (36-55)	29(2)	7	32(4)	0	3	71(6)
Old-aged adult (56+)	0	0	2	0	0	2
"adult"	10	3	6	9	28(1)	56(1)
"juvenile"	0	0	0	0	1	1
"child"	0	0	0	0	1	1
Age unknown	0	1	0	0	1	2
	106(5)	20	74(8)	19	154(9)	373(22)

* Determinations for Wedel burials are included in the figure cited for each category; the Wedel subtotal is specified in parentheses following the cited figure.

Table 4-2. Field age and sex determinations, Ala-328 burial sample.

Age	Male	Male?	Female	Female?	Sex unknown	Total
Infant (birth-3)	0	0	0	0	39(3)*	39(3)
Child (4-8)	0	0	0	0	1(1)	1(1)
Pre-adolescent (9-12)	0	0	0	0	1(1)	1(1)
Adolescent (13-17)	0	0	1	0	0	1
Subadult (18-20)	0	0	0	0	1	1
Young adult (21-35)	1	0	0	0	0	1
"young adult"	0	0	0	1	0	1
"old adult"	0	0	0	1(1)	0	1 (1)
"adult"	8(1)	2	5(1, 1)**	1(1)	31(9)	47(12, 1)**
"adolescent"	0	0	1	0	1	2
"subadult"	0	0	0	0	4	4
"child"	0	0	0	0	6(4)	6(4)
	9(1)	2	7(1, 1)**	3(2)	84(18)	105(22, 1)**

* Determinations for Hayward burials are included in the figure cited for each category; the Hayward subtotal is specified in parentheses following the cited figure.

** A single Wedel burial is included in this sample.

not specified. The field determinations indicated that about twice as many adults were recovered as were individuals of lesser age. No sex determinations were made in the field. Tabled burial lot information (Appendix 3 of Bickel 1976) gives the age data for individual burials.

Burial placement -- Ala-328.

Information concerning the placement of burials in graves varied in quality. Where photographs and sketches permitted, reported placement data were checked; where this was not possible, reported designations were accepted if they involved no internal contradictions.

Table 4-3 summarizes the known information concerning posture, orientation and position of the burials removed from Ala-328 Placement data are available for individual burials in the tabled burial lot information (Appendix 1 of Bickel 1976). The data have been examined for any significant vertical or horizonal patterning. There are no apparent isolated areas of characteristic disposal patterns differing from other areas. Some general similarities can be shown among burials within the basal cemetery, but these are not exclusive traits differentiating this group of burials from others around it. They do suggest some trends of change over time in preferred orientation and posture. These are discussed below in the section devoted to the basal cemetery.

Position of face, upper limbs, and hands and feet was rarely recorded or accurately shown on sketches, so no finer attributes of placement than orientation, position and posture were isolated for analysis. The paragraphs below present the general characteristics of the Ala-328 sample regarding placement of burials.

Burial orientation is considered here to be the direction of an imaginary axis drawn through the spine of a burial in situ, from lumbar to cervical end, labeled for the cervical end. For example, a burial laid so that the spine was parallel to a north-south line would be considered to be oriented "south" if the cranium were to the south, innominate to the north. There is no indication that a compass was used in measuring burial orientation in the field; probably the alighment of pit walls was used as a guide in determining burial orientation. Within the Ala-328 population, orientation is variable. As Table 4-3 indicates some preference for westerly orientation is suggested and the quadrant from north to west was more popular than the others. Orientation to the northwest occurs with greater frequency in the basal cemetery discussed below than in the sample as a whole. A trend is indicated from a preference for for northwesterly orientation early in the site's occupation to a lack of preference for a particular orientation later.

Table 4-3. Placement of burials, Ala-328.

Orientation	N	NW	NE	S	SW	SE	W	E	Unknown	Total
No. burials	50	49	17	37	21	12	74	36	221	517
% of burials w/ known orient.	17	17	6	13	7	4	25	12		

Posture	Ext.	Loose Flex	Tight Flex	Unspec. Flex	?	Total
No. burials	7*	125	117	74	194	517
% of burials w/ known posture	2	39	36	23		

Position	Left	Right	Face	Back	Seated	Unknown	Total
No. burials	103	106	34	69	4	201	517
% of burials w/ known position	33	34	11	22	1		

Orientation = direction of axis through spine, labeled for cranial end (e.g., a N-S axis would be labeled "N" if skull were to north, pelvis to south).

Posture: Extended = no flexure of legs at hip or knee.
Loose Flex = flexure at hips 90° or less from extended position.
Tight Flex = flexure at hips greater than 90° from extended position.
Unspecified Flex = degree of flexure unspecified in records.

Position: side upon which body lay when exposed.

Placement of face and upper limbs was rarely recorded or accurately shown on sketches, and so is omitted from analysis.

* Several of these are dubious extensions. See text.

Among the burials for which position was reported, about two-thirds were positioned on 1 side, with about equal preference for left and right sides. Roughly one-fifth of the known sample were dorsal burials, and about one-tenth, ventral. Only 4 burials were reported to have been sitting. Examination of sketches in burial records suggests that a number of others were originally interred in a sitting position. However, no reclassifications of reported position have been made because of the uncertain accuracy of such a procedure.

Information concerning burial posture is available only in the crude categories of loose, tight, and unspecified flexures, and extended burials. Category definitions are included in Table 4-3, which summarizes the postural data for the sample. Flexed burials were in the great majority, with only 7 extended burials reported. Loose and tight flexures occurred in roughly equal numbers among the cases for which degree of flexure was specified.

Burials with extended posture included W6, W16, 141, 444, and possibly 51, 58 and 363. For burial 141, a sketch is lacking and the skull was missing, but the burial record reports posture as extended. Burials 51, 58, and 363 were also reported as extensions, but the sketch of 51 suggests the absence of lower leg bones, the burial record for 58 shows that bones below the femurs were missing, and the tibiae and fibulae of 363 were left unexposed in a side wall, so the extended posture is uncertain in these cases. The position of burial W1, reported as an extended burial by Davis (D&T 1959: 13), was indeterminate when excavated, according to the burial record. The record does note that the burial was possibly extended originally, but this is insufficient proof for treating W1 as an extended burial.

Attributes of the reported extended burials are summarized here in tabular form:

Bur.	Age	Sex	Side	Orient.	Pit	Depth	Assoc.
W6	inf	?	back	E	10-15'E 0-5'S	66	yes
W16	35 to 40	M	face	E	5-10'E 10-15'S	86	no
141	3 to 4	?	face	?	B-2 $_{I}$	66	no
444	inf	?	?	E	C-5 $_{II}$	96	no
51	inf	?	?	W	D-5 $_{I}$	72	no
58	?	?	face	SE	A-5/6 $_{I}$	79	yes
363	15 to 20	M	face	SW	G-5 $_{II}$	42	no

The preponderance of young individuals, ventral position, and eastern orientation are perhaps noteworthy. Both burials with associations were accompanied by cut shell beads, and burial 58 was one of the more richly endowed burials at the site (see Appendix 1 of Bickel 1976). Burial 444 came from within the basal cemetery area, and was the only extended burial at submound depths.

Burial placement -- Ala-13.

This discussion of the Ala-13 burial sample draws upon the original burial records and upon Rackerby's published presentation (1967). As will be seen from a comparison of the published data and the tabled burial lot information provided in Appendix 2 of Bickel (1976), some of Rackerby's conclusions regarding burial placement have been changed. This was done only when a careful sketch or informative photograph available in the original burial record showed an error in Rackerby's Appendix C. Since Rackerby directed the excavations and was presumably present during the exposure of most burials, his interpretations were changed only when errors were clearly documented. Unfortunately, many of the burial records lack sketches, photographs, or even adequate written descriptions; hence a complete check on the accuracy of Rackerby's presentation was not possible.

Table 4-4 summarizes the known information concerning orientation, position and posture of the burials removed from Ala-13. Placement data are available for individual burials in Appendix 2 of Bickel (1976).

Burial orientation is variable, with some preference for east-west orientations over north-south. Among the former, about the same number of burials was oriented east as west. Orientation toward the northeast quadrant was least frequent; the other 3 quadrants were about equally popular.

The sitting position occurred in only 4 cases. The majority of burials lay on 1 side, with no evident preference for the left or right side. Ventral and dorsal burials, although less frequent than lateral burials, likewise occurred in roughly equal numbers.

All but one of the burials for which posture was determined were flexed burials. Degree of flexure was specified in less than one-half of the cases; tight flexures outnumbered loose flexures 3 to 2.

According to Rackerby (1967: 4, 71), burial 40, an infant, was extended ventrally in a north-south direction (whether cervical end was to north or south is unspecified). It should be noted that the burial record does not specify the posture of the burial, and no sketch or photograph is present, so it is not possible to verify Rackerby's attribution of extended posture to burial 40. Skull and mandible were absent from the burial. It was accompanied by an entire Haliotis cracherodii shell, reportedly stopped with asphaltum in the siphonal openings when recovered; there were no other grave goods.

Table 4-4. Placement of burials, Ala-13.

Orientation	N	NW	NE	S	SW	SE	W	E	Unknown	Total
No. burials	6*	5	1	4*	7	10	13**	10**	52	108
% of burials w/ known orient.	11	9	2	7	13	18	23	18		

* 1 burial was oriented N-S, with direction of cervical end unspecified; it is counted as unknown orientation, rather than N or S.

** 2 burials were oriented E-W, with direction of cervical end unspecified; they were counted as unknown orientation, rather than E or W.

Posture	Ext.	Loose Flex	Tight Flex	Unspec. Flex	?	Total
No. burials	1	13	17	32	45	108
% of burials w/ known posture	2	21	27	51		

Position	Left	Right	Face	Back	Seated	Unknown	Total
No. burials	18	16	11	9	4	50	108
% of burials w/ known position	31	28	19	16	7		

Definitions of "orientation", "posture", and "position" are included on Table 4-3.

Burial placement -- Ala-12.

Sketches and photographs, other than the published sketch of burials 7 and 8 (R 1967: 32) were not available for confirmation of the recorded data regarding placement of burials.

Table 4-5 summarizes the known information concerning orientation, position and posture of the burials exposed at Ala-12. Placement data are available for individual burials in Appendix 3 of Bickel (1976).

Burial orientation is known for only 8 burials, and was variable.

Of 9 burials for which position is known, 4 were lateral, 1 ventral and 4 dorsal; no sitting burials were recovered.

Eight flexed burials were recovered, of which 6 were tight flexures, and 2 were loosely flexed. One extended burial was recovered among the 9 for which posture could be determined. This was burial 8, an adult dorsally extended. The cranium, mandible, and much of the left side of the body were absent, including the bones of the left leg. Ocher was concentrated in the rib area of the burial. There were no artifactual grave goods with burial 8, although reportedly it lay in the same grave as burial 7, a flexed adult which was accompanied by several artifacts.

Mode of disposal -- Ala-13, Ala-12, and Ala-328.

All burials recovered from Ala-13 and Ala-12 were inhumations. The burial record indicates charring of the ribs of burial 40 at Ala-13, but Rackerby did not include this in his Appendix C. There were no other reported indications of the practice of cremation at either site.

The predominant mode of disposal throughout occupation of Ala-328 was inhumation. At least 474 of the 517 burials recovered were evidently inhumations, according to the available records. Some cremations were recovered, however. Although they represent a relatively small part of the burial sample, the evidence for cremation at Ala-328 is discussed at length here because it contributes to a growing body of evidence that cremation has had a long history in the Bay area (see Gerow with Force 1968: 37-40), possibly a different history from that characterizing the practice of cremation in the interior Valley.

There is some indication of a localized cremation area near the site surface with associated artifacts which are attributed to the Late Horizon when recovered in the Valley. There is also evidence in the site for continuity of cremation as a mode of disposal over a long time period, beginning with the earliest occupancy of the site.

Evidence from the bulk of the excavations, those of Wedel and SFSU, suggests that only 6% of all burials were cremations. Contradictory evidence comes from the Hayward excavations, in which 48% of the burial sample were cremations. The disagreement in data may be partially explained by different criteria used by different excavators in perceiving burials as cremations, especially since partial cremations predominated at the site, as will be discussed below. In addition, the location of the Hayward excavations on a different portion of the site from the SFSU excavations might imply differential burial practices in different parts of the mound.

The evidence for cremation at the site will be discussed further with regard to these factors below. The conclusion to be demonstrated is that in spite of the unsatisfactory state of knowledge of the extent and significance of cremation at the site, there is evidence for in situ partial cremation of the dead throughout much of the occupancy of the site, probably including both the earliest and the latest periods of aboriginal site use. Two examples of the burial of bones after their near-complete cremation elsewhere are known from the base of the site. One case of near-complete in situ cremation is reported, also from the base of the site. Other complete cremations, in situ or ex situ, cannot be claimed with certainty elsewhere in the site.

Davis (D&T 1959: 9-11) reports the occurrence of 9 cremations among the remains of 169 individuals. He distinguishes between full or partial cremation in situ, in which charcoal is present in the matrix, and the occurrence of a handful of bone dissociated from any charcoal or ash, which is taken to represent inhumation of the remains of an individual cremated elsewhere. Two cremations of the latter type and 7 of the former are mentioned in the text, but only 8 cremations are indicated on the tables of burials (D&T 1959: 12-14), burials 40, 47, 65, 129, 130, 131, 100, 106.

Brooks' and Oliphant's comments on the condition of some of the skeletal material suggest that several other burials from Davis' sample may have been cremations. Burial 49 was described as a cremation by Oliphant, and the pestle associated with it is blackened, like pestles found with cremations 129 and 131. Burial 38 was considered by both Brooks and Oliphant to be a cremation, and 2 of the bone artifacts associated with it are whitened in parts, in the manner associated with fire action on bone. Burial 102 was described as a probable cremation by Brooks, and the burial record contains the notation: "Shows evidence of burning -- probably partial cremation and reburial? ". The cranium of burial 103 is described as burned by both the burial record and Brooks' notes; unfortunately the record does not show whether charcoal was present in the grave matrix or whether a situation other than deliberate

Table 4-5. Placement of burials, Ala-12.

Orientation	N	NW	NE	S	SW	SE	W	E	Unknown	Total
No. burials	1	1	0	3	0	0	1	2	5	13
% of burials w/ known orient.	13	13		38			13	25		

Posture	Extended	Loose Flex	Tight Flex	Unknown	Total
No. burials	1	2	6	4	13
% of burials w/ known posture	11	22	67		

Position	Left	Right	Face	Back	Seated	Unknown	Total
No. burials	1	3	1	4	0	4	13
% of burials w/ known position	11	33	11	44			

Definitions of "orientation", "posture", and "position" are included in Table 4-3 for Ala-328.

Table 4-6. Location of cremation burials, Ala-328.

Depths in inches below surface, except where shown in parentheses.
( ) = depths in inches below datum plane.
p = possible cremation.
* = at or in submound soil.

SFSU Grid I

A-5	87p, 100*, 101*
C-2	15
C-5/6	12
C-6	8, 12
C-7	17p
D-4	78p
D-6	84*p
D-7	24, 24p
D-8	22
E-6	36p
E-7	18

SFSU burials 247 and 249 were reported at 92" and 89" depth, both in submound; each is credited to pit? -10, Grid II.

SFSU Grid II

A-3	12
A-10	48p
B-4	110*p
B-9	56p
B-10	36p
D-10	32p
E/F-8	72*p, 72*p
E-10	60*p
G-5	40p

Hayward Excavation

A-66	39
A1-67	14
B2-67	52*
C-66	14, 30-36
C1-67	36
D-66	(32)p
D1-67	(24)
D2-67	(18-24)
E-66	12
E1-67	(18-24)
E2-67	(27), (35)
F1-67	(22-30)
F1-67	52*
Test Pit 1	51*p

burning of the corpse was indicated. The record for burial 5 states, "indication of burning at knee", and Brooks noted that the bones were charred; however, the burial record also refers to a hearth over the knee of the burial, so burning may have been post-interment. Brooks comments on the charred condition of burial 125; the burial record makes no reference to charcoal or possible burning.

Among the burials excavated by SFSU after the sample described by Davis, only 2 were reported to be cremations, burials 156 and 272. Each of these was accompanied by a charred net-like item of cordage, good evidence that they were indeed cremations. In addition to these instances of cremation, burials 164, 165, 171, 183, 207, 247, 249, 252, 253, 347, and 441 were possible cremations, as indicated by the comments made on their charred condition when they were examined in the laboratory. These comments are included in the tabled burial lot information (Appendix 1 of Bickel 1976).

Were all of the above-mentioned possible cremations to be accepted (and surely some represent post-interment burning due to causes other than cremation), they would bring the total number of cremations to 27, about 6% of the total of 484 burials exposed by the Wedel and SFSU excavations. In addition to these, there are 14 burials reported to be cremations (66-3, 66-4, 66-10, 66-13, 67-1, 67-2, 67-3, 67-5, 67-6, 67-8, 67-9, 67-13, 68-1B, 68-F1) and 2 possible cremations (66-7, 67-4) from the sample of 33 burials excavated from the site by Hayward. This gives a maximum of 43 cremations, or about 8% of the total of 517 burials recovered. In the Hayward sample alone, however, about 48% of the burials were cremations.

This difference could be attributable to the fact that the Hayward excavations sampled a different portion of the mound, to the west and mostly to the north of the SFSU excavations, but the fact that cremations occur from s shallow depths to sterile base in that area would require that it was a locus for unusually frequent disposal of the dead by cremation throughout a long time period. Charmstones from the base of the Hayward excavations are similar in raw material and stylistic form to charmstones found in a basal cemetery near the central portion of the mound, which suggests some contemporaneity in use of those 2 areas of the site very early in its occupancy.

It is possible that the low incidence of cremation reported by SFSU excavators may relfect an inability to recognize partial cremations.[1] On the

1 At nearby site Ala-329, probably occupied contemporaneously during much of the period when -328 was occupied, cremations occurred relatively frequently. About 25% of the first 71 graves excavated there by Stanford were cremations (Coberly 1971: 11). On the other hand, not a single cremation was recovered from either Ala-12 or Ala-13, also close to Ala-328 and at

other hand, it may reflect long term differential usage of parts of the site with regard to mortuary behavior. In either case, intra- or inter-site comparisons which consider frequency of cremation should be made with care.

Mode of cremation. From description of cremations in burial records and from the physical anthropologists' notations concerning the condition of cremated skeletal material, it appears that the common practice at Ala-328 was partial cremation. The evidence suggests the procedures labeled "pre-interment grave pit burning" by Lillard, Heizer and Fenenga (1939: 4). Position and orientation of the cremated individuals was ascertainable in most cases. Charring of the underside of the bone, or burning of parts of bones rather than complete consumption was the general rule. The presence of charcoal was noted around reported cremations, and many of the artifacts recovered from cremation graves show signs of burning. Cremation 68-F1, a hearth feature with burned infant bones in the matrix, may be an exception which represents more complete cremation. Burials 100 and 106 were interpreted as near-complete cremations which had been interred away from the place of burning (D&T 1959: 9). Little or no charcoal was found in the matrix of either burial, and the bones were few enough and sufficiently burned so that definite age and sex determinations could not be made, nor could placement of the burials be ascertained.

Age and sex determination. Among the 16 Hayward cremations, age was determined in the field for 12. There were 8 adults, 2 children and 2 infants; the ratio of adults to younger individuals is about the same as that in the Hayward burial sample as a whole. Among the 27 cremations and possible cremations recovered by SFSU, 25 were examined in the laboratory. This sample included 18 adults and 4 individuals of lesser age, a ratio of more than 4 to 1, greater than the ratio of adults to younger individuals in the SFSU sample as a whole. Age was not determined for 3 individuals examined. Seven to 8 years was the youngest age determined for an SFSU cremation. Sex was determined

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least partly contemporary with it. Since Ala-12 and -13 were excavated by students with the same training as those who excavated in Ala-328, the absence of cremations might perhaps be interpreted as an artefact of the excavators' perceptions, rather than a cultural attribute of the aboriginal mortuary behavior at those sites. Another interpretation would make the Hayward cremations and the comparatively high incidence of cremation at Ala-329 the unusual features requiring explanation. No resolution seems possible at present, given the nature of the evidence from the Ala-328, -13, and -12 excavations. For the latter two, we lack any reports of the lab examinations of skeletal material which might provide information concerning the presence or absence of charred bone in the burial sample. Future work could meet this need.

(in the field) for only 1 Hayward cremation, a female. Sex was determined for 18 of the SFSU cremations, of which 3 were females, 13 were males, and 2 were probable males. The data thus suggest some preference for adults and for males among individuals who were cremated rather than inhumed after death.

Placement. Orientation was predominantly westerly and northwesterly: 7 W, 7 NW, 4S, 1 SW, 2 SE, 1 N, 3E, 18 not determined. The figures expressed as percentages of the 25 burials for which orientation is known are: 28% W, 28% NW, 16% S, 4% SW, 8% SE, 4% N, 12% E.

All cremations were flexed. There were 11 tight flexures, 8 loose flexures, and 8 flexures of unspecified degree. Posture was not determined for 16 cremations.

There were 5 ventral cremations, 5 dorsal, 9 on the left side, 7 on the right side, and 1 with side undetermined. Position was not ascertained for 16 cremations.

Grave goods. Among the Hayward cremations, artifactual grave goods were found with 8 individuals, half of the sample. Small stones under, over, or around the cremations were mentioned in several cases, but details are insufficient for conclusions to be drawn concerning their frequency of occurrence or significance, if any. The artifactual associations were mostly of the sort interpreted to be utilitarian, such as mortar fragments and blunt pointed antler tools possibly used as flakers. A complete mortar accompanied burial 67-6. Burial 66-13 was exceptional in the Hayward sample, reportedly accompanied by an entire Haliotis shell, several bone flutes, ocher and possibly a few Olivella disk beads; unfortunately, most of the associated goods are missing from the collection, so their recovery cannot be confirmed.

Among the SFSU cremations, grave goods were found with 17 burials, over half the sample. The 10 individuals lacking accompaniments (125, 164, 165, 171, 183, 207, 247, 249, 253, 347) are all "possible" cremations, so classified by me on the basis of physical anthropologists' observations of charring of the skeletal material. Many of the grave goods are of the sort interpreted to be non-utilitarian, such as shell beads, pigment, and bone flutes. Frequent accompaniments of cremations were: pigment (10 occurrences), Olivella beads (8 occurrences), and charred cordage -- possibly the remains of a net-like garment or hair covering -- (6 occurrences).

All 6 occurrences of the cordage, 7 of the beads and 6 of pigment occurred with cremations which lay at depths of 24 inches or less. A shallow localized cemetery including at least 9 of the SFSU cremations is indicated: it will be discussed in a separate section below.

Location. Table 4-6 gives provenience of definite and possible cremations recovered from Ala-328, and shows which were recovered at submound depths. Thirteen of the SFSU cremations were shallow enough to have been interred from the historic surface, assuming a 36 inch maximum depth for aboriginal graves (and ignoring the possibility that recorded depths below surface may refer to a "surface" brought into existence after bulldozer clearing of the historic surface). Six cremations lay at the base of the mound, in a matrix of sterile clay, and another 3 were on or just inches above the base. Three of the submound cremations lay within the area of the basal cemetery which will be discussed below in a separate section; all 3 were accompanied by pigment, and 1 by Olivella beads.

The Hayward cremations likewise were distributed from submound to near-surface depths. Three cremations were at the base of the mound, and at least 5 were within 36 inches of the surface; variable reporting of depth with reference to surface and datum plane makes it impossible to be more precise.

The uncertainty of these data on definite and possible cremations and their provenience makes it unwise to use them for generalizations regarding trends. What is indicated if all possible cremations are accepted as definite is greater incidence of cremation as a mode of disposal both early and late in the site's occupation history than during the intervening periods of its use. [1]

Multiple burials -- Ala-328.

About 15% of the Ala-328 burial sample was recovered from what were interpreted to be graves in which more than 1 individual had been interred contemporaneously. Thirty six such groupings were indicated in burial records; in 9 of these cases, the presence of multiple individuals were not observed in the field, but notation was added to the burial record after laboratory examination of skeletal material revealed in the presence of multiple individuals in a single grave lot.

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1 12 basal cremations comprise 16% of the 75 burials at those depths; 18 cremations within 36" of surface comprise 12% of 145 burials at those depths; 13 cremations within 24" of surface comprise 17% of 76 burials at those depths. Overall incidence of cremation at the site is 8%. Incidence of cremation at middle depths is 4% to 5% (13 of 291 below 36" but above submound; or 18 of 360 below 24" but above submound).

Table 4-7 gives burial numbers and age and sex data where available for graves believed to have contained more than 1 individual. The 2 major categories of association were· 2 adults paired (8 occurrences), and 1 adult paired with 1 infant (7 occurrences; in 3 of 4 cases where sex was determined, the adult was male). Seven graves contained the remains of 3 individuals, and in one case, 4 individuals were buried together.

It is difficult to interpret the presence of multiple graves beyond noting their occurrence. Gerow (Gerow with Force 1968: 40) reports an incidence of 41% dual graves among the SMa-77 sample. His summary of the documented occurrences of dual and multiple graves elsewhere in central California shows the incidence to be much lower at other sites (Gerow with Force 1968: 41). In this connection, it may be of interest that 5 dual graves and 1 triple grave occurred within the basal cemetery area at Ala-328 to be described below. This gives an incidence of 26% of multiple burials at the base of the site (no other burials at submound depths are among the reported multiple graves). Thus in this regard, the lower levels of Ala-328 are more similar to SMa-77 than are the upper levels.

Multiple burials -- Ala-13.

Nine groups of multiple burials were recorded at Ala-13, including 7 dual graves and 2 triple graves. The 20 individuals involved make up 19% of the entire burial sample. Pairs include: 22 and 23 (adult, infant), 33 and 34 (2 adults), 29 and 30 (adult, child), 46 and 47 (adult, infant), 70 and 71 (2 youths), 73 and 74 (2 adults), 94 and 95 (2 adults). Triple burials included: 88, 89 and 90 (2 adults, youth), and 79, 81 and 83 (2 adults, youth).

It should be noted that burials 38, 40, 80, 82, 87, and 91 are not considered as multiple burials here, in spite of notation in the burial record that they were associated with other burials. As used here, the term multiple is restricted to burials inferred to have been interred in a common grave. Burials 38, 40, 80 and 82 were all evidently interred later than the burials with which they were associated when excavated. Burials 87 and 91 were adjacent to a triple cluster of burials, but there is no evidence (such as shared grave pits) that they were interred contemporaneously with that cluster.

All but 2 of the multiple graves were at the base of the mound, in pits intrusive to submound. Thus 16 of a total of 43 individuals interred at mound base, or 37% of all submound burials, were found in multiple graves. The comparable figure is 7% for individuals buried higher in the mound (ignoring bulldozed graves 100-108).

Table 4-7. Multiple burials at Ala-328.

/ / = field age and sex determination.
( ) = lab age and sex determination.
* = grave in basal cemetery.
** = individual not tabulated in total count for site; too little documentation to be certain of validity.

Subadult or Adult + Infant

34+34a (M adult), /inf/
167+167a (? @17), /inf/
242+242a (M 31-33, inf)
248+248a (M 30+), /inf/
292+292a (F 25-30), /inf/
339+339a /? adult, inf/
67-2+67-2a** /? ?, inf/

Subadult or Adult + Adult

15+16 (F adult), /? adult/
207+208 (F 40+, F 26-27)
227+227a (M @30, ? @17)
308+309 (F adult, M 25-30)
*360+361 (F 25-35, F 20-25)
*376+376a (F? adult, F? adult)
*379+383 (F? adult, M 30-35)
388+388a (M adult, F adult)

Infant + Multiple Individuals
51+52+53 (0-2, F @28, M @25)
231+236+237+237a (½-1, F @33 F @45, M @33)
281+281a+281b** (M 30-35, 0-2, F? adult)
346+346a+347 (F 15-18, 0-2, M adult)
403+403a+403b (F? 15-18, 1-3, 1-3)

Other

104+112+117 (F @45, F @40, M 17+)
227+278 (M @14, @3)
296+296a (? 12-18, ? 12-18)
302+302a (less than 1, child)
351+352 (? 5-8, ? 5-10)
373+373a+373b (F 10-15, ? adult, ? 8-12)
*395+396+397 (? 10-15, M 31-35, M 35-46)

Age Information Incomplete

49+65 (? ?, ? ?)
68+69 /inf/, (? ?)
85+86 (? ?, ? ?)
279+280 (F 20-25, ? ?)
336+337+poss 338 (? 5-10, ? ?, poss ? 5-10)
*380+381 (? ?, F 25-35)
*410+411 (F 25-30, ? ?)
422+423 (? ?, ? ?)

Multiple burials -- Ala-12.

There were 2 dual graves at Ala-12, an incidence of 20% of the entire sample. Burials 4 and 5 were paired, as were 7 and 8. All 4 individuals were adults accompanied by grave goods.

Burials 11, 12 and 13 were reported to be a complex, but evidence does not suggest that they were interred contemporaneously in 1 grave. In part, evidence is lacking because the burial area was vandalized before the relationships among the 3 individuals were clearly understood.

Partial burials; evidence of "violent death" -- Ala-328.

Isolated skulls. A few isolated skulls were recovered at Ala-328, burials 66-7, 66-12, 95, 166, 176, 242a, 322, and 392. None were found in circumstances which implied deliberate burial of a skull alone. None were accompanied by grave goods. Three of the burials consisted of fragments of infant skulls, apparently the only remains of originally more complete skeletons. Two adult skulls came from disturbed contexts. Another was pulled from a pit wall; the postcranial material might have been excavated during a previous season, or perhaps lay undetected further in the wall. Another skull, 66-7, found amongst much charcoal was interpreted in the burial record to be the remains of a cremation. The paucity of isolated skulls in the sample and the circumstances of their recovery argue against the existence of a pattern of headtaking among inhabitants of Ala-328.

Headless torsos. As with isolated skulls, the evidence for headless torsos does not suggest a pattern of headtaking. Sixteen burials were reported to lack skulls: 22, 41, 73, 84, 89, 115, 136, 141, 288, 311, 315, 328, 353, 375, 390, 402. The ages of burials 73, 89, 353, and 402 were not determined; 136 was an infant, 141 was a child, 315 was probably a subadult, and the others were adults. All but burials 41, 89, 311, 328, and 353 came from contexts that were observed to be disturbed. Burials 41, 315, and 353 were the only ones with grave goods in association. The mandible of burial 390 was present, suggesting that the skull had been with the body at time of burial. Burials 22, 84, 115, 288, 315, 353, and 375 were missing some postcranial bones as well as the skull; this argues against deliberate beheading at death such as the taking of trophy heads suggested by Davis (D&T 1959: 40) with regard to burial 115.

"Violent deaths". This terminology is taken from Rackerby (1967: 31); who writes of a "pattern of head-taking and violent death... emerging from the data of these southern San Francisco Bay shellmounds." The evidence from Ala-328 does not support such a pattern, nor, as will be argued below, does that from Ala-13 or Ala-12, the sites to which Rackerby referred in the quotation.

Some evidence regarding violence at Ala-328 comes from Ryan's (1972: 27-31, 54, 84-86) discussion of skeletal evidence of trauma. His sample was 451 individuals. He found 23 long bone fractures, of which 14 or 15 could be attributed to violence. These were "night-stick fractures" of the radius or ulna, which occurred when the recipient of a hard blow raised an arm to protect the upper body. Individuals with such fractures were evenly divided between males and females. Ryan found 5 depressed cranial fractures. One is a parietal fracture on a female probably caused by the end of a club. Four are small (2 cm or less in diameter) fractures of the frontal bone, perhaps caused by a stone. Three females and 1 male suffered these fractures. Only 1 of the individuals examined by Ryan showed evidence of a wound (non-lethal) by a projectile point; this was a male adult showing a healing rib penetration.

Davis (D&T 1959: 40) suggests that burial 115 died as a result of a wound caused by an obsidian blade found with the burial. The blade was not embedded in bone, nor were the 3 blades and a fragment found with burials 200, 237, 278, and 2, respectively. In short, the evidence for death by projectile wound is equivocal in the few cases where artifactual associations suggest such a possibility. Even if 5 individuals at Ala-328 died of this cause, they would represent less than one percent of the total burial sample.

Conclusion. Considering the data just discussed, it seems clear that Ala-328 does not provide suggestive evidence for violent conflict or headtaking to the extent that a "pattern" of such behavior should be postulated. More noteworthy is the absence or near-absence of such attributes as isolated skulls, headless torsos and projectiles embedded in human bone, which have been used to infer the existence of such cultural practices at other sites (e.g., Beardsley 1954: 75).

Partial burials; evidence of "violent death" -- Ala-13.

Isolated skulls. Six isolated skulls were recovered in the midden of Ala-13, burials 28, 39, 60, 66, and 2 skulls found together and classified as burial 17. At most 3 of these could represent beheadings at death. The latter 2 were found with a historic artifact at shallow depths, and were interpreted as historic re-interments of plow-disturbed burials (R 1967: 66). Burial 28 lacked atlas and axis, which presumably would have been kept intact if head-taking had occurred before disposal of the corpse (R 1967: 68). The other skulls might represent heads taken as trophies, although post-interment disturbance could also account for their isolation from post-cranial material, as Rackerby (1967: 75) specifically suggests for burial 66.

Rackerby (1967: 68, 70) reports that burial 28 showed a possible wound mark, and burial 39 had a small round hole through the occipital. Similar holes occurred in the occipitals of 2 complete burials, 41 and 42 (R 1967: 71). These possible wound scars have not received further study to date; hence their bearing on the incidence of "violent death" at Ala-13 is not known. No similar skull pathology has been reported at Ala-328 (Ryan 1972) or Ala-12 (R 1967).

In addition to the 6 isolated skulls just mentioned, 6 isolated mandibles were considered to represent burials at Ala-13, burials 21, 27, 52, 56, 58, 68. Burial 85 was an isolated human parietal bone. Among all of the isolated skulls and mandibles recovered, burial 85 was the only one at submound depths; it was recovered in a disturbed context, after the creation of Trench 12 by bulldozing.

Headless torsos. Burials 14, 24, 29, 31, 40, 47, 48, 61, 65, and 69 lacked skulls. It appears that none of the individuals involved were victims of beheading at death. All were found in contexts which showed disturbance due to rodents, power equipment, intrusion by or into other burials, or unknown causes. The mandible of burial 69 was present; it presumably would have been removed if beheading had occurred at death. Burials 24, 29, 31, 47, 61, 65, and 69 were all missing post-cranial bones as well as the skull. The burial records for 14 and 40 do not state whether post-cranial bones are absent, but the disturbed context of both is specified.

"Violent deaths". Burials 18, 33, and 34 probably died of projectile wounds (R 1967: 4). An obsidian blade lay between the manubrium and cervical vertebrae of burial 18. A blade fragment was found between the second and third lumbar vertebrae of burial 33. An obsidian blade was embedded in a thoracic vertebra of burial 34. None of the apparently wounded individuals was accompanied by artifacts. Two obsidian blades found in the thoracic region of burial 94 between the left humerus and radius and ulna were not taken as evidence of the wounding of that individual (R 1967: 4, 5, 81). No bones had been penetrated, and the position of the blades could have resulted from placement as grave goods; other artifacts were present in the grave as well.

All 3 presumed wound victims were adults. It is interesting that 2 of the 3 were interred together in a dual grave; burial 94 was also part of an apparent double burial.

Conclusion. Three deaths from projectile wounds, 3 isolated skulls possibly interpretable as remains of beheadings, and 4 indications of skull wounds comprise the evidence for violent death at Ala-13. The individuals involved in each case were adults. A study of the paleopathology of the burial sample, which might add to this evidence, has not yet been made. The evidence seems insufficient to warrant Rackerby's inference of "a pattern of headtaking and violent death" (1967: 31).

Partial burials; evidence of "violent death" -- Ala-12.

Isolated skulls; headless torsos. No isolated skulls were recovered at Ala-12. Burial 1 is the single instance of an isolated mandible recorded as a burial at the site. Burials 7 and 8 were the only headless torsos in the sample. Rackerby (1967: 31) alludes to a pattern of headtaking with regard to these burials, but in neither case does the evidence indicate beheading at the time of the burial. The mandible, axis and atlas of burial 7 were present; those parts presumably would have been removed with a trophy head. Many postcranial bones were absent from burial 8, a fact which suggests post-interment disturbance.

"Violent death". An obsidian blade found in the chest cavity of burial 7 had reportedly nicked a vertebra; another, recovered near the ischium of burial 4 left no traces on any bone, but either or both blades might have caused the deaths of the individuals with which they were found. An obsidian blade was found with burial 6, but Rackerby does not mention it as a cause of death; details on placement of the point in the grave are lacking. It is curious that both possible victims of violent death were interred in dual graves.

Conclusion. Two individuals of the 13 excavated at Ala-12 may have died as a result of projectile wounds. It appears unlikely that any of the dead at Ala-12 were beheaded at death. It would be inappropriate to infer a pattern of violent death from such a small sample, and certainly no pattern of headtaking can be postulated on the basis of Ala-12 data. Evidence from this site, like that from Ala-13 and Ala-328 discussed above, does not support Rackerby's perception of such patterns for south San Francisco Bay shellmounds.

Grave associations -- Ala-328.

Grave associations were found with about one third of the burials at Ala-328. There were definite artifactual associations with 158 of the burials exposed; artifacts were reported to be in possible association with 4 more burials; in 7 other cases documentation for associations is incomplete, missing from either the burial record or catalog. Hence 31% to 33% of the burials recovered were accompanied by artifacts, depending upon whether the inadequately documented cases are accepted or not; the figure rises to 36% if 16 burials accompanied solely by ocher are included. In addition, 7 burials lacking associated artifacts were accompanied by non-artifactual associations such as unmodified stone or animal bone which appeared to have been placed deliberately in the grave; in another 8 cases documentation for such associations is incomplete. According to these data, non-artifactual accompaniments of burials lacking other grave goods were found with 3% of the total sample at most, but there is reason to suspect that many occurrences of this sort were never recorded.

The absence of grave goods or other associations is documented for 314 burials, 61% of the total of 517 excavated. The ratio of graves with accompaniments to graves without is about one to two (31% to 61%). At most the ratio is two to three (39% to 61%) if ocher and non-artifactual associations are weighted equally with artifactual goods, and all inadequately documented and possible associations are accepted.

Grave associations appear to be distributed uniformly with regard to individuals of different ages and sexes. Some vertical and horizontal clustering of burials with associated artifacts is observable; this clustering is the subject of a subsequent section devoted to groupings of burials within the mound.

Most frequent grave associations at Ala-328 were pigment, shell beads, shell ornaments, bone tubes, antler wedges, bone whistles, and serrate bone artifacts. Table 3-1 shows the number of burials with which particular artifact types were associated, listing all artifact types found as grave goods in order of their frequency of occurrence in graves at the site.

Grave associations -- Ala-13.

There were definite artifactual associations with 44 of the burials exposed at Ala-13. Six other burials were accompanied by ocher. Forty nine burials definitely lacked accompaniments. There were no reports of artifacts in association with 9 burials exposed by earthmoving equipment. Disregarding the latter 9 burials, about half of the graves at Ala-13 contained artifactual accompaniments.

Shell beads were the most frequent grave association at Ala-13 followed by shell ornaments, pigment, obsidian blades, stone mortars, and bone whistles. Table 3-2 shows the number of burials with which particular artifact types were associated, listing all artifact types found as grave goods in order of their frequency of occurrence in graves at the site.

Grave associations -- Ala-12.

There were definite artifactual associations with 8 of the burials exposed at Ala-12. A ninth burial was accompanied by ocher and by unmodified stone and bone which may have been deliberate inclusions in the grave. Three burials lacked grave goods. Burial 13 was vandalized before conclusions could be drawn regarding the presence or absence of grave goods. About two thirds of the graves at Ala-12 contained artifactual accompaniments.

Pigment was the most frequent burial association at Ala-12, followed by obsidian blades, chipping hammers, mortars, shell beads, and pointed bone artifacts with angular tips. Table 3-3 shows the number of burials with which particular artifact types were associated, listing all artifact types found as grave goods in order of their frequency of occurrence in graves at the site.

Burial clusters -- introduction.

Burial distribution data were examined for evidence of cemeteries or burial clusters. One purpose was simply to determine an attribute of mortuary behavior, specifically, whether or not disposal of the dead was confined to particular areas during any periof of occupation of the sites.

A second motive for the effort to define burial clusters stems from their utility in establishing temporal control in analysis of artifacts. Particularly because of the absence of stratigraphic control and the lack of precision in vertical and horizontal provenience data due to circumstances of excavation and recording discussed in Chapter 2, any isolable unit which permits the establishment of contemporaneity of occurrence of certain artifact forms is useful in interpreting the archaeology of these sites. One admitted weakness of this approach to interpretation, pioneered in California by Lillard, Heizer and Fenenga (1939), is precisely its focus on grave goods, since items buried with the dead cannot be presumed to represent the full complement of artifacts in use among the living. Hence gravelot analysis does not give full information about the span of activities of the living. However, it is useful in gaining temporal control by permitting the isolation of contemporary units which can then be compared with one another to determine formal changes over time.

Another reason for the attempt to isolate burial clusters was to permit the study of mortuary behavior itself in an effort to extract social structural information from dimensions of mortuary patterning. Such a goal requires that comparisons be made among contemporary or near-contemporary burials, so that variation among the burials can be safely attributed to factors other than temporal changes in burial customs.

Success in isolation of burial clusters at the 3 sites was limited. Ala-328 offered the best opportunity because a broad, continuous expanse had been excavated, and here a definite basal cemetery, a possible shallow cemetery, and a cluster of possibly contemporaneous burials associated with a housefloor were isolated. Discreet burial clusters were not isolable at Ala-13 and Ala-12 because no broad block of units were excavated at either site. In the absence of data which might have shown horizontal clustering, attributes of submound and shallow burials were compared for each site on the assumption that some degree of contemporaneity could be assumed within those two depth groupings.

The analysis of evident cemeteries and other burial clusters did reveal some formal variation in mortuary attributes over time at the sites, as discussed in descriptions of the burial groupings below for each site. Because the isolable clusters were few in the case of Ala-328 and were very gross units at Ala-13 and Ala-12, the degree of temporal control obtained from the analysis is crude.

The attempt to extract social structural information from the mortuary patterning was abandoned after it became evident that there were not data on sufficient attributes to command a reasonable picture of the degree of variation in treatment of different individuals. Saxe's (1970) study of ethnographic mortuary patterning shows the difficulty of verifying and interpreting correlations between the nature of social distinctions among the living and variations in treatment of the dead unless the full scope of variability is controlled. Some attributes of mortuary behavior (e.g., spoken ritual) are not recorded archaeologically; others (e.g., distinctive clothing) may not be preserved in some environments; still others (e.g., details of placement of the body or of other items within the grave) may be lost if not observed and recorded by excavators. So few attributes of the burials recovered at the Coyote Hills sites were recorded that, even excluding the first two limitations, the degree of potential variability controlled is not great.

Furthermore, the social interpretation of mortuary patterning is still in developmental stages. Although some predictions have been made regarding particular patterns which might correspond to social structures organized around certain principles such as ranking or stratification (e.g., see Binford 1962), these remain to be tested. Saxe's (1970) effort to formulate hypothetical relationships between social structural principles and structural principles underlying mortuary behavior patterns and to test them ethnographically met with limited success; to my knowledge, it is the only such attempt to date.

Several studies have used Binford's proffered hypotheses as if they were valid tested generalizations. On this basis T. King (1970), for example, suggested the existence of ranked societies on the Marin County shores of San Francisco Bay as early as a few centuries BC. Data from the basal cemetery at Ala-328, described below, can be interpreted in the same way (Bickel 1974). However, such interpretations presume that it is already known what kinds of mortuary patterning will characterize particular social structures, when it is precisely this which remains to be established -- probably with ethnographic rather than archaeological data, unless indicators other than mortuary behavior can be agreed upon which will permit social structural classification of prehistoric societies.

The discussions of burial clusters below describe some aspects of formal variability among a limited portion of the total burial sample excavated from the 3 sites. The meaning of the variability remains unclear, partly because of incomplete knowledge of formal variability and, more importantly, because there remain to be determined "regularities in the processes that result in a set of mortuary practices rather than the formal attributes of the practices themselves, each of which is necessarily unique" (Saxe 1970: 1; emphasis his).

Burial clusters -- Ala-328.

Basal cemetery.

An obvious group of burials lies in sterile soil at the base of the mound near its center (see Figure 4-1). In the first site report (D&T 1959) it was considered to be a definite cemetery, and later excavations confirmed this. Fifty individuals lay buried within an area of less than 100 square yards, all in, on, or very near the sterile soil at the base of the mound.

Davis (D&T 1959: 9-10) locates the cemetery in pits A-4 through A-7 near the base of the mound between 94 and 116 inches. I found no record of burials as deep as 94 inches below the surface in pit A-7. The cemetery probably falls between pits A-4 and A-6 in grid I, and there are records documenting what appear to be 19 of the 20 burials to which Davis refers: 41, 42, 50, 54, 55, 57, 80, 92, 100, 106, 107, 108, 109, 119, 120, 121, 124, 126, 132.

At least 13 of these interments were made into submound yellow clay. Records place burials 50 and 100 on, although not in, sterile soil; this implies a matrix of midden material. Burial 119 lay "in submound" in a matrix of "mound mass". No information on stratification or matrix is given for 57 and

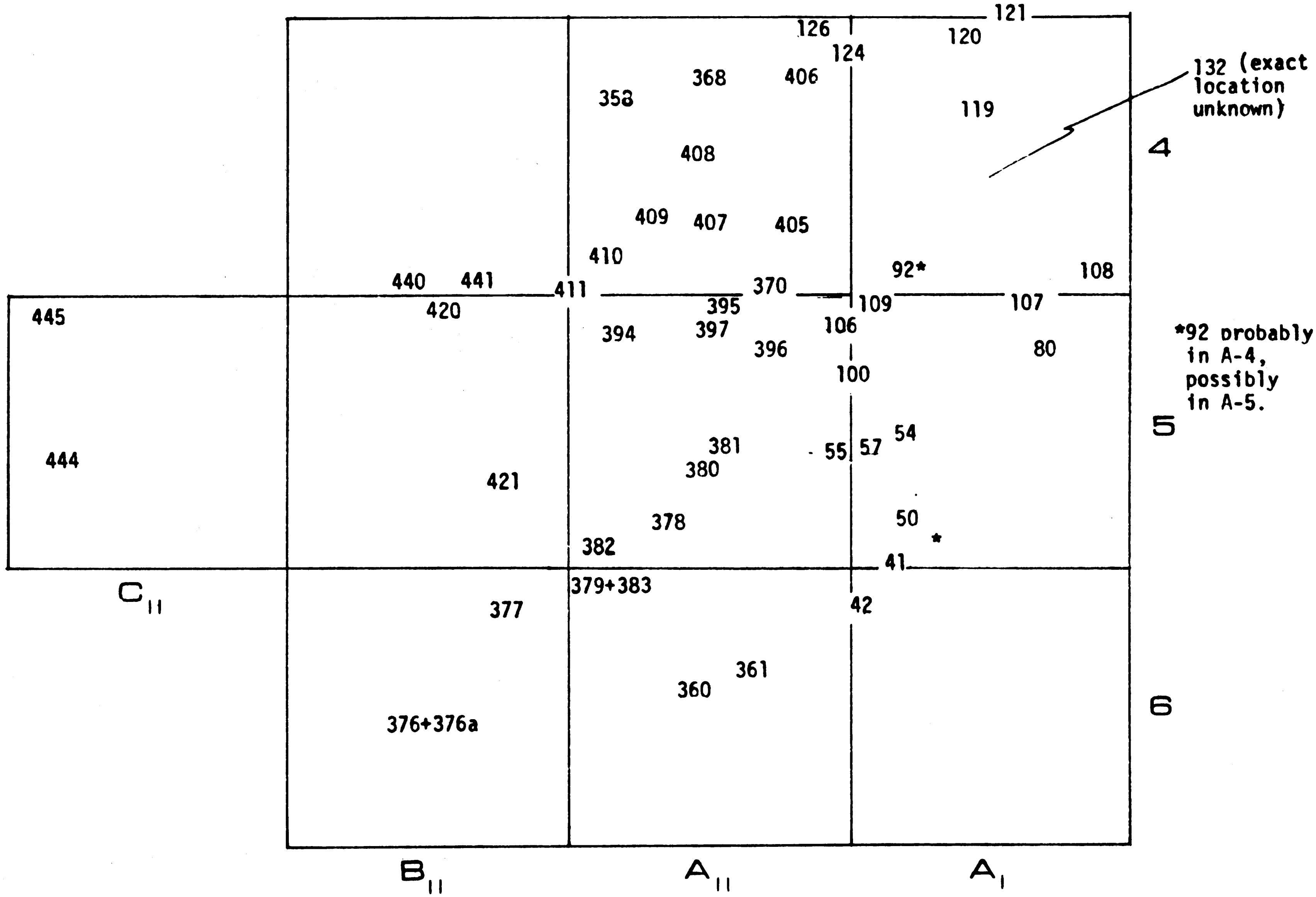

Figure 4-1. Schematic location of burials in basal cemetery. Error in orientation of Grid II pits ignored.

120, but each is as deep as nearby submound burials. Burial 124, in mound mass matrix, is as deep as nearby 121 in sterile matrix.

Excavation carried out subsequent to Davis' report exposed more of the cemetery in grid II, in pits A-4, A-5, A-6, B-4, B-5, B-6, and in the western portion of C-5. Probably 31 burials belong to the cemetery: 358, 360-361, 368, 370, 376-376a, 377, 378, 379-383, 380-381, 382, 394, 395-396-397, 405, 406, 407, 408, 409, 410-411, 420, 421, 440, 441, 444, 445 (hyphens link multiple burials).

Of the 31, 20 were in submound deposit. Burials 360-361 were in a mound mass matrix in the sterile stratum (i. e., submound); 376-376a were in submound in a mixed matrix of submound and mound mass. Burials 368 and 370 were on the base of the mound in a mound mass matrix, with 368 directly over burial 406; 444 lay in a mixture of clay and baked clay from a surrounding feature. Detail is lacking for burial 411, but it was closely associated with 410, which lay within submound. The situation of burials 379-383 is unclear. Burial 358 was recorded to be in compact shell matrix under a shell layer and over an ash layer, yet it was deeper than adjacent 368 which lay on the base of the mound; however, its reported depth is only 1 inch above that of 408 and 409 which were excavated from submound in the same vicinity as 358 during a subsequent season. Burials 379-383 were recorded as mound mass interments, yet lay as deep as nearby submound burials. [1]

Detailed information for individual burials is provided in Appendix I of Bickel (1976). The paragraphs below describe the distinctive features of the 50 burials which appear to fall within the basal cemetery, here considered to be a discrete cultural unit isolable from other material in the site.

Following the description of the attributes of burials in the basal cemetery is a summary of the attributes of other burials in, on, or near the base of the mound which were recovered outside the cemetery area. In the descriptions below, frequent comparisons are made with this sample of 25 non-cemetery basal burials to show the distinctiveness of the cemetery cluster.

As stated above, all cemetery burials lay in, on, or near the base of the mound, with absolute depth ranging from 83 to 120 inches below surface.

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1 Student notes show that the height of northern and southern sidewalls differed by 20" during the excavation of pit A-5. This difference, perhaps caused or added to by surface contour, may have led to some confusion regarding the measured depth of submound in the pit. Submound depth is reported over a range of 30" in different areas of the pit in a manner inconsistent with the contour suggested by the site map.

Mode of disposal. Two burials (100, 106) in the cemetery have been interpreted (D&T 1959: 9) as near-complete cremations interred away from the cremation site; they were the only examples of this cremation type recorded at Ala-328. A third burial (441) was possibly a partial cremation. The other individuals in the cemetery were apparently inhumed with no cremation. The incidence of cremation in the cemetery was about the same (6%) as that for the site as a whole (8%), but much lower than that among other submound burials (36%).

Age and sex distribution. Laboratory determinations of sex are available for 28 of the cemetery burials. The sample includes 11 males and 1 probable male, 11 females and 5 probable females. This suggests a slight preponderance of females in the cemetery, in contrast to the slight preponderance of males in the site as a whole and the predominance of males among submound burials outside the cemetery.

Laboratory determinations of age are available for 38 individuals in the cemetery. The sample includes: 2 infants (0 to 3 years), 1 child (4 to 8), 2 pre-adolescents (9 to 12), 3 adolescents (13 to 17), 13 young adults (21 to 35), 6 middle-aged adults (36 to 55), 2 old-aged adults (56+), and 9 adults of unspecified age. Expressed as percentages of the sample of 38, the figures are: 5% infants, 3% children, 5% pre-adolescents, 8% adolescents, 34% young adults, 16% middle-aged adults, 5% old-aged adults, and 24% adults of unspecified ages. Combining these figures gives a ratio of almost 4 adults to 1 individual below adulthood in the cemetery, which is more than double the 3-to-2 ratio which holds for the site as a whole and for other submound burials. Hence some preference for burial of adults in the cemetery is suggested.

Placement. Orientation was predominantly northwesterly: 28 NW, 10 W, 2 SW, 1 S, 3 E, 6 not determined. The figures expressed as percentages of the 44 burials for which orientation is known are: 63% NW, 23% W, 5% SW, 2% S, 7% E. Only 17% of the entire sample of burials from the site were oriented northwest; 33% of the submound burials outside the cemetery were oriented northwest. There does seem to be unusual preference for northwesterly orientation among cemetery burials.

If the 44 basal cemetery burials of known orientation are removed from the entire site sample of 296 burials with known orientation (to give a sample of 252), figures for burials outside the cemetery are: 8% NW, 25% W, 8% SW, 14% S, 13% E, 20% N, 7% NE, 5% SE. The predominance of northwesterly orientation in the basal cemetery is highlighted in this contrast: 63% versus 8%. As can be seen by comparing these figures with Table 4-2, no other notable contrasts between basal cemetery and other burials are pointed up by this change in sample. Whether basal burials outside the cemetery are included in or removed from the comparative sample makes no significant difference. If one wished to infer a temporal change in the orientation of the dead, it would be from preference for northwesterly orientation during the early occupation of the site to evident lack of preference later. It should be noted that throughout the site history, about one quarter of all burials were oriented to the west; westerly orientation did not increase or decrease in frequency through time, according to the evidence. The incidence of west-to-east orientation is about the same for the cemetery sample (23%), other sub-mound burials (27%), and the site as a whole (25%).

Most cemetery burials were flexed. There were 26 tight flexures, 10 loose flexures, and 4 flexures of unspecified degree. One extended burial came from the cemetery. Posture was not determined for 9 cemetery burials. An unusual preference for tight flexure is apparent; 63% of the burials of known posture were tightly flexed. Among other submound burials, the figure is 26%; within the entire burial sample, 36% were tight flextures. In both of the latter samples, loosely flexed burials outnumbered tight flexures slightly.

There were 6 ventral burials, 3 dorsal, 17 on the left side and 14 on the right among the cemetery burials. The position of the extended burial and 9 others was not determined. There are relatively more burials on the left side (43%) and face (15%) among the cemetery burials than is the case for the site as a whole (33% and 11% respectively), but the difference is not striking. There is no notable difference in the pattern of positioning between the cemetery burials and other submound burials outside the cemetery.

<u>Grave goods</u>. Almost two thirds of the cemetery burials (32) were definitely accompanied by artifactual grave goods. Ocher was found with 20 of these burials. Three additional burials had ocher as the sole grave association.[1] For computation purposes, grave goods associated with dual burials 376-376a and 279-383 are attributed to 376 and 379 alone (existence of 376a and 383 was recognized only in laboratory counts of bones).

Among the entire sample, about one third of the burials were recovered with grave goods. Among submound burials outside the cemetery, one fifth to one fourth of the sample were recovered with grave goods. Hence the high incidence of artifactual associations with graves in the cemetery is an unusual feature.

1 This is a minimal figure for occurrence of ocher; evidence for several occurrences was lacking in burial records, but present in Davis' tabled burial data; there were no such tables compiled for burials not treated by Davis, and so no way to check for occurrences of ocher which were not mentioned on burial records for the burials exposed after 1953.

Olivella spire-lopped beads were the most common grave good (25 occurrences), found with half of the burials in the cemetery. Among the 19 lots examined (6 are missing from the collection), 10 are of the small subtype (A1a) and 9 are medium-sized (A1b). The 10 A1a lots include all beads of that size recovered at the site. Beads of large size (A1c) occurred only once in the cemetery, in a mixed lot dominated by small beads (A1a). Only 1 other lot of mixed sizes, A1a and A1b, occurred in the cemetery. Olivella spire-lopped beads accompanied every cemetery burial with which Haliotis ornaments or beads were found. Three quarters of all occurrences of Olivella spire-lopped beads at the site were located in the cemetery. None of the submound burials outside the cemetery was accompanied by spire-lopped beads.

Pigment was second in frequency as a grave association (23 occurrences). It accompanied 46% of all cemetery burials, compared to about 11% of the entire burial sample and 8% of other submound burials. Pigment accompanied two thirds of the cemetery burials with other associations. Outside the cemetery, both among other submound burials and in the entire site sample, pigment accompanied about one-third of the burials with other associations.

Third in frequency of occurrence (12 graves) were the most distinctive artifacts associated with burials in the cemetery, Haliotis ornaments of a shield-like form apparently unique to Ala-328. These ornaments were found only in the cemetery area, always as grave associations, always with co-occurrences of Olivella spire-lopped beads.

Haliotis ring ornaments were recovered with 6 cemetery burials. Like the shields, these ornaments were found only in the cemetery area, always as grave associations, and always with co-occurrences of Olivella spire-lopped beads. They are not unique to the site, however.

Bone tubes were associated with 5 burials. In 2 of these cases, tubes with a bead overlay were recovered; round saucer Olivella beads overlaid 1 occurrence of tubes, Haliotis disk beads reportedly overlaid the other (tubes and beads from this occurrence are missing from the collection). Tubes occurred as grave goods in the cemetery with about twice the frequency as in the entire burial sample; there were no tubes associated with other submound burials outside the cemetery.

Various unmodified animal bones were apparent associations with 5 of the cemetery burials. Due to lack of documentation of associations of this sort, which rarely were catalogued and placed in the collection, it is impossible to assess the overall frequency of such associations for the site as a whole, or for other submound burials.

Non-cemetery basal burials. Twenty five burials were recovered in, on or near the base of the site but outside the area of the cemetery. These include:

29, 46, 125, 138, 183, 247, 249, 252, 253, 254, 258, 261, 263, 314, 317, 324, 328, 331, 334, 372, 392, 67-4, 68-F1, 68-1B, 68-2. According to burial records, 8 individuals were interred in submound clay: 46, 125, 247, 249, 261, 331, 392, 68-F1; 372 was in midden matrix in a pit intrusive to submound; 68-1B and 67-4 were at the base in a matrix of mixed midden and sterile; 183, 258, 334, 68-2 were in midden matrix lying on the sterile base. Burials 314, 317, 324, and 328, in the same pit and just inches above 334, were probably close to base though in midden matrix. The same may be true for 252, 253, 254, and 263, reported at the same depth as nearby 258, which lay on the base of the mound. The non-cemetery basal burials ranged in depth from 52 inches to 120 inches below surface.

Attributes of non-cemetery basal burials are summarized here. Detailed information for individual burials is provided in Appendix 1 of Bickel (1976). Although the non-cemetery basal burials are not presumed to represent a cultural unit [1], they provide a useful sample against which the basal cemetery burials can be compared.

Mode of disposal. At least 16 of the burials were inhumations with no cremation. The other 9 burials include 2 reported as cremations (68-F1, 68-1B), and 7 considered to be possible cremations (67-4, 125, 183, 247, 249, 252, 253). Burial 68-F1 probably represents near-complete cremation *in situ*; the other cases are partial cremations *in situ*. Incidence of cremation among non-cemetery submound burials is unusually high (36%) compared to that in the site as a whole (8%), in the basal cemetery (6%), or among all submound burials (16%).

Age and sex distribution. Laboratory determinations of sex are available for 11 individuals: 7 males and 4 females. Age was determined for 17 individuals: 3 infants (0 to 3 years), 1 pre-adolescent (9 to 12), 2 adolsecents (13 to 17), 1 subadult (18 to 20), 4 young adults (21 to 35), 4 middle-aged adults (36 to 55), and 2 adults of unspecified age.

Placement. Orientation was variable: 5 NW, 4 W, 3 N, 2 S, 1 E, 10 not determined. Flexure was the only reported posture: 6 loose, 5 tight, 8 degree unspecified; posture was not determined for 6 burials. There was slight preference for lateral position: 6 left, 4 right, 4 ventral, 2 dorsal, 9 undetermined.

[1] It should be noted that 11 of the 25 burials were recovered from adjacent pits E-7, E-8 and F-8 in grid II (252, 253, 254, 258, 263, 314, 317, 324, 328, 331, 334). The density of burials at submound in these pits is equivalent to that in the basal cemetery. It is possible that this clustering represents a cemetery, perhaps contemporary with the other, but containing fewer and different artifactual accompaniments.

Grave goods. Artifactual grave goods were definite associations with 5 graves. One of these was also accompanied by ocher. A sixth burial was accompanied solely by ocher. The artifactual accompaniments consisted of antler wedges, mortar wall fragments, and a perforated biconical schist charmstone.

Shallow cremation cemetery.

As mentioned above, 9 cremations were recovered at shallow depths (8 to 36 inches below surface) within an area small enough to suggest a localized cemetery. These were burials 38, 40, 47, 49, 65, 102, 129, 130, 131. Figure 4-2 shows their locations. Davis (D&T 1959: 10) located the cemetery "in pits 5 and 6 in trenches B, C, D, E." However, burial records place the cemetery cremations in pits 5, 6 and 7 in trenches C, D, and E of grid I. There were no reported or possible cremations in trench B of grid I. Four shallow cremations were recovered outside of the apparent cemetery area; 156 and 272, both reported as cremations, and 164 and 165, considered here to be possible cremations on the basis of Brooks' observations.

Like all but 3 cremations recovered from the site, the cemetery cremations were partial cremations in situ. Burials 38 and 102 were possible cremations, not reported as such by Davis (D&T 1959: 12, 13), but so designated here on the basis of Brooks' comments on the charred condition of the skeletal remains. Burial 103, at 36 inches depth, was recovered 12 inches deeper than any of the other cemetery cremations.

Age and sex distribution. Skeletal remains of 8 of the cemetery cremations were examined by physical anthropologists. They included 6 adults, 1 child, and 1 individual for which age was not determined, a higher proportion of adults than that found in the cremation sample as a whole. Sex was determined for 5 individuals, all male; this accords with the predominance of males among all cremations.

Placement. Orientation was recorded for only 3 of the cemetery cremations, 1 oriented to the northwest, and 2 to the south. Two ventral flexures, a flexure on the right side and a burial of unspecified posture on the left side were recorded.

Grave goods. All of the cremations in the cemetery had some artifactual accompaniment. This was true for only about half of the cremation sample as a whole, so the cemetery is exceptional in this regard. Pigment and shell beads were most frequent associations, each found with 6 cemetery cremations, co-occurring in 5 instances. Five of the bead lots included *Olivella* full lipped

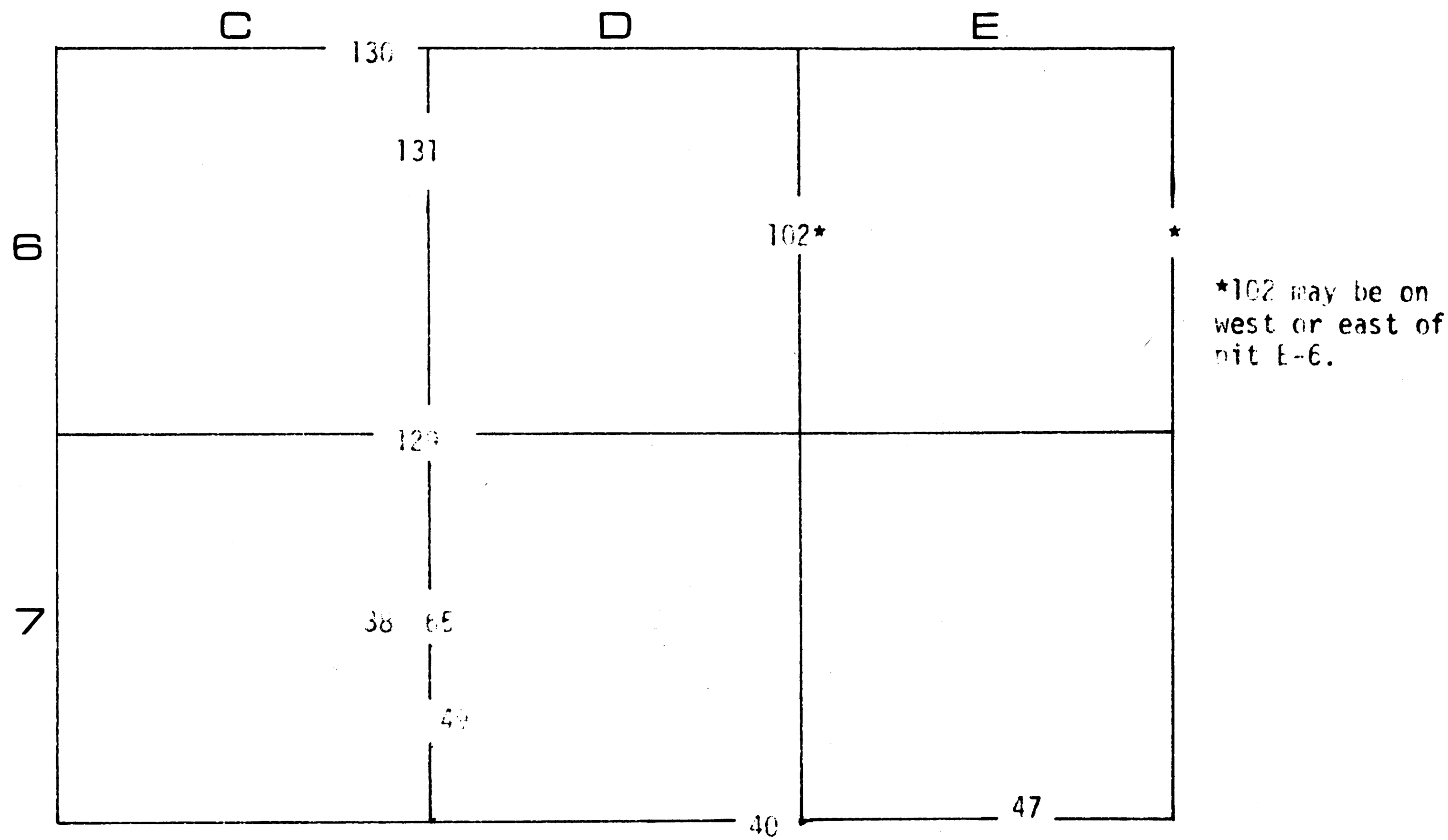

Figure 4-2. Schematic location of cremations in shallow cemetery area.

beads, co-occurring in one case with clam disk beads. These bead types are commonly attributed to Phase 2 of Late Horizon when recovered in sites in the interior Valley. Both types of beads were recovered at least once outside the cemetery area with an inhumed burial, but all occurrences were at shallow depths (see Table 3-6), quite likely from a single component of the site. Charred cordage was recovered with 4 cemetery cremations, co-occurring with pigment and shell beads. Pestles, including both whole flanged pestles from the site, accompanied 3 cemetery cremations. Bone whistles were found with 2 others. Pigment and beads co-occurred with the whistles and with 2 of the 3 pestle associations.

Other burials. Within the presumed cremation cemetery area were 13 inhumations recovered at depths of 36 inches or less (37, 48, 67, 91, 93, 95, 98, 99, 101, 105, 110, 134, 138); 4 of these (48, 49, 93, 95) were at 24 inches or less. One female adult, an adult of unknown sex, a probable female 13 to 14 years old, a 12 year old of unknown sex, and 2 infants were identified. This suggests a higher proportion of young individuals and females compared with the cemetery cremations, but more than half of the inhumed individuals lack age and sex determinations. Among a total of 7 flexures observed, position was recorded for 2, both on the left side. Orientation was variable, recorded for only 5 individuals. Eight of the 13 lacked grave goods. One was accompanied by ocher alone. Burial 138 was found with cut Olivella beads suggestive of a transition between saucer and saddle types; this contrasts with the full lipped Olivella and clam disk beads found with cremations in the cemetery.

Housefloor cluster.

A more tenuous grouping than either the basal cemetery or the shallow cremation group is a cluster of burials reportedly associated with a housefloor. Student notes for 1949 showed a housefloor at average depth of 50 to 55 inches in pits A-1, A-2, A-3, B-1, B-2, and B-3 of grid I (see Figure 4-3). It was reportedly several inches thick, and sloped upward so that the edges were about 12 inches shallower than central portions. A break in the floor in pit A-1 was interpreted as due to earlier excavations by Wedel; records show that much of pit A-1 was excavated to 120 inches depth under his direction in 1935 (see Map 2-3, Table 2-6). Student notes or burial records, or both, show 8 burials to be associated with the floor, burials 7, 8, 14, 128, 142, field #18 (probably burial 64), field #17 (found in B-2 at 56 inches depth), and an unnumbered burial on the B-1/B-2 line. [1]

[1] Student notes occasionally identify burials by numbers which differ from those used in burial records. It has been possible to match record and field numbers in most cases, as with burial 64 and field #18, but there remain some field burials which cannot be matched with the final burial record numbers.

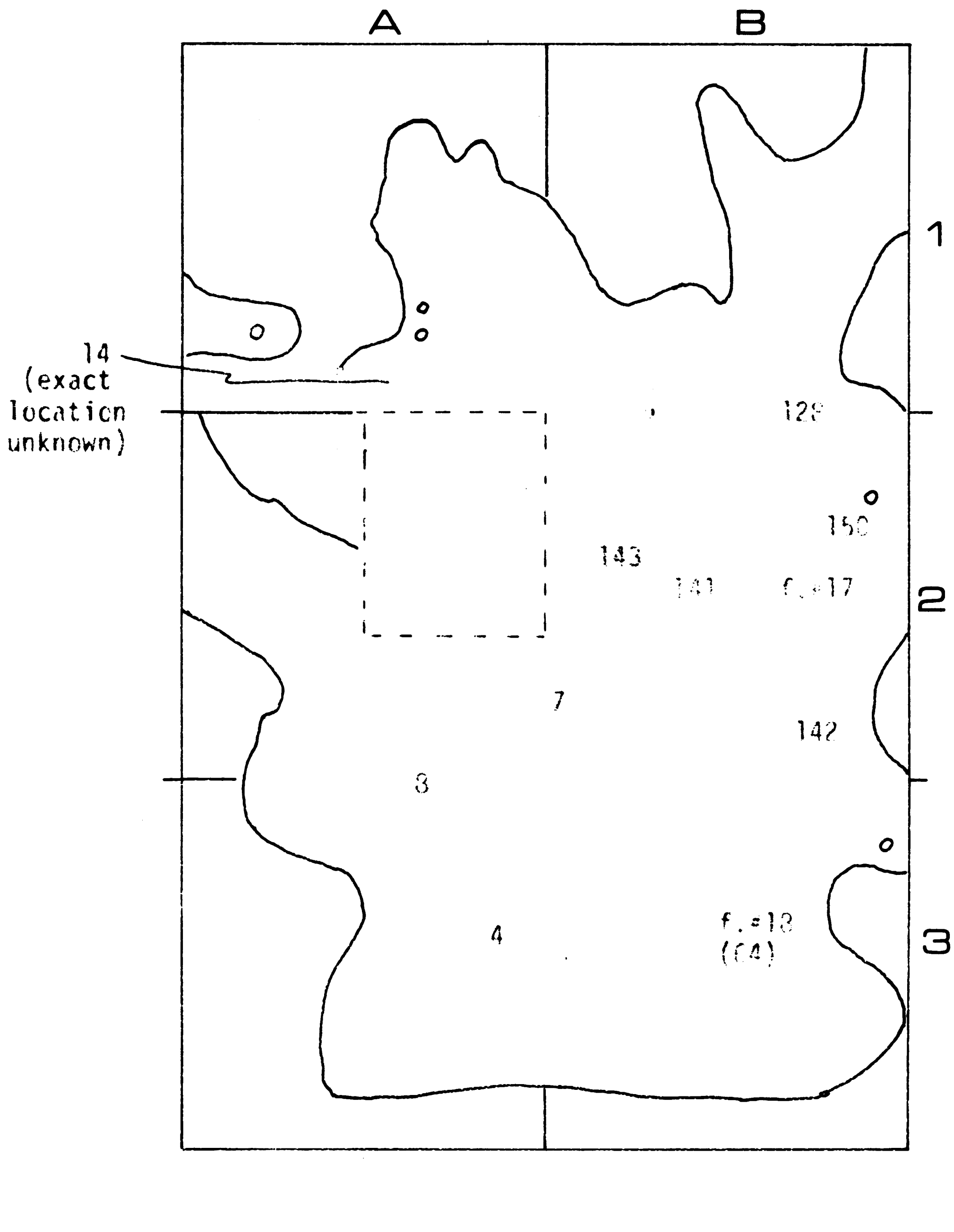

Figure 4-3. Outline of housefloor indicated in 1949 student notes, showing burials probably associated with floor. Dashed line indicates area labeled "former test pit" in notes. Circles indicate post holes.

Their common association with the housefloor is not proof of their contemporaneity, since there is no evidence that all were placed on the housefloor deliberately. If their graves were dug from above, the floor would have been covered, and it perhaps served as a grave bottom for so many burials because its hardness discouraged further digging. [1] A suggestive link does exist between some of the housefloor burials, in the form of associated artifacts. Three of the 8 burials (7, 14, 142) were accompanied by multiple grave goods, including circular Olivella beads in each case. Ocher was reportedly found with field #17, and was also the sole association of burials 8 and 64. Grave goods were not found with burial 128 or the unnumbered burial.

Among 8 other burials (4, 141, 43, 150, 122, 152, 153, field #38 [in pit B-1, 68 inches deep]) located in the same pits and at comparable depth, the first 4 were probably associated with the housefloor group, the latter 4 not; these inferences are based on horizontal locations. Among the probable associates, only burial 4 possessed grave goods, consisting of pigment and circular Olivella beads.

The housefloor cluster burials include 3 female adults, 1 male adult, and an infant; age and sex information is lacking for 3 burials. The 4 possibly associated burials were all individuals below 4 years of age. Placement among the 12 burials appears to be unpatterned; 2 of the 7 possible extended burials recovered from the site, burials 14 and 141, are among these 12.

The depth range among the housefloor cluster and possible associated burials is 32 to 66 or 72 inches. Specifically, 128, 142 and the unnumbered burial in the cluster, and 141 and 143 among possible associated are deeper than the other burials. This may have to do with excavation of different burials during separate field seasons (when "surface" height was altered by addition of backdirt, e.g.), and to the curvature of the floor itself. Notes referring to pits A-1 and C-1 imply the existence of a second, deeper housefloor in the area (burial 63 and animal burial at 66 inches depth in A-1 is said to be on "2nd housefloor") and perhaps these deeper burials were associated with it. However, the circular Olivella beads with burial 142 link the deeper burials with the rest of the group.

As Table 3-6 shows, circular Olivella beads of similar form occurred in 6 lots elsewhere in the site from depth of 40 to 70 inches below surface. Unfortunately, none of the graves with which they were found, nor any other burials at these middle depths, pertain to an evident cluster with which the housefloor group may be compared.

1 Two burials in the same area, 20 and field #31 (pit A-3, 36 inches depth), cut through a floor, according to records.

Burial clusters -- Ala-13.

As discussed above, burial clusters were not isolable at Ala-13 because broad blocks of adjacent pits were not excavated. [1] Two arbitrary vertical groupings, burials in submound and shallow burials (36 inches or less below surface) were compared to test for changes in mortuary attributes over time. Forty three burials were recovered from submound pits; their submound provenience is noted in Appendix 2 of Bickel (1976). There were 50 shallow burials (of which 31 were recovered at 24 inches or less below surface). Burial 7, in a submound pit at 36 inches below surface in unit N-17 is included in both these totals. Seven burials were recovered deeper than 36 inches but above submound. Burials 100 through 108, noted during bulldozing operations, are ignored here because the method of exposure prevented detailed observation of placement and possible burial associations.

The submound and shallow burial samples show no difference in horizontal location in the site, in attributes of body placement of burials, nor in frequency of occurrence of grave goods. There are some differences in artifact types found with burials of the 2 groups. Mortars, bone tubes and circular cut shell beads were associations only of burials in submound graves. Whole shell beads and rectangular beads as burial associations were found only in shallow graves, the latter within 13 inches of surface. Pigment was more frequently associated with submound graves than with shallow graves; 6 of 9 occurrences of pigment were with submound burials, 2 with shallow burials above 24 inches, and 1 at intermediate depths.

Burial cluster -- Ala-12.

The 13 burials recovered from Ala-12 comprise too small a sample to permit meaningful intrasite comparisons of mortuary attributes. The sample is about evenly divided between 4 submound burials (1 as shallow as 24 inches below surface), 4 shallow burials, including 1 in submound (all 24 inches or less below surface; no burials were recovered between 24 and 36 inches), and 5 burials in a transitional zone between midden and submound; burial 6, in midden at 44 inches depth, fits none of these categories.

There are no evident contrasts in horizontal location, attributes of body placement, or frequency of occurrence of grave goods among the categories. Three of the 4 occurrences of pigment in graves were in submound graves;

[1] Rackerby (1967: 8) indicates a possible cluster of 6 burials (51, 59, 60, 62, 63, 64) which lay around the edges of a housefloor (feature 6). Because some of the burials cut through the floor, their contemporaneity cannot be assumed. There are no common artifact types among the grave goods which might provide a basis for postulating contemporaneity.

the fourth was with a burial in the transitional zone. Other distributional segregation of artifact types in graves is not apparent, not surprising since no artifact type was found with more than 3 burials.

Features -- Ala-328.

In contrast to the relatively large sample of burials from Ala-328, recorded features are few. This is unfortunate because the broad and deep expanse of the site excavated offered an opportunity for the mapping and study of the relationships among features such as floors, pits and hearths which could have added interpretive depth to the information gained from the consideration of artifacts and burials.

Systematic feature records from the bulk of the area eacavated at Ala-328 are lacking. Field feature records for 1967 and 1968 seasons which were saved, references in the artifact catalog and student notes, and comments by Davis (D&T 1959) permit brief characterization of 8 features. Descriptions and provenience information for each are given in Appendix 4 of Bickel (1976).

Three features were related to burials. Hayward feature 68-1 consisted of 26 "pebbles" reportedly associated with partial cremation 68-1B. Baked clay in the vicinity of burial 444 was recorded as SFSU feature 68-29. A complex of charcoal, baked clay, a human humerus bone, 3 quartz crystals and an artifact of thick pointed spatulate bone made up SFSU feature 68-33, which was interpreted as a partial cremation; probably because the feature was not completely excavated, no burial number was assigned. Hayward burials 66-13 and 68-F1 were both initially recorded as features, but were subsequently incorporated into burial records.

Other features included a "cache" of stone artifacts, SFSU feature 1; and SFSU feature 67-9, a miscellaneous association of unmodified animal bone and stone, burned shell, a mortar fragment and a chipping hammer fragment. SFSU feature 68-35, an ash lens interpreted to be a hearth, was accompanied by a mortar fragment. SFSU feature X, a "fire-pit", contained a chipping hammer.

Feature 68-18 was reportedly a housefloor which covered an entire excavation unit; an anvil hammerstone was recovered from the floor, and 2 small ash lenses were noted. The feature record makes no mention of floor thickness or composition. Apparently the edges of the floor extended beyond the excavation unit. No post holes were noted.

Although there are occasional allusions to housefloors in student notes and burial records, there is descriptive information regarding only 3 floors. Wedel excavated a nearly complete floor, described in his notes (1935), and by

Davis (D&T 1959: 58). Student notes from SFSU excavations provided a sketch and descriptive information for an other floor (see Figure 4-3), and Davis commented briefly on a housefloor shown in cross section in his Diagram 2. All reports refer to floors of packed earth or clay several inches thick sloping upward from enter to edges. Wedel's floor, roughly circular in outline, was the only one complete enough to indicate shape.

Features -- Ala-13.

Features recorded at Ala-13 included 9 ash lenses or hearths, 2 pits, 3 areas of packed floor, an articulated deer pelvis, a cache of bird bone tubes and whistles, and an artifact cluster interpreted as the contents of a perishable container (R 1967: 5-10). Descriptions of each feature are included in Appendix 4 of Bickel (1976).

One complete floor was excavated, feature 6, shown in Rackerby's Figure 2. It consisted of packed clay several inches thick and was similar in size and shape to the floor exposed at Ala-328 by Wedel.

Both pits were intrusive into the submound clay; Rackerby notes that pit outlines in midden were not discernible around burials, and hence there may have been many pits at middle and upper levels in the site which were not detected.

Features -- Ala-12.

Features recorded at Ala-12 included 1 shell lens, 9 ash lenses or hearths, and 20 pits, some filled primarily with midden and some mostly with oyster shell (R 1967: 32-37; Oliphant 1968: 5). Descriptions of each feature are included in Appendix 4 of Bickel (1976).

As at Ala-13, all detected pits extended into sterile. The relatively greater number of pits noted at Ala-12, while possibly due to different activities or cultural practices, may simply be a function of the sand substratum of the site, which contrasts more with midden than the clay at the bases of Ala-13 and -328, and which may have been more easily excavated by the original makers of the pits. Rackerby speculated (1967: 34) that the midden-filled pits were abandoned storage pits, and the shell-filled pits were basins for steaming oysters.

No features interpretable as house floors were recorded at Ala-12, probably due to the relatively small portion of the site excavated, as Rackerby suggested (1967: 32).

Chapter 5. CONCLUSIONS.

Characteristics of Ala-328, Ala-13, and Ala-12.

Tables 5-1, 5-2, and 5-3 show 3 listings of the 15 most important artifact types at Ala-328, -13 and -12 according to different criteria: incidence as grave goods, numbers of specimens recovered, and numbers of occurrences. By comparing lists within each table and among the 3, a fuller picture of the archaeological assemblage is gained than evaluation by a single criterion permits.

Shell artifacts dominate the assemblages less from this perspective. It highlights the importance of tool types previously recognized as characteristic of the Bay area, such as serrate bone and antler wedges (Gifford 1940: 172, 183; Gerow with Force 1968: 85, 87, 90), and chipping hammers (Beardsley's "elongate hammerstone" /1954: 80 ff./). Pointed bone artifacts with varying tip forms also figure importantly, as do blunt pointed antler tools. Mortars and pestles are well represented, in spite of the fact that the small absolute numbers of whole grinding tools suggest off-site food processing, as discussed in Chapter 3. Notable is the absence of items which can be interpreted as primary extractive tools (e.g., projectile points, fishspear prongs, or netsinkers) except for mortars, pestles, and possibly serrate bone, all linked to plant procurement and processing.

Not surprisingly, the types which are important according to multiple criteria at all 3 sites show no restricted distribution within any of them, although some figure differently in the burial complex at different times, such as mortars and pestles at Ala-328. These are types characteristic of the entire occupation span reflected in the archaeological sample from the 3 sites.

General traits of the mortuary complex shared among the sites include predominance of inhumation as mode of disposal, and flexure as characteristic posture. Burials were placed on the side about twice as frequently as on face or back at Ala-328 and -13. A consistent slight preference for westerly orientation is evident at Ala-328 and Ala-13. Ala-12 does not share the latter 2 traits, but the effect of small sample size may explain the disagreement.

Pigment, shell beads, and mortars were relatively frequent grave associations at all 3 sites. Other correspondences are between pairs rather than all 3 of the sites: shell ornaments, whistles and serrate bone at -328 and -13; obsidian blades and modified obsidian lacking use-wear at -13 and -12; and pestles at -12 and -328.

Table 5-1. Characteristic artifacts, Ala-328.

Present in Most Graves	No. burs w/type	Recovered in Greatest Numbers	Total no. recovered	Most Numerous Occurrences	Total no. occurrences
pigment	53	whole shell beads	4810	serrate bone	221
whole shell beads	34	cut shell beads	2332	pointed bone, nippled tip	211
shell ornaments	27	bone tubes	261	chipping hammers	203
bone tubes	25	serrate bone	223	antler wedges	164
cut shell beads	23	pted. bone, nippled tip	211	bone tubes	133
antler wedges	19	chipping hammers	204	pestles	124
bone whistles	16	antler wedges	171	mortars	122
serrate bone	14	bone whistles	128	bone whistles	114
mortars	14	pestles	127	blunt pted. antler tool	110
quartz crystals	11	mortars	124	pted. bone, dull rnd. tip	70
pestles	9	blunt pted. antler tool	110	pted. bone, angular tip	67
blunt. pted. antler tool	8	shell ornaments	87+	obsidian blades	58
chipping hammers	6	pted. bone, dull rnd. tip	70	sidebladed rib artifacts	57
quartz cobbles	6	pted. bone, angular tip	68	pted. bone, br. smooth tip	52
pted. bone, angular tip	5	sidebladed rib artifacts	60	mod. non-obsid., no use	42
obsidian blades	5			pted. bird bone, hol. tip	42
charmstones	5				
mod. non-obsid., no use	5				
perf. mammal teeth	5				
mod. obsidian, no use	5				

Note: a minimum of fifteen items are included on each list; because of tied categories, some lists are longer.

Table 5-2. Characteristic artifacts, Ala-13.

Present in Most Graves	No. burs. w/type	Recovered in Greatest Numbers	Total no. recovered	Most Numerous Occurrences	Total no. occurrences
cut shell beads	12	cut shell beads	1228	serrate bone	28
shell ornaments	9	whole shell beads	299	mod. obsid., no use	26
pigment	8-9	shell ornaments	78	antler wedges	25
whole shell beads	7	sting ray spines	38	shell ornaments	23
obsidian blades	5	serrate bone	30	charmstones	22
mortars	5	mod. obsid., no use	30	whole shell beads	17
bone whistles	4	antler wedges	25	chipping hammers	16
non-obsid., no use	4	charmstones	22	pted. bone, angular tip	14
serrate bone	3	chipping hammers	16	cut shell beads	13
whole <u>Haliotis</u>	2	bone whistles	14	blunt pted. antler tools	12
pted. bone, flat tip	2	pted. bone, angular tip	14	pted. bone, dull rnd. tip	12
chipping hammers	1	bone tubes	13	obsidian blades	10
pted. bone, angular tip	1	blunt pted. antler tool	12	mortars	9
bone tubes	1	pted. bird bone, hol. tip	12	pted. deer splint	9
pted. deer splint	1	pted. bone, dull rnd. tip	12	bone whistles	9
non-obsid. flake scraper	1				
non-obsid. blades	1				
antler "peg"	1				
serrate shell	1				
shell pendant (?)	1				

Note: a minimum of fifteen items are included on each list; because of tied categories, some lists are longer.

Table 5-3. Characteristic artifacts, Ala-12.

Present in Most Graves	No. burs. w/type	Recovered in Greatest Numbers	Total no. recovered	Most Numerous Occurrences	Total no. occurrences
pigment	4	pted. bone, nippled tip	36	pted. bone, nippled tip	36
obsidian blades	3	mortars	27	chipping hammers	22
chipping hammers	3	pestles	26	mortars	20
mortars	2	unperf. mammal teeth	23	pestles	20
pted. bone, angular tip	2	chipping hammers	22	antler wedges	14
unperf. mammal teeth	1	whole shell beads	15+	pted. bone, dull rnd. tip	11
pestles	1	antler wedges	14	non-obsid. flake scraper	9
cut beads	1	pted. bone, dull rnd. tip	11	serrate bone	9
mod. obsid., no use	1	quartz cobbles	10	mod. obsid., no use	9
blunt pted. antler tool	1	serrate bone	10	quartz cobbles	8
pted. thick spat. bone	1	non-obsid. flake scraper	9	obsidian blades	8
bone whistle	1	mod. obsid., no use	9	blunt pted. antler tool	7
cut *Haliotis* ornament (?)	1	obsidian blades	8	pted. bone, angular tip	5
cut shell bead	1	blunt pted. antler tool	7	pted. bone, flat tip	5
antler rack artifact	1	pted. bone, angular tip	5	pted. bone, br. smooth tip	4
bipointed bone	1	pted. bone, flat tip	5		
bone bead	1				
quartz crystal	1				

Note: a minimum of fifteen items are included on each list; because of tied categories, some lists are longer.

Temporal relationships among Ala-328, Ala-13, and Ala-12.

There are some differences in mortuary complexes and artifactual assemblages among the 3 sites. These may be due to varying sample size, some to differential usage of the sites, and some to temporal differences. Evaluation and control of the first 2 factors is not possible with the data at hand, but some assessment of temporal differences can be made. Indications of relative age among the sites provided by differences in occurrence of particular artifact types were mentioned in various sections of Chapter 3, and may be drawn together here.

As reported in Chapter 2, there are radiocarbon determinations of age of the basal levels of Ala-328 and Ala-13 which suggest that initial occupation was earlier at the former site by several hundred years. The suggestion is supported by several trends evident at Ala-328 which are reflected at Ala-13 in such a way to indicate the relatively lesser age of the latter. There are also some indications that Ala-12 was occupied earlier than Ala-13; it may have been occupied contemporaneously with Ala-328 during much of the span of occupation there, although the range of overlap is difficult to assess because of the relatively small artifact sample.

At Ala-328, whole shell beads predominate over cut shell beads, and a trend from early popularity of whole shell beads toward later popularity of cut shell beads is indicated. At Ala-13, cut shell beads predominate over whole shell beads, and all beads recovered in submound graves are cut shell beads, of a circular form similar to beads recovered well above submound at Ala-328. The 2 lots of beads from Ala-12 include 1 lot of type A1a Olivella whole shell beads, a type found only in submound graves at Ala-328, and a single rectangular Haliotis bead with 2 perforations [1], unmatched by other specimens at the other 2 sites.

Obsidian from eastern sources is represented primarily by specimens from relatively great depths at Ala-328; obsidian from northwestern sources occurred at all depths but predominates among specimens from middle and upper levels. One quarter of the forty sourced specimens from Ala-328 came from eastern sources. At Ala-13, all but 3 of the 20 sourced specimens came from northwestern sources. At Ala-12, 4 of the 10 sourced specimens came from eastern obsidian flows.

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1 Rectangular Haliotis beads are generally characteristic of the early period in other central California contexts (B&F 1967: 31), and single-perforated rectangular Haliotis beads were recovered at early Bay area site SMa-77 and from the deep component of Ala-307. Temporal attribution based on 1 specimen would be improper, however.

At Ala-328, mortars occurred as grave goods at middle depths in the site. All mortars recovered in mortuary context at Ala-13 came from submound gravepits. The single burial accompanied by mortars at Ala-12 was not in a submound grave.

Charmstones from Ala-328 are about evenly divided between perforated and unperforated forms, and between schist and sandstone materials; within the site the trend over time is from perforated forms of schist, often found as grave goods, to unperforated forms of sandstone, rarely found as grave goods. In the Ala-13 collection, unperforated forms of sandstone predominate; none were burial associations. The single charmstone from Ala-12 is a perforated form of schist, found unassociated near mound base.

At Ala-328, artifacts of pointed bone with nippled tip were numerous, exceeded in absolute numbers only by tubes and serrate bone among bone artifact types; the majority of specimens were recovered from relatively great depths in the site. Only 4 artifacts of pointed bone with nippled tip were recovered at Ala-13, placing it ninth among bone artifact types in absolute numbers and numbers of occurrences. Artifacts of pointed bone with nippled tip were the most numerous and most frequently occurring of all artifact types at Ala-12, and were found at all depths.

The above evidence suggests that Ala-12 was inhabited during much of the early occupation of Ala-328, in spite of the absence from Ala-12 of shell ornament forms unique to the basal cemetery at Ala-328. It is interesting to note that Ala-12 shares some features with early site SMa-77 which are not shared by Ala-328. These are absence of bird bone whistles but presence of whistles of mammal bone (2 at Ala-12, 1 at SMa-77), and relative paucity of bird bone tubes (1 at Ala-12, none at SMa-77). A few mammal bone whistles were recovered at Ala-328 and 1 at Ala-13, but bird bone predominates in both cases. Although the mammal bone whistles at Ala-328 showed no restricted distribution, the few mammal bone tubes from the site were recovered within 2 feet of submound.

Regarding Ala-13, the above comparisons suggest that initial occupation of that site began after several feet of midden had accumulated at Ala-328. Some contrasts in artifact forms pertaining to later occupation of both sites should also be mentioned. As noted in Chapter 2, Beardsley found no artifact types at Ala-328 which cross-dated to Valley components placed in Phase I of the Late Horizon. Subsequent excavations by SFSU also produced none. At Ala-13, the presence of a few rectangular beads might reflect occupation of the site during or soon after the period when that form was popular in Valley sites, i. e., Phase 1 Late. Split punched beads, characteristic of a transitional period between Middle Horizon and Phase 1 Late when recovered in Valley sites, are also present at Ala-12 and absent at Ala-328. On the other hand, several lots of clam disk beads and Olivella lipped beads, types considered diagnostic of Phase 2 of Late Horizon when recovered in Valley contexts, were recovered at Ala-328; but none came from Ala-13. The implication is that final occupation of Ala-13 ceased before Ala-328 was last occupied. However, bead lots are relatively few at Bay area sites as compared to Valley sites regardless of time period, and it seems unwise to infer lack of occupation during a particular time period if the only evidence is absence of particular bead types, especially since understanding of the mechanisms by which stylistic changes traveled between Bay and Valley is unclear. It should be noted that nearby site Ala-329 produced rectangular and lipped beads of Olivella and clam shell disk beads, as well as other artifacts characteristic of Valley Late Horizon components. The analysis of material from that site may clarify the nature of the later periods of occupation in the Coyote Hills area.

Components within Ala-328.

In addition to the general artifactual and mortuary characteristics of the Alameda sites summarized, and the contrasts among them just discussed, attention to the restricted distribution of some attributes of the Ala-328 assemblage permits some tentative and crude phasing of the long occupation span there. Small sample size prohibits similar procedures for Ala-12 and -13.

Davis proposed a division of Ala-328 into 3 cultural components on the basis of material excavated through 1953. His Table 16 (D&T 1959), reproduced here as Figure 5-1, summarizes the traits by which he traced continuity and change through time according to the depth range of occurrence of different attributes. The additional data gained from later excavations require some modifications of his scheme but it is a credit to his analysis that his general divisions hold.

His shallow component, from 0 to 30 inches below surface, was characterized by: steatite pipes, unperforated charmstones, girdled stones, clam disk beads, lipped Olivella beads, knobbed pestles, his "type 1" bird bone whistles, an incised bone tube, and partial cremation in situ (his "type I" cremation) as exclusive traits.

His whistle types do not hold for the enlarged sample of bone whistles which were recovered at all depths of the site. No new specimens of steatite pipes or incised bone were recovered; however, use of those items as phase indicators seems inappropriate, since they account for a total of only 3 artifacts in the assemblage. Partial cremation in situ occurred at all depths in the site. Girdled stones, described here as pecked grooved stones, came from 18 to 56 inches depth, and unperforated charmstones from 0 to 72 or 112

Depth in inches		Steatite pipe	Type II charmstone	Girdled stone	Clam disc bead	Olivella bead type 3a1	Pestle type IIB4	Bird bone whistle type I	Incised bird bone tube	Type I cremation	Type I Haliotis ornament	Olivella bead type 1b	Bone pendant	Awl type A1bI	Olivella bead type 3c
0-30	No. of Specimens	2	6	5	2	8	6	3	1	7	19	2			
	No. of Graves				2	8	2	1	1	7	2	2			
	% of Total Burials				10	40	10	15	5	16	10	10			
31-79	No. of Specimens										1	1	2	2	8
	No. of Graves										1	1			8
	% of Total Burials										3	3			26
80-156	No. of Specimens														
	No. of Graves														
	% of Total Burials														

Depth in inches		Olivella bead type 3b	Olivella bead type 3b1	Mortar type A2b	Bone fishhook MM2b	Perforated canid tooth bead	Haliotis bead type 3	Bird bone whistle type II	"Fiber-stripper"	Sting ray spine	Bird radius pin	Thatching needle	Awl type A1bII	Rib "strigil"	Ulna flaker
0-30	No. of Specimens														
	No. of Graves														
	% of Total Burials														
31-79	No. of Specimens	2	1	3	5	5	1	23	5	2	6	3	8	3	6
	No. of Graves	2	1	1	1	3	1	3				1	2		
	% of Total Burials	6	3	3	3	10	3	10				3	6		
80-156	No. of Specimens						2	22	41	3	3	4	11	9	1
	No. of Graves						2	2		1		1	1	1	
	% of Total Burials						11	11		5		5	5	5	

Depth in inches		Notched fish bone	Mano	Type I charmstone	Type NAa projectile point	Extended burial posture	Type II cremation	Type III Haliotis ornament	Type IV Haliotis ornament	Bipointed bone pin	Olivella bead type 3d	Olivella bead type 1a	Burials with red ocher	Burial orientation N through W	Burials with associated artifacts
0-30	No. of Specimens											3	8	10	20
	No. of Graves											3	8	10	20
	% of Total Burials											15	18	23	45
31-79	No. of Specimens	7	2	1	5	4						1	8	30	31
	No. of Graves	1		1		4						1	8	30	31
	% of Total Burials	3		3		5						3	9	34	35
80-156	No. of Specimens	1	1	12	5	1	2	13	5	4	2	12	17	25	20
	No. of Graves			2	1	1	2	8	3	1	2	12	17	25	20
	% of Total Burials			11	5	5	11	42	16	5	11	63	46	68	54

Table 16. Vertical distribution of selected traits illustrating "culture strata".

Note: The first horizontal line of figures gives the total number of specimens of each type occurring in that level. The second line of figures indicates the number of burials accompanied by the artifact indicated. The third line of figures indicates the percentage of the burials with associated artifacts in each level that possess the trait (excepting burial complex traits, such as orientation, and also the occurrences of red ocher, which are expressions in percentage of all burials in each level).

Figure 5-1. Reproduced from Davis and Treganza (1959).

inches (depending upon whether or not a unique cup shaped specimen with burial 42 is included). However, in both cases, the majority of specimens occurred at depths above 30 inches; hence the enlarged sample increased the depth range, but the shallow distribution noted by Davis is characteristic of both types. Lipped Olivella beads, clam disk beads, and knobbed pestles are restricted to depths above 30 inches (if a flanged pestle end fragment from 64 inches depth is ignored).

Davis showed tabular Haliotis ornaments (his type I) and large whole shell Olivella beads (his type 1b) to be links between his shallow and middle components, since they were recovered above 20 inches as well as below to a depth of 79 inches. Restricted to occurrences between those 2 depths, and hence characteristic of Davis' middle component, were bone pendants, awl type A1bI, mortar type A1b, fishspear prong type MM2b, perforated mammal teeth, and Olivella beads of saucer and ring, saddle, and split drilled types.

The enlarged sample shows an increased range for bone pendants, described here as unpointed perforated bone (24 to 84 inches), MM2b fishspear prongs (14 to 58 inches) and perforated mammal teeth (3 to 74 inches). Awl types used in this study differ from Davis' use of Gifford's types, but A1bI specimens among pointed bone artifacts in the collection were recovered from 17 to 108 inches. The bead types and A1b cobble mortars characteristic of Davis' middle component retain that restricted distribution in the enlarged sample. His treatment of tabular ornaments and large Olivella whole shell beads as link traits is also valid for the larger sample.

Davis found a number of traits linking his middle and deep components (30 inches to submound depths): Haliotis small disk beads, "type II" bird bone whistles, "fiber-strippers", sting ray spines, bird radius pins, thatching needle, awl type A1bII, rib strigils, ulna flakers, notched fish bone, manos, perforated charmstones, bipointed leaf-shaped projectile points, and extended burial posture.

In the enlarged sample, the range of several of these types was ex panded to shallower depths as well: "fiber-strippers" (pointed bone with nippled tip), sting ray spines, bird radius pins (pointed bird bone with hollowbacked tip), thatching needles (pointed bone with flat tip, and some specimens of pointed perforated bone), rib "strigils" (side-bladed rib artifacts), ulna flakers (ulnae grouped with pointed bone with dull rounded tip), notched fishbone (part of group of serrate bone), and perforated charmstones. In the case of pointed bone with nippled tip and perforated charmstones, the great majority of specimens of each type falls within the middle and deep range indicated by Davis. As mentioned above, flutes show no restricted distribution within the site according to attributes coded in Davis' typology. Davis' "mano" category was not recognized in the present analysis, and it is not known what specimens he so designated. As already noted, his segregation of awls by Gifford type was not followed here, but a single A1bII specimen among pointed bone artifacts was recovered from 0 to 18 inches thus increasing the range of that type. Davis' link traits of Haliotis small disk beads, bipointed leaf-shaped projectile points and extended burial posture are validated in the larger sample, where all examples were confined to depths below 30 inches.

Specific to the deep component (80 inches to submound depths) in Davis' sample were: near-complete cremations inhumed away from site of burning (his "type II cremation"), Haliotis shield and ring ornament forms (his types III and IV), Olivella round saucer beads and bipointed bone pins.

Data from the later excavations confirm the restricted distribution of the first 3 items, all of which came only from basal graves. The range of bipointed bone was increased by a single find of 1 lot at 18 inches depth. However, it contains only specimens of shorter length and smaller diameter than those recorded by Davis, and may reflect a temporal change in size noted elsewhere in central California (see discussion of bipointed bone in Chapter 3). In any case, the attributes of bipointed bone and near-complete cremation isolated by Davis each consisted of only 2 occurrences in his sample, and only 3 in the enlarged sample, and hence are of little value in isolating a component, although they may be used as supportive evidence.

Davis showed 4 attributes which link all 3 components, although they varied in frequency of occurrence among the 3: small Olivella whole shell beads (his type 1a), burials with associated pigment, burial orientation north through west, and burials with associated artifacts.

The enlarged sample generally confirms the trends noted for pigment and associated artifacts. It shows a much greater concentration of northwesterly and westerly orientation at basal depths than did Davis' sample (86% vs. 68%). The classification of bead occurrences by lots in this paper restricts small Olivella whole shell beads (type A1a here) to submound depths, contrary to Davis, although the existence of some specimens of small size at middle and shallow depths is acknowledged (see Table 3-4); Davis' figures do show the relative concentration at basal depths.

From Davis original scheme, the enlarged sample leaves the following traits restricted as shown on his Table 16 (Figure 5-1 here):

0 to 30 inches: lipped Olivella beads, clam disk beads, knobbed pestles, steatite pipes, incised bone.
31 to 79 inches: mortar type A2b: Olivella saucer, ring, saddle, and split drilled bead types
80 inches to submound: Haliotis shield ornaments, Haliotis ring

ornaments, Olivella round saucer beads, near-complete cremation.

Most of the traits which support Davis' divisions are items which figure importantly in the mortuary complex, but not in overall numbers of occurrences at the site. The enlarged sample shows some other restricted artifact distributions which may be used to broaden the content of components, although to do so necessarily requires less rigid depth boundaries between them.

Table 5-4 shows the content of the proposed expanded components. Groups I, II, and III are bounded by strict depth lines, and are equivalent to Davis' components; "middle-shallow" and "middle-deep" groups IIa and IIb supplement "middle" group II to create an expanded middle component and "deep-middle" group IIIa supplements "deep" group III to create an expanded deep component. Expansion of the shallow component was not warranted because so few of the traits which overlap the shallow and middle depth ranges are concentrated at shallow depths. Ordering within groups is determined by numbers of occurrences. The groups based on strict depth boundaries remain ill-defined, each characterized almost entirely by grave goods of limited occurrence in the entire assemblage. When boundaries are relaxed to include artifact types which range over 2 components, a greater variety and number of artifact types are included.

Even the expanded artifact groupings leave the analyst relatively far from the context in which these items were used. For the shallow component, little is known except the form of some items which ultimately were disposed as grave goods, and which are of interest because they may cross date the component with a particular phase in the interior. Since the function of charmstones is not known, the significance of the predominance of unperforated forms at shallow depths is also unknown. Unperforated charmstones and pecked grooved stones are the only link traits in the middle-shallow overlap group which were more numerous at shallow than at middle depths. The paucity of traits distinctive of the shallow component in part reflects the lesser span of depth and time embraced by the unit. [1]

In the middle component there are likewise some characteristic grave goods of interest chiefly for their value in cross dating Bay components with Valley phases. Other grave goods, however, such as the pointed thick spatulate bone artifacts and the cobble mortars found in graves at middle depths, reflect mortuary behavior more characteristic of Bay components than of

[1] As mentioned above, adjacent site Ala-329 should provide more information regarding occupation in the Coyote Hills area during the periods represented by sparse shallow components at Ala-328 and Ala-13.

Table 5-4. Components at Ala-328.

Trait	Occurrences	Depth Range (inches)
I. Shallow.		
clam disk beads	6	8-24
lipped Olivella beads	5	4-18
unperforated (sandstone) charmstones	26 of 29 total	0-24
steatite pipes	2	above 12
stone pendant	1	near surface
stone bead	1	12
mica ornament	1	28
whalebone specimen of pointed thick spatulate bone	1 of 5 total	18
IIa. Middle-Shallow.		
unperforated (sandstone) charmstones	28 of 29 total	0-72
MM2b fishspear prongs	17	14-58
perforated mammal teeth	15	3-74
antler sockets	11	18-60
pecked grooved stones	8	18-56
abraded grooved stones	6	12-60
tabular Haliotis ornaments	6	12-72
straight ended thick spatulate bone	5	18-73
pointed deer splints	5	20-70
miscellaneous Haliotis ornaments	4	11-60
large Olivella whole shell beads, A1c	3 of 4* total	12-50
unperforated canid teeth	2	20-72
pointed thick spatulate bone	5 of 5 total	18-48
II. Middle.		
cobble mortar	10 of 13* total	36-72
Olivella saucer and ring beads	7	32-79
small pol'ed. bone and antler objects	5	44-68
pointed thick spatulate bone	4 of 5 total	37-48
Olivella saddle beads	3	28-36
Olivella split drilled beads	1 of 2* total	79

Table 5-4. (continued)

Trait	Occurrences	Depth Range (inches)
IIb. Middle-Deep.		
pointed bone with flat tip	27	8-84
miscellaneous abraded stones	11	10-80
unpointed perforated bone	8	24-84
abraded rubbing stones	2	7-84
IIIa. Deep-Middle.		
pointed bone with nippled tip	ca. 160 of 221	48-122
perforated schist charmstones	23 of 24 total	35-112
obsidian from eastern sources	9 of 10 total	58-94
bird talons	8	48-112
mammal bone tubes	4	79-108
bird bone tubes with bead overlay	4	79-108
edge-notched stones	3	72-106
antler fork juncture	2	74-94
serpentinite clusters	2	60-84
bone whistles with bead overlay	1 or 2	50, poss. 93
III. Deep.		
Haliotis shield ornaments	12	93-116
small Olivella whole shell beads, A1a	10	88-116
Haliotis ring ornaments	6	93-100
near-complete cremation	3	submound
Olivella round saucer beads	1	105
unperforated bear tooth	1	100

* Depth of some occurrences unknown.
( ) Most specimens made of this rock type.

Valley sites. Other items, such as the MM2b fishspear prongs, antler sockets and various forms of pecked and abraded stone which fall within the expanded middle component surely reflect activities of a more everyday sort than mortuary ceremony, but, as with charmstones in the shallow component, lack of knowledge regarding the use of the artifacts hampers interpretation of their presence in that component.

The strictly defined deep component, characterized entirely (except for 1 near-complete cremation from the Hayward excavations) by traits exclusive to the basal cemetery, again consists of grave goods, including 1 type exclusive to Ala-328. In the expanded deep component, the concentration of pointed bone with nippled tip implies a particular activity or industry which was not practiced with equal intensity during occupation of the middle and shallow components of the site, but the nature of that activity remains unknown. The concentration of obsidian from eastern sources in the deep component and the similar, though not necessarily related, restriction of schist as a charmstone material both suggest changes over time in factors related to trade, and possibly to political and social organization as well, but the nature of these changes is yet to be investigated.

Tables 5-1 and 5-4 together give a good picture of some general attributes of the Ala-328 assemblage, but a few trends of possible significance are not clearly shown in either. These include the possible hiatus in use of Haliotis ornaments indicated by their absence between submound and 72 inches depth, and a difference in forms recovered at submound from those at shallower depths. Similarly, there is an apparent hiatus in use of whole shell beads indicated by their absence between 88 and 50 inches depth. Pigment, though found in graves at all depths, was more frequent at basal depths; about half of the occurrences of pigment were in submound graves, the rest evenly spread throughout shallower depths. Shell beads have a similar distribution in the site, with even greater concentration at base of whole shell forms; two thirds of the occurrences of the latter were recovered in submound graves.

Implications for models of change in central California prehistory.

Beardsley (1948: 5) stated that within central California, "temporal differences are sharper than changes from one area to another." Gerow (Gerow with Force 1968: 12) argued for "the coexistence of two distinct cultures or traditions and populations in central California between 1500 and 1000 B. C. After that date Bay and Delta cultures and populations gradually converged."

The discussions above have presented general characteristics of the archaeological assemblages from Ala-328, -13, and -12, and comparisons of attribute occurrence within and among the sites have indicated a few trends of change over time. This information may be used to evaluate the parallel and convergent models proposed to describe prehistoric cultural change in central California. To the degree that general characteristics of these Bay area site assemblages and trends of change within them are shared with Valley sites, the parallel model embodied in the work of Lillard, Heizer, Fenenga, and Beardsley is supported. To the degree that general characteristics differ, particularly early in the sequence, and trends are opposite, the convergent model proposed by Gerow is supported. For information supplementary to the data from the 3 Alameda sites, discussion below draws primarily on Beardsley's (1948) summary of characteristics of the Valley sequence and evident parallels in the Bay area, and on Gerow's (Gerow with Force 1968) presentation of differences between early Bay and Valley assemblages and his delineation of evident convergent trends in both areas.

General characteristics of the Alameda sites include the importance throughout the sequence of tool types such as serrate bone, antler wedges, chipping hammers, various pointed bone artifacts, blunt pointed antler tools, mortars and pestles. Likewise, for early Bay area site SMa-77, Gerow noted that cylindrical flat-ended pestles, cobble mortars, pointed bone tools, serrate bone, and antler wedges were relatively frequent compared to the occurrence of similar forms in Valley sites. These items seem to be characteristic of Bay area sites throughout the prehistoric sequence so far known. Some forms, such as antler wedges, serrate bone, and chipping hammers are rarely found in interior sites; others, such as pointed bone tools, mortars and pestles are little known from early Valley assemblages, but are more numerous in later assemblages.

Among stone artifacts, items of pecked and ground stone are more numerous than chipped stone artifacts in the Alameda site assemblages. Particularly notable is the relative rarity of blade forms of chipped stone throughout the sequence, in contrast to assemblages from the Valley, where chipped stone points are numerous both absolutely and relative to other artifact types. This difference in the importance of chipped stone points was first emphasized as a contrast between Bay and Valley areas by Gerow, on the basis of the SMa-77 assemblage. The evidence from Ala-328, -13 and -12 suggests that it is a consistent difference between the 2 areas over time. [1]

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[1] It may be symptomatic of a difference in subsistence orientation between the 2 areas. From the SMa-77 evidence, Gerow (Gerow with Force 1968: 13 and passim) contrasted an early Bay culture oriented to generalized collecting, fishing and hunting (based on relative abundance of mortar and pestle, inference that fishing was by net rather than spear or line, relative rarity of chipped stone points, and evidence for shellfish exploitation) with an early Valley culture oriented to specialized hunting (based on relative abundance of chipped stone points, lesser importance of mortar and pestle, and evidence for line

Turning to consideration of gravelots, which provided the basis for delineation of the Valley sequence, other contrasts and also some similarities are apparent between Valley and Bay. A difference often mentioned is the absence from the Bay area of components characterized by the rigid mortuary ceremonialism evident in Valley Early Horizon components, where extended posture, ventral position, and westerly orientation strongly predominate. The evidence from SMa-77 agrees with that from the Alameda sites, and indicates that flexed posture varying in degree of flexure, variable placement with some preference for lateral position, and variable orientation with slight preference for westerly orientation were characteristic of the mortuary complex in the Bay area throughout the time span represented by Early, Middle and Late Horizons in the Valley.

There is some evidence for flexure in Valley Early Horizon components, and the deep component of interior site CCo-308, older than any of the Early Horizon components according to radiocarbon determinations, is characterized by flexed burials (Fredrickson 1968). The rigid pattern of extended posture in some Valley components may reflect an intrusive ideology, and perhaps an intrusive population movement [1], which did not affect peripheral interior areas or the Bay area to such a degree. The only evidence for rigid mortuary patterning in the Bay area is the strong preference for northwesterly orientation among basal burials at Ala-328. If the few extended burials at the Alameda sites are evidence of Valley influence, it was slight and appeared in the Bay area after the practice of extension had begun to decrease in the Valley, as signified by the presence of shell bead types characteristic of Valley Middle Horizon components associated with the 2 extended burials accompanied by grave goods.

It has long been noted that fewer burials in Bay area sites are accompanied by grave goods than is the case for Valley sites, and that the content of gravelots is generally lesser in the former area than in the latter. The Alameda sites confirm this contrast with regard to content of gravelots; it is unusual to find burials accompanied by more than a few items, and such finds are usually interpreted as the remains of special individuals (see, e.g., Davis'

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and spear fishing rather than net fishing).. Obvious hunting tools -- chipped stone points and fishspear prongs or hooks -- are relatively rare at the Alameda sites too, but it seems unwise to propose a major contrast or even different emphases in subsistence techniques without more direct information regarding diet, seasonality of occupation of bayshore and Valley sites, and special activity sites in both areas.

1 This is speculation; see Gerow's discussion of skeletal differences between early Valley and early Bay populations (Gerow with Force 1968: 97-98, 125-126).

treatment of a "shaman burial" at Ala-328 /D&T 1959: 27/). However, consideration of the data regarding relative numbers of burials with goods suggests the differences between Bay and Valley were not marked throughout much of the sequence.

At SMa-77, artifacts were found with three quarters of all burials recovered, and with more if pigment is considered to be artifactual. At Ala-12, the figure is similar, although the sample may be too small to be significant. There were associations with nearly one half of the burials at Ala-13. The overall figure for Ala-328 is one third, rising to one half among basal burials; in basal and shallow cemetery areas, the figure is higher. Thus the proportion of graves accompanied by goods ranges from three quarters to one third in the Bay area sites considered, with some evidence for decrease in frequency of occurrence of artifactual associations over time. Figures cited by Beardsley indicate the presence of artifacts in 70% of Early Horizon graves, 50% or less of Middle Horizon graves, and 55% to 70% of Late Horizon graves. It appears to be only at the later end of the temporal sequence that there is a contrast between Bay area and Valley in relative numbers of graves with goods, and this contrast should be considered tentative for the Alameda area until checked against data from Ala-329. Hence the salient contrast between Bay and Valley regarding artifactual associations is not a difference in relative numbers of graves with accompaniments, but a difference in the content of gravelots, both in quantity and kind.

It is precisely this difference which makes it difficult to characterize Bay area assemblages on the basis of gravelots, since so few items are widely shared among graves. Consider, for example, the 3 items shared by all 3 Alameda sites as relatively frequent grave goods: pigment (30, 16, 44), shell beads (29, 32, 22), and mortars (8, 10, 22); the figures in parentheses indicate the percentage of burials with each type from Ala-328, -13, and -12, respectively. A brief comparison of the importance of these items in mortuary contexts in Valley and Bay will illustrate some of the similarities and differences between the 2 areas which strain the descriptive capacities of both the parallel and convergent models of change which have been proposed.

Pigment is perhaps the most characteristic accompaniment of burials from Bay area sites. It was relatively important as a grave good throughout the sequence at the Alameda sites, although most pigment occurred in submound graves at all 3. At SMa-77, pigment was the most common grave good. The frequent usage of pigment in the Bay area contrasts with the Valley, where pigment accompanied about 10% of graves recovered from Early Horizon components, increased slightly in frequency of use among graves with associated goods in Middle Horizon sites, and was infrequently found in Late Horizon contexts. The increased usage in Middle Horizon Valley components might be taken as evidence of Bay area influence; to Gerow, it reflects some convergence between the 2 areas in that time period (Gerow with Force 1968: 108). Interestingly, pigment is the most frequent grave good in the shallow cemetery at Ala-328, suggesting a trend counter to the decrease in pigment use in the Valley between Middle and Late Horizon. Disregarding the pattern of changing popularity of pigment in the 2 areas relative to one another, which cannot be simply described either as parallelism or convergence, the overall contrast in importance of pigment in the 2 areas stands as a clear difference.

As mentioned above, mortars characterize Bay area assemblages throughout the prehistoric sequence, but are relatively infrequent in Valley Early Horizon components. In the Bay area, mortars figure most prominently in mortuary context during middle periods of the sequence represented by assemblages from Ala-328, -12 and -13.[1] In contrast, it is only in Late Horizon contexts in the Valley that mortars are relatively frequent grave goods Pestles are also frequent grave accompaniments in Valley Late Horizon components. Half of the pestles recovered as grave goods at Ala-328 came from graves which can be cross dated to the Late Horizon period in the Valley. The others came from basal graves; in this regard it is of interest that about one third of the pestles recovered at SMa-77 were grave goods.

The data suggest that mortars and pestles, commonly used items in the Bay area throughout the sequence, were prominent in the mortuary complex in that area before they became so in the Valley. The lag in mortuary usage is probably related to the later inception of common usage of stone mortars in Valley sites. It is important to note that the Alameda sites do not provide evidence for an increase in usage of mortars and pestles in the Bay area over time. However, an increase in usage in Valley sites was responsible for the greater similarity of later assemblages of the 2 areas with regard to mortars and pestles; this is what Gerow would label as a convergent trend. On the other hand, the increase over time in the importance of mortars and pestles in mortuary contexts might be considered a parallel trend, with Valley following Bay.

Shell beads were a relatively frequent grave good in both Bay and Valley. Virtually every bead type found in 1 area is found in the other, although there is evidence for regional preference for particular types and for the occurrence of regional variants of particular forms.[2] Using the criterion of absolute

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1 Although they are absent as grave goods from shallow depths at Ala-328 and -13, evidence from other Bay area components shows that mortars continued to be used in mortuary context during later periods; evidence from Ala-329 will clarify the situation for the Coyote Hills area.

2 Information comes from informal conversation with Bennyhoff. The more common occurrence of smaller, less oval saddle forms in the Bay is interpre-

numbers, Gerow noted a preference early in both areas for whole shell beads, with increasing popularity of cut shell beads over time. He emphasized the relatively greater preference for whole shell beads at SMa-77 compared to Valley Early Horizon sites, and argued that the subsequent convergence of preference for cut shell forms over whole shell forms in later Bay and Valley assemblages required a greater degree of change in the Bay than in the Valley. If one considers the prominence of whole shell beads in the basal cemetery at Ala-328, their absence in lower middle depths at that site and their absence from submound graves at Ala-13, the evidence supports Gerow's argument. Data from the Alameda sites suggest that early popularity of whole shell forms was followed by an initial shift entirely away from whole shell forms, while subsequent usage of whole shell forms was comparable to that in the Valley. However, if numbers of occurrences, rather than absolute numbers, are used to measure preference, the picture is different for the Valley sites and SMa-77, although it remains the same for the Alameda sites. By this measure, cut shell beads were preferred over whole shell beads in Valley components from all horizons [1] and both forms were equally favored at SMa-77, where whole shell and cut shell beads were recovered from graves in nearly equal numbers of occurrences (17 vs. 15). From this perspective, neither a parallel trend nor a convergent trend is adequate to explain the course of change in the Bay area vis-a-vis the Valley regarding relative preferences for whole shell and cut shell beads.

What conclusions may be drawn from this review? A comparison of early components in the Bay area and the Valley shows sufficient contrasts in the artifactual assemblages and in mortuary behavior to support Gerow's contention that there were great differences between Valley and Bay at that time, in spite of some attributes shared in both areas. There is sufficient persistence into later periods of some of the early contrasts to argue for separate traditions in the 2 areas. When specific trends over time are considered, it is difficult to invoke either convergent or parallel change between the 2 areas as a descriptive or explanatory device. One sees convergence or parallels only by focusing on changes in form and ignoring the differences in context in which the changes take place (e.g., the evidently parallel succession of similar bead types and the evidently convergent focus on cut shell bead forms over time both occur against relative differences in numbers of occurrences and size of bead lots between the 2 areas). Attention to the cultural setting of

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ted as a regional preference. Occurrences such as the transitional saucer-saddle lots with larger perforations than are found on comparable forms in the Valley, which appear to be distinctive of the Bay area, are interpreted as regional variants.

[1] Based on data reported in Lillard, Heizer and Fenenga (1939).

particular changes is required to understand their separate significance in the prehistory of each area. Labeling changes in one area as parallel to, or convergent with, changes in another says little, either about relationships between the 2 areas or about the meaning of change within either.

It must be admitted that this conclusion regarding the inadequacy of both parallel and convergent models is made using insights which originated with their proponents. It was the extension of the Valley sequence which conclusively drew attention to cultural change in the Bay area, and the stylistic parallels with the Valley which were indicated by Lillard, Heizer and Fenenga and substantiated by Beardsley continue to be used for temporal control over the sequence in the Bay area. Likewise, it was Gerow's demonstration of fundamental differences between Bay and Valley at an early time period which led to consideration of a distinctive Bay area tradition. Some of the early contrasts noted by Gerow stem from characteristic Bay area traits which appear to be a part of the tradition throughout the sequence; he may be faulted for not emphasizing their continuance over time, but it must be remembered that his work was concerned with the earlier time period.

An examination of central California archaeology from these 2 perspectives leaves strong impressions of change in both areas and separate traditions in each, interwoven with evidence of interplay between them -- a complex picture which cannot be portrayed in simple models of parallel or convergent change.

Taking what is useful from each of these models of change in central California, it is time to proceed to an analysis of specific trends of change in the Bay area (and in the Valley as well) from a perspective which focuses on the contexts in which changes occur, treating the variations in form which signify change as background information. Some general characteristics of the Bay area throughout its prehistory have been elucidated by emphasizing formal contrasts with the Valley in aspects of the artifactual assemblages and mortuary behavior. The work which lies ahead is to gain insight into the behavior in economic, social and ideological realms which produced the patterns in archaeological remains from which an understanding of Bay area prehistory is to be derived.

In part this will require the collection of data of sorts which have previously been ignored, and the sampling of site types and site loci underrepresented among sites excavated so far. However, continued attention to formal aspects of artifactual assemblages and mortuary behavior will also be required, including re-examination of data of that sort which have already been gathered, as well as collection of more. Because consideration of the prehistory of the San Francisco Bay area separate from the rest of central California is relatively young, there is much to be done at a descriptive level, to define characteristics of the area as a whole and to detect and gain control over temporal and spatial variations within the area. It is to this end that the present study has been directed.

References Cited

Abbreviations:

UC-AR	University of California Anthropological Records
UCAS -R	Reports of the University of California Archaeological Survey. Berkeley.
UCPAAE	University of California Publications in American Archaeology and Ethnology.

Atwater, B. F. and C. W. Hedel

1976 Distribution of seed plants with respect to tide levels and water salinity in the natural tidal marshes of the northern San Francisco Bay estuary, California. United States Geological Survey, Open-File Report 76-389. Menlo Park.

Baumhoff, M. A. and J. S. Byrne

1959 Desert Side-Notched points as a time marker in California. UCAS-R 48: 32-65.

Beardsley, R. K.

1948 Cultural sequences in central California archaeology. American Antiquity 14: 1-29.

1954 Temporal and areal relationships in central California archaeology. UCAS-R 24, 25.

B&F

1967 See Bennyhoff and Fredrickson 1967.

B&H

1958 See Bennyhoff and Heizer 1958.

Bennyhoff, J. A.

1950 Californian fish spears and harpoons. UC-AR 9: 295-338.

1953 Bone, antler, and claws. In: The archaeology of the Napa region, edited by R. F. Heizer. Pp. 265-272. UC-AR 12(6).

1961 The ethnogeography of the Plains Miwok. Ph. D. dissertation, Department of Anthropology, University of California, Berkeley. Published in 1977 as Ethnogeography of the Plains Miwok, Center for Archaeological Research at Davis, Publication 5.

Bennyhoff, J. A. and D. A. Fredrickson
1967 A typology of shell and stone beads from central California. Manuscript on file at California Department of Parks and Recreation, Sacramento, and at Archaeological Research Laboratory, San Francisco State University.

Bennyhoff, J. A. and R. F. Heizer
1958 Cross-dating Great Basin sites by Californian shell beads. UCAS-R 42: 60-92.

Bickel, P. McW.
1974 Toward a prehistory of the San Francisco Bay area. Paper read at Annual Meeting, Society for California Archaeology, Riverside. On file at Archaeological Research Laboratory, San Francisco State University.

1976 Toward a prehistory of the San Francisco Bay area: the archaeology of sites Ala-328, Ala-13, and Ala-12. Ph. D. dissertation, Department of Anthropology, Harvard University. Published on demand by University Microfilms, Ann Arbor, MI (dissertation number 77-8673).

1978a Changing sea levels along the California coast: anthropological implications. Journal of California Anthropology 5(1): 6-20.

1978b Corrections to sea level article. Journal of California Anthropology 5(2): 296-297.

Binford, L. R.
1962 Archaeology as anthropology. American Antiquity 28: 217-225.

1965 Archaeological systematics and the study of culture process. American Antiquity 31: 203-210.

Braun, D. P.
1974 Explanatory models for the evolution of coastal adaptation in prehistoric New England. American Antiquity 39: 582-596.

Brennan, L. A.
1976 Coastal adaptation in prehistoric New England. American Antiquity 41: 112-113.

Brooks, S. T. and W. D. Hohenthal
1963 Archaeological defective palate crania from California. American Journal of Physical Anthropology 21: 25-32.

Clark, D. L.
1964 Archaeological chronology in California and the obsidian hydration method: part I. Annual Report, Archaeological Survey, Department of Anthropology, University of California, Los Angeles, 1964. Pp. 139-225.

Coberly, Mary B.
1973 The archaeology of the Ryan mound, site Ala-329, a central California coastal village site. University of Northern Colorado, Museum of Anthropology, Occasional Publications in Anthropology, Archaeology Series 4.

D&T
1959 See Davis and Treganza 1959.

Davis, J. T.
1960 The archaeology of the Fernandez site, a San Francisco Bay region shellmound. UCAS-R 49: 11-52.

Davis, J. T. and A. E. Treganza
1959 The Patterson mound: a comparative analysis of the archaeology of site Ala-328. UCAS-R 47.

Deetz, J.
1970 Archaeology as a social science. American Anthropological Association Bulletins 3(3): 115-125.

Desgrandchamp, C. S.
1976 Estuary exploitation in aboriginal California. M.A. thesis, Department of Anthropology, San Francisco State University.

Elford, C. R.
1972 Climatological summary; means and extremes for the period 1931-1971, Station Fremont. U. S. Department of Commerce, Weather Bureau, Washington, D. C.

Elsasser, A. B.
1955 A charmstone site in Sonoma County, California. UCAS-R 28: 29-33.

Follett, W. I.
1975a Fish remains from the West Berkeley shellmound (CA-Ala-307), Alameda County, California. In: West Berkeley (CA-Ala-307): a culturally stratified shellmound on the east shore of San Francisco Bay, by W. J. Wallace and D. J. Lathrap. Pp. 71-98. Contributions of the University of California Archaeological Research Facility 29. Berkeley.

1975b Fish remains from the Stege mounds, Richmond, Contra Costa County, California. In: West Berkeley (CA-Ala-307): a culturally stratified shellmound on the east shore of San Francisco Bay, by W. J. Wallace and D. J. Lathrap. Pp. 123-129. Contributions of the University of California Archaeological Research Facility 29. Berkeley.

Fredrickson, D. A.
1966 CCo-308: the archaeology of a Middle Horizon site in interior Contra Costa County, California. M. A. thesis, Department of Anthropology, University of California, Davis.

1968 Archaeological investigations at CCo-30 near Alamo, Contra Costa County, California. Center for Archaeological Research at Davis, Publication 1.

1973 Early cultures of the North Coast Ranges. Ph. D. dissertation, Department of Anthropology, University of California, Davis.

1974 Cultural diversity in early central California: a view from the north Coast Ranges. Journal of California Anthropology 1(1): 41-53.

Gerow, B. A. with R. W. Force
1968 An analysis of the University Village complex with a reappraisal of central California archaeology. Stanford.

Gerow, B. A.
1974 Co-traditions and convergent trends in prehistoric California. San Luis Obispo County Archaeological Society, Occasional Papers 8.

Gifford, E. W.
1916 Composition of Californian shellmounds. UCPAAE 12: 1-29.

1940 Californian bone artifacts. UC-AR 3: 153-237.

1947 Californian shell artifacts. UC-AR 9: 1-132.

Gifford, E. W. and W. E. Schenck
1926 Archaeology of the southern San Joaquin Valley, California. UCPAAE 23: 1-122.

Greengo, R. E.
1951 Molluscan species in California shell middens. UCAS-R 13: 1-23.

Heizer, R. F.
1949 The archaeology of central California I: the Early Horizon. UC-AR 12: 1-84.

1964 The western coast of North America. In: Prehistoric Man in the New World, edited by J. D. Jennings and E. Norbeck. Pp. 117-148. University of Chicago Press, Chicago.

1974 The Costanoan Indians. California History Center, De Anza College, Local History Studies, Volume 18. Cupertino, CA.

1975 Some thoughts on California archaeology of today. Journal of New World Archaeology 1(1). Institute of Archaeology, University of California, Los Angeles.

Heizer, R. F. and F. Fenenga
1939 Archaeological horizons in central California. American Anthropologist 41: 378-399.

Heizer, R. F. and A. E. Treganza
1944 Mines and quarries of the Indians of California. California Journal of Mines and Geology 40(3): 291-359.

Hester, T. R. and R. F. Heizer
1973 Review and discussion of Great Basin projectile points: form and chronology. Archaeological Research Facility, Department of Anthropology, University of California, Berkeley.

Iverson, J.
1956 Forest clearance in the stone age. Scientific American 194 (3): 36-41.

Jackson, T. L.
1974 The economics of obsidian in central California prehistory: applications of X-ray fluorescence spectrography in archaeology. M.A. thesis, Department of Anthropology, San Francisco State University.

Kesseli, J. E.
1942 The climates of California according to the Koppen classification. Geographical Review 32: 476-480.

King, C. D.
1968 Excavations at Ala-342: a summary report. Manuscript on file at California Department of Parks and Recreation, Sacramento.

1974a The explanation of differences and similarities among beads used in prehistoric and early historic California. In: ? Antap. California Indian political and economic organization, edited by L. J. Bean and T. F. King. Pp. 75-92. Ballena Press Anthropological Papers 2.

1974b Northern Santa Clara ethnography. In: Environmental impact report, San Felipe water distribution system, Archaeological resources, by T. King and G. Berg. Appendix I. Report prepared for Santa Clara Valley Water District.

1977 Matalan ethnohistory. In: Final report of archaeological test excavations for construction of freeway 04-SCL-101 Post Miles 17.2/29.4. by S. A. Dietz. Chapter IV. Report prepared by Archaeological Consulting and Research Services for Cal-Trans, District 04, San Francisco.

1978 The historic Indian settlements of San Jose. In: Archaeological investigations at CA-SCl-128: the Holiday Inn site, by J. C. Winter, ed. Chapter XI. Report prepared for the Ohlone People and the Redevelopment Agency of the City of San Jose.

King, T. F.
1970 The dead at Tiburon. Northwestern California Archaeological Society, Occasional Papers 2.

1974 The evolution of status ascription around San Francisco Bay. In: ? Antap. California Indian political and economic organization, edited by L. J. Bean and T. F. King. Pp. 35-54. Ballena Press Anthropological Papers 2.

Kroeber, A. L.
1925 Handbook of the Indians of California. Bureau of American Ethnology Bulletin 78. (Reprinted by California Book Co., Ltd., Berkeley. 3rd Printing 1970).

1936 Prospects in California prehistory. American Antiquity 2: 108-116.

LH&F
1939 *See* Lillard, Heizer and Fenenga 1939.

Levy, R.
1976 Costanoan internal relationships. Archaeological Research Facility, University of California, Berkeley.

1978 Costanoan. *In:* California, R. F. Heizer, ed., Vol. 8 of *Handbook of North American Indians,* W. C. Sturtevant, gen'l ed. Pp. 485-495. Smithsonian Institution.

Lewis, H. T.
1973 Patterns of Indian burning in California. *Ballena Press Anthropological Papers* 1.

Libby, W. F.
1954 Chicago radiocarbon dates IV. *Science* 119(3083): 135-140.

Lillard, J. B., R. F. Heizer, and F. Fenenga
1939 An introduction to the archaeology of central California. *Sacramento Junior College, Department of Anthropology, Bulletin* 2.

Lillard, J. B. and W. K. Purves
1936 Archaeology of the Deer Creek-Cosumnes area, Sacramento Co., California. *Sacramento Junior College, Department of Anthropology, Bulletin* 1.

Loud, L. L.
1924 The Stege mounds at Richmond. *UCPAAE* 17: 355-372.

Mayfield, D. W.
1978 Ecology of the pre-Spanish San Francisco Bay area. M. A. thesis, Department of Geography, San Francisco State University.

Meighan, C.
1955 Notes on the archaeology of Mono County, California. *UCAS-R* 28: 6-26.

1959 California cultures and the concept of an Archaic stage. *American Antiquity* 24: 289-305.

Milliken, R.
1978 Ethno-history of the lower Napa Valley. *In:* Report of

archaeological excavations at the River Glen site (CA-NAP-261), by T. L. Jackson. Chapter 2. Report prepared by Archaeological Consulting and Research Services for U.S. Army Corps of Engineers, San Francisco District.

1979 The ethnohistory of the Huchiun and Baptismal records from Mission Dolores. In: Final report of the testing of cultural resources within the Wildcat and San Pablo Creeks flood control and water resources project, Contra Costa County, California, by P. M. Banks and R. I. Orlins. Chapter 4 and Appendix 5. Report prepared by California Archaeological Consultants for U.S. Army Corps of Engineers, San Francisco District.

Moratto, M. J.

1974 Anthropological and ethnohistorical sources for the San Francisco Bay region. San Francisco State University, Treganza Anthropology Museum Papers 13.

Nelson, N. C.

1909 Shellmounds of the San Francisco Bay region. UCPAAE 7: 309-356.

1910 The Ellis Landing shellmound. UCPAAE 7: 357-426.

Nichols, D. R. and N. A. Wright

1971 Preliminary map of historic margins of marshlands, San Francisco Bay, California. United States Geological Survey Open-File Map. Menlo Park.

Oliphant, R.

1968 Further excavation of site 4-Ala-12. Manuscript on file at Archaeological Research Laboratory, San Francisco State University.

Olson, R. L.

1930 Chumash prehistory. UCPAAE 28: 1-21.

Olsen, S. J.

1964 Mammal remains from archaeological sites. Peabody Museum Papers 56(1).

1968 Fish, amphibian and reptile remains from archaeological sites. Peabody Museum Papers 56(2).

Pestrong, R.
1972 San Francisco Bay tidelands. California Geology 25(2): 27-40.

Phebus, G. Jr.
1973 Contributions to Costanoan archaeology: archaeological investigations at 4-Ala-330 and 4-SMa-22. San Francisco State University, Treganza Anthropology Museum Papers 12.

Pressler, J.
1973 Landscape modification through time: Coyote Hills, Alameda County, California. M.A. thesis, Department of Geography, California State University, Hayward.

R
1967 See Rackerby 1967.

Rackerby, F.
1967 The archaeological salvage of two San Francisco Bay shellmounds. Department of Anthropology, San Francisco State College, Occasional Papers in Anthropology 3.

Reid, G. K.
1961 Ecology of inland waters and estuaries. Van Nostrand Reinhold, New York.

Ringer, R. D.
1972 Environmental exploitation at a prehistoric Indian site (Ala-328) in Alameda County, California. M. A. thesis, Department of Anthropology, San Francisco State University.

Rogers, D. B.
1929 Prehistoric man of the Santa Barbara coast. Santa Barbara Museum of Natural History, Santa Barbara.

Rowe, J.
1962 Stages and periods in archaeological interpretation. Southwestern Journal of Anthropology 18: 40-54.

Ryan, D. J.
1972 The paleopathology of Ala-328; the relationships among disease, culture, and environment in a California Indian population. M. A. thesis, Department of Anthropology, San Francisco State University.

Saxe, A. A.
1970 Social dimensions of mortuary practices. Ph. D. dissertation, Department of Anthropology, University of Michigan.

Schenck, W. E.
1926 The Emeryville shellmound, final report. UCPAAE 23: 147-282.

Schlocker, J.
1968 Regional geology. Association of Bay Area Governments, Bay Area Regional Planning Program, Supplemental Report, IS-3.

Sharp, L.
1952 Steel axes for stone-age Australians. Human Organization 11 (2): 17-22.

Snow, D. R.
1972 Rising sea level and prehistoric cultural ecology in northern New England. American Antiquity 37: 211-221.

Story, J. A., V. E. Wessels and J. A. Wolfe
1966 Radiocarbon dating of Recent sediments in San Francisco Bay. Mineral Information Service 19(3): 47-50.

Strong, W. D.
1935 An introduction to Nebraska archaeology. Smithsonian Miscellaneous Collections 93(10).

Suchey, J. M.
1975 Biological distance of prehistoric central California population, derived from non-metric traits of the cranium. Ph. D. dissertation, Department of Anthropology, University of California, Riverside.

UC-Extension Media Center
1963 Pomo shaman. 16 mm film. University of California Extension, American Indian Film Series. Berkeley.

Uhle, M.
1907 The Emeryville shellmound. UCPAAE 7: 1-106

Wallace, W. J. and D. J. Lathrap
1975 West Berkeley (CA-Ala-307): a culturally stratified shellmound on the east shore of San Francisco Bay. Contributions

of the University of California Archaeological Research Facility 29. Berkeley.

Wedel, W.
1935 Notes regarding excavations at Ala-328. In: Excavations at Ala-328 and Ala-329, by W. Wedel and C. E. Smith. Manuscript 67, on file at the Archaeological Research Facility, University of California, Berkeley.

Whelan, J. P.
1967 A partial faunal analysis of 4-Ala-12 and 13, two San Francisco Bay shellmounds. Department of Anthropology, San Francisco State College, Occasional Papers in Anthropology 3.

1970 The comparative analysis of the mammal remains from three prehistoric Indian sites in Alameda County, California. M. A. thesis, Department of Anthropology, San Francisco State University.

Wildesen, L. E.
1968 Report of preliminary investigations at Ala-343, Fremont. Manuscript on file at Archaeological Research Laboratory, San Francisco State University.

1969 Ohlone prehistory. The Indian Historian 2(1): 25-28. American Indian Historical Society, San Francisco.

Willey, G. and P. Phillips
1958 Method and theory in American archaeology. University of Chicago Press, Chicago.

Winter, J. C., ed.
1978 Archaeological investigations at CA-SCL-128: the Holiday Inn site. Report prepared for the Ohlone People and the Redevelopment Agency of the City of San Jose.

Wright, R. H.
1971 Map showing locations of samples dated by radiocarbon methods in the San Francisco Bay region. United States Geological Survey, Miscellaneous Field Studies Map MF-317, Basic Data Contributions 33. Menlo Park.

Plates

Plate 1. Shell beads and other artifacts.

A. Large *Olivella biplicata* spire-lopped beads, type A1c. 1-2800. (Burned in a cremation).
B. Medium *Olivella biplicata* spire-lopped beads, type A1b. 1-2730.
C. Small *Olivella biplicata* spire-lopped beads, type A1a. 1-628.
D. Small *Olivella baetica* spire-lopped beads, type A1d. 30-59.
E. Round saucer *Olivella* beads, type G1. 1-629.
F. Small saucer *Olivella* beads, type G2a. 1-521. These beads were recovered as as overlay on the bone tube shown in the plate with one bead still adhering and imprints of two others visible.
G. Split, punched *Olivella* beads, type D1. 30-74.
H. Split, shelved *Olivella* bead, type C2. 1-2815.
I. Small clam shell disk bead, type A1c. 1-1574. (Burned in a cremation).
J. Small disk *Haliotis* beads, type H3a2. 1-322.
K. Small disk *Haliotis* bead, type H3a1. 1-2805.
L. Large ring *Olivella* beads, type G3b. 30-72.
M. Large saucer *Olivella* beads, type G2b. 30-57.
N. Full-lipped *Olivella* beads, type E2. 1-45.
O. Oval saddle Olivella bead, type F1. 1-646.
P. Full saddle or round saddle *Olivella* bead, type F2a or F2b. 30-63.
Q. Round saddle *Olivella* bead, type F2b. 30-46.
R. Square saddle *Olivella* beads, type F3a. l. 30-69, r. 30-46.
S. Plain, centrally perforated thin rectangular *Olivella* beads, type M1a. 30-53.
T. *Rectangular* Haliotis bead, type H1. 30-59.
U. Multiperforated rectangular *Haliotis* bead, type H2. 29-152. Specimen still adheres to canid incisor on which it was found.
V. Incised split bone. 30-118.
W. Quartz crystals. a. 1-2876, r. 1-1305.
X. Perforated mammal teeth. l. 1-560, r. 1-2226.
Y. Sting ray spine. 1-1161.
Z. Serpentinite clusters. 1-1182.

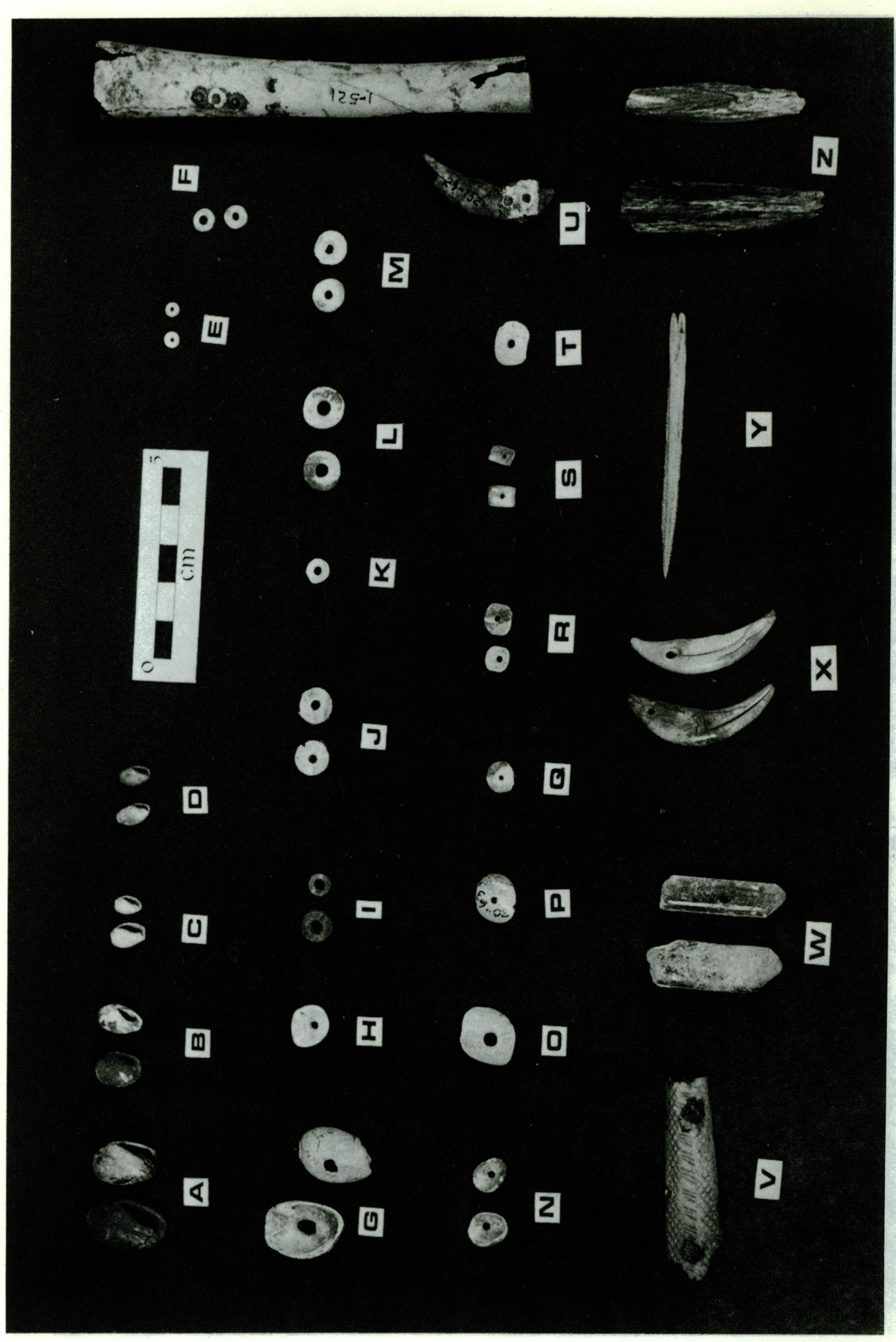


Plate 1

Plate 2. Haliotis ornaments.

A. Shield ornament. 1-524.
B. Broad subrectangular ornament. 30-368.
C. Broad subrectangular ornament. 30-380.
D. Circular ornament. 1-1255.
E. Shield ornament. 1-2689.
F. Ring ornament and fragment. l. 1-586, r. 1-587.
G. Pointed end ornament. 30-352.
H. Pointed end ornament. 30-352.
I. Pointed end ornament. 30-352.
J. Circular ornament. 1-1257.
K. Split disc ornament. 1-1248.
L. Split disc ornament. 30-352. Note serrated edge.
M. Tabular ornament. 30-352.
N. Tabular ornament. 30-352.
O. Oval ornament. 30-352.
P. Oval ornament. 30-369. Note siphonal openings at bottom.

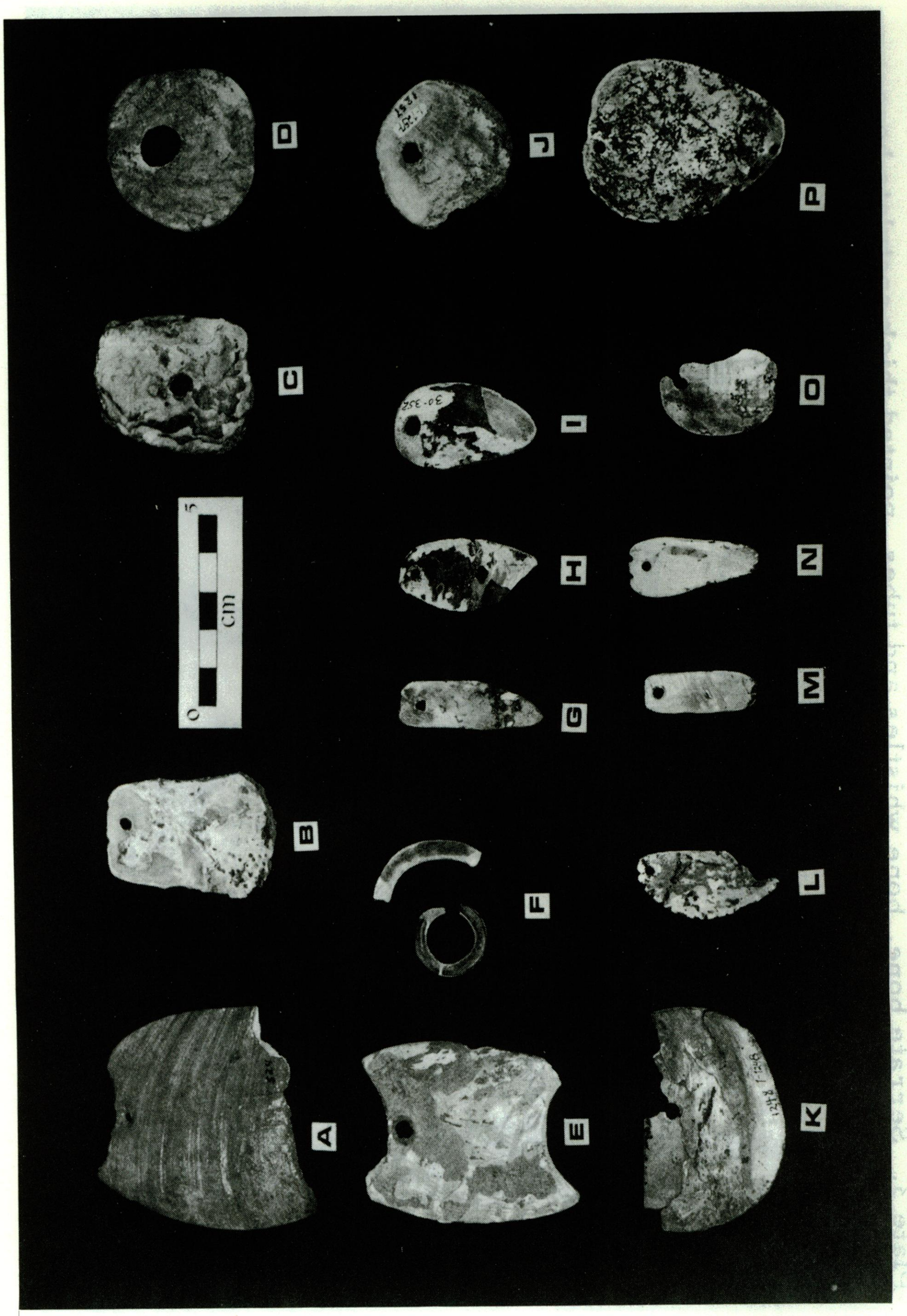


Plate 3. Serrate bone, bone whistles and tubes, pointed thick spatulate bone.

A. Pointed thick spatulate bone. Unnumbered specimen found with burial 226, Ala-328.
B. Pointed thick spatulate bone. Unnumbered specimen found with burial 226, Ala-328.
C. Serrate fish parasphenoid. 1-2255.
D. Serrate sea otter pelvis. 1-1308.
E. Serrate deer scapula, de-spined specimen. 1-833.
F. Serrate elk scapula, de-spined specimen. 1-633.
G. Bird bone tube. 1-1794.
H. Bird bone whistle. 1-431.
I. Mammal bone whistle. 29-370.
J. Scapula socket end fragment with trimmed spine. 1-223.
K. Serrate deer scapula, spined specimen. 1-831.
L. Serrate deer or antelope ulna. 1-1948.
M. Drilled uncut rodent femur. 1-1057.
N. Bird bone whistle. 1-1168.
O. Bird bone whistle. 1-1210.
P. Bird bone tube. 1-1396.
Q. Bird bone bead. 1-2436.
R. Bird bone bead. 1-909.
S. Shimmed bird bone bead. 1-1437.

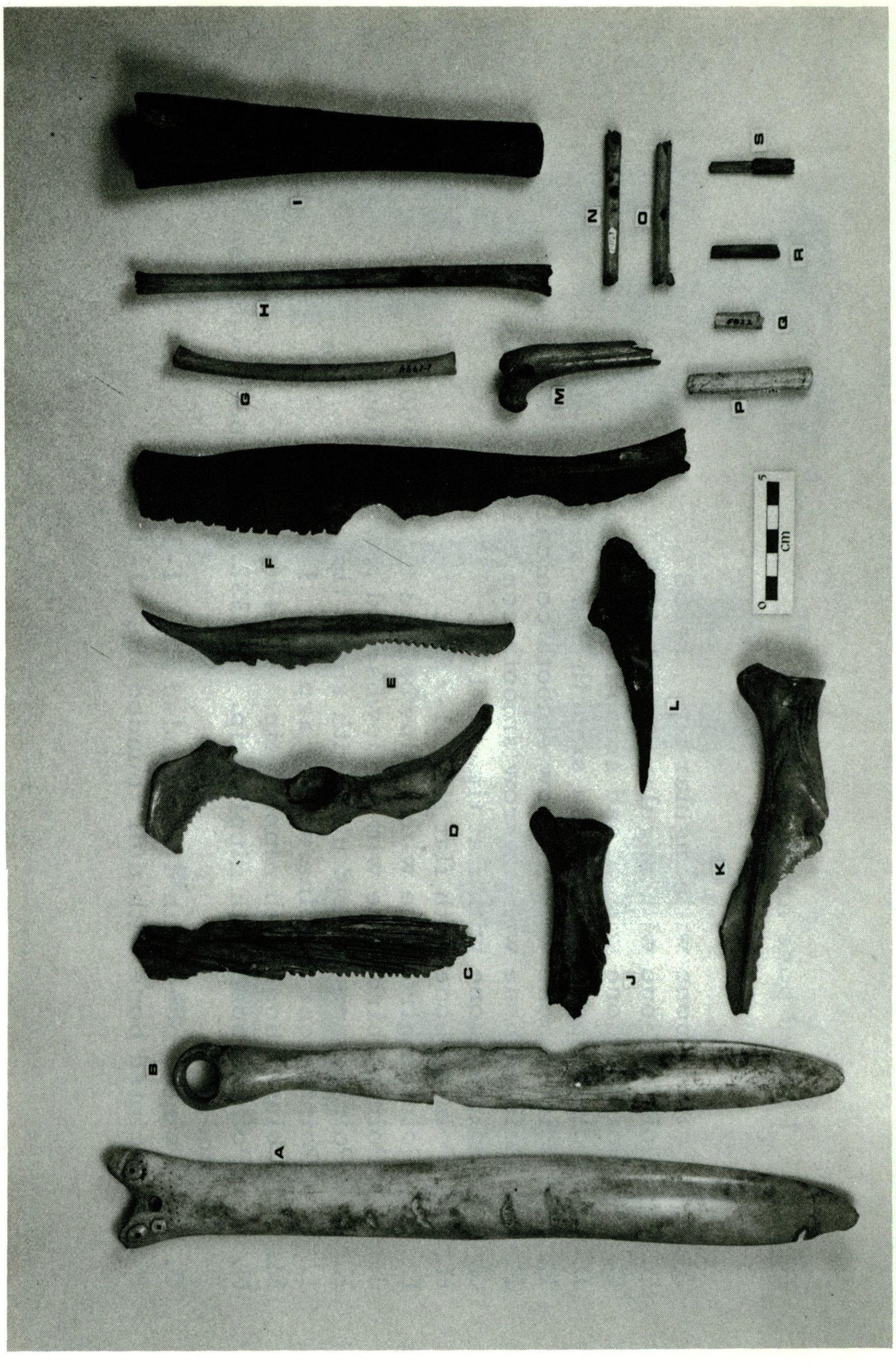


Plate 3

Plate 4. Pointed bone artifacts.

A. Pointed bone with angular tip. 1-1587.
B. Pointed bone with angular tip. 1-1732.
C. Pointed bone with broad smooth conical tip. 1-921.
D. Pointed bone with broad smooth conical tip. 1-1711.
E. Pointed bone with narrow smooth conical tip. 1-2148.
F. Pointed bone with narrow smooth conical tip. 1-838.
G. Pointed bone with flat tip. 1-1721.
H. Pointed bone with flat tip. 1-2138.
I. Pointed bird bone with hollowbacked tip. 1-2360.
J. Pointed bird bone with hollowbacked tip. 1-2366.
K. Pointed non-cervid ulna with sharp tip. 1-74.
L. Pointed cervid ulna with sharp tip. 1-1853.
M. Pointed bone with nippled tip. 1-1496.
N. Pointed bone with nippled tip. 1-1332. Note both working ends.
O. Pointed bone with dull rounded tip. 1-1844.
P. Pointed bone with dull rounded tip. 1-1501.

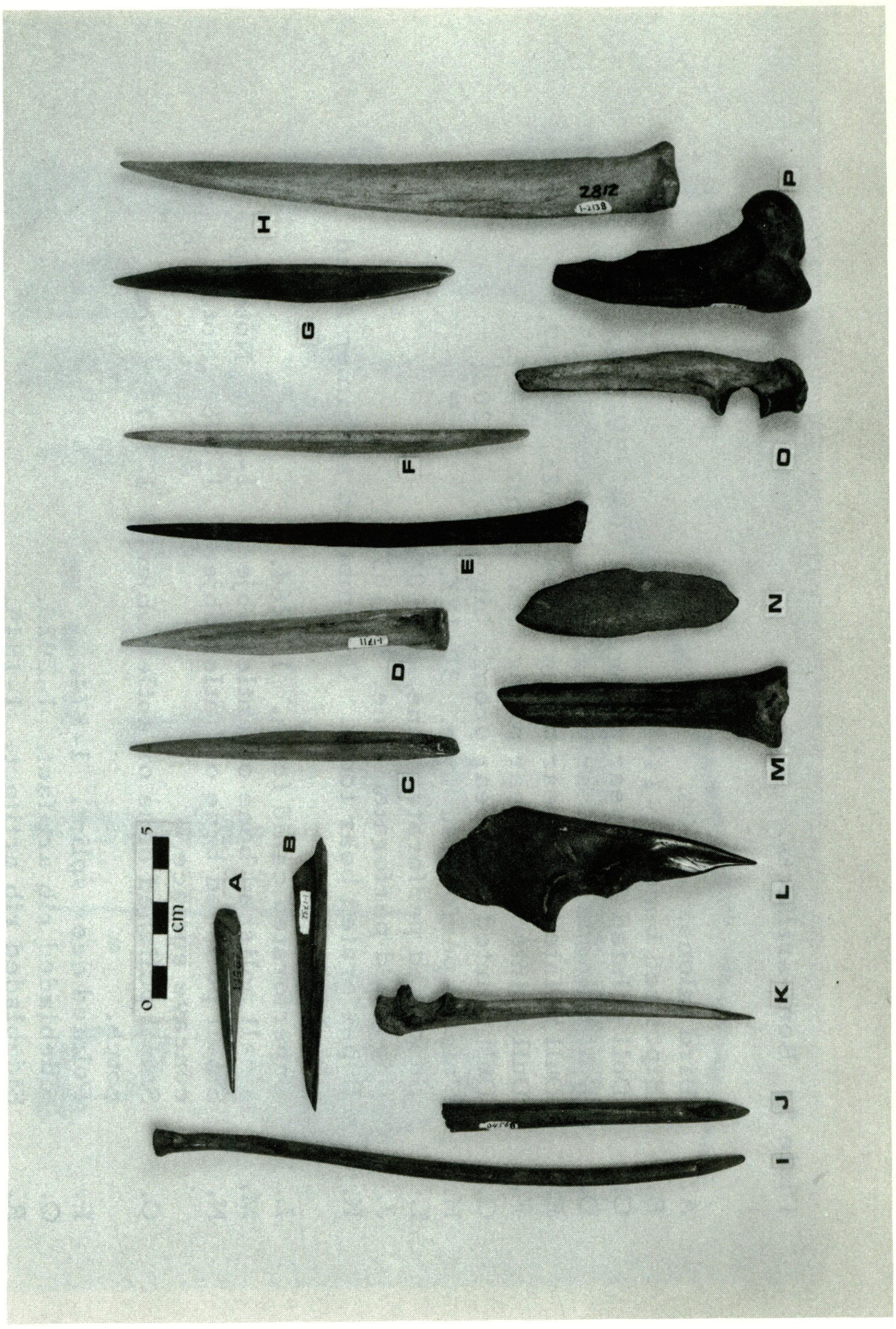


Plate 4

Plate 5. Bone artifacts.

A. Bird talons. 1-504.
B. Bipointed bone. 1-1448.
C. Dull pointed fishspear prong, type 001 30-114.
D. Dull pointed fishspear prong, type MM2b. 1-1855.
E. Dull pointed fishspear prong, type MM2a. 1-947.
F. Dull pointed fishspear prong, flat point. 1-952.
G. Dull pointed fishspear prong, bipoint. 1-2202.
H. Pointed perforated bone. 30-183.
I. Unpointed perforated bone. 1-2204.
J. Unpointed perforated bone. 1-1183.
K. Unperforated bear tooth. Unnumbered specimen found with burial 106.
L. Unperforated canid tooth. 1-2264.
M. Small polished bone or antler object. 1-806. Note spur.
N. Small polished bone or antler object. 1-896. Note concave surface.
O. Small polished bone or antler object. 1-1573. Note notch.
P. Pointed deer splint. 1-874.
Q. Sidebladed rib artifact. 1-2020.
R. Sidebladed rib artifact. 1-1845.
S. Flaked bone. 1-2085.
T. Flaked bone. 1-1196.

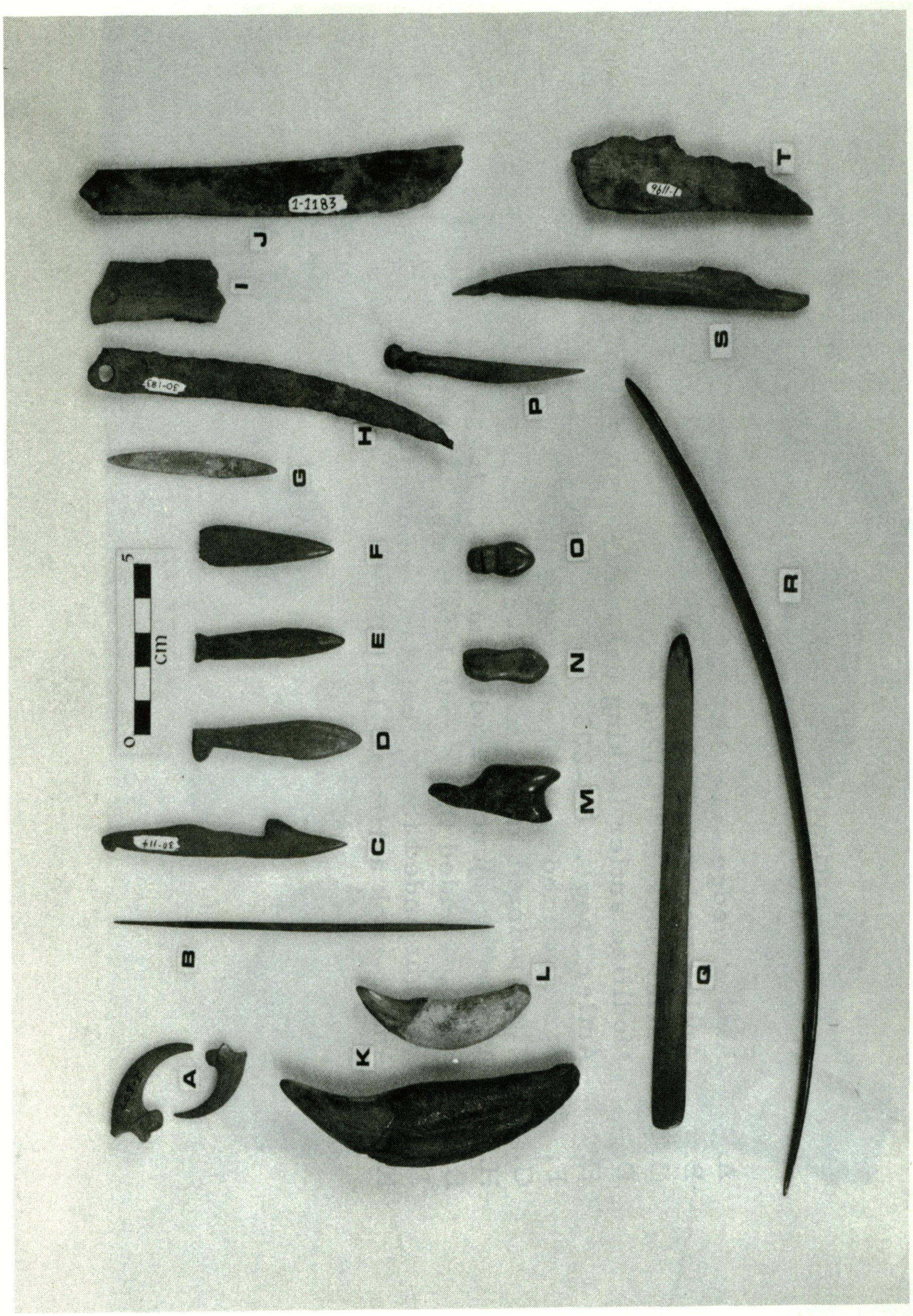


Plate 5

Plate 6. Antler artifacts.

A. Antler wedge. 1-226.
B. Antler wedge. 1-657.
C. Antler socket. 1-1264.
D. Modified antler lacking use-wear. 30-211.
E. Antler "peg". 30-203.
F. Blunt pointed antler tool. 30-346.
G. Blunt pointed antler tool. 1-2315.
H. Antler fork juncture with cut hole. 1-2261.
I. Straight ended thick spatulate bone. 1-1111.
J. Straight ended thick spatulate bone. 1-1983.
K. Antler rack artifact. 1-1095.

Plate 6

Plate 7. Pestles, grooved and notched stones.

A. Flanged pestle. 1-744.
B. Cylindrical pestle. 1-712. Note pit on shaft.
C. Round-ended pestle. 1-541.
D. Pecked edge-notched stone. 1-2628.
E. Pecked grooved stone. 1-70.
F. Abraded grooved stone. 1-437.
G. Cylindrical pestle. 1-953. Note short length.

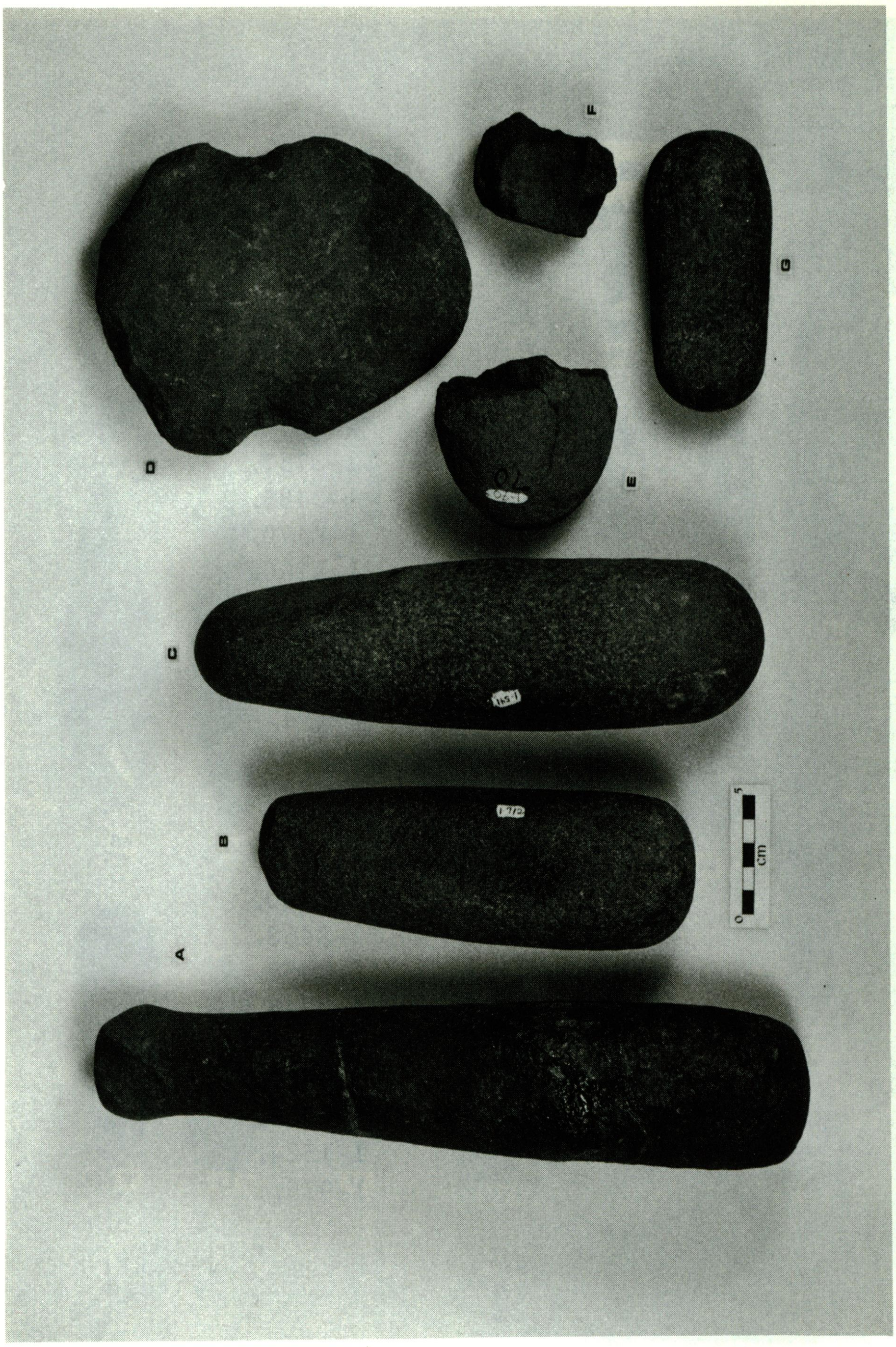
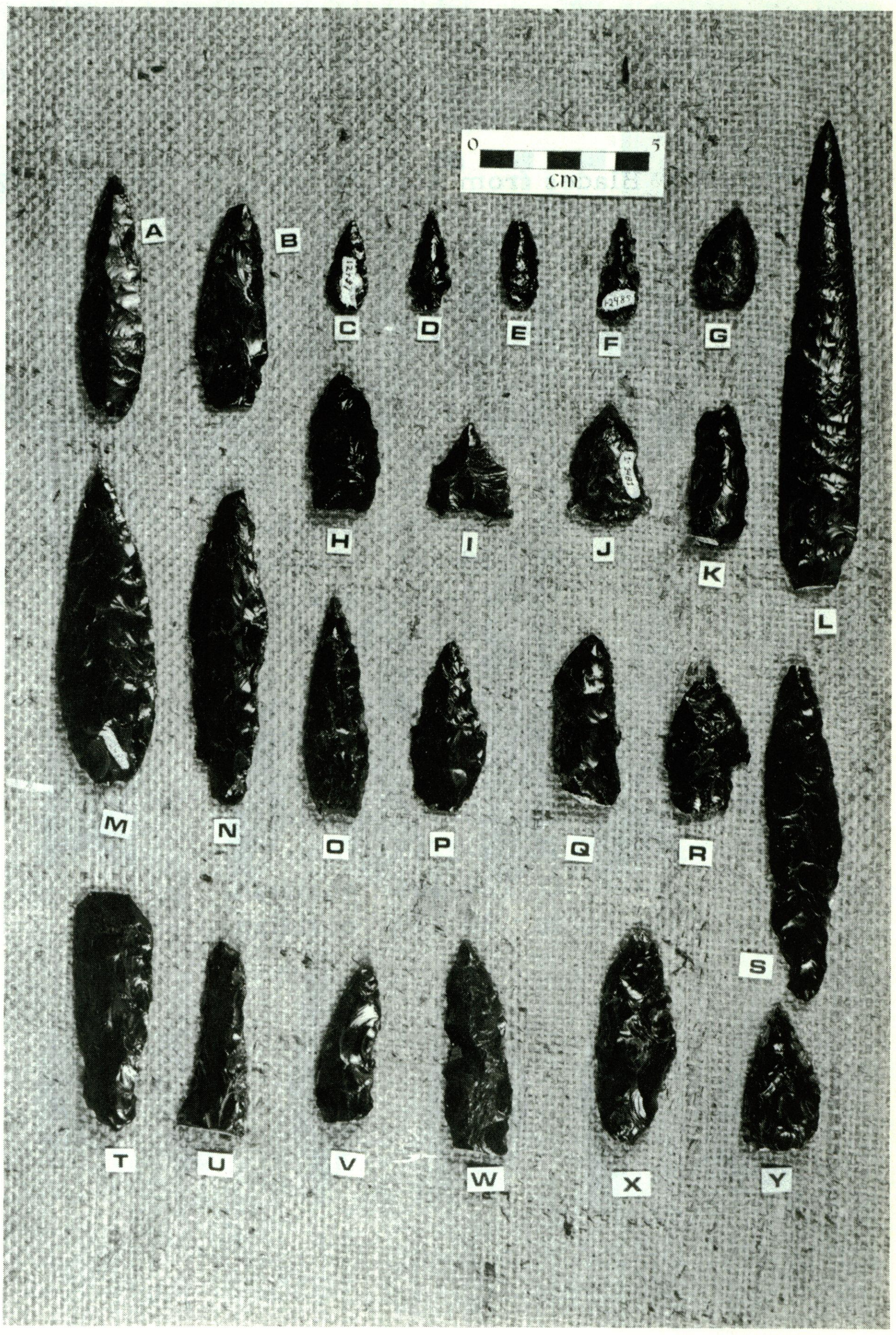


Plate 7

Plate 8. Obsidian blades from Ala-328.

A.	1-2788.
B.	1-1469.
C.	1-2767.
D.	1-2839.
E.	1-2757.
F.	1-2485.
G.	1-2470.
H.	1-2760.
I.	1-2471.
J.	1-1481.
K.	1-596.
L.	1-594.
M.	1-2483.
N.	1-2789.
O.	1-1241.
P.	1-2454.
Q.	1-2460.
R.	1-2468.
S.	1-2459.
T.	1-2748.
U.	1-1244.
V.	1-387.
W.	1-1480.
X.	1-1524.
Y.	1-975.



A. 30-281. obsidian.
B. 29-169. obsidian.
C. 1-140. flint.
D. 1-715. flint.
E. 1-1852. flint.
F. 30-282. obsidian.
G. 30-284. obsidian.
H. 30-295. obsidian.
I. 29-192. obsidian.
J. 30-288. phyllite.
K. 30-285. flint.
L. 29-166. obsidian.
M. 30-286. obsidian.
N. 30-275. chert.
O. 29-165. obsidian.
P. 1-2743. flint.
Q. 29-164. obsidian.
R. 30-279. obsidian.

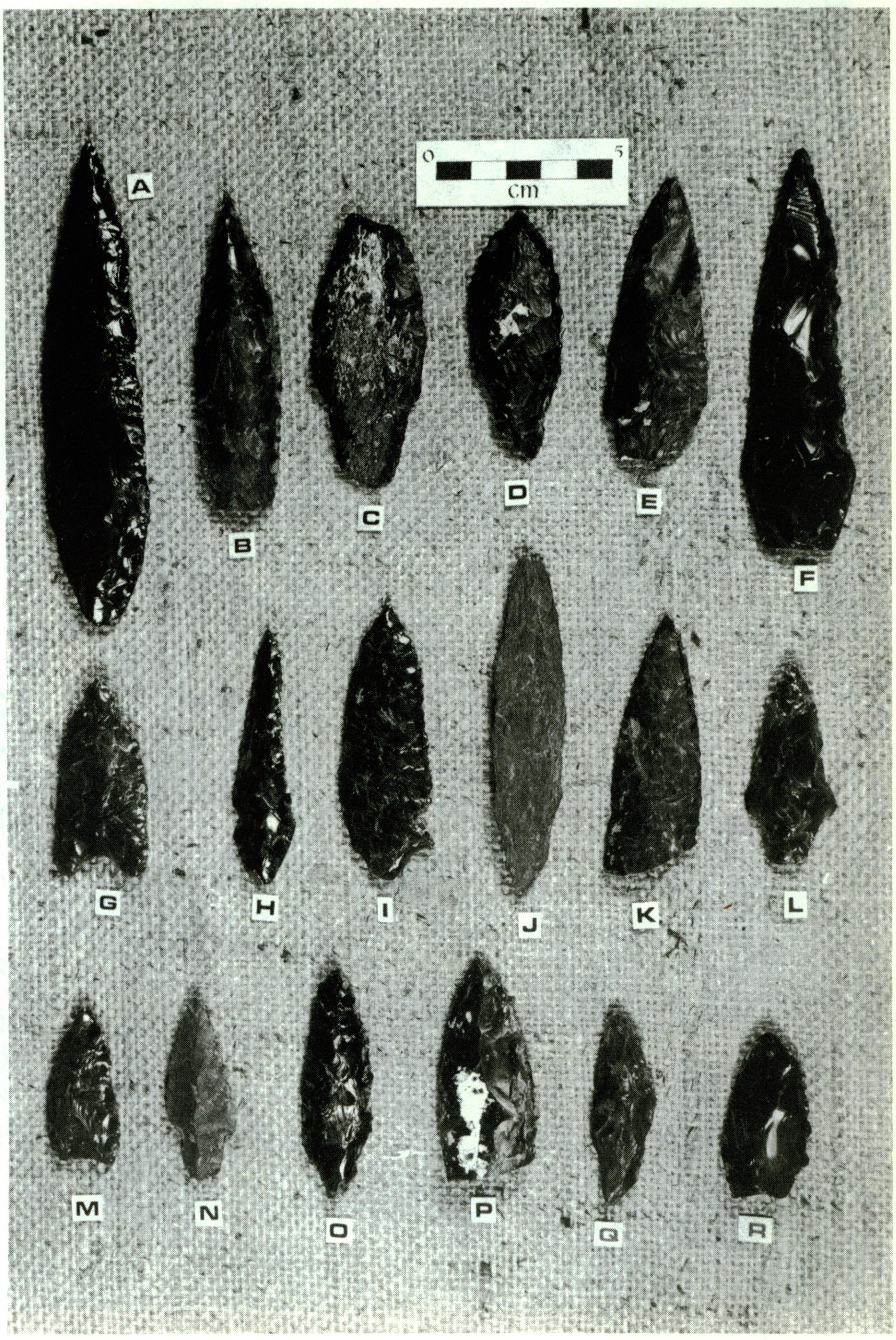


Plate 10. Chipped stone blades, other chipped stone, other artifacts.

A. Obsidian blade. 29-167.
B. Flint blade. 1-2772.
C. Flint blade. 29-168.
D. Flint blade. 29-172.
E. Chalcedony blade. 1-1846. Desert Sidenotched point.
F. Flint blade. 1-2762.
G. Flint blade. 29-170.
H. Jasper blade. 1-575.
I. Chert blade. 29-171.
J. Chert blade. 1-1041.
K. Obsidian reamer. 1-1080.
L. Non-obsidian flake scraper (thin edge flake knife). 1-2704.
M. Obsidian flake scraper. 1-2476.
N. Non-obsidian flake scraper. 1-1054.
O. Non-obsidian bifacially chipper scraper. 1-608.
P. Obsidian bifacially chipped scraper. 1-1432.
Q. Obsidian bifacially chipped scraper. 1-1627.
R. Non-obsidian small chopper. 1-2715.
S. Non-obsidian small chopper. 1-1523.
T. Mica ornaments. 1-2802.
U. Phyllite pieces. 1-1146.
V. Obsidian scraper plane. 1-1245.
W. Non-obsidian scraper plane. 1-1295.

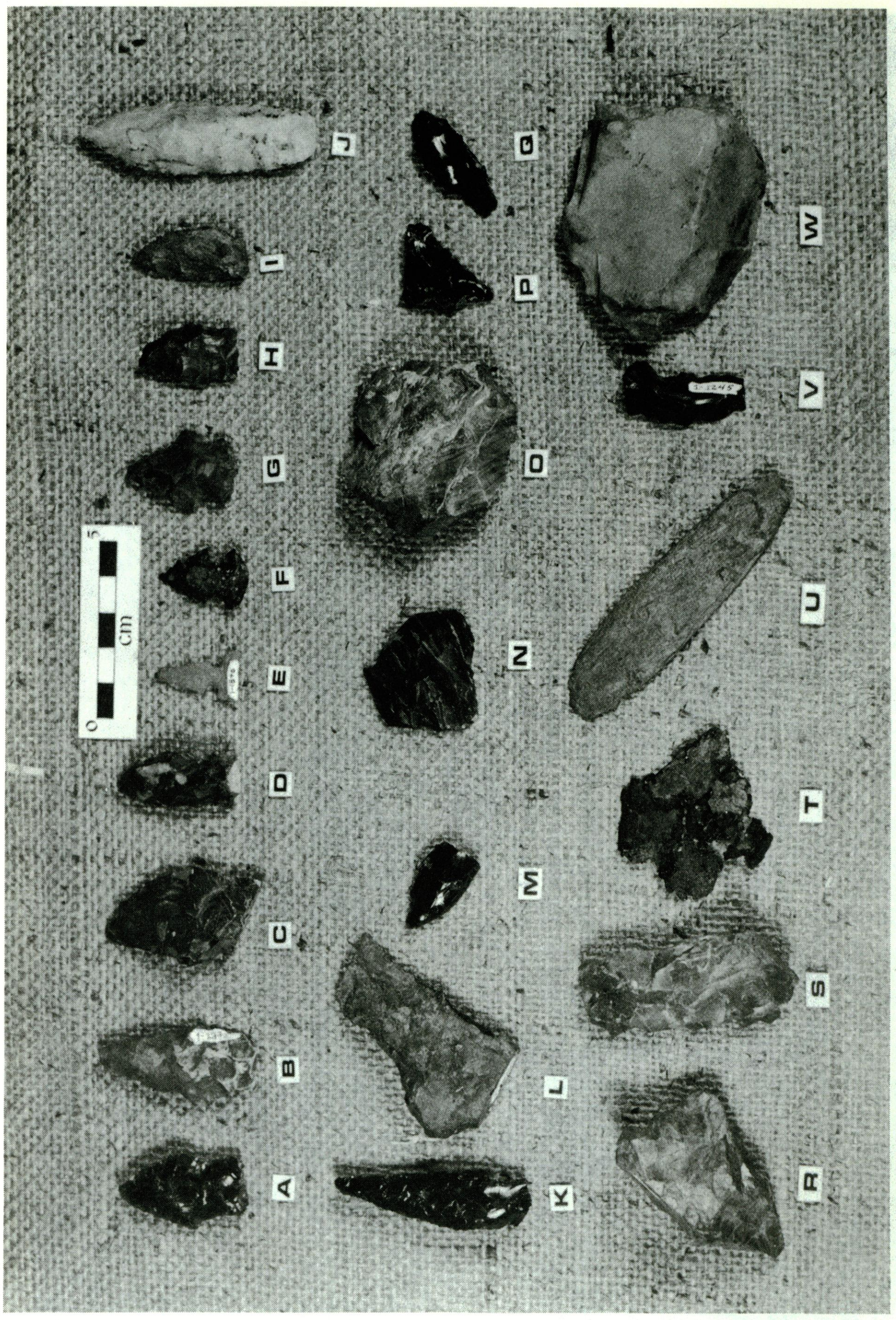


Plate 11. Charmstones and other artifacts.

A. Pointed longnecked tear-shaped charmstone. 30-424.
B. Knobbed longnecked tear-shaped charmstone. 1-1620.
C. Fragment of phallic charmstone. 12182.
D. Unperforated squat plummet charmstone. 30-244.
E. Squat phallic charmstone. 1-423.
F. Long phallic charmstone. 1-421.
G. Angular biconical charmstone. 1-1444.
H. Rounded longnecked tear-shaped charmstone. 1-847.
I. Miscellaneous pecked stone: sphere. 1-939.
J. Quartz cobble. 1-1263.
K. Perforated cigar-shaped charmstone. 30-248.

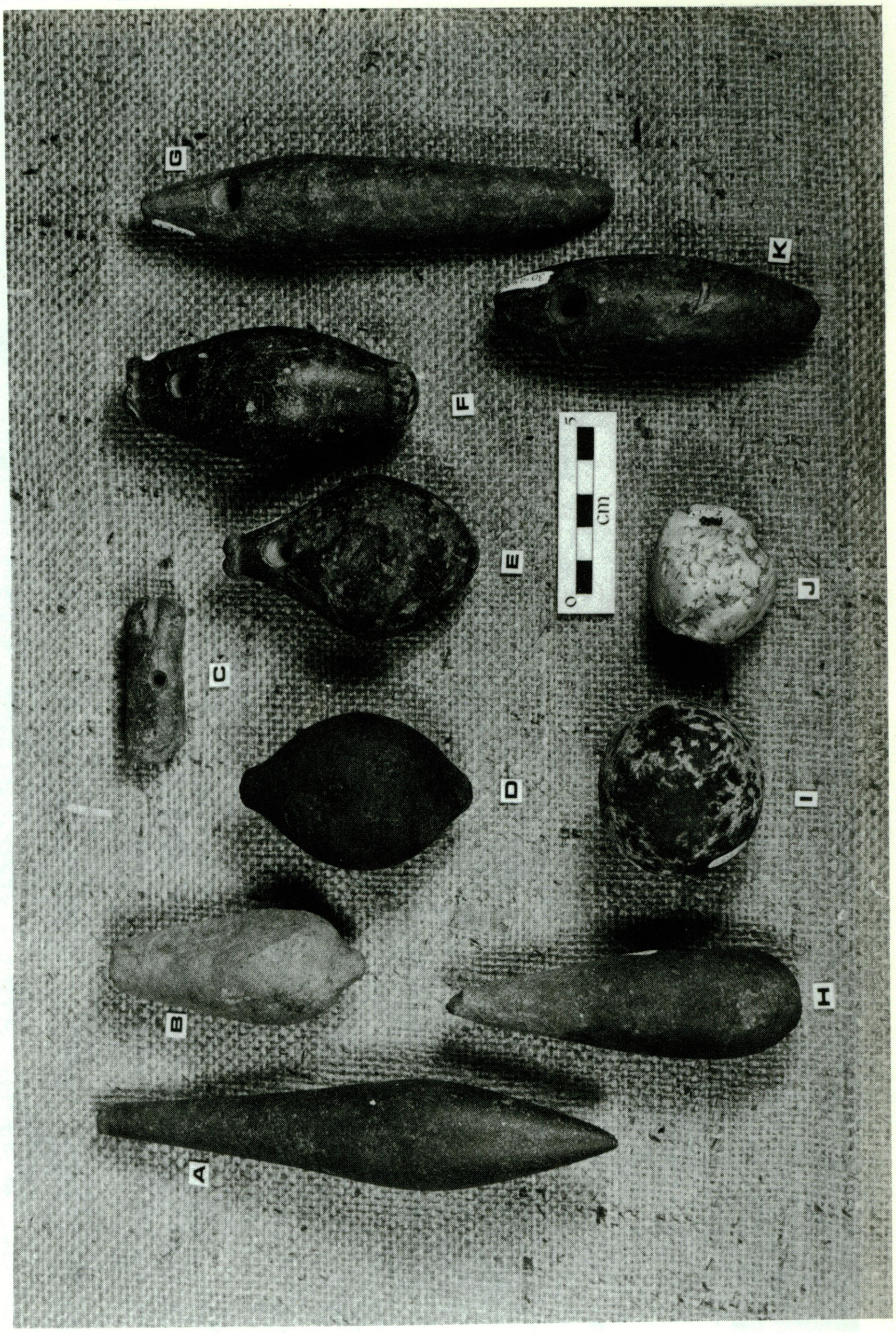


Plate 12. Pecked and ground stone artifacts.

A. Anvil hammerstone. 30-20.
B. Miniature mortar. 30-4.
C. Miniature mortar. 1-2666.
D. Pebble chipping hammer. 1-12.
E. Chipping hammer. 1-958.
F. Cobble chopper hammerstone. 1-1262.
G. Anvil hammerstone. 1-2658.
H. Miscellaneous grinding tool: mano-like artifact. 6524.
I. Abraded pecking stone. 1-247.
J. Miscellaneous grinding tool: anvil slab. 29-90.
K. Abraded rubbing stone. 1-325.
L. Miscellaneous pecked stone: pestle-like object. 1-2487.